Creekside Assisted Living

Technical Appendices

Appendix H1

Preliminary

Stormwater Quality Management Plan

CITY OF SAN MARCOS

PRELIMINARY

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)

FOR

CREEKSIDE ASSISTED LIVING

Permit No. TBD

SEC N Twin Oaks Valley Road & Richmar Avenue
San Marcos, CA 92069

ASSESSOR'S PARCEL NUMBER(S):
220-063-03

ENGINEER OF WORK:

Aaron M. Albertson, RCE No. 65513 Exp. 09/30/21

PREPARED FOR:
Breakers Real Estate
647 S Cedros Avenue
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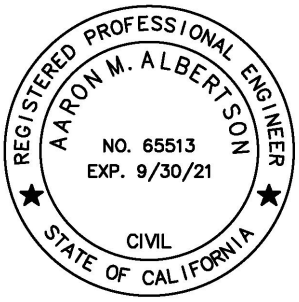

PDP SWQMP PREPARED BY:
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(949) 610-8997

DATE OF SWQMP:
February 14th, 2020

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ACRONYMS

APN	Assessor's Parcel Number
BMP	Best Management Practice
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan

PDP SWQMP PREPARER'S CERTIFICATION PAGE

Project Name: CREEKSIDE ASSISTED LIVING
Permit Application Number: TBD

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the City of San Marcos BMP Design Manual, which is a design manual for compliance with local City of San Marcos and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

I have read and understand that the **[City Engineer]** has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the **[City Engineer]** is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

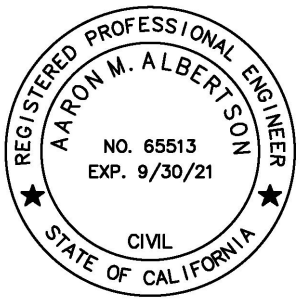
RCE No. 65513, Exp. 09/30/21
Engineer of Work's Signature, PE Number & Expiration Date

Aaron M. Albertson
Print Name

Commercial Development Resources
Company

02/14/2020
Date

Engineer's Seal:



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PDP SWQMP PROJECT OWNER'S CERTIFICATION PAGE

Project Name: CREEKSIDE ASSISTED LIVING
Permit Application Number: TBD

PROJECT OWNER'S CERTIFICATION

This PDP SWQMP has been prepared for Breaker's Real Estate by Commercial Development Resources. The PDP SWQMP is intended to comply with the PDP requirements of the City of San Marcos BMP Design Manual, which is a design manual for compliance with local City of San Marcos and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

Project Owner's Signature

Aaron Whitfield
Print Name

Breaker's Real Estate
Company

2/20/20
Date

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SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Submittal Number	Date	Project Status	Summary of Changes
1	02/14/20	☒ Preliminary Design / Planning/ CEQA ☐ Final Design	Initial Submittal
2		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	
3		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	
4		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	

PROJECT VICINITY MAP

Project Name: CREEKSIDE ASSISTED LIVING
Permit Application Number: TBD

[Insert Project Vicinity Map here]

Applicability of Storm Water Best Management Practices (BMP) Requirements

(Storm Water Intake Form for all Development Permit Applications)
For detailed information please visit:
http://www.san-marcos.net/departments/development-services/stormwater/development-planning

Form I-1 [March 15, 2016]

Project Identification

Project Name: CREEKSIDE ASSISTED LIVING

Description: Proposed residential development consisting of 129 residential units with onsite parking.

Permit Application Number (if applicable): TBD | Date: 02/14/20

Project Address: SEC N Twin Oaks Valley Road & Richmar Avenue, San Marcos, CA 92069

Determination of Requirements

This form is required as part of the City's application process. The purpose of this form is to identify potential land development planning storm water requirements that apply to development projects.

Development projects are defined as construction, rehabilitation, redevelopment, or reconstruction of any public or private projects. In addition, the identification of a development project, as it relates to storm water regulations, would truly apply to development and redevelopment activities that have the potential to contact storm water and contribute a source of pollutants, or reduce the natural absorption and infiltration abilities of the land.

To access the BMP Design Manual, Storm Water Quality Management Plan (SWQMP) templates, and other pertinent information related to this program please refer to:
http://www.san-marcos.net/departments/development-services/stormwater/development-planning

Please answer each of the following steps below, starting with Step 1 and progressing through each step until reaching "Stop".

Step	Answer	Progression
Step 1: Based on the above, Is the project a "development project" (See definition above)? See Section 1.3 of the BMP Design Manual for further guidance if necessary.	☒ Yes	Go to Step 2.
	☐ No	Permanent BMP requirements do not apply. No SWQMP will be required. Provide brief discussion below. **STOP.**
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? **To answer this item, complete Form I-2, Project Type Determination. See Section 1.4 of the BMP Design Manual *in its entirety* for guidance.** **In addition to Section 1.4, please refer to the City's SWQMP Submittal Requirements form.**	☐ Standard Project	Only Standard Project requirements apply, including Standard Project SWQMP. **STOP.**
	☒ PDP	Standard and PDP requirements apply, including PDP SWQMP. **Go to Step 3 on the following page.**
	☐ Exception to PDP definitions	Standard Project requirements apply, and any additional requirements specific to the type of project. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP. **STOP.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2, Form Date: March 15, 2016		
Step 3 (PDPs only). Please answer the list of questions in this section to determine if hydromodification requirements reply to the proposed PDP. Does the project:		
Step 3a. Discharge storm water runoff directly to the Pacific Ocean?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3b.
Step 3b. Discharge storm water runoff directly to an enclosed embayment, not within protected areas?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3c.
Step 3c. Discharge storm water runoff directly to a water storage reservoir or lake, below spillway or normal operating level?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3d.
Step 3d. Discharge storm water runoff directly to an area identified in WMAA?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Hydromodification requirements apply to the project. Go to Step 4.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 4 (PDPs subject to hydromodification control requirements only). Does protection of critical coarse sediment yield areas apply based on review of WMAA Potential Critical Coarse Sediment Yield Area Map? See Section 6.2 of the BMP Design Manual for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **STOP.**
	☒ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **STOP.** <u>See map WMAA Potential Critical Course Sediment Yield Area map included in Attachment 2b.</u>

Project Type Determination Checklist			Form I-2 [March 15, 2016]
Project Information			
Project Name/Description: CREEKSIDE ASSISTED LIVING			
Permit Application Number (if applicable): TBD			Date: 02/14/20
Project Address: SEC N Twin Oaks Valley Road & Richmar Avenue, San Marcos, CA 92069			
Project Type Determination: Standard Project or Priority Development Project (PDP)			
The project is (select one): **X** New Development ☐ Redevelopment			
The total proposed newly created or replaced impervious area is: 83,563 ft^2 (1.92 acres)			
Is the project in any of the following categories, (a) through (f)?			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

Form I-2 Page 2, Form Date: March 15, 2016			
Yes ☐	No ☒	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.*
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See BMP Design Manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?

☐ No – the project is not a Priority Development Project (Standard Project).

☒ **Yes – the project is a Priority Development Project (PDP).**

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is: _____ ft^2 (A)

The total proposed newly created or replaced impervious area is: _____ ft^2 (B)

Percent impervious surface created or replaced (B/A)*100: _____%

The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – only new impervious areas are considered PDP

OR

☐ greater than fifty percent (50%) – the entire project site is a PDP

Site Information Checklist For PDPs	Form I-3B (PDPs) [March 15, 2016]
Project Summary Information	
Project Name	Creekside Assisted Living
Project Address	SEC N Twin Oaks Valley Road & Richmar Avenue San Marcos, CA 92069
Assessor's Parcel Number(s) (APN(s))	220-063-03
Permit Application Number	TBD
Project Hydrologic Unit	Select One: ☐ Santa Margarita 902 ☐ San Luis Rey 903 ☒ Carlsbad 904 ☐ San Dieguito 905 ☐ Penasquitos 906 ☐ San Diego 907 ☐ Pueblo San Diego 908 ☐ Sweetwater 909 ☐ Otay 910 ☐ Tijuana 911
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Carlsbad Hydrologic Unit (904) San Marcos Hydrologic Sub-Area (904.52)
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	2.91 Acres (126,684 Square Feet)
Area to be Disturbed by the Project (Project Area)	2.33 Acres (101,347 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	1.92 Acres (83,563 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.41 Acres (17,783 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Form I-3B Page 2 of 10, Form Date: March 15, 2016

Description of Existing Site Condition

Current Status of the Site (select all that apply):

- ☐ Existing development
- ☐ Previously graded but not built out
- ☐ Demolition completed without new construction
- ☐ Agricultural or other non-impervious use
- ☒ Vacant, undeveloped/natural

Description / Additional Information:

Existing Land Cover Includes (select all that apply):

- ☒ Vegetative Cover
- ☐ Non-Vegetated Pervious Areas
- ☐ Impervious Areas

Description / Additional Information:

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

- ☐ NRCS Type A
- ☐ NRCS Type B
- ☒ NRCS Type C (69% of project site)
- ☒ NRCS Type D (31% of project site)

Approximate Depth to Groundwater (GW):

- ☐ GW Depth < 5 feet
- ☐ 5 feet < GW Depth < 10 feet
- ☒ 10 feet < GW Depth < 20 feet
- ☐ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☒ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☐ None

Description / Additional Information:

Twin Oaks Valley Creek along eastern PL.

Form I-3B Page 3 of 10, Form Date: March 15, 2016

Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

(1) whether existing drainage conveyance is natural or urban;

(2) Is runoff from offsite conveyed through the site? if yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site;

(3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and

(4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Description of existing site drainage patterns:

(1) Existing drainage conveyance is natural – runoff sheet flows east across the project site directly to the Twin Oaks Valley Creek.

(2) Offsite runoff is conveyed through the project site. The hillside area between western property line and N Twin Oaks Valley Road (approximately 0.34 ac) flows east into the project site area and surface flows to the Twin Oaks Valley Creek.

(3) The Twin Oaks Valley Creek flows south along the eastern property line within property limits. Runoff from the project site area sheet flows to the existing creek and is conveyed to San Marcos Creek, which discharges to the Pacific Ocean. There is an existing storm drain inlet at the SE corner of Twin Oaks Valley Road and Richmar Avenue on Twin Oaks connect to 36" CMP storm drain line flowing east along the northern property line and discharges to the creek. There is a storm drain inlet in the public right-of-way on Mission Road that collects flows from south of the property southern property line and discharges to the Twin Oaks Valley Creek.

(4) The existing condition acts as one drainage area and discharges to the Twin Oaks Valley Creek within property limits. See drainage study for additional information regarding drainage area flow rates.

Form I-3B Page 4 of 10, Form Date: March 15, 2016

Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

The project is proposing a new residential development with 128 residential units, covered trash enclosure, retaining walls, new landscape areas, fire access lane, underground utilities, and new underground storm drain system.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

The project will consist of a new building with interior courtyard, AC pavement for onsite parking and fire lane, and concrete sidewalk.

List/describe proposed pervious features of the project (e.g., landscape areas):

Proposed landscaped areas will be added throughout the project site. Two new biofiltration basins in the northern parking lot for pollutant treatment and flow control. The existing creek along the eastern property limit will remain protected in place.

Does the project include grading and changes to site topography?

☒ Yes

☐ No

Description / Additional Information:

The project site will be re-graded to direct all onsite storm water to new localized onsite inlets or biofiltration basins for hydromodification and water quality treatment prior to discharging to the City's storm drain system. A concrete swale is proposed along the western property line to collect runoff from the adjacent hillside area and convey flows directly to the City's storm drain system.

Form I-3B Page 5 of 10, Form Date: March 15, 2016

Description of Proposed Site Drainage Patterns

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒ Yes

☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:

A new underground storm drain system will be constructed to meet City's LID DCV and hydromodification flow control management requirements. Runoff in the northern portion of the project site (parking lot area and a portion of the building roof) will surface flow to biofiltration basins for pollutant treatment and flow control. Treated runoff and basin overflows discharge to an underground detention vault for hydromodification management prior to discharging to the existing storm drain structure on Mission Road. Runoff from the remaining portion of the project site includes building roof, landscape area, and the fire access lane along the eastern property line. Runoff from this area flows to localized inlets and into an underground detention vault for flow control management, then through a Modular Wetland System (MWS) for proprietary biofiltration. Treated runoff and overflows are pumped to the existing storm drain structure on Mission Road. Project site overflows discharge to the public right-of-way on Mission Road and enter the City's storm drain system as it does in the existing condition. A concrete swale is proposed along the western property line to collect runoff from the adjacent hillside area and convey flows directly to the City's storm drain system. See separate Hydrology Study for additional information regarding drainage areas and flow rates. See separate hydrology study for project site runoff.

Form I-3B Page 6 of 10, Form Date: March 15, 2016

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

- ☒ On-site storm drain inlets
- ☐ Interior floor drains and elevator shaft sump pumps
- ☐ Interior parking garages
- ☒ Need for future indoor & structural pest control
- ☒ Landscape/Outdoor Pesticide Use
- ☐ Pools, spas, ponds, decorative fountains, and other water features
- ☐ Food service
- ☒ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and Equipment Cleaning
- ☐ Vehicle/Equipment Repair and Maintenance
- ☐ Fuel Dispensing Areas
- ☐ Loading Docks
- ☒ Fire Sprinkler Test Water
- ☐ Miscellaneous Drain or Wash Water
- ☒ Plazas, sidewalks, and parking lots

Description / Additional Information:

Form I-3B Page 7 of 10, Form Date: March 15, 2016

Identification and Narrative of Receiving Water and Pollutants of Concern

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

Biofiltration basins will discharge to the existing storm drain along Richmar Avenue and discharge to Twin Oaks Valley Creek. Flow path is as follows:

Project Site → City SD System → Twin Oaks Valley Creek → San Marcos Creek → San Marcos Lake → San Marcos Creek → Batiquitos Lagoon → Pacific Ocean

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
San Marcos Creek	Pesticides, Nutrients, Toxicity, Metals/Metalloids	Pesticides, Nutrients, Toxicity, Metals/Metalloids
San Marcos Lake	Nutrients	Nutrients

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6): ***Detached Residential Development, Parking Lot***

Pollutant	Not Applicable to the Project Site	Expected from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		**X**	**X**
Nutrients		**X**	**X**
Heavy Metals		**X**	**X**
Organic Compounds	X		
Trash & Debris		X	
Oxygen Demanding Substances		X	
Oil & Grease		X	
Bacteria & Viruses		X	
Pesticides		**X**	**X**

Form I-3B Page 8 of 10, Form Date: March 15, 2016

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☒ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

N/A

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐ Yes

☒ No, No critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite

☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment

☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite

☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.

☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

See map included in Attachment 2b.

Form I-3B Page 9 of 10, Form Date: March 15, 2016

Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

There is 1 point of compliance (POC) for flow control for hydromodification management for the proposed project:

POC #1 (entire project site) → City Storm Drain System → Twin Oaks Valley Creek → San Marcos Creek → San Marcos Lake → San Marcos Creek → Batiquitos Lagoon → Pacific Ocean

Has a geomorphic assessment been performed for the receiving channel(s)?

☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)

☐ Yes, the result is the low flow threshold is 0.1Q2

☐ Yes, the result is the low flow threshold is 0.3Q2

☐ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

N/A

Discussion / Additional Information: (optional)

N/A

Form I-3B Page 10 of 10, Form Date: March 15, 2016
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. Twin Oaks Valley Creek runs through the eastern portion of the project site's property. The proposed limits of work do not include this area.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed. N/A

Source Control BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)	Form I-4 [March 15, 2016]

Project Identification

Project Name: CREEKSIDE ASSISTED LIVING

Permit Application Number: TBD

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: Outdoor material storage areas not proposed for this project.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: Outdoor work areas not proposed for this project.			

Form I-4 Page 2 of 2, Form Date: March 15, 2016			
Source Control Requirement	**Applied?**		
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented:			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
A. On-site storm drain inlets	☒ Yes	☐ No	☐ N/A
B. Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☒ N/A
C. Interior parking garages	☐ Yes	☐ No	☒ N/A
D. Need for future indoor & structural pest control	☐ Yes	☐ No	☒ N/A
E. Landscape/Outdoor Pesticide Use	☒ Yes	☐ No	☐ N/A
F. Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
G. Food service	☐ Yes	☐ No	☒ N/A
H. Refuse areas	☒ Yes	☐ No	☐ N/A
I. Industrial processes	☐ Yes	☐ No	☒ N/A
J. Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
K. Vehicle and Equipment Cleaning	☐ Yes	☐ No	☒ N/A
L. Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☒ N/A
M. Fuel Dispensing Areas	☐ Yes	☐ No	☒ N/A
N. Loading Docks	☐ Yes	☐ No	☒ N/A
O. Fire Sprinkler Test Water	☒ Yes	☐ No	☐ N/A
P. Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☒ N/A
Q. Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Site Design BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)	Form I-5 [March 15, 2016]

Project Identification

Project Name: CREEKSIDE ASSISTED LIVING

Permit Application Number: TBD

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-1 not implemented: Project site area does not include the Twin Oaks Valley Creek along the eastern PL. This is labeled on the SWQMP Exhibits as an undisturbed natural waterway.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:			
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:			

Form I-5 Page 2 of 2, Form Date: March 15, 2016			
Site Design Requirement	**Applied?**		
SD-6 Runoff Collection	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-6 not implemented:			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented: Harvest and use is not proposed for this project due to insufficient irrigation water demand.			

Summary of PDP Structural BMPs	Form I-6 (PDPs) [March 15, 2016]

Project Identification

Project Name: CREEKSIDE ASSISTED LIVING

Permit Application Number: TBD

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The BMP selection process has been developed in accordance with the new MS4 Permit (R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100). Due to the measured low infiltration rates, the project site is classified as “No Infiltration” by the geotechnical engineer (Leighton). Additionally, all stormwater design systems require an impermeable liner to prevent lateral migration of stormwater. Therefore, all infiltration BMPs have been determined to be infeasible for this project. Harvest and re-use is considered impractical for use on the project site due to it being a proposed multi-family residential area with low water usage. Therefore, the project’s pollutant control requirements will be addressed via biofiltration (BF-1) and proprietary biofiltration (BF-3) BMPs as described below. Pollutant control and flow control BMPs are separate for this project.

DMA-1 consists of runoff from AC pavement, concrete sidewalk, onsite landscaping, and a small portion of offsite hillside landscaping. Stormwater in this area will sheetflow to a biofiltration basin (BMP-1) for pollutant treatment and flow control, then routed to an underground detention vault (BMP-3) for hydromodification management flow control.

(Continued on page 2.)

Form I-6 Page 2 of 12, Form Date: March 15, 2016

(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

(Continued from page 1)

DMA-2 consists of runoff from proposed building roof, AC pavement, concrete sidewalk, and onsite landscaping areas. Stormwater in this area will sheetflow to a biofiltration basin (BMP-2) for pollutant treatment and flow control, then routed to an underground detention vault (BMP-3) for hydromodification management flow control.

DMA-3 consists of runoff from the proposed building roof, concrete walkways, AC pavement fire lane, interior courtyard, and hillside landscaping. Stormwater runoff will be collected at a localized inlets and discharge to an underground detention vault (BMP-4) for hydromodification management flow control, then flow thru a compact proprietary biofiltration device (BMP-5) for pollutant control prior to leaving the project site. A traditional biofiltration basin is infeasible due to insufficient landscaping sloped less than 5% outside of the floodway area.

Form I-6 Page 3 of 12, Form Date: March 15, 2016	
Structural BMP Summary Information	
Structural BMP ID No. 1	
Construction Plan Sheet No. CG-01	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ **Biofiltration (BF-1)** ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ **Combined pollutant control and hydromodification control** ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? *Provide name and contact information for the party responsible to sign BMP verification forms if required by City Engineer (see Section 1.12 of the BMP Design Manual).*	Aaron Albertson, PE (949) 610-8997 Aalbertson@cdrwest.com
Who will be the final owner of this BMP?	Breaker's Real Estate
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	Owner

Form I-6 Page 4 of 12, Form Date: March 15, 2016
Structural BMP ID No. 1
Construction Plan Sheet No. CG-01
Discussion (as needed): Biofiltration Basin (BMP-1) is proposed to treat stormwater runoff for DMA-1 via biofiltration (BF-1). The cross-section uses maximum ponding depth of 12" to assist in hydromodification flow control. Per the geotechnical engineer, infiltration is infeasible for the entire project site. The biofiltration basin discharges to an underground detention vault (BMP-3) for hydromodification management. Biofiltration Basin to have the following cross-section: - 2 in freeboard - 12 in ponding - 3 in mulch - 18 in soil media - 12 in gravel w/ 6 in diameter underdrain at 3 in above bottom of basin

Form I-6 Page 5 of 12, Form Date: March 15, 2016	
Structural BMP Summary Information	
Structural BMP ID No. 2	
Construction Plan Sheet No. CG-01	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ **Biofiltration (BF-1)** ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ **Combined pollutant control and hydromodification control** ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? *Provide name and contact information for the party responsible to sign BMP verification forms if required by City Engineer (see Section 1.12 of the BMP Design Manual).*	Aaron Albertson, PE (949) 610-8997 Aalbertson@cdrwest.com
Who will be the final owner of this BMP?	Breaker's Real Estate
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	Owner

Form I-6 Page 6 of 12, Form Date: March 15, 2016
Structural BMP ID No. 2
Construction Plan Sheet No. CG-01
Discussion (as needed): Biofiltration Basin (BMP-2) is proposed to treat stormwater runoff for DMA-2 via biofiltration (BF-1). The cross-section uses maximum ponding depth of 12" to assist in hydromodification flow control. Per the geotechnical engineer, infiltration is infeasible for the entire project site and the basin requires an impermeable liner to being located within 10' of the retaining wall. The biofiltration basin discharges to an underground detention vault (BMP-3) for hydromodification management. Biofiltration Basin to have the following cross-section: - 2 in freeboard - 12 in ponding - 3 in mulch - 18 in soil media - 12 in gravel w/ 6 in diameter underdrain at 3 in above bottom of basin

Form I-6 Page 7 of 12, Form Date: March 15, 2016	
Structural BMP Summary Information	
Structural BMP ID No. 3	
Construction Plan Sheet No. CG-01	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒ **Detention pond or vault for hydromodification management** ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☒ **Hydromodification control only** ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? *Provide name and contact information for the party responsible to sign BMP verification forms if required by City Engineer (see Section 1.12 of the BMP Design Manual).*	Aaron Albertson, PE (949) 610-8997 Aalbertson@cdrwest.com
Who will be the final owner of this BMP?	Breaker's Real Estate
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	Owner

Form I-6 Page 8 of 12, Form Date: March 15, 2016
Structural BMP ID No. 3
Construction Plan Sheet No. CG-01
Discussion (as needed): Proposed underground detention vault (BMP-3) for hydromodification flow control management for DMA-1 and DMA-2. Per the geotechnical engineer, the project site is classified as a “No Infiltration” condition.

Form I-6 Page 9 of 12, Form Date: March 15, 2016	
Structural BMP Summary Information	
Structural BMP ID No. 4	
Construction Plan Sheet No. CG-01	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒ **Detention pond or vault for hydromodification management** ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☒ **Hydromodification control only** ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? *Provide name and contact information for the party responsible to sign BMP verification forms if required by City Engineer (see Section 1.12 of the BMP Design Manual).*	Aaron Albertson, PE (949) 610-8997 Aalbertson@cdrwest.com
Who will be the final owner of this BMP?	Breaker's Real Estate
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	Owner

Form I-6 Page 10 of 12, Form Date: March 15, 2016
Structural BMP ID No. 4
Construction Plan Sheet No. CG-01
Discussion (as needed): Proposed underground detention vault (BMP-4) for hydromodification flow control management for DMA-3. Per the geotechnical engineer, the project site is classified as a "No Infiltration" condition. The detention vault (BMP-4) discharges to Modular Wetland System (BMP-5) for pollutant treatment prior to leaving the project site.

Form I-6 Page 11 of 12, Form Date: March 15, 2016	
Structural BMP Summary Information	
Structural BMP ID No. 5	
Construction Plan Sheet No. CG-01	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☒ **Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F** ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☒ **Pollutant control only** ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? *Provide name and contact information for the party responsible to sign BMP verification forms if required by City Engineer (see Section 1.12 of the BMP Design Manual).*	Aaron Albertson, PE (949) 610-8997 Aalbertson@cdrwest.com
Who will be the final owner of this BMP?	Breaker's Real Estate
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	Owner

Form I-6 Page 12 of 12, Form Date: March 15, 2016
Structural BMP ID No. 5
Construction Plan Sheet No. CG-01
Discussion (as needed): Proposed BioClean Modular Wetland System (MWS) to treat stormwater runoff for DMA-3 via proprietary biofiltration (BF-3). Per the geotechnical engineer, infiltration is infeasible for the entire project site. Per the City BMP worksheets, 1,682 SF is required for a biofiltration basin to treat flows for DMA-3. However, pervious cover outside the floodway area is hillside landscaping and does not allow for the minimum basin footprint. Therefore, proprietary biofiltration is proposed to treat flows for this area. Treated flows and overflows from the MWS are pumped to the existing storm drain structure in the public right-of-way on Mission Road.

ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☐ Included on DMA Exhibit in Attachment 1a ☒ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☒ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒ Included

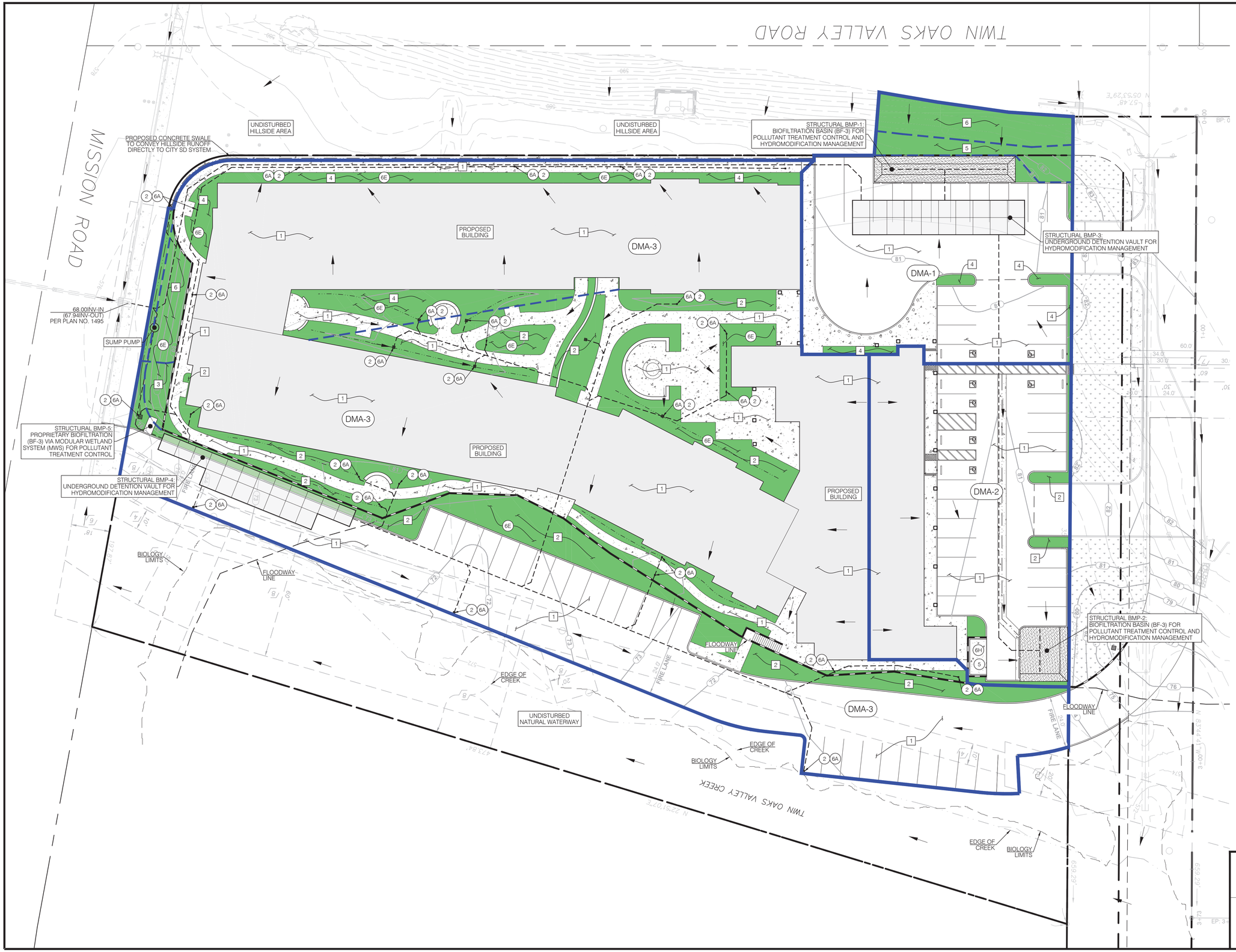
Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- ☒ Underlying hydrologic soil group
- ☒ Approximate depth to groundwater
- ☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☒ Critical coarse sediment yield areas to be protected
- ☒ Existing topography and impervious areas
- ☒ Existing and proposed site drainage network and connections to drainage offsite
- ☒ Proposed demolition
- ☒ Proposed grading
- ☒ Proposed impervious features
- ☒ Proposed design features and surface treatments used to minimize imperviousness
- ☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☒ Structural BMPs (identify location, type of BMP, and size/detail)

ATTACHMENT 1A:

DMA EXHIBIT



LEGEND:

- ASPHALT (IMPERVIOUS)
- CONCRETE (IMPERVIOUS)
- LANDSCAPE
- BIOFILTRATION BASIN
- DETENTION VAULT
- MAJOR DMA BOUNDARY
- CHANGE IN LAND COVER
- PROPERTY LINE
- SURFACE FLOW DIRECTION
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- DMA-# DMA ID
- # DMA LAND COVER TYPE
- # PROPOSED CONTOUR
- # EXISTING CONTOUR
- CENTERLINE

GEOTECHNICAL INFO:

- HYDROLOGIC SOIL GROUP: C/D
- MEASURED INFILTRATION: <0.01 IN/HR
- SOIL EXPANSIVE POTENTIAL: LOW/MEDIUM
- DEPTH TO GROUNDWATER: 15-30 FT BELOW EX GROUND SURFACE
- TWIN OAKS VALLEY CREEK, BIOLOGICAL AREA WITHIN PROPERTY LIMITS
- PROJECT SITE LOCATED WITHIN FEMA FLOODPLAIN

CCSYA ANALYSIS:

NO CRITICAL COURSE SEDIMENT YIELD AREAS TO BE PROTECTED. SEE MAP IN ATTACHMENT 2B OF SWQMP.

BMP DETAILS:

SEE DETAILS IN ATTACHMENT 1E OF SWQMP

SOURCE CONTROL BMPS:

- (1) SC-1: PREVENTION OF ILLICIT DISCHARGES TO THE MS4 (SITE-WIDE BMP)
- (2) SC-2: STORM DRAIN STENCILING OR SIGNAGE
- (5) SC-5: PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON RUNOFF, AND WIND DISPERSAL
- (6A) SC-6A: ONSITE STORM DRAIN INLETS
- (6E) SC-6E: LANDSCAPE PESTICIDE USE
- (6H) SC-6H: REFUSE AREAS
- (6O) SC-6O: FIRE SPRINKLER TEST WATER (SITE-WIDE BMP)
- (6Q) SC-6Q: PLAZAS, SIDEWALKS, AND PARKING LOTS (SITE-WIDE BMP)

DMA SUMMARY:

SEE ATTACHMENT 1B OF SWQMP

LAND COVER TYPE:

- [1] IMPERVIOUS (0-5%)
- [2] LANDSCAPE (C, 0-5%)
- [3] LANDSCAPE (C, >15%)
- [4] LANDSCAPE (D, 0-5%)
- [5] LANDSCAPE (D, 5-15%)
- [6] LANDSCAPE (D, >15%)

20 0 20 40

GRAPHIC SCALE
SCALE: 1" = 20'

PREPARED BY:

Commercial Development Resources
Today's Ideas. Tomorrow's Reality
4121 Westerly Place #112 Newport Beach CA 92660
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PREPARED FOR:

BREAKER'S REAL ESTATE
647 S CEDROS AVENUE
SOLANA BEACH, CA 92075
CONTACT: AARON WHITFIELD
TEL: (858) 663-8215

SWQMP ATTACHMENT: DMA EXHIBIT

CREEKSIDE ASSISTED LIVING

N TWIN OAKS VALLEY RD & RICHMAR AVE
SAN MARCOS, CA 92069

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ATTACHMENT 1B:
DMA SUMMARY

ATTACHMENT 1b: DMA SUMMARY

PROJECT: Creekside Assisted Living
LOCATION: San Marcos, CA
DATE: 12/12/2019

Pre-Developed Condition

DMA ID	Type	Area (SF)	Area (AC)
DMA-1 → POC #1			
1	Natural Veg (C, 0-5%)	71,279	1.636
2	Natural Veg (D, 0-5%)	32,159	0.738
	∑	103,438	2.375
	POC #1 TOTAL	**103,438**	**2.375**

Rain Gage: Escondido

SDHM3.1 Slope Classification:
0-5% → FLAT
5-15% → MODERATE
>15% → STEEP

Post-Developed Condition

DMA ID	Type	Area (SF)	Area (AC)
DMA-1 → BIOFILTRATION BASIN → POC #1			
1	Impervious (0-5%)	10,396	0.239
4	Landscape (D, 0-5%)	1,186	**0.027**
5	Landscape (D, 5-15%)	900	0.021
6	Landscape (D, >15%)	1,457	0.033
	∑	13,938	0.320
DMA-2 → BIOFILTRATION BASIN → POC #1			
1	Impervious (0-5%)	12,566	0.288
2	Landscape (C, 0-5%)	1,035	**0.024**
	∑	13,601	0.312
DMA-3 → PROPRIETARY BIOFILT. (MWS) → POC #1			
1	Impervious (0-5%)	60,601	1.391
2	Landscape (C, 0-5%)	10,951	0.251
3	Landscape (C, >15%)	299	0.007
4	Landscape (D, 0-5%)	3,391	0.078
6	Landscape (D, >15%)	657	0.015
	∑	75,899	1.742
DMA-4 → SELF-MITIGATING AREA → POC #1			
6	Landscape (D, >15%)	0	0.000
	∑	0	0.000
	POC #1 TOTAL	**103,438**	**2.375**

ATTACHMENT 1C:
HARVEST AND USE FEASIBILITY CHECKLIST (FORM I-7)

Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_____

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

Toilet Flushing = 7 gal x 30 employees x 1.5 days= 315 gal = 42 cf
Irrigation = 390 gal/ac x 0.46 ac = 179 gal = 24 cf
Total 36-Hour Demand = 66 cf

3. Calculate the DCV using worksheet B.2-1.

DCV = 4,310 (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV?	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36 hour demand less than 0.25DCV?
☐ Yes / ☒ No ⇨ ⇩	☐ Yes / ☒ No ⇨ ⇩	☒ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☒ No, select alternate BMPs.

ATTACHMENT 1D:

INFILTRATION FEASIBILITY CHECKLIST (FORM I-8) & GEOTECHNICAL INVESTIGATION REPORT

(Leighton)

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition		Worksheet C.4-1	
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	**Yes**	**No**
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		**X**
Provide basis: Per Appendix F of Soils Report by Leighton: "Based on our field percolation testing, the in-situ infiltration rates of the soils at the subject site are less than 0.01 inches per hour (Leighton, 2017). Specifically, the calculated infiltration rate via the Porchet Method and applied safety factor of 2 is less than 0.01 inches per hour across the site and therefore the site is considered appropriate for a "No-Infiltration" designation." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	**X**	
Provide basis: Per Appendix F of Soils Report by Leighton: "If the infiltration rates were greater than 0.5 inches per hour, it may be possible that the risk of geotechnical hazards would not be increased provided mitigation is performed for any underground utilities/structures, slopes (i.e., setbacks) and undocumented fill depths greater than 5 feet within the vicinity of the proposed infiltration site." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	**X**	
Provide basis: Per Appendix F of Soils Report by Leighton: "If the infiltration rates were greater than 0.5 inches per hour, it may be possible that the risk of groundwater contamination would not be increased provided there are no contaminated soil or groundwater sites within 250 feet of the proposed infiltration site. In addition, groundwater depths are anticipated to be greater than 50 feet bgs." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	**X**	
Provide basis: Per Appendix F of Soils Report by Leighton: "If the infiltration rates were greater than 0.5 inches per hour, it may be possible that potential water balance issues would not be affected provided there are no unlined site drainages/creeks/ streams within 250 feet of the proposed infiltration site." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	**Go to Part 2.**	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

Per Appendix F of Soils Report by Leighton:

"Based on our field percolation testing, the in-situ infiltration rates of the soils at the subject site are less than 0.01 inches per hour (Leighton, 2017). Specifically, the calculated infiltration rate via the Porchet Method and applied safety factor of 2 is less than 0.01 inches per hour across the site and therefore the site is considered appropriate for a "No-Infiltration" designation."

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

Per Appendix F of Soils Report by Leighton:

"If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, it may be possible that the risk of geotechnical hazards will not be increase by partial infiltration provided mitigation is performed for any underground utilities/structures, slopes (i.e., setbacks) and undocumented fill depths greater than 5 feet within the vicinity of the proposed infiltration site. Mitigation includes subsurface vertical barriers and subdrains to limit perched ground water mounding conditions."

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	**X**	
Provide basis: Per Appendix F of Soils Report by Leighton: "If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, it may be possible that the risk of groundwater contamination will not be increased by partial infiltration provided there are no contaminated soil or groundwater sites within 250 feet of the proposed infiltration site. In addition, groundwater depths are anticipated to be greater than 50 feet bgs." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	**X**	
Provide basis: Per Appendix F of Soils Report by Leighton: "If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, violation of downstream water rights is not anticipated based on the site location and that there are no unlined site drainages/creeks/streams within 250 feet of the proposed infiltration site." Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		**No Infiltration Feasibility**

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

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1.0 INTRODUCTION

We recommend that all individuals utilizing this report read the preceding information sheet prepared by GBA (the Geoprofessional Business Association) and the Limitations, Section 7.0, located at the end of this report.

1.1 Purpose and Scope

This report presents the results of our geotechnical investigation for the site located on the southeast corner of Richmar Avenue and North Twin Oaks Valley Road in the City of San Marcos, California (Figure 1). The intent of this report is to provide specific geotechnical conclusions and recommendations for the currently proposed project.

1.2 Site Location and Description

The subject site is a rectangular shaped parcel consisting of approximately 3 acres (see Figure 2). In general, the site is bordered by North Twin Oaks Valley Road to the west, Richmar Avenue to the north, East Mission Road to the south, and a drainage wetland area to the east.

Currently the site is unoccupied and undeveloped, with a dirt path trending northwest to southeast throughout the site. Vegetation across the site consists of overgrown grasses, weeds and shrubs.

Site topography is nearly level with elevations gently sloping from the west to the east, ranging from approximately 570 to 590 feet above mean sea level (msl). A westerly descending fill slope is located along the western property line of the site and is approximately 20 feet in height over a horizontal distance of approximately 260 feet.

Site Latitude and Longitude
33.1434° N
117.1623° W

1.3 Proposed Development

We understand that the proposed residential development will primarily consist of 8 multi-family residential units. The proposed residential buildings are anticipated to be typical 2- to 3-story wood-frame structures with slab-on-grade foundations. Additionally, a 9 to 12 foot retaining wall is proposed along the eastern side of the site. Other improvements at the site will consist of associated roadways, utilities, landscape and hardscape. Import material up to 8 feet is anticipated to raise pads grades above the flood zone.

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Site Investigation

Our exploration consisted of excavating five (5) 8-inch small diameter geotechnical borings (B-1 through B-5) to approximately 26.5 to 40 feet below the existing ground surface. Additionally, four (4) percolation tests were performed at the site as part of the subsurface exploration. All borings were drilled using a heavy-duty truck mounted hollow-stem auger drill rig. The four percolation test locations were also advanced with the hollow-stem auger drill rig to a depth of 5 feet below the existing ground surface. The percolation test well locations were presoaked overnight and the testing was performed the following day by the falling head method. During the exploration operations, a geologist from our firm prepared geologic logs and collected bulk and relatively undisturbed samples for laboratory testing and evaluation.

After logging, the borings were backfilled with bentonite. The boring logs are provided in Appendix B. Geotechnical boring and percolation test locations are depicted on Figure 2.

2.2 Laboratory Testing

Laboratory testing performed on soil samples representative of on-site soils obtained during the recent subsurface exploration included, moisture content, density determination, shear strength, grain size, expansion index, and a screening geochemical analysis for corrosion. A discussion of the laboratory tests performed and a summary of the laboratory test results are presented in Appendix C.

3.0 SUMMARY OF GEOTECHNICAL CONDITIONS

3.1 Geologic Setting

The project area is situated in the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California, and varies in width from approximately 30 to 100 miles (Norris and Webb, 1990). The province is characterized by mountainous terrain on the east composed mostly of Mesozoic igneous and metamorphic rocks, and relatively low-lying coastal terraces to the west underlain by late Cretaceous, Tertiary, and Quaternary age sedimentary rocks.

Gradual emergence of the region from the sea occurred in Pleistocene time, and numerous wave-cut platforms, most of which were covered by relatively thin marine and non-marine terrace deposits, formed as the sea receded from the land. Accelerated fluvial erosion during periods of heavy rainfall, coupled with the lowering of the base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms we see in the general site area today.

3.2 Site-Specific Geology

Based on our subsurface exploration and review of pertinent geologic literature and maps, the geologic units underlying the site consist of undocumented artificial fill soils (Afu), Quaternary-aged Young and Old Alluvium (Qya and Qoa), and at depth undifferentiated Mesozoic-aged Metasedimentary/Metavolcanic (Mzu) basement rocks and Cretaceous Tonalite. Brief descriptions of the geologic units present on the site are presented in the following sections. The approximate aerial distributions of those units are shown on the Geotechnical Map (Figure 2).

3.2.1 Artificial Fill, Undocumented (Map Symbol – Afu)

The site generally consists of a previously placed fill area with approximately 1-2 feet thick across the site. Deeper fills associated with surrounding road improvements should be anticipated. The fill is characterized by moist and medium stiff to medium dense varying shades

of brown to gray brown silty to sandy clays and clayey sands. Currently, there is not a geotechnical report discussing the placement and quality of the placed fill, therefore, at this time, the fill is considered to be undocumented. Fill was not encountered in our borings, but is associated with sewer and surrounding road improvements present on the site.

3.2.2 Quaternary - Aged Young Alluvium

Quaternary young alluvium is present beneath the undocumented fill in Boring B-3, a channelized deposit trending from the northern vicinity of the site to the southeastern vicinity of the site. The materials that comprise the young alluvial materials are predominantly brown to gray brown, moist to wet, medium stiff clays with varying amounts of silty and sandy constituents. We anticipate these materials will be 3 to 7 feet below existing grades.

3.2.3 Quaternary - Aged Old Alluvium (Map Symbol – Qoa)

Quaternary old alluvium is present beneath the undocumented fill and young alluvial deposits throughout the site. The materials that comprise the old alluvial materials vary in thickness and consistency from medium dense to very dense, moist to saturated silty and clayey sands to medium stiff to hard, moist to wet clays with varying silt and sandy constituents.

3.2.4 Cretaceous Tonalite (Kt)

Cretaceous-aged Tonalite was observed to be underlying the undocumented fill and alluvial deposits in the eastern portion of the site. As encountered, the Cretaceous-aged Tonalite deposits predominately consists of orange-brown and medium to dark grey to black, damp to moist, very-dense to hard, poorly-graded sandstones with interbedded quartz veins observed throughout.

3.2.5 Mesozoic-Aged Metasedimentary and Metavolcanic (Mzu)

Mesozoic-aged undifferentiated metasedimentary and metavolcanic geologic units were observed to underlie the majority of the site. When encountered, Mesozoic-aged undivided metasedimentary and metavolcanic geologic units primarily consisted of greenish-black, moist to wet, very dense to hard, silty to clayey sands with gravels.

3.3 Surface Water and Ground Water

No indication of surface water or evidence of surface ponding was encountered during our field exploration. Ground water was locally encountered in Borings B-1 through B-4 during our geotechnical investigation at the site at depths ranging from 15 to 30 feet below the ground surface. It should be noted that ground water levels may fluctuate with seasonal variations and irrigation and local perched ground water conditions may exist within cemented layers and sandy lenses within the quaternary alluvium deposits. Nevertheless, based on the above information, we do not anticipate ground water will be a constraint to the construction of the proposed improvements.

3.4 Engineering Characteristics of On-site Soils

Based on the results of our laboratory testing of representative on-site soils, and our professional experience on similar sites with similar soils conditions, the engineering characteristics of the on-site soils are discussed below.

3.4.1 Compressible Soils

The site is underlain by artificial fill and young alluvial soils which are considered compressible. Additionally, the upper portions of the old alluvium deposits are considered compressible. Portions of the compressible fill soils and alluvium deposits are expected to be removed during excavation operations for the proposed residential development at the project site. Recommendations for remedial grading of these soils are provided in the following sections of this report.

3.4.2 Expansion Potential

The majority of the onsite material is expected to have a low to medium expansion potential. However, higher expansive soils may be encountered during the grading of the site. It is recommended that highly expansive soils (EI>90), if encountered, are not used as engineered fill, and may require selective grading.

3.4.3 Soil Corrosivity

During our investigation, preliminary screenings of representative on-site soil samples were performed to evaluate their potential corrosive effect on concrete and ferrous metals. In summary, laboratory testing on the representative soil samples obtained during our subsurface exploration evaluated pH, minimum electrical resistivity, and chloride and soluble sulfate content. The samples tested had a measured pH of 7.53 and a measured minimum electrical resistivity of 1,300 ohm-cm. The test results also indicated that the samples had a chloride content of 24 parts per million (ppm), and a soluble sulfate content of less than 150 ppm.

3.4.4 Excavation Characteristics

It is anticipated the onsite soils can be excavated with conventional heavy-duty construction equipment. Localized cemented zones located within the old alluvial deposits, if encountered, may require heavy ripping or breaking. If oversize material (larger than 8 inches in maximum dimensions) is generated, it should be placed in non-structural areas or hauled off site. Localized interbedded gravels and cobbles may be encountered within the alluvial deposits. In addition, localized zones of friable sands may be encountered within the alluvial deposits. Beds of friable sands, gravel, and cobble may experience caving during unsupported excavation or drilling.

3.4.5 Percolation and Infiltration Rates

Percolation tests were performed in general accordance with the County of Riverside borehole percolation method and County of San Diego Regional Storm Water Standards. Based on our field percolation testing, the in-situ percolation rates and calculated infiltration rates at tested locations and depths are summarized in Table 1 below. It should be noted that we have used the following equation based upon the Porchet Method to convert measured percolation rates to infiltration rates in accordance with County of Riverside Standards (2011). In addition, we have included a recommended infiltration rate with a minimum factor of safety of 2 for the preliminary design of potential infiltration systems:

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

Where:

I_t = calculated infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = radius of test hole
H_{AVG} = average head over the time interval, inches

The field percolation test locations are shown on Figure 2 (Geotechnical Map). Field data and calculated percolation rates for each field percolation test location is presented in Appendix F.

Table 1
Percolation and Infiltration Rates

Test No.	Depth (ft)	Soil Type	Measured Percolation Rate (mins/in)	Calculated Infiltration Rate (inches/hr)	Recommended Infiltration Rate w/ FS of 2 (inches/hr)
P-1	4.17	Old Alluvium	NP	<0.01	<0.005
P-2	3.96	Old Alluvium	NP	<0.01	<0.005
P-3	3.75	Old Alluvium	NP	<0.01	<0.005
P-4	3.70	Old Alluvium	NP	<0.01	<0.005

NP – No percolation measured.

Based on the field percolation testing and the recommended calculated infiltration rates, the site is categorized as "No-Infiltration", as determined by the Storm Water Standards BMP Design Manual, San Diego Region, February 2016. The County of San Diego Infiltration Worksheet I-8, Categorization of Infiltration Feasibility Condition, has been completed and is presented in Appendix F. Note that the above percolation test results are representative of the tested locations and depths where they were performed. It should also be noted that percolation test field measurements are accurate to 0.01 feet. Varying subsurface conditions may exist outside of the test locations, which could alter the calculated percolation rate indicated below. In addition, it is important to note that percolation rates are not equal to infiltration rates. As a result, we have made a distinction between percolation rates where water movement is considered laterally and vertically versus infiltration rates where only the vertical direction is considered.

It is possible that the long term rate of transmissivity of permeable soil strata may be lower than the values obtained by testing. Infiltration may be influenced by a combination of factors including but not limited to: a highly variable vertical permeability and limited lateral extent of permeable soil strata; a reduction of permeability rates over time due to silting of the soil pore spaces; and other unknown factors. Accordingly, the possibility of future surface ponding of water, as well as, shallow groundwater impacts on subterranean structures such as basements, underground utilities, etc. should be anticipated as possible future conditions in all design aspects of the site.

