Appendix F-1

Mojave River Watershed
Water Quality Management Plan for Shiloh West Medical

Anacal Engineering

January 26, 2023, Revised June 6, 2024

MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

Shiloh West Medical

N.W. CORNER OF PALMDALE RD AND MESA LINDA AVE, VICTORVILLE, CA

APN: 3103-561-20

Prepared for:

Martinez + Okamoto Architects, Inc

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Victorville, CA 92392

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Submittal Date: 01/26/23

Revision No. and Date: 1st Revision, 1/5/2024

Revision No. and Date: 2nd Revision 6/6/2024

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Revision No. and Date: Insert No and Current Revision Date

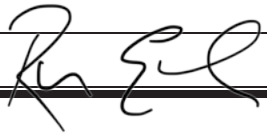
Final Approval Date:_____

Project Owner's Certification

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

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

Project Data			
Permit/Application Number(s):	Project No. 125752	Grading Permit Number(s):	PLAN23-00010
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			3103-561-20

Owner's Signature			
Owner Name: Shiloh Medical Center Inc.			
Title	CEO		
Company	Shiloh Medical Center Inc.		
Address	12984 Hesperia Rd #101, Victorville, CA 92395		
Email	pearle@shilohmc.com		
Telephone #	760-810-2229		
Signature		Date	5/3/2024

Preparer's Certification

Project Data			
Permit/Application Number(s):	Project No. 125752	Grading Permit Number(s):	PLAN23-00010
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 3103-561-20

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

Engineer: David C. Queyrel		PE Stamp Below
Title	President/R.C.E.	
Company	Anacal Engineering Co.	
Address	1211 N Tustin Avenue, Anaheim, CA 92807	
Email	Dave@anacalengineering.com	
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Signature	D C Queyrel	
Date	6-3-24	



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Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Shiloh West Medical				
Project Owner Contact Name:	Shiloh Medical Center Inc.				
Mailing Address:	12984 Hespena Rd. #101, Vicotrville, CA 92395	E-mail Address:		Telephone:	
Permit/Application Number(s):	Project No. 125752		Tract/Parcel Map Number(s):	APN: 3103-561-20	
Additional Information/ Comments:					
Description of Project:	The project is located in an undeveloped area of Victorville. Surrounding the property are undeveloped parcels except for the one commercial property to the west of the site. The project is currently zoned as C-1 for commercial development. The site currently is undeveloped without an existing address. Currently, the site is relatively flat with slopes ranging from 0-5%. Since the site is undeveloped, it's barren, making the existing impervious area 0%. The site sheet flows in a north direction from Palmdale Rd to the back of the site at a rate of roughly 1.5%. From there, the site follows the planned drain E-01, which outlets to the Mojave River per the Williams & Schmidt's Master Drainage Plan. The project is proposing developing a commercial plaza consisting of two buildings, parking drives, and landscaping areas. The project will be phased into two phases. Each will consist of its own drainage management areas and both outlet to the north of the development. Phase 1 is to be DMA-A. This area consists of roughly 1.57 acres. This area is composed of roughly 88.4% impervious surfaces. Impervious surfaces consist of parking, drive areas, and hardscapes such as sidewalks, curbs, and gutters. Runoff produced from the development will be captured with the use of curb and gutters that route storm water into catch basins. The catch basins are to be equipped with FloGard's certified trash capture device known as the Grate Inlet Basket (G.I.B). Once captured, runoff will be routed towards underground infiltration CMP chambers. These chambers are to be 60" CMP pipes with perforations to allow infiltration with 2.16 feet of rock underneath for additional storage. The system has been designed to completely infiltrate the DCV with a pump system set up to displace any overflow derived from the higher storms out Aster Rd. via 2-5” force mains out a parkway drain. It is during this phase that Aster Rd will be built along with an access road spanning from Aster Rd to the edge of phase 1 providing dual access to and from the site. the access road will be built in the place of phase 2. The access road will add roughly 10,344 s.f. of impermeable area out of the 57,935 sf available area for phase 2. This area will utilize impervious area dispersion for self-mitigation until phase 2 starts construction where the road will be removed and replaced with the proposed development. The road creates a DCV of 675cf where the dispersion achieves 1983cf of retention thus self-mitigating this portion of the site.				

	Phase 2 is to be DMA-B. During this phase, the access road will be removed and replaced with a full development plan as detailed on the site plan. DMA-B consists of roughly 1.33 acres of the overall 2.90-acre property. This area is composed of 82.3% impervious surfaces. The design of this area is similar to DMA-A as the runoff is collected in concrete gutters towards catch basins equipped with filters. Runoff is routed towards underground chambers where it will undergo infiltration. Overflow from the higher storms is set to be pumped out to Aster Rd through a separate parkway drain. Both areas will follow their original drainage path once outletted. The site experiences partial run-on from the neighboring properties. From the west, the adjacent parcel drains roughly 0.13 acres onto our property. From the east, the property only experiences roughly 1000 sf of run-on. Both areas plan to be mitigated with the use of vegetated swales as shown on the site plan. The site is subject to Hydromodification. The sizes of the chambers have been increased with restricted flow to mimic existing conditions and mitigate the 10-year, 24-hour storm, and the 100-year, 1-hour storm.
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	n/a

Section 2 Project Description

2.1 Project Information

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

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

2.1.1 Project Sizing Categorization

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

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

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):			
☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface
☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) *Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.*			

2 Project Area (ft2):	126,260 s.f.	**3** Number of Dwelling Units:	n/a	**4** SIC Code:	2834, 2095, 8011

5 Is Project going to be phased? Yes ☒ No ☐ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

2.2 Property Ownership/Management

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

Form 2.2-1 Property Ownership/Management

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

Ownershop of the project will be held with Shiloh Medical Center Inc. Long term maintenance will be the responsibility of the owners. This includes BMP maintenance of efficeint irrigation, landscape area and trash until the property is sold or transferred.

Shiloh Meical Center Inc.

12984 Hespena Rd. #101

Victorville, CA 92392

Contact: Elie Najm

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	From commercial and employee use
Nutrients - Phosphorous	E ☒	N ☐	Expected from Landscaped Areas
Nutrients - Nitrogen	E ☒	N ☐	Expected from Landscaped Areas
Noxious Aquatic Plants	E ☐	N ☒	N/A
Sediment	E ☒	N ☐	Expected from Landscaped Areas
Metals	E ☒	N ☐	Expected from commercial use/Vehicles
Oil and Grease	E ☒	N ☐	Expected from commercial use/Vehicles
Trash/Debris	E ☒	N ☐	From Commercial Use and surface area of streets
Pesticides / Herbicides	E ☒	N ☐	Expected from Landscaped Areas
Organic Compounds	E ☒	N ☐	Expected from Landscaped Areas
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

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

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.507246	Longitude -117.391689	Thomas Bros Map page
1 San Bernardino County climatic region: ☒ Desert			
2 Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*			

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 DMA A to Outlet 1	Using underground chambers to store and infiltraiton runoff. Any overflow from DMA-A will outlet to the north portion of the site via headwall and rip rap for velocity dissipation.
DA1 DMA B to Outlet 1	Using undergorund chambers to store and infiltrate runoff. Any overflow from DMA-B will outlet to the north portion of the site via headwall and rip rap for velocity dissipation.
DA2 to Outlet 2	

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	126,260			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	657			
6 Longest flowpath slope (ft/ft)	0.015			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural Cover Barren			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Poor			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*				
4 Hydrologic soil group *County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*				
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*				

Form 3-3 Watershed Description for Drainage Area

Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Not Applicable
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Sulfates, Fluoride, Sodium
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	-Desert Tortoise Habitat Cat 3 -Mojave Ground Squirrel
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

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

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

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

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The property owners shall become familiar with the requirements of this WQMP and the BMPs used on the site. The owners will provide education materials to tenants (if applicable) on BMPs and housekeeping practices that contribute to the protection of storm water.
N2	Activity Restrictions	☒	☐	The property owner shall control the discharge of the stormwater pollutants from this site through activity restrictions. Restrictions shall be provided to all new occupants, or other mechanisms upon first occupancy of the lease space and annually thereafter.
N3	Landscape Management BMPs	☒	☐	The property owner and landscape maintenance contractors will practice on going landscape maintenance BMPs consistent with applicable local ordinances and will regularly inspect the irrigation system for signs of erosion or sediment debris and clean/ repair them as needed.
N4	BMP Maintenance	☒	☐	Maintain in accordance with the WQMP.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Storage of hazordous material or waste on site must comply with all Title 22 CCR regualtions.
N6	Local Water Quality Ordinances	☒	☐	The owners shall comply with the City of Victorville's stormwater Ordinance through the implementation of BMP's.
N7	Spill Contingency Plan	☒	☐	Building operators shall prepare specific plans based on materials onsite for the cleanup of spills. plans shall mandate stock piling of cleanup materials, notification of agencies, disposal, and documentation. storage shall comply with Hazmat Regulations and any required contingency plans.
N8	Underground Storage Tank Compliance	☐	☒	Not Applicable

Form 4.1-1 Non-Structural Source Control BMPs				
N9	Hazardous Materials Disclosure Compliance	☐	☒	Not Applicable

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	The site shall conform to the building code requirements for fire saftey implementation and all fire code requirements, regardless of product stored.
N11	Litter/Debris Control Program	☒	☐	The owner shall be responsible for trash and litter to be swept from the site and dumped into a city approved dumpster with lids. The owner shall contract with the city of Victorville or local trash collector to empty dumpsters on a weekly basis.
N12	Employee Training	☒	☐	The owners will be familiar with onsite BMP's along with the maintenance required for them. Owner will check with the City and county at least once a year to obtain new updated education meterials and provide these to tenants.
N13	Housekeeping of Loading Docks	☐	☒	Not Applicable
N14	Catch Basin Inspection Program	☒	☐	Catch basins and filter liners shall be inspected and cleaned. At least 80% of the catch basins with filters must be inspected, cleaned and maintained on an annual basis with 100% of the completed every 2 years. Additional maintenance based off of manufactures specifications found in section 6 of this WQMP.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Street and parking areas will be swept regularly using a vaccum assisted sweeper. Frequency will depend on waste accumulations with a minimum of once per month and prior to the start of the rainy season.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not applicable- not a public agency project
N17	Comply with all other applicable NPDES permits	☒	☐	The developer will comply with the California statewide Construction General Permit during construction and all future occupants of the site shall comply with the requirements of the statewide General Stormwater Permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Provide signage at catch basins as shown on WQMP site plan which illistrate an anti-dumping message.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	Not applicable- this development does not include the storage of material outdoors.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash areas are to have rain right lids and shall be located away from storm drain inlets.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation systems shall be designed to each landscaped area's specific water needs. Provide smart controllerts to irrigation system and provide landscaping per approved landscape plan. Maintain irrigation system on a regualr basis to prevent overspray and leaks. Sweep silt back into planter areas and stablize with planting.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscpaed areas shall be below a minimum of 1" to 2" below the top of curb or walk.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	No slopes proposed.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No docks proposed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	None proposed.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No vehicle wash areas proposed within new development.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing areas proposed within new development.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No wash area on site. Owner will not allow outdoor processing area on this site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas onsite.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Not a hillside project
S14	Wash water control for food preparation areas	☐	☒	No food preperation area on site.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community car wash racks on site.

4.1.2 Site Design BMPs

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

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

Describe site design and drainage plan including:

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

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

Form 4.1-3 Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Using minimum parking and drive areas to serve project needs to maximize landscaped areas.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Providing underground chambers for capturing and infiltrating runoff.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☒ Explanation: After development, the time of concentration direction will be slightly decreased and proposed drainage pattern will follow existing condition.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation: Runoff is disconnected to the maximum extent possible. All runoff routed towards underground infiltraiton.
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: This project does not propose porous pavement.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: Project shows no existing vegetation and sensitve areas to protect.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☐ No ☒ Explanation: No re-vegetation areas on site.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: The infiltration areas will not be over-excavated and compacted as they are below grade.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: Using vegetation swales where available for drainage.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Staking areas to be landscaped to prevent compaction to be utilized during construction.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: Using infiltration cahmbers for LID devices, no barrels or cisterns are planned.
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: No streams near project.

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

San Bernardino County Special Districts:

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

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

Mojave Water Agency:

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

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

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

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

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

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

4.2 Treatment BMPs

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

4.2.1 Project Specific Hydrology Characterization

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

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

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

Methods applied in the following forms include:

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

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

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
[1] Project area DA 1 (ft^2): 126,260 S.F.	[2] Imperviousness after applying preventative site design practices (Imp%): 85.6	[3] Runoff Coefficient (Rc): _0.67 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.377 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.466 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] Compute design capture volume, DCV (ft^3): 6,449 cf *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

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

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

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 9121 cfs *Form 4.2-3 Item 12*	[2] 16 min *Form 4.2-4 Item 13*	[3] 2.32 cfs *Form 4.2-5 Item 10*
Post-developed	[4] 15,643cf *Form 4.2-3 Item 13*	[5] 8.6 min *Form 4.2-4 Item 14*	[6] 3.6 cfs *Form 4.2-5 Item 14*
Difference	[7] *6,522 cf* *Item 4 – Item 1*	[8] *7.4 min* *Item 2 – Item 5*	[9] *1.28* *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] *71.5%* *Item 7 / Item 1*	[11] *46.2%* *Item 8 / Item 2*	[12] *55.2%* *Item 9 / Item 3*

This was utilized to calculate the DCV for phase 2 interim condition. The DCV was used to show water quality compliance for the addition of the access road.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 2 (ft^2): 57,935	**2** Imperviousness after applying preventative site design practices (Imp%): 0.17	**3** Runoff Coefficient (Rc): _0.153 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.377 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.466

*P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*

6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

7 Compute design capture volume, DCV (ft^3): 675cf

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

*See Form 4.3-2 for Impervious Area Dispersion Calculations

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

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	Barren							
2a Hydrologic Soil Group (HSG)	A							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	126,260 sf							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	78							
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	Mixed	Mixed						
2b Hydrologic Soil Group (HSG)	A	A						
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	68,542 sf	57,718 sf						
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	90	86						

5 Pre-Developed area-weighted CN: 78	**7** Pre-developed soil storage capacity, S (in): 2.82 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 0.564 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 88	**8** Post-developed soil storage capacity, S (in): 1.36 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 0.272 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.62 in
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 9,121 cf
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 15,643 cf
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft^3): 5,740 cf
*Vhydro = (Item 13 * 0.95) – Item 12*

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

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

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	657				417	342		
2 Change in elevation (ft)	9.6				5.45	2.57		
3 Slope (ft/ft), *S_o = Item 2 / Item 1*	0.015				0.013	0.0075		
4 Land cover	Barren				Mixed Com.	Mixed Com.		
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	16 min				8.5 min	9 min		
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	0				20	45		
7 Cross-sectional area of channel (ft^2)	N/A				0.196	0.196		
8 Wetted perimeter of channel (ft)	N/A				1.57	1.57		
9 Manning's roughness of channel (n)	N/A				0.009	0.009		
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	N/A				4.68	3.55		
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	N/A				0.07	0.21		
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	16 min				8.6 min	9.2 min		
13 Pre-developed time of concentration (min): 16 min *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): 8.6 min *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet hydromodification requirement (min): 6.6 min *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14*								

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

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*		0.95			1.48	1.42	
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		2.9			1.57	1.33	
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.144			0.116	0.177	
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0.42			0.2	0.27	
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.06			0.023	0.047	
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		2.32			2.06	1.64	
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*	0.93	
	DMA B		*n/a*		1	*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: 2.32 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: -- *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: -- *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): 2.32 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: 2.06 *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: 3.6 *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): 3.6 *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): 1.1 cfs *$Q_{p\text{-}hydro}$ = (Item 14 * 0.95) – Item 10*		

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

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

> Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

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

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

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

If the combination of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

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

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

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

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

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ *Refer to Section 5.3.2.1 of the TGD for WQMP*
If Yes, Provide basis: (attach)
[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ *See Section 3.5 of the TGD for WQMP and WAP*
If Yes, Provide basis: (attach)
[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.* *If no, then proceed to Item 8 below.* [8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.* *If no, then proceed to Item 9, below.* [9] All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Site Design BMPs.*

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive

with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☒ No ☐ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA 2 DMA B BMP Type Impervious Area Dispersion	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)	10,344		
3 Ratio of pervious area receiving runoff to impervious area	4.6		
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	1,983		
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 1,983cf *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 Site Design BMPs (DA 1)

Form 4.3-2 cont. Site Design BMPs (DA 1)

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

4.3.3 Infiltration BMPs

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

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

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

4.3.3.1 Allowed Variations for Special Site Conditions

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

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

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

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

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

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

1 Remaining LID DCV not met by site design BMP (ft^3): 6,449 cf *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type Infil. Trench	DA 1 DMA B BMP Type Infil. Trench	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	18.0	3.0	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	1.75	1.75	
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	10.28	1.7	
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48 hr	48hr	
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a	n/a	
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	n/a	n/a	
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	1,525 sf	1,820 sf	
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	
10 Amended soil porosity	n/a	n/a	
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	2.16	2	
12 Gravel porosity	0.4	0.4	
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	8,058cf	9004 cf	

16 Total Retention Volume from LID Infiltration BMPs: 17,062 cf *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 265% *Retention% = Item 16 / Form 4.2-1 Item 7*

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

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.4 Biotreatment BMP

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

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)

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

Form 4.3-5 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

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

Form 4.3-6 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

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

Form 4.3-7 Flow Based Biotreatment (DA 1)

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

4.3.5 Conformance Summary

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

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 6,449 cf *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): 1,983cf *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 17,062 cf *Copy Item 16 in Form 4.3-3*

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

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

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

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

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

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

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

4.3.6 Hydromodification Control BMP

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

Form 4.3-9 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 5,740 cf *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 19,045 cf *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): 0 cf *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): n/a

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

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

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

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

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

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

4.4 Alternative Compliance Plan (if applicable)

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

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

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

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

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

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

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

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

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

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

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

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Signage and stencil	Owner	Inspect stenciling and/ or signs and perform necessary maintenance as required.	Annually
Catch basins/ Insert filter; FloGard Filter Inserts	Owner	Inspect Catch basins, maintenance should be implemented between storm events if basket is at more than 75% capacity. Maintenance must be implemented immediately if basket is at 100% capacity and in bypass. Clean debris using industrial vacuum. If minor damage to the baskets is found, it shall be corrected on the spot and made note on maintenance record. If more extensive deficiencies are found that cannot be fixed on-site, replace baskets as required.	Once prior, during and following the rainy season on October 15 and after significant rain events.
Litter/Debris control Program	Owner	Inspect and clean site. Dispose of litter and debris by vacuume-sweeping streets and collecting in the trash receptacle.	Weekly
Landscape Management	Owner	Landscape management shall include smart water controllers and planting in accordance with the approved landscape plans.Damaged vegetation shall be replaced in-kind. Hire contractor familiar with San Bernardino county guidelines for use of fertilizers and pesticides.	Bi-weekly

		Pesticide application shall be done by a certified applicator.	
Use efficient Irrigation systems	Owner	Maintain irrigation system on a regular basis to prevent overspray and leaks. Seep silt back into planter areas and stablize with planting.	Monthly
Trash Enclosure	Owner	Empty trash receptacles. Clean and clear the areas around the enclsures by sweeping.	Weekly
Undergrou nd CMP Chambers	Owner	CMP infiltration system should be cleaned when an inspection reveals accumulated sediment of 3" or trash is clogging the system. Schedule cleaning during dry weather. Follow maintenance per manufactures recommendations attached in education materials.	Once prior to rainy season- Oct 15th and after significant rainfall.
Stormwat er Pump	Owner	In accordance to what the manufacture recommends.	Once yearly prior to rainy season.

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

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

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

6.2 Electronic Data Submittal

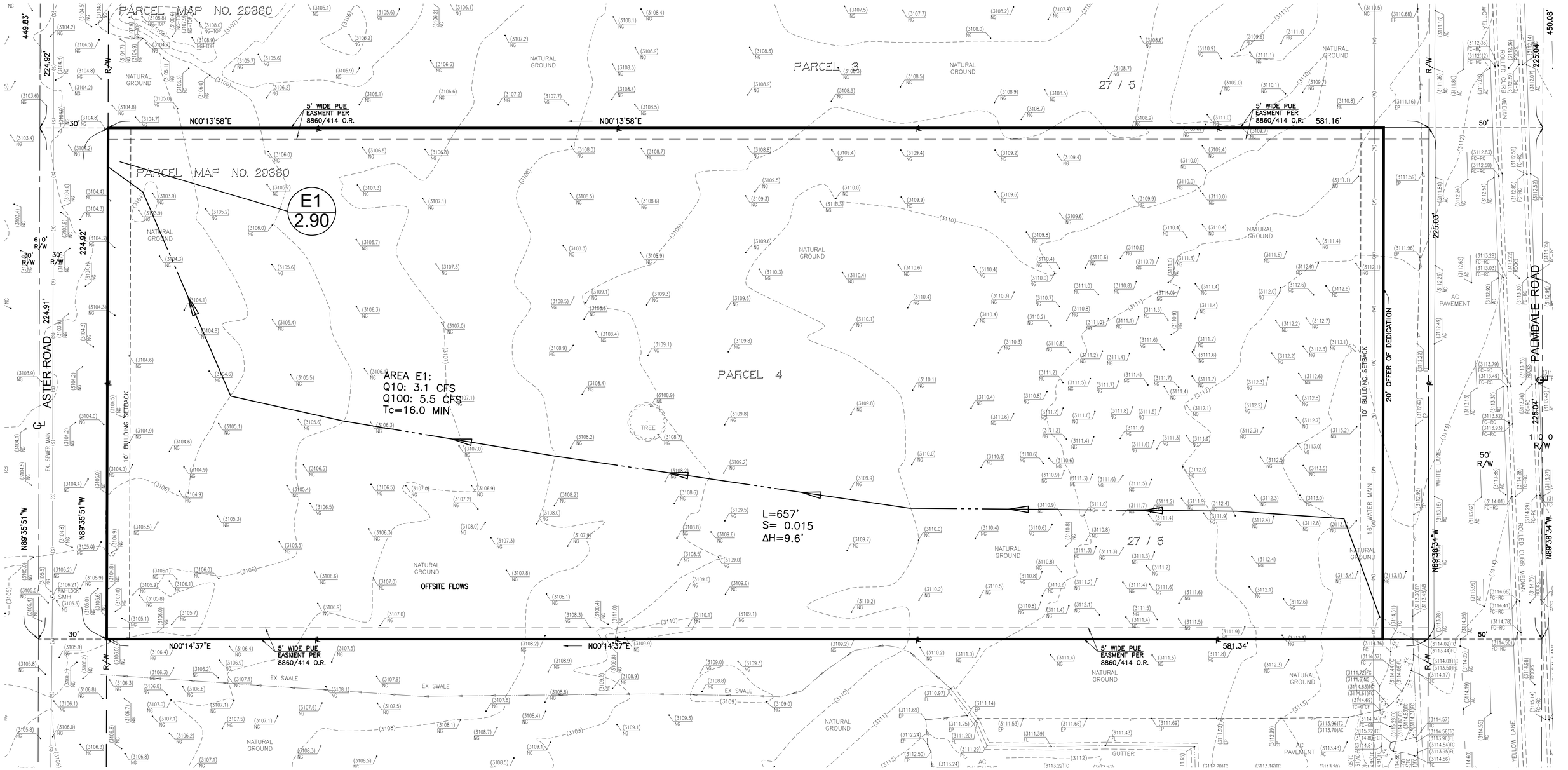
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents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

6.3 Post Construction

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

6.4 Other Supporting Documentation

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



LEGEND

— DRAINAGE PATH

— DRAINAGE BOUNDARY

E1 / 1.36 — AREA DESIGNATION / ACRES

AREA CALCULATIONS

TOTAL AREA: 126,260 S.F. (2.90 AC)

GRAPHIC SCALE

20 15 10 5 0 10 20 40 60

(IN FEET)
1 INCH = 20 FT.

Know what's **below**. **Call** before you dig.

PREPARED BY:

ANACAL ENGINEERING CO.
CIVIL ENGINEERING & LAND SURVEYING
1211 NORTH TUSTIN AVENUE
ANAHEIM, CALIFORNIA 92807
PHONE: 714-774-1763 FAX: 714-774-4690
E-MAIL ADDRESS: ANACAL@ANACALENGINEERING.COM

JOB NO. 22-029-GP

CITY CASE NO. XXX

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 CIVIC DRIVE, VICTORVILLE, CA. 92392 PHONE: 760-955-5158

APPROVED BY:

BRIAN W. GENGLER, RCE C44730 — DATE
CITY ENGINEER

REVISION			
NO.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT

FIELD BOOK NO. XXXXX

BENCHMARK NO. V-220

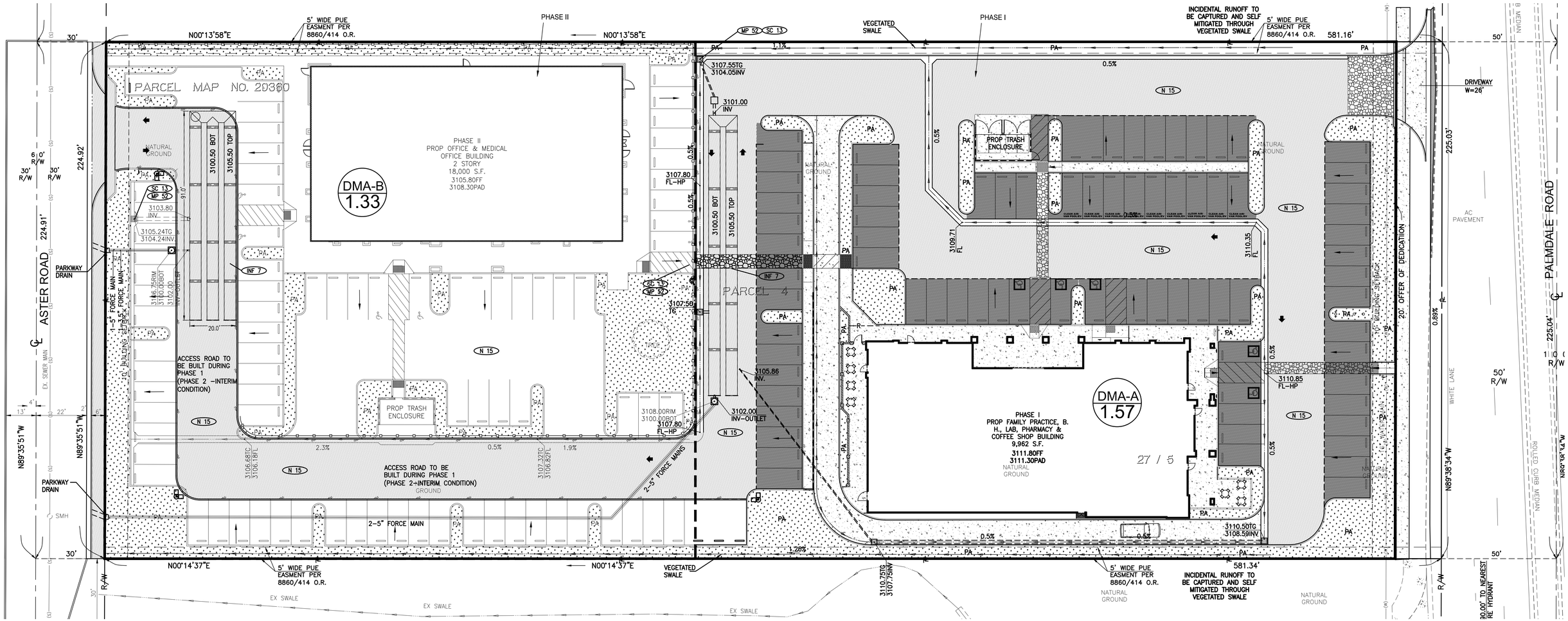
ELEVATION: 3090.38'

SHILOH WEST MEDICAL
REDEVELOPED SITE PLAN

PALMDALE ROAD - APN 3103-561-20

DESIGNED BY: D. C. Q.
DRAWN BY: V. F. L.
CHECKED BY: D. C. Q.
DATE: 05-31-24

SHEET NO.
1 OF 1



AREA CALCULATIONS

TOTAL AREA: 126,260 S.F. (2.90 AC)

PHASE 1
AREA: 68,542 S.F. (1.57 AC)
LANDSCAPE: 7,984 S.F.
HARDSCAPE: 60,558 S.F.

PHASE 2
AREA: 57,718 S.F. (1.33 AC)
LANDSCAPE: 10,220 S.F.
HARDSCAPE: 47,498 S.F.

PHASE 2-INTERIM CONDITION
AREA: 57,718 S.F. (1.33 AC)
LANDSCAPE: 47,374 S.F.
HARDSCAPE: 10,344 S.F.

FloGard® Grate Inlet Basket - Capacities*

Catch Basin Size	Hydraulic Capacity: Filtered Flow (CFS) Empty	25% Full	50% Full	75% Full	Peak/ Bypass Flow (CFS)	Storage Capacity (CF)
12x12	5.75	4.31	2.88	1.44	1.21	0.75
16x16	7.95	5.97	3.98	1.99	1.61	1.33
18x18	9.11	6.83	4.55	2.28	1.81	1.69
18x36	14.38	10.79	7.19	3.60	2.71	3.38
24x24	12.78	9.59	6.39	3.20	2.41	3.00
24x36	16.62	12.47	8.31	4.16	3.01	4.50
36x36**	28.77	21.57	14.38	7.19	5.42	6.75
36x48**	33.24	24.93	16.62	8.31	6.03	9.00

Notes:
* Additional sizes available per region and request. Please speak with an Oldcastle Infrastructure representative for more detailed information.
** Systems noted are comprised of (2) FloGard® GIBs in parallel

CATCH BASIN INSERTS (FLOWGARD G.I.B.)

LEGEND

- DRAINAGE PATH
- DRAINAGE BOUNDARY
- DMA–A 1.36 — AREA DESIGNATION / ACRES
- PROPOSED LANDSCAPE AREA
- PROPOSED HARDSCAPE AREA (PHASE 1)

BMP'S

- N 15 — STREET SWEEPING PARKING LOT
- INF 7 — UNDERGROUND INFILTRATION
- N 14 — CATCH BASIN MAINTENANCE
- MP 52 — CATCH BASIN INSERT (FLOGARD G.I.B.)
- SC 13 — STORM DRAIN SIGNAGE

GRAPHIC SCALE
20 15 10 5 0 10 20 40 60
(IN FEET)
1 INCH = 20 FT.

Know what's **below.** Call before you dig.

PREPARED BY:
ANACAL ENGINEERING CO.
CIVIL ENGINEERING & LAND SURVEYING
1211 NORTH TUSTIN AVENUE
ANAHEIM, CALIFORNIA 92807
PHONE: 714–774–1763 FAX: 714–774–4690
E–MAIL ADDRESS: ANACAL@ANACALENGINEERING.COM

JOB NO. 22-029-GP

CITY CASE NO. XXX

CITY OF VICTORVILLE
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14343 CIVIC DRIVE, VICTORVILLE, CA. 92392 PHONE: 760-955-5158
APPROVED BY:

BRIAN W. GENGLER, RCE C44730 — DATE
CITY ENGINEER

REVISION NO.	DESCRIPTION	DATE	APPROVED

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT

FIELD BOOK NO. XXXXX
BENCHMARK NO. V–220
ELEVATION: 3090.38'

SHILOH WEST MEDICAL
WQMP SITE PLAN

PALMDALE ROAD - APN 3103-561-20

DESIGNED BY: D. C. Q.
DRAWN BY: V. F. L.
CHECKED BY: D. C. Q.
DATE: 05–01–23

SHEET NO.
1 OF 3

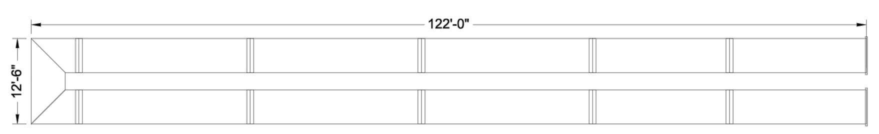
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 247 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 8,000 CF
- PIPE STORAGE VOLUME = 4,840 CF
- BACKFILL STORAGE VOLUME = 3,218 CF
- TOTAL STORAGE PROVIDED = 8,058 CF
- STONE VOID = 40%

PIPE DETAILS
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 30"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 26"



ASSEMBLY
SCALE: 1" = 20'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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

CONTECH CMP DETENTION SYSTEMS — CONTECH DYODS DRAWING

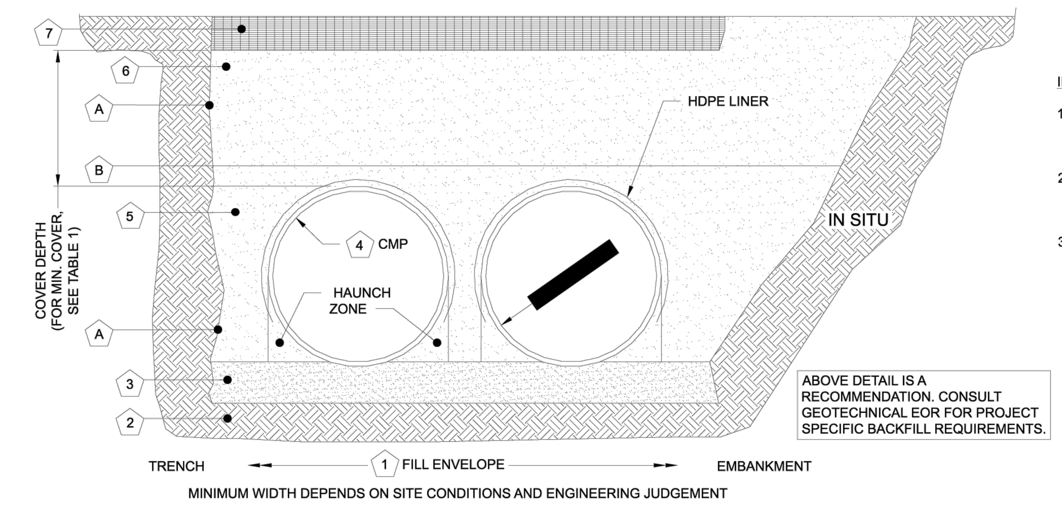
DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM

PROJECT No.: 17351	SEQ. No.: 26153	DATE: 5/31/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

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

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



INSTALLATION NOTES

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

TABLE 2: PERFORATED STANDARD

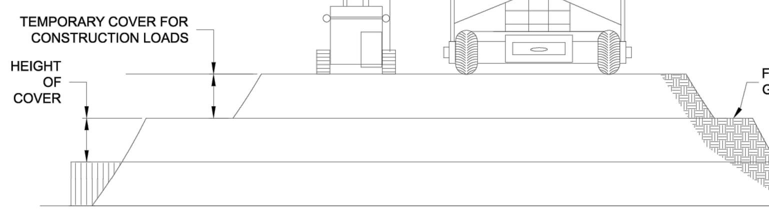
CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

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

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5 INCLUDE CA-7, MIDOT 6AA, 6A, OR 5G, PROVIDED THEY MEET THE PARTICLE SIZES INDICATED.

MANUFACTURER RECOMMENDED BACKFILL
NOT TO SCALE

DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM
PROJECT No.: 17351 SEQ. No.: 26153 DATE: 5/31/2024 DESIGNED: DYO DRAWN: DYO CHECKED: DYO APPROVED: DYO SHEET NO.: 1



CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM
SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

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

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

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

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

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

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

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

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

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

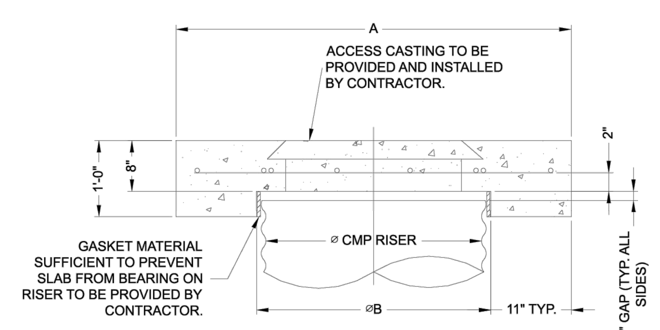
GALVANIZED: AASHTO M-36 OR ASTM A-760

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

ALUMINUM: AASHTO M-196 OR ASTM B-745
APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

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

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

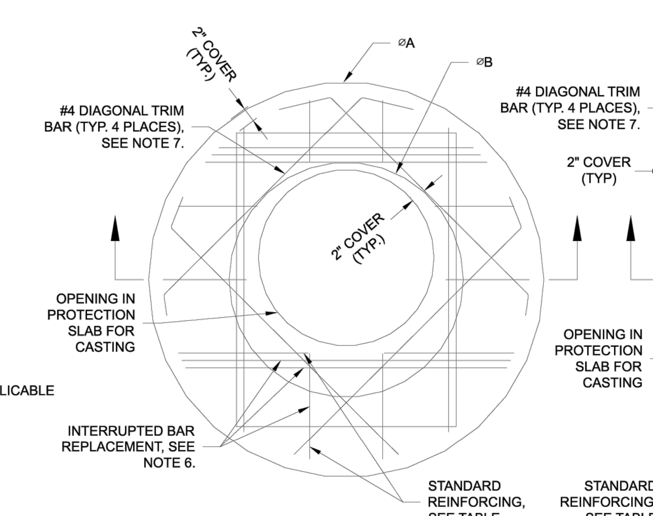


SECTION VIEW

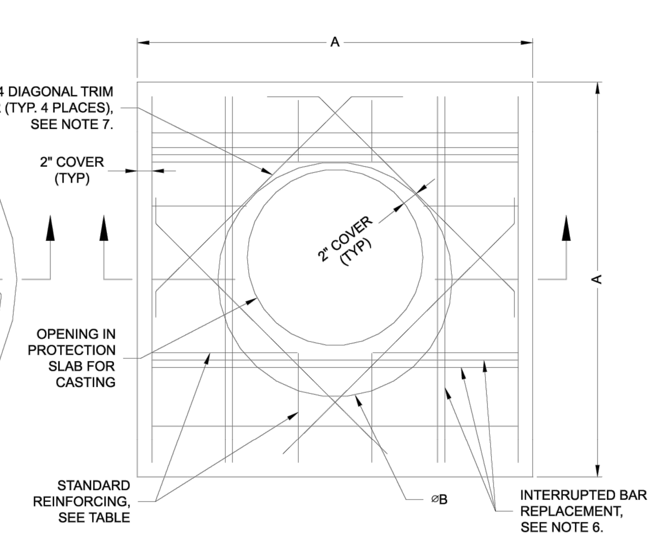
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW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

REINFORCING TABLE

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

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

MANHOLE CAP DETAIL
SCALE: N.T.S.

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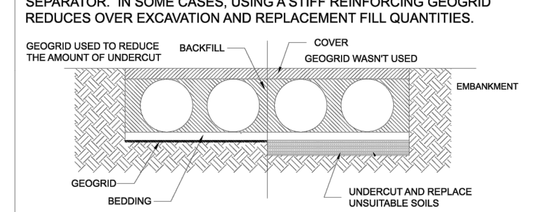
CMP DETENTION INSTALLATION GUIDE

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

FOUNDATION

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

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

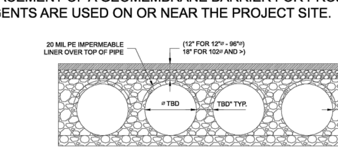


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING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

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

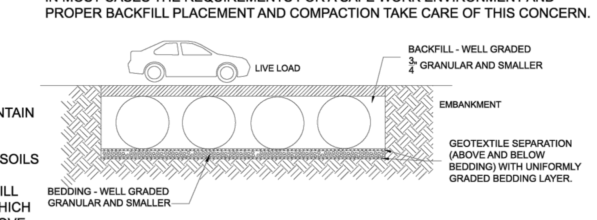
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

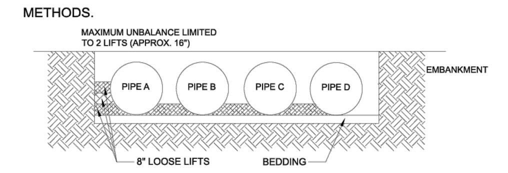
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION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

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



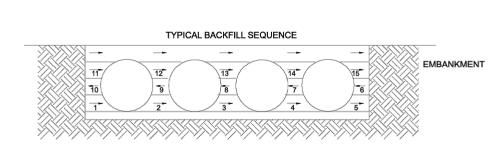
BACKFILL PLACEMENT

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

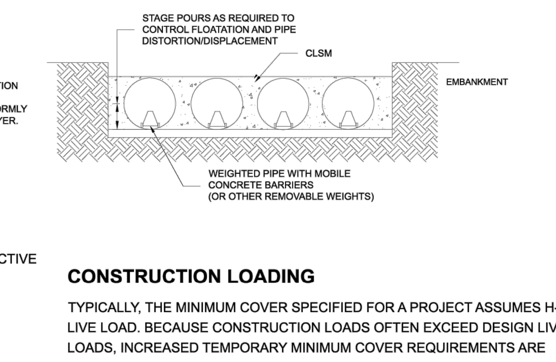


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE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

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



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

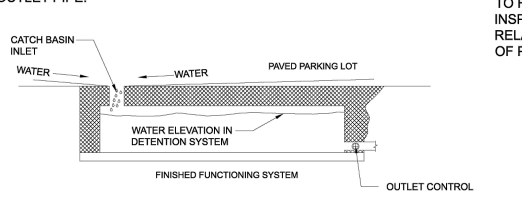


CONSTRUCTION LOADING

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

ADDITIONAL CONSIDERATIONS

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



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

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

INSPECTION

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

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

MAINTENANCE

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

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

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

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

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

DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM

Know what's **below**. Call before you dig.

PREPARED BY:
ANACAL ENGINEERING CO.
CIVIL ENGINEERING & LAND SURVEYING
1211 NORTH TUSTIN AVENUE
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JOB NO. 22-029-GP

CITY CASE NO. XXX

CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 CIVIC DRIVE, VICTORVILLE, CA. 92392 PHONE: 760-955-5158
APPROVED BY:

BRIAN W. GENGLER, RCE C44730 — DATE
CITY ENGINEER

REVISION

NO.	DESCRIPTION	DATE	APPROVED

FIELD BOOK NO. XXXXX
BENCHMARK NO. V-220
ELEVATION: 3090.38'

SHILOH WEST MEDICAL
WQMP DETAILS -PHASE 1

PALMDALE ROAD - APN 3103-561-20

DESIGNED BY: D. C. Q.	SHEET NO.
DRAWN BY: V. F. L.	
CHECKED BY: D. C. Q.	2 OF 3
DATE: 05-01-23	

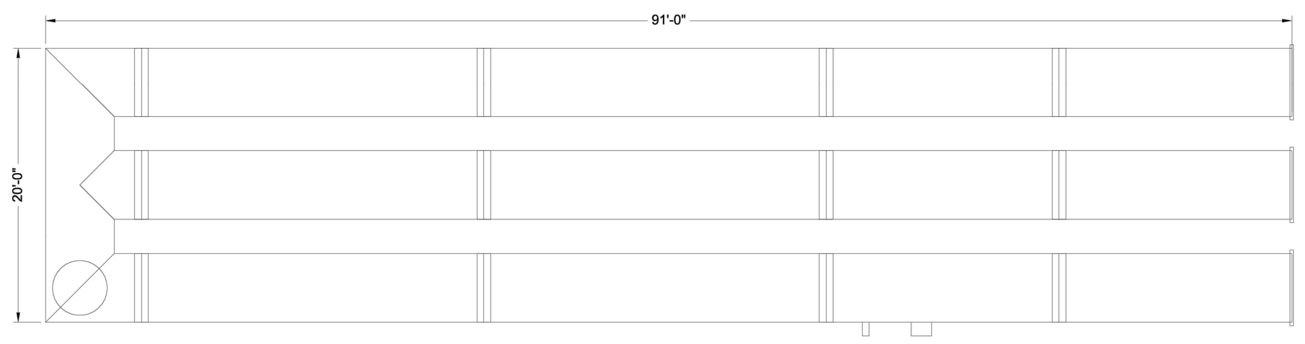
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 278 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 9,000 CF
- PIPE STORAGE VOLUME = 5,459 CF
- BACKFILL STORAGE VOLUME = 3,545 CF
- TOTAL STORAGE PROVIDED = 9,004 CF
- STONE VOID = 40%

PIPE DETAILS
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 30"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 24"



ASSEMBLY
SCALE: 1" = 10'

NOTES
- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

C:\USERS\JEREMY.JOHNSON\DOCUMENTS\DYO\CMP_V10.DWG 10/18/2019 10:02 AM

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

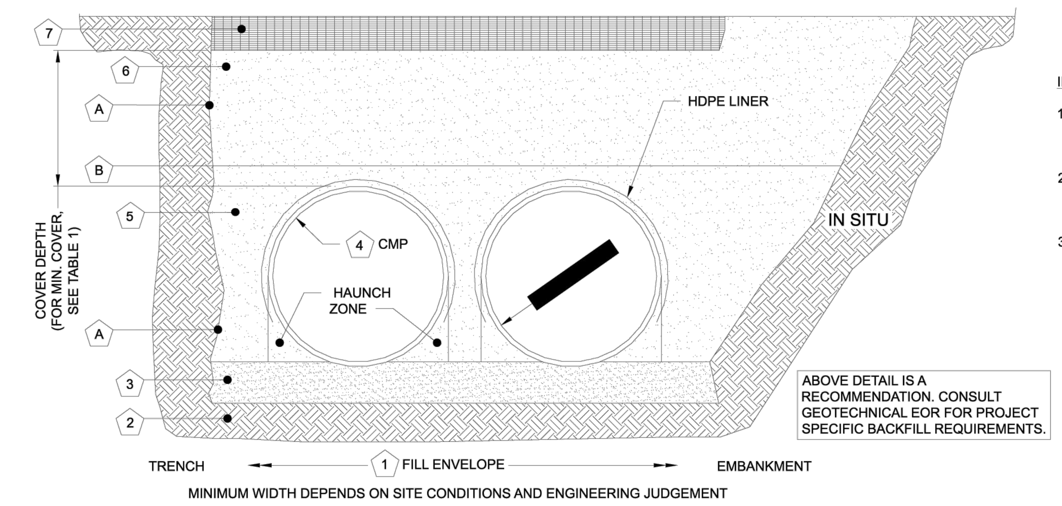
DYO26157 Shiloh West Medical
Infiltration System-Phase 2
Victorville, CA
DETENTION SYSTEM

PROJECT No.: 17351	SEQ. No.: 26157	DATE: 5/29/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		1

TABLE 1:

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

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



INSTALLATION NOTES

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

TABLE 2: PERFORATED STANDARD

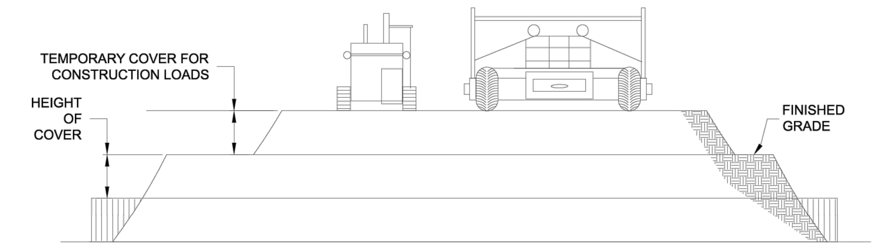
CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

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

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- * APPROVED REGIONAL EQUIVALENTS FOR SECTION 5 INCLUDE CA-7, MIDOT 6AA, 6A, OR 5G, PROVIDED THEY MEET THE PARTICLE SIZES INDICATED.