4.0 SEISMIC AND GEOLOGIC HAZARDS

4.1 Local Faulting

Our review of available geologic literature (Appendix A) indicates that there are no known Active or Potentially Active faults transecting the site. The subject site is also not located within any State Mapped Earthquake Fault Zones or County of San Diego mapped fault zones. The nearest active fault is the Rose Canyon fault zone located approximately 12.6 miles west of the site (Blake, 2001).

4.2 Seismicity

The site is considered to lie within a seismically active region, as is all of Southern California. As previously mentioned above, the Rose Canyon fault zone located approximately 12.6 miles west of the site is considered the 'active' fault having the most significant effect at the site from a design standpoint.

4.3 Seismic Hazards

Severe ground shaking is most likely to occur during an earthquake on one of the regional active faults in Southern California. The effect of seismic shaking may be mitigated by adhering to the California Building Code or state-of-the-art seismic design parameters of the Structural Engineers Association of California.

4.3.1 Shallow Ground Rupture

No active faults are mapped crossing the site, and the site is not located within a mapped Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). Shallow ground rupture due to shaking from distant seismic events is not considered a significant hazard, although it is a possibility at any site.

4.3.2 Mapped Fault Zones

The site is not located within a State Mapped Earthquake Fault Zone (EFZ). As previously discussed, the subject site is not underlain by known active or potentially active faults.

4.3.3 Site Class

Utilizing 2016 California Building Code (CBC) procedures, we have characterized the site soil profile to be Site Class D based on our experience with similar sites in the project area and the results of our subsurface evaluation.

4.3.4 Building Code Mapped Spectral Acceleration Parameters

The effect of seismic shaking may be mitigated by adhering to the California Building Code and state-of-the-art seismic design practices of the Structural Engineers Association of California. Provided below in Table 2 are the spectral acceleration parameters for the project determined in accordance with the 2016 CBC (CBSC, 2016) and the USGS Worldwide Seismic Design Values tool (Version 3.1.0).

Table 2
2016 CBC Mapped Spectral Acceleration Parameters

Site Class	D		
Site Coefficients	F_a	=	1.093
	F_v	=	1.604
Mapped MCE Spectral Accelerations	S_S	=	1.018g
	S_1	=	0.398g
Site Modified MCE Spectral Accelerations	S_{MS}	=	1.113g
	S_{M1}	=	0.639g
Design Spectral Accelerations	S_{DS}	=	0.742g
	S_{D1}	=	0.426g

Utilizing ASCE Standard 7-10, in accordance with Section 11.8.3, the following additional parameters for the peak horizontal ground acceleration are associated with the Geometric Mean Maximum Considered Earthquake (MCE_G). The mapped MCE_G peak ground acceleration (PGA) is 0.381g for the site. For a Site Class D, the F_{PGA} is 1.119 and the mapped peak ground acceleration adjusted for Site Class effects (PGA_M) is 0.426g for the site.

4.4 Secondary Seismic Hazards

In general, secondary seismic hazards can include soil liquefaction, seismically-induced settlement, lateral displacement, surface manifestations of liquefaction, landsliding, seiches, and tsunamis. The potential for secondary seismic hazards at the subject site is discussed below.

4.4.1 Liquefaction and Dynamic Settlement

Liquefaction and dynamic settlement of soils can be caused by strong vibratory motion due to earthquakes. Both research and historical data indicate that loose, saturated, granular soils are susceptible to liquefaction and dynamic settlement. Liquefaction is typified by a loss of shear strength in the affected soil layer, thereby causing the soil to behave as a viscous liquid. This effect may be manifested by excessive settlements and sand boils at the ground surface.

Based on our analysis, much of the alluvial soils encountered are considered too clay rich to experience liquefaction. In addition, the relatively dense nature of the underlying Old Alluvial deposits are considered too dense to exhibit the effects prone to a liquefiable event and thus the potential for adverse effects produced by liquefaction is considered low.

4.4.2 Lateral Spread

Empirical relationships have been derived (Youd et al., 1999) to estimate the magnitude of lateral spread due to liquefaction. These relationships include parameters such as earthquake magnitude, distance of the earthquake from the site, slope height and angle, the thickness of liquefiable soil, and gradation characteristics of the soil. Based on the low susceptibility to liquefaction and the formational material unit underlying the site, the possibility of earthquake-induced lateral spread is considered to be low for the site.

4.4.3 Tsunamis and Seiches

Based on the distance between the site and large, open bodies of water, and the elevation of the site with respect to sea level, the possibility of seiches and/or tsunamis is considered to be nil.

4.5 Landslides

Our investigation was limited primarily to the existing flat, undeveloped areas. No ancient landslides or other slope instability problems have been mapped on the subject site. In addition, no evidence of landsliding was encountered during our site investigation. Based on our review of geotechnical literature, site topography, and our observations, landsliding is not a constraint to the currently proposed development.

4.6 Flood Hazard

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 2012); the site is located within a floodplain. Therefore, the potential for flooding of the site is considered moderate to high at current site grades.

5.0 CONCLUSIONS

Based on the results of our geotechnical investigation of the site, it is our opinion that the proposed improvements are feasible from a geotechnical standpoint, provided the following conclusions and recommendations are incorporated into the project plans and specifications.

- As the site is located in the seismically active southern California area, all structures should be designed to tolerate the dynamic loading resulting from seismic ground motions.
- The site is not transected by Potentially Active or Active faults.
- The existing onsite soils are generally suitable for use as engineered fill, provided they are free of organic material, debris, and rock fragments larger than 8 inches in maximum dimension. Onsite clay soils have a medium expansion potential, and if reused, will require moisture conditioning to be suitable for use as engineered fill in select areas.
- Import soil is anticipated to obtain site proposed grades. Recommendations are based on import material possessing an expansion index less than 50.
- Based on the results of our subsurface exploration, we anticipate that the onsite materials should be generally excavatable with conventional heavy-duty earthwork equipment. Localized cemented zones within the old alluvial deposits may be difficult to excavate and may require heavy ripping which can produce oversized rock fragments.
- Based on our experience with similar sites and the results of our investigations of the site, excavations within the alluvial and old alluvial deposits may encounter zones of poorly graded cohesionless sands that may cave or slough during site excavation and drilling. Therefore, measures to shore excavations should consider the presence of friable soil layers that will likely tend to cave during excavation.
- The static ground water table should not be encountered during remedial grading activities. Although not encountered during our exploration, localized seepage along cemented zones and sand lenses within the alluvial deposits may occur.
- Based on the results of our geotechnical evaluation, it is our opinion that the proposed site improvements can be supported on conventional reinforced concrete foundations.

- Although Leighton does not practice corrosion engineering, laboratory test results indicate the soils present on the site have a negligible potential for sulfate attack on normal concrete. In addition, the onsite soils are considered to be corrosive to buried uncoated ferrous metals. We recommend that a corrosion engineer be retained to design corrosion protection systems and to evaluate the appropriate concrete properties for the project.
- The new compacted artificial fill consisting of mixture of soils ranging from silty sands to sandy clays will have permeable and impermeable layers that can transmit and perched ground water in unpredictable ways. Low Impact Development (LID) measures may impact down gradient improvements and the use of some LID measures may not be appropriate for this project. It is likely that as a No-Infiltration site, impermeable membrane liners may be needed to prevent lateral migration of storm water. Any proposed bioretention stormwater systems design should be reviewed by geotechnical consultant and will likely require a 30 mil HDPE liner to prevent lateral migration of storm water.

6.0 RECOMMENDATIONS

6.1 Earthwork

We anticipate that earthwork at the site will consist of site preparation and remedial grading. We recommend that earthwork on the site be performed in accordance with the following recommendations and the General Earthwork and Grading Specifications for Rough Grading included in Appendix D. In case of conflict, the following recommendations supersede those in Appendix D.

6.1.1 Site Preparation

Prior to grading, all areas to receive structural fill, engineered structures, and pavements should be cleared of surface and subsurface obstructions, including any existing debris and undocumented fill, young alluvium, old slabs, loose, compressible, or unsuitable soils, and stripped of vegetation. Removed vegetation and debris should be properly disposed off-site. All areas to receive fill and/or other surface improvements should be scarified to a minimum depth of 8 inches, brought to optimum or above-optimum moisture conditions, and recompacted to at least 90 percent relative compaction based on ASTM Test Method D1557.

6.1.2 Excavations and Oversize Material

Excavations of the onsite materials may generally be accomplished with conventional heavy-duty earthwork equipment. However, local heavy ripping or breaking may be required if cemented zones within the old alluvial deposits is encountered. Excavation for utilities may also be difficult in some areas.

Due to the high-density characteristics of the old alluvial deposits, temporary shallow excavations less than 5 feet in depth with vertical sides should remain stable for the period required to construct utilities, provided the trenches are free of adverse geologic conditions. Overlying artificial fill soils and beds of friable sands within the young alluvium deposits present at the site may cave during trenching operations. In accordance with OSHA requirements, excavations deeper than 5 feet should be shored or

be laid back in accordance with Section 6.2 if workers are to enter such excavations.

6.1.3 Removal of Compressible Soils

Potentially compressible undocumented fill, young alluvium, and the upper portions of the old alluvial deposits at the site may settle as a result of wetting or settle under the surcharge of engineered fill and/or structural loads supported on shallow foundations.

All undocumented fill soils and young alluvium at the site should be completely removed. In addition, all old alluvial deposits encountered within 3 feet from the bottom of the site settlement-sensitive improvements and foundations (i.e. residential structures and retaining walls) should be removed. Horizontally, the lateral limits of the removal excavations should extend at least 5 feet beyond the foundation limits of the site sensitive improvements. The bottom of all removals should be evaluated by a Certified Engineering Geologist to confirm conditions are as anticipated.

In general, the soil that is removed may be reused and placed as engineered fill provided the material is free of oversized rock, organic materials, and deleterious debris, and moisture conditioned to above optimum moisture content. Onsite soil with an expansion index greater than 50 should not be used within 5 feet of finish grade in the building pad. The actual depth and extent of the required removals should be confirmed during grading operations by the geotechnical consultant.

6.1.4 Engineered Fill

The onsite soils are generally suitable for use as compacted fill provided they are free of organic material, debris, and rock fragments larger than 6 inches in maximum dimension. All fill soils should be brought to at least 2 percent above optimum moisture conditions (i.e., depending on the soil types) and compacted in uniform lifts to at least 90 percent relative compaction based on laboratory standard ASTM Test Method D1557, 95 percent for wall backfill soils or if used for structural purposes (such as to support a footing, wall, etc.). We anticipate the majority of wall backfill will be compacted to 95% due to close proximity of the proposed buildings. The optimum lift thickness required to produce a uniformly compacted fill

will depend on the type and size of compaction equipment used. In general, fill should be placed in lifts not exceeding 8 inches in thickness.

Placement and compaction of fill should be performed in general accordance with the current City of San Marcos grading ordinances, sound construction practice, and the General Earthwork and Grading Specifications for Rough Grading presented in Appendix D.

6.1.5 Earthwork Shrinkage/Bulking

The volume change of excavated onsite materials upon recompaction as fill is expected to vary with material and location. Typically, the fill soils and alluvial deposits vary significantly in natural and compacted density, and therefore, accurate earthwork shrinkage/bulking estimates cannot be determined. However, based on the results of our geotechnical analysis and our experience, a 5 percent shrinkage factor is considered appropriate for the artificial fill, young alluvium, and a 3 to 5 percent bulking factor is considered appropriate for the old alluvial deposits.

6.1.6 Trench Backfill

Pipe bedding should consist of sand with a sand equivalent (SE) of not less than 30. Bedding should be extended the full width of the trench for the entire pipe zone, which is the zone from the bottom of the trench, to one foot above the top of the pipe. The sand should be brought up evenly on each side of the pipe to avoid unbalanced loads. Onsite materials will probably not meet bedding requirements. Except for predominantly clayey soils, the onsite soils may be used as trench backfill above the pipe zone (i.e. in the trench zone) provided they are free of organic matter and have a maximum particle size of three inches. Compaction by jetting or flooding is not recommended.

6.1.7 Expansive Soils and Selective Grading

Based on our laboratory testing and observations, we anticipate the onsite soil materials possess a low to medium expansion potential (Appendix C). Although not anticipated, should an abundance of highly expansive materials be encountered, selective grading may need to be performed. In addition, to accommodate conventional foundation design, the upper 5

feet of materials within the building pad and 5 feet outside the limits of the building foundation should have a very low to low expansion potential. (EI<50).

6.1.8 Import Soils

Import soils is anticipated at the site to bring the site up to the proposed grades above floodway, these soils should be granular in nature, and have an expansion index less than 50 (per ASTM Test Method D4829) and have a low corrosion impact to the proposed improvements. Beneath pavements, subgrade materials should possess an R-value of 20, or greater. Import soils and/or the borrow site location should be evaluated by the geotechnical consultant prior to import.

6.2 Temporary Excavations

Sloping excavations may be utilized when adequate space allows. Based on the results of our update evaluation, we provide the following recommendations for sloped excavations in fill soils or competent old alluvial deposits materials without seepage conditions.

Table 3
Maximum Slope Ratios

Excavation Depth (feet)	Maximum Slope Ratio In Fill Soils and Young Alluvium	Maximum Slope Ratio In Old Alluvial Deposits
0 to 5	1:1 (Horizontal to Vertical)	Vertical
5 to 20	1:1 (Horizontal to Vertical)	1:1 (Horizontal to Vertical)

The above values are based on the assumption that no surcharge loading or equipment will be placed within 10 feet of the top of slope. Care should be taken during excavation adjacent to the existing structures so that undermining does not occur. A "competent person" should observe the slope on a daily basis for signs of instability.

6.3 Foundation and Slab Considerations

At the time of drafting this report, building loads were not known. However, based on our understanding of the project, the proposed multi-family residential buildings may be constructed with conventional foundations or post-tensioned foundations. Foundations and slabs should be designed in accordance with structural considerations and the following recommendations. These recommendations assume that the import soils encountered within 5 feet of pad grade have a low potential for expansion (EI<50). If more expansive materials are encountered and selective grading cannot be accomplished, revised foundation recommendations may be necessary. The foundation recommendations below assume that the all building foundations will be underlain by properly compacted fill.

6.3.1 Conventional Foundations

Foundations and slabs should be designed in accordance with structural considerations and the following recommendations. These recommendations assume that the soils encountered within 5 feet of pad grade have a low potential for expansion and a differential fill thickness of less than 10 feet. Additional expansion testing should be performed as part of the fine grading operations. If medium or highly expansive soils are encountered and selective grading cannot be accomplished, additional foundation design may be necessary.

6.3.2 Preliminary Foundation and Slab Design

The proposed buildings may be supported by conventional, continuous or isolated spread footings. Footings should extend a minimum of 24 inches beneath the lowest adjacent soil grade. At these depths, footings may be designed for a maximum allowable bearing pressure of 3,000 pounds per square foot (psf) if founded in dense compacted fill soils. The allowable bearing pressures may also be increased by one-third when considering loads of short duration such as wind or seismic forces. The minimum recommended width of footings is 18 inches for continuous footings and 24 inches for square or round footings. Footings should be designed in accordance with the structural engineer's requirements.

Slabs on grade should be reinforced with reinforcing bars placed at slab mid-height. Slabs should have crack joints at spacings designed by the structural engineer. Columns, if any, should be structurally isolated from slabs. Slabs should be a minimum of 5 inches thick and reinforced with No. 3 rebars at 18 inches on center on center (each way). The slab should be underlain by 2-inch layer of clean sand (S.E. greater than 30). A moisture barrier (10-mil non-recycled plastic sheeting) should be placed below the sand layer if reduction of moisture vapor up through the concrete slab is desired (such as below equipment, living/office areas, etc.), which is in turn underlain by an additional 2-inches of clean sand. If applicable, slabs should also be designed for the anticipated traffic loading using a modulus of subgrade reaction of 140 pounds per cubic inch. All waterproofing measures should be designed by the project architect.

The slab subgrade soils underlying the foundation systems should be presoaked in accordance with the recommendations presented in Table 4 prior to placement of the moisture barrier and slab concrete. The subgrade soil moisture content should be checked by a representative of Leighton prior to slab construction.

6.3.3 Foundation Setback

We recommend a minimum horizontal setback distance from the face of slopes for all structural foundations, footings, and other settlement-sensitive structures as indicated on the Table 4 below. This distance is measured from the outside bottom edge of the footing, horizontally to the slope face, and is based on the slope height. However, the foundation setback distance may be revised by the geotechnical consultant on a case-by-case basis if the geotechnical conditions are different than anticipated.

Table 4 Minimum Foundation Setback from Slope Faces	
Slope Height	Setback
less than 5 feet	5 feet
5 to 15 feet	7 feet
15 to 30 feet	10 feet

Please note that the soils within the structural setback area possess poor lateral stability, and improvements (such as retaining walls, sidewalks, fences, pavements, etc.) constructed within this setback area may be subject to lateral movement and/or differential settlement. Potential distress to such improvements may be mitigated by providing a deepened footing or a grade beam foundation system to support the improvement. Based on USGS topographic maps, the buildings located in the northwestern portion of the site are located on an existing slope. These buildings will likely require retaining walls and deepened foundations.

In addition, open or backfilled utility trenches that parallel or nearly parallel structure footings should not encroach within an imaginary 2:1 (horizontal to vertical) downward sloping line starting 9 inches above the bottom edge of the footing and should also not be located closer than 18 inches from the face of the footing. Deepened footings should meet the setbacks as described above. Also, over-excavation should be accomplished such that deepening of footings to accomplish the setback will not introduce a cut/fill transition bearing condition.

Where pipes may cross under footings, the footings should be specially designed. Pipe sleeves should be provided where pipes cross through footings or footing walls and sleeve clearances should provide for possible footing settlement, but not less than 1 inch around the pipe.

6.3.4 Settlement

Fill depths between 5 and 15 feet are anticipated beneath the proposed building foundations following final grading. For conventional footings, the recommended allowable-bearing capacity is based on a maximum total and differential static settlement of 3/4 inch and 1/2 inch, respectively. Since settlements are a function of footing size and contact bearing pressures, some differential settlement can be expected where a large differential loading condition exists. However, for most cases, differential settlements are considered unlikely to exceed 1/2 inch.

6.3.5 Moisture Conditioning

The slab subgrade soils underlying the foundation systems should be presoaked in accordance with the recommendations presented in Table 5 prior to placement of the moisture barrier and slab concrete. The subgrade soil moisture content should be checked by a representative of Leighton prior to slab construction.

Presoaking or moisture conditioning may be achieved in a number of ways. But based on our professional experience, we have found that minimizing the moisture loss on pads that have been completed (by periodic wetting to keep the upper portion of the pad from drying out) and/or berming the lot and flooding for a short period of time (days to a few weeks) are some of the more efficient ways to meet the presoaking recommendations. If flooding is performed, a couple of days to let the upper portion of the pad dry out and form a crust so equipment can be utilized should be anticipated.

Table 5 Presoaking Recommendations Based on Finish Grade Soil Expansion Potential	
Expansion Potential	Presoaking Recommendations
Very Low	Near-optimum moisture content to a minimum depth of 6 inches
Low	120 percent of the optimum moisture content to a minimum depth of 12 inches below slab subgrade
Medium	130 percent of the optimum moisture content to a minimum depth of 18 inches below slab subgrade
High	130 percent of the optimum moisture content to a minimum depth of 24 inches below slab subgrade

6.3.6 Post-Tension Foundation Recommendations

As an alternative to the conventional foundations for the buildings, post-tensioned foundations may be used. We recommend that post-tensioned foundations be designed using the geotechnical parameters presented in the table below and criteria of the 2016 California Building Code and the Third Edition of Post-Tension Institute Manual. A post-tensioned foundation system designed and constructed in accordance with these recommendations is expected to be structurally adequate for the support of the buildings planned at the site provided our recommendations for surface drainage and landscaping are carried out and maintained through the design life of the project. Based on an evaluation of the depths of fill beneath the building pads, the attached Table 6 presents the recommended post-tension foundation category for residential buildings for this site.

Table 6 Post-Tensioned Foundation Design Recommendations				
Design Criteria		Category I Very Low to Low Expansion Potential (EI 0 to 50)	Category II Medium Expansion Potential (EI 50 to 90)	Category III High Expansion Potential (EI 90 to 130)
Edge Moisture Variation, e_m	Center Lift:	9.0 feet	8.3 feet	7.0 feet
	Edge Lift:	4.8 feet	4.2 feet	3.7 feet
Differential Swell, y_m	Center Lift:	0.46 inches	0.75 inches	1.09 inches
	Edge Lift:	0.78 inches	1.32 inches	1.99 inches
Perimeter Footing Depth:		18 inches	24 inches	30 inches
Allowable Bearing Capacity		2,000 psf		

The post-tensioned (PT) foundation and slab should also be designed in accordance with structural considerations. For a ribbed PT foundation, the concrete slab section should be at least 5 inches thick. Continuous footings (ribs or thickened edges) with a minimum width of 12 inches and a minimum depth of 12 inches below lowest adjacent soil grade may be designed for a maximum allowable bearing pressure of 2,000 pounds per square foot. For a uniform thickness "mat" PT foundation, the perimeter cut off wall should be at least 8 inches below the lowest adjacent grade. However, note that where a foundation footing or perimeter cut off wall is within 3 feet (horizontally) of adjacent drainage swales, the adjacent footing should be embedded a minimum depth of 12 inches below the swale flow line. The allowable bearing capacity may be increased by one-third for short-term loading. The slab subgrade soils should be presoaked in accordance with the recommendation presented in Table 6 above prior to placement of the moisture barrier.

The slab should be underlain by a moisture barrier as discussed in Section 6.3.2 above. Note that moisture barriers can retard, but not eliminate moisture vapor movement from the underlying soils up through the slabs. We recommend that the floor covering installer test the moisture vapor flux rate prior to attempting applications of the flooring. "Breathable" floor coverings should be considered if the vapor flux rates are high. A slip-sheet or equivalent should be utilized above the concrete slab if crack-sensitive floor coverings (such as ceramic tiles, etc.) are to be placed directly on the concrete slab. Additional guidance is provided in ACI Publications 302.1R-04 Guide for Concrete Floor and Slab Construction and 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Floor Materials.

6.4 Lateral Earth Pressures and Retaining Wall Design

Should retaining walls be added to the project, Table 7 presents the lateral earth pressure values for level or sloping backfill for walls backfilled with and bearing against fully drained soils of very low to low expansion potential (less than 50 per ASTM D4829).

Table 7
Static Equivalent Fluid Weight (pcf)

Conditions	Level	2:1 Slope
Active	35	55
At-Rest	55	65
Passive	350 (Maximum of 3 ksf)	150 (sloping down)

Walls up to 10 feet in height should be designed for the applicable equivalent fluid unit weight values provided above. If conditions other than those covered herein are anticipated, the equivalent fluid unit weight values should be provided on an individual case-by-case basis by the geotechnical engineer. A surcharge load for a restrained or unrestrained wall resulting from automobile traffic may be assumed to be equivalent to a uniform lateral pressure of 75 psf which is in addition to the equivalent fluid pressure given above. For other uniform surcharge loads, a uniform pressure equal to 0.35q should be applied to the wall. The wall pressures assume walls are backfilled with free draining materials and

water is not allowed to accumulate behind walls. A typical drainage design is contained in Appendix D. Wall backfill should be compacted by mechanical methods to at least 90 percent relative compaction (based on ASTM D1557). If foundations are planned over the backfill, the backfill should be compacted to 95 percent. Wall footings should be designed in accordance with the foundation design recommendations and reinforced in accordance with structural considerations. For all retaining walls, we recommend a minimum horizontal distance from the outside base of the footing to daylight as outlined in Section 6.3.3.

Lateral soil resistance developed against lateral structural movement can be obtained from the passive pressure value provided above. Further, for sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. These values may be increased by one-third when considering loads of short duration including wind or seismic loads. The total resistance may be taken as the sum of the frictional and passive resistance provided that the passive portion does not exceed two-thirds of the total resistance.

To account for potential redistribution of forces during a seismic event, retaining walls providing lateral support where exterior grades on opposites sides differ by more than 6 feet fall under the requirements of 2016 CBC Section 1803.5.12 and/or ASCE 7-10 Section 15.6.1 and should also be analyzed for seismic loading. For that analysis, an additional uniform lateral seismic force of 8H should be considered for the design of the retaining walls with level backfill, where H is the height of the wall. This value should be increased by 150% for restrained walls.

Based on the geotechnical conditions of the site and anticipate import, the recommended soil parameters presented on Table 8 should be utilized in the design of the proposed MSE retaining walls. Temporary sloping should be performed in accordance with current OSHA requirements.

Table 8 Retaining Wall Soil Parameters			
Soil Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Internal Friction Angle (degrees)	28	28	28
Cohesion (psf)	0	0	0
Total Unit Weight (pcf)	125	125	125

Additional details relevant to the design of the MSE wall are presented on Detail G - Segmental Retaining Walls in Appendix D - General Earthwork and Grading Specifications. In addition, we recommend that water should be prevented from infiltrating into the reinforced soil zone. All drains and swales should outlet to suitable locations as determined by the project civil engineer. In general, the project civil engineer should verify that the subdrain is connected to the proper drainage facility.

Note that we also recommend a 7 foot minimum horizontal setback distance from the face of slopes for all retaining wall footings. This distance is measured from the outside bottom edge of the footing, horizontally to the slope face and is based on the slope height and type of soil. Appropriate surcharge pressures should also be applied for walls influenced within the retained or reinforced zones by improvements or vehicular traffic. The wall design engineer should also select grid design strength based on deflections tolerable to the proposed improvements. Settlement sensitive structures should not be located within the reinforced zone or active backfill prism.

6.5 Geochemical Considerations

Concrete in direct contact with soil or water that contains a high concentration of soluble sulfates can be subject to chemical deterioration commonly known as "sulfate attack." Soluble sulfate results (Appendix C) indicated a negligible soluble sulfate content. We recommend that concrete in contact with earth materials be designed in accordance with Section 4 of ACI 318-11 (ACI, 2011).

Based on the results of preliminary screening laboratory testing, the site soils have a generally very high corrosion potential to buried uncoated metal conduits. We recommend measures to mitigate corrosion be implemented during design and construction.

6.6 Concrete Flatwork

Concrete sidewalks and other flatwork (including construction joints) should be designed by the project civil engineer and should have a minimum thickness of 4 inches. For all concrete flatwork, the upper 12 inches of subgrade soils should be moisture conditioned to at least 2 percent above optimum moisture content and compacted to at least 90 percent relative compaction based on ASTM Test Method D1557 prior to the concrete placement.

6.7 Preliminary Pavement Design

The appropriate pavement section will depend on the type of subgrade soil, shear strength, traffic load, and planned pavement life. Pavement sections for the city streets should be designed in accordance with the City of San Marcos requirements.

For planning purposes only, preliminary pavement sections were developed based on our laboratory testing (i.e., assumed minimum R-value of 19) and potential Traffic Indices (TI) of 4.5, 5, and 6. As required by the City of San Marcos, final pavement designs should be completed after grading operations, but prior to street section construction where R-value confirmation tests can be performed on actual subgrade materials.

Table 9
Preliminary Pavement Sections

Traffic Index	Preliminary Pavement
4.5	4 inches AC over 4 inches Aggregate Base
5	4 inches AC over 5 inches Aggregate Base
6	4 inches AC over 9 inches Aggregate Base

Prior to placement of the aggregate base, the upper 12 inches of subgrade soils should be scarified, moisture-conditioned to at least optimum moisture content and

compacted to a minimum 95 percent relative compaction based on American Standard of Testing and Materials (ASTM) Test Method D1557.

Class 2 Aggregate Base or Crushed Aggregate Base should then be placed and compacted at a minimum 95 percent relative compaction in accordance with ASTM Test Method D1557. The aggregate base material (AB) should be a maximum of 6 inches thick below the curb and gutter and extend a minimum of 6 inches behind the back of the curb. The AB should conform to and placed in accordance with the approved grading plans, the City of San Marcos, and latest revision of the Standard Specifications Public Works Construction (Greenbook).

The Asphalt Concrete (AC) material should conform to Caltrans Standard Specifications, Sections 39 and 92, with a Performance Grade (PG) of 64-10, and the City of San Marcos requirements. The placement of the AC should be in accordance with the approved grading plans, Section 203-6 of the "Greenbook" Standard Specifications for Public Works Construction, and the City of San Marcos requirements. AC sections greater than 3-inches thick should be placed in two lifts. The 1st lift should be a 2-inch minimum base course consisting of a 3/4-inch maximum coarse aggregate. The 2nd lift should be a 2-inch minimum surface capping course consisting of a 1/2-inch maximum coarse aggregate. No single lift shall be greater than 3 inches.

If pavement areas are adjacent to heavily watered landscaping areas, we recommend some measures of moisture control be taken to prevent the subgrade soils from becoming saturated. It is recommended that the concrete curbing, separating the landscaping area from the pavement, extend below the aggregate base to help seal the ends of the sections where heavy landscape watering may have access to the aggregate base. Concrete swales should be designed if asphalt pavement is used for drainage of surface waters.

6.8 Control of Ground Water and Surface Waters

Regarding Low Impact Development (LID) measures, we are of the opinion that infiltration basins, and other onsite storm water retention and infiltration systems can potentially create adverse perched ground water conditions when not installed using proper design recommendations (such as the use of liners) and infiltration design parameters. Due to the dense nature of the alluvial deposits and resulting

very low infiltration rate, we do not recommend the use of infiltration type LID devices at the site.

6.9 Construction Observation

The recommendations provided in this report are based on preliminary design information and subsurface conditions disclosed by widely spaced excavations. The interpolated subsurface conditions should be checked by Leighton in the field during construction. Construction observation of all onsite excavations and field density testing of all compacted fill should be performed by a representative of this office. We recommend that all excavations be mapped by the geotechnical consultant during grading to determine if any potentially adverse geologic conditions exist at the site.

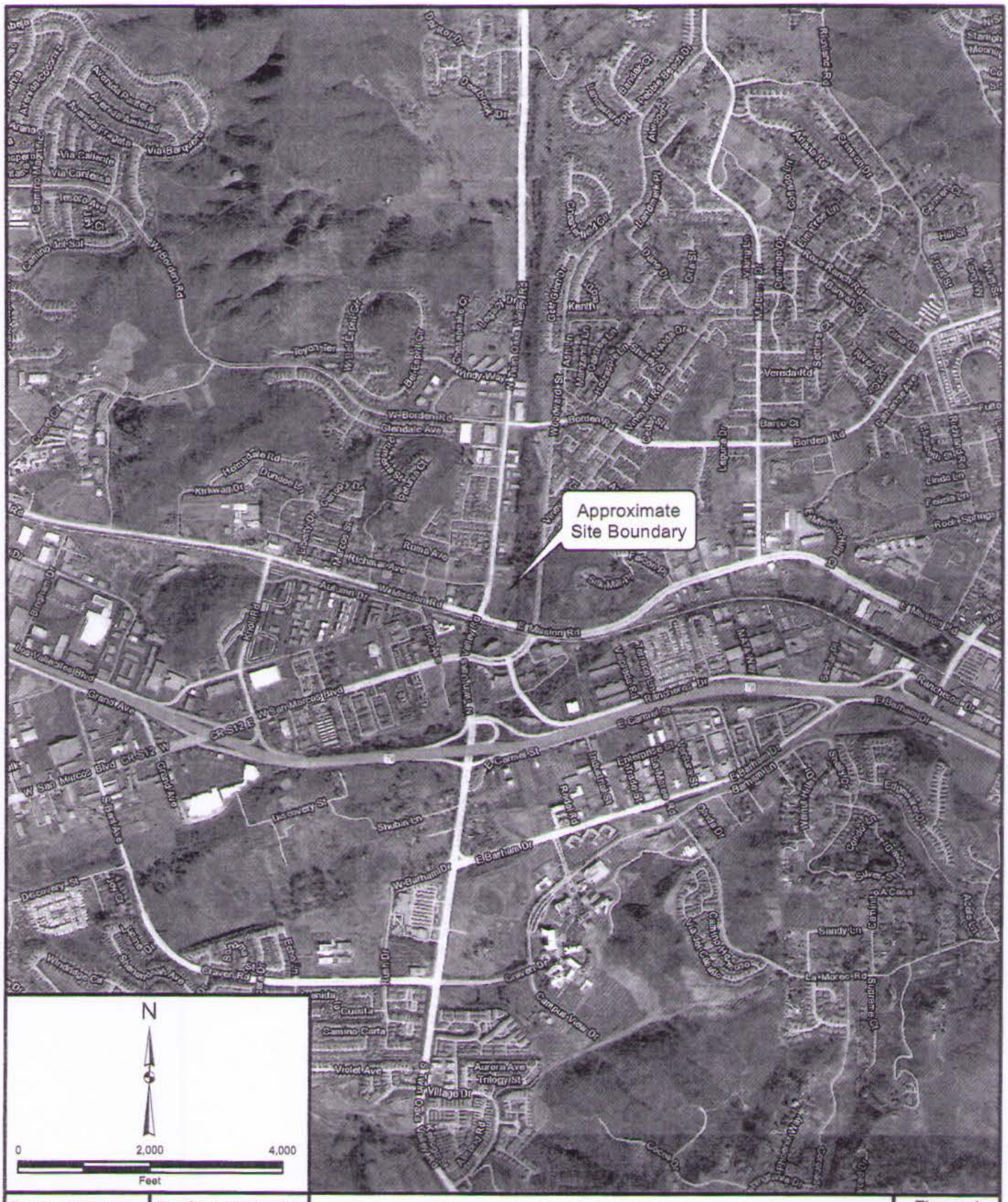
6.10 Plan Review

Final project grading and foundation plans should be reviewed by Leighton as part of the design development process to ensure that recommendations in this report are incorporated in project plans.

7.0 LIMITATIONS

The conclusions and recommendations presented in this report are based in part upon data that were obtained from a limited number of observations, site visits, excavations, samples, and tests. Such information is by necessity incomplete. The nature of many sites is such that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if Leighton has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site.

Figures



Project: 11777.001	Eng/Geol: WDO/MDJ
Scale: 1 " = 2,000 '	Date: October 2017

Base Map: ESRI ArcGIS Online 2017
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

SITE LOCATION MAP

Warmington Residential
San Marcos, California

Figure 1

Leighton

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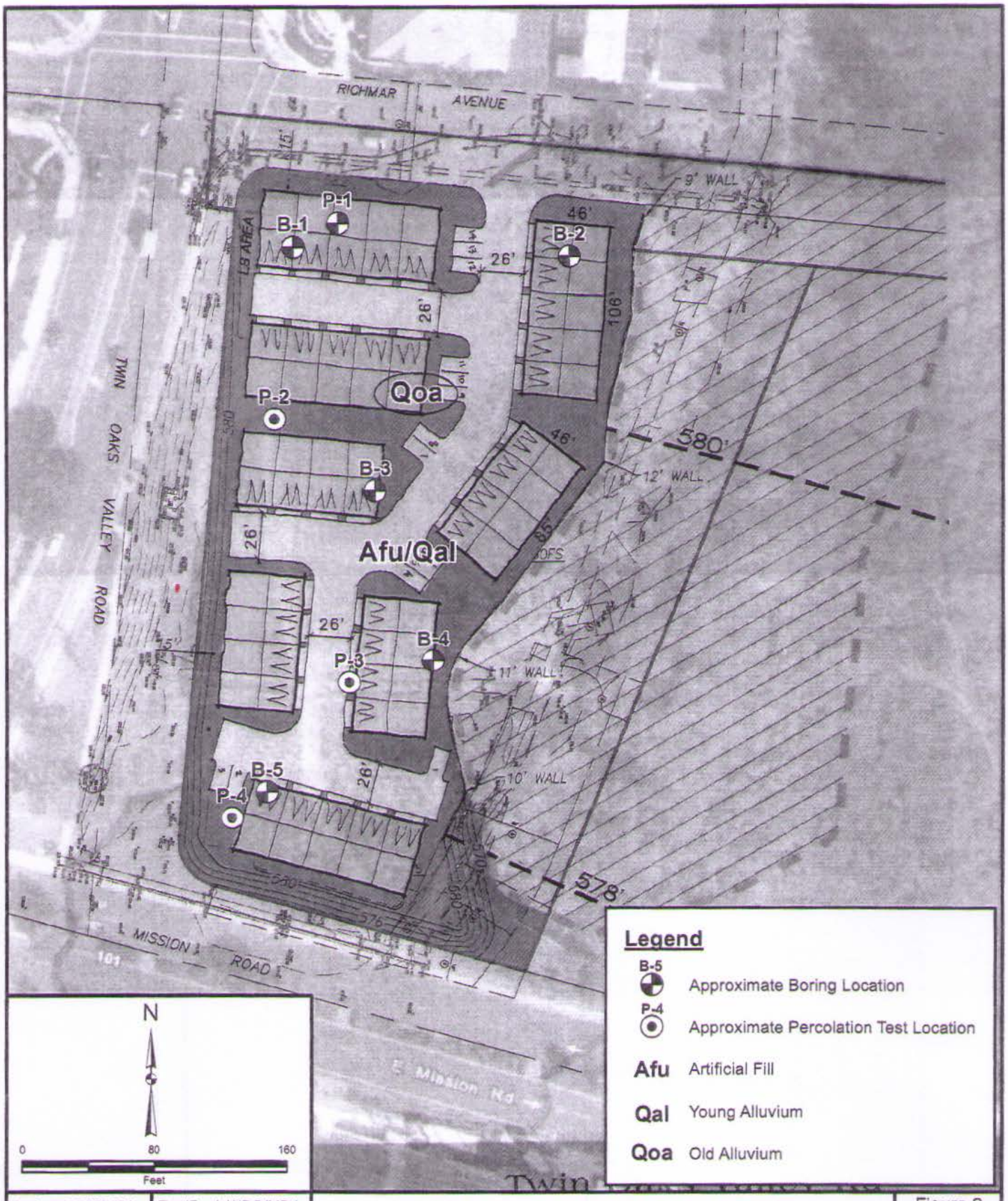

Project: 11777.001	Eng/Geol: WDO/MDJ
Scale: 1 " = 80 '	Date: October 2017

Base Map: ESRI ArcGIS Online 2017
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

GEOTECHNICAL MAP

Warmington Residential
San Marcos, California

Figure 2

Leighton

Map Saved as P:\Drafting\11777\001\Maps\11777-001_F02_GM_2017-10-19.mxd on 10/20/2017 10:41:54 AM

Appendix A
References

APPENDIX A

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Appendix B
Boring Logs and Percolation Tests

GEOTECHNICAL BORING LOG KEY

Date _____ Sheet 1 of 1

Project KEY TO BORING LOG GRAPHICS Project No. _____

Drilling Co. _____ Type of Rig _____

Hole Diameter _____ Drive Weight _____ Drop _____"

Elevation Top of Elevation _____' Location _____

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								Logged By _____ Sampled By _____	
									Asphaltic concrete.	
									Portland cement concrete.	
								CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay.	
								CH	Inorganic clay; high plasticity, fat clays.	
								OL	Organic clay; medium to plasticity, organic silts.	
	5							ML	Inorganic silt; clayey silt with low plasticity.	
								MH	Inorganic silt; diatomaceous fine sandy or silty soils; elastic silt.	
								ML-CL	Clayey silt to silty clay.	
								GW	Well-graded gravel; gravel-sand mixture, little or no fines.	
								GP	Poorly graded gravel; gravel-sand mixture, little or no fines.	
	10							GM	Silty gravel; gravel-sand-silt mixtures.	
								GC	Clayey gravel; gravel-sand-clay mixtures.	
								SW	Well-graded sand; gravelly sand, little or no fines.	
								SP	Poorly graded sand; gravelly sand, little or no fines.	
								SM	Silty sand: poorly graded sand-silt mixtures.	
	15							SC	Clayey sand; sand-clay mixtures.	
									Bedrock.	
									Ground water encountered at time of drilling.	
				B-1					Bulk Sample 1.	
	20			B-1					Bulk Sample 2.	
				C-1					Core Sample.	
				G-1					Grab Sample.	
				R-1					Modified California Sampler (3" O.D., 2.5 I.D.).	
				SH-1					Shelby Tube Sampler (3" O.D.).	
	25			S-1					Standard Penetration Test SPT (Sampler (2" O.D., 1.4" I.D.).	
				PUSH					Sampler Penetrates without Hammer Blow.	
									Bulk Sample 2.	
	30									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

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GEOTECHNICAL BORING LOG B-1

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	580' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
580	0			B-1 0-5'				ML	QUATERNARY OLD ALLUVIUM (Qoa) @ 0': Sandy SILT, brownish yellow, dry, fine SAND	
								CL/ML		
575	5			R-1	23 40 50/3"	128	15		@ 5': Clayey SILT, hard, mottled brown and dark brown, moist, some fine SAND, manganese nodules/staining	
570	10			S-1	11 16 28				@ 10': Clayey SILT, hard, mottled brown and dark brown, moist, some coarse SAND, manganese nodules/staining	
565	15				14 23 37	114	14	SM	@ 15': Silty SAND, dense, light olive-brown, moist, fine SAND, mild oxidation, infilled root casts	
560 ▽	20			S-2	7 12 13			SP	@ 20': Poorly-graded SAND, dense, light olive-brown, wet, fine to coarse SAND in poorly graded thin beds	
555	25			R-3	7 16 25	101	23	SC	@ 25': Clayey SAND, medium dense, dark olive-brown, moist, coarse SAND	
								CL	@ 26': Silty CLAY, hard, dark olive-brown, moist, trace fine SAND	
550	30								**Total Depth = 26.5 Feet** **Perched groundwater encountered at 20-25 feet** **Backfilled on 9/6/17**	

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-2

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	580' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
580	0			B-1 0-5'				CL	QUATERNARY OLD ALLUVIUM (Qoa) @ 0': Silty CLAY, dark reddish brown, dry	
								CH		
575	5			R-1	10 12 17	106	21		@ 5': Fat CLAY, hard, mottled dark reddish brown, moist, poorly developed paleosol, irregular ped facies	
570	10			S-1	8 10 14			SM	@ 10': Silty SAND, medium dense, olive-brown, moist, fine SAND, some CLAY, mild oxidization	-200
565	15			R-2	8 15 26	105	21	CL	@ 15': CLAY with fine SAND, hard, mottled dark reddish brown and olive-brown, moist, trace fine micaceous SAND, moderately developed paleosol, charcoal fragments	
560	20			S-2	5 7 10			ML CL	@ 20': Clayey SILT, very stiff, mottled dark reddish brown and olive-brown, moist, some fine mica SAND @ 20.8': Silty CLAY, very stiff, mottled dark reddish brown and olive-brown, moist, no SAND	
555	25			R-3	18 50/5"	115	17	ML/CL	BEDROCK (RESIDUAL SOIL/META SEDIMENTARY (Mzu) @ 25': Silty to clayey SANDSTONE, very dense, greenish black, moist, fine to coarse SAND with depth SILT to CLAY with depth root casts healed with reddish brown matrix	
550	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG B-2

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	580' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
550	30			S-3	7 10 17			SM	BEDROCK (RESIDUAL SOIL/META SEDIMENTARY (Mzu) continued) @ 30': Silty SANDSTONE, dense, greenish black, wet, fine SAND, liquefaction dilatancy from driving sample with upper 1 foot	
545	35			S-4	31 50/2"			GC	@ 35': Refusal on bedrock, sample @ 35.5': Clayey GRAVEL CONGLOMERATE, very dense, greenish black, wet, coarse SAND, some small angular gravel	
									Total Depth = 35.5 Feet **Groundwater encountered at 30 feet time of drilling** **Backfilled on 9/6/17**	
540	40									
535	45									
530	50									
525	55									
520	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG B-3

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	579' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1 0-5'				ML	QUATERNARY YOUNG ALLUVIUM (Qal) @ 0': Sandy SILT, yellowish red, moist, fine SAND	EI, CR
								SP		
575	5			S-1	6 7 10				@ 5': Poorly-graded SAND, medium dense, strong brown, damp, medium SAND	
								SC	QUATERNARY OLD ALLUVIUM (Qoa)	
570	10			R-1	14 39 50/5"	119	10		@ 10': Clayey SAND, very dense, dark brown, moist, coarse SAND, fine downwards, to medium to coarse SAND, fines reduce with depth (damaged rings)	
565	15			S-2	6 9 15				@ 15': Clayey SAND, dense, dark brown, moist, medium to coarse SAND, 1 foot interbed of CLAY, medium expansive, manganese, moderately developed paleosol	
560	20			R-2	7 12 25	113	17		@ 20': Clayey SAND, medium dense, dark brown, upper sample is wet, fine to coarse SAND, manganese development, trace well-rounded GRAVEL	
555	25			S-3	21 15 50/2"				@ 25': Clayey SAND, very dense, dark brown, wet, fine to coarse SAND, angular fine gravel grades with depth to silty SAND, very dense, reddish brown, moist, fine SAND	
550	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-3

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	579' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	30			S-4	16 50/6"			SC	@ 30': Clayey SAND, very dense, yellowish red, wet, medium to coarse SAND	
									Total Depth = 30.5 Feet **Groundwater encountered at 20 feet** **Backfilled on 9/6/17**	
545	35									
540	40									
535	45									
530	50									
525	55									
520	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-4

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	576' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
575	0							SM	QUATERNARY OLD ALLUVIUM (Qoa) @ 0': Silty SAND, yellowish red, damp, fine SAND	
570	5			R-1	12 12 18	128	10	SC/CL	@ 5': Clayey SAND to sandy CLAY, hard, mottled dark reddish brown and strong brown, moist, medium to fine SAND with depth, manganese development	DS
565	10			S-1	5 5 9				@ 10': Sandy clayey SILT, very stiff, mottled strong brown and olive-brown, moist, fine SAND with coarse SAND, grades with depth to sandy SILT, fully decomposed vertical rootlets	
560	15			R-2	7 14 21	104	22	SC	@ 15': Clayey SAND, medium dense, olive-brown, wet, fine to coarse SAND with depth, very thin braided channels, trace fine subround GRAVEL	
555	20			S-2	4 7 9			SW	@ 20': Well-graded SAND, medium dense, olive-brown, wet, fine to coarse, low sample recovery	
550	25			R-3	11 24 50/4"			ML	@ 25': Sandy SILT, hard, mottled to laminated olive-brown and brown, moist, very thin sand bed	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-4

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	576' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-3	15 35 47			GC	@ 30': Clayey GRAVEL, very dense, variegated (orange, reddish brown greenish black) moist, angular	
545									CRETACEOUS TONALITE (Kt)	
	35			S-4	50/2"				@ 35': Tonalite, poorly-graded SAND, very dense, damp, quartz vein, sample recovered by coring effect, weathered	
540									@ 40': Tonalite, poorly-graded SAND, orange-brown, some clay development	
	40			S-5	50/3"				**Total Depth = 40 Feet** **Groundwater encountered at 15 feet at time of drilling** **Backfilled on 9/6/17**	
535										
	45									
530										
	50									
525										
	55									
520										
	60									

Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-5

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	577' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1 0-5'				SM	QUATERNARY OLD ALLUVIUM (Qoa) @ 0': Silty SAND, yellowish red, damp, fine SAND	
575										
	5			S-1	14 27 38			ML	@ 5': Sandy SILT, hard, mottled reddish brown and strong brown, damp, fine SAND, manganese development	-200
570										
	10			R-1	9 15 23	110	18		@ 10': Sandy SILT, hard, mottled reddish brown and strong brown, damp, fine SAND, root clasts, moist	
565										
	15			S-2	8 10 14			SM	@ 15': Silty SAND, dense, brown, very moist, fine to medium SAND	
560										
	20			R-2	11 17 25	117	15	SW	@ 20': Well-graded SAND, medium dense, brown, wet, fine to coarse SAND, some CLAY	
555										
	25			S-3	4 9 12			SM	@ 25': Silty SAND, dense, mottled reddish brown and brown, very moist, fine SAND, micaceous	
550										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-5

Project No.	11777.001	**Date Drilled**	9-6-17
Project	Warmington San Marcos	**Logged By**	CDL
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	CME-95 - 140lb - Autohammer - 30" Drop	**Ground Elevation**	577' msl
Location	See Figure 2	**Sampled By**	CDL

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
545	30			S-4	6 6 18			CL	BEDROCK (RESIDUAL SOIL, META SEDIMENTARY (Mzu) @ 30': CLAY, hard, greenish black, very moist, some fine SAND **Total Depth = 31 Feet** **No groundwater encountered at time of drilling** **Backfilled on 9/6/17**	
540	35									
535	40									
530	45									
525	50									
520	55									
	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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FIELD PERCOLATION TEST DATA SHEET

Project Name:	Warminton	Project No.:	111777.001
Proj. Address:	Twin Oaks Road, San Marcos CA		