MANUFACTURER RECOMMENDED BACKFILL
NOT TO SCALE

DYO26157 Shiloh West Medical
Infiltration System-Phase 2
Victorville, CA
DETENTION SYSTEM



CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM
SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

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

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

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

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

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

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

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

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

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

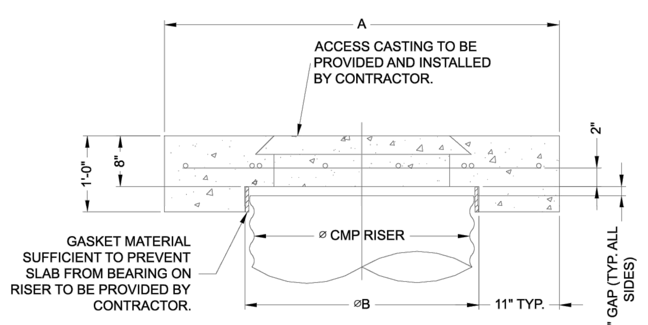
GALVANIZED: AASHTO M-36 OR ASTM A-760

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

ALUMINUM: AASHTO M-196 OR ASTM B-745
APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

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

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

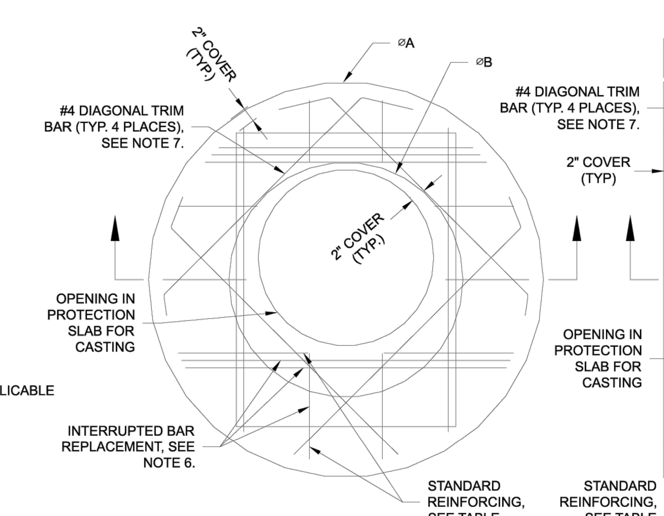


SECTION VIEW

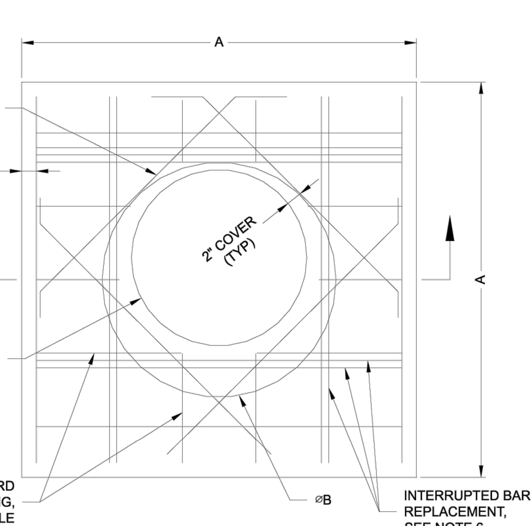
REINFORCING TABLE

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

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

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

MANHOLE CAP DETAIL
SCALE: N.T.S.

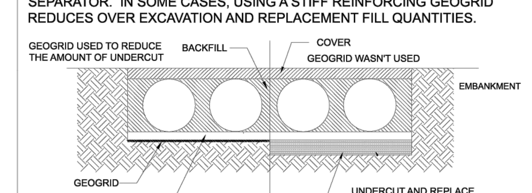
CMP DETENTION INSTALLATION GUIDE

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

FOUNDATION

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

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

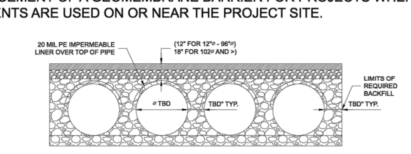


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING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

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

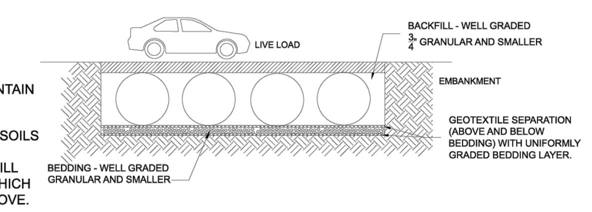
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

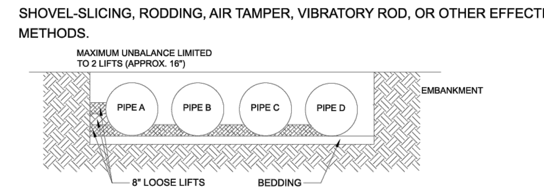
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION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

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



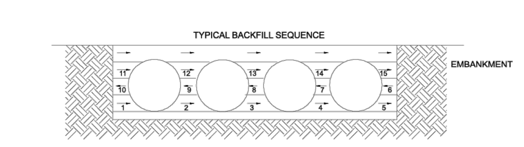
BACKFILL PLACEMENT

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

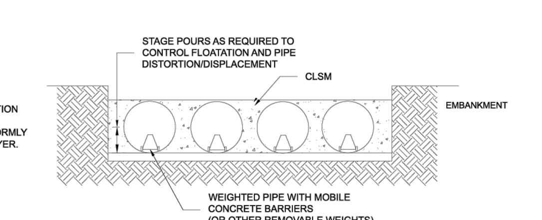


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE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

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



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

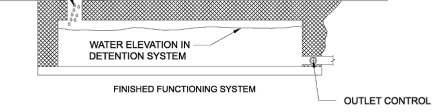


CONSTRUCTION LOADING

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

ADDITIONAL CONSIDERATIONS

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



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

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

INSPECTION

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

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

MAINTENANCE

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

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

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

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

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

Know what's **below**. **Call** before you dig.

PREPARED BY: JOB NO. 22-029-GP
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CITY OF VICTORVILLE
ENGINEERING DEPARTMENT
14343 CIVIC DRIVE, VICTORVILLE, CA. 92392 PHONE: 760-955-5158
APPROVED BY:

BRIAN W. GENGLER, RCE C44730 DATE
CITY ENGINEER

REVISION

NO.	DESCRIPTION	DATE	APPROVED

FIELD BOOK NO. XXXXX
BENCHMARK NO. V-220
ELEVATION: 3090.38'

SHILOH WEST MEDICAL
WQMP DETAILS-PHASE 2

PALMDALE ROAD - APN 3103-561-20

DESIGNED BY: D. C. Q.	SHEET NO.
DRAWN BY: V. F. L.	
CHECKED BY: D. C. Q.	3 OF 3
DATE: 05-01-23	

Education Materials

Shiloh West Medical Center
Site: Palmdale & Mesa Linda Rd.

INF-7: Underground Infiltration

Underground infiltration is a vault or chamber with an open bottom that used to store runoff and percolate into the subsurface. A number of vendors offer proprietary infiltration products that allow for similar or enhanced rates of infiltration and subsurface storage while offering durable prefrabricated structures. There are many varieties of proprietary infiltration BMPs that can be used for roads and parking lots, parks and open spaces, single and multi-family residential, or mixed-use and commercial uses.

Also known as:

- *Infiltration vault*
- *Recharge vault*



Underground Infiltration

Source: http://www.contech-cpi.com

Feasibility Screening Considerations

- Infiltration bains shall pass infeasible screening criteria to be considered for use.
- Underground infiltration galleries pose a potential risk of groundwater contamination; pretreatment should be used.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Appropriate for sites with limited surface space.
- Can be placed beneath roads, parking lots, parks, and athletic fields.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, sngle-family and multi-family, roads and parking lots, and parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)

☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.

☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should not be directed to the facility.

☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.

☐ Design infiltration rate should be determined as described **in Appendix VII**.

☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

☐ For infiltration facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.

Computing Underground Infiltration Device Size

Underground infiltration devices vary by design and by proprietary designs. The sizing method selected for use must be based on the BMP type it most strongly resembles.

- For underground infiltration devices with open pore volume (e.g., vaults, crates, pipe sections, etc), sizing will be most similar to infiltration basins.
- For underground infiltration devices with pore space (e.g., aggregate reservoirs), sizing will be most similar to permeable pavement.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**

Drain Inserts MP-52

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

CASQA California Stormwater Quality Association

one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

Street Sweeping and Vacuuming SE-7



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

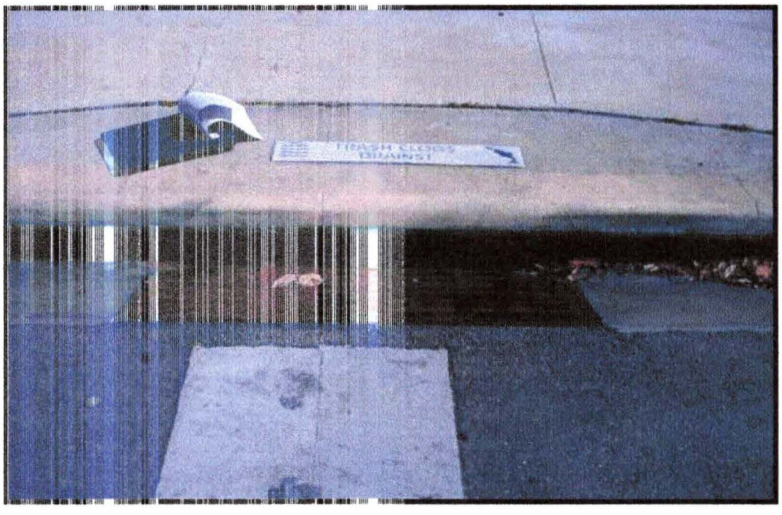
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

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 groundwaters. 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 –

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.

Contech® CMP Detention Inspection and Maintenance Guide

Underground stormwater detention and infiltration systems must be inspected and maintained at regular intervals for purposes of performance and longevity.

Inspection

Inspection is the key to effective maintenance of CMP detention systems and is easily performed. Contech recommends ongoing, annual inspections. Sites with high trash load or small outlet control orifices may need more frequent inspections. The rate at which the system collects pollutants will depend more on-site specific activities rather than the size or configuration of the system.

Inspections should be performed more often in equipment washdown areas, in climates where sanding and/or salting operations take place, and in other various instances in which one would expect higher accumulations of sediment or abrasive/corrosive conditions. A record of each inspection is to be maintained for the life of the system.

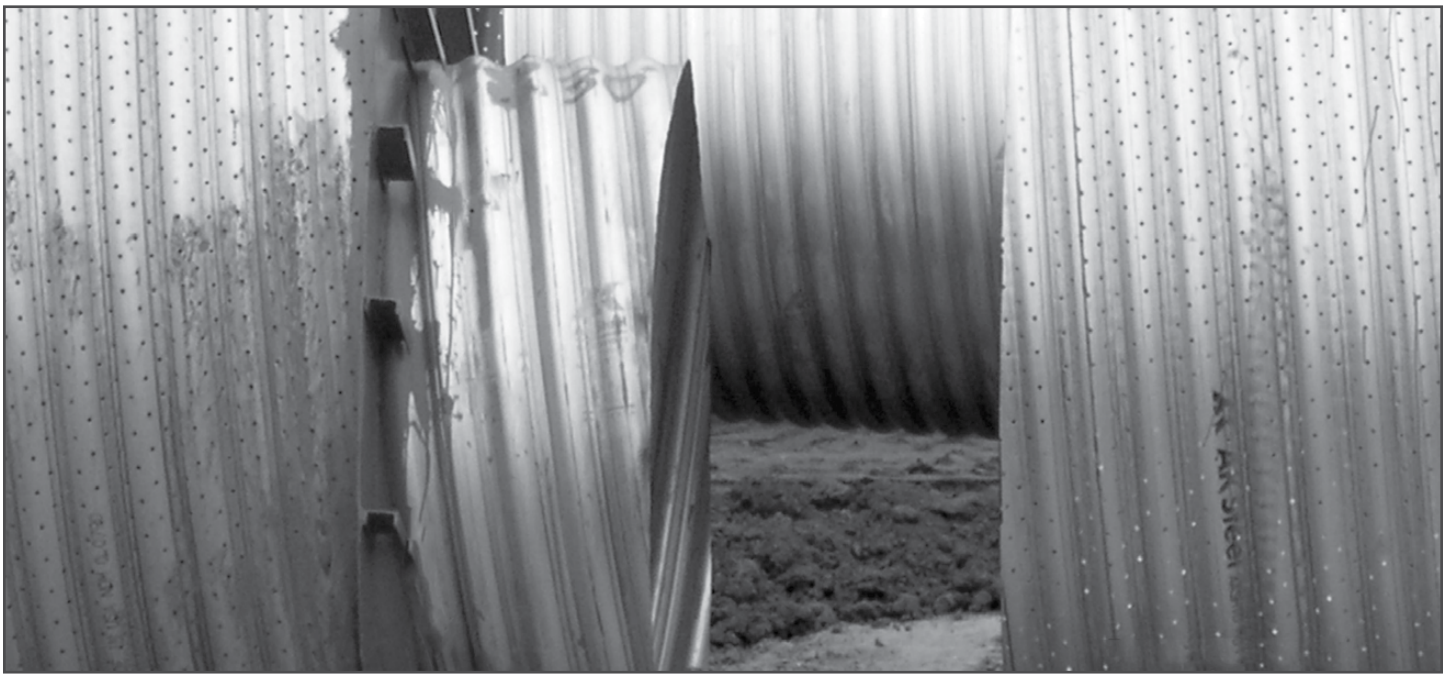
Maintenance

CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice. Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Annual inspections are best practice for all underground systems. During this inspection if evidence of salting/de-icing agents is observed within the system, it is best practice for the system to be rinsed, including above the spring line soon after the spring thaw as part of the maintenance program for the system.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

The foregoing inspection and maintenance efforts help ensure underground pipe systems used for stormwater storage continue to function as intended by identifying recommended regular inspection and maintenance practices. Inspection and maintenance related to the structural integrity of the pipe or the soundness of pipe joint connections is beyond the scope of this guide.



NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

CONTECH® CMP DETENTION SYSTEMS

CONTECH® ENGINEERED SOLUTIONS

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7100 Longe Street
Stockton, CA 95304

June 9, 2021

Mr. Leo Cosentini
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-0100

RE: Former Product Name: Flo Guard + Plus® Catchbasin Trash Screen Insert, Flat Grated Inlet Style Drop in Basket (KS-2)

Dear Mr. Cosentini,

Oldcastle Infrastructure™ is pleased to submit this updated fact sheet. The enclosed updated fact sheet has been compiled in conformance with the Trash Treatment Control Device Application Requirements. This updated fact sheet is replacing the GIB updated fact sheet submitted January 26, 2021 (superseded due to manufacturing requirements). As the previous updated fact sheet was never completed, we sincerely appreciate your attention to make the following changes from the original fact sheet:

- Update Name: FloGard® Grate Inlet Basket (GIB)
- Remove “formerly KriStar Enterprises Inc.” (acquisition was 2014, pre-trash requirements; systems have been updated; KriStar reference confuses customers)
- Fact Sheet: Change from KS-2 to OI-2

Thank you for your consideration of this application. If any additional information is needed, please contact Laraine Sanfilippo per information provided below.

Respectfully,

Oldcastle Infrastructure™, A CRH Company



Laraine Sanfilippo
Southwest Region Regulatory Manager
laraine.sanfilippo@oldcastle.com
(619) 481-0608

1. Cover Letter

a. Product Name and General Description of Device

The FloGard® Grate Inlet Basket (FloGard® GIB) is a specialized inlet filter used specifically for grated catch basins. The FloGard® GIB provides physical screening of pollutants such as gross solids, trash and debris. It is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas.

b. Applicant's Contact Information and Location

Chief Executive Officer:	Matt Clemson Oldcastle Infrastructure™ Vice President and General Manager, Stormwater matt.clemson@oldcastle.com (470) 261-7620
Authorized Representative:	Laraine Sanfilippo Oldcastle Infrastructure™ Regulatory Manager laraine.sanfilippo@oldcastle.com (619) 481-0608
Mailing Address:	Oldcastle Infrastructure, Stormwater c/o Laraine Sanfilippo 10441 Vine Street Lakeside, CA 92040

c. Manufacturer's Website for Device

https://oldcastleinfrastructure.com/brands/flogard/

d. Manufacturing Location for Device

Manufacturer Name:	Oldcastle Infrastructure™
Manufacturer Address:	7100 Longe Street Stockton, CA 95304
Manufacturer Phone:	(800) 579-8819
Manufacturer Representative:	Gary Jones (888) 950-8826

e. Summary of Field/Lab Testing Results

All trash and debris for the designed storm event is captured within the FloGard® GIB due to the basket's full capture 4.9mm perforations. No lab testing has been recorded for the FloGard® GIB.

f. Summary of Device Limitations, and Operational, Sizing, and Maintenance Considerations

FloGard® GIB is designed for ease of use and compatibility with most catch basin configurations. Standard sizes are available and custom units will be considered as unusual or challenging projects arise. Please contact an Oldcastle Infrastructure™ representative for sizing assistance.

Maintenance on any stormwater management device is mandatory. The schedule of maintenance will depend on site conditions and should be determined during the first year of operation by assessing capacity levels after large storm events. Consistent maintenance is imperative to ensure constant trash capture is attained and bypass does not occur.

g. Description, or List of Locations, where Device has been installed

FloGard® GIB has been installed throughout California and nationally to meet trash capture demands. See chart below for a few example installations:

Example Installations*		
Project	**Location**	**Contact**
City of Berkely Police Department	2100 Martin Luther King Jr Way Berkeley, CA 94704	Environmental Compliance Specialist Lam Inthavong
City of Santa Clara Transportation Authority	3331 North First Street San Jose, CA 95134	Facilities Maintenance Manager Valley Transit Authority
In-N-Out Burger California	28 Locations throughout California	Facilities Management Patty Olivares

*Please contact an Oldcastle Infrastructure™ representative for more detailed information.

h. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



5/18/2021

Matt Clemson
Oldcastle Infrastructure™
General Manager, Stormwater
matt.clemson@oldcastle.com
(470) 261-7620

Date



5/18/2021

Laraine Sanfilippo
Oldcastle Infrastructure™
Regulatory Manager
laraine.sanfilippo@oldcastle.com
(619) 481-0608

Date

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3. Physical Description

a. Trash Capture: Description of Device

FloGard® GIB is configured with openings less than 4.9mm to ensure trash capture regulations and requirements are met. The system location in the catch basin ensures all flows discharging form the stormwater system will be treated. The FloGard® GIB sizing is dependent on catch basin dimensions with bypass flows accounted for on all required designs.

b. Peak Flows/ Trash Volumes

The tables in **Section 3c.1. Hydraulic Capacities** list Peak Flow and Trash (Storage) Volume capacities for 8 standard sizes of the FloGard® GIB.

c. Hydraulic Capacity

1) Hydraulic Capacity Table

FloGard® Grate Inlet Basket - Capacities*						
Catch Basin Size	Hydraulic Capacity					Storage Capacity (CF)
	Filtered Flow (CFS)				Peak/ Bypass Flow (CFS)	
	Empty	25% Full	50% Full	75% Full		
12x12	5.75	4.31	2.88	1.44	1.21	0.75
16x16	7.95	5.97	3.98	1.99	1.61	1.33
18x18	9.11	6.83	4.55	2.28	1.81	1.69
18x36	14.38	10.79	7.19	3.60	2.71	3.38
24x24	12.78	9.59	6.39	3.20	2.41	3.00
24x36	16.62	12.47	8.31	4.16	3.01	4.50
36x36**	28.77	21.57	14.38	7.19	5.42	6.75
36x48**	33.24	24.93	16.62	8.31	6.03	9.00

Notes:

* Additional sizes available per region and request. Please speak with an Oldcastle Infrastructure representative for more detailed information.

** Systems noted are comprised of (2) FloGard® GIBs in parallel

2) Alternative Configuration Hydraulic Capacity Table

FloGard® GIB does not have alternative configurations.

3) Hydraulic Capacity Calculations or Field Test Results

Hydraulic capacity calculations for FloGard® GIB are included in **Appendix A**.

d. Comparison Table

The tables in **Section 3c.1. Hydraulic Capacities** list storage and hydraulic capacities for 8 standard sizes of the FloGard® GIB.

e. Design Drawings

Design drawings for FloGard® GIB are included in **Appendix B**.

f. Alternative Configurations

FloGard® GIB does not have alternative configurations.

g. Internal Bypass

Bypass is designed to occur in situations that 100% storage capacity has been met (which should be avoided through regular inspection and maintenance). In situations where bypass occurs, FloGard® GIB is designed to hydraulically contain the previously captured trash and allow flows to enter and exit the system at the center of the basket.

h. Previously Trapped Trash

The basket is hydraulically designed to retain previously captured trash. If the system achieves bypass, some previously captured trash may reanimate and discharge downstream; however, the design is meant to prevent this occurrence. So long as the system is regularly maintained and bypass is avoided, no previously trapped trash will discharge from the system.

i. Calibration Feature

FloGard® GIB does not include an adjustable calibration feature.

j. Photos

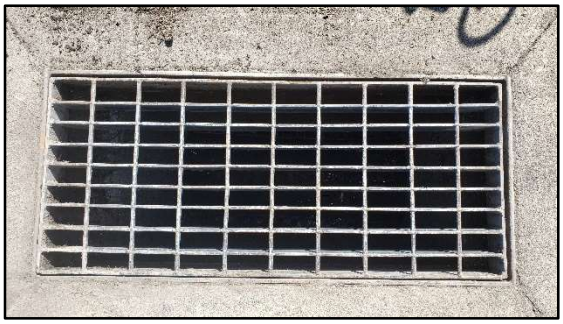


Figure 1. Pre-Installation Grate Inlet.



Figure 2. Installed FloGard® GIB without grate.

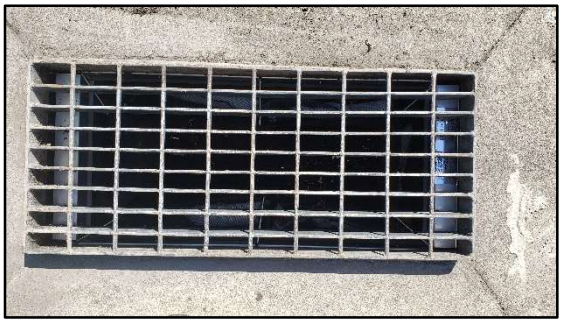


Figure 3. Installed FloGard® GIB with grate.



Figure 4. Installed FloGard® GIB – parallel systems.



Figure 5. Installed FloGard® GIB – view to bottom.



Figure 6. Installed FloGard® GIB – view to bottom: water.

k. Material Type

The FloGard® GIB system consists of mounting angles and basket with trash capture compliant screen. The mounting angles and basket frame are 304 stainless-steel. The basket is flexible knit nylon mesh backed by reinforced polypropylene geogrid. The screen perforations measure 4.9mm for trash capture compliance.

l. Design Life

The estimated design life for the FloGard® GIB is 25 years. Design life estimate is dependent on the proper design, installation and maintenance of the system and assume no extraordinary circumstances.

4. Installation Guidance

a. Installation Procedures

Oldcastle Infrastructure™ recommends referring to approved drawings and field measurements to ensure site conditions are properly met prior to installation. It is recommended that catch basins are properly cleaned and inspected for any damage or irregularities prior to installing any devices. If installation points on walls are irregular or damaged, grind the concrete down to create an even mounting surface.

1. Remove grate cover and set aside.
2. Clean catch basin frame and FloGard® GIB support flanges.
3. Place FloGard® GIB into catch basin frame so that support flanges are held up on all ends by the extents of the catch basin frame.
    a. If flanges are not supported on all sides by the catch basin frame, remove and call an Oldcastle Infrastructure™ representative for sizing/customization guidance.
4. Replace grate.

b. Device Installation Limitations/ Non-standard Installation Procedures

Installation to help meet trash TMDLs or the statewide trash amendment are often retrofit. In the case of retrofit, the site should be inspected prior to installation to be sure record drawings are correct. The trash capture system should be designed and fabricated to meet existing site conditions.

c. Diagnosing and Correcting Installation Errors

Oldcastle Infrastructure™ FloGard® GIB is designed for simple installation. Once installed, ensure a proper fit by performing a visual inspection. If all components are not secure and in proper placement, remove and reinstall by following **Section 4a. Installation Procedures**. If questions during or after installation, please contact Oldcastle Infrastructure™ for project specific assistance.

5. Operation and Maintenance Information

a. Device Inspection Procedures and Frequency Considerations

Oldcastle Infrastructure™ recommends the following timing of inspections to ensure proper maintenance can be conducted:

Oldcastle Infrastructure™ recommends that installed FloGard® GIB be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be inspected a minimum of three times per year.

Oldcastle Infrastructure™ guidelines for the timing of inspections are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per year).

b. Device Maintenance Frequency Related to Hydraulic Capacity

Due to the configuration of FloGard® GIB, maintenance does not rely on hydraulic capacity, but rather on storage (trash and debris) capacity. Maintenance should be implemented between storm events if basket is at more than 75% capacity. Maintenance must be implemented immediately if basket is at 100% capacity and in bypass.

c. Maintenance Procedures

Oldcastle Infrastructure™ recommends the following maintenance procedures:

1. The grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the basket.
3. When all collected materials have been removed, the basket can be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that cannot be fixed on-site should be addressed through a maintenance service or by replacement of parts.

4. After inspection is complete and system is certified as functional, replace grate.
5. All removed debris shall be disposed of in accordance with local, state, and federal agency requirements.

d. Maintenance Equipment and Materials

The following equipment should be used to conduct maintenance on the FloGard® GIB:

- Personal Protective Equipment (PPE)
    - i.e. hardhat, gloves, appropriate footwear, safety glasses, etc.
- Industrial vacuum
- Dumpster or truck bed for disposal of collected trash and debris
- Tools for uninstallation and reinstallation
    - Crow bar to help remove grate from catch basin
    - File or wire brush to clean frame of catch basin and FloGard® GIB

e. Effects of Deferred Maintenance

Deferred maintenance may allow the FloGard® GIB to achieve capacity and go into bypass. Once the system is in bypass, no additional trash or debris will be collected. If bypass occurs, the debris in the bypass flows will pass through the system and discharge in receiving waters.

f. Repair Procedures

If inspection of the condition of the FloGard® GIB reveals damage and need for repair, the damage should be documented, photographed, and then submitted to Oldcastle Infrastructure™ for assessment. Engineering and Operations staff at Oldcastle Infrastructure™ will evaluate the damage and recommend a repair. Responsibility for the repair will depend on the cause of damage.

Field repairs can be implemented if issues or damage is minimal.

If inspection of the condition of the FloGard® GIB (basket) reveals extensive damage that cannot be repaired in field, a replacement basket will need to be installed to ensure proper trash capture capacity is attained.

6. Vector Control Accessibility

a. Date of Submittal to Mosquito Vector Control Association

Application for approval of the FloGard® GIB was initially submitted to the Mosquito and Vector Control Association of California (MVCAC) on May 18, 2021. This submittal was made concurrently with the original California Water Boards Trash Treatment Control Device Updated Fact Sheet submittal.

b. Description of Access for Vector Control Personnel



The bottom of the catch basin (includes any area beneath the basket) can be easily accessed through the grate. The grate can be opened/removed for visual inspection and physical treatment of the catch basin. Due to the location of the basket within the catch basin, complete access is available to the entire bottom of catch basin, the inside of the basket, and the entrance to all outlet pipes within the basin for both inspection and treatment. It is also possible to inspect and treat through the grate depending on the spacing of the bars and type of treatment required.

c. Letter of Verification from Mosquito Vector Control Association

Refer to Appendix C for letter of verification from MVCAC, Mosquito and Vector Control Association of California, dated June 9, 2021. Approval letter verifies all design requirements have been met and allow for full visual and treatment access to all areas.

7. Reliability Information

a. Estimated Design Life

The estimated design life for the FloGard® GIB is 25 years. Design life estimate is dependent on the proper design, installation and maintenance of the system and assume no extraordinary circumstances.

b. Warranty Information

Oldcastle Infrastructure™ warranties FloGard® GIB to be free from manufacturing defects for a period of one (1) year from the date of purchase. Abusive treatment, neglect or improper use of the FloGard® GIB will not be covered by this warranty.

c. Customer Support Information

Oldcastle Infrastructure offers full customer support for all products including the FloGard® GIB. Customer Support contact information is as follows:

Oldcastle Infrastructure™
7100 Longe Street
Stockton, CA 95304
Phone: (888) 965-3227
Website: www.oldcastleinfrastructure.com
Email Contact: ContactInfrastructure@Oldcastle.com

8. Field/Lab Testing Information and Analysis

a. Available Field/Lab Testing Information – Devices with 5mm Screen

The FloGard® GIB includes a screen with 4.9mm apertures through which all treatment flow must pass to travel downstream; therefore, testing is not required to demonstrate trash capture performance because particles 5mm in diameter and larger cannot physically pass through the screen.

b. Available Field/Lab Testing Information – Devices without 5mm Screen

FloGard® GIB systems without the trash capture (4.9mm aperture) screen do not have testing or field data available and will not be used for trash capture applications.

APPENDIX A

Technical Memorandum
FloGard® GIB
Hydraulic Capacity Calculations

This technical memorandum documents the hydraulic calculations for the FloGard® GIB.

I. Standard Equations

Filtered and Bypass Flow Capacity

- Orifice Equation for Screen Basket; $Q_f = \frac{C\ As\ \sqrt{2\ g\ h}}{SF}$
    - Q_f = Treatment Flow Rate; ft^3/sec
    - C = Discharge (Orifice) Coefficient; 0.85
    - A_{screen} = (Surface Area) $*$ (% Open); ft^2
        - $A_{square} = 4(DW) + 4(DL) + WL_{ext} - WL_{int}$
        - $A_{rectangle} = 2(DL)_{ext} + 2(DW)_{ext} + 2(DL)_{int} + 2(DW)_{int} + WL_{ext} – WL_{int}$
        - $A_{Bypass} = (H_{bypass})(2L_{int} + 2W_{int})$
    - g = Gravity; $32.174\ ft/sec^2$
    - h = Available (Driving) Head; ft
        - Filtered Flow = 0.25 ft
        - Bypass Flow = 0.5 ft
    - SF = Safety Factor; 2

- Storage Volume for Screen Basket; $V_s = WLD_{ext} - WLD_{int}$
    - V_s = Storage Volume; ft^3
    - W = Basket Width; ft
    - L = Basket Length; ft
    - D = Basket Depth; ft

II. **Example Calculations**

Filtered Flow Calculation; 12” x 12” Grate Inlet

- A_{square} = 4(DW) + 4(DL_{int}) + WL_{ext} - WL_{int}
  - W = $\frac{12\ in}{12\ in}$ = 1.00 ft
  - L_{ext} = $\frac{12\ in}{12\ in}$ = 1.00 ft
  - L_{int} = $\frac{6\ in}{12\ in}$ = 0.50 ft
  - D = $\frac{12\ in}{12\ in}$ = 1.00 ft
  - A_{square} = (4)(1.00 ft)(1.00 ft) + (4)(1.00 ft)(0.50 ft) + (1.00)(1.00 ft) – (0.50 ft)(0.50 ft) = 6.75 ft^2

- A_{screen} = (Surface Area, A_{square}) $*$ (% Open)
  - A_{screen} = 6.75 ft^2 $*$ 50% = 3.375 ft^2

- $Q_f = \frac{C\ As\ \sqrt{2\ g\ h}}{SF}$
  - C = 0.85; A_{screen} = 3.375 ft^2; g = 32.174 ft/s^2; h = 0.25 ft; SF = 2
  - $Q_f = \frac{0.85 * 3.375\ \sqrt{2*32.174*0.25}}{2}$
  - Q_f = 5.75 ft^3/sec

  Filtered Flow at 100% capacity is 5.75 cfs.

Bypass Flow Calculation; 12” x 12” Grate Inlet

- A_{Bypass} = (H_{bypass})(2L_{int} + 2W_{int})
  - H_{bypass} = $\frac{3\ in}{12\ in}$ = 0.25 ft
  - L_{int} = $\frac{6\ in}{12\ in}$ = 1.50 ft
  - W_{int} = $\frac{6\ in}{12\ in}$ = 1.50 ft
  - A_x = (0.25 ft)((2)(0.50 ft) + (2)(0.50 ft))= 0.50 ft^2

- $Q_b = \frac{C\ As\ \sqrt{2\ g\ h}}{SF}$
  - C = 0.85; A_s = 0.50 ft^2; g = 32.174 ft/s^2; h = 0.50 ft; SF = 2
  - $Q_b = \frac{0.85 * 0.50\ \sqrt{2*32.174*0.50}}{2}$
  - Q_b = 1.21 ft^3/sec

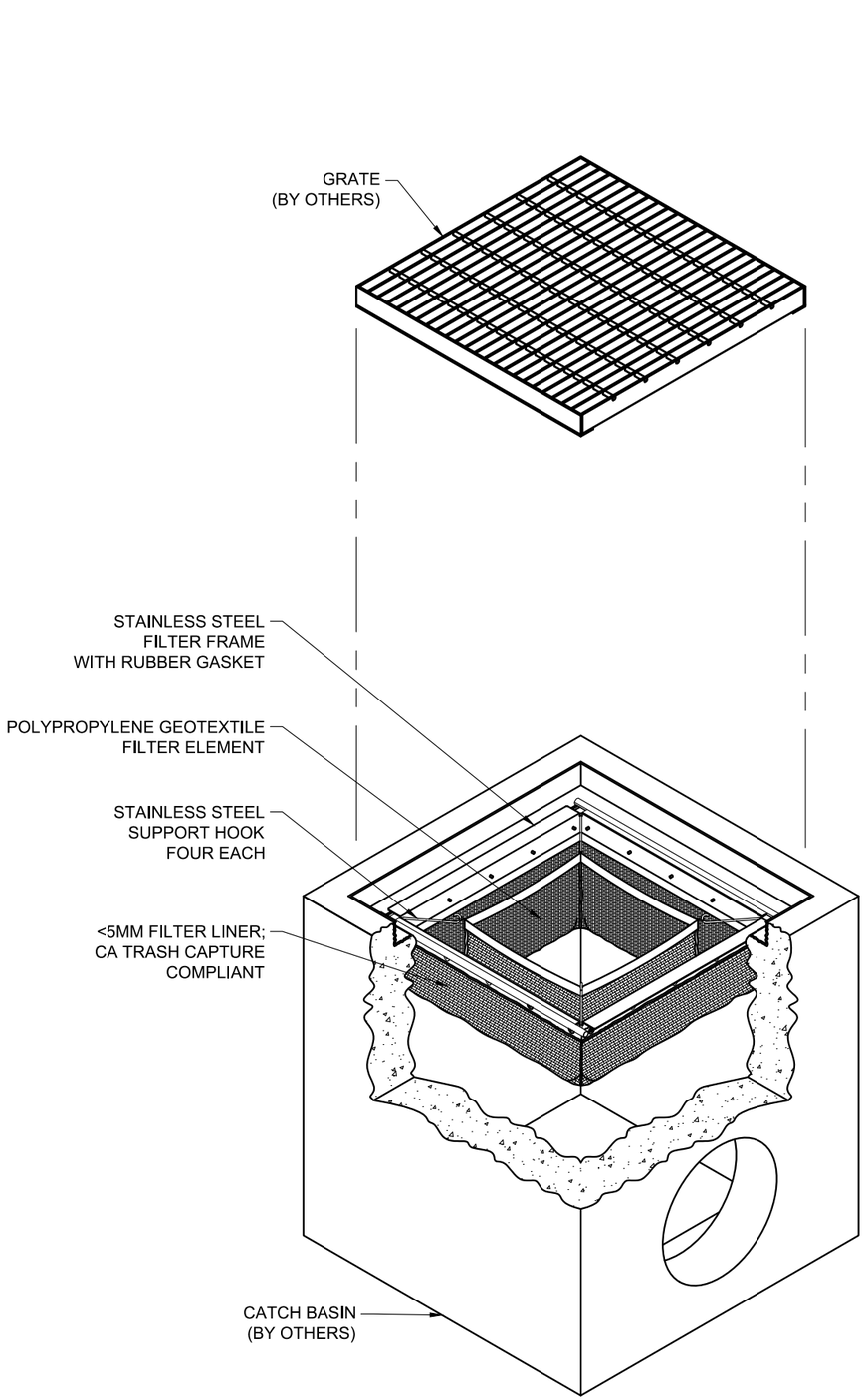
  Bypass Flow is 1.21 cfs.

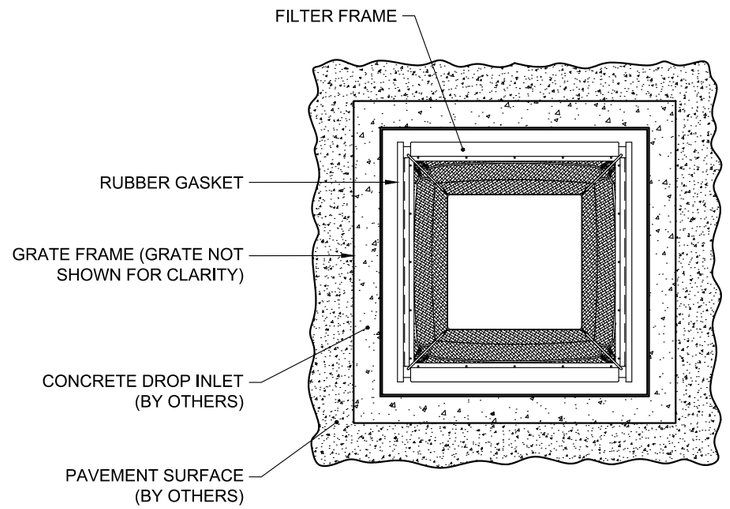
Storage Capacity Calculation; 12” x 12” Grate Inlet

- Storage Volume for Screen Basket; $V_s = (WLD)_{ext} – (WLD)_{int}$
  - $W_{ext} = \frac{12\ in}{12\ in}$ = 1.00 ft
  - $W_{int} = \frac{6\ in}{12\ in}$ = 0.50 ft
  - $L_{ext} = \frac{12\ in}{12\ in}$ = 1.00 ft
  - $L_{int} = \frac{6\ in}{12\ in}$ = 0.50ft
  - $D_{ext} = \frac{12\ in}{12\ in}$ = 1.00 ft
  - $D_{int} = \frac{12\ in}{12\ in}$ = 1.00 ft
  - V_s = ((1.00 ft)(1.00 ft)(1.00 ft)) – ((0.50 ft)(0.50 ft)(1.00 ft))= 0.75 ft^3

  Storage Capacity is 0.75 cf.

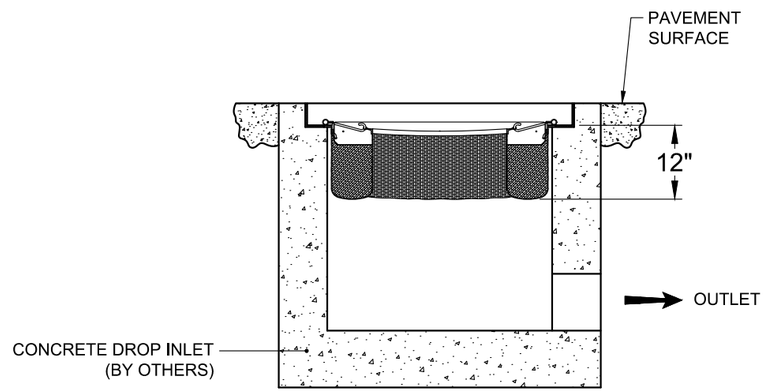
APPENDIX B





PLAN VIEW

(GRATE NOT SHOWN FOR CLARITY)



SECTION VIEW

NOTES:

1. FILTER INSERT SHALL HAVE A HIGH FLOW BYPASS FEATURE.
2. FILTER SUPPORT FRAME SHALL BE CONSTRUCTED FROM STAINLESS STEEL TYPE 304.
3. FLOGARD CURB INLET BASKET IS AVAILABLE IN SIZES TO ACCOMMODATE STANDARD INDUSTRY CATCH BASIN INLETS. NON-STANDARD/ CUSTOM SIZES CAN BE ACCOMMODATED WITH MINIMAL MODIFICATION BY CONTACTING YOUR LOCAL OLDCASTLE INFRASTRUCTURE REPRESENTATIVE.
4. STORAGE CAPACITY REFLECTS 100% OF MAXIMUM SOLIDS COLLECTION PRIOR TO IMPENDING FILTERING BYPASS.
5. 36"X 36" AND LARGER GRATES WILL UTILIZE A DUAL BASKET CONFIGURATION.

Inlet
Filtration

Oldcastle Infrastructure
A CRH COMPANY

Ph: 800.579.8819 | www.oldcastleinfrastructure.com/stormwater

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-

FloGard® Grate Inlet Basket

CUSTOMER		
-		
JOB NAME		
-		
DRAWING NUMBER	REVISION - REV DATE -	SHEET
Flow Gard Grate Inlet		1 OF 1

APPENDIX C

MVCAC
Mosquito and Vector Control Association of California
One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p: (916) 440-0826 • f: (916) 444-7462 • e: mvcac@mvcac.org

Oldcastle Infrastructure
10441 Vine Street
Lakeside, CA 92040

June 9, 2021

Dear Ms. Sanfilippo,

Thank you for the submission of the Oldcastle FloGard Grate Inlet Basket full trash capture device for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the FloGard grate Inlet Basket and verifies that provisions have been included in the designs that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the FloGard Grate Inlet Basket as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,



Bob Achermann,
MVCAC Executive Director

Appendix A

Geotechnical Report

Shilo West Medical Center
Site: Palmdale & Mesa Linda Rd.

Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

March 25, 2022

Project No. 21-7337

Robert A. Martinez
Martinez + Okamoto Architects
14467 Park Ave.
Victorville, CA 92392

Subject: Preliminary Geotechnical Investigation Report, Shiloh West Medical Center, Northwest Corner of Palmdale Road and Mesa Linda Avenue, Victorville, California 92392, APN 3103-561-20.

Robert,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed development at the subject site in the City of Victorville, California. This report presents the findings of our geotechnical investigation including site seismicity, settlement potential, infiltration rates and provides geotechnical design recommendations for the proposed improvements. The work was performed in general accordance with our proposal dated September 21, 2021.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

TGR GEOTECHNICAL, INC.

Robert Aguilar
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
SANJAY GOVIL
No. GE2382
EXP. 6/30/2022
GEOTECHNICAL
STATE OF CALIFORNIA

Sanjay Govil, PhD, PE, GE 2382
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL GEOLOGIST
EDWARD LOUIS BURROWS
No. 1750
CERTIFIED ENGINEERING GEOLOGIST
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Edward L. Burrows, MS, PG, CEG 1750
Principal Engineering Geologist

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www.tgrgeotech.com

ATTACHMENTS

Plate 1 – Boring and Test Pit Location Map

Figure 1 – Site Location Map
Figure 2 – Regional Geology Map
Figure 3 – Regional Fault Map
Figure 4 – Geologic Hazards Map

Tables 1 through 3 – Double Ring Infiltrometer Test Worksheets

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Appendix C – Laboratory Testing Procedures and Results
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Appendix E – Standard Grading Guidelines

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INTRODUCTION

Site Description and Proposed Project Development

The subject site is located on the northwest corner of Palmdale Road and Mesa Linda Avenue in the City of Victorville, California. The subject site is relatively flat, approximately 2.91-acre, dirt and gravel covered vacant lot with sparse vegetation. The elevation in the north of the site is approximately 3112 feet and approximately 3120 feet in the southwest with a differential elevation of 8 feet over a distance of approximately 600 feet and gradient of 1.33%. It is our understanding that the proposed development will consist of a 18,000 square foot, 2-story medical office building and an approximately 12,256 square foot commercial building consisting of a proposed family practice, medical lab, pharmacy, coffee shop and associated parking lots.

Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance to assess current site conditions, mark boring and test pit locations and notify Dig-Alert.
- Sampling and logging eight (8) hollow stem auger borings utilizing a hollow stem drill rig to approximate depths ranging from 11.5 to 26.5 feet at the subject site to evaluate subsurface soil conditions. The borings were backfilled with cuttings and any excess soil was disposed onsite.
- Excavation, sampling and logging three (3) test pits for infiltration testing utilizing double ring infiltrometers at three (3) locations at an approximate depth of 5 feet below existing grade at the proposed locations of stormwater infiltration for WQMP. The testing procedures followed the County of San Bernardino guidelines.
- Laboratory testing of selected samples to include in-situ moisture density, maximum density and optimum moisture content, shear, consolidation, passing No. 200 sieve, corrosion series and R-value.
- Engineering analysis including infiltration rates, site seismicity, seismic settlement, foundation design and soils engineering/earthwork with respect to the suitability of the proposed development.
- Preparation of this report summarizing current subsurface soil conditions, findings, and presenting our recommendations for the proposed development.