SOIL TYPE / TEST LOCATION / BOREHOLE

Soil Type: brown silty sand

Location: P-1

Hole Dia: 8"

Depth 4.17'

Tested by:SMM Pre-Saturation Date:9/6/2017 Test Date:9/7/2017

Notes: Measurements in 100ths of foot

Time of Day	Interval / Notes	Water Level	Time of Day	Interval / Notes	Water Level
9:15		2.62			
9:45	30 min	2.62			
10:15	31 min	2.63			
10:45	32 min	2.64			
11:15	33 min	2.64			
11:45	34 min	2.64			
12:15	35 min	2.65			
12:45	36 min	2.65			
1:15	37 min	2.65			
1:45	38 min	2.66			
2:15	39 min	2.66			
2:45	40 min	2.66			
3:15	41 min	2.66			

FOR OFFICE USE ONLY	**DATE RECEIVED:**	**By:**

Notes: 250.0 min/inch

Leighton

FIELD PERCOLATION TEST DATA SHEET

Project Name:	Warminton	Project No.:	111777.001
Proj. Address:	Twin Oaks Road, San Marcos CA		

SOIL TYPE / TEST LOCATION / BOREHOLE

Soil Type: brown silty sand

Location: P-2

Hole Dia: 8"

Depth 3.96'

Tested by:SMM Pre-Saturation Date:9/6/2017 Test Date:9/7/2017

Notes: Measurements in 100ths of foot

Time of Day	Interval / Notes	Water Level	Time of Day	Interval / Notes	Water Level
9:11		2.80			
9:41	30 min	2.80			
10:11	30 min	2.81			
10:41	30 min	2.82			
11:11	30 min	2.82			
11:41	30 min	2.83			
12:11	30 min	2.83			
12:41	30 min	2.83			
1:11	30 min	2.84			
1:41	30 min	2.84			
2:11	30 min	2.84			
2:41	30 min	2.85			
3:11	30 min	2.85			

FOR OFFICE USE ONLY	**DATE RECEIVED:**	**By:**

Notes: perc rate 500 min/inch

Leighton

FIELD PERCOLATION TEST DATA SHEET

Project Name:	Warminton	Project No.:	111777.001
Proj. Address:	Twin Oaks Road, San Marcos CA		

SOIL TYPE / TEST LOCATION / BOREHOLE

Soil Type: brown silty sand

Location: P-3

Hole Dia: 8"

Depth 3.75'

Tested by:SMM Pre-Saturation Date:9/6/2017 Test Date:9/7/2017

Notes: Measurements in 100ths of foot

Time of Day	Interval / Notes	Water Level	Time of Day	Interval / Notes	Water Level
9:07		2.80			
9:37	30 min	2.81			
10:07	30 min	2.82			
10:37	30 min	2.82			
11:07	30 min	2.82			
11:37	30 min	2.82			
12:07	30 min	2.82			
12:37	30 min	2.82			
1:07	30 min	2.82			
1:37	30 min	2.82			
2:07	30 min	2.82			
2:37	30 min	2.82			
3:07	30 min	2.82			

FOR OFFICE USE ONLY	**DATE RECEIVED:**	**By:**

Notes: no perc

Leighton

FIELD PERCOLATION TEST DATA SHEET

Project Name:	Warminton	Project No.:	111777.001
Proj. Address:	Twin Oaks Road, San Marcos CA		

SOIL TYPE / TEST LOCATION / BOREHOLE

Soil Type: brown silty sand

Location: P-4

Hole Dia: 8"

Depth 3.7'

Tested by:SMM Pre-Saturation Date:9/6/2017 Test Date:9/7/2017

Notes: Measurements in 100ths of foot

Time of Day	Interval / Notes	Water Level	Time of Day	Interval / Notes	Water Level
9:02		2.75			
9:32	30 min	2.75			
10:02	30 min	2.78			
10:32	30 min	2.8			
10:32	add Water	2.75			
11:02	30 min	2.75			
11:32	30 min	2.76			
12:02	30 min	2.77			
12:32	30 min	2.77			
1:02	30 min	2.77			
1:32	30 min	2.77			
2:02	30 min	2.78			
2:32	30 min	2.78			
3:02	30 min	2.78			

FOR OFFICE USE ONLY	**DATE RECEIVED:**	**By:**

Notes: no perc

Appendix C
Laboratory Testing Procedures and Test Results

APPENDIX C

Laboratory Testing Procedures and Test Results

Direct Shear Test: A direct shear test were performed on a selected undisturbed sample which was 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 of the sample, the 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 utilizing a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less 0.05 inches per minute. The test result is presented on the attached figure.

Moisture and Density Determination Tests: Moisture content (ASTM Test Method D2937) and dry density determinations were performed on relatively undisturbed ring samples obtained from the test borings and/or trenches. The results of these tests are presented in the geotechnical boring logs (Appendix B).

Particle/Grain Size Analysis: Particle size analysis was performed by mechanical sieving and wash sieving methods according to ASTM D1140. Plots of sieve results are provided on the figures in this appendix.

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Text, ASTM Test Method 4829. Specimens are molded under a given compactive energy to approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with 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-1 @ 0 to 5 feet	Clayey SAND (SC)	65	Medium

APPENDIX C (Continued)

Soluble Sulfates: The soluble sulfate content of a selected sample was determined by standard geochemical methods (Caltrans Test Method CT417). The test result is presented in the table below:

Sample Location	Sulfate Content (%)	Potential Degree of Sulfate Attack*
B-1 @ 1 foot to 5 feet	0.0150	Negligible

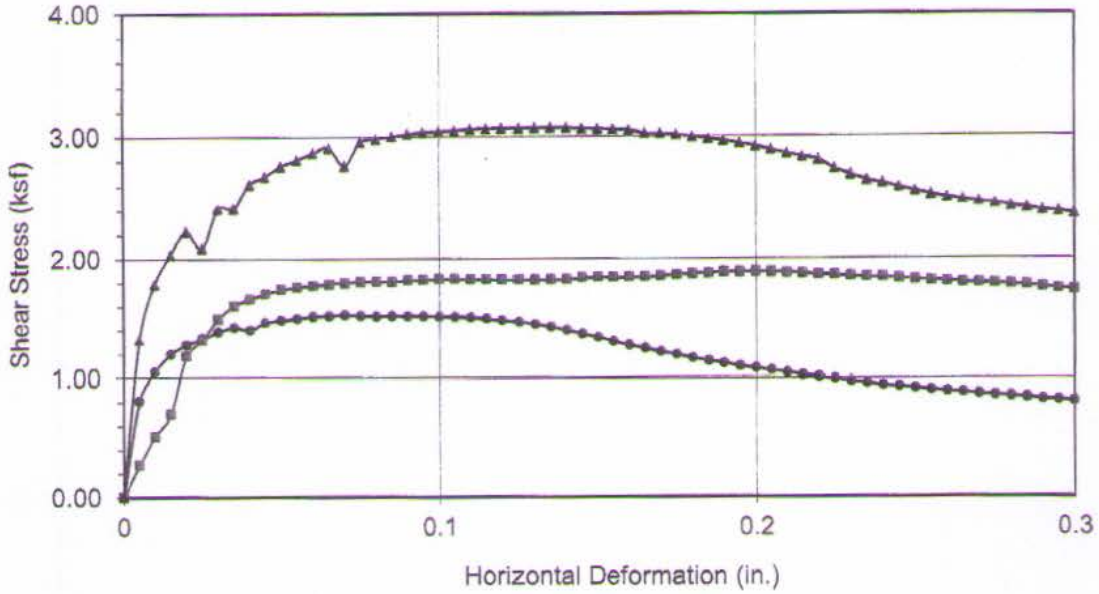
* Based on the 2008 edition of American Concrete Institute (ACI) Committee 318R, Table No. 4.2.1.

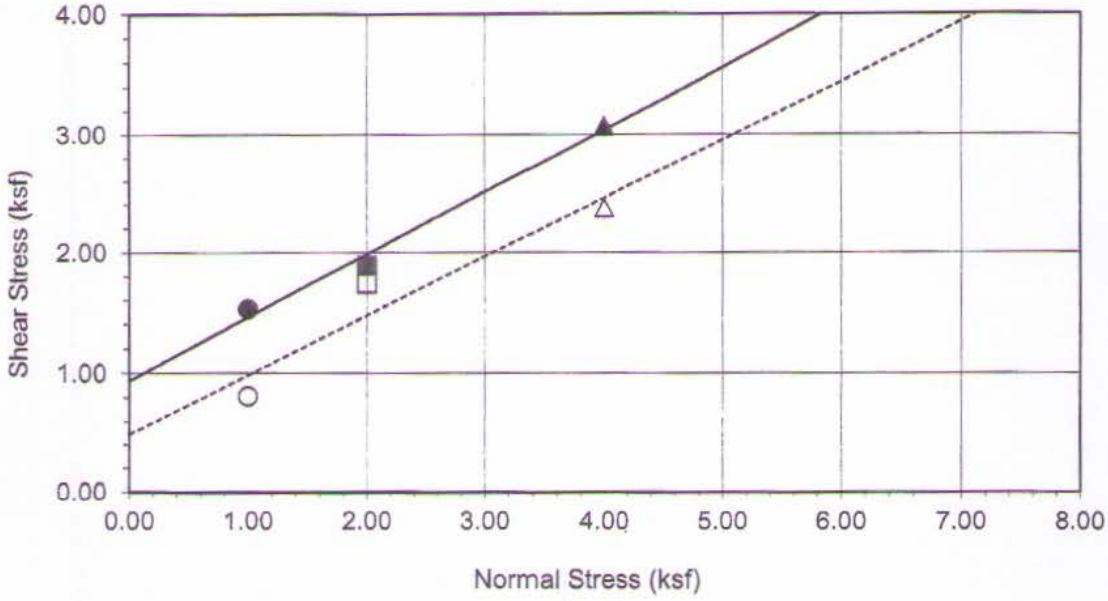
Chloride Content: Chloride content was tested in accordance with DOT Test Method No. 422. The results are presented below:

Sample Location	Chloride Content, ppm
B-1 @ 1 foot to 5 feet	24

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with California Test Method 643. The results are presented in the table below:

Sample Location	pH	Minimum Resistivity (ohms-cm)
B-1 @ 1 foot to 5 feet	7.53	1300





Boring No.	**B-4**
Sample No.	**R-1**
Depth (ft)	**5**
Sample Type:	Ring
Soil Identification:	Lean Clay (CL), Reddish Brown.

Strength Parameters

	C (psf)	ϕ (°)
Peak	938	28
Ultimate	490	26

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.527	■ 1.891	▲ 3.069
Shear Stress @ End of Test (ksf)	○ 0.807	□ 1.737	△ 2.372
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	18.79	18.79	18.79
Dry Density (pcf)	111.0	112.1	108.1
Saturation (%)	97.9	100.7	90.7
Soil Height Before Shearing (in.)	1.0024	0.9868	0.9760
Final Moisture Content (%)	23.4	22.2	22.5

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11777.001

Warmington/Due Dilligance

09-17

Appendix D
General Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

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

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical

Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to

inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill

All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified. Backfill shall be placed and densified to a minimum of 90 percent of relative compaction from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

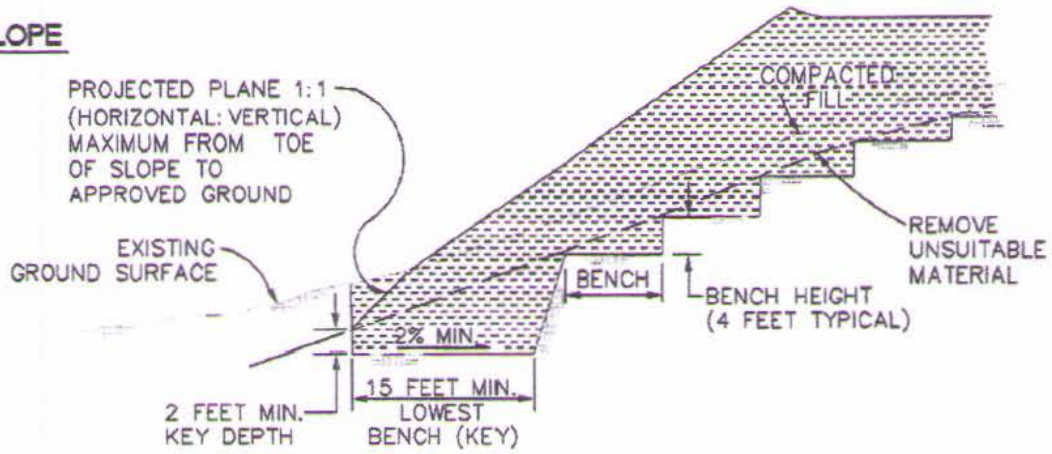
7.3 Lift Thickness

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

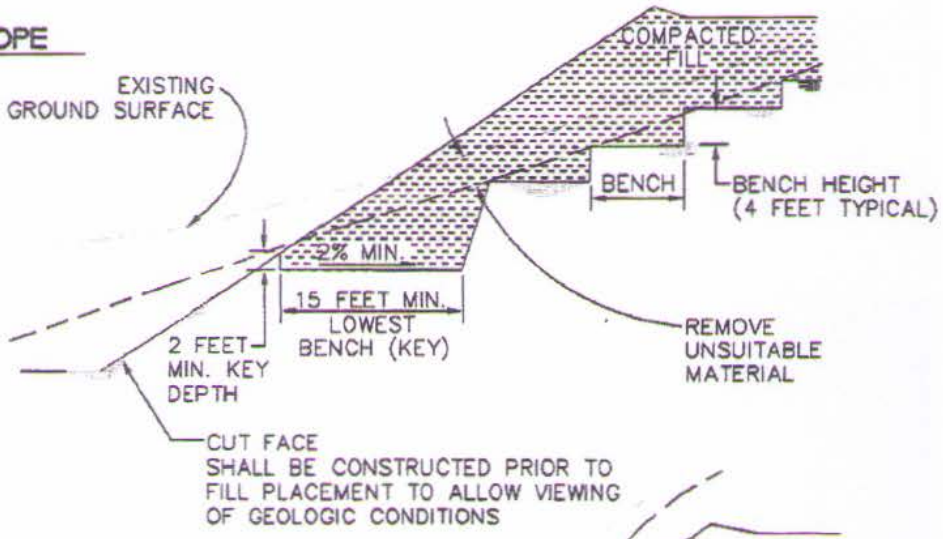
7.4 Observation and Testing

The densification of the bedding around the conduits shall be observed by the Geotechnical Consultant.

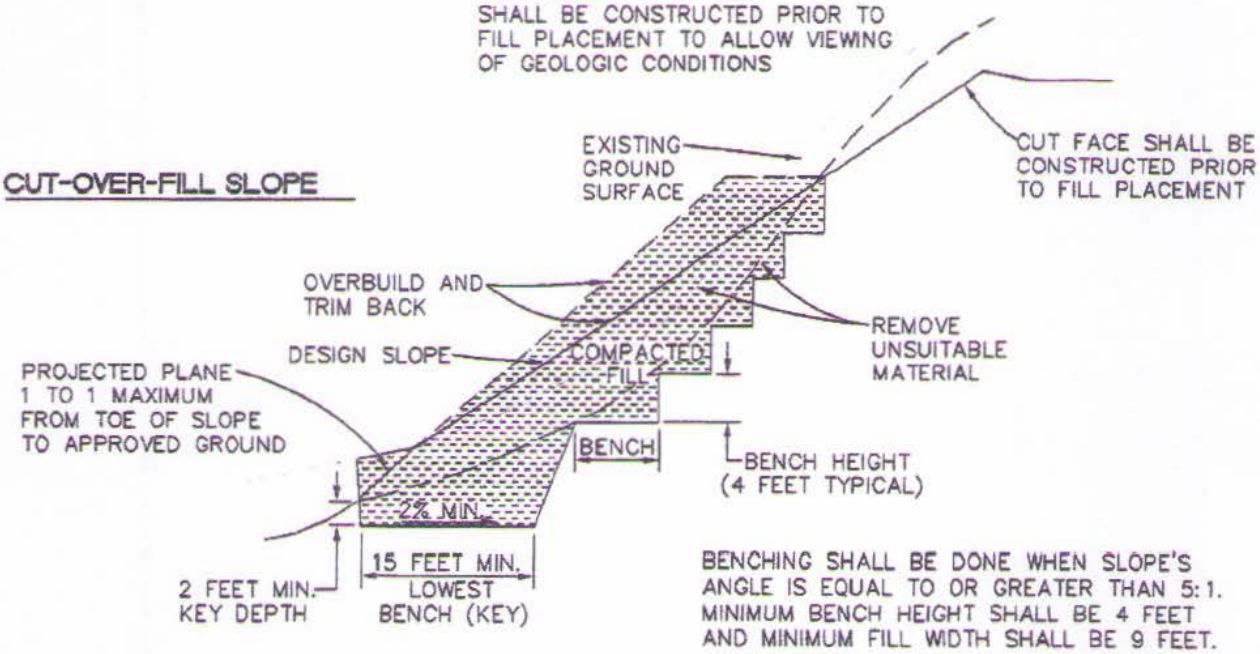
FILL SLOPE



FILL-OVER-CUT SLOPE



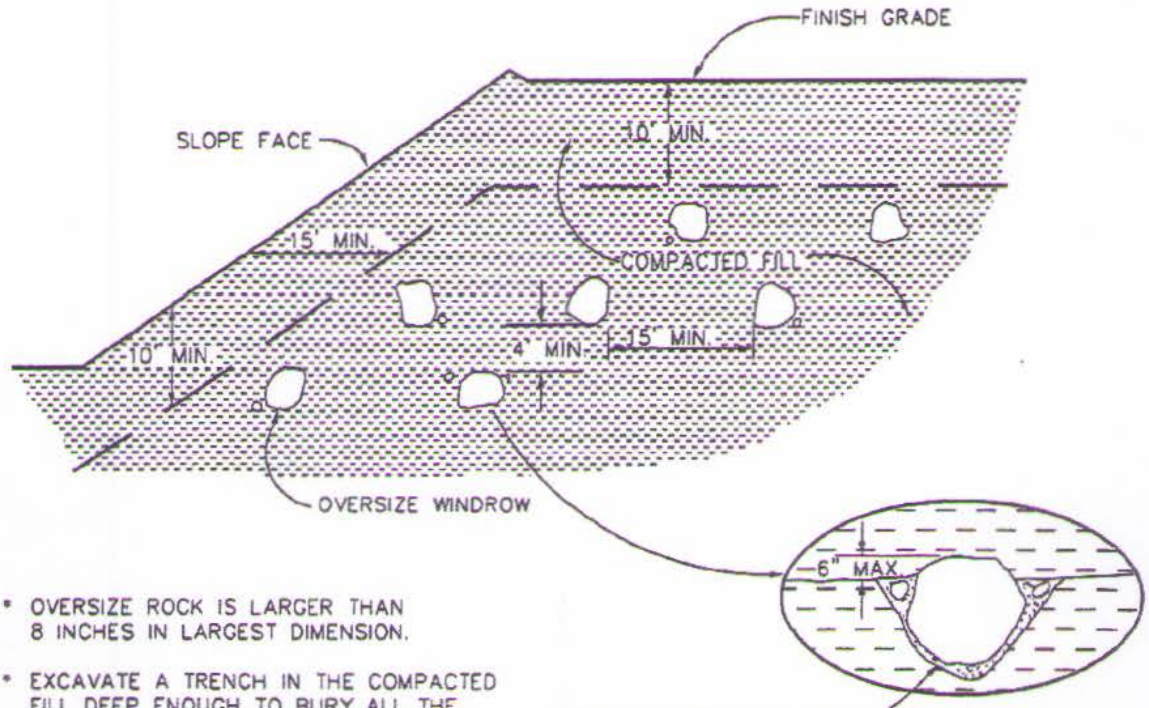
CUT-OVER-FILL SLOPE



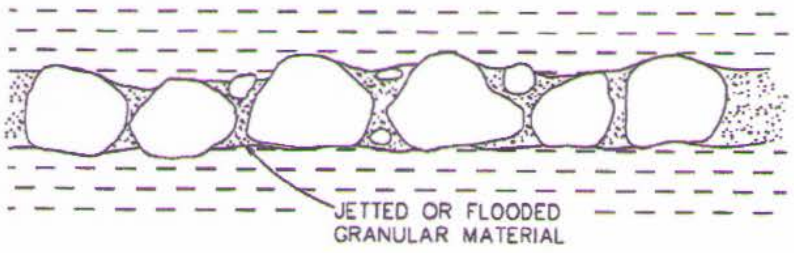
BENCHING SHALL BE DONE WHEN SLOPE'S ANGLE IS EQUAL TO OR GREATER THAN 5:1. MINIMUM BENCH HEIGHT SHALL BE 4 FEET AND MINIMUM FILL WIDTH SHALL BE 9 FEET.

KEYING AND BENCHING

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAIL A



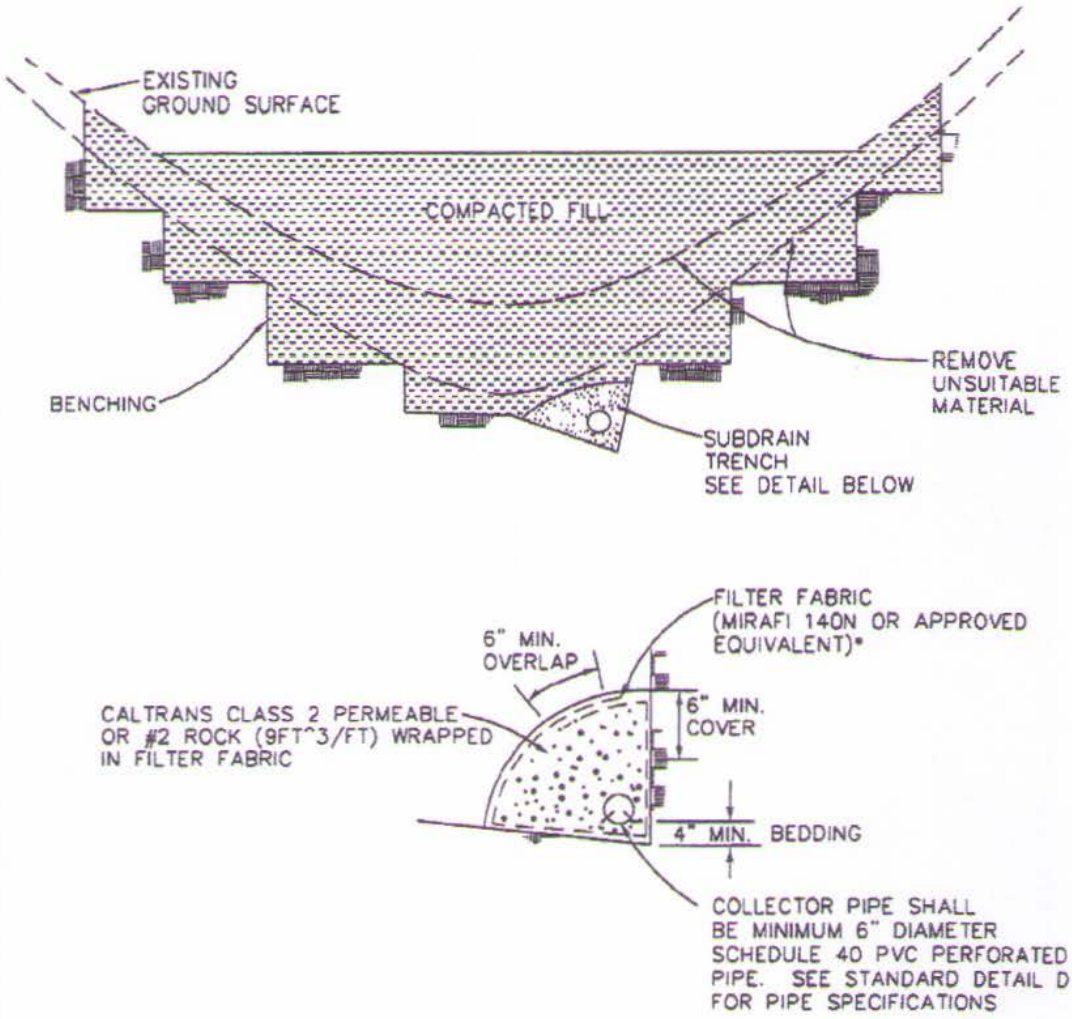
* OVERSIZE ROCK IS LARGER THAN 8 INCHES IN LARGEST DIMENSION.
* EXCAVATE A TRENCH IN THE COMPACTED FILL DEEP ENOUGH TO BURY ALL THE ROCK.
* BACKFILL WITH GRANULAR SOIL JETTED OR FLOODED IN PLACE TO FILL ALL THE VOIDS.
* DO NOT BURY ROCK WITHIN 10 FEET OF FINISH GRADE.
* WINDROW OF BURIED ROCK SHALL BE PARALLEL TO THE FINISHED SLOPE.