Field Investigation

Field exploration was performed on March 2, 2021 by members from our firm who logged the borings and test pits and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging eight (8) borings with a truck mounted hollow stem drill rig to approximate depths ranging eleven and one half (16.5) feet to twenty-six and one half (26.5) feet below existing grade. Subsequent to drilling, all borings were backfilled with cuttings. The logs of borings together with an explanation of symbols used are given in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter and SPT samples. Driven

samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings.

The samples were driven using an automatic 140-pound hammer falling freely from a height of 30-inches. The blow counts for CRS were converted to equivalent SPT blow counts. Soil descriptions were entered on the logs in general accordance with the Unified Soil Classification System (USCS). The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Three (3) infiltration test pits TP-1 through TP-3 were excavated to a depth of approximately five (5) feet below existing ground surface for the proposed stormwater infiltration system. Subsequent to percolation testing the borings were backfilled with excavated soils.

Double Ring Infiltrometer Testing

Infiltration testing were performed at three (3) locations to determine the infiltration rate of the near surface subgrade soils. The locations of the infiltration test pits are shown on Plate 1. The field infiltration tests were performed at depths of 5 feet below existing grade. A description of the soils encountered at the test locations are presented in the table below. Testing was performed in general accordance with procedures for infiltration testing using ASTM Method D 3385, “Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.”

As noted above, the test pits were excavated to a depth of 5 feet below the existing ground surface. Upon completion of excavation the bottom of the test pit was cleaned of loose material and the inner and outer infiltrometer rings were driven using a sledgehammer. At the start of the test, water was introduced into the inner ring and annular space (outer ring). The water level was measured at constant time interval for both the inner ring and the annular space (outer ring) and was utilized to calculate the infiltration rate.

Field test data are enclosed in on Tables 1 - 3. A summary of test results is provided below:

Test Pit No.	Soil Description	Tested Infiltration Rate (in/hr.)
TP-1	Silty Sand	3.0
TP-2	Sand	18.0
TP-3	Sand	24.0

Suitability Assessment Safety Factor

Factor values (v), for Factor Category A, were assigned according to the San Bernardino Technical Guidance Document for WQMP, VII.4.

Table 2 (below) presents assigned factor values and the calculated Suitability Assessment Safety Factor (Σp) in Worksheet H from the San Bernardino Technical Guidance Document for WQMP Appendix VII.

Table 2 – Worksheet H

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w * v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75

The above values should be used in conjunction with Factor Category B parameters (to be determined by others) as specified in Worksheet H of the San Bernardino Technical Guidance Document for WQMP Appendix VII to evaluate the combined safety factor that should be applied to the tested infiltration rates.

Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ Moisture Content (ASTM D2216) and Dry Density (ASTM D7263);
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Direct Shear Strength (ASTM D3080);
- Consolidation (ASTM D2435);
- Expansion Potential (ASTM D4829);
- Passing No. 200 Sieve (ASTM D1140);
- R-value (CAL 301); and
- Corrosion series:
    1. Soluble Sulfate (CAL.417A);
    2. Soluble Chlorides (CAL.422);
    3. Minimum Resistivity (CAL.643); and
    4. pH.

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the borings logs (Appendix B). The results of the laboratory tests are presented in Appendix C.

GEOTECHNICAL FINDINGS

Geology

Regional Geologic Setting

The proposed development is located in the western Mojave Desert, in San Bernardino County, California. The area is located within what is known as the Mojave Block, which is a tectonic region bounded by the San Andreas fault to the southwest, and the Garlock fault to the northeast (Dibblee, 1967). The mountains that border the Mojave Desert were uplifted along these faults and other secondary faults that generally trend to the northwest across the Mojave Desert. It is theorized that in the geologic past, much of this area was intermittently submerged with water, at which time a large amount of sediment was deposited along the valley floor (Dibblee, 1967). The entire region was then intruded by granitic rocks, elevated and subsequently deeply eroded. Finally, during the more recent geologic past, deformation occurred throughout the Mojave Block due to the very active San Andreas, Garlock and associated fault zones (Dibblee, 1967).

On a local scale, the site is underlain by relatively young alluvial silt, sand and gravel derived from adjacent higher ground and deposited in the site vicinity (Dibblee, 1960).

Earth Units

The upper 2 to 2.5 feet of soil generally consists undocumented fill comprised of light brown silty sand to sandy silt in a dry to slightly moist condition underlain by interbedded layers of silty sand and sand to 26.5 feet below existing grade, the maximum depth explored. The undocumented fill encountered in the upper 2 to 2.5 feet is considered unsuitable and shall be removed and replaced with engineered fill. Detailed descriptions of the earth units encountered in our exploratory borings and test pits are presented in the log of the borings and test pits. (Appendix B)

Groundwater

Groundwater was not encountered during our subsurface exploration at a depth of 26.5 feet below existing grade, the maximum depth explored. Based on our review of available historical groundwater information (CDMG) regional historic high groundwater has not been mapped at the subject site.

Per USGS groundwater well data for the nation, the historic high groundwater for wells nearest to the subject site is approximately 284 feet below existing grade and 2821 feet above NGVD 1929 (USGS 343018117231501 005N005W22K001S), dating back to 1938.

Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from our observations may occur.

Static groundwater is not anticipated to impact the proposed development.

Expansive Soil

Onsite soils have a tested expansion index of 0, correlating to a “very low” expansion potential. The recommendations provided in this report account for the expansion potential of the onsite soils.

Hydro Collapse

Laboratory testing indicates near surface soils undergo a 2-3% hydro collapse when inundated under load, correlating to a “moderate” potential for hydro collapse. The recommendations in this report account for the hydro collapse potential of near surface soils.

Cement Type and Corrosion

Based on laboratory testing concrete used should be designed in accordance with the provisions of ACI 318-14, Chapter 19 for Exposure Class S0: Cement with a minimum unconfined compressive strength of 2,500 psi, and for Exposure Class C1 (Moderate) – Concrete exposed to moisture but not a significant source of chlorides, per ACI 318-14 Table 19.3.1.1.

Corrosion tests indicate a moderate corrosion potential for ferrous metals exposed to site soils.

TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

Seismic Review

Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

We consider the most significant geologic hazard to be the potential for moderate to strong seismic shaking that is likely to occur at the subject site. The subject site is located in the highly seismic Southern California region within the influence of several faults that are considered to be Holocene-active or pre-Holocene faults. A Holocene-active fault is defined by the State of California as a fault that has exhibited surface displacement within the Holocene time (about the last 11,700 years). A pre-Holocene fault is defined by the State as a fault whose history of past movement is older than 11,700 years ago and does not meet the criteria for a Holocene-active fault.

These Holocene-active and pre-Holocene faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the subject site will periodically experience ground acceleration as the result of small to moderate magnitude earthquakes. Other active faults without surface expression (blind faults) or other potentially active seismic sources that are not currently zoned and may be capable of generating an earthquake are known to be present under in the region.

The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property.

The nearest fault to the subject site is the Ord Mountains fault mapped approximately 12.6 miles to the southeast of the site. Other nearby faults include the Mirage Valley fault mapped approximately 12.6 miles to the northwest of the site, the Ocotillo Ridge fold mapped approximately 13.0 miles southeast of the site, the Helendale fault mapped approximately 16.2 miles northeast of the site and the San Andreas fault mapped approximately 16.2 miles to the southwest of the site. The Regional Fault Map, Figure 4, shows the location of the subject site in respect to the regional faults.

Secondary Seismic Hazards

Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the close proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

A review of the San Bernardino County General Plan: Geologic Hazard Overlays, Map EHFH C indicates that the subject site is not located within an area mapped as having a potential for earthquake induced liquefaction (Figure 5).

Based on the above and depth to groundwater, potential for liquefaction is considered to be negligible.

Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. Based on the density of the subsurface soils and relatively high SPT blow counts recorded during drilling, seismic settlement is anticipated to be negligible.

Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography in the vicinity of the subject site is relatively flat and the potential for seismically induced liquefaction is considered negligible. Therefore, the potential for lateral spreading at the subject site is considered very low.

DISCUSSIONS AND CONCLUSIONS

General

Based on our field exploration, laboratory testing, and geotechnical engineering analysis, the proposed development is considered suitable from a geotechnical viewpoint, provided that the recommendations contained in this report are incorporated into the design and construction phases of the project.

Conclusions

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structure and should be designed accordingly.

The primary conditions affecting the proposed project site development are as follows:

- Presence of approximately 2 to 2.5 feet of undocumented fill.
- Potential for hydro collapse in near surface soils.

The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the development of an approximately 18,000 square foot, 2-story medical office building and an approximately 12,256 square foot commercial building consisting of a proposed family practice, medical lab, pharmacy, coffee shop and associated parking lots. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations of this report are verified or modified in writing by TGR.

RECOMMENDATIONS

Seismic Design Parameters

When reviewing the 2019 California Building Code the following data should be incorporated into the design.

Parameter	Value
Latitude (degree)	34.0578
Longitude (degree)	-117.3917
Site Class	D – Stiff Soil
Site Coefficient, F_a	1.0
Site Coefficient, F_v	N/A
Mapped Spectral Acceleration at 0.2-sec Period, S_s	1.588 g
Mapped Spectral Acceleration at 1.0-sec Period, S_1	0.617 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, S_{MS}	1.588 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, S_{M1}	N/A
Design Spectral Acceleration at 0.2-sec Period, S_{DS}	1.058 g
Design Spectral Acceleration at 1.0-sec Period, S_{D1}	N/A

Site Specific Response Spectra

The USGS Unified Hazard tool, the USGS RTGM Calculator and the USGS App for Deterministic Spectra Acceleration were utilized to develop site specific ground motion spectra. The analysis was performed utilizing the following attenuation relationships that are part of NGA as required by 2019 CBC code requirements.

- Campbell & Bozorgnia (2014)
- Boore, Stewart, Seyhan & Atkinson (2014)
- Chiou & Youngs (2014)
- Abrahamson, Silva & Kamal (2014)

The results of the Site Specific Response Spectra are incorporated in Table 1 and on Figure 1 in Appendix D. The results include deterministic spectra at 5% damping, maximum rotated component at 0.84 fractile and the probabilistic spectra, maximum rotated component at 5% damping for a return period of 2475 year and subsequently multiplied by risk coefficient to obtain the MCER probabilistic spectral acceleration. The Vs30 utilized was 260 m/s.

The probabilistic response spectrum was determined using the OSHPD generated seismic values and raw output generated from the U.S. Geological Survey Unified Hazard Tool. The spectral response acceleration data generated from the U.S. Geological Survey Unified Hazard Tool was entered into the U.S. Geological Survey Risk-Targeted Ground Motion Calculator tool for each time period. The data is presented on Table 2 in Appendix D.

The deterministic response spectrum was determined using the greatest Deaggregation Contributor from the U.S. Geological Survey Unified Hazard Tool. The largest contributing fault parameters were

entered into the Pacific Earthquake Engineering Research Center NGAW2 tool with a user defined sigma + 5% damping. For the deterministic analysis for the subject site, the fault utilized was the San Andreas (San Bernardino N) fault, with a characteristic magnitude M of 7.99 and a fault distance R of 25.63 km. The data is presented on Table 3 in Appendix D.

The above generated spectral accelerations were compared against the minimum code requirements in ASCE7-16 (Chapters 11 and 21) resulting in the final design response spectra which is presented in Table 1 and on Figure 1 in Appendix D.

Based on Table 1 and Figure 1, the recommended Site Specific S_{DS} and S_{D1} are as follows:

$S_{DS} = 0.900$
$S_{D1} = 1.050$

Mapped values may be used in lieu of site-specific values to design structures on Site Class D sites with an S1 greater than or equal to 0.2, provided the value of the seismic response coefficient Cs is determined by Eq. (12.8-2) for values of $T \leq 1.5Ts$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $TL \geq T > 1.5Ts$ or Eq. (12.8-4) for $T > TL$.

The structural consultant should review the above parameters and the 2019 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is “life safety” and not to completely prevent damage of the structure, since such design may be economically prohibitive.

Foundation Design Recommendations

The proposed buildings and retaining walls may be supported on continuous and/or spread footings. Bearing capacity recommendations for shallow foundations are presented below. These recommendations assume that the footings will be supported on a minimum of three (3) feet of engineered fill.

For foundations supported on three (3) feet of engineered fill with minimum ninety (90) percent relative compaction an allowable bearing pressure of 2,000 pounds per square foot may be used in design.

All shallow foundations should extend a minimum of twenty-four (24) inches below the lowest adjacent grade. The minimum recommended footing width is eighteen (18) inches for continuous footing and twenty-four (24) inches for pad footing. A minimum reinforcement of two (2) No. 4 steel bar top and two (2) No. 4 steel bar bottom is required for continuous footings from a geotechnical viewpoint.

A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

The total static settlement and total differential settlements between adjacent footings supported on compacted fill are not anticipated to exceed 1 inch and 0.50 inches over 30 feet, respectively.

Retaining Wall Recommendations

The following soil parameters may be used for the design of the retaining wall with level backfill and a maximum height of six (6) feet:

Conditions	Parameters
Active (Level)	35 psf/ft
Passive	300 (maximum 3,000 psf)
Friction Coefficient	0.43

- Unrestrained retaining wall, such as a cantilever wall, the active earth pressure shall be used.
- Any import backfill shall be granular non-expansive select fill with a minimum sand equivalent of 30 The import fill should be tested and approved by TGR prior to backfill.
- An allowable coefficient of friction between properly compacted on-site fill soil and concrete of 0.43 may be used with the dead-load forces.
- Passive pressure and frictional resistance could be combined in determining the total lateral resistance. However, one of them shall be reduced by 50 percent.
- The passive pressure in the upper 6 inches of soil not confined by slabs or pavement should be neglected.

Retaining structures should be provided with a drainage system to prevent buildup of hydrostatic pressure behind the walls. Provisions should be made to collect and dispose of excess water away from the wall. Wall drainage may be provided by a perforated pipe encased in gravel or crushed rock and enclosed by geo-synthetic filter fabric. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of the retaining wall. A minimum vertical surcharge load of 300 psf should be used in design of walls due to adjacent traffic unless the traffic is kept at least 6 feet from the walls. Loads applied within a 1:1 projection from any surcharging structure on the stem of the wall shall be considered as lateral surcharge.

For uniform lateral surcharge conditions applied to free-to-deflect walls and restrained walls, we recommend utilizing a minimum horizontal load equal to 33 percent and 50 percent of the vertical load, respectively, and should be applied uniformly over the entire height of the wall. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Retaining wall footings should have a minimum embedment of twenty-four (24) inches below the lowest adjacent grade. The retaining walls footings shall be supported on a minimum three (3) feet of compacted engineered fill compacted to a minimum ninety (90) percent relative compaction as per ASTM D1557.

Slab-On-Grade

Slab-on-grade should be a minimum of 5-inches thick and reinforced with a minimum of No. 4 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the

reinforcement is not considered an acceptable method of positioning the steel. The slab should not be structurally connected to the buildings.

Subgrade material for the slab-on-grade should be compacted to a minimum of ninety (90) percent of the maximum laboratory dry density to a minimum depth of three (3) feet. Prior to placement of concrete, the subgrade soils should be moistened to near optimum moisture content and verified by our field representative.

The actual thickness and reinforcement of the slab shall be designed by the structural engineer per the 2019 California Building Code and should include the anticipated loading condition and the anticipated use of the building.

For moisture sensitive flooring, the floor slab should be underlain by minimum 15-mil impermeable polyethylene membrane (Stego Wrap, Moistop Plus, or any equivalent meeting the requirements of ASTM E1745, Class A rating) as a capillary break. Sand may be placed above and below the impermeable polyethylene membrane at the discretion of the project structural engineer/concrete contractor for proper curing and finish of the concrete slab-on-grade and protection of the membrane and is considered outside the scope of geotechnical engineering.

Flatwork

Flatwork should be a minimum of 4-inches thick should be reinforced with a minimum of No. 3 reinforcing bar on 24-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of ninety (90) percent of the maximum laboratory dry density (ASTM D1557) to a minimum depth of two (2) feet. Prior to placement of concrete, the subgrade soils should be moistened to near percent of optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition, the anticipated use of the flatwork and should incorporate mitigation measures for shrinkage, expansion and thermal cracking.

Modulus of Subgrade Reaction

The modulus of subgrade reaction may be taken as 150 pci (K_1) for one (1) square foot footing/slab founded on site soils. This value should be reduced for change in size per the following formula:

$$K = K_1 \left(\frac{B+1}{B}\right)^2$$

Where B = Width of Mat;
K = Coefficient of Subgrade Reaction of Footings Measuring B (ft) x B (ft).

Site Development Recommendations

General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered.

Grading

All grading should conform to the guidelines presented in the California Building Code (2019 edition), except where specifically superseded in the text of this report. Prior to grading, TGR's representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork. Oversize particles may be encountered during grading. All particles greater than 4-inches shall be removed and disposed offsite.

The site is underlain by undocumented fill to depths ranging from 2 to 2.5 feet below existing grade. This fill is considered unsuitable for the support of structures and shall be removed and replaced with engineered fill. Remedial overexcavation shall extend to at least six (6) feet below existing grade and the lateral extent of removals beyond the building/structure/footing limits should be equal to at least the depth of fill or six (6) feet, whichever is greater, to limit the potential for hydro collapse.

Site soils may be reused as engineered fill provided the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 6-inches, moisture conditioned and compacted to a minimum ninety (90) percent relative compaction. Subsequently, site fill soils should be re-compacted to a minimum of ninety (90) percent relative compaction at a minimum of optimum moisture content.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

Fill Placement

Prior to any fill placement TGR should observe the exposed surface soils. The site soils may be re-used as engineered fill provided they are free of organic content and particle size greater than 4-inches. Fill shall be moisture-conditioned to a minimum of optimum and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D1557. Any import soils shall be non-expansive and approved by TGR.

Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of six (6) inches, fill placed in six (6) inches loose lifts, moisture conditioned to near optimum for and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D1557.

Trenching

All excavations should conform to CAL-OSHA and local safety codes.

Shrinkage/Subsidence

Removal and recompaction of the near surface soils is estimated to result in shrinkage ranging from 5 to 10 percent. Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be between one and two tenths of a foot.

Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards street/parking or other approved area.

Utility Trench Backfill

All utility trench backfill in structural areas and beneath hardscape features should be brought to near-optimum moisture content and compacted to a minimum relative compaction of ninety (90) percent of the laboratory standard.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to ninety (90) percent minimum relative compaction.

Temporary Excavation and Shoring

Due to dry to slightly moist granular onsite soils, all cuts shall be properly shored or sloped back to at least 1H:1V (Horizontal: Vertical) or flatter. Some sloughing may be anticipated due to the granular nature of site soils. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. No surcharge loads should be permitted within a horizontal distance equal to the height of cut from the toe of excavation unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any nearby adjacent existing site facilities should be properly shored to maintain foundation support at the adjacent structures. Temporary excavation adjacent to existing footings may require A-B-C slot cuts.

Per Cal OSHA, site soils can be classified as “Type B” for temporary excavations based on field observation and testing.

Preliminary Pavement Design

The Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on a tested “R-Value” for compacted site subgrade soils of 23.

Traffic indices of 4.5, 5, 6 and 7 were assumed for use in the evaluation of pavement sections. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

ASPHALT PAVEMENT SECTION				PCC PAVEMENT SECTION		
Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	*PCC	Aggregate Base (Inch)	Total (Inch)
4.5	3.0	6.0	9.0	--	--	--
5.0	3.0	7.5	10.5	--	--	--
6.0	4.0	8.5	12.5	7.0*	4.0	11.0
7.0	5.0	10.0	15.0	8.0*	4.0	12.0

*Minimum concrete compressive strength of 3,500 psi.

Aggregate base material for Asphalt Pavement should consist of CAB/CMB complying with the specifications in Section 200-2.2/200-2.4 of the current "Standard Specifications for Public Works Construction" and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving. The asphalt concrete shall be compacted to a minimum of ninety-five (95) percent relative compaction.

The pavement subgrade should be constructed in accordance with the recommendations presented in the grading section of this report.

An increase in the PCC pavement slab thickness, placement of steel reinforcement (or other alternatives such as Fibermesh) and joint spacing due to loading conditions including shrinkage and thermal effects may be necessary and should be incorporated by the structural engineer as necessary to prevent adverse impact on pavement performance and maintenance.

The R-value and the associated pavement section should be confirmed at the completion of site grading.

Geotechnical Review of Plans

All grading and foundation plans should be reviewed and accepted by the geotechnical consultant prior to construction. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

Geotechnical Observation/Testing During Construction

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, periodic special inspection shall be performed to:

- Verify materials below shallow foundations are adequate to achieve the design bearing capacity;
- Verify excavations are extended to the proper depth and have reached proper material;
- Verify classification and test compacted materials; and
- Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly.

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, continuous special inspection shall be performed to:

- Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill.

The geotechnical consultant should also perform observation and/or testing at the following stages:

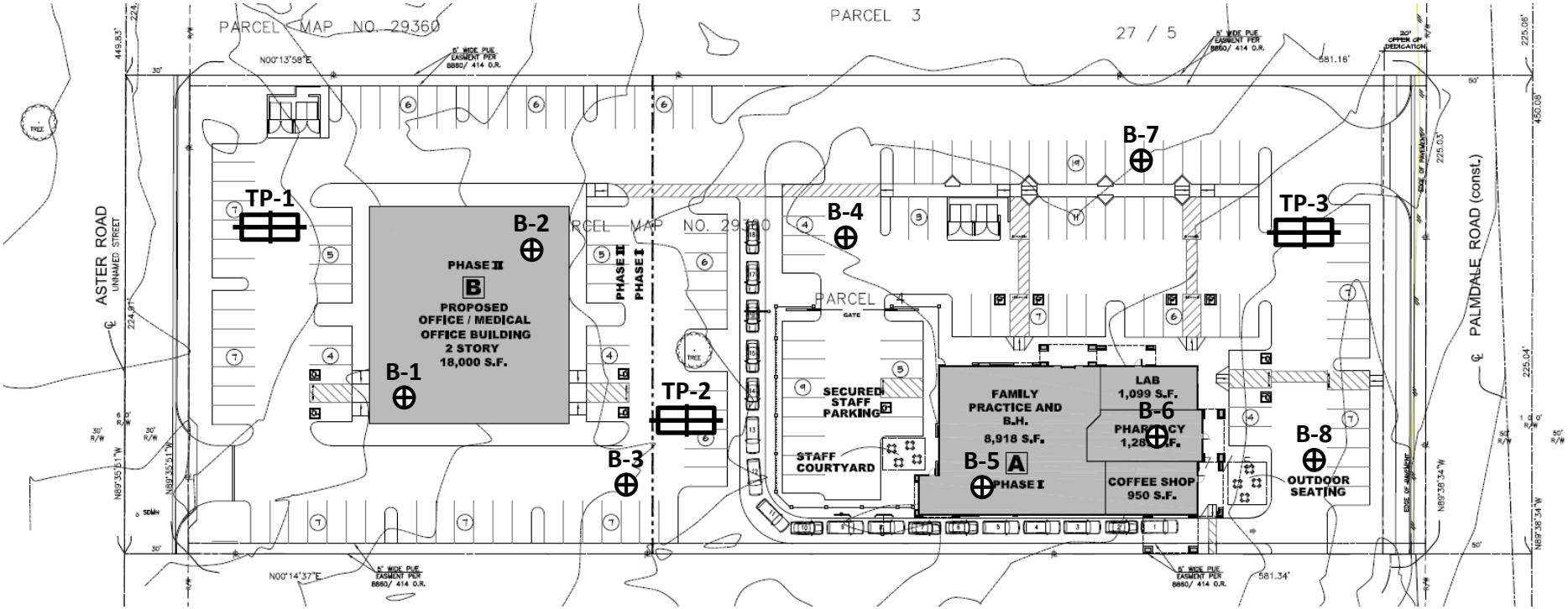
- During any grading and fill placement;
- After foundation excavation and prior to placing concrete;
- Prior to placing slab and flatwork concrete;
- During placement of aggregate base and asphalt concrete or Portland cement concrete;
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

This report is not authorized for use by and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.



B-8 ⊕ APPROXIMATE LOCATION OF EXPLORATORY BORING

TP-3 ⊞ APPROXIMATE LOCATION OF INFILTRATION TEST PIT

N

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

BORING AND TEST PIT LOCATION MAP
NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE
VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

PLATE 1



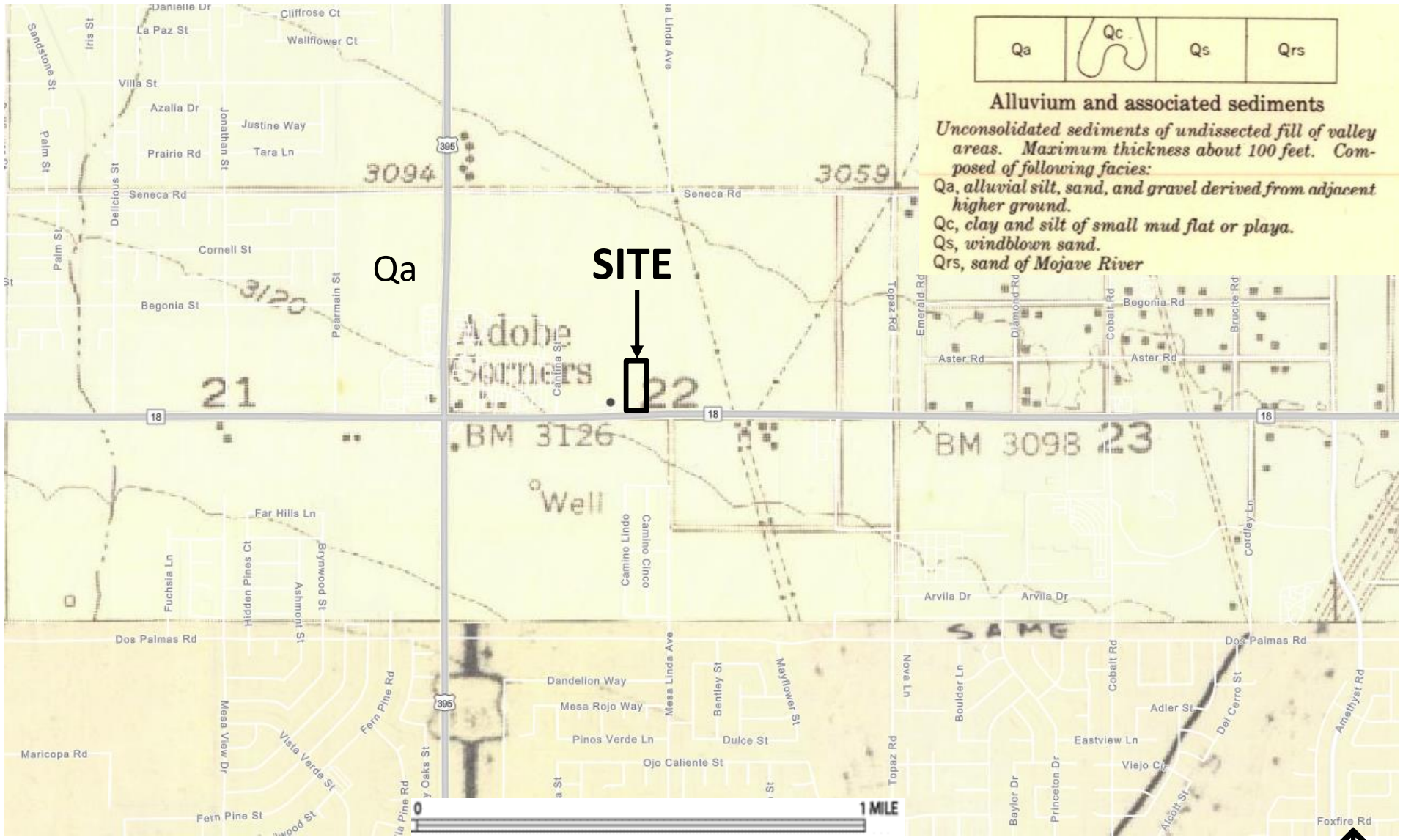
N

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SITE LOCATION MAP
NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE
VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

FIGURE 1



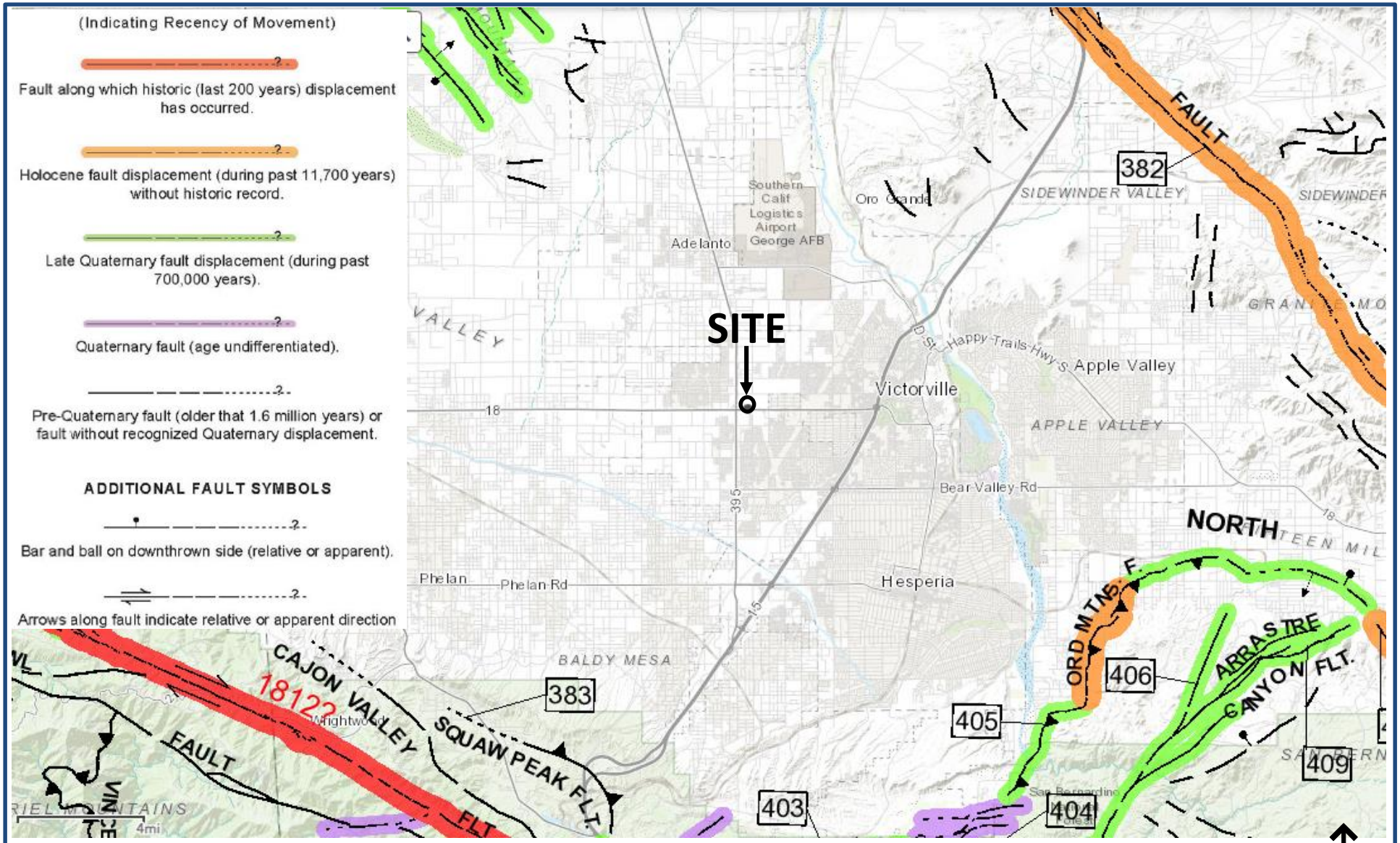
Modified From: Dibblee, T.W., 1960, Preliminary geologic map of the Victorville quadrangle, California: U.S. Geological Survey, MF-229, scale 1:62,500.

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REGIONAL GEOLOGY MAP
NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE
VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

FIGURE 2



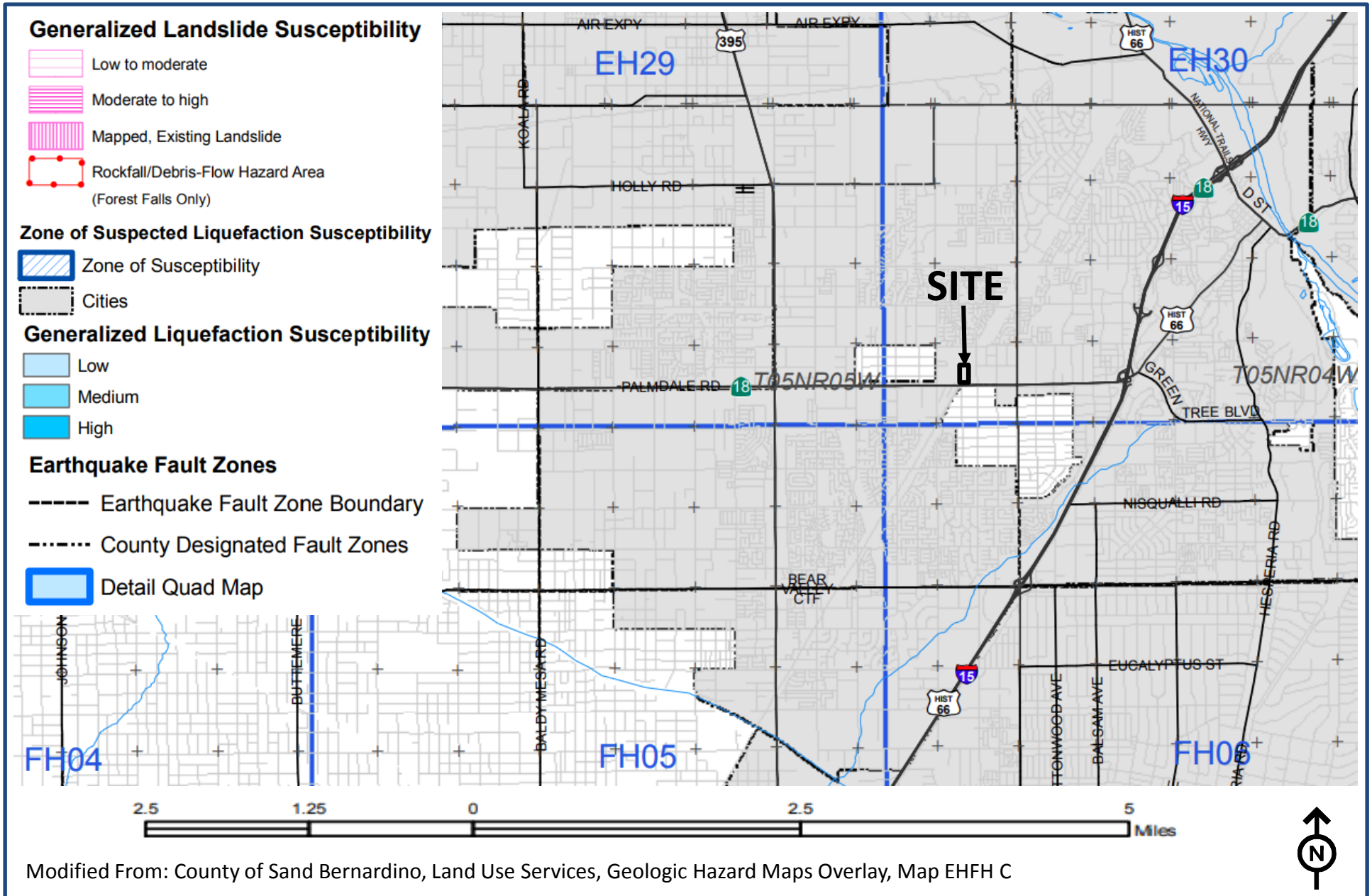
Modified From: Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

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REGIONAL FAULT MAP
NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE
VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

FIGURE 3



Modified From: County of Sand Bernardino, Land Use Services, Geologic Hazard Maps Overlay, Map EHFH C

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GEOLOGIC HAZARDS MAP
NW CORNER OF PALMDALE ROAD AND MESA LINDA AVENUE
VICTORVILLE, CALIFORNIA

PROJECT NO. 21-7337

FIGURE 4

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TABLE 1

Project No. 21-7337
Project Name: Shiloh West Medical
Date of Test: 3/2/2022
Test Location: TP-1

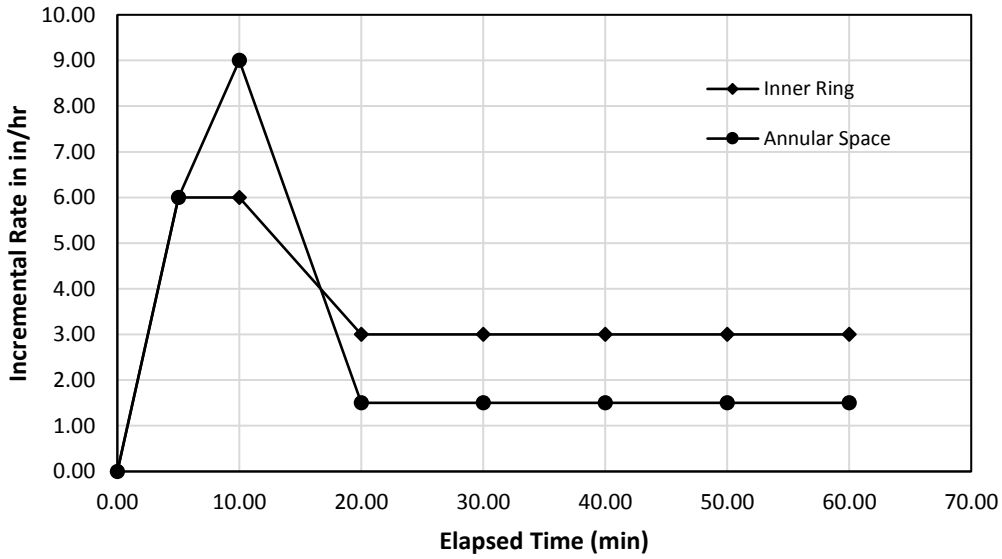
Inner Ring: 113 in^3
Annular Space: 339 in^3

dt (min)	Time (min)	Volume (in^3)	V_{IR} Infiltration Rate (in/hr)	Volume (in^3)	V_{OR} Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	56.50	6.00	169.50	6.00
5.00	10.00	113.00	6.00	423.75	9.00
10.00	20.00	169.50	3.00	508.50	1.50
10.00	30.00	226.00	3.00	593.25	1.50
10.00	40.00	282.50	3.00	678.00	1.50
10.00	50.00	339.00	3.00	762.75	1.50
10.00	60.00	395.50	3.00	847.50	1.50

V_{IR}= **3 in/hr**

Where: V_{IR} is Inner Ring incremental infiltration velocity, inch per hour
V_{OR} is Annular Space incremental infiltration velocity, inch per hour

Incremental Infiltration Rate



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TABLE 2

Project No. 21-7337
Project Name: Shiloh West Medical
Date of Test: 3/2/2022
Test Location: TP-2

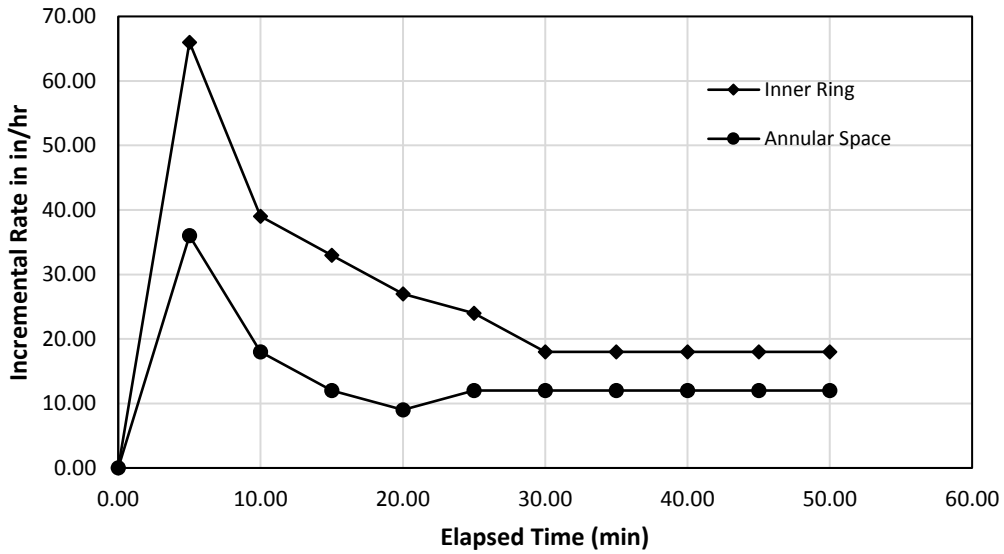
Inner Ring: 113 in^3
Annular Space: 339 in^3

dt (min)	Time (min)	Volume (in^3)	V_{IR} Infiltration Rate (in/hr)	Volume (in^3)	V_{OR} Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	621.50	66.00	1017.00	36.00
5.00	10.00	988.75	39.00	1525.50	18.00
5.00	15.00	1299.50	33.00	1864.50	12.00
5.00	20.00	1553.75	27.00	2118.75	9.00
5.00	25.00	1779.75	24.00	2457.75	12.00
5.00	30.00	1949.25	18.00	2796.75	12.00
5.00	35.00	2118.75	18.00	3135.75	12.00
5.00	40.00	2288.25	18.00	3474.75	12.00
5.00	45.00	2457.75	18.00	3813.75	12.00
5.00	50.00	2627.25	18.00	4152.75	12.00

V_{IR}= **18 in/hr**

Where: V_{IR} is Inner Ring incremental infiltration velocity, inch per hour
V_{OR} is Annular Space incremental infiltration velocity, inch per hour

Incremental Infiltration Rate



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TABLE 3

Project No. 21-7337
Project Name: Shiloh West Medical
Date of Test: 3/2/2022
Test Location: TP-3

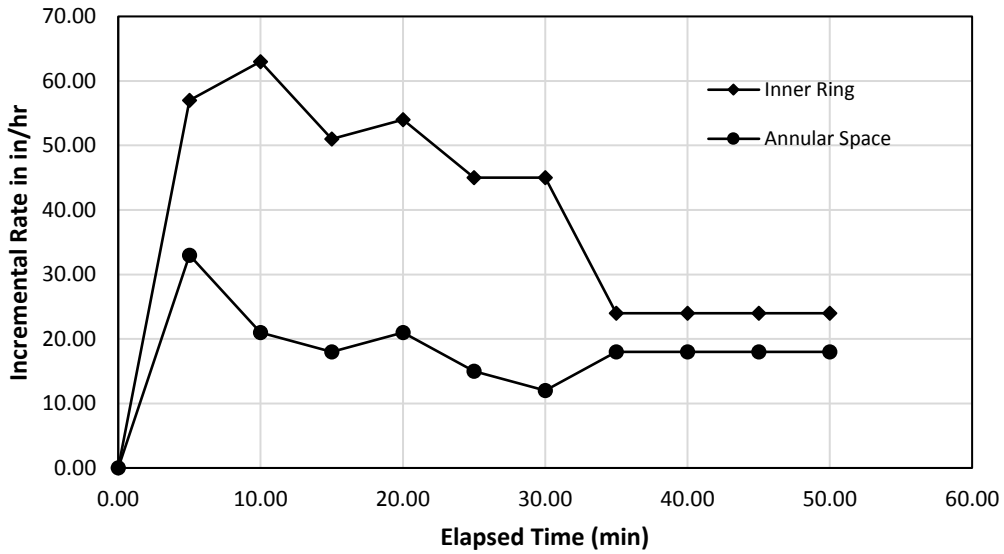
Inner Ring: 113 in^3
Annular Space: 339 in^3

dt (min)	Time (min)	Volume (in^3)	V_{IR} Infiltration Rate (in/hr)	Volume (in^3)	V_{OR} Infiltration Rate (in/hr)
0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	536.75	57.00	932.25	33.00
5.00	10.00	1130.00	63.00	1525.50	21.00
5.00	15.00	1610.25	51.00	2034.00	18.00
5.00	20.00	2118.75	54.00	2627.25	21.00
5.00	25.00	2542.50	45.00	3051.00	15.00
5.00	30.00	2966.25	45.00	3390.00	12.00
5.00	35.00	3192.25	24.00	3898.50	18.00
5.00	40.00	3418.25	24.00	4407.00	18.00
5.00	45.00	3644.25	24.00	4915.50	18.00
5.00	50.00	3870.25	24.00	5424.00	18.00

V_{IR}= **24 in/hr**

Where: V_{IR} is Inner Ring incremental infiltration velocity, inch per hour
V_{OR} is Annular Space incremental infiltration velocity, inch per hour

Incremental Infiltration Rate



APPENDIX A
REFERENCES

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APPENDIX A

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APPENDIX B
LOG OF BORINGS AND TEST PITS

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THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING

DENSITY AND CONSISTENCY

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (Tsf)	FINE GRAINED SOILS	
Very Loose	< 4	< 0.25	Very Soft	< 2
Loose	4 – 10	0.35 – 0.50	Soft	2 – 4
Medium	10 – 30	0.50 – 1.0	Firm (Medium)	4 – 8
Dense	30 – 50	1.0 – 2.0	Stiff	8 – 15
Very Dense	> 50	2.0 – 4.0	Very Stiff	15 – 30
		> 4.0	Hard	> 30

PARTICLE SIZE DEFINITION (As per ASTM D2487 and D422)

Boulder	⇒ Larger than 12 inches	Coarse Sands	⇒ No. 10 to No. 4 sieve
Cobbles	⇒ 3 to 12 inches	Medium Sands	⇒ No. 40 to No. 10 sieve
Coarse Gravel	⇒ 3/4 to 3 inches	Fine Sands	⇒ No. 200 to 40 sieve
Fine Gravel	⇒ No. 4 to 3/4 inches	Silt	⇒ 5µm to No. 200 sieve
		Clay	⇒ Smaller than 5µm

SOIL CLASSIFICATION

Soils and bedrock are classified and described based on their engineering properties and characteristics using ASTM D2487 and D2488.

Percentage description of minor components:

Trace	1 – 10%	Some	20 – 35%
Little	10 – 20%	And or y	25 – 50%

Stratified soils description:

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

SOIL CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

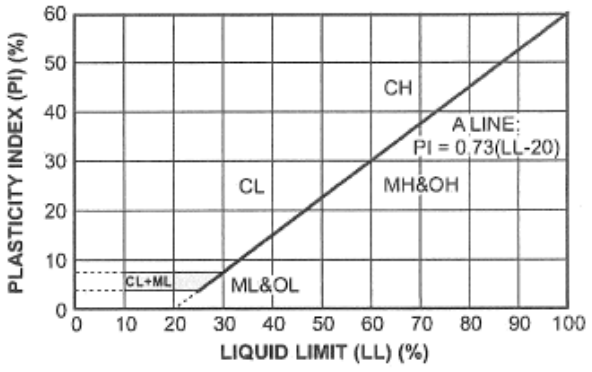
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



PARTICLE SIZE LIMITS

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	
	3"	¾"	NO. 4	NO. 10	NO. 40	NO. 200

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

LOG OF BORING EXPLANATION

LOG OF EXPLORATORY BORING B-1

Project Number: **21-7337**
Project Name: **Shiloh West Medical Center, Victorville**
Date Drilled: **3/2/22 - 3/2/22**
Ground Elev: **3113**

Logged By: **PK**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surface is sand, gravel and sparce vegetation.			
								FILL: Silty SAND- to Sandy SILT- light brown, fine to coarse grained sand, slightly moist to dry, medium dense.			
3110								NATIVE: Silty SAND- light brown, dry, medium dense, fine to coarse grained sand, scattered fine gravel.			R-Value
	5				25		SM	...Same as above.	2	115	Consol
3105											
	10				20		SM	...Same as above, less fines.	1	92	Consol
3100											
	15				>50			NO RECOVERY			
3095											
	20				>50		SM	Silty SAND- light brown, moist, very dense, fine to coarse grained sand, slightly cemented.	4		
3090											
	25				58		SM	...Same as above, dense.	5		
3085								Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
	30							Ground elevation estimated with Google Earth.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2

TGR GEOTECHNICAL, INC.

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

LOG OF EXPLORATORY BORING B-2

Project Number: **21-7337**
Project Name: **Shiloh West Medical Center, Victorville**
Date Drilled: **3/2/22 - 3/2/22**
Ground Elev: **3115**

Logged By: **PK**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surface is sand, gravel and sparce vegetation.			
								FILL: Silty SAND to Sandy SILT- light brown, slightly moist, medium dense, fine grained sand.			
								NATIVE: Silty SAND- light brown, slightly moist, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
3110	5			■	27		SM	...Same as above.	2	99	
3105	10			■	36		SM	...Same as above, fine grained sand, slightly cemented.	3	118	
3100	15			■	>50		MLS	Sandy SILT to Silty SAND- greyish brown, slightly moist, very dense, fine to medium grained sand, cemented.	6	95	
3095	20			⊠	52		SM	Silty SAND- greyish brown, slightly moist, dense, fine to medium grained sand.	4		
3090	25			⊠	45		SM	...Same as above.	5		
								Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
3085	30							Ground elevation estimated with Google Earth.			

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-3

Sheet **1** of **1**

Project Number:	**21-7337**	Logged By:	**PK**
Project Name:	**Shiloh West Medical Center, Victorville**	Project Engineer:	**SG**
Date Drilled:	**3/2/22 - 3/2/22**	Drill Type:	**Hollow Stem**
Ground Elev:	**3115**	Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surface is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT- light brown, slightly moist, stiff, fine to coarse grained sand.			
								NATIVE: Silty SAND- light brown, slightly moist, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
3110	5			■	22		SM	...Same as above.	3	116	
3105	10			■	27		SM	...Same as above, dry.	2	105	
								Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion. Ground elevation estimated with Google Earth.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4

TGR GEOTECHNICAL, INC.

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

LOG OF EXPLORATORY BORING B-4

Sheet **1** of **1**

Project Number:	**21-7337**	Logged By:	**PK**
Project Name:	**Shiloh West Medical Center, Victorville**	Project Engineer:	**SG**
Date Drilled:	**3/2/22 - 3/2/22**	Drill Type:	**Hollow Stem**
Ground Elev:	**3115**	Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surface is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT- light brown, slightly moist, stiff, fine grained sand.			
								NATIVE: Silty SAND light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
3110	5			■	22		SM	...Same as above.	2	111	
3105	10			■	56		SM	...Same as above, very dense.	2	107	
								Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion. Ground elevation estimated with Google Earth.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5

TGR GEOTECHNICAL, INC.

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

LOG OF EXPLORATORY BORING B-5

Project Number: **21-7337**
Project Name: **Shiloh West Medical Center, Victorville**
Date Drilled: **3/2/22 - 3/2/22**
Ground Elev: **3116**

Logged By: **PK**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
3115								Surface is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT- light brown, slightly moist, stiff, fine to coarse grained sand.			
								NATIVE: Silty SAND- light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
	5										
3110				■	21		SM	...Same as above.	2	118	Consol
	10										
3105				■	54		SM	...Same as above, very dense.	2	113	
	15										
3100				■	>50		SM	NO RECOVERY			
	20										
3095				⊠	>50		SM	Silty SAND- light greyish brown, moist, very dense, fine grained sand, cemented.	4		
	25										
3090				⊠	57		SM	...Same as above, medium dense, fine to medium grained sand.	4		
								Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
	30							Ground elevation estimated with Google Earth.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 6

TGR GEOTECHNICAL, INC.

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

LOG OF EXPLORATORY BORING B-6

Sheet **1** of **1**

Project Number:	**21-7337**	Logged By:	**PK**
Project Name:	**Shiloh West Medical Center, Victorville**	Project Engineer:	**SG**
Date Drilled:	**3/2/22 - 3/2/22**	Drill Type:	**Hollow Stem**
Ground Elev:	**3116**	Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
3115	0							Surface is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT- light brown, slightly moist, stiff, fine grained sand.			
								NATIVE: Silty SAND- light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.			
	5			■	21		SM	...Same as above.	2	114	
3110											
	10			■	31		SM	...Same as above, slightly moist, dense.	3	101	Consol
3105											
	15			■	>50		SM	Silty SAND- greyish brown, moist, very dense, fine grained sand, slightly cemented.	5	94	
3100											
	20			⊠	60		SM	...Same as above.	6		
3095											
	25			⊠	>50		SM	...Same as above.	5		
3090								Total Depth: 26.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion.			
	30							Ground elevation estimated with Google Earth.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7

TGR GEOTECHNICAL, INC.

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

LOG OF EXPLORATORY BORING B-7

Project Number:	**21-7337**	Logged By:	**PK**
Project Name:	**Shiloh West Medical Center, Victorville**	Project Engineer:	**SG**
Date Drilled:	**3/2/22 - 3/2/22**	Drill Type:	**Hollow Stem**
Ground Elev:	**3118**	Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surfaace is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT- light brown, slightly moist, stiff, fine grained.			
3115								NATIVE: Silty SAND- light brown, slightly moist, medium dense, fine to medium grained sand, scattered fine grained gravel.			
	5				8		SM	...Same as above.	3	110	
3110											
	10				22		SM	...Same as above, moist.	4	111	
3105								Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion. Ground elevation estimated with Google Earth.			

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 8

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-8

Project Number:	**21-7337**	Logged By:	**PK**
Project Name:	**Shiloh West Medical Center, Victorville**	Project Engineer:	**SG**
Date Drilled:	**3/2/22 - 3/2/22**	Drill Type:	**Hollow Stem**
Ground Elev:	**3117**	Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Elevation (ft)	Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
								Surface is sand, gravel and sparce vegetation.			
								FILL: Sandy SILT to Silty SAND- light brown, moist, stiff, medium to coarse grained sand.			
3115								NATIVE: Silty SAND- light brown, dry, medium dense, medium to coarse grained sand, scattered fine grained gravel.			Max, Shear, EI, Corrosion
	5				24		SM	...Same as above.	1	111	
3110											
	10				39		SM	...Same as above, moist, dense.	4	103	
3105								Total Depth: 11.5 feet. No groundwater encountered during drilling. No caving observed. Boring backfilled with soil cuttings upon completion. Ground elevation estimated with Google Earth.			

LOG OF BORING 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/25/22

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 9

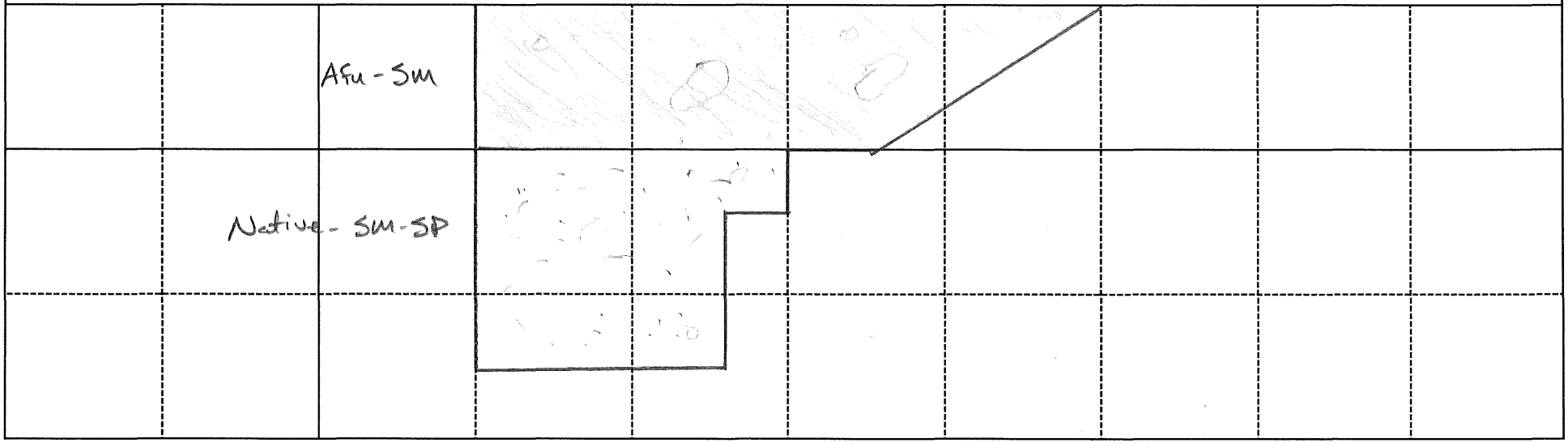
TGR GEOTECHNICAL, INC.

TGR GEOTECHNICAL INC

Project Name:	Shiloh West Medical	Logged by:	RA		
Project Number:	21-7337	Elevation:	3119 ft	Trench No.	TP-1
Equipment:	Back Hoe Excavator	Location:			

GEOLOGIC ATTITUDES	DATE: 3/2/2022 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests
	0-2' - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, fine grained sand, some coarse, some fine to coarse gravel.	Afu	SM				
	2-5' - NATIVE: Silty SAND to SAND, reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.	Qa	SM-SP				
	Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.				2.1%		-200= 10.8%
	Bulk Sample @ ´5 feet						

GRAPHIC PRESENTATION SCALE: 1" = 2' SURFACE SLOPE: Flat TREND: E-W



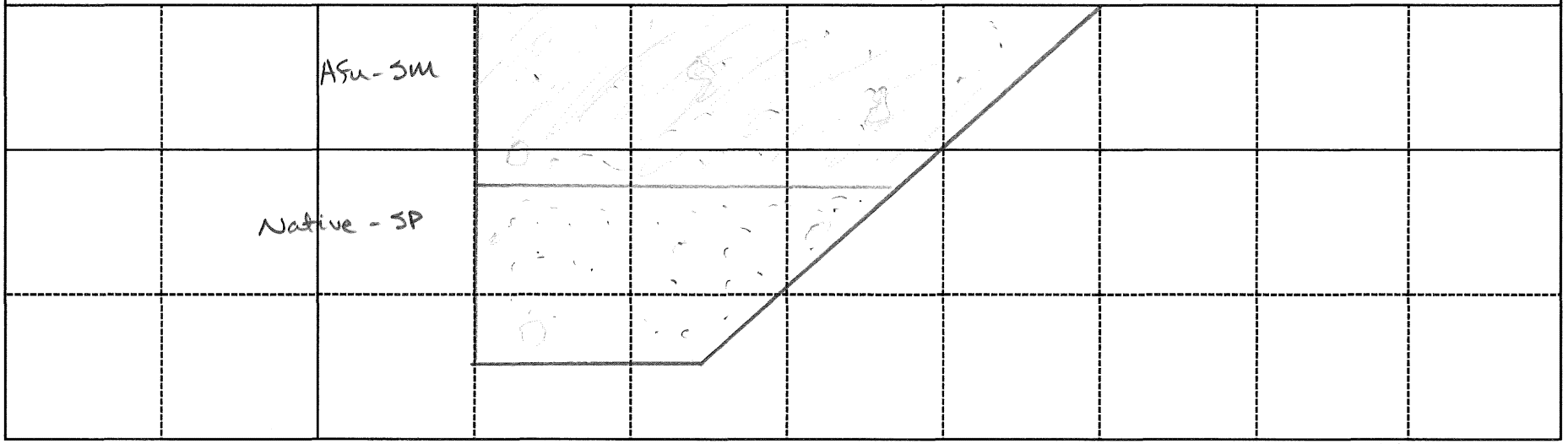
Log of Trench No. TP-1

TGR GEOTECHNICAL INC

Project Name:	Shiloh West Medical	Logged by:	RA			ENGINEERING PROPERTIES				
Project Number:	21-7337	Elevation:	3116 ft	Trench No.	TP-2					
Equipment:	Back Hoe Excavator	Location:								

GEOLOGIC ATTITUDES	DATE: 3/2/2022 DESCRIPTION:	GEOLOGIC UNIT	U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests
	0-2.5' - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, fine grained sand, some coarse, some fine to coarse gravel.	Afu	SM				
	2.5-5' - NATIVE: SAND, light reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.	Qa	SP				
	Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.				1.5%		-200= 4.5%
	Bulk Sample @ ´5 feet						

GRAPHIC PRESENTATION SCALE: 1" = 2' SURFACE SLOPE: Flat TREND: E-W



Log of Trench No. TP-2

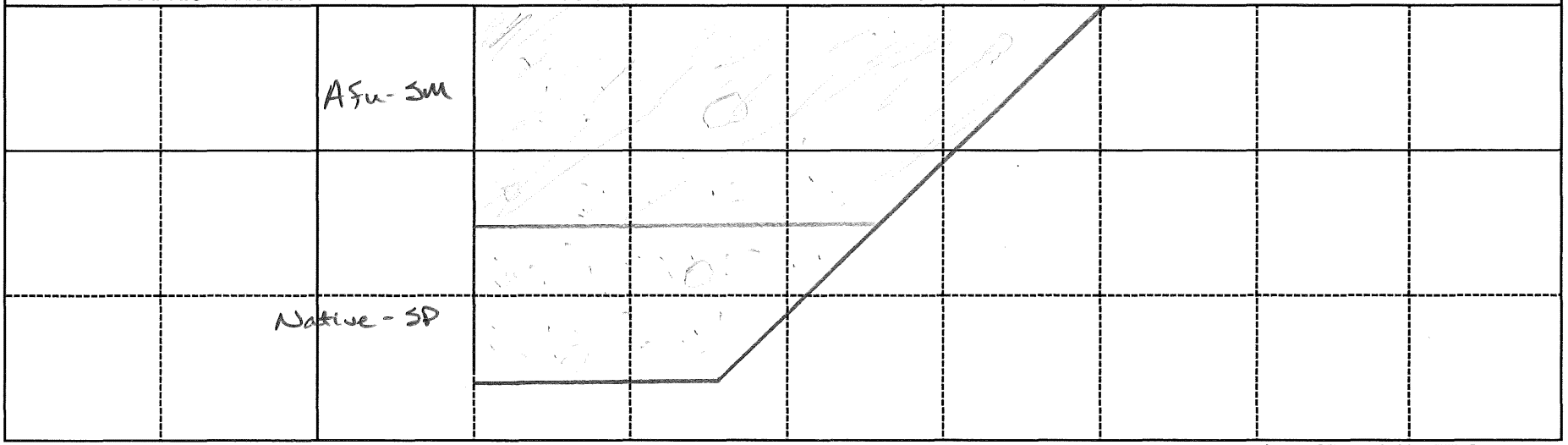
TGR GEOTECHNICAL INC

Project Name:	Shiloh West Medical	Logged by:	RA		
Project Number:	21-7337	Elevation:	3113 ft	Trench No.	TP-3
Equipment:	Back Hoe Excavator	Location:			

GEOLOGIC ATTITUDES	DATE: 3/2/2022 DESCRIPTION:	GEOLOGIC UNIT	U.S.C.S.	Sample No.	Moisture (%)	Density (pcf)	Other Tests
	0-3" - UNDOCUMENTED FILL: Silty SAND, reddish brown, slightly moist, medium dense to dense, very fine to fine grained sand, some coarse, some fine to coarse gravel.	Afu	SM				
	3-5' - NATIVE: SAND, light reddish brown, slightly moist, medium dense, fine to coarse grained, some fine to coarse gravel.	Qa	SP				
	Total Depth: 5 feet. Double Ring Infiltrometer testing performed in test pit. Trench backfilled with excavated soil upon completion.				2.3%		-200= 6.0%
	Bulk Sample @ ´5 feet						

ENGINEERING PROPERTIES

GRAPHIC PRESENTATION SCALE: 1" = 2' SURFACE SLOPE: Flat TREND: E-W



Log of Trench No. TP-3

APPENDIX C
LABORATORY TEST RESULTS

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APPENDIX C

Laboratory Testing Procedures and Results

In-Situ Moisture and Dry Density Determination (ASTM D2216 and D7263): Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density and Optimum Moisture Content (ASTM D1557): The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	133.0	9.0

Direct Shear Strength (ASTM D3080): Direct shear test was performed on selected remolded samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test results are presented in the test data and in the table below:

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-8 @ 0-5 feet	Sandy Silt to Silty Sand (Remolded)	33	120

Consolidation Tests (ASTM D2435): Consolidation test were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data.

Expansion Potential (ASTM D4829): The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Expansion Index	Expansion Potential
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	0	Very Low

Soluble Sulfate (CAL 417A): The soluble sulfate content of selected sample was determined by standard geochemical methods. The test results are presented in the test data and in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	0.0185	185	S0

* Based on the current version of ACI 318-14 Building Code, Table No. 19.3.1.1; Exposure Categories and Classes.

Corrosivity Tests (CAL 422, CAL 643 and CAL 747): Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are provided in the test data and in the table below:

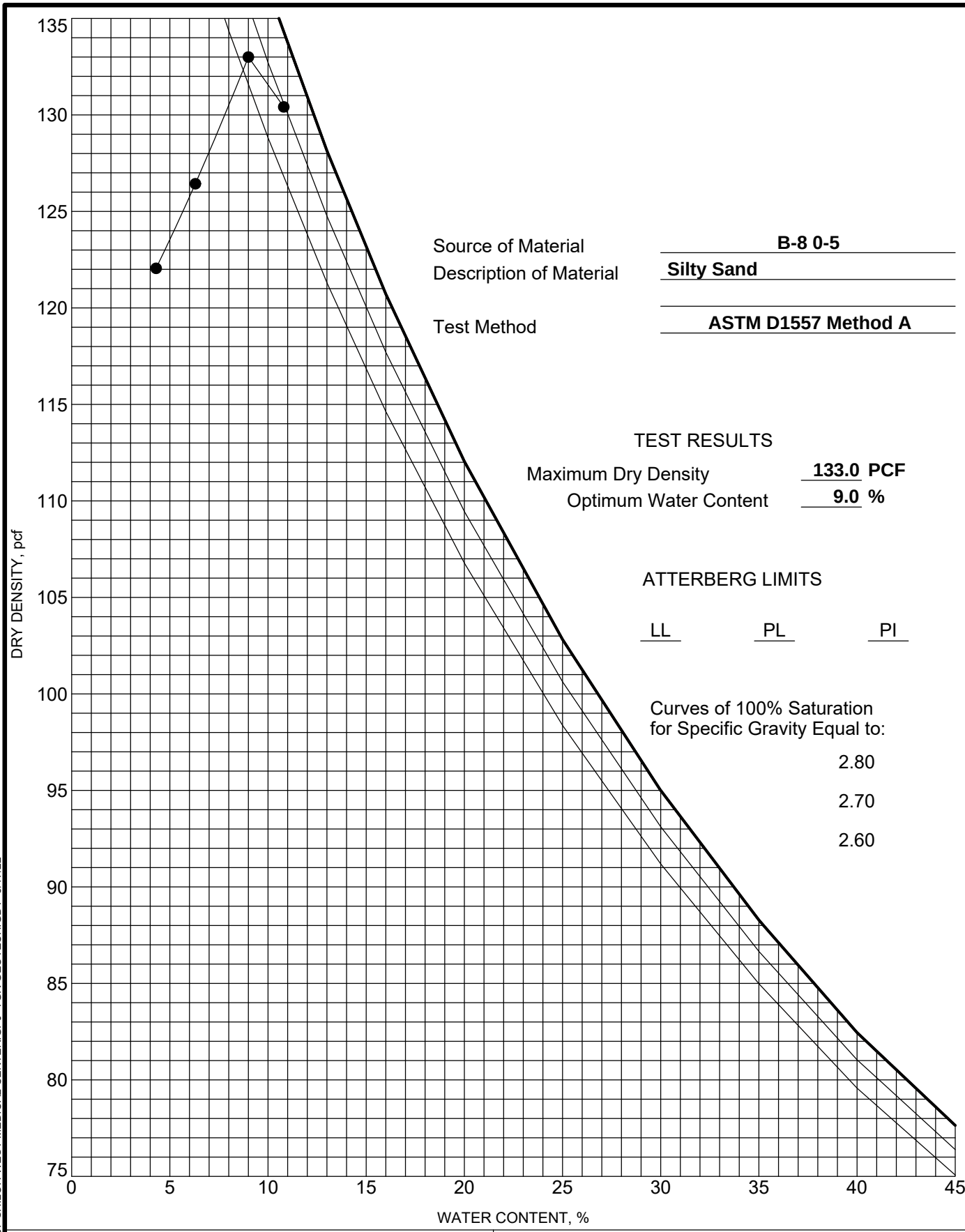
Sample Location	Sample Description	Soluble Chloride (CAL 422) (ppm)	Electrical Resistivity (CAL 643) (ohm-cm)	pH (CAL 747)	Potential Degree of Attack on Steel
B-8 @ 0-5 feet	Sandy Silt to Silty Sand	69	6,100	7.9	Moderate

R-Value (CAL 301): The resistance "R"-Value was determined by the California Materials Method No. 301 for subgrade soils. Samples were prepared and exudation pressure and "R"-Value determined. The graphically determined "R"-Values at exudation pressure of 300 psi are shown in the test data and summarized in the table below:

Sample Location	Sample Description	R-Value
B-2 @ 0-5 feet	Silty Sand and Sandy Silt	23

Passing No. 200 Sieve (ASTM D1140): Typical materials were washed over No. 200 sieve. The test results are presented below:

Sample Location	% Passing No. 200 Sieve
TP-1 @ 5 feet	10.8
TP-2 @ 5 feet	4.5
TP-3 @ 5 feet	6.0



Source of Material: **B-8 0-5**

Description of Material: **Silty Sand**

Test Method: **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density: **133.0 PCF**

Optimum Water Content: **9.0 %**

ATTERBERG LIMITS

LL PL PI

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

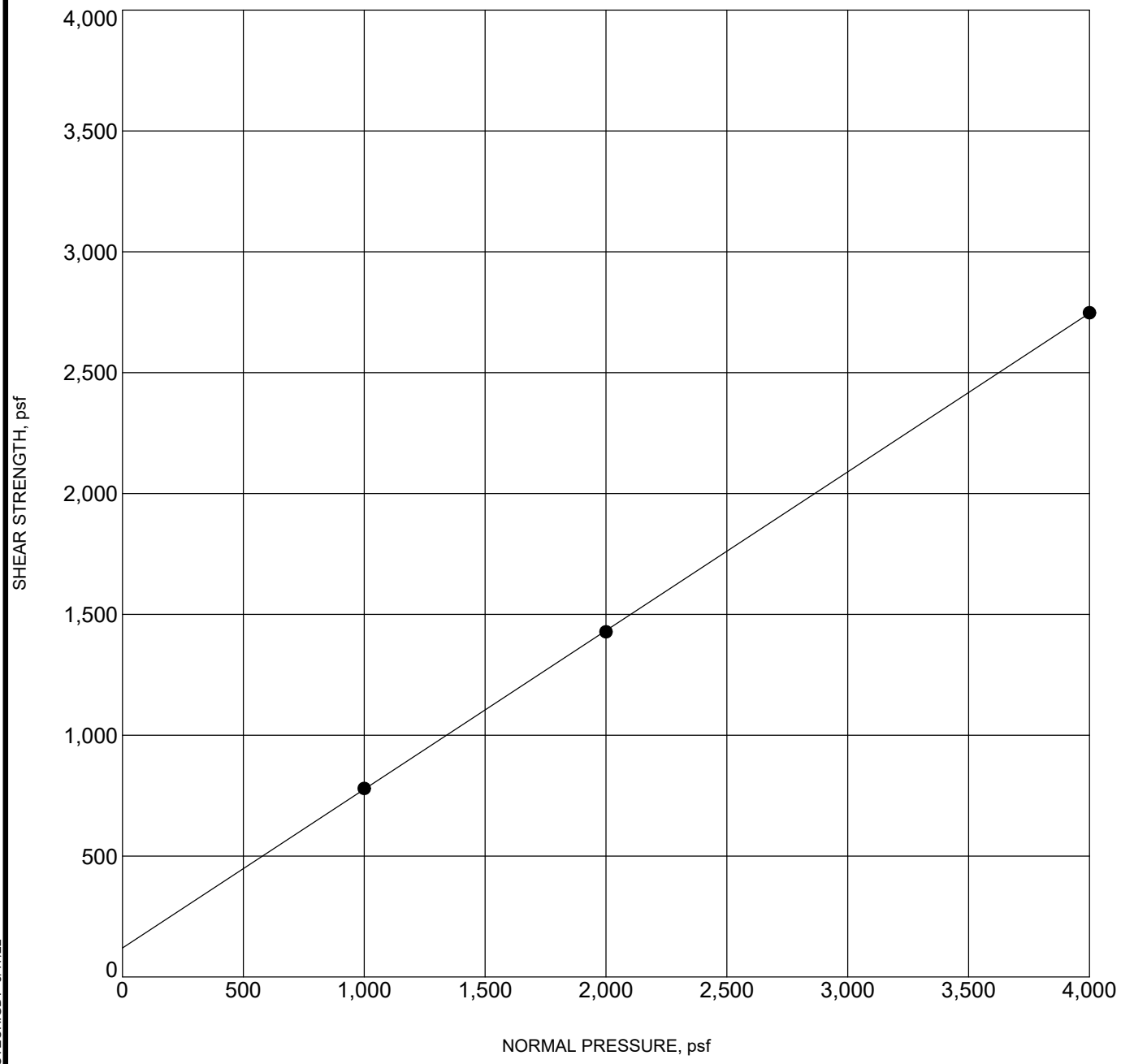
MOISTURE-DENSITY RELATIONSHIP

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax: 714-641-7190

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US COMPACTION 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/17/22



Specimen Identification		Classification	γ_d	MC%	c	ϕ
● **B-8**	**0-5**	**Silty Sand - Remolded - 90% RC**	**120**	**9**	**120**	**33**

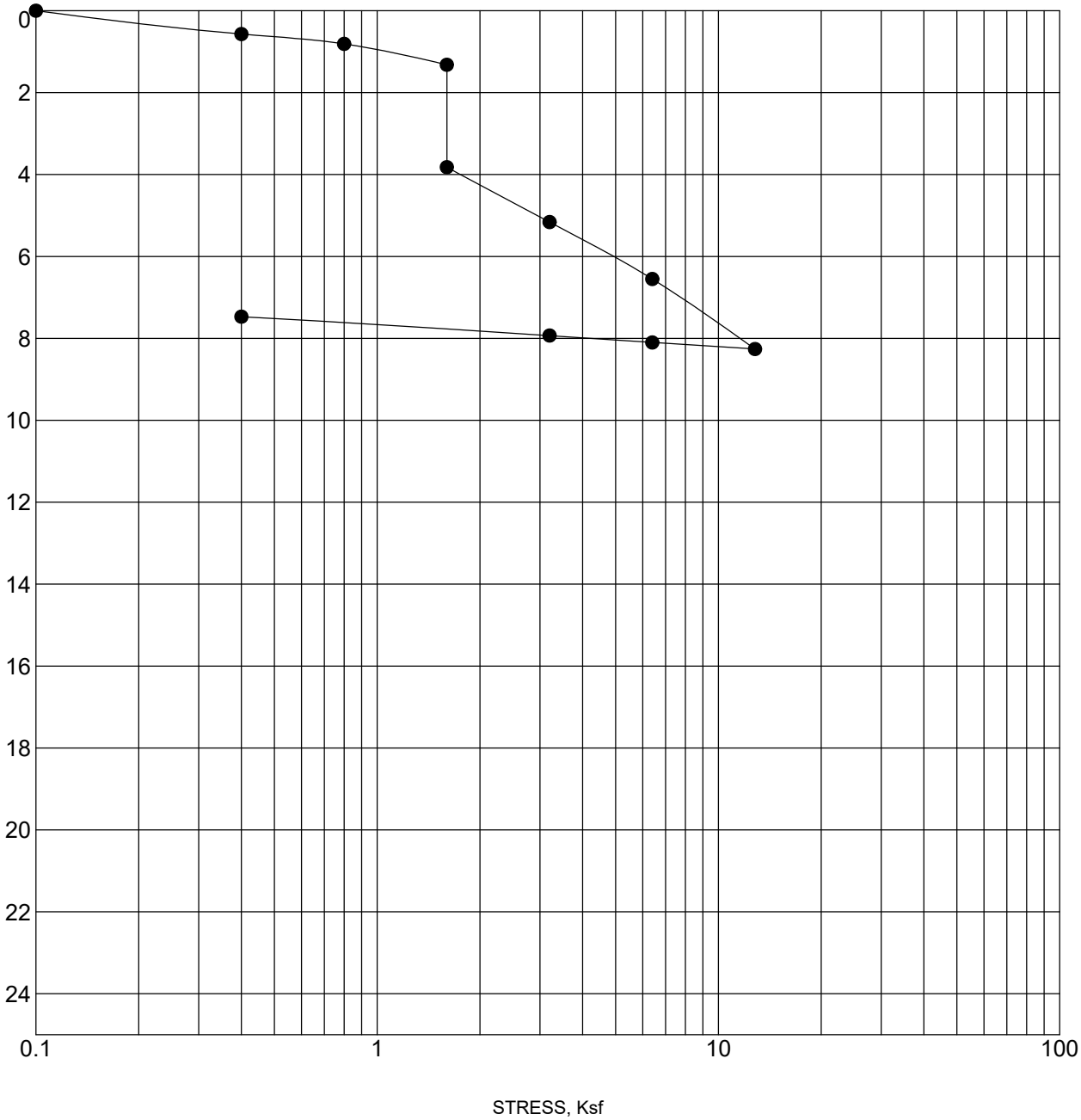
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax: 714-641-7190

DIRECT SHEAR TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US DIRECT SHEAR 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/17/22



Specimen Identification		Classification	γ_d	MC%
● **B-1** **5.0**		**Silty Sand**	**115**	**2**

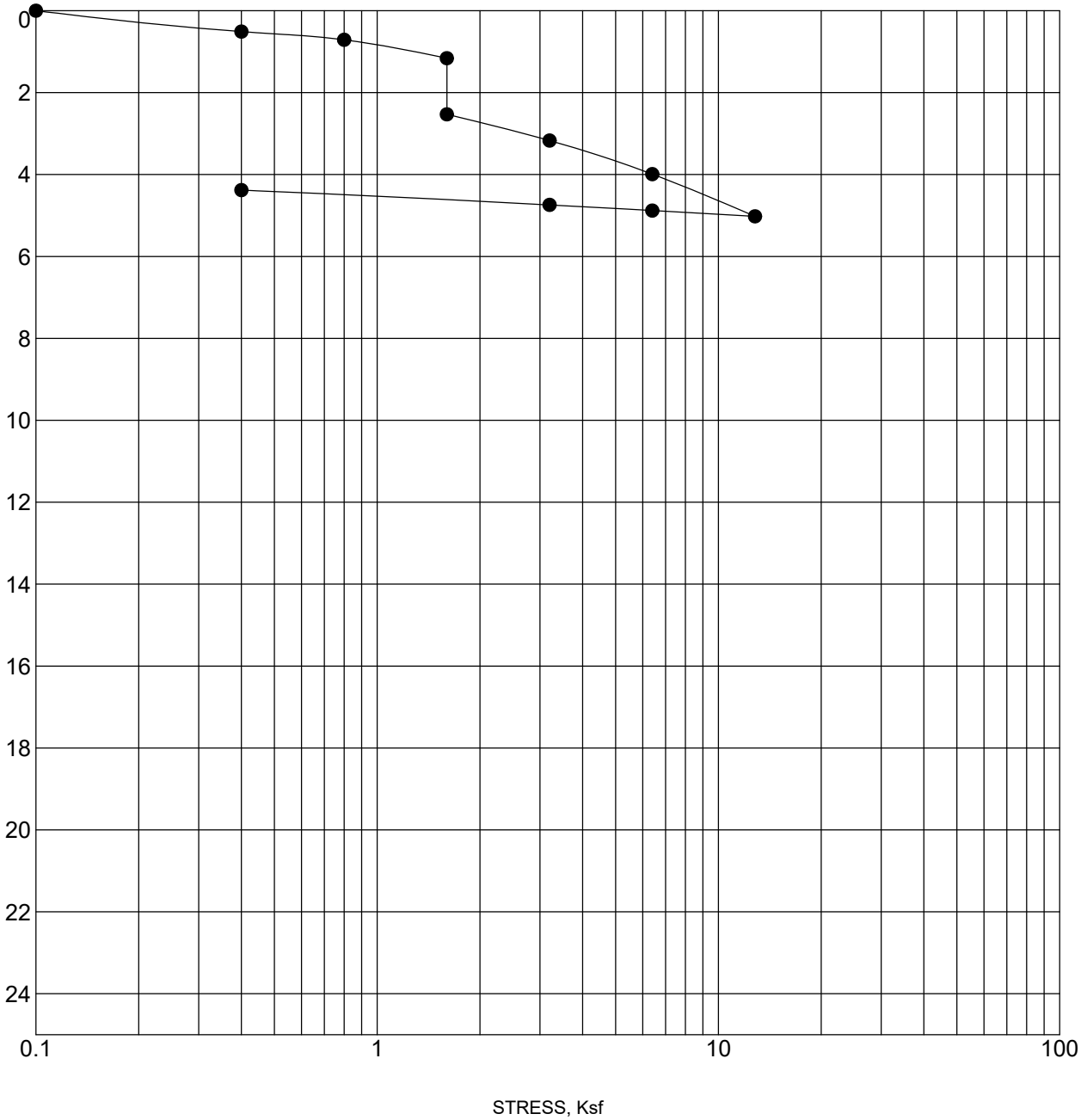
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
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Telephone: 714-641-7189
Fax: 714-641-7190

CONSOLIDATION TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22



Specimen Identification		Classification	γ_d	MC%
● **B-1** **10.0**		**Silty Sand**	**92**	**1**

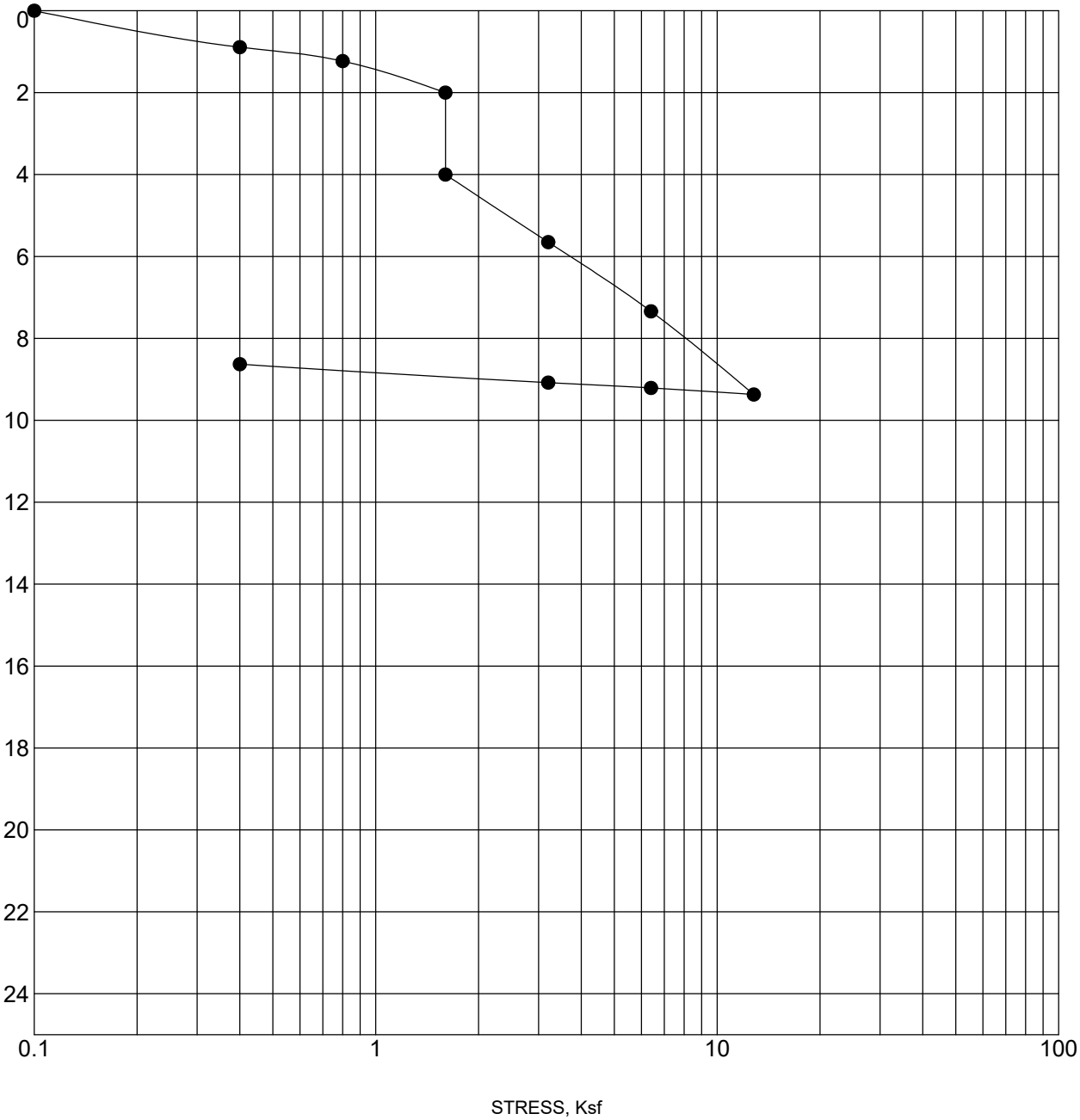
TGR GEOTECHNICAL, INC.
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CONSOLIDATION TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/21/22



Specimen Identification		Classification	γ_d	MC%
● **B-5** **5.0**		**Silty Sand**	**118**	**2**

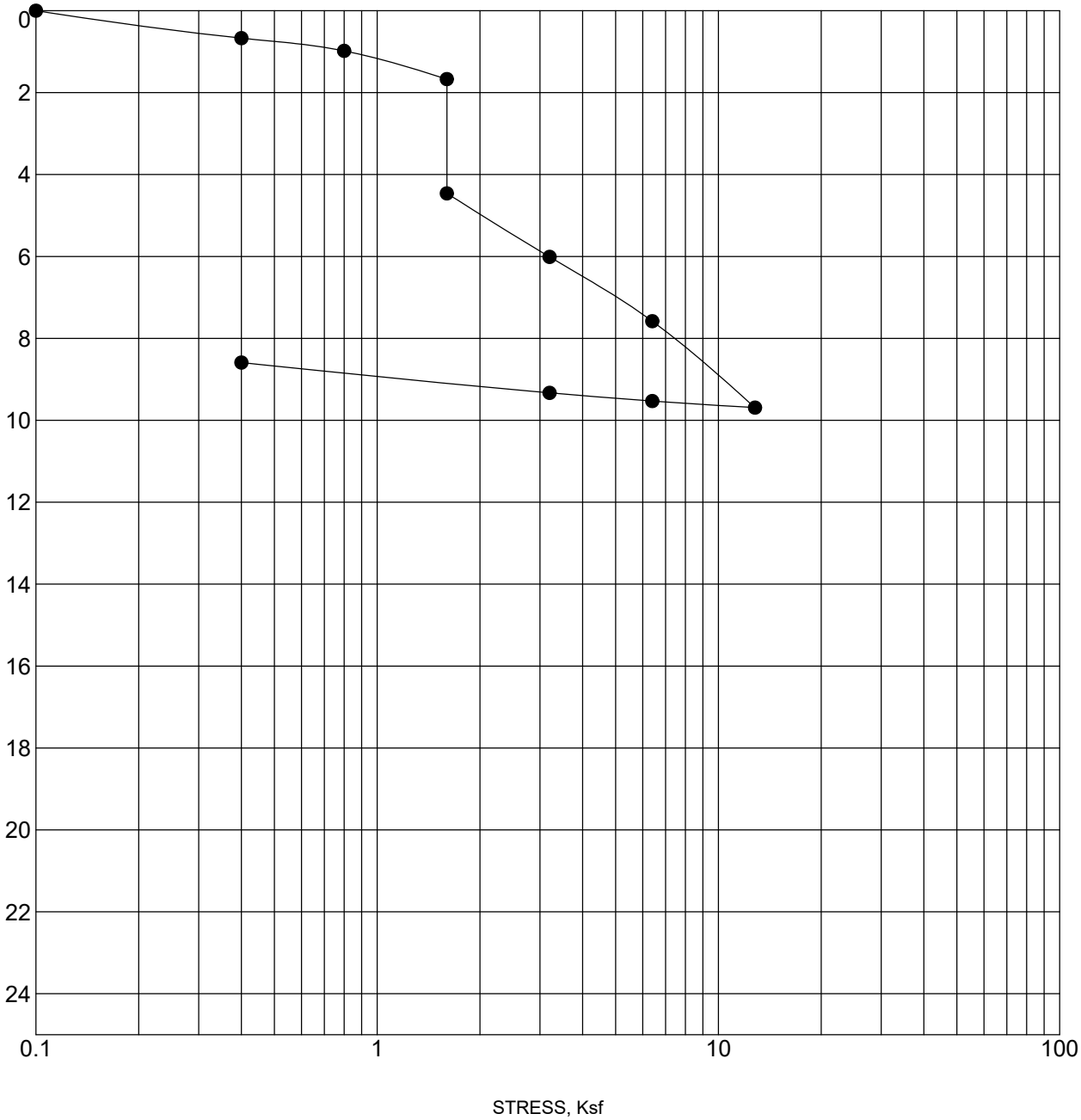
TGR GEOTECHNICAL, INC.
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Telephone: 714-641-7189
Fax: 714-641-7190

CONSOLIDATION TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22



Specimen Identification		Classification	γ_d	MC%
● **B-6** **10.0**		**Silty Sand**	**101**	**3**

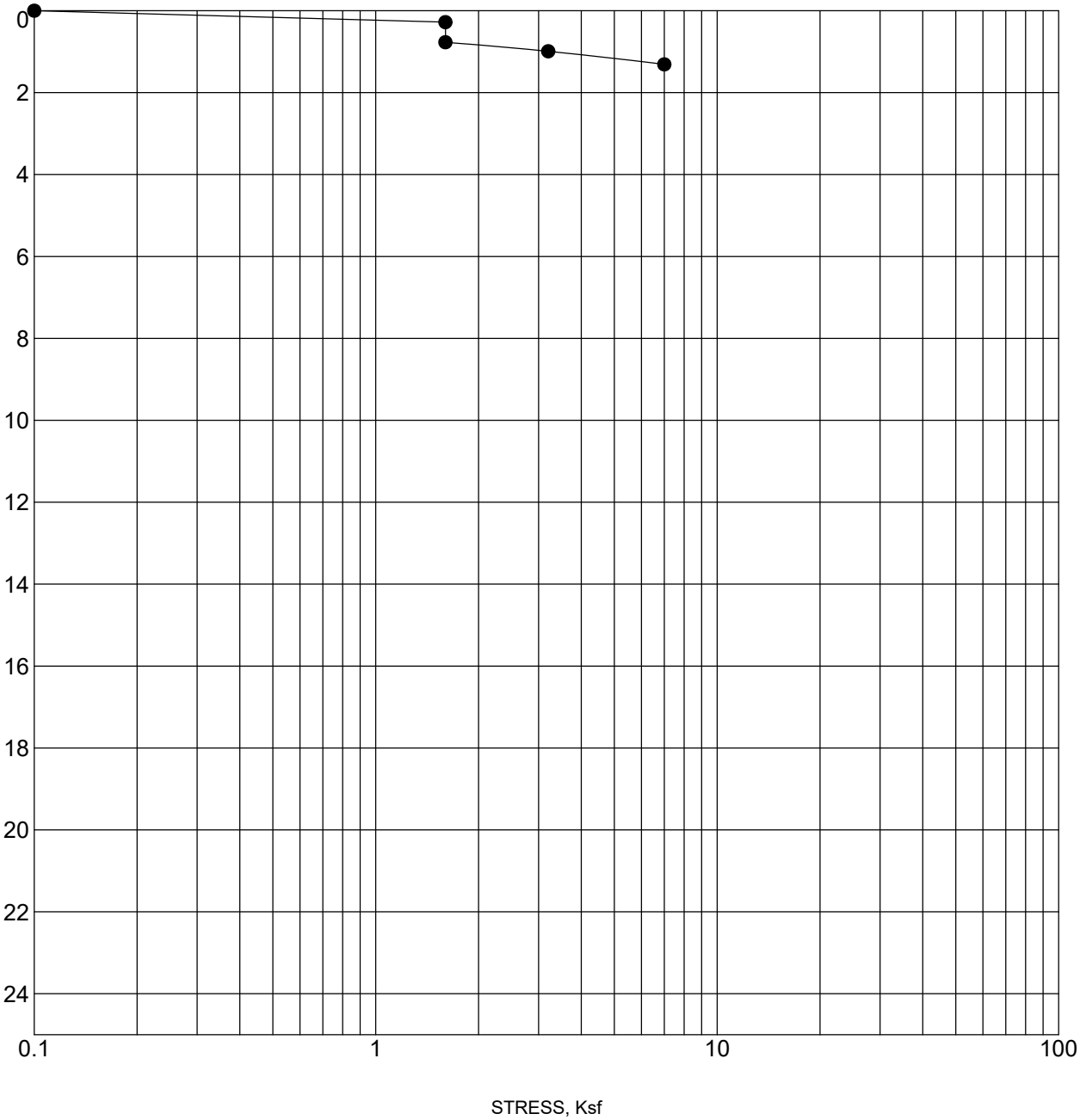
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax: 714-641-7190