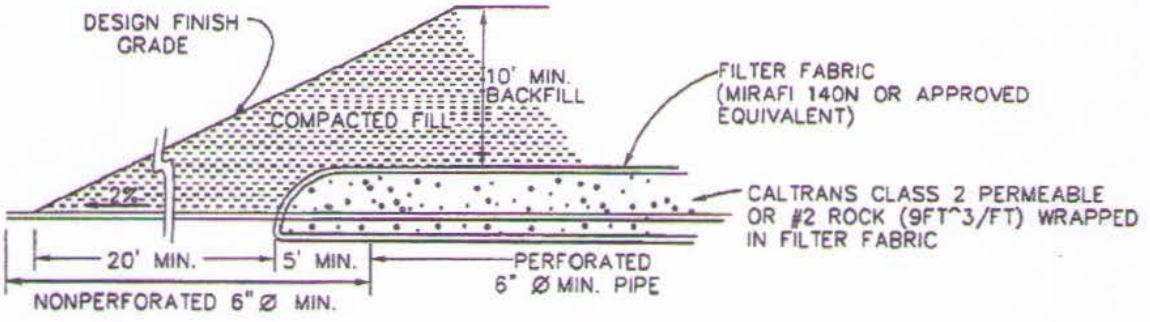
TYPICAL PROFILE ALONG WINDROW

OVERSIZE ROCK DISPOSAL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAIL B



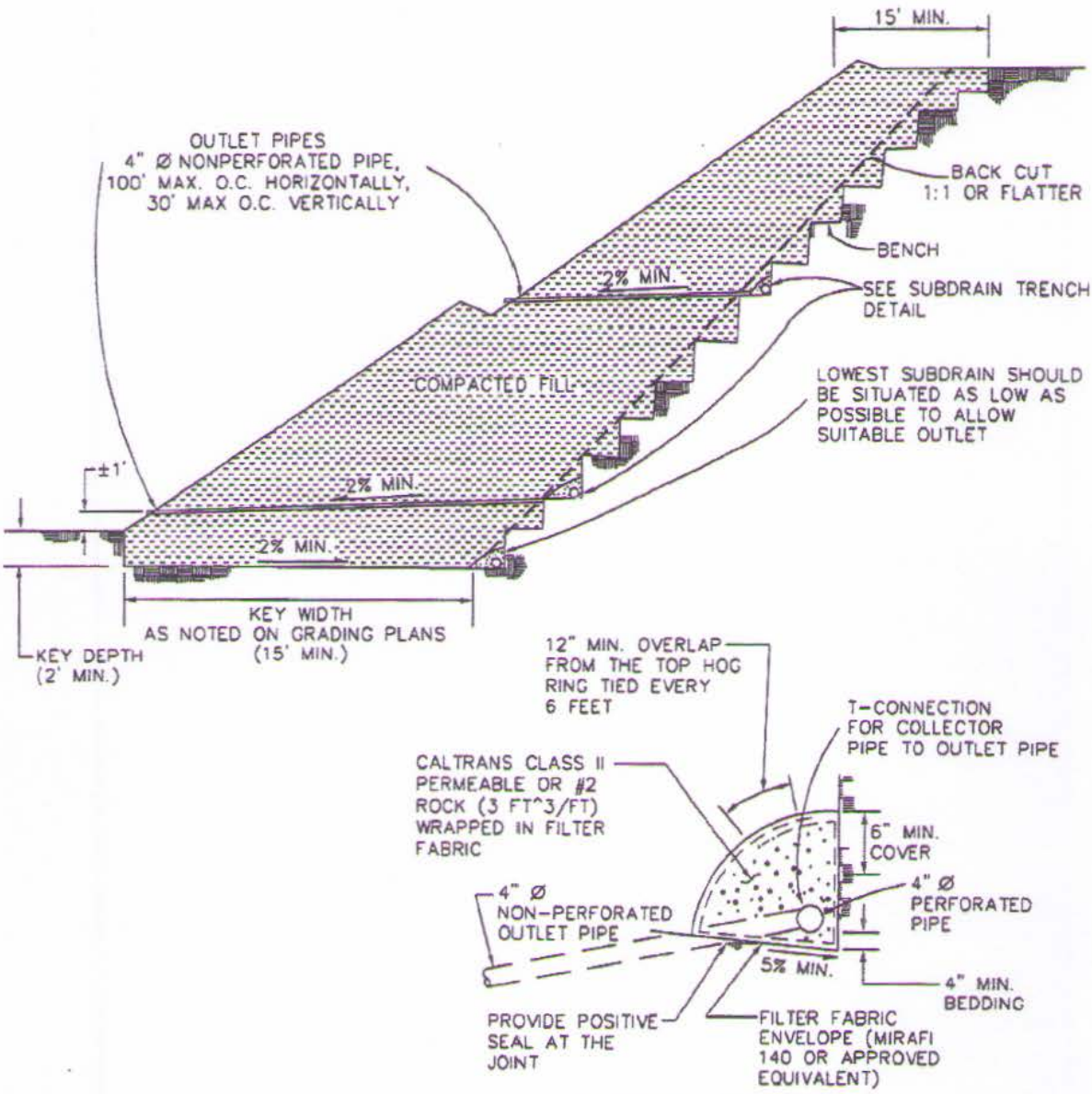
SUBDRAIN DETAIL



DETAIL OF CANYON SUBDRAIN OUTLET

CANYON SUBDRAINS

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL C



SUBDRAIN TRENCH DETAIL

SUBDRAIN INSTALLATION – subdrain collector pipe shall be installed with perforation down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drill holes are used. All subdrain pipes shall have a gradient of at least 2% towards the outlet.

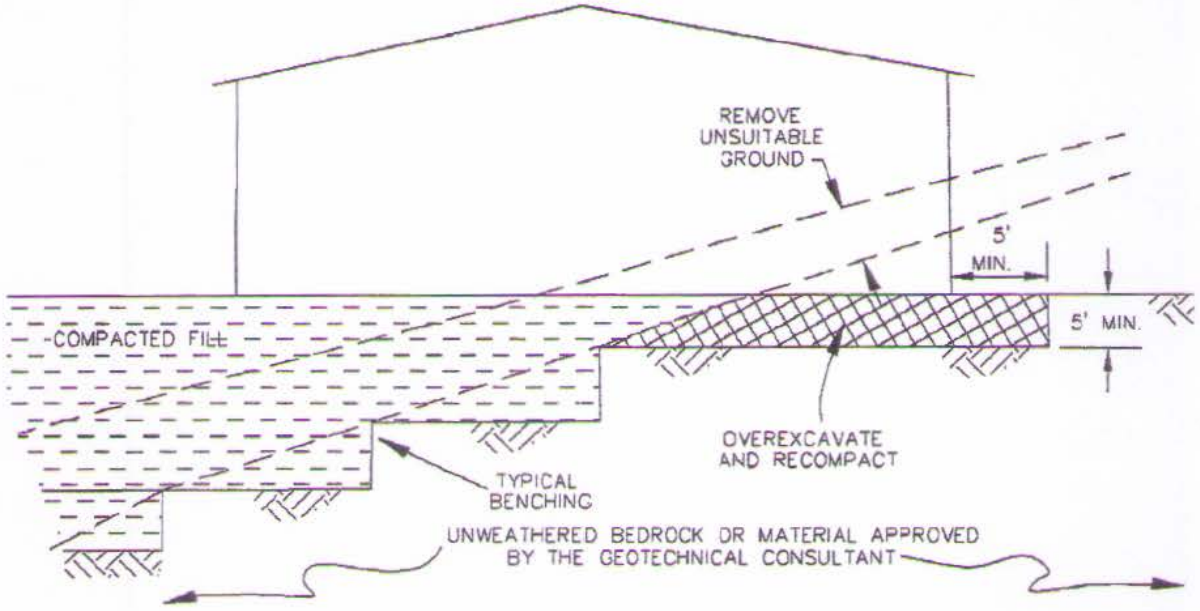
SUBDRAIN PIPE – Subdrain pipe shall be ASTM D2751, SDR 23.5 or ASTM D1527, Schedule 40, or ASTM D3034, SDR 23.5, Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe.

All outlet pipe shall be placed in a trench no wider than twice the subdrain pipe.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS

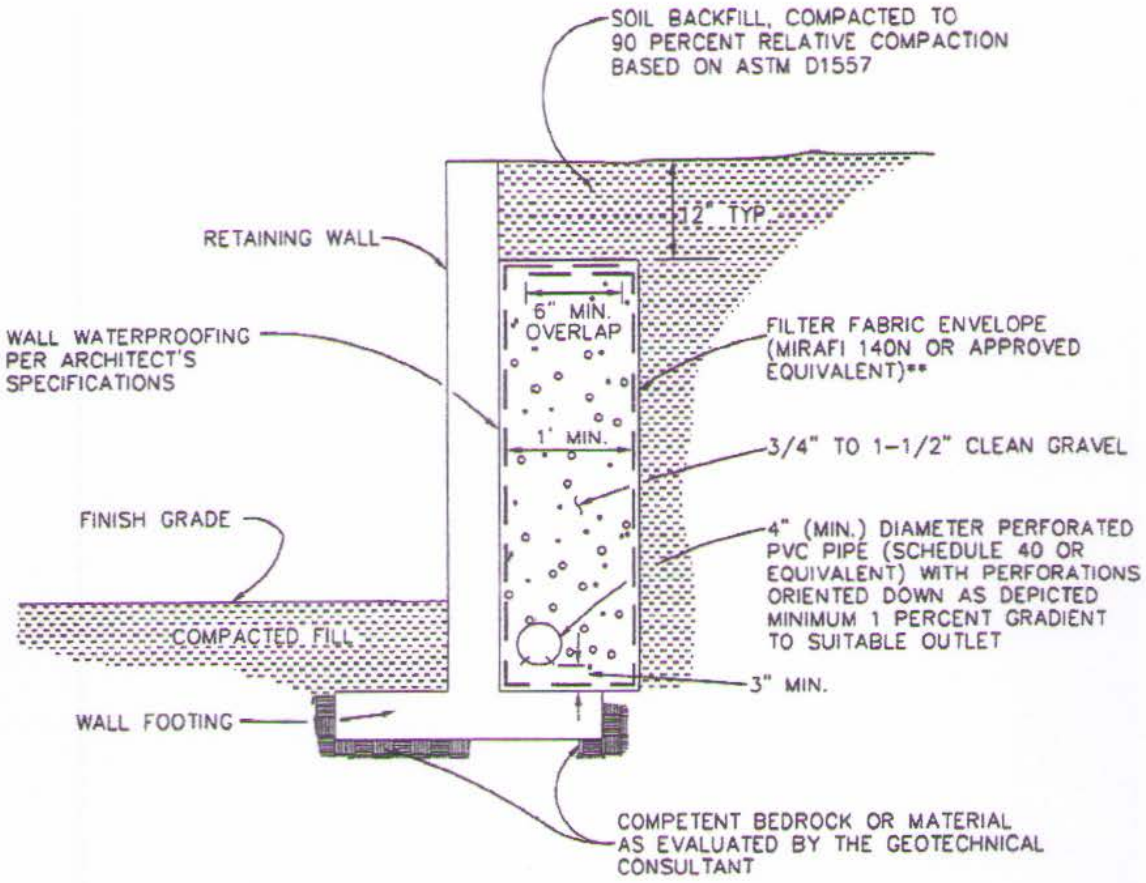
GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAIL D

CUT–FILL TRANSITION LOT OVEREXCAVATION



TRANSITION LOT FILLS

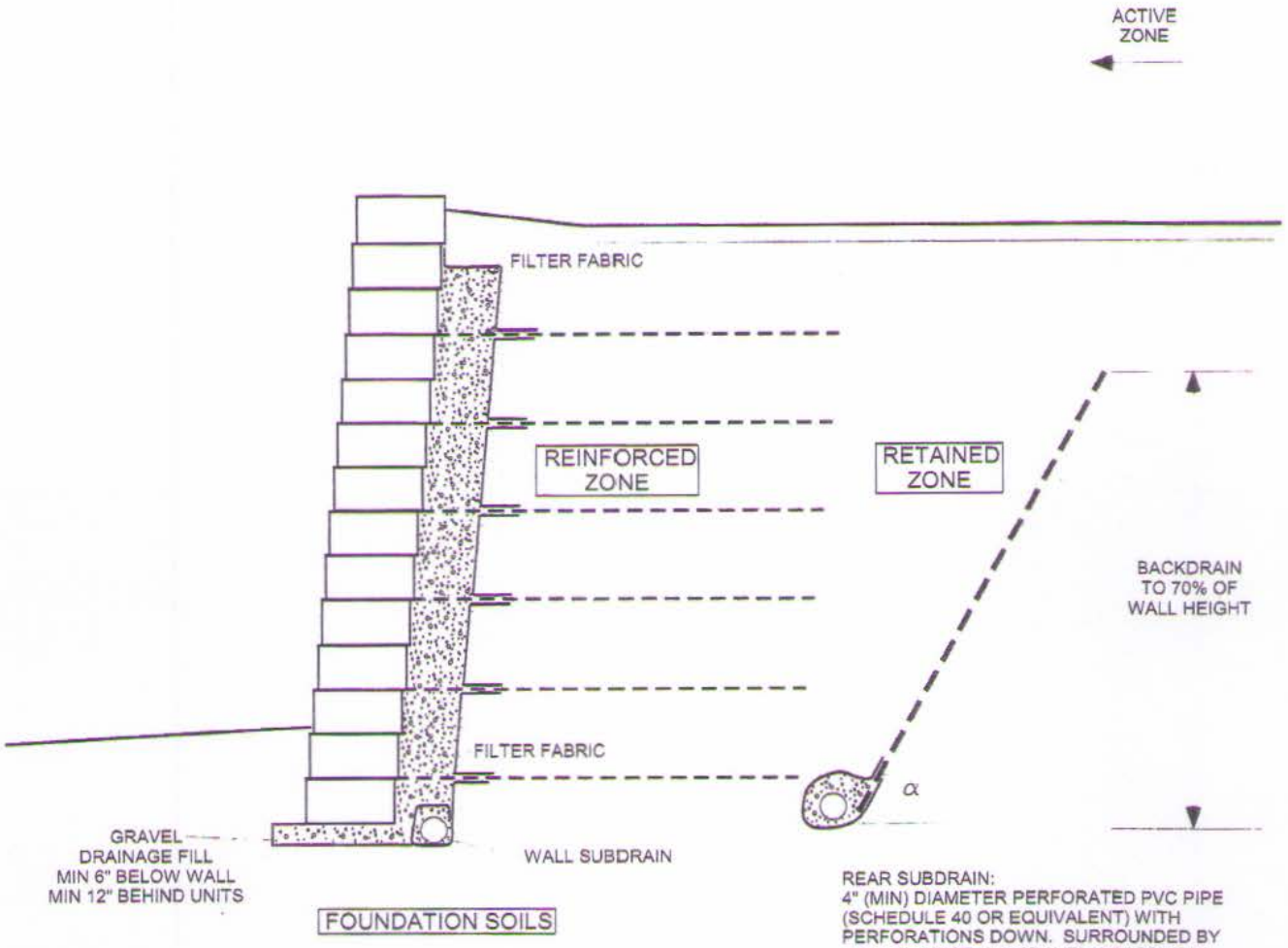
GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL E



NOTE: UPON REVIEW BY THE GEOTECHNICAL CONSULTANT, COMPOSITE DRAINAGE PRODUCTS SUCH AS MIRADRAIN OR J-DRAIN MAY BE USED AS AN ALTERNATIVE TO GRAVEL OR CLASS 2 PERMEABLE MATERIAL. INSTALLATION SHOULD BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

RETAINING WALL DRAINAGE

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAIL F



REAR SUBDRAIN:
4" (MIN) DIAMETER PERFORATED PVC PIPE (SCHEDULE 40 OR EQUIVALENT) WITH PERFORATIONS DOWN. SURROUNDED BY 1 CU. FT/FT OF 3/4" GRAVEL WRAPPED IN FILTER FABRIC (MIRAFI 140N OR EQUIVALENT)

OUTLET SUBDRAINS EVERY 100 FEET, OR CLOSER, BY TIGHTLINE TO SUITABLE PROTECTED OUTLET

NOTES:

1) MATERIAL GRADATION AND PLASTICITY

REINFORCED ZONE:

SIEVE SIZE	% PASSING
1 INCH	100
NO. 4	20-100
NO. 40	0-60
NO. 200	0-35

GRAVEL DRAINAGE FILL:

SIEVE SIZE	% PASSING
1 INCH	100
3/4 INCH	75-100
NO. 4	0-60
NO. 40	0-50
NO. 200	0-5

FOR WALL HEIGHT < 10 FEET, PLASTICITY INDEX < 20
FOR WALL HEIGHT 10 TO 20 FEET, PLASTICITY INDEX < 10
FOR TIERED WALLS, USE COMBINED WALL HEIGHTS
WALL DESIGNER TO REQUEST SITE-SPECIFIC CRITERIA FOR WALL HEIGHT > 20 FEET

2) CONTRACTOR TO USE SOILS WITHIN THE RETAINED AND REINFORCED ZONES THAT MEET THE STRENGTH REQUIREMENTS OF WALL DESIGN.

3) GEOGRID REINFORCEMENT TO BE DESIGNED BY WALL DESIGNER CONSIDERING INTERNAL, EXTERNAL, AND COMPOUND STABILITY.

3) GEOGRID TO BE PRETENSIONED DURING INSTALLATION.

4) IMPROVEMENTS WITHIN THE ACTIVE ZONE ARE SUSCEPTIBLE TO POST-CONSTRUCTION SETTLEMENT. ANGLE $\alpha = 45+\Phi/2$, WHERE Φ IS THE FRICTION ANGLE OF THE MATERIAL IN THE RETAINED ZONE.

5) BACKDRAIN SHOULD CONSIST OF J-DRAIN 302 (OR EQUIVALENT) OR 6-INCH THICK DRAINAGE FILL WRAPPED IN FILTER FABRIC. PERCENT COVERAGE OF BACKDRAIN TO BE PER GEOTECHNICAL REVIEW.

SEGMENTAL RETAINING WALLS

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAIL G

Appendix E
GBA Insert

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Appendix F
County of San Diego Form I-8

Categorization of Infiltration Feasibility Condition

FORM I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

Based on our field percolation testing, the in-situ infiltration rates of the soils at the subject site are less than 0.01 inches per hour (Leighton, 2017). Specifically, the calculated infiltration rate via the Porchet Method and applied safety factor of 2 is less than 0.01 inches per hour across the site and therefore the site is considered appropriate for a "No-Infiltration" designation.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

If the infiltration rates were greater than 0.5 inches per hour, it may be possible that the risk of geotechnical hazards would not be increased provided mitigation is performed for any underground utilities/structures, slopes (i.e., setbacks) and undocumented fill depths greater than 5 feet within the vicinity of the proposed infiltration site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

FORM I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: If the infiltration rates were greater than 0.5 inches per hour, it may be possible that the risk of groundwater contamination would not be increased provided there are no contaminated soil or groundwater sites within 250 feet of the proposed infiltration site. In addition, groundwater depths are anticipated to be greater than 50 feet bgs. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: If the infiltration rates were greater than 0.5 inches per hour, it may be possible that potential water balance issues would not be affected provided there are no unlined site drainages/creeks/streams within 250 feet of the proposed infiltration site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		Go to Part 2

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

Based on our field percolation testing, the in-situ infiltration rates of the soils at the subject site are less than 0.01 inches per hour (Leighton, 2017). Specifically, the calculated infiltration rate via the Porchet Method and applied safety factor of 2 is less than 0.01 inches per hour across the site and therefore the site is considered appropriate for a "No-Infiltration" designation.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, it may be possible that the risk of geotechnical hazards will not be increased by partial infiltration provided mitigation is performed for any underground utilities/structures, slopes (i.e., setbacks) and undocumented fill depths greater than 5 feet within the vicinity of the proposed infiltration site. Mitigation includes subsurface vertical barriers and subdrains to limit perched ground water mounding conditions.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

FORM I-8 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, it may be possible that the risk of groundwater contamination will not be increased by partial infiltration provided there are no contaminated soil or groundwater sites within 250 feet of the proposed infiltration site. In addition, groundwater depths are anticipated to be greater than 50 feet bgs. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: If partial infiltration conditions (greater than 0.01 inches per hour) existed across the site, violation of downstream water rights is not anticipated based on the site location and that there are no unlined site drainages/creeks/streams within 250 feet of the proposed infiltration site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		No Infiltration Feasibility

ATTACHMENT 1E:

POLLUTANT CONTROL BMP DESIGN WORKSHEETS / CALCULATIONS

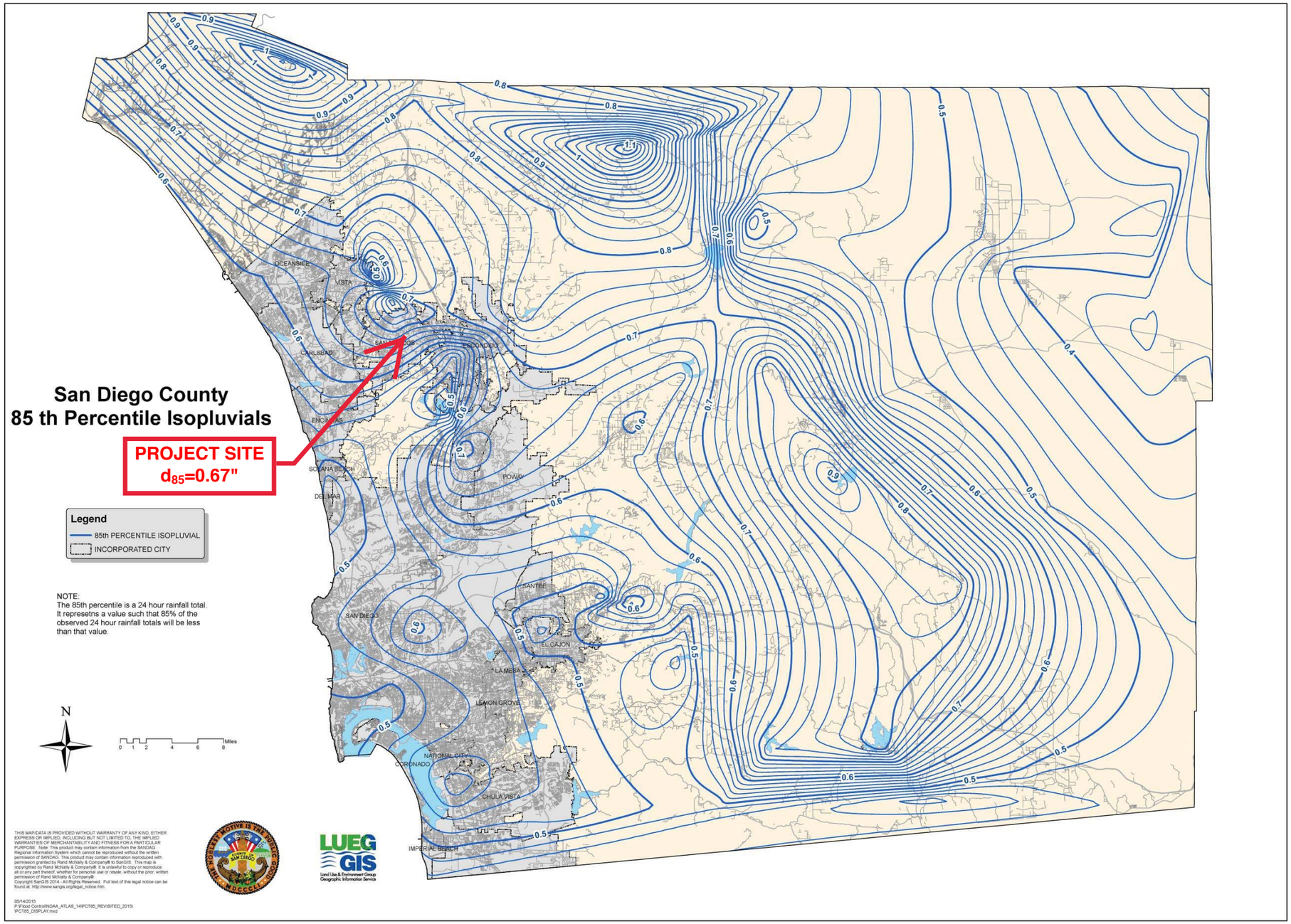


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

ATTACHMENT 1e:
LID DESIGN CAPTURE VOLUME (DCV) CALCULATIONS

PROJECT: Creekside Assisted Living

LOCATION: San Marcos, CA

DATE: 02/13/2020

Per the City of San Marcos BMP Manual:

DCV = 3,630 X C X d x A

Q = C X i X A

DCV = Design Capture Volume (cf)

Q = Diversion flow rate (cfs) for offline BMP

C = Adjusted runoff factor (unitless) = ($\sum C_x A_x / \sum A_x$)

d = 85th percentile, 24-hr storm event rainfall depth (in)= 0.67

A = Tributary area to BMP (ac)

i = Rainfall intensity = 0.2 in/hr

NOTES:

1. Impervious → Roof/Pavement **[C_x=0.90]**

2. Pervious → Landscape **[C_x=0.10]**

3. DCV result used for City Worksheet B.5-1 & B.4-1

DMA ID	Area, A (SF)	Area, A (AC)	A_i (SF)	A_P (SF)	A_i (%)	A_P (%)	$C = \frac{\sum C_x A_x}{\sum Ax}$	DCV (CF)	Min Footprint 3%[AxC] (SF)	$Q_{Req.}$ (CFS)
Flows To Biofiltration Basin → Detention Vault → POC #1										
1	13,938	0.320	10,395.80	3,542	0.75	0.25	0.70	542	291	0.045
2	13,601	0.312	12,566	1,035	0.92	0.08	0.84	637	342	0.052
	27,539	0.632	22,962	4,577	0.83	0.17		1,179		
Flows To Proprietary Biofiltration (MWS) → Detention Vault → POC #1										
3	75,899	1.742	60,601	15,298	0.80	0.20	0.74	3,131	1,682	0.257
	75,899	1.742	60,601	15,298	0.80	0.20		3,131		
TOTAL	**103,438**	**2.375**	**83,563**	**19,875**	**0.81**	**0.19**		**4,310**		

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 1 of 2)	
1	Remaining DCV after implementing retention BMPs	542	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	---	inches
7	Assumed surface area of the biofiltration BMP	291	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	542	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18+3=21	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	13.8	inches
19	Total Depth Treated [Line 17 + Line 18]	43.8	inches

Worksheet Error! No text of specified style in document.**-1: Simple Sizing Method for Biofiltration BMPs (continued)**

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	813	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	223	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	407	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	353	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	13,938	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.70	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	unitless
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	291	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	291	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of the DCV retained by the BMP [Line 9/ Line 1]		unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV > 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes	☐ No

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

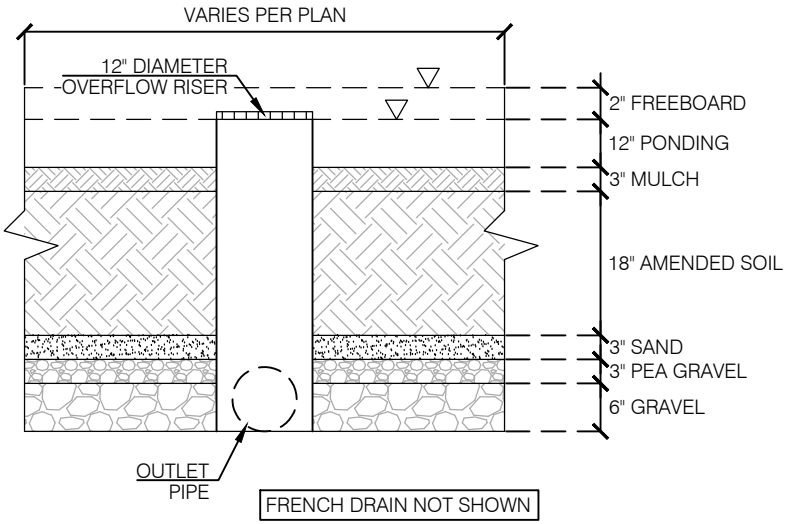
Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 1 of 2)	
1	Remaining DCV after implementing retention BMPs	637	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	---	inches
7	Assumed surface area of the biofiltration BMP	402	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	637	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18+3=21	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	13.8	inches
19	Total Depth Treated [Line 17 + Line 18]	43.8	inches

Worksheet Error! No text of specified style in document.**-1: Simple Sizing Method for Biofiltration BMPs (continued)**

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	956	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	262	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	478	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	415	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	13,601	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.84	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	unitless
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	342	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	342	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of the DCV retained by the BMP [Line 9/ Line 1]		unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV > 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes	☐ No

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.



BASIN CROSS-SECTION (TYP.)

(N.T.S.)

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BMP-1 & BMP-2: BASIN DETAILS

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SAN MARCOS, CA 92069

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Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 1 of 2)	
1	Remaining DCV after implementing retention BMPs	3,131	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	---	inches
7	Assumed surface area of the biofiltration BMP	---	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	3,131	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18+3=21	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	13.8	inches
19	Total Depth Treated [Line 17 + Line 18]	43.8	inches

Worksheet Error! No text of specified style in document.**-1: Simple Sizing Method for Biofiltration BMPs (continued)**

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	4,696	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	1,287	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	2,348	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	2,042	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	75,899	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.74	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	unitless
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	1,682	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	1,682	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of the DCV retained by the BMP [Line 9/ Line 1]		unitless
30	Minimum condition	0.375	unitless
31	Is the reta footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes	☐ No

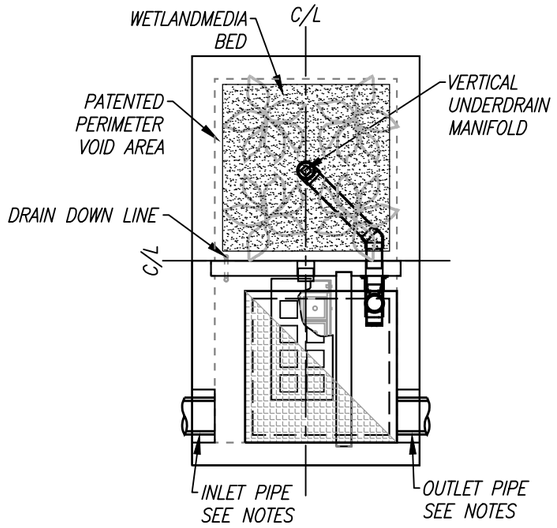
The minimum footprint required for standard biofiltration BMP is not feasible for this DMA due to most of the landscape area sloped >15% to match existing grade along Mission Road.

Note:

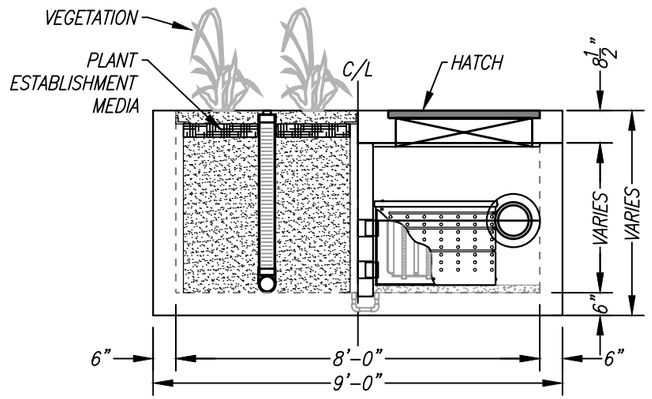
1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	36" X 36"	OPEN PLANTER	N/A
NOTES: VOLUME-BASED SIZING: 5,036 CU-FT, 48-HR DRAWDOWN			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



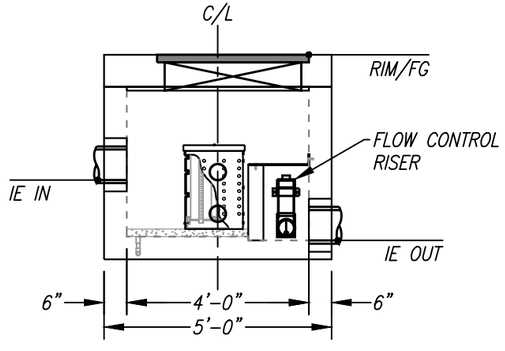
LEFT END VIEW

INSTALLATION NOTES

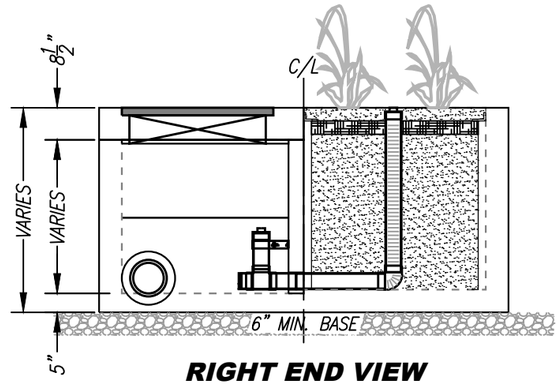
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

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



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.115
OPERATING HEAD (FT)	0
PRETREATMENT LOADING RATE (GPM/SF)	0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19 10:LEF

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

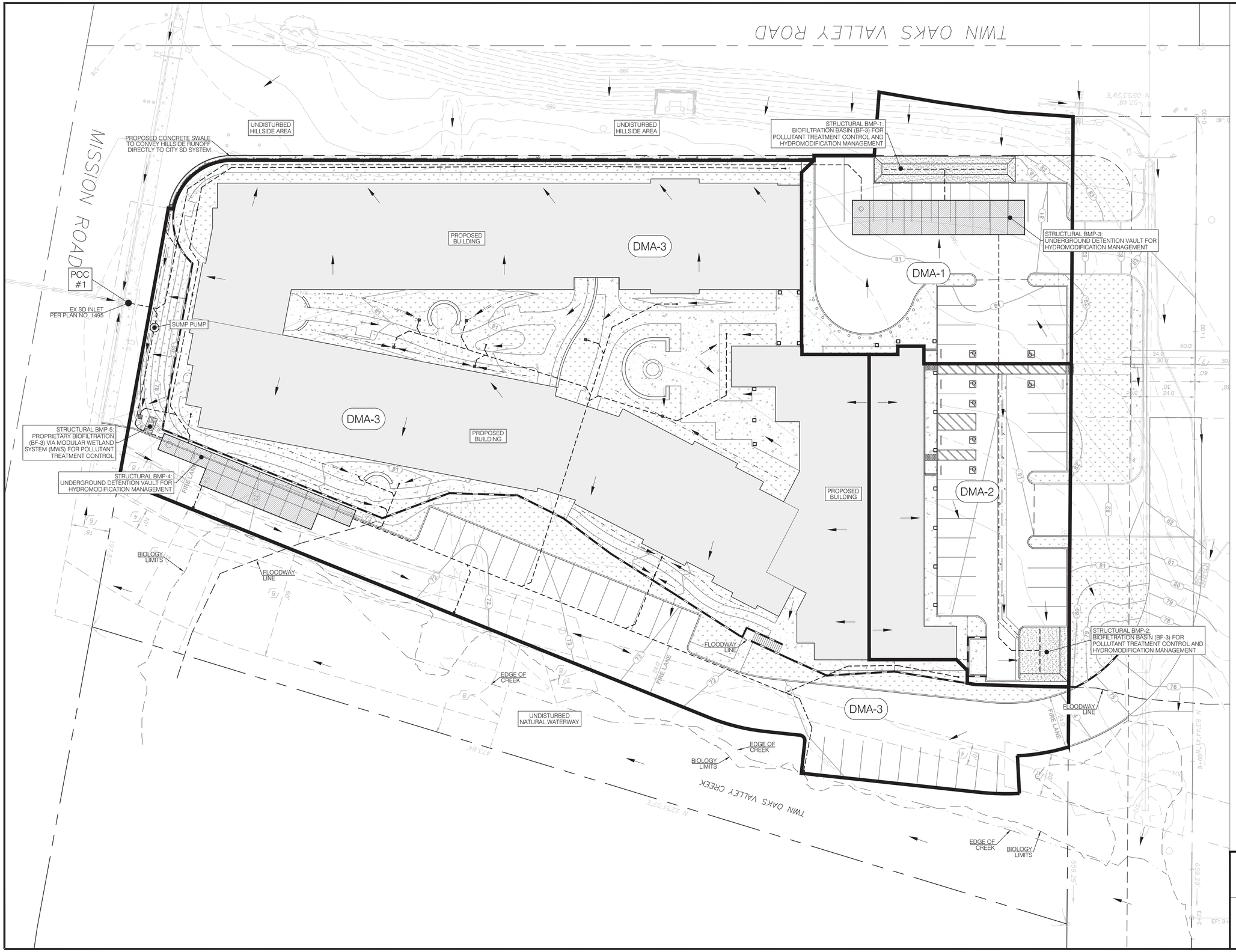
Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

- ☒ Underlying hydrologic soil group
- ☒ Approximate depth to groundwater
- ☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☒ Critical coarse sediment yield areas to be protected
- ☒ Existing topography
- ☒ Existing and proposed site drainage network and connections to drainage offsite
- ☒ Proposed grading
- ☒ Proposed impervious features
- ☒ Proposed design features and surface treatments used to minimize imperviousness
- ☒ Point(s) of Compliance (POC) for Hydromodification Management
- ☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
- ☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

ATTACHMENT 2A:

HYDROMODIFICATION MANAGEMENT EXHIBIT



LEGEND:

- ASPHALT (IMPERVIOUS)
- CONCRETE (IMPERVIOUS)
- LANDSCAPE
- BIOFILTRATION BASIN
- DETENTION VAULT
- MAJOR DMA BOUNDARY
- PROPERTY LINE
- CENTERLINE
- SURFACE FLOW DIRECTION
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- DMA-# DMA ID
- # PROPOSED CONTOUR
- # EXISTING CONTOUR
- MODULAR WETLAND SYSTEM (MWS)

GEOTECHNICAL INFO:

- HYDROLOGIC SOIL GROUP: C/D
- MEASURED INFILTRATION: <0.01 IN/HR
- SOIL EXPANSIVE POTENTIAL: LOW/MEDIUM
- DEPTH TO GROUNDWATER: 15-30 FT BELOW EX GROUND SURFACE
- TWIN OAKS VALLEY CREEK, BIOLOGICAL AREA WITHIN PROPERTY LIMITS
- PROJECT SITE LOCATED WITHIN FEMA FLOODPLAIN

CCSYA ANALYSIS:

NO CRITICAL COURSE SEDIMENT YIELD AREAS TO BE PROTECTED.a SEE MAP IN ATTACHMENT 2B OF SWQMP.

BMP DETAILS:

SEE DETAILS ON THIS SHEET. ADDITIONAL DETAILS ARE LOCATED IN ATTACHMENT 1E OF THE SWQMP.

20 0 20 40

GRAPHIC SCALE
SCALE: 1" = 20'

PREPARED BY:

Commercial Development Resources
Today's Ideas. Tomorrow's Reality.
4121 Westerly Place #112 Newport Beach CA 92660
T 949-640-8997 www.CDRwest.com

PREPARED FOR:

BREAKER'S REAL ESTATE
647 S CEDROS AVENUE
SOLANA BEACH, CA 92075
CONTACT: AARON WHITFIELD
TEL: (858) 663-8215

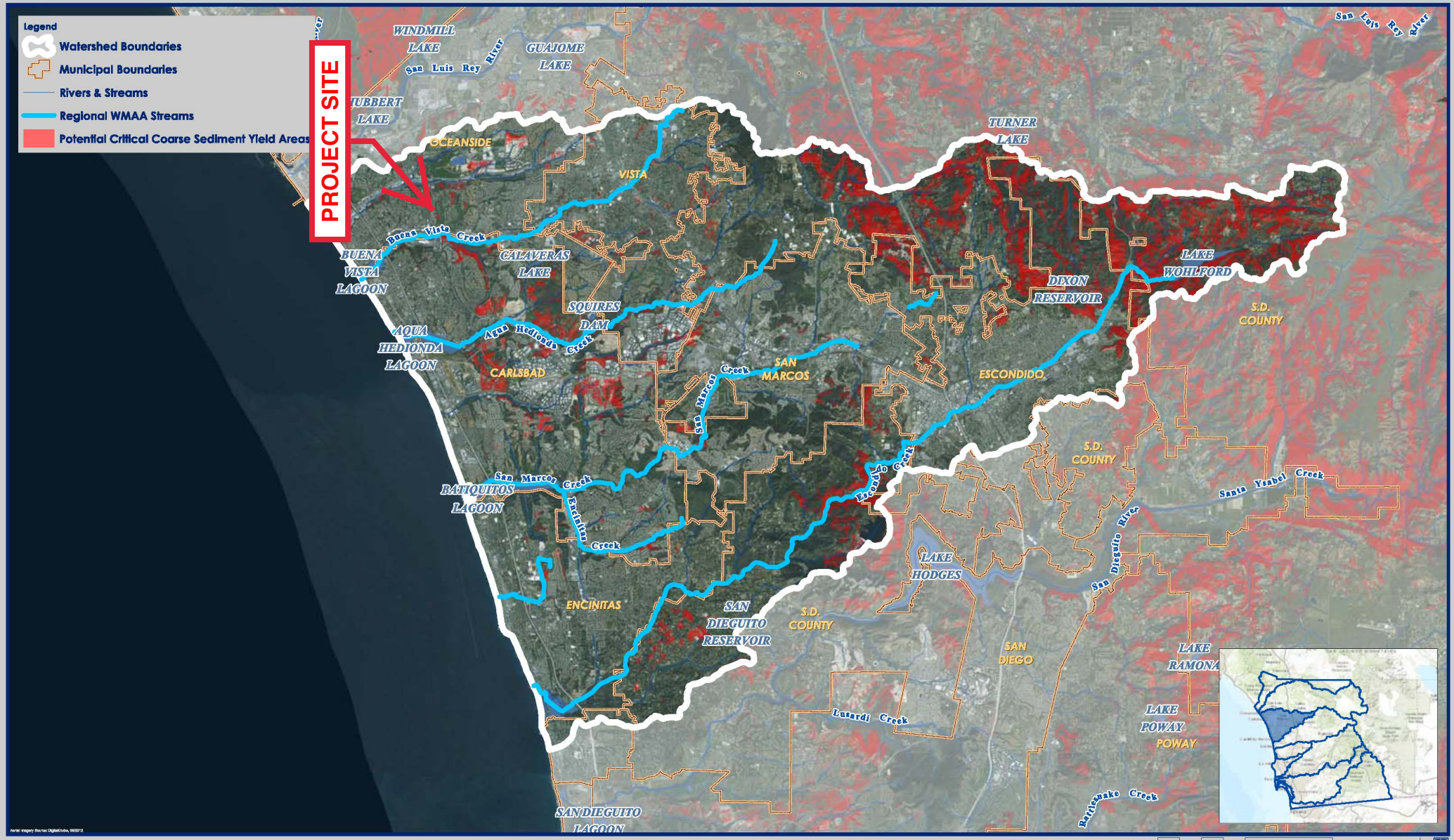
SWQMP ATTACHMENT: HMP EXHIBIT

CREEKSIDE ASSISTED LIVING

N TWIN OAKS VALLEY RD & RICHMAR AVE
SAN MARCOS, CA 92069

S:\Projects\2019\19064_Breakers RE_NEC Mission & Twin Oaks Valley_San Marcos CA\SWQMP\19064_Attachment 2A_HMP Exhibit.dwg

ATTACHMENT 2B:
WMAA EXHIBIT



Potential Critical Coarse Sediment Yield Areas

Carlsbad Watershed - HU 904.00, 211 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT 2C:

NOT INCLUDED

ATTACHMENT 2D:

FLOW CONTROL FACILITY DESIGN &
STRUCTURAL BMP DRAWDOWN CALCULATIONS

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	2020.02.14_Creekside Assisted Living
Site Name:	Creekside Assisted Living
Site Address:	SEC N Twin Oaks Valley & Richmar
City:	San Marcos
Report Date:	2/14/2020
Gage:	ESCONDID
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/12/01

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA-1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C,NatVeg,Flat	1.636
D,NatVeg,Flat	0.738
Pervious Total	2.374
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.374

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA-1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,Urban,Flat	0.009
D,Urban,Moderate	0.021
D,Urban,Steep	0.033
Pervious Total	0.063

Impervious Land Use	acre
IMPERVIOUS-FLAT	0.239
Impervious Total	0.239
Basin Total	0.302

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

DMA-2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C,Urban,Flat	0.011
Pervious Total	0.011

Impervious Land Use	acre
IMPERVIOUS-FLAT	0.288
Impervious Total	0.288
Basin Total	0.299

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 2	Surface Biofilter 2	

DMA-3

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C,Urban,Flat	0.251
C,Urban,Steep	0.007
D,Urban,Flat	0.078
D,Urban,Steep	0.015
Pervious Total	0.351

Impervious Land Use	acre
IMPERVIOUS-FLAT	1.391
Impervious Total	1.391

Basin Total	1.742

Element Flows To:

Surface	Interflow	Groundwater
Vault 2	Vault 2	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length:	58.50 ft.
Bottom Width:	4.98 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	1.5
Material type for second layer:	ESM
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	9.625
Total Outflow (ac-ft.):	9.673
Percent Through Underdrain:	99.51
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2
Vault 1	

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0370	0.0000	0.0000	0.0000
0.0431	0.0365	0.0001	0.0000	0.0000
0.0862	0.0359	0.0002	0.0000	0.0000
0.1292	0.0354	0.0003	0.0000	0.0000
0.1723	0.0348	0.0004	0.0000	0.0000
0.2154	0.0342	0.0005	0.0000	0.0000
0.2585	0.0337	0.0006	0.0000	0.0000
0.3015	0.0331	0.0007	0.0000	0.0000
0.3446	0.0326	0.0009	0.0000	0.0000
0.3877	0.0320	0.0010	0.0000	0.0000
0.4308	0.0315	0.0011	0.0000	0.0000
0.4738	0.0310	0.0013	0.0000	0.0000
0.5169	0.0304	0.0014	0.0000	0.0000
0.5600	0.0299	0.0015	0.0000	0.0000
0.6031	0.0294	0.0017	0.0000	0.0000
0.6462	0.0288	0.0019	0.0000	0.0000
0.6892	0.0283	0.0020	0.0000	0.0000
0.7323	0.0278	0.0022	0.0000	0.0000
0.7754	0.0273	0.0024	0.0000	0.0000
0.8185	0.0267	0.0026	0.0000	0.0000
0.8615	0.0262	0.0028	0.0000	0.0000
0.9046	0.0257	0.0029	0.0000	0.0000
0.9477	0.0252	0.0031	0.0000	0.0000
0.9908	0.0247	0.0034	0.0000	0.0000
1.0338	0.0242	0.0036	0.0000	0.0000
1.0769	0.0237	0.0038	0.0000	0.0000
1.1200	0.0232	0.0040	0.0000	0.0000
1.1631	0.0227	0.0042	0.0000	0.0000
1.2062	0.0222	0.0045	0.0000	0.0000