CONSOLIDATION TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/21/22



Specimen Identification		Classification	γ_d	MC%
● **B-3** **5.0**		**Silty Sand**	**116**	**3**

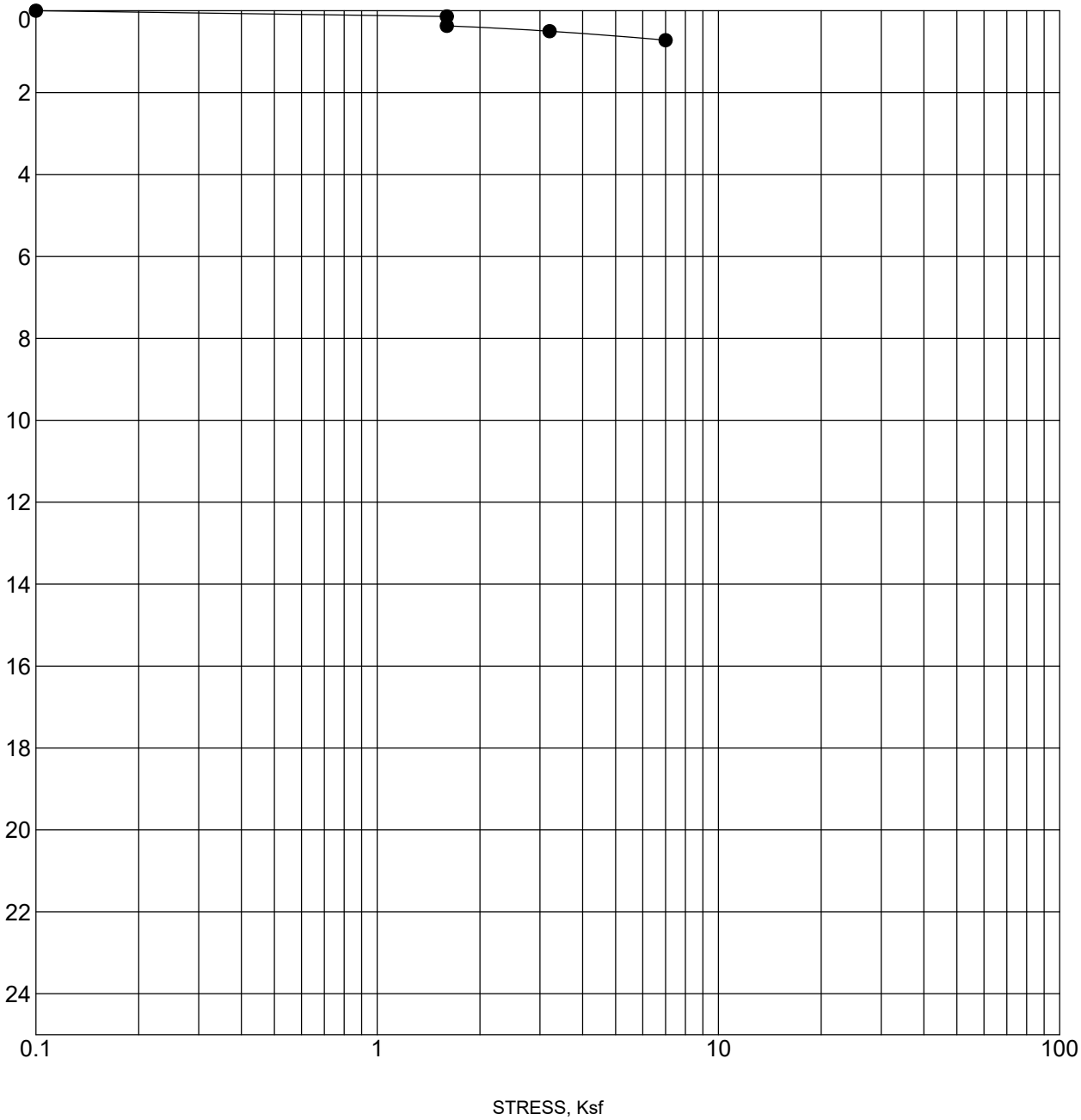
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax: 714-641-7190

COLLAPSE TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22



Specimen Identification		Classification	γ_d	MC%
● **B-6** **5.0**		**Silty Sand**	**114**	**2**

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax: 714-641-7190

COLLAPSE TEST

Project Number: 21-7337

Project Name: Shiloh West Medical Center, Victorville

US CONSOL STRAIN 21-7337 SHILOH WEST MEDICAL CENTER.GPJ TGR GEOTECH.GDT 3/22/22

ANAHEIM TEST LAB, INC

196 Technology Dr., Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA 92704

DATE: 3/17/2022

P.O. NO: VERBAL

LAB NO: C-5771

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 21-7337
Project: Shiloh West Medical Center
Sample ID: B8 @ 0-5'

ANALYTICAL REPORT

CORROSION SERIES

SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.9	6,100	185	69

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA. 92704

DATE: 3/18/2022

P.O. NO.: VERBAL

LAB NO.: C-5777

SPECIFICATION: CTM- 301

MATERIAL: Brown, Sandy Clay

Project No.: 21-7337
Project: Shiloh West Medical Center
Sample ID: B1 @ 0-5'

ANALYTICAL REPORT

"R" VALUE

BY EXUDATION	BY EXPANSION
23	N/A

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: TGR Geotechnical **ATL No.:** C 5777 **Date:** 3/18/2022

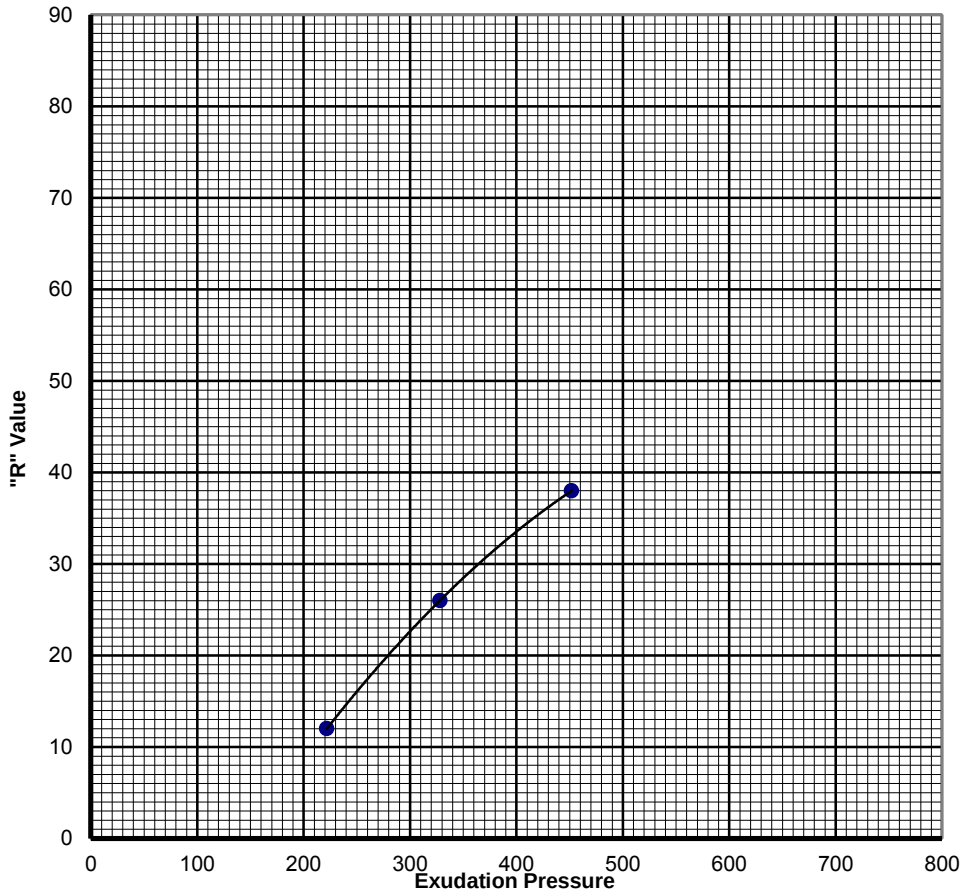
Client Reference No.: 21-7337

Sample: B1 @ 0-5' **Soil Type:** Brown, Sandy Clay

.

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	100	60	80	
Initial Moisture Content	%	4.6	4.6	4.6	
Moisture at Compaction	%	11.6	13.4	12.5	
Briquette Height	in.	2.48	2.51	2.51	
Dry Density	pcf	125.5	120.4	123.1	
EXUDATION PRESSURE	psi	452	222	328	
EXPANSION PRESSURE	psf	121	35	65	
Ph at 1000 pounds	psi	38	65	49	
Ph at 2000 pounds	psi	88	131	105	
Displacement	turns	3.36	4.12	3.82	
"R" Value		38	12	26	
CORRECTED "R" VALUE		38	12	26	

Final "R" Value	
BY EXUDATION: @ 300 psi	**23**
BY EXPANSION: TI = 5.0	**N/A**



APPENDIX D
SITE SEISMICITY AND DEAGGREGATED PARAMETERS

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TABLE 1

SITE SPECIFIC GROUND MOTION ANALYSIS

21-7337 Shiloh West Medical

SA Period (sec)	Probabilistic Spectral Acceleration MCER (g)	Deterministic Spectral Acceleration (g)	Is Largest Deterministic Spectral Acceleration <1.5*Fa	Deterministic MCER	Site Specific MCER	2/3 of Site Specific MCER	80% Code Design	Site Specific Design Response Spectrum
	Rotated Maximum	Rotated Maximum 84th Percentile						
0	0.6864	0.4565		0.5810	0.5810	0.3874	0.3388	0.3874
0.1	1.2034	0.7106		0.9045	0.9045	0.6030	0.6003	0.6030
0.2	1.6192	0.9746		1.2405	1.2405	0.8270	0.8469	0.8469
0.3	1.8045	1.1419		1.4534	1.4534	0.9689	0.8469	0.9689
0.5	1.7555	1.1785		1.5000	1.5000	1.0000	0.8469	1.0000
0.75	1.4751	1.0209	Yes	1.2994	1.2994	0.8663	0.8469	0.8663
1	1.2649	0.9022		1.1483	1.1483	0.7655	0.8227	0.8227
2	0.7236	0.5589		0.7114	0.7114	0.4742	0.4113	0.4742
3	0.5096	0.4074		0.5185	0.5096	0.3397	0.2742	0.3397
4	0.3930	0.3132		0.3986	0.3930	0.2620	0.2057	0.2620
5	0.3165	0.2475		0.3150	0.3150	0.2100	0.1645	0.2100

Code Sds	1.059	Crs =	0.927	Code Ss =	1.588
Code Sd1	1.028	Cr1 =	0.902	Code S1 =	0.617
To	0.19	Code Fa =	1	Sms =	1.588
Ts	0.97	Code Fv =	2.5	Sm1 =	1.5425
TL	8				
Input					

Site Specific S_{DS} = 0.900

Site Specific S_{D1} = 1.050

FIGURE 1
Site Specific Design Response Spectra
21-7337 Shiloh West Medical

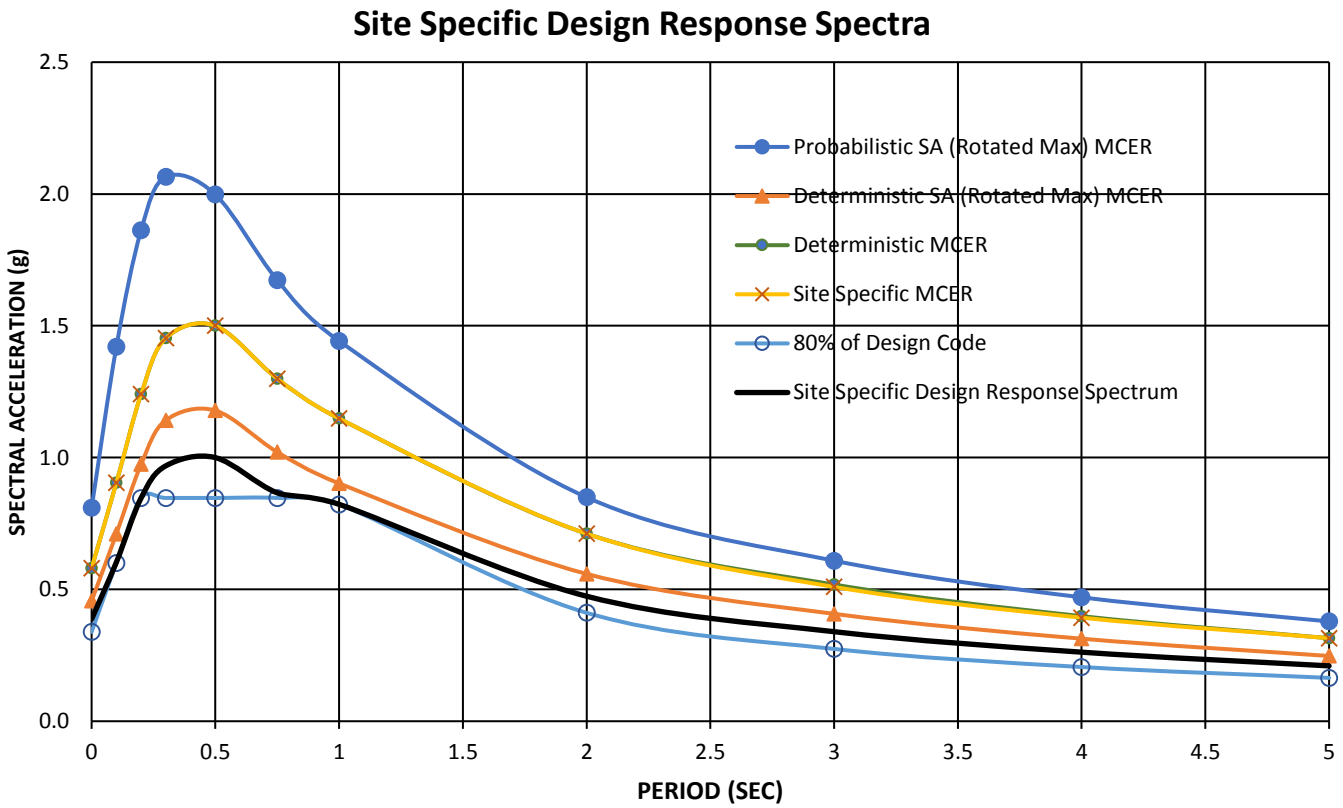


TABLE 2

Probabilistic Response Spectrum ASCE 7-16 Method 2

21-7337 Shiloh West Medical

Period (g)	UHGM (g)	RTGM (g)	Max Dir Scale factor	Max Dir RTGM (g)
0	0.648	0.624	1.1	0.686
0.1	1.108	1.094	1.1	1.203
0.2	1.497	1.472	1.1	1.619
0.3	1.651	1.604	1.125	1.805
0.5	1.578	1.494	1.175	1.755
0.75	1.276	1.192	1.2375	1.475
1	1.054	0.973	1.3	1.265
2	0.594	0.536	1.35	0.724
3	0.409	0.364	1.4	0.510
4	0.306	0.271	1.45	0.393
5	0.239	0.211	1.5	0.317

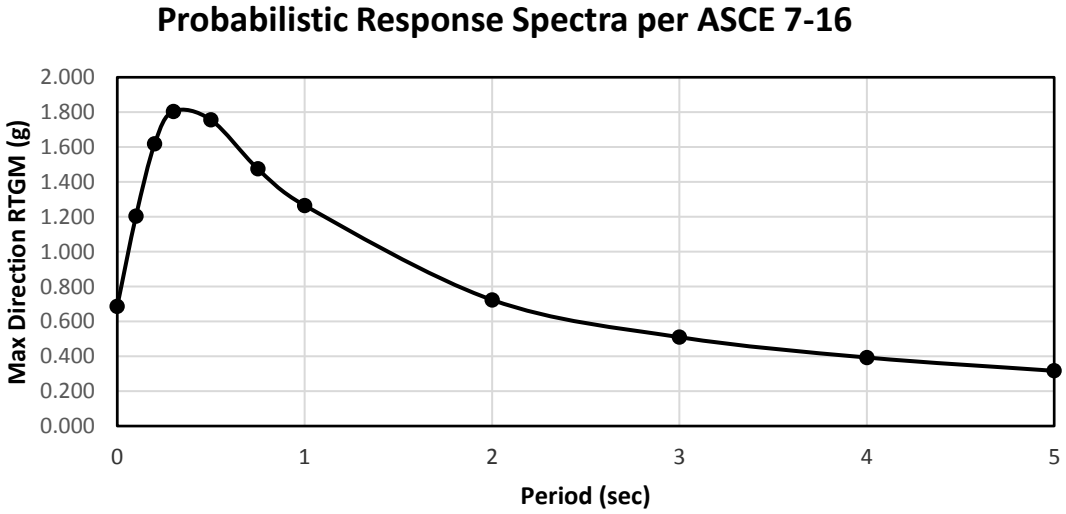
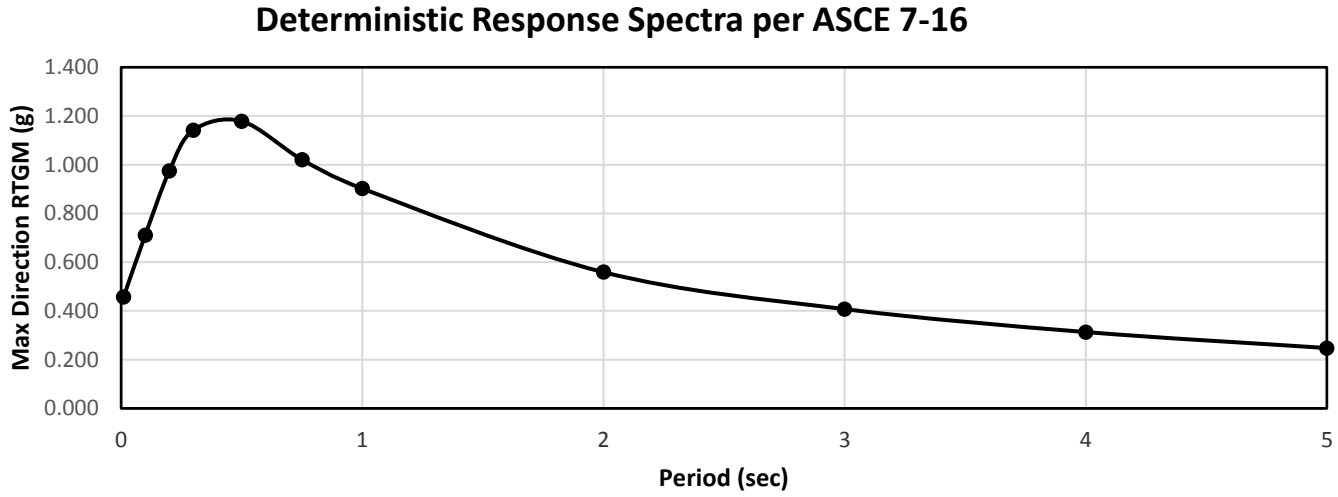


TABLE 3

Deterministic Response Spectrum ASCE 7-16 - San Andreas (San Bernardino N)

21-7337 Shiloh West Medical

Period (g)	84th-Percentile Spectral Acceleration (g)	Max Dir Scale factor	Max Dir Deterministic SA (g)
0.01	0.415	1.1	0.457
0.1	0.646	1.1	0.711
0.2	0.886	1.1	0.975
0.3	1.015	1.125	1.142
0.5	1.003	1.175	1.179
0.75	0.825	1.2375	1.021
1	0.694	1.3	0.902
2	0.414	1.35	0.559
3	0.291	1.4	0.407
4	0.216	1.45	0.313
5	0.165	1.5	0.248



PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER

WEIGHTED AVERAGE of 2014 NGA WEST-2 GMPEs

Last updated: 04 14 15

by Emel Seyhan, PhD, PEER & UCLA -- email: emel.seyhan@gmail.com, peer_center@berkeley.edu

San Andreas (San Bernardino N) fault

This excel file will be updated as necessary on the PEER website to fix any typos or other errors. Please check the website frequently for new versions at: http://peer.berkeley.edu/ngawest2/databases/

Legend	Pre-defined option	Main input variable	Calculated variable	Input var. flag	Internal variable

GMPE averaging	Geometric

Weighted average of the natural logarithm of the spectral values

GMPEs	ASK14	BSSA14	CB14	CY14	I14
Weight	0.25	0.25	0.25	0.25	0

# of std. dev.	1
Damping ratio (%)	5

Modification factors are calculated in Sheet DSF

ASK14 Abrahamson & Silva & Kamai 2014 NGA West-2 Model
BSSA14 Boore & Stewart & Seyhan & Atkinson 2014 NGA West-2 Model
CB14 Campbell & Bozorgnia 2014 NGA West-2 Model
CY14 Chiou & Youngs 2014 NGA West-2 Model
I14 Idriss 2014 NGA West-2 Model

Input variables | **Errors and warnings**

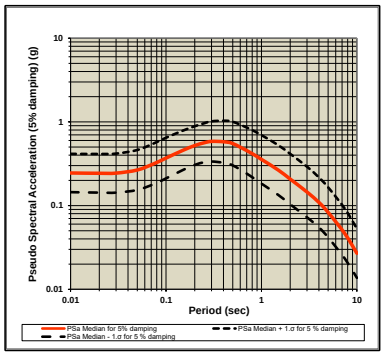
M_w	7.99
R_{RUP} (km)	25.63
R_{JB} (km)	25.63
R_X (km)	25.63
Ry0 (km)	999 — *If unknown use 999*
V_{S30} (m/sec)	260
U (BSSA13)	1 — *1: Unspecified fault mech.*
F_{RV}	0 — *1: reverse fault*
F_{NM}	0 — *1: normal fault*
F_{HW}	0 — *1: hanging wall side*
Dip (deg)	90
Z_{TOR} (km)	999 — *If unknown use 999*
Z_{HYP} (km)	8.32 — *If unknown use 999*
$Z_{1.0}$ (km)	999 — *If unknown use 999*
$Z_{2.5}$ (km)	999 — *If unknown use 999*
W (km)	12.8 — *If unknown use 999*
Vs30Flag	measured — *Choose options for V_{s30} from the list*
F_{AS}	no — *Aftershock effect is not applicable.*
Region	California — *Choose region from the list*

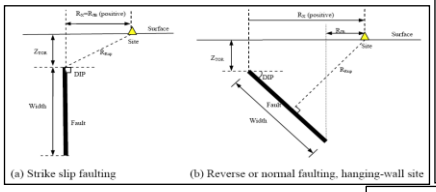
Calculated Variables/Flags

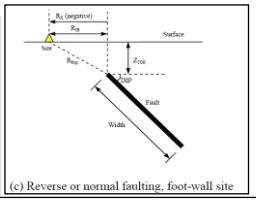
ΔDPP	0 — *Always 0 for median calcs.*
PGA_r (g)	0.186
Z_{BOT} (km) (CB14)	15 — *Enter for default W calcs*
SS	1 — *auto calculated*
$V_{s30flag}$	1 — *measured*
F_{AS}	0 — *Aftershock effect is not applicable.*
Region	0 — *California*
Option for Sa value	1 — *Weighted average of the natural logarithm of the spectral values*

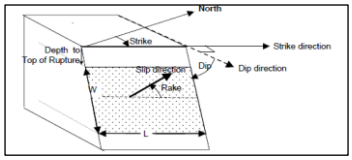
RotD50 Horizontal Component of PGA, PGV and *IMs*

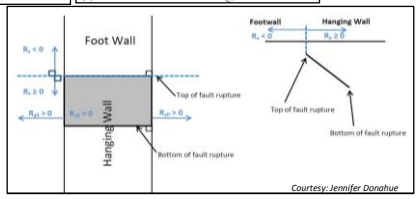
GMP	T (s)	Baseline: 5% Damping: PSa Median for 5% damping	PSa Median + 1.σ for 5% damping	PSa Median - 1.σ for 5% damping	S_d Median for 5% damping	User defined: 5% Damping: PSa Median for 5% damping	PSa Median + 1.σ for 5 % damping	PSa Median - 1.σ for 5 % damping	Sd Median for 5 % damping
PSa (g), S_d (cm)	0.01	0.2450841	0.4150918	0.144706	0.000608	0.245084	0.4150918	0.144706	0.000608
	0.02	0.2431492	0.4138145	0.14287	0.002414	0.243149	0.4138145	0.14287	0.002414
	0.03	0.2445347	0.4183282	0.142943	0.005463	0.24429	0.4179099	0.1428	0.005458
	0.05	0.2662535	0.4610385	0.153764	0.016523	0.266254	0.4610385	0.153764	0.016523
	0.075	0.3160745	0.5534551	0.180508	0.044135	0.317023	0.5551155	0.181049	0.044267
	0.1	0.3680452	0.6438461	0.210388	0.091362	0.369517	0.6464215	0.211229	0.091728
	0.15	0.4554409	0.782871	0.264956	0.254379	0.456807	0.7852196	0.265751	0.255142
	0.2	0.5194956	0.8842188	0.305214	0.515832	0.521054	0.8868714	0.306129	0.517379
	0.25	0.5616029	0.9595421	0.328696	0.871316	0.562165	0.9605016	0.329025	0.872187
	0.3	0.5832032	1.0132972	0.335663	1.302953	0.58437	1.0153238	0.336334	1.305559
	0.4	0.57733	1.0295552	0.323742	2.293034	0.578485	1.0316143	0.324389	2.29762
	0.5	0.5503516	1.0027043	0.30207	3.415439	0.550902	1.003707	0.302372	3.418855
	0.75	0.4352151	0.8256252	0.229417	6.07705	0.435215	0.8256252	0.229417	6.07705
	1	0.356387	0.6941533	0.182974	8.846841	0.356387	0.6941533	0.182974	8.846841
	1.5	0.2654701	0.5263771	0.133886	14.82738	0.265736	0.5269035	0.13402	14.84221
	2	0.2076665	0.415138	0.103882	20.6202	0.207459	0.4147228	0.103778	20.59958
	3	0.1452813	0.2916202	0.072377	32.45776	0.145281	0.2916202	0.072377	32.45776
	4	0.1092637	0.2171802	0.054971	43.39727	0.109154	0.216963	0.054916	43.35387
	5	0.0830898	0.1655004	0.041715	51.5649	0.082924	0.1651694	0.041632	51.46177
	7.5	0.046202	0.091776	0.023259	64.51332	0.045971	0.0913171	0.023143	64.19076
	10	0.0270943	0.0533163	0.013769	67.25806	0.026959	0.0530497	0.0137	66.92177
PGA (g)	0	0.2438553	0.4127088	0.144086	0.000605	0.245084	0.4150918	0.144706	0.000608
PGV (cm/s)	-1	38.050443	67.615287	21.41285	0.094455	NA	NA	NA	NA











Definition of Parameters

Damping ratio = Viscous damping ratio (%) See Sanaz et al. (2012) PEER Report
PSA = Pseudo-absolute acceleration response spectrum (g)
PGA = Peak ground acceleration (g)
PGV = Peak ground velocity (cm/s)
S_d = Relative displacement response spectrum (cm)
M_w = Moment magnitude
R_{RUP} = Closest distance to coseismic rupture (km), used in ASK13, CB13 and CY13. See Figures a, b and c for illustation
R_{JB} = Closest distance to surface projection of coseismic rupture (km). See Figures a, b and c for illustation
R_X = Horizontal distance from top of rupture measured perpendicular to fault strike (km). See Figures a, b and c for illustation
R_{Y0} = The horizontal distance off the end of the rupture measured parallel to strike (km)
V_{S30} = The average shear-wave velocity (m/s) over a subsurface depth of 30 m
U = Unspecified-mechanism factor: 1 for unspecified; 0 otherwise
F_{RV} = Reverse-faulting factor: 0 for strike slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust
F_{NM} = Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique, thrust and normal-oblique; 1 for normal
F_{HW} = Hanging-wall factor: 1 for site on down-dip side of top of rupture; 0 otherwise
Dip = Average dip of rupture plane (degrees)
Z_{TOR} = Depth to top of coseismic rupture (km)
Z_{HYP} = Hypocentral depth from the earthquake
$Z_{1.0}$ = Depth to Vs=1 km/sec
$Z_{2.5}$ = Depth to Vs=2.5 km/sec
W = Fault rupture width (km)
$V_{s30flag}$ = 1 for measured, 0 for inferred Vs30
F_{AS} = 0 for mainshock; 1 for aftershock
Region = Specific regions considered in the models, Click on Region to see codes
ΔDPP = Directivity term, direct point parameter; uses 0 for median predictions
PGA_r ***(g)*** = Peak ground acceleration on rock (g), this specific cell is updated in the cell for BSSA14 and CB14, for others it is taken account for in the macros
Z_{BOT} ***(km)*** = The depth to the bottom of the seismogenic crust
Z_{BOR} ***(km)*** = The depth to the bottom of the rupture plane
SS = 1 for strike slip, automatically updated in the cell

Input variables with defaults (If entered 999 as input):

Red colored value: The value is used in the code when input is unknown

DEFAULTS	USER defined	ASK14	BSSA14	CB14	CY14	I14
W (km)	12.80			15.000		
$Z_{1.0}$ (km)	999.000	0.475			0.485	
$\delta Z_{1.0}$ (km)	0.000		0.000			
$Z_{2.5}$ (V_{S30}=1100)(km)	999.000			0.398		
$Z_{2.5}$ (V_{S30})(km)	999.000			2.070		
Z_{HYP} (km)	8.32			10.227		
Z_{RV} (km)	999.00			0.000	0.000	
Z_{BOR} (km)	-			15.000		

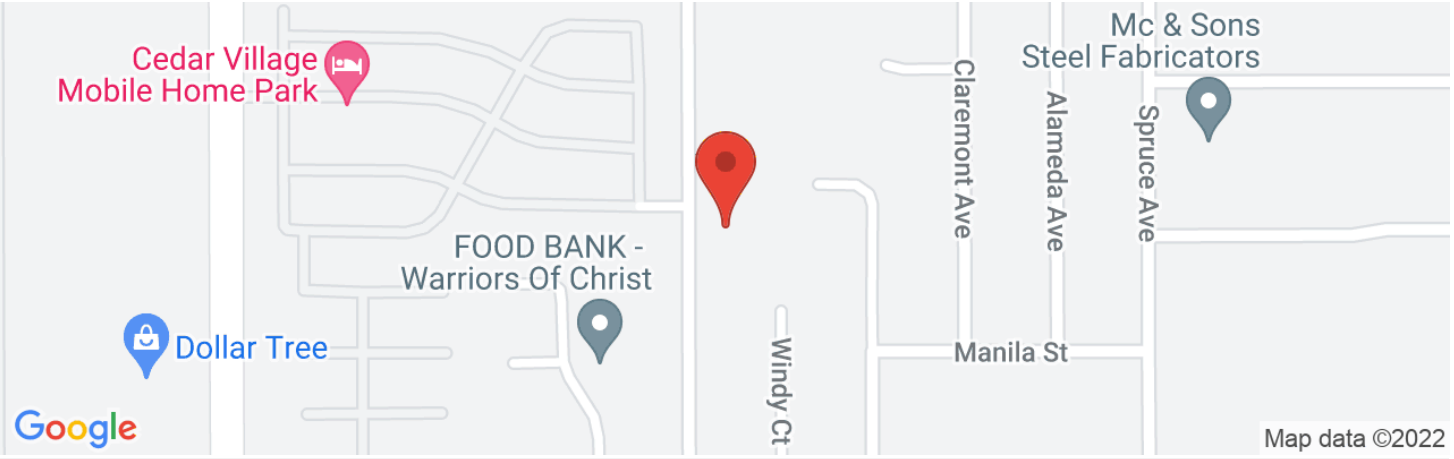
ACKNOWLEDGEMENTS

Nick Gregor, Bechtel
Silvia Mazzoni, Consultant

All NGA West-2 participants are acknowledged for their constructive comments and feedback.

Shiloh West Medical

Latitude, Longitude: 34.0578, -117.3917



Date	3/11/2022, 3:25:13 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.588	MCE_R ground motion. (for 0.2 second period)
S_1	0.617	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.588	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.058	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.673	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.741	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.98	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.136	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.588	Factored deterministic acceleration value. (0.2 second)
S1RT	0.757	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.84	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.617	Factored deterministic acceleration value. (1.0 second)
PGAd	0.673	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.927	Mapped value of the risk coefficient at short periods
C_{R1}	0.902	Mapped value of the risk coefficient at a period of 1 s

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (upd…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.5078

Time Horizon

Return period in years

2475

Longitude

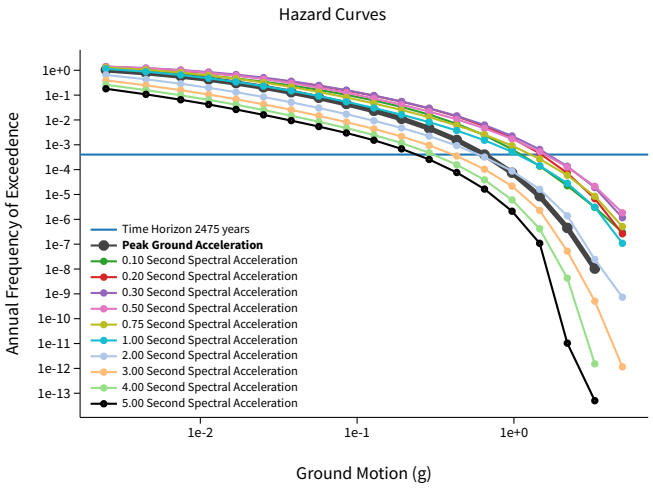
Decimal degrees, negative values for western longitudes

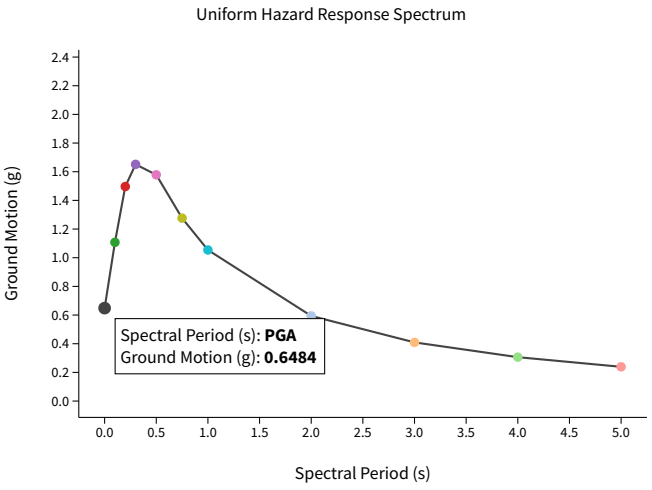
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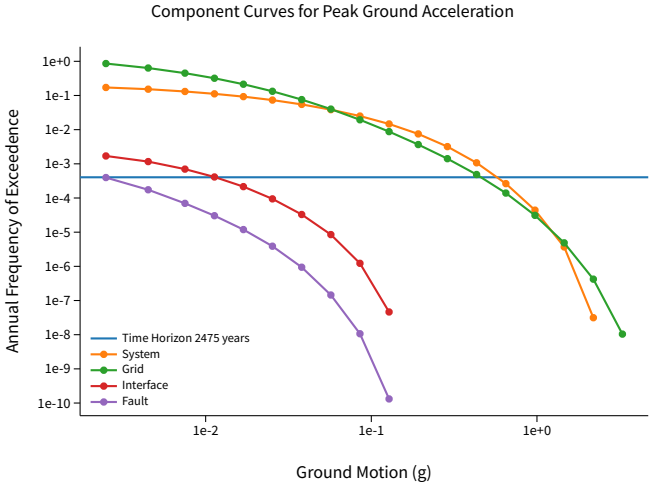
Site Class

259 m/s (Site class D)

Hazard Curve





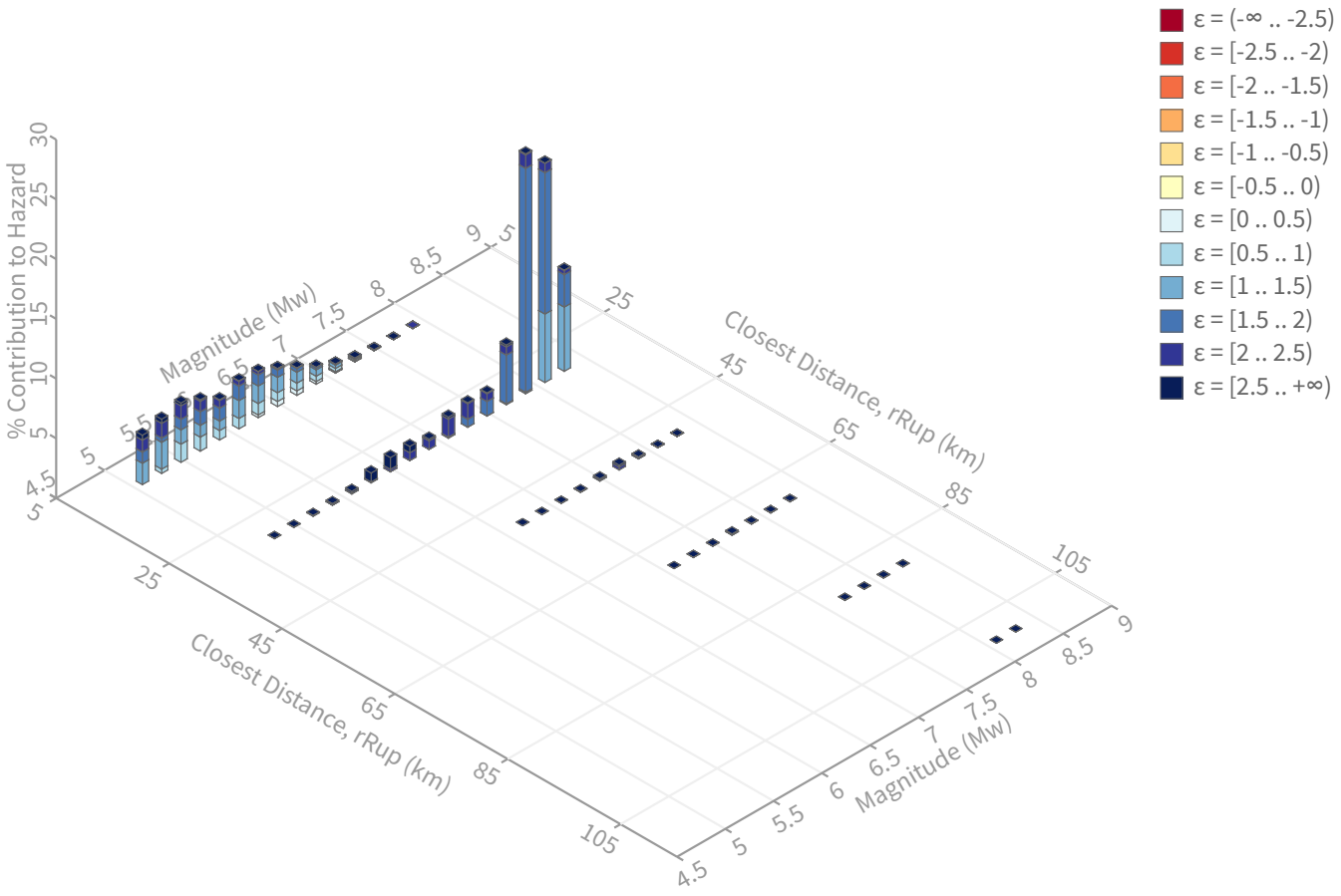


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.64839141 g

Recovered targets

Return period: 3165.3233 yrs
Exceedance rate: 0.00031592349 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.1 %

Mean (over all sources)

m: 7.12
r: 19.68 km
ε₀: 1.64 σ

Mode (largest m-r bin)

m: 7.9
r: 26.17 km
ε₀: 1.73 σ
Contribution: 20.04 %

Mode (largest m-r-ε₀ bin)

m: 7.9
r: 25.98 km
ε₀: 1.69 σ
Contribution: 18.73 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							31.10
San Andreas (San Bernardino N) [0]		25.63	7.98	1.67	117.530°W	34.308°N	209.79	23.64
San Andreas (Mojave S) [14]		25.72	7.31	2.09	117.549°W	34.316°N	214.17	1.38
Cucamonga [0]		28.07	7.84	1.74	117.445°W	34.192°N	187.88	1.10
UC33brAvg_FM31	System							30.98
San Andreas (San Bernardino N) [0]		25.63	7.99	1.66	117.530°W	34.308°N	209.79	23.53
San Andreas (Mojave S) [14]		25.72	7.30	2.10	117.549°W	34.316°N	214.17	1.40
Cucamonga [0]		28.07	7.83	1.75	117.445°W	34.192°N	187.88	1.02
UC33brAvg_FM31 (opt)	Grid							18.97
PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
UC33brAvg_FM32 (opt)	Grid							18.95
PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
PointSourceFinite: -117.392, 34.521		5.14	5.71	1.05	117.392°W	34.521°N	0.00	4.22
PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31
PointSourceFinite: -117.392, 34.584		8.89	5.96	1.52	117.392°W	34.584°N	0.00	1.31

APPENDIX E
STANDARD GRADING GUIDELINES

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for grading operations performed under the observation and testing of TGR Geotechnical, Inc.

No deviation from these specifications will be allowed, except where specifically superseded in the Preliminary Geotechnical Investigation report, or in other written communication signed by the Soils Engineer or Engineering Geologist.

1.0 GENERAL

- The Soils Engineer and Engineering Geologist are the Owner's or Builder's representatives on the project. For the purpose of these specifications, observation and testing by the Soils Engineer includes that observation and testing performed by any person or persons employed by, and responsible to, the licensed Geotechnical Engineer or Geologist signing the grading report.

- All clearing, site preparation or earthwork performed on the project shall be conducted by the Contractor under the observation of the Geotechnical Engineer.

- It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Engineer and to place, spread, mix, water and compact the fill in accordance with the specifications of the Geotechnical Engineer. The Contractor shall also remove all material considered unsatisfactory by the Geotechnical Engineer.

- It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of Compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.

- A final report will be issued by the Geotechnical Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.

2.0 SITE PREPARATION

- All vegetation and deleterious material such as rubbish shall be disposed of off-site. The removal must be concluded prior to placing fill.

- The Civil Engineer shall locate all houses, sheds, sewage disposal systems, large trees or structures on the site, or on the grading plan to the best of his knowledge prior to preparing the ground surface.

- Soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and wasted from the site. Any material incorporated as part of a compacted fill must be approved by the Geotechnical Engineer.

- After the ground surface to receive fill has been cleared, it shall be scarified, disced or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks or other uneven features which may prevent uniform compaction.

  The scarified ground surface shall then be brought to optimum moisture content, mixed as required, and compacted as specified. If the scarified zone is greater than twelve inches in depth, the excess shall be removed and placed in lifts restricted to six inches. Prior to placing fill, the ground surface to receive fill shall be inspected, tested and approved by the Geotechnical Engineer.

- Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines or others not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer.

3.0 COMPACTED FILLS

- Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Geotechnical Engineer. Roots, tree branches and other matter missed during clearing shall be removed from the fill as directed by the Geotechnical Engineer.
- Rock fragments less than six inches in diameter may be utilized in the fill, provided:

- They are not placed in concentrated pockets.
- There is a sufficient percentage of fine-grained material to surround the rocks.
- The distribution of the rocks is observed by the Geotechnical Engineer.

- Rocks greater than six inches in diameter shall be taken off-site, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal. Details for rock disposal such as location, moisture control, percentage of the rock placed, etc., will be referred to in the "Conclusions and Recommendations" section of the Geotechnical Report, if applicable.

  If rocks greater than six inches in diameter were not anticipated in the Preliminary Geotechnical report, rock disposal recommendations may not have been made in the "Conclusions and Recommendations" section. In this case, the Contractor shall notify the Geotechnical Engineer if rocks greater than six inches in diameter are encountered. The Geotechnical Engineer will then prepare a rock disposal recommendation or request that such rocks be taken off-site.

- Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.

- Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the Geotechnical Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Geotechnical Engineer as soon as possible.

- Material used in the compacting process shall be evenly spread, watered or dried, processed and compacted in thin lifts not to exceed six inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer.

- If the moisture content or relative compaction varies from that required by the Geotechnical Engineer, the Contractor shall rework the fill until it is approved by the Geotechnical Engineer.

- Each layer shall be compacted to 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency; (in general, ASTM D1557 will be used.)

  If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use of expansive soil conditions, the area to receive fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the grading report.

- All fill shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material where the slope receiving fill exceeds a ratio of five horizontal to one vertical, in accordance with the recommendations of the Geotechnical Engineer.

- The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the Preliminary report. (See details)

- Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendation of the Geotechnical Engineer and Engineer Geologist.

- The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses and stabilization fills. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

The Contractor shall prepare a written detailed description of the method or methods he will employ to obtain the required slope compaction. Such documents shall be submitted to the Geotechnical Engineer for review and comments prior to the start of grading.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the contractor will be notified by the Geotechnical Engineer.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer.

- All fill slopes should be planted or protected from erosion by methods specified in the preliminary report or by means approved by the governing authorities.

- Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials; and the transition shall be stripped of all soil prior to placing fill. (See detail)

4.0 CUT SLOPES

- The Engineering Geologist shall inspect all cut slopes excavated in rock, lithified or formation material at vertical intervals not exceeding ten feet.

- If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these

conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer; and recommendations shall be made to treat these problems.

- Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erosive interceptor swale placed at the top of the slope.

- Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

- Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

5.0 GRADING CONTROL

- Inspection of the fill placement shall be provided by the Geotechnical Engineer during the progress of grading.

- In general, density tests should be made at intervals not exceeding two feet of fill height or every 500 cubic yards of fill placed. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction of being achieved.
- Density tests should be made on the surface material to receive fill as required by the Geotechnical Engineer.

- All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal must be inspected and approved by the Geotechnical Engineer (and often by the governing authorities) prior to placing any fill. It shall be the Contractor's responsibility to notify the Geotechnical Engineer and governing authorities when such areas are ready for inspection.

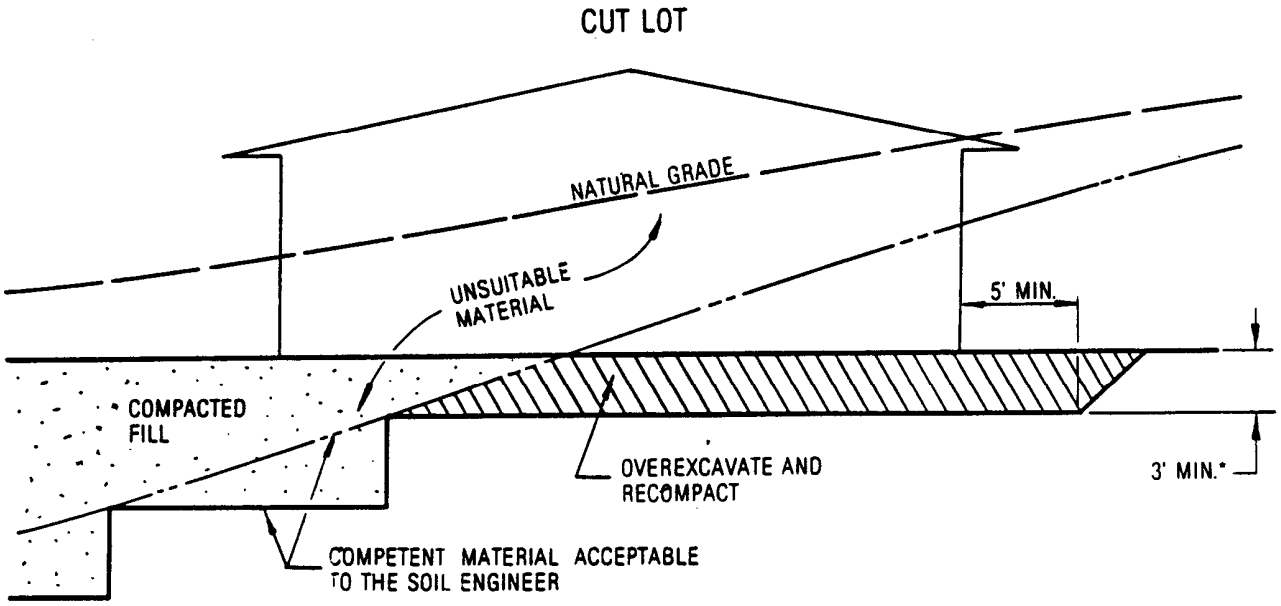
6.0 CONSTRUCTION CONSIDERATIONS

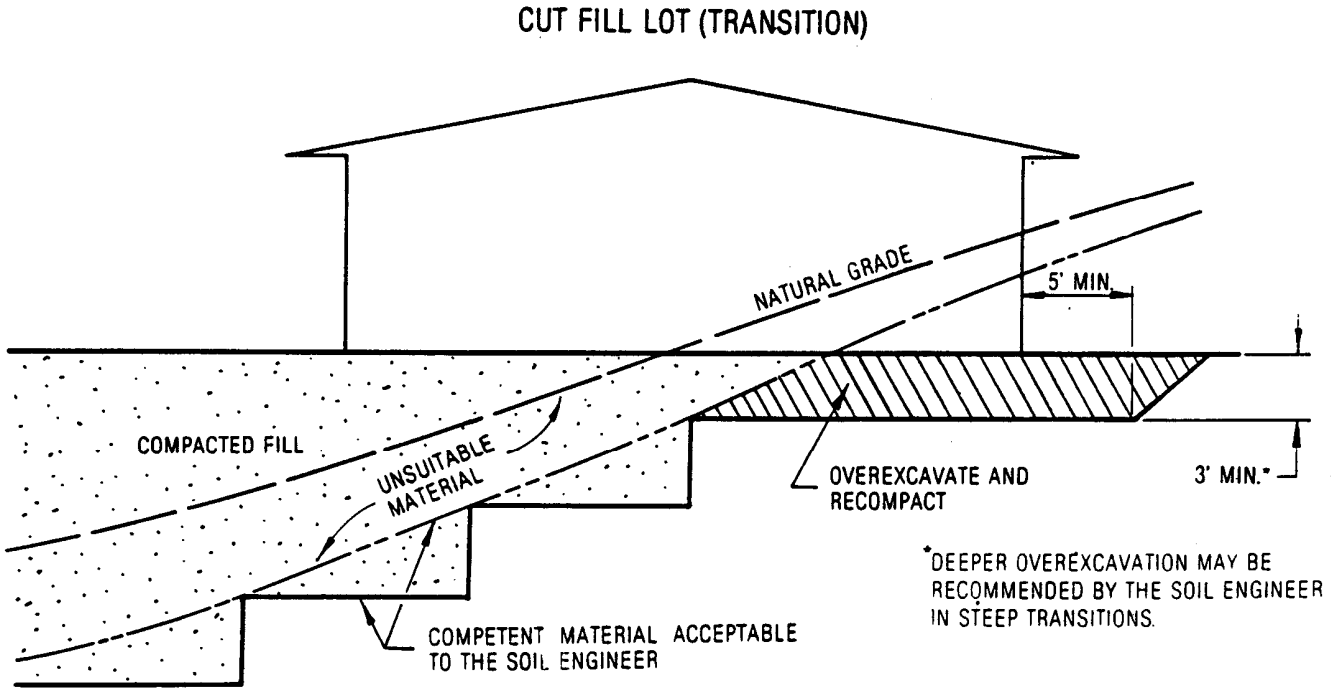
- Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

- Upon completion of grading and termination of observations by the Geotechnical Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Geotechnical Engineer or Engineering Geologist.

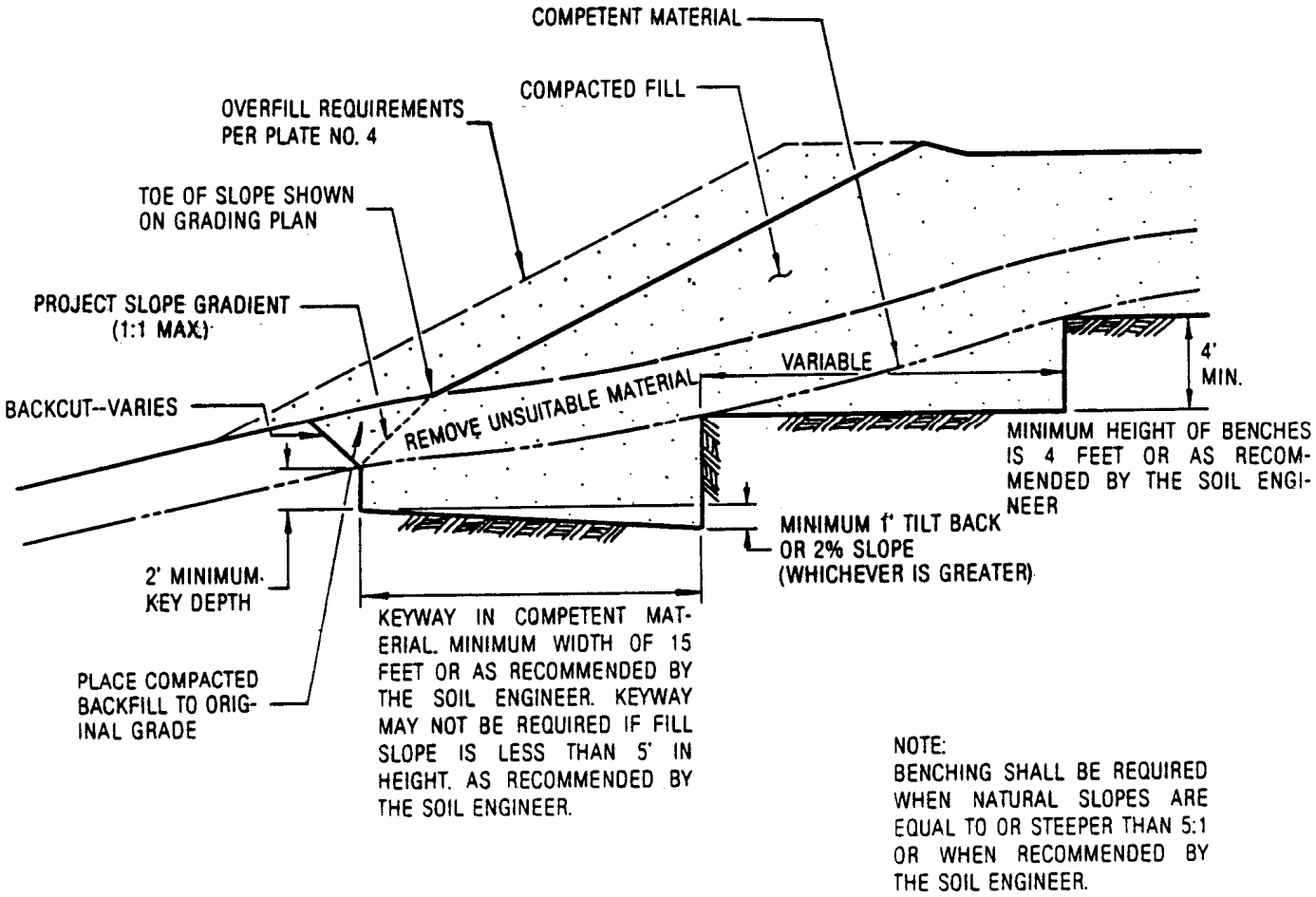
- Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

TYPICAL OVEREXCAVATION OF DAYLIGHT LINE



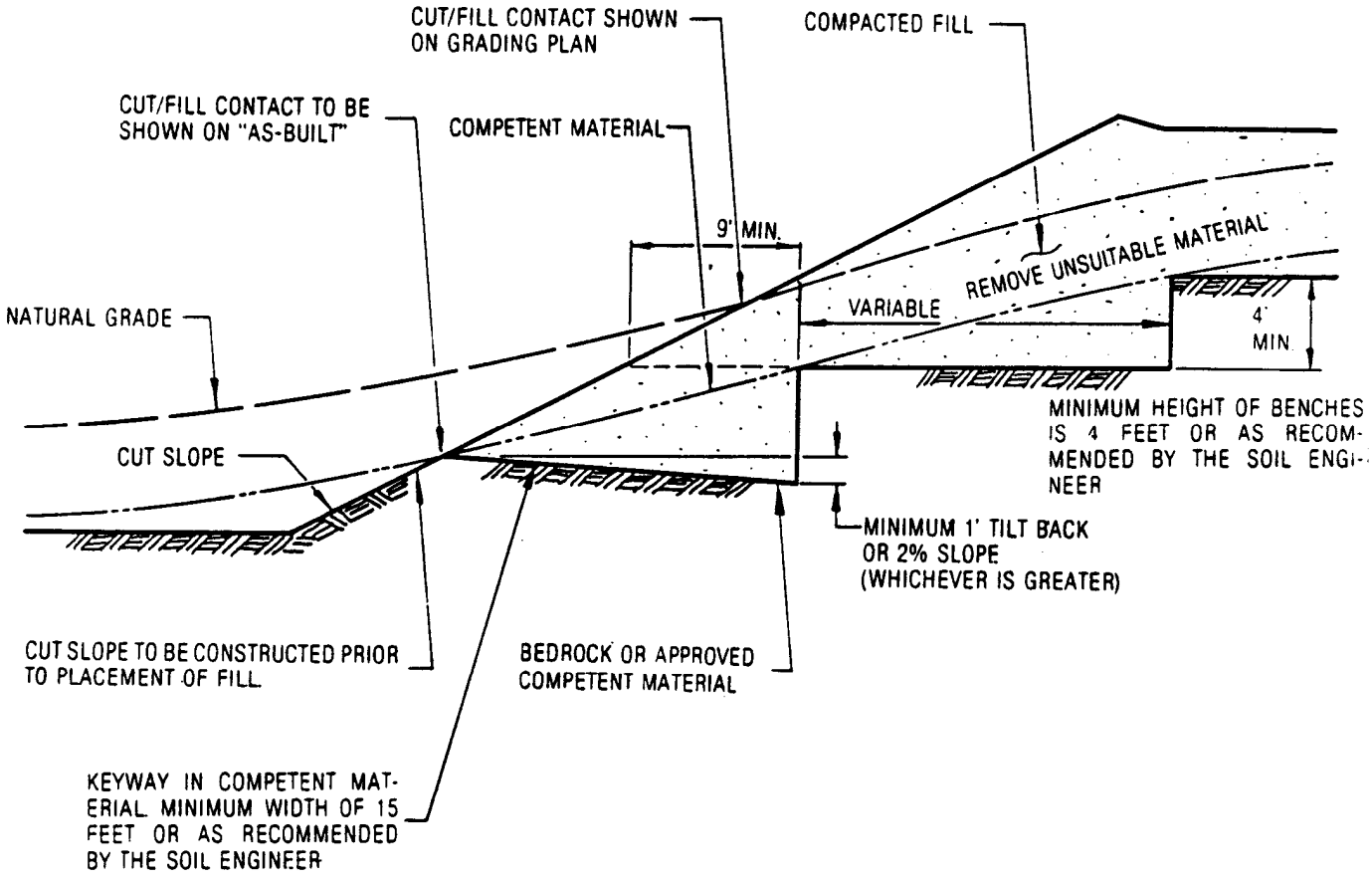


TYPICAL FILL OVER NATURAL SLOPE

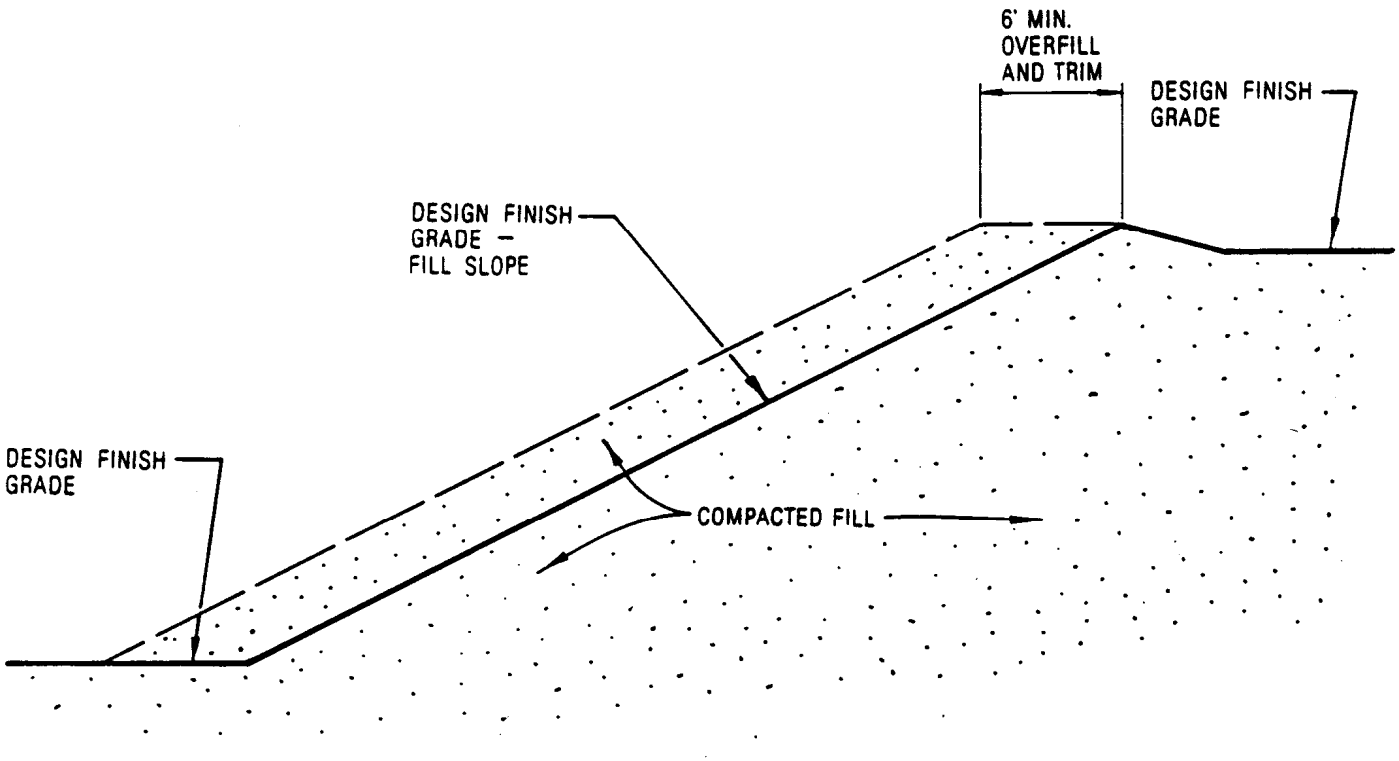


NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE SOIL ENGINEER.

TYPICAL FILL-OVER-CUT SLOPE



TYPICAL FILL SLOPE CONSTRUCTION



NOTES:

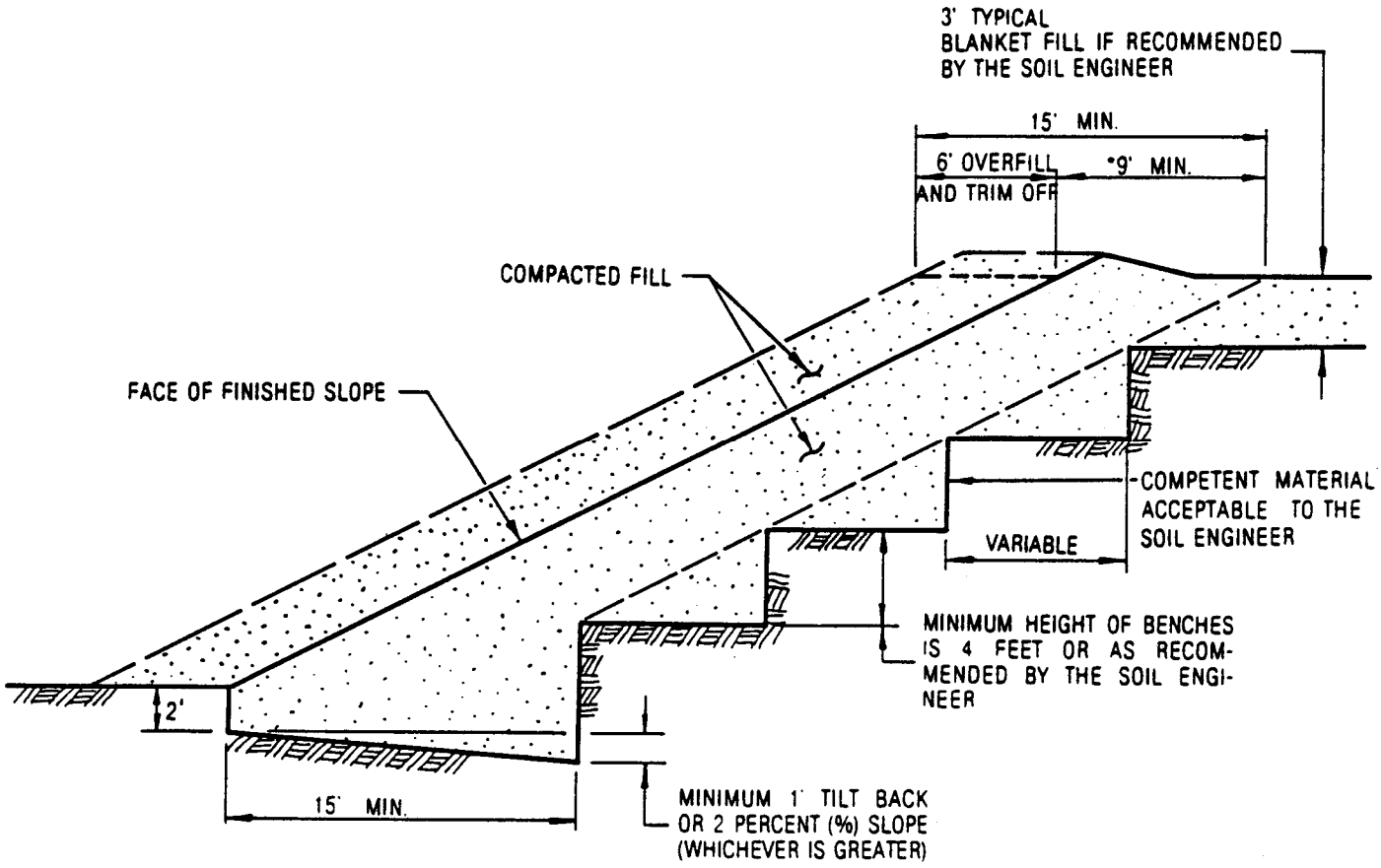
1. ALL FILL SLOPES, INCLUDING BUTTRESS AND STABILIZATION FILLS, SHALL BE OVERFILLED A MINIMUM OF SIX FEET HORIZONTALLY WITH COMPACTED FILL AND TRIMMED TO THE DESIGN FINISH GRADE.

   EXCEPTIONS:

   A. FILL SLOPE OVER CUT SLOPE.
   B. FILL SLOPE ADJACENT TO EXISTING IMPROVEMENTS.

2. THE EXCEPTIONS ABOVE WHICH DO NOT HAVE THE 6 FOOT SLOPE OVERFILL AND TRIM SHALL BE COMPACTED AS STATED IN THE PROJECT SPECIFICATIONS.

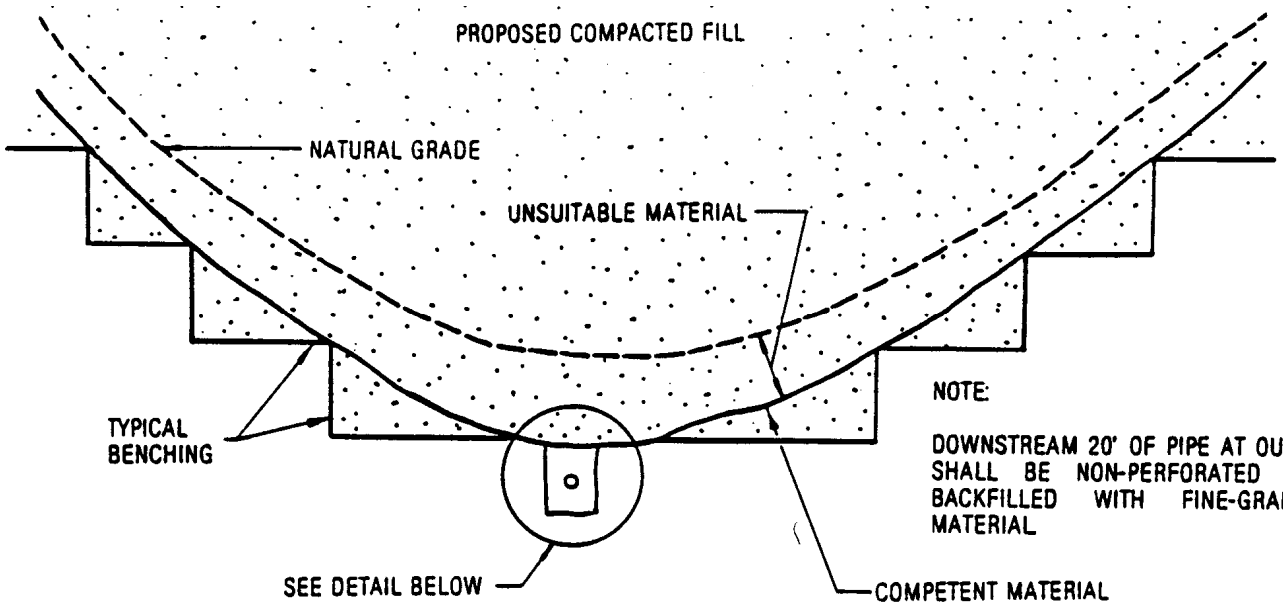
TYPICAL STABILIZATION FILL



NOTE:
SEE PLATE 6 FOR TYPICAL SUBDRAIN DETAILS FOR STABILIZATION FILLS. IF RECOMMENDED BY THE SOIL ENGINEER.

*GREATER THAN 9' IF RECOMMENDED BY THE SOIL ENGINEER: 15' WHERE NO 6' OVERFILL

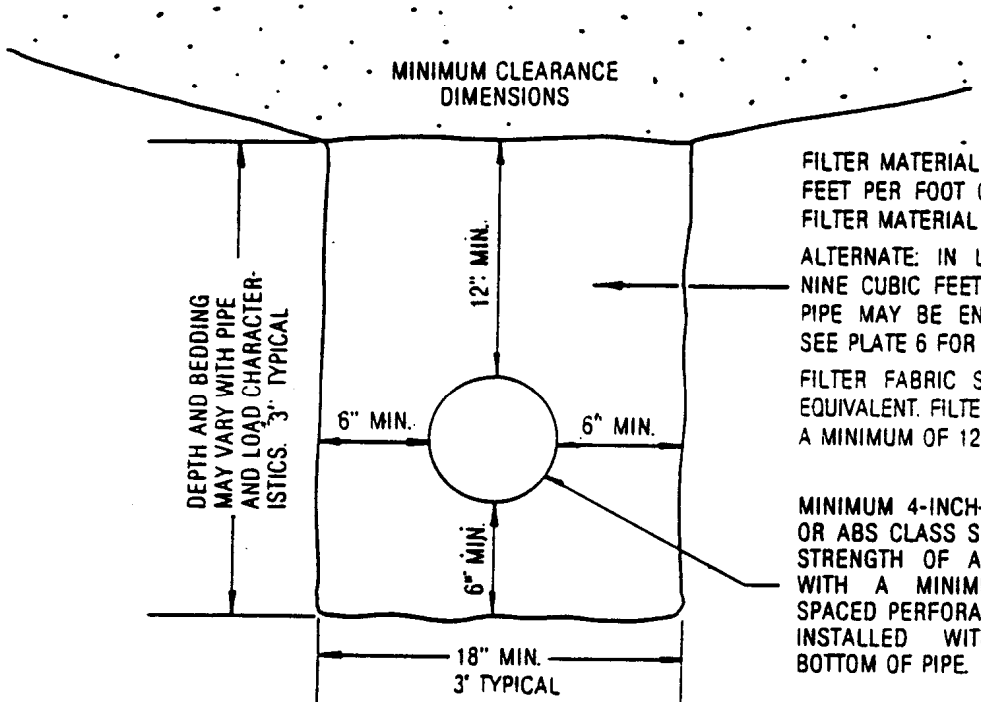
TYPICAL CANYON SUBDRAIN



NOTE:

DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL

NOTES:
PIPE SHALL BE A MINIMUM OF 4 INCHES DIAMETER AND RUNS OF 500 FEET OR MORE USE 6-INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE SOIL ENGINEER



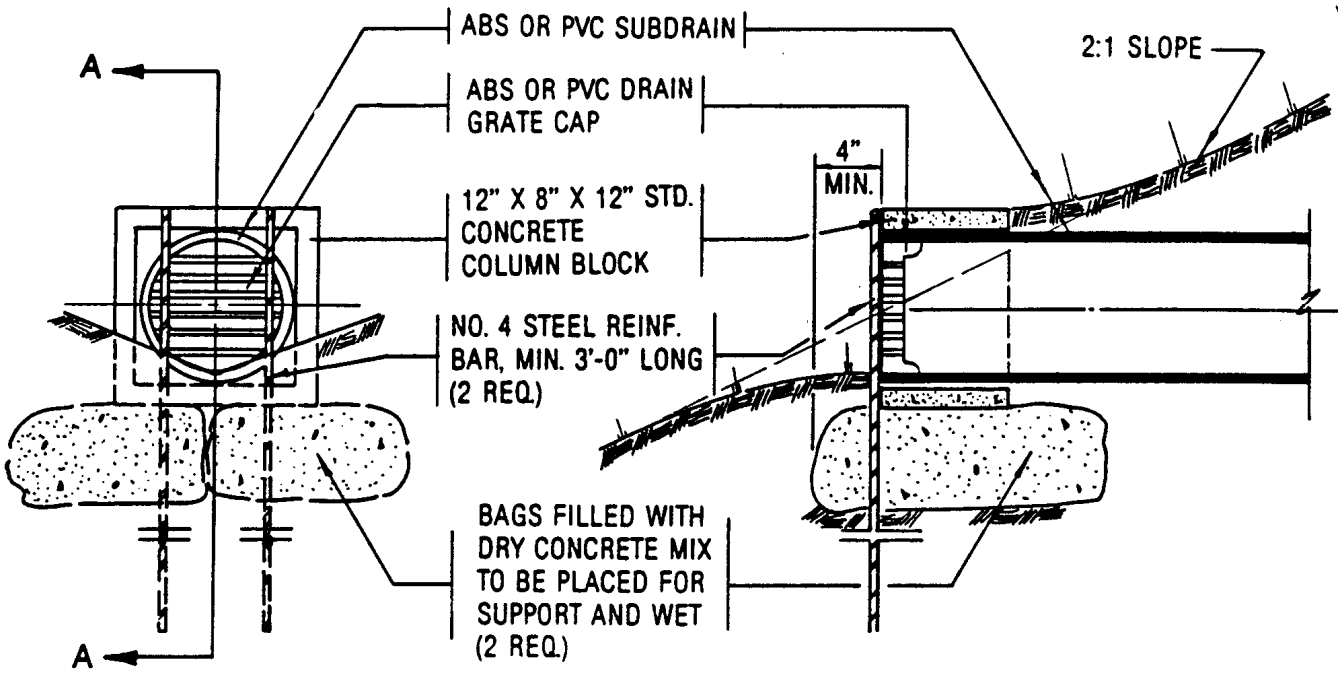
FILTER MATERIAL – MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE. SEE PLATE 6 FOR FILTER MATERIAL SPECIFICATION.

ALTERNATE: IN LIEU OF FILTER MATERIAL NINE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE PLATE 6 FOR GRAVEL SPECIFICATIONS.

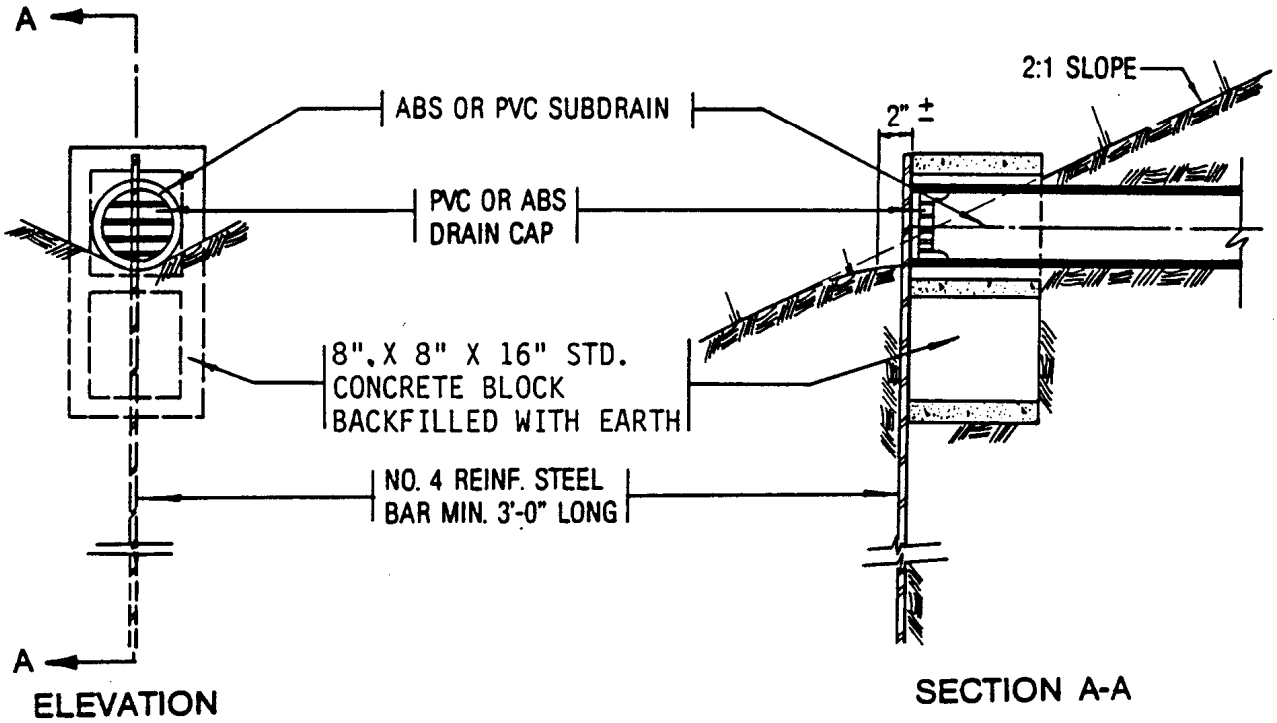
FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH-DIAMETER, PVC SCH. 40 OR ABS CLASS SDR-35 WITH A CRUSHING STRENGTH OF AT LEAST 1000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE, INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE.

SUBDRAIN OUTLET MARKER

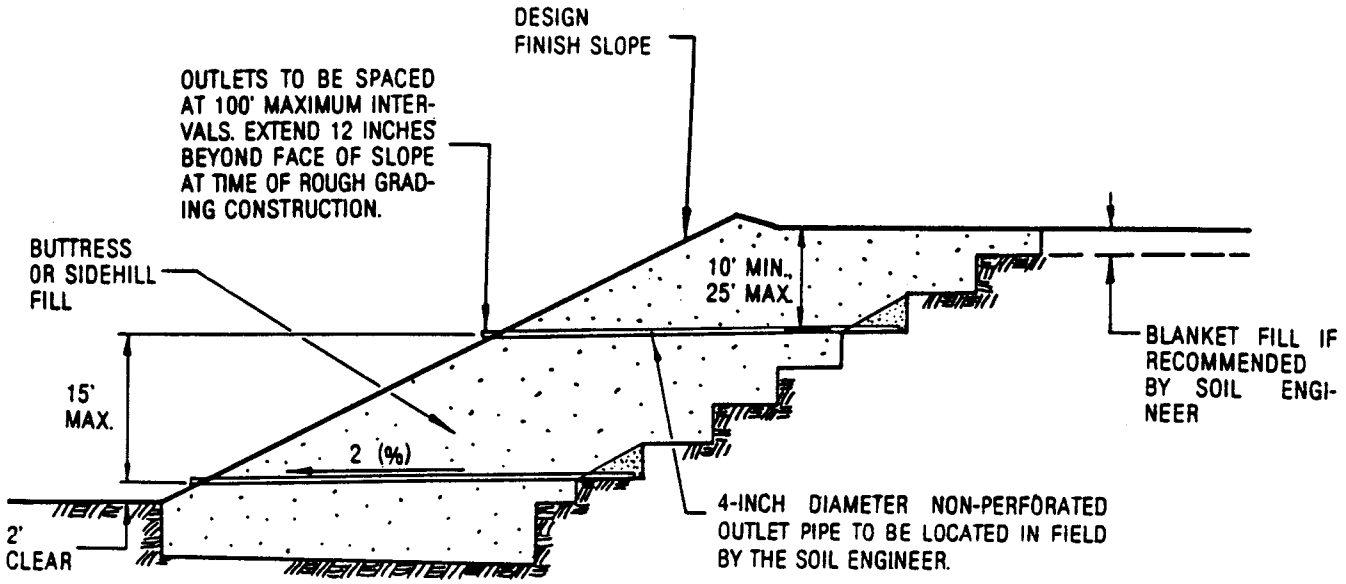


SUBDRAIN OUTLET MARKER FOR 6" AND 8" PIPES



SUBDRAIN OUTLET MARKER – 4" PIPE

TYPICAL STABILIZATION AND BUTTRESS FILL SUBDRAIN



FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO MA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1½"	100
NO. 4	50
NO. 200	8

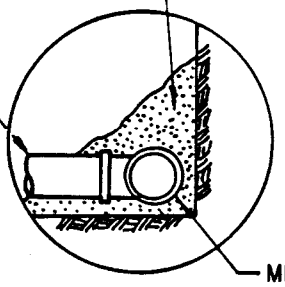
SAND EQUIVALENT = MINIMUM OF 50

FILTER MATERIAL – MINIMUM OF FIVE CUBIC FEET PER FOOT OF PIPE. SEE ABOVE FOR FILTER MATERIAL SPECIFICATION.

ALTERNATIVE: IN LIEU OF FILTER MATERIAL, FIVE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE ABOVE FOR GRAVEL SPECIFICATION.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW



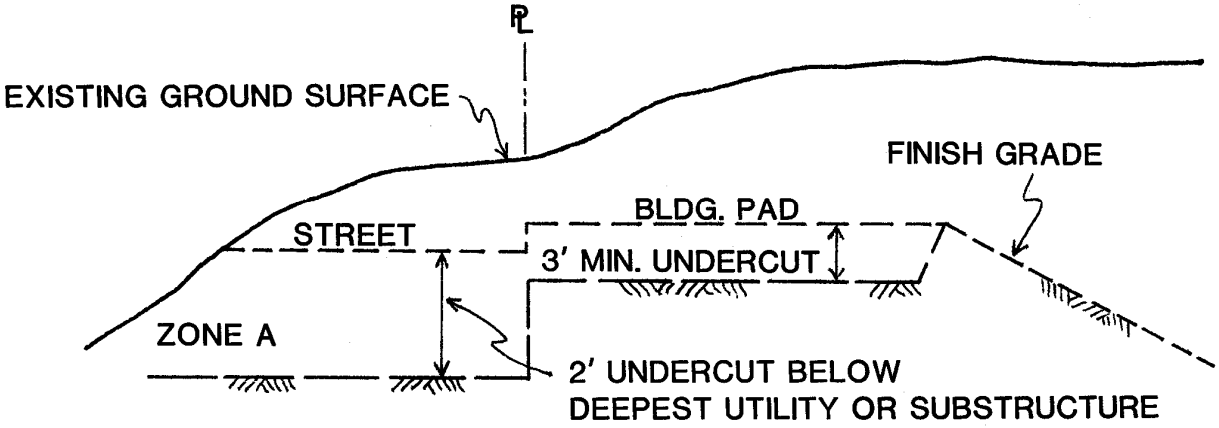
MINIMUM 4-INCH DIAMETER PVC SCH 40 OR ABS CLASS SDR 35 WITH A CRUSHING STRENGTH OF AT LEASE 1,000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

NOTES:

1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

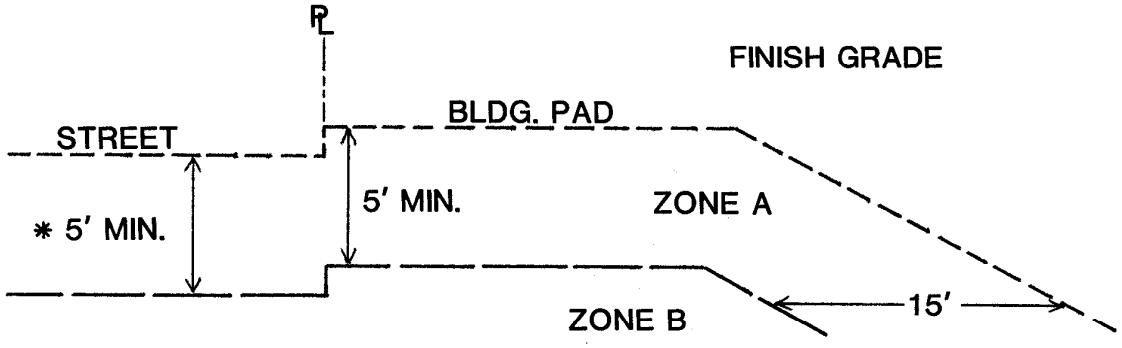
TYPICAL CUT AND FILL GRADING DETAILS

TYPICAL GRADING WITHIN PROPOSED DEEP BEDROCK CUT AREAS



NO SCALE

TYPICAL GRADING WITHIN PROPOSED FILL AREAS



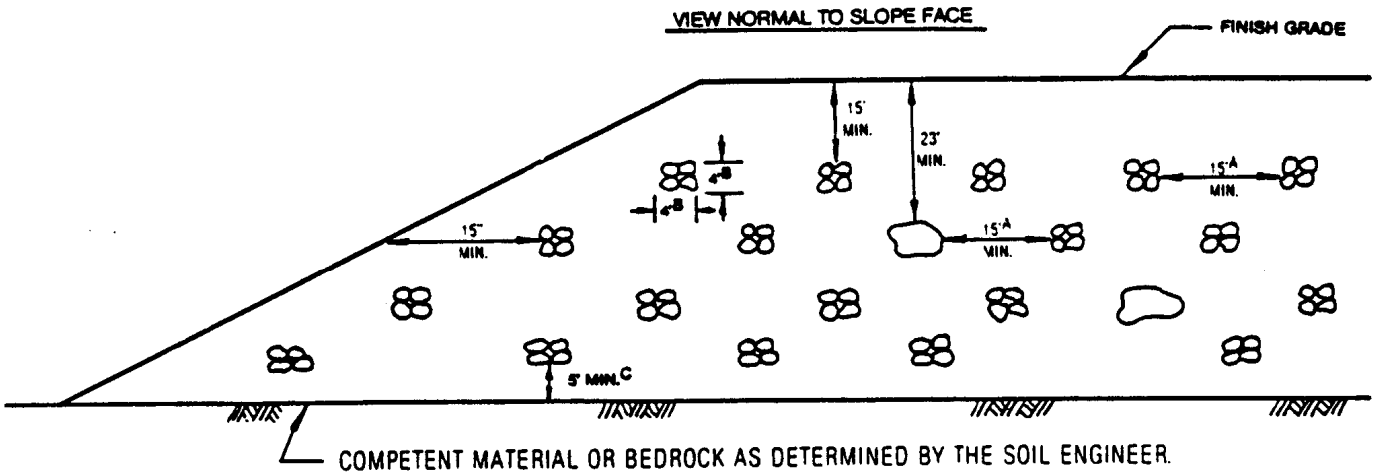
LEGEND

ZONE A ....."SOIL" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

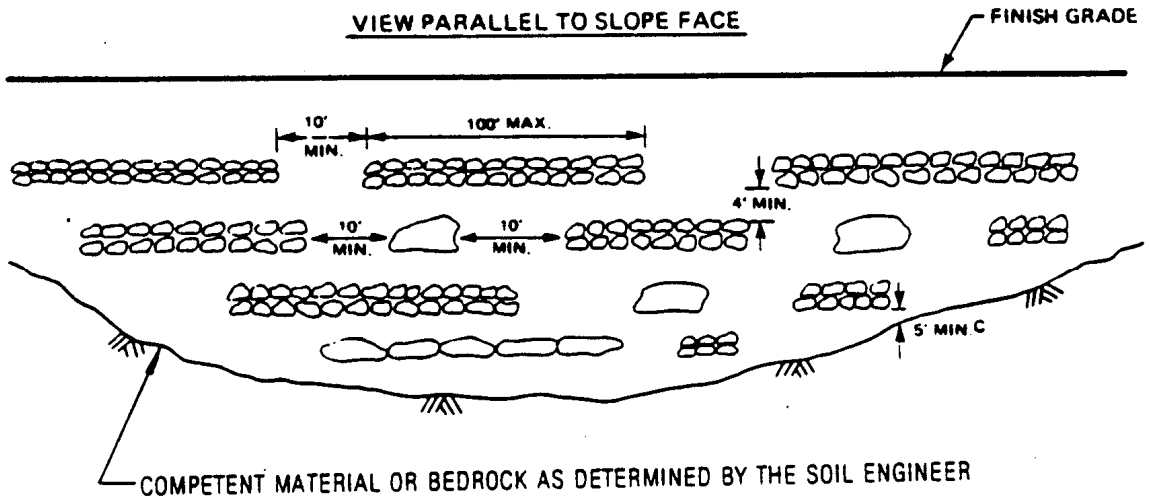
ZONE B ....."SOIL-ROCK" AND/OR "ROCK" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

* 5′ OR 1′ BELOW DEEPEST UTILITY, WHICHEVER IS GREATER

TYPICAL OVERSIZE ROCK DISPOSAL – "SOIL-ROCK" FILL



NOTE:
ORIENTATION OF WINDROWS MAY VARY BUT SHALL BE AS RECOMMENDED BY SOIL ENGINEER.



NOTES:

A. ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.
B. HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE AND TYPE OF EQUIPMENT.
C. IF APPROVED BY THE SOIL ENGINEER, WINDROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK PROVIDING ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.
D. VOIDS IN WINDROW TO BE FILLED BY FLOODING GRANULAR SOIL INTO PLACE. GRANULAR SOIL SHALL MEAN ANY SOIL WHICH HAS A UNIFIED SOIL CLASSIFICATION SYSTEM (UBC 29-1) DESIGNATION OF SM, SP, SW, GM, GP, OR GW.
E. AFTER FILL BETWEEN WINDROWS IS PLACED AND COMPACTED WITH THE LIFT OF FILL COVERING WINDROW, WINDROW SHALL BE PROOF-ROLLED WITH D-9 DOZER OR EQUIVALENT.
F. OVERSIZED ROCK IS DEFINED AS LARGER THAN 12" IN SIZE.

Appendix B

BMP Information and Supporting Calculations

Shilo West Medical Center
Site: Palmdale & Mesa Linda Rd.

INF-7: Underground Infiltration

Underground infiltration is a vault or chamber with an open bottom that used to store runoff and percolate into the subsurface. A number of vendors offer proprietary infiltration products that allow for similar or enhanced rates of infiltration and subsurface storage while offering durable prefrabricated structures. There are many varieties of proprietary infiltration BMPs that can be used for roads and parking lots, parks and open spaces, single and multi-family residential, or mixed-use and commercial uses.