1.2492	0.0217	0.0047	0.0078	0.0000
1.2923	0.0213	0.0050	0.0088	0.0000
1.3354	0.0208	0.0052	0.0089	0.0000
1.3785	0.0203	0.0055	0.0099	0.0000
1.4215	0.0198	0.0057	0.0111	0.0000
1.4646	0.0194	0.0060	0.0124	0.0000
1.5077	0.0189	0.0063	0.0137	0.0000
1.5508	0.0184	0.0066	0.0151	0.0000
1.5938	0.0180	0.0069	0.0158	0.0000
1.6369	0.0175	0.0072	0.0167	0.0000
1.6800	0.0171	0.0075	0.0182	0.0000
1.7231	0.0166	0.0078	0.0199	0.0000
1.7662	0.0162	0.0082	0.0217	0.0000
1.8092	0.0157	0.0087	0.0236	0.0000
1.8523	0.0153	0.0091	0.0253	0.0000
1.8954	0.0148	0.0096	0.0253	0.0000
1.9385	0.0144	0.0101	0.0488	0.0000
1.9815	0.0140	0.0105	0.0528	0.0000
2.0246	0.0135	0.0110	0.0577	0.0000
2.0677	0.0131	0.0115	0.0618	0.0000
2.1108	0.0127	0.0120	0.0618	0.0000
2.1538	0.0123	0.0126	0.0618	0.0000
2.1969	0.0118	0.0131	0.0618	0.0000
2.2400	0.0114	0.0136	0.0618	0.0000
2.2831	0.0110	0.0142	0.0618	0.0000
2.3262	0.0106	0.0147	0.0618	0.0000
2.3692	0.0102	0.0153	0.0618	0.0000
2.4123	0.0098	0.0159	0.0618	0.0000
2.4554	0.0094	0.0165	0.0618	0.0000
2.4985	0.0090	0.0171	0.0618	0.0000
2.5415	0.0086	0.0177	0.0618	0.0000
2.5846	0.0082	0.0183	0.0618	0.0000
2.6277	0.0078	0.0189	0.0618	0.0000
2.6708	0.0074	0.0196	0.0618	0.0000
2.7138	0.0071	0.0202	0.0618	0.0000
2.7500	0.0067	0.0208	0.0618	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.7500	0.0370	0.0208	0.0000	0.0337	0.0000
2.7931	0.0376	0.0224	0.0000	0.0337	0.0000
2.8362	0.0381	0.0240	0.0000	0.0413	0.0000
2.8792	0.0387	0.0256	0.0000	0.0422	0.0000
2.9223	0.0393	0.0273	0.0000	0.0432	0.0000
2.9654	0.0399	0.0290	0.0000	0.0442	0.0000
3.0085	0.0405	0.0308	0.0000	0.0451	0.0000
3.0515	0.0411	0.0325	0.0000	0.0461	0.0000
3.0946	0.0417	0.0343	0.0000	0.0471	0.0000
3.1377	0.0423	0.0361	0.0000	0.0481	0.0000
3.1808	0.0429	0.0379	0.0000	0.0490	0.0000
3.2238	0.0435	0.0398	0.0000	0.0500	0.0000
3.2669	0.0441	0.0417	0.0000	0.0510	0.0000
3.3100	0.0447	0.0436	0.0000	0.0519	0.0000
3.3531	0.0453	0.0455	0.0000	0.0529	0.0000
3.3962	0.0459	0.0475	0.0000	0.0539	0.0000
3.4392	0.0465	0.0495	0.0000	0.0548	0.0000
3.4823	0.0472	0.0515	0.0000	0.0558	0.0000
3.5254	0.0478	0.0536	0.0000	0.0568	0.0000

3.5685	0.0484	0.0556	0.0000	0.0577	0.0000
3.6115	0.0490	0.0577	0.0000	0.0587	0.0000
3.6546	0.0497	0.0598	0.0000	0.0597	0.0000
3.6977	0.0503	0.0620	0.0000	0.0606	0.0000
3.7408	0.0510	0.0642	0.0000	0.0616	0.0000
3.7838	0.0516	0.0664	0.0660	0.0618	0.0000
3.8269	0.0523	0.0686	0.2257	0.0618	0.0000
3.8700	0.0529	0.0709	0.4367	0.0618	0.0000
3.9131	0.0536	0.0732	0.6819	0.0618	0.0000
3.9200	0.0537	0.0736	0.9459	0.0618	0.0000

Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Biofilter 1

Biofilter 2

Bottom Length:	21.70 ft.
Bottom Width:	18.52 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	1.5
Material type for second layer:	ESM
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	10.511
Total Outflow (ac-ft.):	10.554
Percent Through Underdrain:	99.6
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2
Vault 1	

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0184	0.0000	0.0000	0.0000
0.0431	0.0183	0.0001	0.0000	0.0000
0.0862	0.0181	0.0002	0.0000	0.0000
0.1292	0.0179	0.0004	0.0000	0.0000
0.1723	0.0178	0.0005	0.0000	0.0000
0.2154	0.0176	0.0006	0.0000	0.0000
0.2585	0.0174	0.0007	0.0000	0.0000
0.3015	0.0173	0.0009	0.0000	0.0000
0.3446	0.0171	0.0010	0.0000	0.0000
0.3877	0.0169	0.0011	0.0000	0.0000
0.4308	0.0168	0.0013	0.0000	0.0000
0.4738	0.0166	0.0014	0.0000	0.0000
0.5169	0.0165	0.0015	0.0000	0.0000
0.5600	0.0163	0.0017	0.0000	0.0000
0.6031	0.0162	0.0018	0.0000	0.0000
0.6462	0.0160	0.0020	0.0000	0.0000
0.6892	0.0158	0.0021	0.0000	0.0000
0.7323	0.0157	0.0023	0.0000	0.0000
0.7754	0.0155	0.0024	0.0000	0.0000
0.8185	0.0154	0.0026	0.0000	0.0000
0.8615	0.0152	0.0027	0.0000	0.0000
0.9046	0.0151	0.0029	0.0000	0.0000
0.9477	0.0149	0.0030	0.0000	0.0000
0.9908	0.0148	0.0032	0.0000	0.0000
1.0338	0.0146	0.0033	0.0000	0.0000
1.0769	0.0145	0.0035	0.0000	0.0000
1.1200	0.0143	0.0037	0.0000	0.0000
1.1631	0.0142	0.0038	0.0000	0.0000
1.2062	0.0140	0.0040	0.0000	0.0000
1.2492	0.0139	0.0041	0.0108	0.0000
1.2923	0.0137	0.0043	0.0122	0.0000

1.3354	0.0136	0.0045	0.0123	0.0000
1.3785	0.0134	0.0047	0.0137	0.0000
1.4215	0.0133	0.0048	0.0153	0.0000
1.4646	0.0132	0.0050	0.0171	0.0000
1.5077	0.0130	0.0052	0.0189	0.0000
1.5508	0.0129	0.0054	0.0209	0.0000
1.5938	0.0127	0.0056	0.0218	0.0000
1.6369	0.0126	0.0057	0.0230	0.0000
1.6800	0.0124	0.0059	0.0252	0.0000
1.7231	0.0123	0.0061	0.0275	0.0000
1.7662	0.0122	0.0064	0.0300	0.0000
1.8092	0.0120	0.0066	0.0325	0.0000
1.8523	0.0119	0.0069	0.0349	0.0000
1.8954	0.0118	0.0072	0.0349	0.0000
1.9385	0.0116	0.0074	0.0674	0.0000
1.9815	0.0115	0.0077	0.0729	0.0000
2.0246	0.0114	0.0080	0.0796	0.0000
2.0677	0.0112	0.0083	0.0853	0.0000
2.1108	0.0111	0.0086	0.0853	0.0000
2.1538	0.0110	0.0089	0.0853	0.0000
2.1969	0.0108	0.0091	0.0853	0.0000
2.2400	0.0107	0.0094	0.0853	0.0000
2.2831	0.0106	0.0097	0.0853	0.0000
2.3262	0.0105	0.0100	0.0853	0.0000
2.3692	0.0103	0.0103	0.0853	0.0000
2.4123	0.0102	0.0106	0.0853	0.0000
2.4554	0.0101	0.0109	0.0853	0.0000
2.4985	0.0100	0.0113	0.0853	0.0000
2.5415	0.0098	0.0116	0.0853	0.0000
2.5846	0.0097	0.0119	0.0853	0.0000
2.6277	0.0096	0.0122	0.0853	0.0000
2.6708	0.0095	0.0125	0.0853	0.0000
2.7138	0.0093	0.0129	0.0853	0.0000
2.7500	0.0092	0.0131	0.0853	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.7500	0.0184	0.0131	0.0000	0.0465	0.0000
2.7931	0.0186	0.0139	0.0000	0.0465	0.0000
2.8362	0.0187	0.0147	0.0000	0.0569	0.0000
2.8792	0.0189	0.0155	0.0000	0.0583	0.0000
2.9223	0.0191	0.0164	0.0000	0.0596	0.0000
2.9654	0.0193	0.0172	0.0000	0.0609	0.0000
3.0085	0.0194	0.0180	0.0000	0.0623	0.0000
3.0515	0.0196	0.0189	0.0000	0.0636	0.0000
3.0946	0.0198	0.0197	0.0000	0.0650	0.0000
3.1377	0.0200	0.0206	0.0000	0.0663	0.0000
3.1808	0.0201	0.0214	0.0000	0.0676	0.0000
3.2238	0.0203	0.0223	0.0000	0.0690	0.0000
3.2669	0.0205	0.0232	0.0000	0.0703	0.0000
3.3100	0.0207	0.0241	0.0000	0.0716	0.0000
3.3531	0.0208	0.0250	0.0000	0.0730	0.0000
3.3962	0.0210	0.0259	0.0000	0.0743	0.0000
3.4392	0.0212	0.0268	0.0000	0.0756	0.0000
3.4823	0.0214	0.0277	0.0000	0.0770	0.0000
3.5254	0.0216	0.0286	0.0000	0.0783	0.0000
3.5685	0.0217	0.0295	0.0000	0.0796	0.0000
3.6115	0.0219	0.0305	0.0000	0.0810	0.0000

3.6546	0.0221	0.0314	0.0000	0.0823	0.0000
3.6977	0.0223	0.0324	0.0000	0.0837	0.0000
3.7408	0.0225	0.0333	0.0000	0.0850	0.0000
3.7838	0.0227	0.0343	0.0660	0.0853	0.0000
3.8269	0.0229	0.0353	0.2257	0.0853	0.0000
3.8700	0.0230	0.0363	0.4367	0.0853	0.0000
3.9131	0.0232	0.0373	0.6819	0.0853	0.0000
3.9200	0.0233	0.0374	0.9459	0.0853	0.0000

Surface Biofilter 2

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Biofilter 2

Vault 1

Width: 16 ft.
Length: 80 ft.
Depth: 5 ft.
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 24 in.
Notch Type: Rectangular
Notch Width: 0.750 ft.
Notch Height: 0.250 ft.
Orifice 1 Diameter: 0.685 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.029	0.000	0.000	0.000
0.0556	0.029	0.001	0.003	0.000
0.1111	0.029	0.003	0.004	0.000
0.1667	0.029	0.004	0.005	0.000
0.2222	0.029	0.006	0.006	0.000
0.2778	0.029	0.008	0.006	0.000
0.3333	0.029	0.009	0.007	0.000
0.3889	0.029	0.011	0.007	0.000
0.4444	0.029	0.013	0.008	0.000
0.5000	0.029	0.014	0.009	0.000
0.5556	0.029	0.016	0.009	0.000
0.6111	0.029	0.018	0.010	0.000
0.6667	0.029	0.019	0.010	0.000
0.7222	0.029	0.021	0.010	0.000
0.7778	0.029	0.022	0.011	0.000
0.8333	0.029	0.024	0.011	0.000
0.8889	0.029	0.026	0.012	0.000
0.9444	0.029	0.027	0.012	0.000
1.0000	0.029	0.029	0.012	0.000
1.0556	0.029	0.031	0.013	0.000
1.1111	0.029	0.032	0.013	0.000
1.1667	0.029	0.034	0.013	0.000
1.2222	0.029	0.035	0.014	0.000
1.2778	0.029	0.037	0.014	0.000
1.3333	0.029	0.039	0.014	0.000
1.3889	0.029	0.040	0.015	0.000
1.4444	0.029	0.042	0.015	0.000
1.5000	0.029	0.044	0.015	0.000
1.5556	0.029	0.045	0.015	0.000
1.6111	0.029	0.047	0.016	0.000
1.6667	0.029	0.049	0.016	0.000
1.7222	0.029	0.050	0.016	0.000
1.7778	0.029	0.052	0.017	0.000
1.8333	0.029	0.053	0.017	0.000
1.8889	0.029	0.055	0.017	0.000
1.9444	0.029	0.057	0.017	0.000
2.0000	0.029	0.058	0.018	0.000
2.0556	0.029	0.060	0.018	0.000
2.1111	0.029	0.062	0.018	0.000

2.1667	0.029	0.063	0.018	0.000
2.2222	0.029	0.065	0.019	0.000
2.2778	0.029	0.066	0.019	0.000
2.3333	0.029	0.068	0.019	0.000
2.3889	0.029	0.070	0.019	0.000
2.4444	0.029	0.071	0.019	0.000
2.5000	0.029	0.073	0.020	0.000
2.5556	0.029	0.075	0.020	0.000
2.6111	0.029	0.076	0.020	0.000
2.6667	0.029	0.078	0.020	0.000
2.7222	0.029	0.080	0.021	0.000
2.7778	0.029	0.081	0.021	0.000
2.8333	0.029	0.083	0.021	0.000
2.8889	0.029	0.084	0.021	0.000
2.9444	0.029	0.086	0.021	0.000
3.0000	0.029	0.088	0.022	0.000
3.0556	0.029	0.089	0.022	0.000
3.1111	0.029	0.091	0.022	0.000
3.1667	0.029	0.093	0.022	0.000
3.2222	0.029	0.094	0.022	0.000
3.2778	0.029	0.096	0.023	0.000
3.3333	0.029	0.097	0.023	0.000
3.3889	0.029	0.099	0.023	0.000
3.4444	0.029	0.101	0.023	0.000
3.5000	0.029	0.102	0.023	0.000
3.5556	0.029	0.104	0.024	0.000
3.6111	0.029	0.106	0.024	0.000
3.6667	0.029	0.107	0.024	0.000
3.7222	0.029	0.109	0.024	0.000
3.7778	0.029	0.111	0.024	0.000
3.8333	0.029	0.112	0.024	0.000
3.8889	0.029	0.114	0.025	0.000
3.9444	0.029	0.115	0.025	0.000
4.0000	0.029	0.117	0.025	0.000
4.0556	0.029	0.119	0.025	0.000
4.1111	0.029	0.120	0.025	0.000
4.1667	0.029	0.122	0.026	0.000
4.2222	0.029	0.124	0.026	0.000
4.2778	0.029	0.125	0.037	0.000
4.3333	0.029	0.127	0.086	0.000
4.3889	0.029	0.129	0.155	0.000
4.4444	0.029	0.130	0.241	0.000
4.5000	0.029	0.132	0.339	0.000
4.5556	0.029	0.133	0.617	0.000
4.6111	0.029	0.135	1.124	0.000
4.6667	0.029	0.137	1.778	0.000
4.7222	0.029	0.138	2.545	0.000
4.7778	0.029	0.140	3.399	0.000
4.8333	0.029	0.142	4.319	0.000
4.8889	0.029	0.143	5.280	0.000
4.9444	0.029	0.145	6.257	0.000
5.0000	0.029	0.146	7.228	0.000
5.0556	0.029	0.148	8.167	0.000
5.1111	0.000	0.000	9.052	0.000

Vault 2

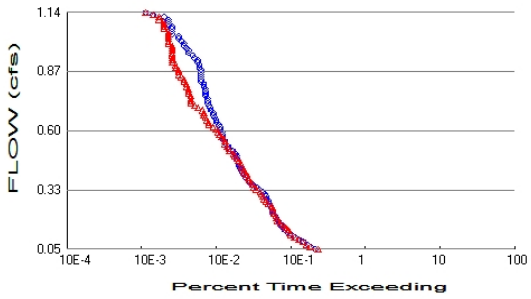
Width: 16 ft.
Length: 76 ft.
Depth: 8 ft.
Discharge Structure
Riser Height: 7.5 ft.
Riser Diameter: 36 in.
Notch Type: Rectangular
Notch Width: 0.330 ft.
Notch Height: 0.830 ft.
Orifice 1 Diameter: 0.65 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

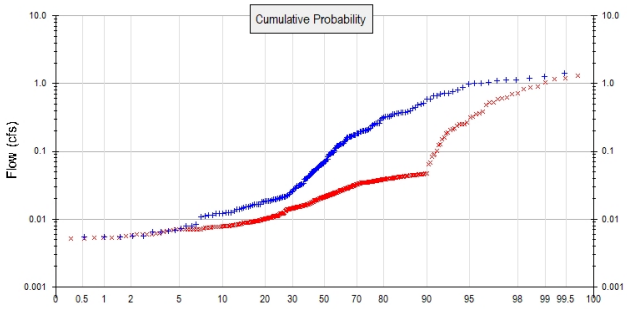
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.027	0.000	0.000	0.000
0.0889	0.027	0.002	0.003	0.000
0.1778	0.027	0.005	0.004	0.000
0.2667	0.027	0.007	0.005	0.000
0.3556	0.027	0.009	0.006	0.000
0.4444	0.027	0.012	0.007	0.000
0.5333	0.027	0.014	0.008	0.000
0.6222	0.027	0.017	0.009	0.000
0.7111	0.027	0.019	0.009	0.000
0.8000	0.027	0.022	0.010	0.000
0.8889	0.027	0.024	0.010	0.000
0.9778	0.027	0.027	0.011	0.000
1.0667	0.027	0.029	0.011	0.000
1.1556	0.027	0.032	0.012	0.000
1.2444	0.027	0.034	0.012	0.000
1.3333	0.027	0.037	0.013	0.000
1.4222	0.027	0.039	0.013	0.000
1.5111	0.027	0.042	0.014	0.000
1.6000	0.027	0.044	0.014	0.000
1.6889	0.027	0.047	0.014	0.000
1.7778	0.027	0.049	0.015	0.000
1.8667	0.027	0.052	0.015	0.000
1.9556	0.027	0.054	0.016	0.000
2.0444	0.027	0.057	0.016	0.000
2.1333	0.027	0.059	0.016	0.000
2.2222	0.027	0.062	0.017	0.000
2.3111	0.027	0.064	0.017	0.000
2.4000	0.027	0.067	0.017	0.000
2.4889	0.027	0.069	0.018	0.000
2.5778	0.027	0.072	0.018	0.000
2.6667	0.027	0.074	0.018	0.000
2.7556	0.027	0.076	0.019	0.000
2.8444	0.027	0.079	0.019	0.000
2.9333	0.027	0.081	0.019	0.000
3.0222	0.027	0.084	0.019	0.000
3.1111	0.027	0.086	0.020	0.000
3.2000	0.027	0.089	0.020	0.000
3.2889	0.027	0.091	0.020	0.000
3.3778	0.027	0.094	0.021	0.000

3.4667	0.027	0.096	0.021	0.000
3.5556	0.027	0.099	0.021	0.000
3.6444	0.027	0.101	0.021	0.000
3.7333	0.027	0.104	0.022	0.000
3.8222	0.027	0.106	0.022	0.000
3.9111	0.027	0.109	0.022	0.000
4.0000	0.027	0.111	0.022	0.000
4.0889	0.027	0.114	0.023	0.000
4.1778	0.027	0.116	0.023	0.000
4.2667	0.027	0.119	0.023	0.000
4.3556	0.027	0.121	0.023	0.000
4.4444	0.027	0.124	0.024	0.000
4.5333	0.027	0.126	0.024	0.000
4.6222	0.027	0.129	0.024	0.000
4.7111	0.027	0.131	0.024	0.000
4.8000	0.027	0.134	0.025	0.000
4.8889	0.027	0.136	0.025	0.000
4.9778	0.027	0.139	0.025	0.000
5.0667	0.027	0.141	0.025	0.000
5.1556	0.027	0.143	0.026	0.000
5.2444	0.027	0.146	0.026	0.000
5.3333	0.027	0.148	0.026	0.000
5.4222	0.027	0.151	0.026	0.000
5.5111	0.027	0.153	0.026	0.000
5.6000	0.027	0.156	0.027	0.000
5.6889	0.027	0.158	0.027	0.000
5.7778	0.027	0.161	0.027	0.000
5.8667	0.027	0.163	0.027	0.000
5.9556	0.027	0.166	0.028	0.000
6.0444	0.027	0.168	0.028	0.000
6.1333	0.027	0.171	0.028	0.000
6.2222	0.027	0.173	0.028	0.000
6.3111	0.027	0.176	0.028	0.000
6.4000	0.027	0.178	0.029	0.000
6.4889	0.027	0.181	0.029	0.000
6.5778	0.027	0.183	0.029	0.000
6.6667	0.027	0.186	0.029	0.000
6.7556	0.027	0.188	0.056	0.000
6.8444	0.027	0.191	0.107	0.000
6.9333	0.027	0.193	0.170	0.000
7.0222	0.027	0.196	0.243	0.000
7.1111	0.027	0.198	0.324	0.000
7.2000	0.027	0.201	0.409	0.000
7.2889	0.027	0.203	0.499	0.000
7.3778	0.027	0.206	0.592	0.000
7.4667	0.027	0.208	0.688	0.000
7.5556	0.027	0.210	1.141	0.000
7.6444	0.027	0.213	2.470	0.000
7.7333	0.027	0.215	4.301	0.000
7.8222	0.027	0.218	6.504	0.000
7.9111	0.027	0.220	8.994	0.000
8.0000	0.027	0.223	11.69	0.000
8.0889	0.027	0.225	14.51	0.000
8.1778	0.000	0.000	17.39	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.374
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.425
Total Impervious Area: 1.918

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.548225
5 year	1.01064
10 year	1.137717
25 year	1.305251

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.293299
5 year	0.713481
10 year	1.033008
25 year	1.218884

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0548	738	814	110	Pass
0.0658	642	638	99	Pass
0.0767	585	565	96	Pass
0.0876	517	507	98	Pass
0.0986	452	448	99	Pass
0.1095	404	395	97	Pass
0.1205	359	354	98	Pass
0.1314	320	337	105	Pass
0.1423	289	320	110	Pass
0.1533	276	299	108	Pass
0.1642	260	279	107	Pass
0.1751	248	253	102	Pass
0.1861	238	235	98	Pass
0.1970	225	224	99	Pass
0.2080	215	220	102	Pass
0.2189	205	210	102	Pass
0.2298	200	203	101	Pass
0.2408	195	201	103	Pass
0.2517	189	194	102	Pass
0.2627	181	174	96	Pass
0.2736	177	164	92	Pass
0.2845	170	155	91	Pass
0.2955	162	148	91	Pass
0.3064	156	142	91	Pass
0.3173	149	136	91	Pass
0.3283	134	120	89	Pass
0.3392	122	113	92	Pass
0.3502	107	107	100	Pass
0.3611	99	104	105	Pass
0.3720	94	97	103	Pass
0.3830	86	94	109	Pass
0.3939	82	89	108	Pass
0.4048	79	83	105	Pass
0.4158	77	83	107	Pass
0.4267	74	80	108	Pass
0.4377	71	77	108	Pass
0.4486	70	74	105	Pass
0.4595	68	69	101	Pass
0.4705	67	66	98	Pass
0.4814	66	62	93	Pass
0.4924	64	60	93	Pass
0.5033	59	53	89	Pass
0.5142	52	52	100	Pass
0.5252	51	49	96	Pass
0.5361	47	46	97	Pass
0.5470	46	46	100	Pass
0.5580	43	45	104	Pass
0.5689	43	41	95	Pass
0.5799	42	39	92	Pass
0.5908	42	37	88	Pass
0.6017	40	35	87	Pass
0.6127	40	32	80	Pass
0.6236	38	28	73	Pass

0.6346	36	28	77	Pass
0.6455	35	26	74	Pass
0.6564	33	25	75	Pass
0.6674	32	24	75	Pass
0.6783	32	24	75	Pass
0.6892	30	23	76	Pass
0.7002	29	20	68	Pass
0.7111	28	18	64	Pass
0.7221	27	16	59	Pass
0.7330	27	16	59	Pass
0.7439	27	16	59	Pass
0.7549	25	16	64	Pass
0.7658	25	15	60	Pass
0.7768	25	15	60	Pass
0.7877	25	15	60	Pass
0.7986	24	14	58	Pass
0.8096	24	14	58	Pass
0.8205	22	13	59	Pass
0.8314	22	13	59	Pass
0.8424	22	12	54	Pass
0.8533	22	11	50	Pass
0.8643	22	11	50	Pass
0.8752	22	11	50	Pass
0.8861	21	10	47	Pass
0.8971	21	10	47	Pass
0.9080	20	9	45	Pass
0.9190	20	9	45	Pass
0.9299	18	9	50	Pass
0.9408	17	9	52	Pass
0.9518	15	9	60	Pass
0.9627	15	9	60	Pass
0.9736	14	9	64	Pass
0.9846	13	9	69	Pass
0.9955	13	8	61	Pass
1.0065	12	8	66	Pass
1.0174	11	8	72	Pass
1.0283	11	8	72	Pass
1.0393	9	8	88	Pass
1.0502	9	8	88	Pass
1.0611	9	7	77	Pass
1.0721	9	7	77	Pass
1.0830	8	7	87	Pass
1.0940	8	7	87	Pass
1.1049	8	6	75	Pass
1.1158	7	6	85	Pass
1.1268	5	5	100	Pass
1.1377	4	4	100	Pass

Water Quality

Drawdown Time Results

Pond: Vault 2

Days	Stage(feet)	Percent of Total Run Time
1	0.674	7.6676
2	1.519	5.1035
3	2.677	3.1394
4	4.147	1.6150
5	5.928	0.6599

Maximum Stage: 7.500 Drawdown Time: 05 00:00:10

Model Default Modifications

Total of 0 changes have been made.