Also known as:

- *Infiltration vault*
- *Recharge vault*



Underground Infiltration

Source: http://www.contech-cpi.com

Feasibility Screening Considerations

- Infiltration bains shall pass infeasible screening criteria to be considered for use.
- Underground infiltration galleries pose a potential risk of groundwater contamination; pretreatment should be used.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Appropriate for sites with limited surface space.
- Can be placed beneath roads, parking lots, parks, and athletic fields.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, sngle-family and multi-family, roads and parking lots, and parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)

☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.

☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should not be directed to the facility.

☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.

☐ Design infiltration rate should be determined as described **in Appendix VII**.

☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

☐ For infiltration facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.

Computing Underground Infiltration Device Size

Underground infiltration devices vary by design and by proprietary designs. The sizing method selected for use must be based on the BMP type it most strongly resembles.

- For underground infiltration devices with open pore volume (e.g., vaults, crates, pipe sections, etc), sizing will be most similar to infiltration basins.
- For underground infiltration devices with pore space (e.g., aggregate reservoirs), sizing will be most similar to permeable pavement.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**

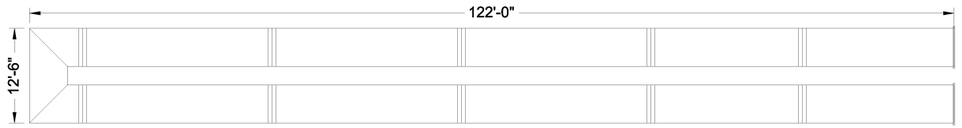
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 247 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 8,000 CF
- PIPE STORAGE VOLUME = 4,840 CF
- BACKFILL STORAGE VOLUME = 3,218 CF
- TOTAL STORAGE PROVIDED = 8,058 CF
- STONE VOID = 40%

PIPE DETAILS
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 30"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 26"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

C:\USERS\JEREMY.JOHNSON\DOCUMENTS\DYO\CMP_V10.DWG 10/18/2019 10:02 AM

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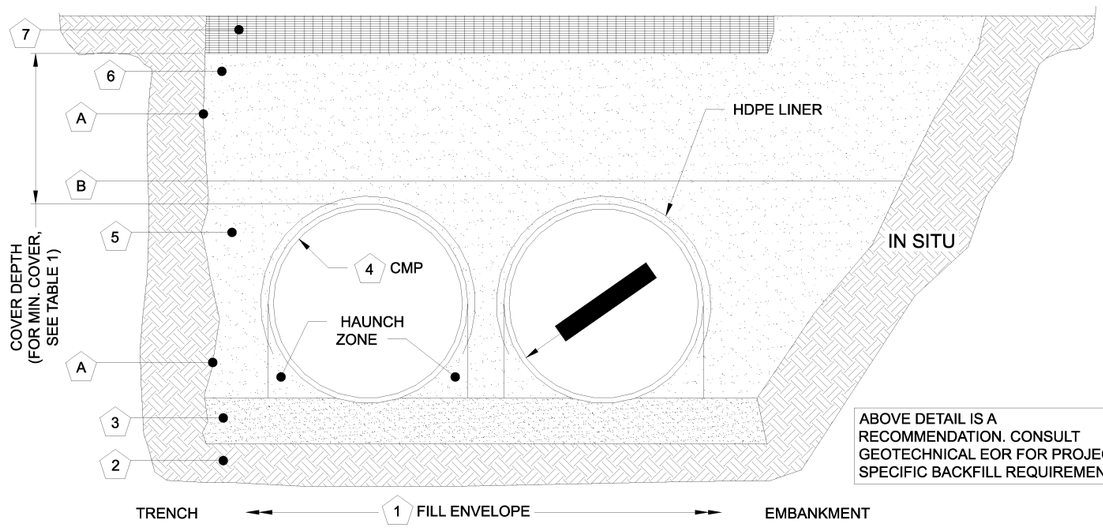
DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
17351	26153	5/31/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

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

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



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

MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

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

TABLE 2: PERFORATED STANDARD

CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

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

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

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

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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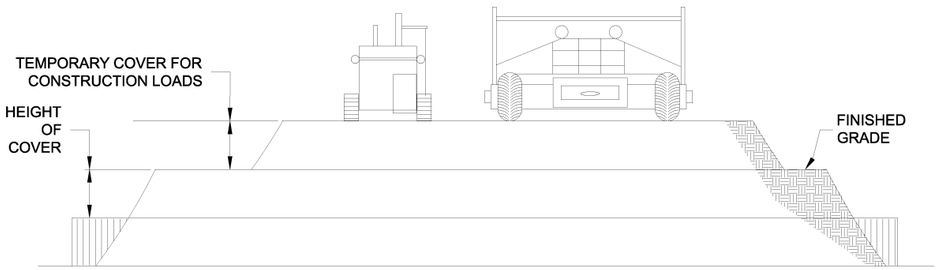
CONTECH® CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

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

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

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

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

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

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

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

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

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

GALVANIZED: AASHTO M-36 OR ASTM A-760

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

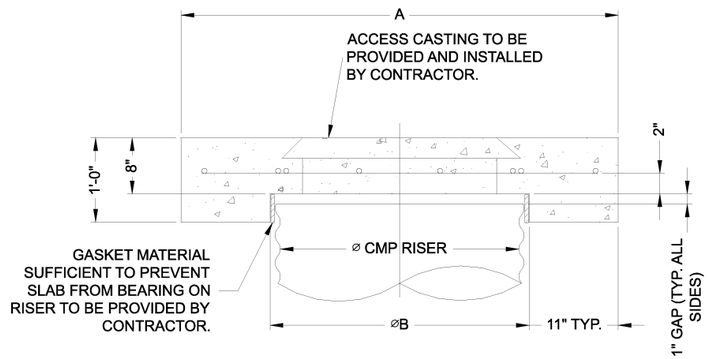
ALUMINUM: AASHTO M-196 OR ASTM B-745

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

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

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

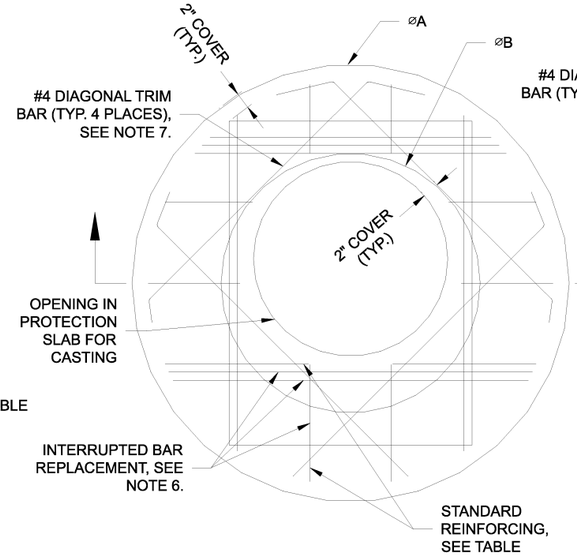
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



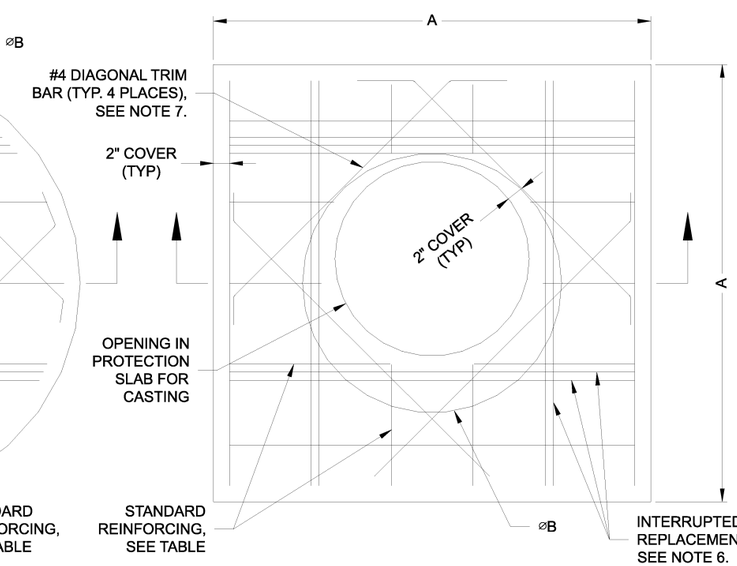
SECTION VIEW

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

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

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

MANHOLE CAP DETAIL

SCALE: N.T.S.

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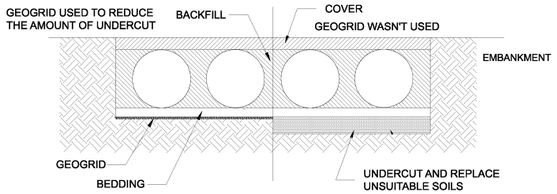
CMP DETENTION INSTALLATION GUIDE

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

FOUNDATION

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

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

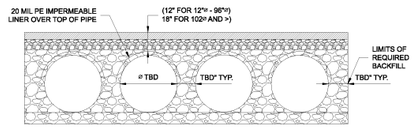


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING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

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

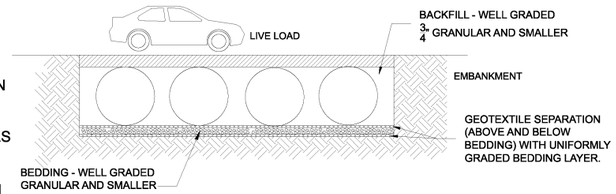
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

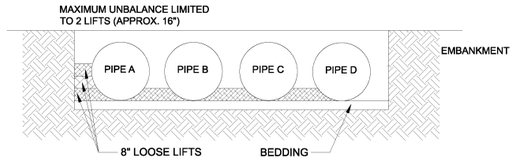
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION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

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



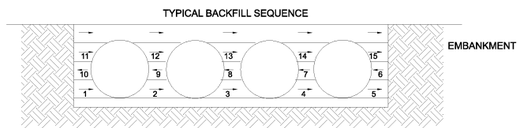
BACKFILL PLACEMENT

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

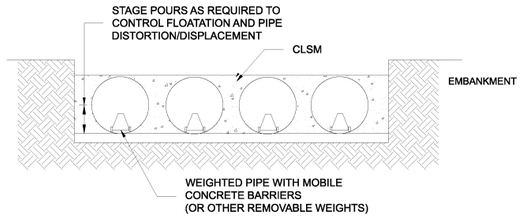


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE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

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



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

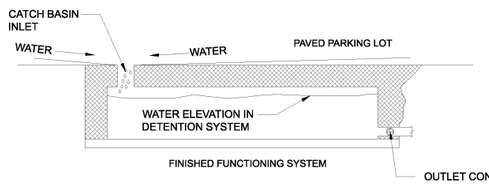


CONSTRUCTION LOADING

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

ADDITIONAL CONSIDERATIONS

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



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

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

INSPECTION

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

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

MAINTENANCE

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

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

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

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

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

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CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO26153 Shiloh West Medical
Infiltraiton System
Victorville, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
17351	26153	5/31/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

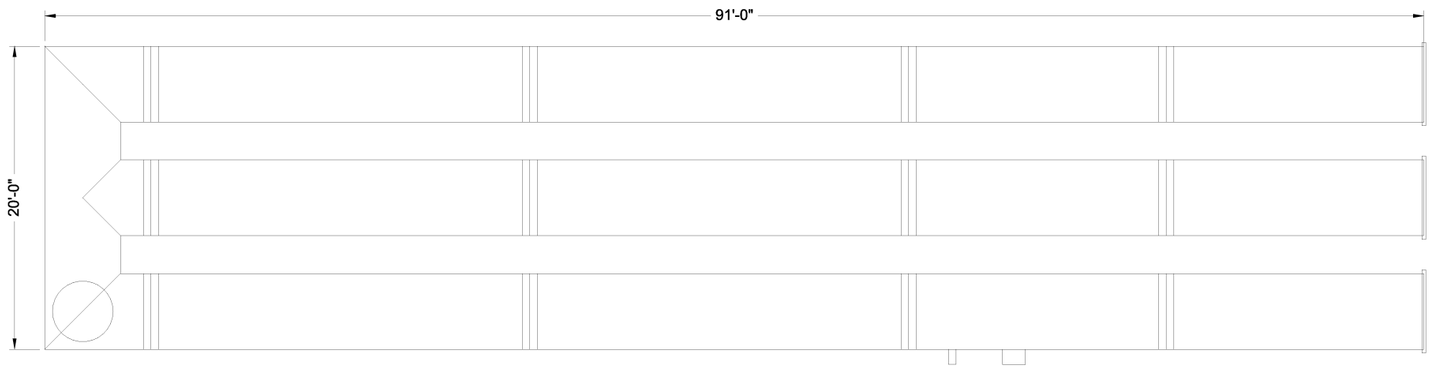
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 278 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 9,000 CF
- PIPE STORAGE VOLUME = 5,459 CF
- BACKFILL STORAGE VOLUME = 3,545 CF
- TOTAL STORAGE PROVIDED = 9,004 CF
- STONE VOID = 40%

PIPE DETAILS
- DIAMETER = 60"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 30"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 24"



ASSEMBLY
SCALE: 1" = 10'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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CMP DETENTION SYSTEMS
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DRAWING

DYO26157 Shiloh West Medical Infiltration System-Phase 2 Victorville, CA DETENTION SYSTEM

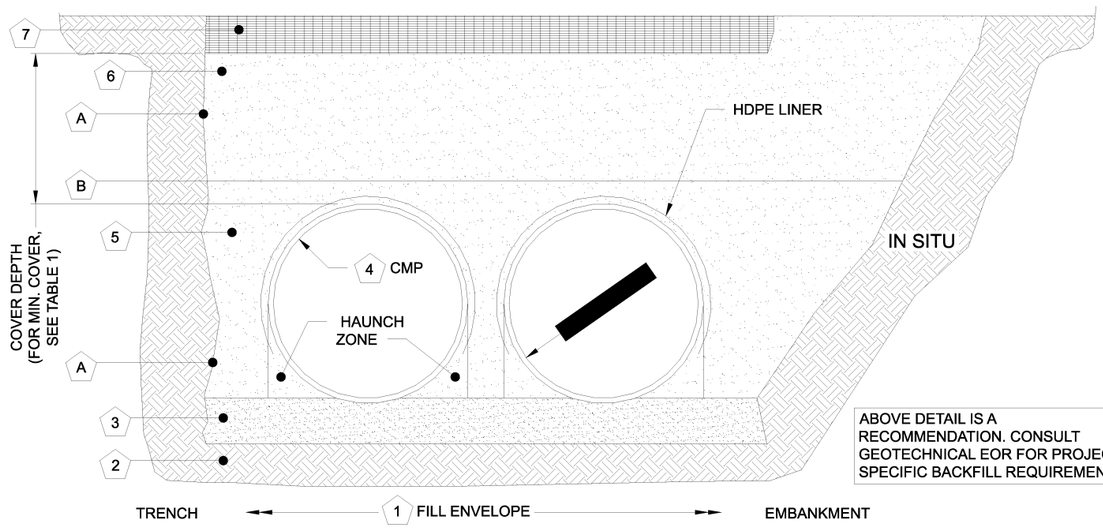
PROJECT No.:	SEQ. No.:	DATE:
17351	26157	5/29/2024
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TABLE 1:

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

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



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

MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

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

TABLE 2: PERFORATED STANDARD

CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

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

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

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

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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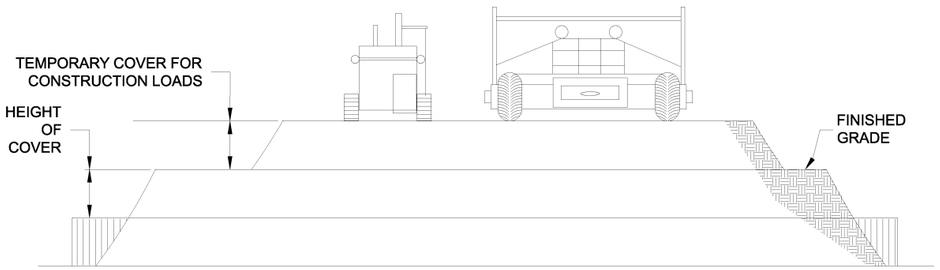
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CONTECH **DYODS** DRAWING

DYO26157 Shiloh West Medical
Infiltration System-Phase 2
Victorville, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: DYO	DRAWN: DYO	
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CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

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

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

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

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

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

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

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

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

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

GALVANIZED: AASHTO M-36 OR ASTM A-760

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

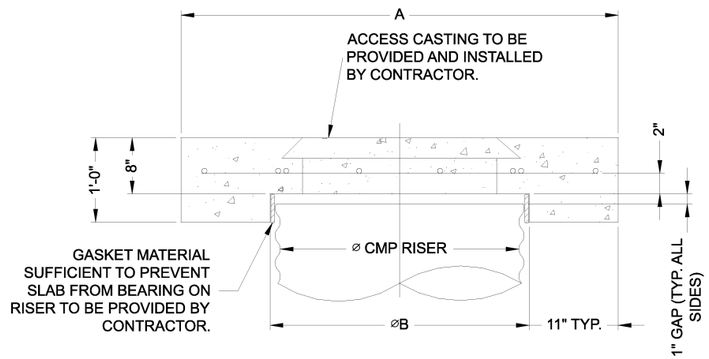
ALUMINUM: AASHTO M-196 OR ASTM B-745

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

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

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

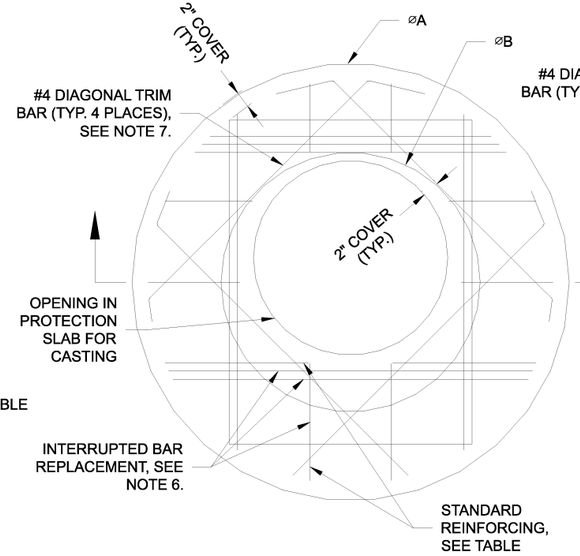
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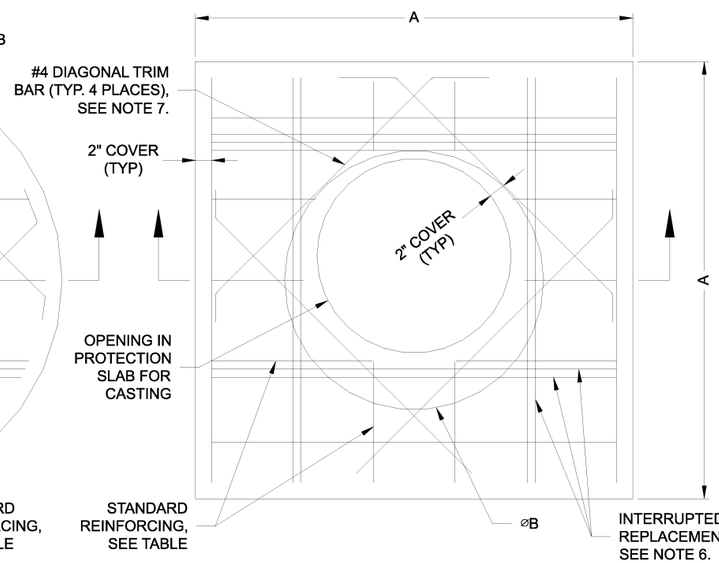
SECTION VIEW

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

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

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

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO26157 Shiloh West Medical Infiltration System-Phase 2 Victorville, CA DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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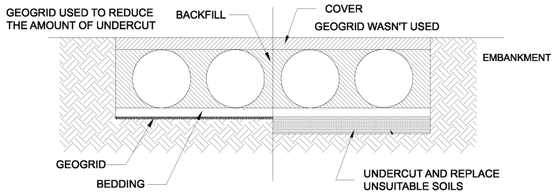
CMP DETENTION INSTALLATION GUIDE

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

FOUNDATION

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

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

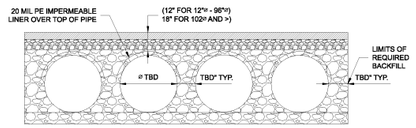


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING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

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

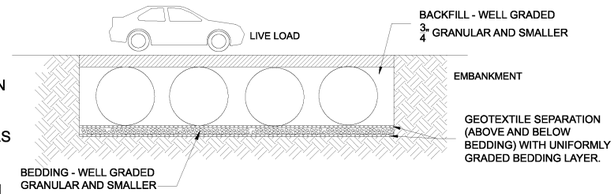
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

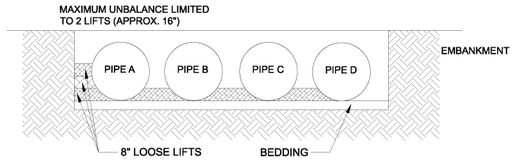
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION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

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



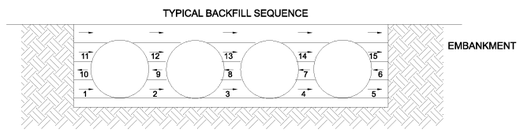
BACKFILL PLACEMENT

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

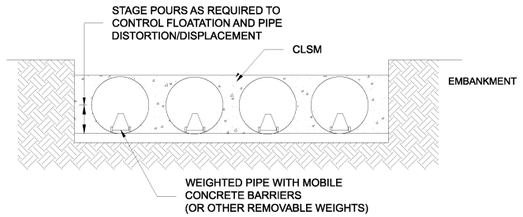


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE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

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



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

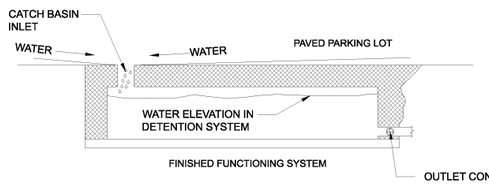


CONSTRUCTION LOADING

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

ADDITIONAL CONSIDERATIONS

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



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

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

INSPECTION

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

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

MAINTENANCE

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

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

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

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

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

C:\USERS\JEREMY.JOHNSON\DOCUMENTS\DYO\CMP_V10.DWG 10/18/2019 10:02 AM

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CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO26157 Shiloh West Medical Infiltration System-Phase 2 Victorville, CA DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
17351	26157	5/29/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Curve Number Calculations

DMA-A

Area = 68,542 (1.57AC)

Y. imp = 88.4 Y.

HSG = A

-Land uses-

Commercial Landscaping, A = 32

Impervious Surface, = 98

-

Commercial Landscape

11.6 Y. * 32 = 3.7

imp. Surface

88.4 Y. * 98 = 86.6

CN = 90.3

DMA-B

Area = 57,7185.f (1.33AC)

Y. imp = 82.3 Y.

HSG = A

- Land uses-

Commercial Landscape

17.7 Y. * 32 = 5.6

Imp. Surface

82.3 Y. * 98 = 80.6

CN = 86.2

∴ Average CN = (90.3 * 0.54) + 86.2 * .45 (A)

= 48.8 + 39.4

= 88

BY: Juan		PROJECT ENGINEER **ANACAL ENGINEERING CO. INC.** CIVIL ENGINEERING & LAND SURVEYING 1211 N. TUSTIN AVENUE ANAHEIM, CA 92807 PHONE: (714) 774-1763 FAX: (714) 774-4690	LOCATION Palmdale Rd
DATE: 1/19/23			
SCALE:	JOB # 22-029		SHEET NO. 1 of 1

BMP Calcs, Checking for Infiltration Adequacy

* DCV for Project = 6,449cf

* HCOC Provided by Project = 5,740cf

- Using Underground Infiltration

- DMA-A-

Measured Infiltration = 18 in/hr

S.F. = 1.75

Design Rate = 10.28 in/hr

in 48 max, infiltration rate = 10.28 * 48 hr * 1 ft/12 in

= 41.12 ft

- DMA-B-

Measured = 3.0 in/hr

Design Rate = 1.7 in/hr

w/ 48 in, able to infil = 1.7 * 48 * 1/12 = 6.8'

Infiltration Areas

DMA-A = 1,250 s.f.

DMA-B = 1,418 s.f.

DMA-A

HCOC Req = 3,107

$\frac{3,107 cf}{1,250} = 2.4' < 41.12'$ ✓

DMA-B

HCOC Req = 2,633cf ✓

$\frac{2,633 cf}{1,418} = 1.86' < 6.8'$

BY: Juan		PROJECT ENGINEER	LOCATION
DATE:		ANACAL ENGINEERING CO. INC. CIVIL ENGINEERING & LAND SURVEYING 1211 N. TUSTIN AVENUE ANAHEIM, CA 92807 PHONE: (714) 774-1763 FAX: (714) 774-4690	Palmdale Rd
SCALE:	JOB # 22-029		SHEET NO. 1 of 1

A1-Storage/Discharge Tables (exert from Hydrology Study)

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - CHAMBER A-1 IN A1
Outflow HYG file = NONE STORED - CHAMBER A-1 OUT A1

Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
.0000	.05	.00	.00	.00	.00	.000	3099.50
.2500	.12	.02	.17	.07	.00	.001	3099.53
.5000	.12	.03	.26	.11	.00	.001	3099.55
.7500	.12	.03	.27	.12	.00	.002	3099.55
1.0000	.12	.03	.27	.12	.00	.002	3099.55
1.2500	.12	.03	.27	.12	.00	.002	3099.55
1.5000	.14	.03	.29	.13	.00	.002	3099.56
1.7500	.14	.03	.30	.13	.00	.002	3099.56
2.0000	.14	.03	.30	.13	.00	.002	3099.56
2.2500	.14	.03	.30	.13	.00	.002	3099.56
2.5000	.14	.03	.30	.13	.00	.002	3099.56
2.7500	.14	.03	.30	.13	.00	.002	3099.56
3.0000	.14	.03	.30	.14	.00	.002	3099.56
3.2500	.14	.03	.30	.14	.00	.002	3099.56
3.5000	.14	.03	.30	.14	.00	.002	3099.56
3.7500	.15	.04	.32	.14	.00	.002	3099.56
4.0000	.15	.04	.34	.15	.00	.002	3099.57
4.2500	.15	.04	.34	.15	.00	.002	3099.57
4.5000	.15	.04	.34	.15	.00	.002	3099.57
4.7500	.15	.04	.34	.15	.00	.002	3099.57
5.0000	.15	.04	.34	.15	.00	.002	3099.57
5.2500	.15	.04	.34	.15	.00	.002	3099.57
5.5000	.17	.04	.35	.16	.00	.002	3099.57
5.7500	.17	.04	.37	.16	.00	.002	3099.57
6.0000	.17	.04	.37	.16	.00	.002	3099.57
6.2500	.17	.04	.37	.16	.00	.002	3099.57
6.5000	.17	.04	.37	.16	.00	.002	3099.57
6.7500	.17	.04	.37	.16	.00	.002	3099.57
7.0000	.18	.04	.39	.17	.00	.002	3099.57
7.2500	.18	.05	.40	.18	.00	.002	3099.58
7.5000	.18	.05	.41	.18	.00	.002	3099.58
7.7500	.18	.05	.41	.18	.00	.002	3099.58
8.0000	.18	.05	.41	.18	.00	.002	3099.58
8.2500	.18	.05	.41	.18	.00	.002	3099.58
8.5000	.20	.05	.42	.19	.00	.002	3099.58
8.7500	.20	.05	.44	.19	.00	.003	3099.58
9.0000	.20	.05	.44	.19	.00	.003	3099.58
9.2500	.21	.05	.45	.20	.00	.003	3099.59
9.5000	.21	.05	.47	.21	.00	.003	3099.59
9.7500	.21	.05	.47	.21	.00	.003	3099.59
10.0000	.23	.05	.49	.22	.00	.003	3099.59
10.2500	.23	.06	.50	.22	.00	.003	3099.60

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - CHAMBER A-1 IN A1
Outflow HYG file = NONE STORED - CHAMBER A-1 OUT A1

Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
10.5000	.24	.06	.52	.23	.00	.003	3099.60
10.7500	.24	.08	.54	.23	.00	.003	3099.61
11.0000	.24	.10	.56	.23	.00	.003	3099.61
11.2500	.26	.13	.59	.23	.00	.004	3099.62
11.5000	.26	.18	.64	.23	.00	.004	3099.64
11.7500	.27	.24	.70	.23	.00	.005	3099.66
12.0000	.29	.33	.79	.23	.00	.006	3099.70
12.2500	.29	.44	.90	.23	.00	.007	3099.73
12.5000	.30	.56	1.03	.23	.00	.008	3099.78
12.7500	.30	.70	1.16	.23	.00	.010	3099.82
13.0000	.32	.85	1.32	.23	.00	.011	3099.88
13.2500	.33	1.04	1.50	.23	.00	.013	3099.94
13.5000	.36	1.27	1.73	.23	.00	.015	3100.02
13.7500	.38	1.54	2.00	.23	.00	.018	3100.11
14.0000	.41	1.86	2.32	.23	.00	.022	3100.22
14.2500	.42	2.22	2.68	.23	.00	.025	3100.35
14.5000	.47	2.64	3.10	.23	.00	.030	3100.49
14.7500	.51	3.16	3.62	.23	.00	.035	3100.67
15.0000	.56	3.76	4.22	.23	.00	.041	3100.88
15.2500	.65	4.50	4.96	.23	.00	.049	3101.14
15.5000	.71	5.38	5.85	.23	.00	.058	3101.44
15.7500	.81	6.44	6.90	.23	.00	.069	3101.81
16.0000	1.38	7.73	8.63	.23	.22	.085	3102.33
16.2500	4.22	9.58	13.33	.23	1.64	.118	3103.46
16.5000	5.10	13.16	18.90	.23	2.64	.166	3104.91
16.7500	.99	13.38	19.25	.23	2.71	.169	3105.03
17.0000	.56	10.57	14.92	.23	1.95	.132	3103.83
17.2500	.45	8.75	11.57	.23	1.18	.105	3103.01
17.5000	.39	8.05	9.59	.23	.54	.091	3102.55
17.7500	.35	7.79	8.78	.23	.26	.086	3102.37
18.0000	.32	7.66	8.45	.23	.16	.083	3102.29
18.2500	.29	7.57	8.26	.23	.12	.082	3102.24
18.5000	.27	7.50	8.12	.23	.08	.081	3102.20
18.7500	.26	7.43	8.03	.23	.06	.080	3102.17
19.0000	.24	7.37	7.93	.23	.05	.079	3102.15
19.2500	.23	7.30	7.83	.23	.03	.078	3102.12
19.5000	.21	7.23	7.74	.23	.02	.077	3102.09
19.7500	.21	7.16	7.65	.23	.01	.077	3102.06
20.0000	.20	7.09	7.57	.23	.01	.076	3102.03
20.2500	.18	7.00	7.46	.23	.00	.075	3102.00
20.5000	.18	6.90	7.36	.23	.00	.074	3101.97
20.7500	.09	6.71	7.17	.23	.00	.072	3101.90

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - CHAMBER A-1 IN A1
Outflow HYG file = NONE STORED - CHAMBER A-1 OUT A1

Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
21.0000	.17	6.50	6.96	.23	.00	.070	3101.83
21.2500	.17	6.37	6.83	.23	.00	.068	3101.78
21.5000	.17	6.24	6.70	.23	.00	.067	3101.74
21.7500	.15	6.09	6.55	.23	.00	.065	3101.69
22.0000	.15	5.93	6.39	.23	.00	.064	3101.63
22.2500	.15	5.77	6.23	.23	.00	.062	3101.57
22.5000	.15	5.60	6.07	.23	.00	.060	3101.52
22.7500	.14	5.43	5.89	.23	.00	.058	3101.46
23.0000	.14	5.23	5.70	.23	.00	.056	3101.39
23.2500	.14	5.04	5.50	.23	.00	.054	3101.32
23.5000	.14	4.85	5.31	.23	.00	.052	3101.26
23.7500	.12	4.64	5.11	.23	.00	.050	3101.19
24.0000	.00	4.30	4.76	.23	.00	.047	3101.07
24.2500	.00	3.84	4.30	.23	.00	.042	3100.91
24.5000	.00	3.38	3.84	.23	.00	.037	3100.75
24.7500	.00	2.92	3.38	.23	.00	.033	3100.59
25.0000	.00	2.45	2.92	.23	.00	.028	3100.43
25.2500	.00	1.99	2.45	.23	.00	.023	3100.27
25.5000	.00	1.53	1.99	.23	.00	.018	3100.11
25.7500	.00	1.07	1.53	.23	.00	.013	3099.95
26.0000	.00	.61	1.07	.23	.00	.009	3099.79
26.2500	.00	.14	.61	.23	.00	.004	3099.63
26.5000	.00	.02	.14	.06	.00	.001	3099.53
26.7500	.00	.00	.02	.01	.00	.000	3099.50
27.0000	.00	.00	.00	.00	.00	.000	3099.50

A2-Storage/Discharge Tables (exert from Hydrology Study)

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - POND 10 IN A2
Outflow HYG file = NONE STORED - POND 10 OUT A2

Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
.0000	.04	.00	.00	.00	.00	.000	3100.50
.2500	.10	.11	.14	.02	.00	.001	3100.53
.5000	.10	.23	.31	.04	.00	.003	3100.57
.7500	.10	.32	.43	.05	.00	.004	3100.59
1.0000	.10	.41	.52	.06	.00	.005	3100.62
1.2500	.10	.50	.61	.06	.00	.006	3100.64
1.5000	.11	.60	.71	.06	.00	.007	3100.66
1.7500	.11	.70	.82	.06	.00	.008	3100.69
2.0000	.11	.81	.92	.06	.00	.009	3100.72
2.2500	.11	.92	1.03	.06	.00	.010	3100.74
2.5000	.11	1.03	1.14	.06	.00	.011	3100.77
2.7500	.11	1.13	1.25	.06	.00	.012	3100.80
3.0000	.11	1.24	1.35	.06	.00	.013	3100.83
3.2500	.12	1.36	1.47	.06	.00	.015	3100.85
3.5000	.12	1.49	1.60	.06	.00	.016	3100.89
3.7500	.12	1.62	1.73	.06	.00	.017	3100.92
4.0000	.12	1.74	1.86	.06	.00	.019	3100.95
4.2500	.12	1.87	1.98	.06	.00	.020	3100.98
4.5000	.12	2.00	2.11	.06	.00	.021	3101.01
4.7500	.12	2.13	2.24	.06	.00	.023	3101.05
5.0000	.13	2.26	2.38	.06	.00	.024	3101.08
5.2500	.13	2.41	2.52	.06	.00	.025	3101.12
5.5000	.13	2.56	2.67	.06	.00	.027	3101.15
5.7500	.13	2.71	2.82	.06	.00	.029	3101.19
6.0000	.13	2.85	2.97	.06	.00	.030	3101.23
6.2500	.14	3.01	3.12	.06	.00	.032	3101.27
6.5000	.14	3.18	3.29	.06	.00	.033	3101.31
6.7500	.14	3.35	3.46	.06	.00	.035	3101.35
7.0000	.14	3.51	3.63	.06	.00	.037	3101.39
7.2500	.14	3.68	3.79	.06	.00	.039	3101.43
7.5000	.15	3.86	3.97	.06	.00	.040	3101.48
7.7500	.15	4.05	4.16	.06	.00	.042	3101.53
8.0000	.15	4.23	4.35	.06	.00	.044	3101.57
8.2500	.15	4.42	4.53	.06	.00	.046	3101.62
8.5000	.16	4.62	4.73	.06	.00	.048	3101.67
8.7500	.16	4.83	4.94	.06	.00	.050	3101.72
9.0000	.17	5.04	5.16	.06	.00	.053	3101.78
9.2500	.17	5.27	5.38	.06	.00	.055	3101.83
9.5000	.17	5.50	5.61	.06	.00	.057	3101.89
9.7500	.18	5.74	5.85	.06	.00	.060	3101.95
10.0000	.18	5.98	6.10	.06	.00	.062	3102.01
10.2500	.19	6.20	6.35	.06	.02	.065	3102.07

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - POND 10 IN A2
Outflow HYG file = NONE STORED - POND 10 OUT A2

Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
10.5000	.19	6.40	6.58	.06	.04	.067	3102.12
10.7500	.20	6.57	6.79	.06	.05	.069	3102.17
11.0000	.20	6.71	6.97	.06	.07	.071	3102.21
11.2500	.21	6.81	7.12	.06	.10	.072	3102.24
11.5000	.21	6.89	7.23	.06	.12	.073	3102.27
11.7500	.22	6.94	7.32	.06	.13	.074	3102.28
12.0000	.23	6.99	7.39	.06	.14	.074	3102.30
12.2500	.24	7.04	7.46	.06	.16	.075	3102.31
12.5000	.25	7.07	7.53	.06	.17	.075	3102.33
12.7500	.25	7.10	7.57	.06	.18	.076	3102.33
13.0000	.26	7.12	7.61	.06	.19	.076	3102.34
13.2500	.27	7.15	7.65	.06	.20	.076	3102.35
13.5000	.29	7.18	7.71	.06	.21	.077	3102.36
13.7500	.31	7.22	7.78	.06	.22	.077	3102.38
14.0000	.33	7.27	7.86	.06	.24	.078	3102.39
14.2500	.35	7.32	7.95	.06	.26	.079	3102.41
14.5000	.38	7.37	8.05	.06	.28	.080	3102.43
14.7500	.41	7.43	8.16	.06	.31	.081	3102.45
15.0000	.46	7.51	8.30	.06	.34	.082	3102.48
15.2500	.53	7.62	8.50	.06	.38	.083	3102.52
15.5000	.59	7.75	8.74	.06	.44	.085	3102.56
15.7500	.67	7.92	9.01	.06	.49	.087	3102.62
16.0000	1.14	8.45	9.73	.06	.58	.094	3102.77
16.2500	3.47	10.95	13.06	.06	1.00	.124	3103.50
16.5000	4.20	15.57	18.62	.06	1.47	.177	3104.77
16.7500	.82	17.26	20.59	.06	1.61	.196	3105.23
17.0000	.46	15.50	18.54	.06	1.46	.176	3104.76
17.2500	.38	13.64	16.34	.06	1.30	.155	3104.25
17.5000	.33	11.99	14.35	.06	1.12	.136	3103.79
17.7500	.29	10.59	12.61	.06	.95	.120	3103.40
18.0000	.26	9.46	11.14	.06	.78	.106	3103.08
18.2500	.24	8.62	9.96	.06	.62	.096	3102.82
18.5000	.22	7.97	9.08	.06	.50	.088	3102.63
18.7500	.21	7.56	8.40	.06	.36	.082	3102.50
19.0000	.20	7.33	7.97	.06	.26	.079	3102.41
19.2500	.19	7.19	7.72	.06	.21	.077	3102.36
19.5000	.18	7.09	7.56	.06	.18	.076	3102.33
19.7500	.17	7.02	7.44	.06	.15	.075	3102.31
20.0000	.16	6.97	7.35	.06	.14	.074	3102.29
20.2500	.15	6.92	7.28	.06	.12	.073	3102.27
20.5000	.15	6.88	7.22	.06	.11	.073	3102.26
20.7500	.08	6.80	7.11	.06	.10	.072	3102.24

LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - POND 10 IN A2
Outflow HYG file = NONE STORED - POND 10 OUT A2

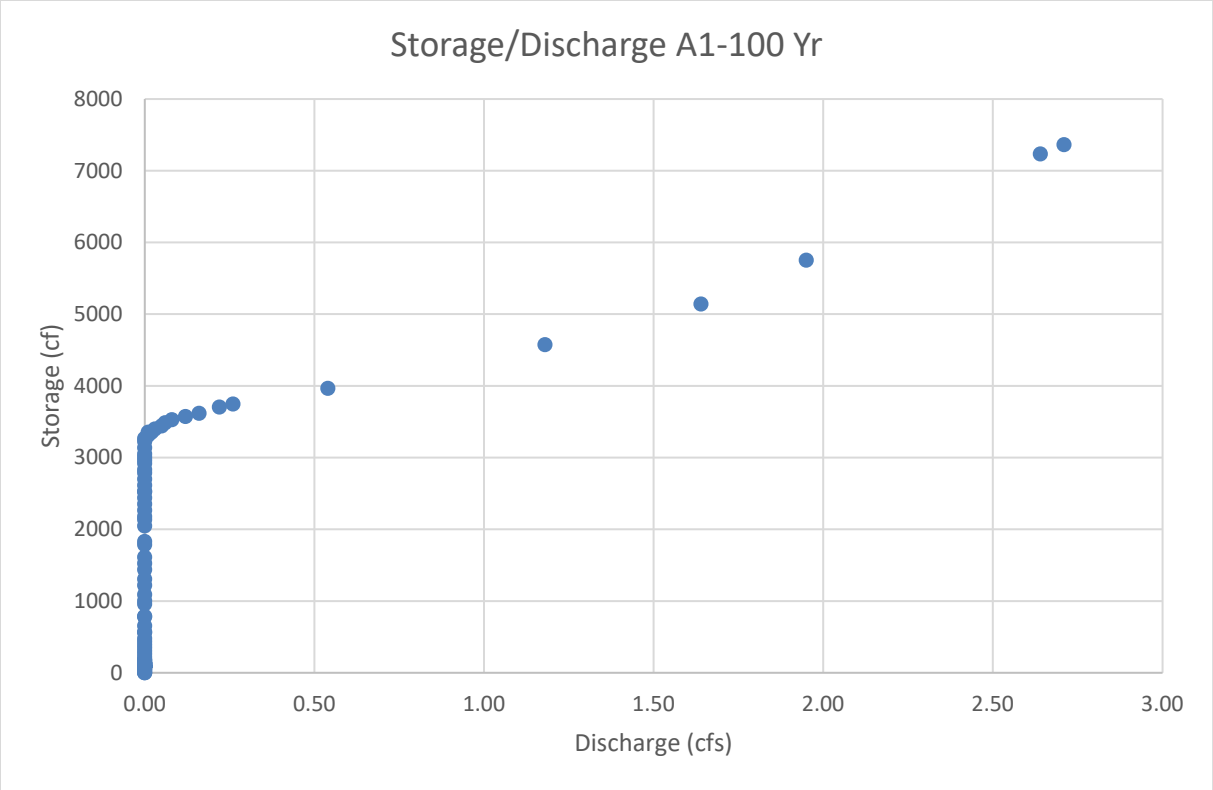
Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
21.0000	.14	6.75	7.02	.06	.08	.071	3102.22
21.2500	.14	6.75	7.03	.06	.08	.071	3102.22
21.5000	.13	6.74	7.02	.06	.08	.071	3102.22
21.7500	.13	6.73	7.00	.06	.08	.071	3102.22
22.0000	.12	6.72	6.98	.06	.08	.071	3102.21
22.2500	.12	6.70	6.96	.06	.07	.071	3102.21
22.5000	.12	6.69	6.94	.06	.07	.070	3102.21
22.7500	.12	6.69	6.93	.06	.07	.070	3102.20
23.0000	.11	6.67	6.92	.06	.06	.070	3102.20
23.2500	.11	6.65	6.89	.06	.06	.070	3102.19
23.5000	.11	6.64	6.87	.06	.06	.070	3102.19
23.7500	.10	6.62	6.85	.06	.06	.070	3102.18
24.0000	.00	6.51	6.72	.06	.05	.068	3102.15
24.2500	.00	6.34	6.51	.06	.03	.066	3102.11
24.5000	.00	6.19	6.34	.06	.02	.065	3102.07
24.7500	.00	6.06	6.19	.06	.01	.063	3102.03
25.0000	.00	5.95	6.06	.06	.00	.062	3102.00
25.2500	.00	5.84	5.95	.06	.00	.061	3101.97
25.5000	.00	5.73	5.84	.06	.00	.060	3101.95
25.7500	.00	5.61	5.73	.06	.00	.059	3101.92
26.0000	.00	5.50	5.61	.06	.00	.057	3101.89
26.2500	.00	5.39	5.50	.06	.00	.056	3101.86
26.5000	.00	5.28	5.39	.06	.00	.055	3101.83
26.7500	.00	5.16	5.28	.06	.00	.054	3101.81
27.0000	.00	5.05	5.16	.06	.00	.053	3101.78
27.2500	.00	4.94	5.05	.06	.00	.052	3101.75
27.5000	.00	4.83	4.94	.06	.00	.050	3101.72
27.7500	.00	4.71	4.83	.06	.00	.049	3101.69
28.0000	.00	4.60	4.71	.06	.00	.048	3101.67
28.2500	.00	4.49	4.60	.06	.00	.047	3101.64
28.5000	.00	4.38	4.49	.06	.00	.046	3101.61
28.7500	.00	4.26	4.38	.06	.00	.045	3101.58
29.0000	.00	4.15	4.26	.06	.00	.043	3101.55
29.2500	.00	4.04	4.15	.06	.00	.042	3101.52
29.5000	.00	3.93	4.04	.06	.00	.041	3101.50
29.7500	.00	3.82	3.93	.06	.00	.040	3101.47
30.0000	.00	3.70	3.82	.06	.00	.039	3101.44
30.2500	.00	3.59	3.70	.06	.00	.038	3101.41
30.5000	.00	3.48	3.59	.06	.00	.037	3101.38
30.7500	.00	3.37	3.48	.06	.00	.035	3101.36
31.0000	.00	3.25	3.37	.06	.00	.034	3101.33
31.2500	.00	3.14	3.25	.06	.00	.033	3101.30

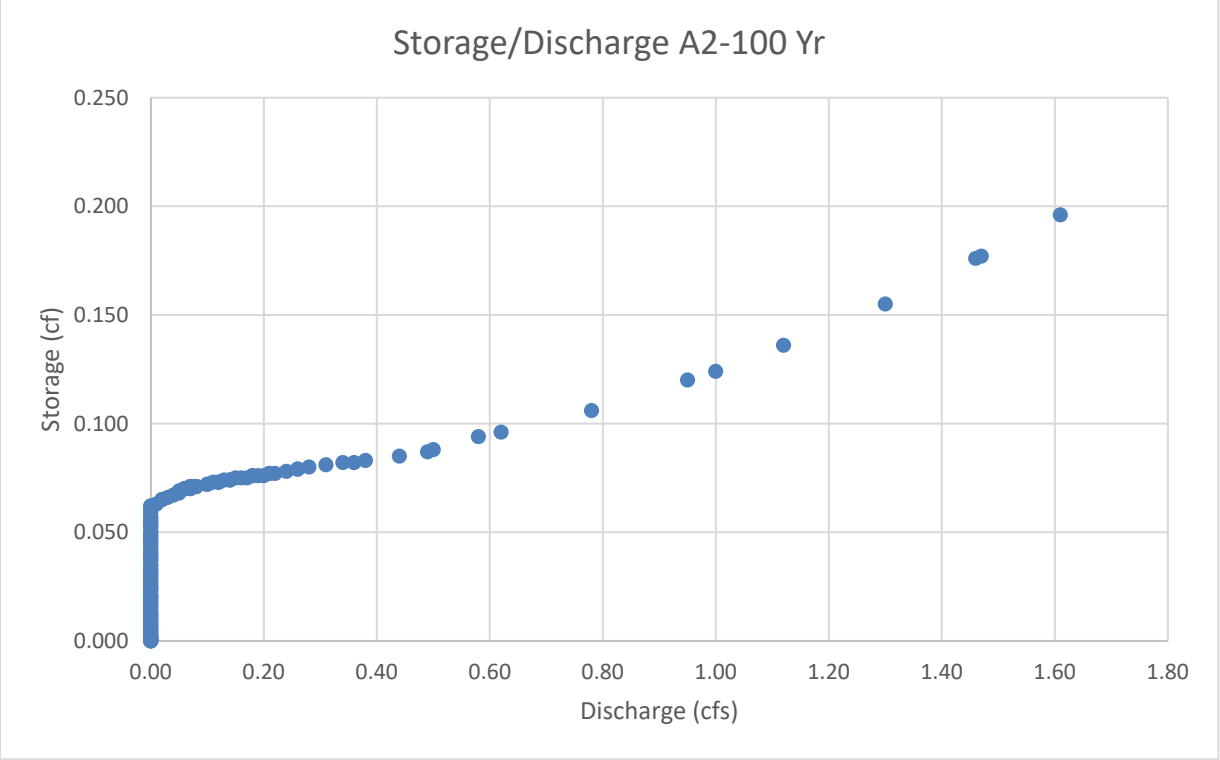
LEVEL POOL ROUTING CALCULATIONS

HYG Dir = C:\Program Files\Haestad\PPKW\Sample\
Inflow HYG file = NONE STORED - POND 10 IN A2
Outflow HYG file = NONE STORED - POND 10 OUT A2

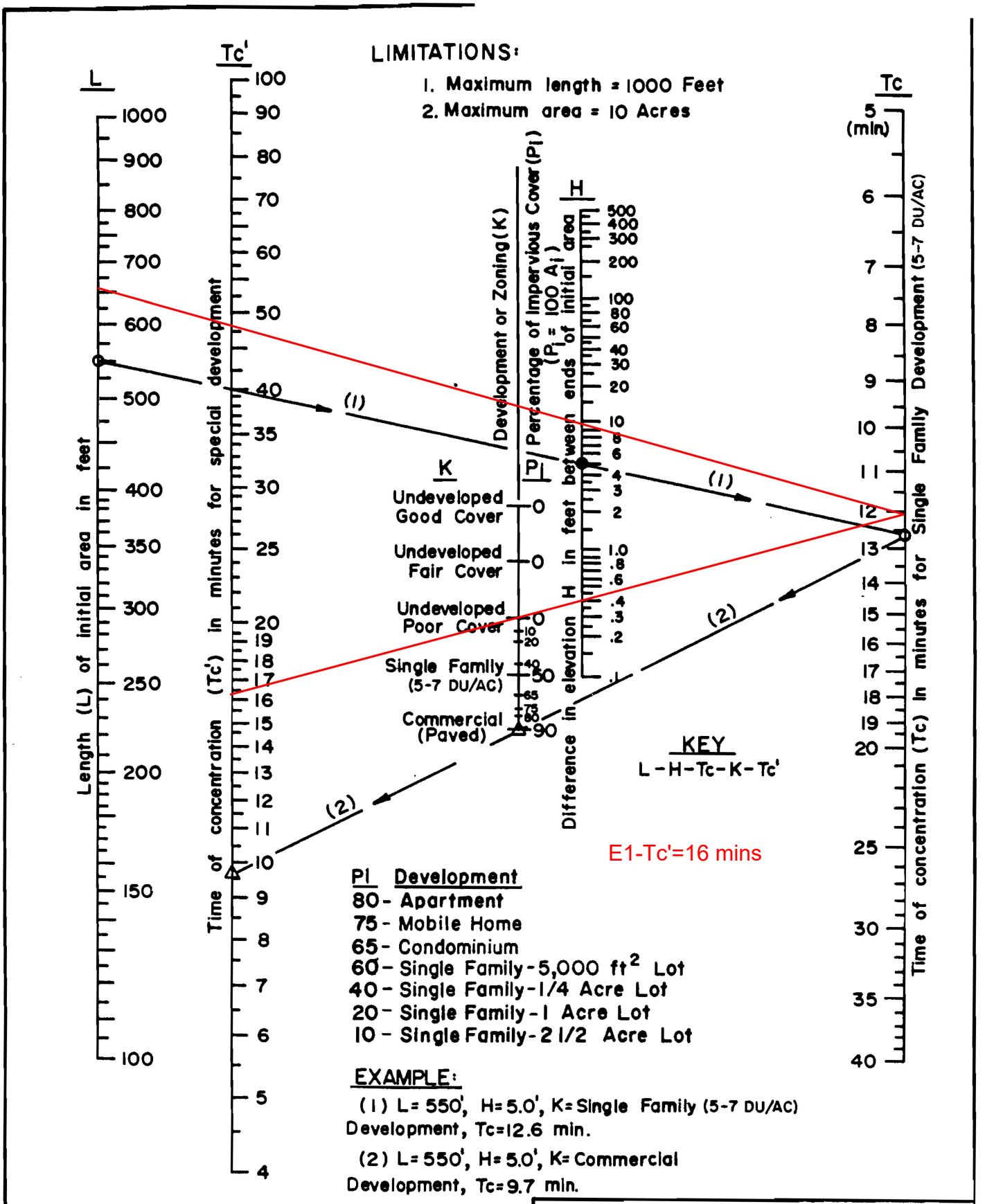
Time hrs	Inflow cfs	2S/t - O cfs	2S/t + O cfs	Infilt. cfs	Outflow cfs	Storage ac-ft	Elev. ft
31.5000	.00	3.03	3.14	.06	.00	.032	3101.27
31.7500	.00	2.92	3.03	.06	.00	.031	3101.24
32.0000	.00	2.80	2.92	.06	.00	.030	3101.22
32.2500	.00	2.69	2.80	.06	.00	.028	3101.19
32.5000	.00	2.58	2.69	.06	.00	.027	3101.16
32.7500	.00	2.47	2.58	.06	.00	.026	3101.13
33.0000	.00	2.35	2.47	.06	.00	.025	3101.10
33.2500	.00	2.24	2.35	.06	.00	.024	3101.07
33.5000	.00	2.13	2.24	.06	.00	.023	3101.05
33.7500	.00	2.02	2.13	.06	.00	.021	3101.02
34.0000	.00	1.90	2.02	.06	.00	.020	3100.99
34.2500	.00	1.79	1.90	.06	.00	.019	3100.96
34.5000	.00	1.68	1.79	.06	.00	.018	3100.93
34.7500	.00	1.57	1.68	.06	.00	.017	3100.91
35.0000	.00	1.45	1.57	.06	.00	.016	3100.88
35.2500	.00	1.34	1.45	.06	.00	.014	3100.85
35.5000	.00	1.23	1.34	.06	.00	.013	3100.82
35.7500	.00	1.12	1.23	.06	.00	.012	3100.79
36.0000	.00	1.01	1.12	.06	.00	.011	3100.77
36.2500	.00	.89	1.01	.06	.00	.010	3100.74
36.5000	.00	.78	.89	.06	.00	.009	3100.71
36.7500	.00	.67	.78	.06	.00	.007	3100.68
37.0000	.00	.56	.67	.06	.00	.006	3100.65
37.2500	.00	.44	.56	.06	.00	.005	3100.63
37.5000	.00	.33	.44	.05	.00	.004	3100.60
37.7500	.00	.25	.33	.04	.00	.003	3100.57
38.0000	.00	.19	.25	.03	.00	.002	3100.56
38.2500	.00	.14	.19	.02	.00	.002	3100.54
38.5000	.00	.11	.14	.02	.00	.001	3100.53
38.7500	.00	.08	.11	.01	.00	.001	3100.52
39.0000	.00	.06	.08	.01	.00	.001	3100.52
39.2500	.00	.05	.06	.01	.00	.001	3100.51
39.5000	.00	.03	.05	.01	.00	.000	3100.51
39.7500	.00	.03	.03	.00	.00	.000	3100.51
40.0000	.00	.02	.03	.00	.00	.000	3100.51
40.2500	.00	.01	.02	.00	.00	.000	3100.50

A1& A2-Storage/Discharge Graph (exert from Hydrology Study)





Existing Condition

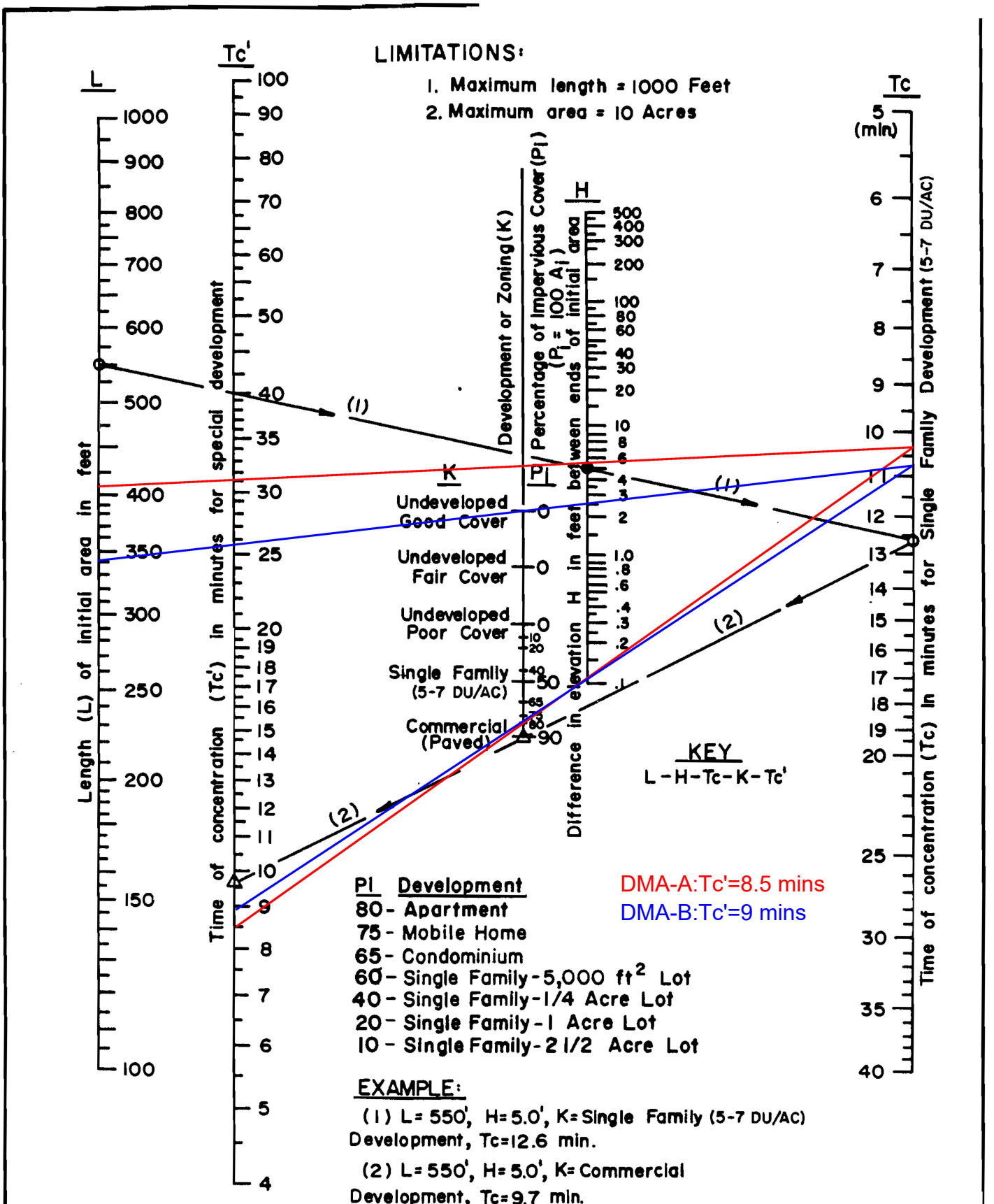


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

Proposed Condition



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

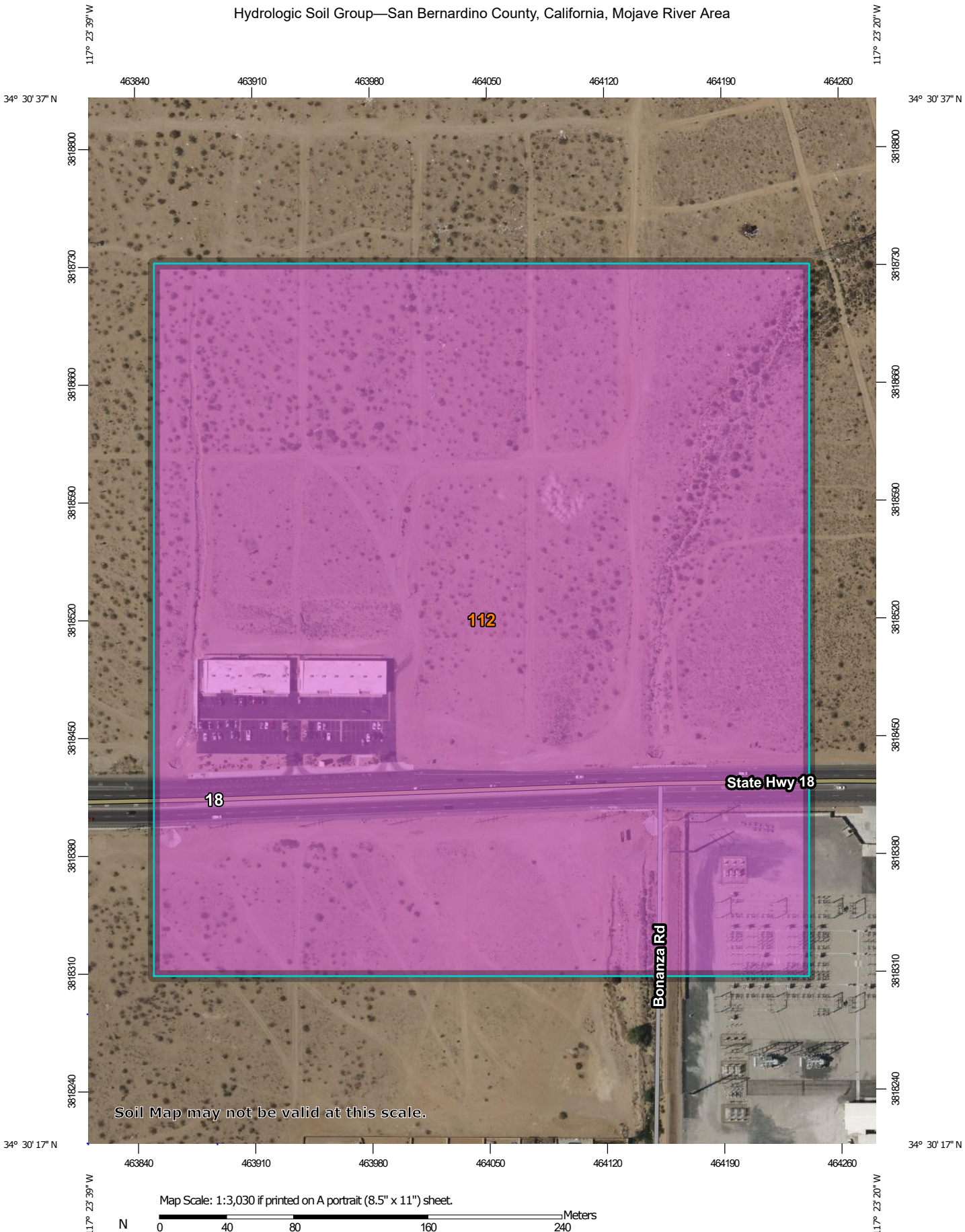
TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

Appendix C

Site Details, HCOC, & Pre-developed site

Shilo West Medical Center
Site: Palmdale & Mesa Linda Rd.



Map Scale: 1:3,030 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 14, Sep 1, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	A	41.1	100.0%
Totals for Area of Interest			**41.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

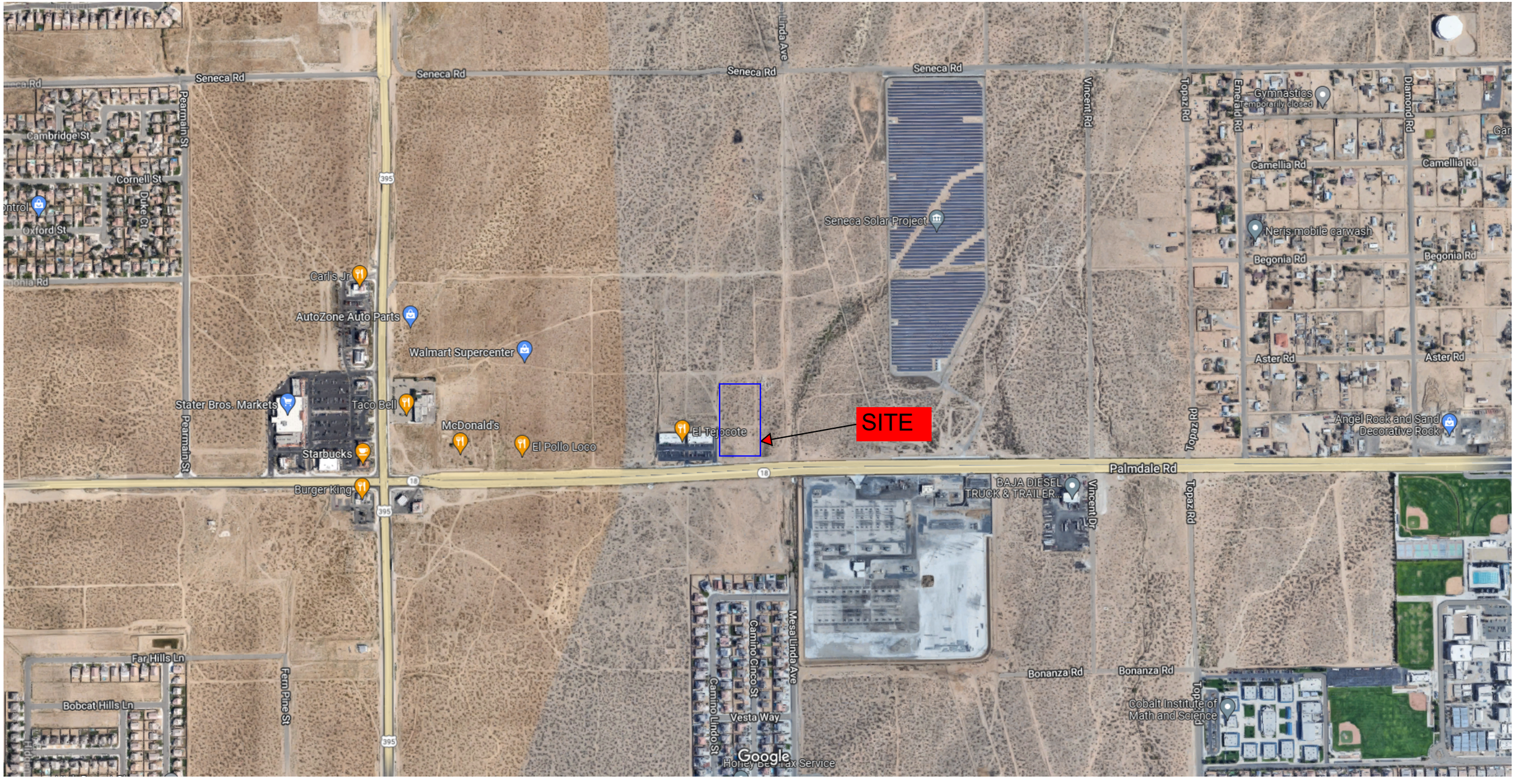
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Google Maps



Imagery ©2023 Google, Imagery ©2023 County of San Bernardino, Maxar Technologies, USDA/FPAC/GEO, Map data ©2023 500 ft

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.5071°, Longitude: -117.3965°
Elevation: 3124.23 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.080** (0.066-0.098)	**0.114** (0.094-0.140)	**0.160** (0.131-0.196)	**0.197** (0.161-0.244)	**0.249** (0.197-0.319)	**0.290** (0.224-0.378)	**0.331** (0.250-0.443)	**0.375** (0.275-0.516)	**0.434** (0.306-0.623)	**0.481** (0.327-0.714)
10-min	**0.114** (0.095-0.140)	**0.163** (0.135-0.200)	**0.229** (0.188-0.281)	**0.283** (0.231-0.350)	**0.357** (0.282-0.457)	**0.415** (0.321-0.542)	**0.475** (0.358-0.635)	**0.537** (0.394-0.739)	**0.622** (0.438-0.893)	**0.689** (0.469-1.02)
15-min	**0.138** (0.114-0.169)	**0.198** (0.163-0.242)	**0.277** (0.228-0.340)	**0.342** (0.279-0.423)	**0.432** (0.341-0.552)	**0.502** (0.388-0.656)	**0.574** (0.433-0.768)	**0.649** (0.477-0.894)	**0.753** (0.530-1.08)	**0.833** (0.567-1.24)
30-min	**0.203** (0.167-0.248)	**0.289** (0.239-0.354)	**0.405** (0.333-0.497)	**0.500** (0.408-0.619)	**0.632** (0.499-0.809)	**0.735** (0.568-0.960)	**0.841** (0.634-1.13)	**0.951** (0.698-1.31)	**1.10** (0.776-1.58)	**1.22** (0.830-1.81)
60-min	**0.264** (0.218-0.322)	**0.377** (0.311-0.461)	**0.527** (0.434-0.647)	**0.651** (0.532-0.806)	**0.823** (0.650-1.05)	**0.956** (0.740-1.25)	**1.09** (0.826-1.46)	**1.24** (0.908-1.70)	**1.43** (1.01-2.06)	**1.59** (1.08-2.36)
2-hr	**0.369** (0.305-0.451)	**0.500** (0.413-0.612)	**0.679** (0.559-0.834)	**0.831** (0.678-1.03)	**1.05** (0.826-1.34)	**1.22** (0.942-1.59)	**1.40** (1.06-1.87)	**1.59** (1.17-2.19)	**1.85** (1.31-2.66)	**2.07** (1.41-3.07)
3-hr	**0.458** (0.378-0.560)	**0.611** (0.504-0.748)	**0.823** (0.677-1.01)	**1.00** (0.820-1.24)	**1.26** (0.997-1.62)	**1.47** (1.14-1.92)	**1.70** (1.28-2.27)	**1.93** (1.42-2.66)	**2.27** (1.60-3.26)	**2.54** (1.73-3.77)
6-hr	**0.623** (0.514-0.761)	**0.824** (0.680-1.01)	**1.11** (0.911-1.36)	**1.35** (1.10-1.67)	**1.71** (1.35-2.18)	**2.00** (1.54-2.61)	**2.31** (1.74-3.09)	**2.65** (1.94-3.64)	**3.13** (2.21-4.49)	**3.53** (2.40-5.24)
12-hr	**0.776** (0.641-0.949)	**1.06** (0.877-1.30)	**1.47** (1.21-1.80)	**1.81** (1.48-2.24)	**2.31** (1.83-2.96)	**2.73** (2.11-3.56)	**3.17** (2.39-4.24)	**3.64** (2.68-5.02)	**4.33** (3.05-6.22)	**4.90** (3.33-7.28)
24-hr	**1.05** (0.929-1.21)	**1.49** (1.32-1.72)	**2.11** (1.87-2.44)	**2.64** (2.32-3.08)	**3.41** (2.89-4.11)	**4.04** (3.35-4.96)	**4.70** (3.81-5.93)	**5.43** (4.28-7.03)	**6.47** (4.89-8.74)	**7.33** (5.35-10.2)
2-day	**1.13** (1.00-1.30)	**1.61** (1.43-1.86)	**2.29** (2.02-2.64)	**2.87** (2.51-3.34)	**3.71** (3.15-4.47)	**4.40** (3.65-5.41)	**5.14** (4.17-6.48)	**5.95** (4.69-7.71)	**7.12** (5.38-9.61)	**8.09** (5.91-11.3)
3-day	**1.21** (1.07-1.39)	**1.72** (1.52-1.98)	**2.44** (2.15-2.81)	**3.05** (2.68-3.56)	**3.95** (3.35-4.76)	**4.69** (3.89-5.76)	**5.48** (4.44-6.90)	**6.35** (5.00-8.22)	**7.60** (5.75-10.3)	**8.65** (6.32-12.1)
4-day	**1.30** (1.15-1.49)	**1.84** (1.63-2.12)	**2.60** (2.30-3.01)	**3.26** (2.86-3.80)	**4.21** (3.57-5.07)	**5.00** (4.15-6.14)	**5.84** (4.73-7.36)	**6.76** (5.32-8.75)	**8.09** (6.12-10.9)	**9.20** (6.72-12.9)
7-day	**1.39** (1.24-1.60)	**1.96** (1.74-2.26)	**2.77** (2.44-3.20)	**3.46** (3.03-4.03)	**4.45** (3.77-5.36)	**5.27** (4.37-6.47)	**6.13** (4.97-7.72)	**7.07** (5.57-9.15)	**8.41** (6.36-11.4)	**9.52** (6.95-13.3)
10-day	**1.48** (1.31-1.71)	**2.08** (1.84-2.40)	**2.92** (2.58-3.38)	**3.65** (3.20-4.25)	**4.70** (3.98-5.66)	**5.55** (4.60-6.82)	**6.45** (5.22-8.12)	**7.42** (5.84-9.61)	**8.81** (6.66-11.9)	**9.94** (7.26-13.9)
20-day	**1.76** (1.56-2.02)	**2.47** (2.19-2.85)	**3.48** (3.07-4.02)	**4.35** (3.81-5.07)	**5.61** (4.75-6.75)	**6.63** (5.51-8.15)	**7.72** (6.25-9.73)	**8.89** (7.00-11.5)	**10.5** (7.96-14.2)	**11.9** (8.66-16.6)
30-day	**2.03** (1.80-2.34)	**2.84** (2.52-3.27)	**4.00** (3.53-4.62)	**5.01** (4.39-5.84)	**6.48** (5.49-7.80)	**7.67** (6.37-9.44)	**8.94** (7.24-11.3)	**10.3** (8.11-13.3)	**12.2** (9.23-16.5)	**13.7** (10.0-19.2)
45-day	**2.37** (2.10-2.73)	**3.30** (2.92-3.80)	**4.62** (4.08-5.34)	**5.79** (5.07-6.75)	**7.51** (6.36-9.04)	**8.92** (7.40-11.0)	**10.4** (8.43-13.1)	**12.0** (9.46-15.6)	**14.3** (10.8-19.3)	**16.1** (11.7-22.5)
60-day	**2.65** (2.35-3.05)	**3.64** (3.23-4.20)	**5.09** (4.50-5.88)	**6.37** (5.58-7.42)	**8.26** (7.00-9.95)	**9.83** (8.16-12.1)	**11.5** (9.32-14.5)	**13.3** (10.5-17.2)	**15.8** (12.0-21.3)	**17.8** (13.0-24.9)

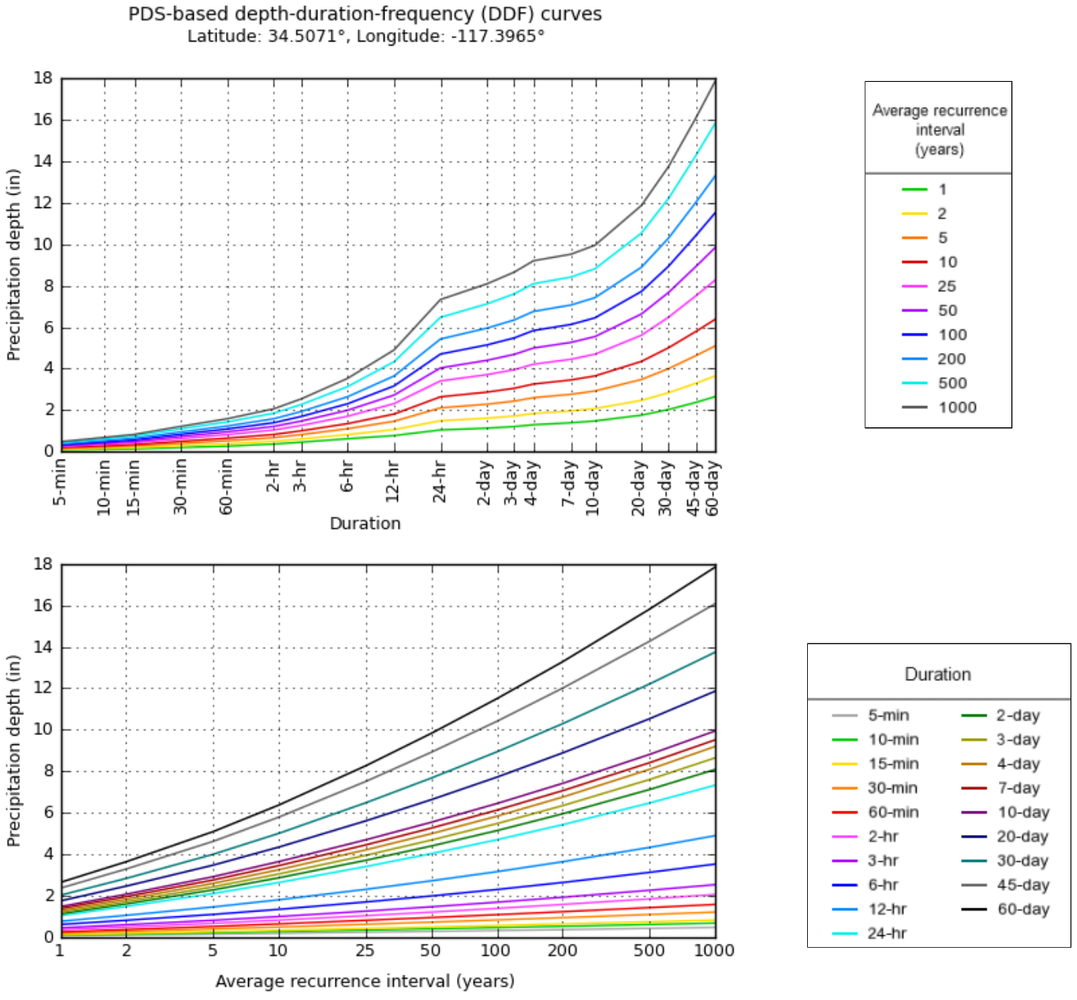
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Jan 26 22:05:10 2023

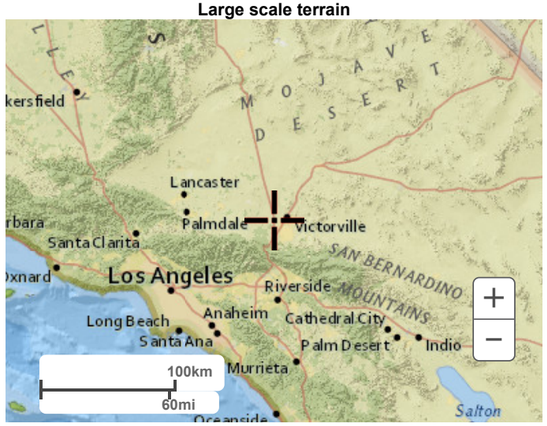
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Maps & aerials

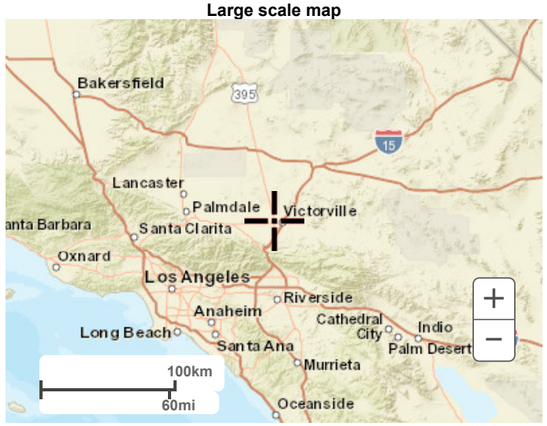
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

Appendix D

Operations and Maintenance Plan

Shilo West Medical Center
Site: Palmdale & Mesa Linda Rd.

Operations and Maintenance (O&M) Plan

Water Quality Management Plan
for

N.W. Corner of Palmdale Rd. & Mesa Linda Ave

Victorville, CA

Shilo West Medical Center

APN 3103-561-20

RECORDING REQUESTED BY:

City of Victorville
Engineering Department

AND WHEN RECORDED MAIL TO:

City of Victorville
Engineering Department
14343 Civic Drive
Victorville, CA 92392

SPACE ABOVE THIS LINE FOR RECORDER'S USE

AGREEMENT

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

Water Quality Management Plan and Stormwater Best Management Practices Transfer, Access and Maintenance Agreement

OWNER NAME: _____

PROPERTY ADDRESS: _____

APN: 3103-561-20

THIS AGREEMENT is made and entered into in

_____, California, this _____ day of

_____, by and between

_____, hereinafter

referred to as Owner, and the CITY OF VICTORVILLE, a municipal corporation, located in the County of San Bernardino, State of California, hereinafter referred to as CITY;

WHEREAS, the Owner owns real property ("Property") in the City of Victorville, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference;

WHEREAS, at the time of initial approval of development project known as

SHILOH WEST MEDICAL CENTER within the Property described herein, the CITY required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff;

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the CITY, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the City;

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP 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, it is mutually stipulated and agreed as follows:

1. All maintenance or replacement of BMPs proposed as part of the WQMP are the sole responsibility of the Owner in accordance with the terms of this Agreement.

2. Owner hereby provides the City of Victorville's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the City's Director of Public Works, no advance notice, for the purpose of inspection, sampling, testing of the Device, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 3 below. The City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property. Denial of access to any premises or facility that contains WQMP features is a violation of the City Stormwater Ordinance. If there is reasonable cause to believe that an illicit discharge or breach of the WQMP operation and maintenance commitments is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions.

3. Owner shall use its best efforts diligently to maintain all BMPs 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 any material(s) from the BMPs 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 City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

4. In the event 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 City , the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense against the property and/or to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the City Code from the date of the notice of expense until paid in full.

5. The City may require the owner to post security in form and for a time period satisfactory to the City to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, 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. As an additional remedy, the Director of Public Works may withdraw any previous stormwater-related approval with respect to the property on which BMPs have been installed and/or implemented until such time as Owner repays to City its reasonable costs incurred in accordance with paragraph 3 above.

6. This agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

7. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to hold the City harmless and pay all costs incurred by the City 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.

8. 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 there against.

9. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, 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 City at the same time such notice is provided to the successor.

10. Time is of the essence in the performance of this Agreement.

11. 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.

12. The Owner its successors and assigns, hereby agrees to save and hold harmless the City, any of its departments, agencies, officers or employees, all of whom while working within their respective authority, from all cost, injury and damage incurred by any of the above, and from any other injury or damage to any person or property whatsoever, any of which is caused by an activity, condition or event arising out of the performance, preparation for performance or nonperformance of any provision of this agreement by the Owner, its agents, or any of its independent contractors.

IF TO CITY:
City of Victorville – Engineering Department

14343 Civic Drive,

Victorville, CA 92392

IF TO OWNER:

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

OWNER:

Signature: _____

Name: R. Paul Earle

Title: CEO

OWNER:

Signature: _____

Name: _____

Title: _____

NOTARIES ON FOLLOWING PAGE

A notary acknowledgement is required for recordation (attach appropriate acknowledgement).

ACCEPTED BY:

_____
Brian W. Gengler., City Engineer for City of Victorville

Date: _____

Attachment: Standard Notary Acknowledgement

EXHIBIT "A"
LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF VICTORVILLE, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA AND IS DESCRIBED AS FOLLOWS:

PARCEL 4 OF PARCEL MAP 2960, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 27 PAGE 5 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE STATE OF CALIFORNIA BY GRANT DEED RECORDED AUGUST 13, 1992, AS INSTRUMENT NO. 92-335367, OFFICIAL RECORDS.

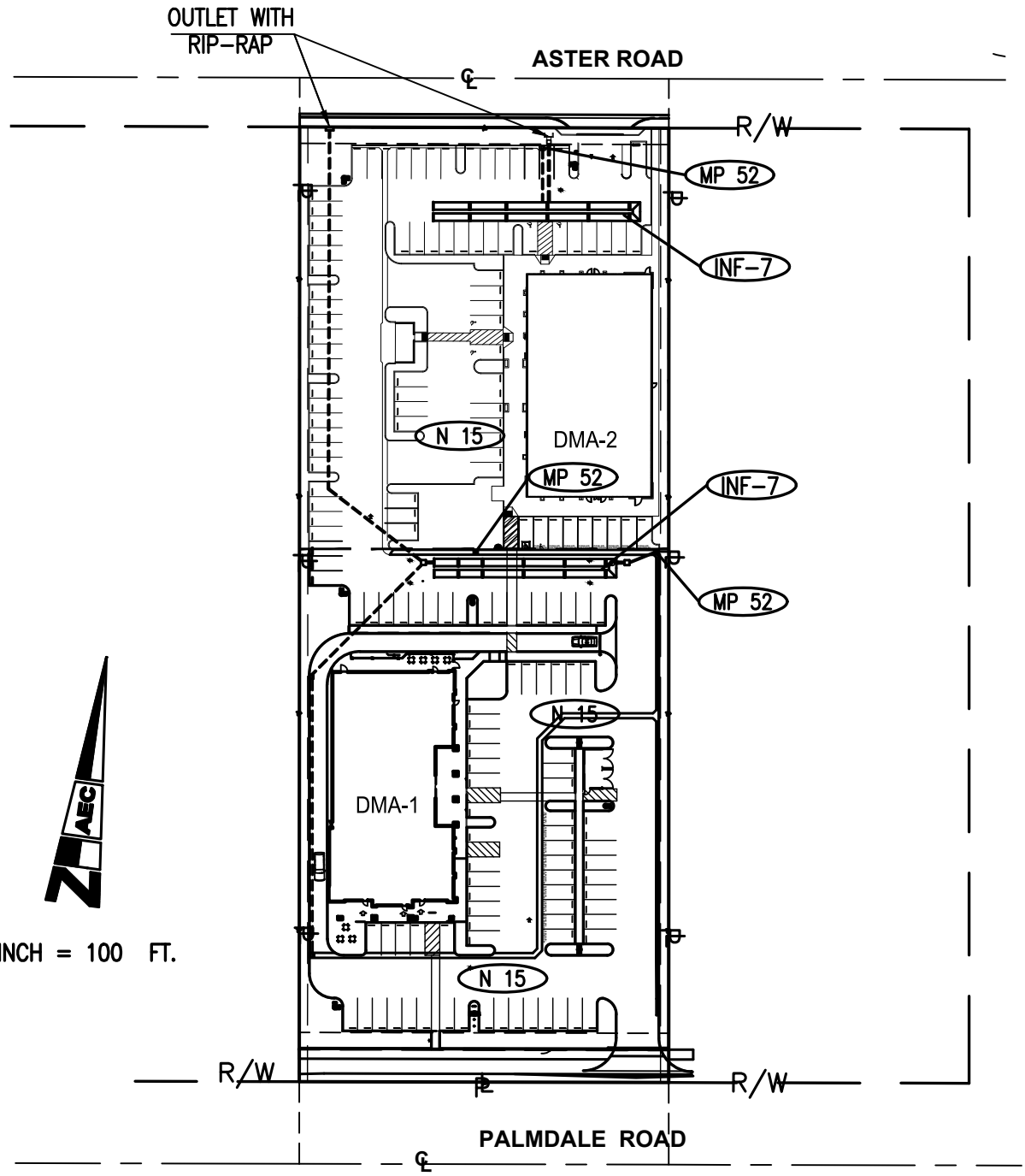
ALSO EXCEPTING THEREFROM THE MINERALS, OIL, GAS, AND OTHER HYDROCARBON SUBSTANCES LYING BELOW THE SURFACE OF SAID LAND.

APN 3103-561-20-0-000

PROJECT ENGINEER
ANACAL ENGINEERING CO.
CIVIL ENGINEERING & LAND SURVEYING
1211 NORTH TUSTIN AVENUE
ANAHEIM , CALIFORNIA 92807
PHONE : (714)774-1763 FAX: (714)774-4690

DATE: 5-21-24
SCALE: N/A
LOCATION: NORTHWEST CORNER OF PALMDALE ROAD AND MESA LINDA AVE

EXHIBIT "B"



1 INCH = 100 FT.

LEGEND

- — PROPOSED STORMDRAIN
- — PROJECT BOUNDARY
- (INF-7) — UNDERGROUND INFILTRATION CHAMBERS
- (N 15) — STREET SWEEP PARKING LOT
- (MP-52) — CATCH BASIN INSERT (FLOGARD G.I.B.)

DMA TABLE		
DMA#	BMP FOOTPRINT (S.F.)	TYPE
DMA#1	1,249	INFILTRATION
DMA#2	1,418	INFILTRATION

PROJECT ENGINEER
ANACAL ENGINEERING CO.
CIVIL ENGINEERING & LAND SURVEYING
1211 NORTH TUSTIN AVENUE
ANAHEIM , CALIFORNIA 92807
PHONE : (714)774-1763 FAX: (714)774-4690

DATE: 5-21-24
SCALE: 1"=100'
LOCATION: NORTHWEST CORNER OF PALMDALE ROAD AND MESA LINDA AVE

Exhibit A, Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Inspection / Maintenance Activities Required	Person or Entity with Operation & Maintenance Responsibility
	Non-Structural Source Control BMPs			
Y	N1. Education for Property Owners, Tenants and Occupants	Once yearly and for new employees	Provide literature and instruction pertaining to environmental awareness included in Section VII, Educational Material to all Leassies.	Owner
Y	N2. Activity Restriction	Continuous	Activities to be restricted on-site include: Prohibit discharges of fertilizers, pesticides, or animal wastes to streets or storm drains. Prohibit blowing or sweeping of debris (leaf litter, grass clippings, litter, etc.) into streets and storm drains. Prohibit vehicle maintenance or repair within common area or such that pollutants can enter streets or storm drains. Report any violations relating to activity restrictions listed herein.	Owner
Y	N3. Common Area Landscape Management	Bi-weekly	Sweep silt and debris. Replace dead vegetation, maintain irrigation in proper working order	
Y	N4. BMP Maintenance	As indicated in WQMP	Provide maintenance as instructed in all sections of this plan.	Owner
N	N5. Title 22 CCR Compliance			
N	N7. Spill Contingency Plan			

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Inspection / Maintenance Activities Required	Person or Entity with Operation & Maintenance Responsibility
N	N8. Underground Storage Tank Compliance			
N	N9. Hazardous Materials Disclosure Compliance			
N	N10. Uniform Fire Code Implementation			
Y	N11. Common Area Litter Control	*Weekly*	Keep grounds free of trash and debris	Owner
Y	N12. Employee Training	Upon hire	Provide all employees with literature consistent with their activities	Owner
N	N13. Housekeeping of Loading Docks			
Y	N14. Common Area Catch Basin Inspection	Once prior to rainy season October 15-April 15	Inspect catch basin storm drains and infiltration system clean and maintain in accordance with manufacturers recommendations	
Y	N15. Street Sweeping Private Streets and Parking Lots	Once prior to rainy season October 15-April 15	Sweep parking and drive areas. No hosing down of areas is allowed. Dispose of debris offsite.	Owner
N	N17. Retail Gasoline Outlets			
	Structural Source Control BMPs			
Y	Provide Storm Drain System Stenciling and Signage	Once Yearly	Repaint when fades 40%	Owner
N	Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction			
Y	Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction	Bi-weekly	Keep lids closed at all times. Provide signage that prohibits dumping of toxic materials. Clean spills with minimal water and wipe clean	

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Inspection / Maintenance Activities Required	Person or Entity with Operation & Maintenance Responsibility
Y	Use Efficient Irrigation Systems & Landscape Design	Inspect monthly	Test for overspray, adjust, maintain and fix irrigation	Owner
N	Protect Slopes and Channels and Provide Energy Dissipation			
N	Loading Docks			
N	Maintenance Bays			
N	Vehicle Wash Areas			
N	Outdoor Processing Areas			
N	Equipment Wash Areas			
N	Fueling Areas			
N	Hillside Landscaping			
N	Wash Water Controls for Food Preparation Areas			
N	Community Car Wash Racks			

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Inspection / Maintenance Activities Required	Person or Entity with Operation & Maintenance Responsibility
	Low Impact Development (LID) and Treatment Control BMPs			
Y	Infiltration Control BMP # 1 Infiltration in Underground Chambers By Contech	After each significant storm event for the first year. At a minimum of once per year prior to rainy season Oct. 15 thereafter.	CMP infiltration system should be cleaned when an inspection reveals accumulated sediment of 3.0" or trash is clogging the system. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed. Accumulated sediment and trash can typically be evacuated through the inspection port. Manhole covers should be securely seated following cleaning activities.	Owner
Y.	FloGard Grate Inlet Basket (G.I.B.)	Once prior, during and following the rainy season on October 15 and after significant rain events.	Inspect Catch basins, maintenance should be implemented between storm events if basket is at more than 75% capacity. Maintenance must be implemented immediately if basket is at 100% capacity and in bypass. Clean debris using industrial vacuum. If minor damage to the baskets is found, it shall be corrected on the spot and made note on maintenance record. If more extensive deficiencies are found that cannot be fixed onsite, replace baskets as required.	Owner
Y	Storm Water Sump pump By Zoeller	Monthly and after significant rain event during rainy season Oct. 15th.	Check for proper and unobstructed float operation. Listen for proper check valve operations Check for even operating times, uneven times indicate a defective unit, float switch or control. For a more detailed maintenance schedule, see manufacturer maintenance recommendations.	Owner

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed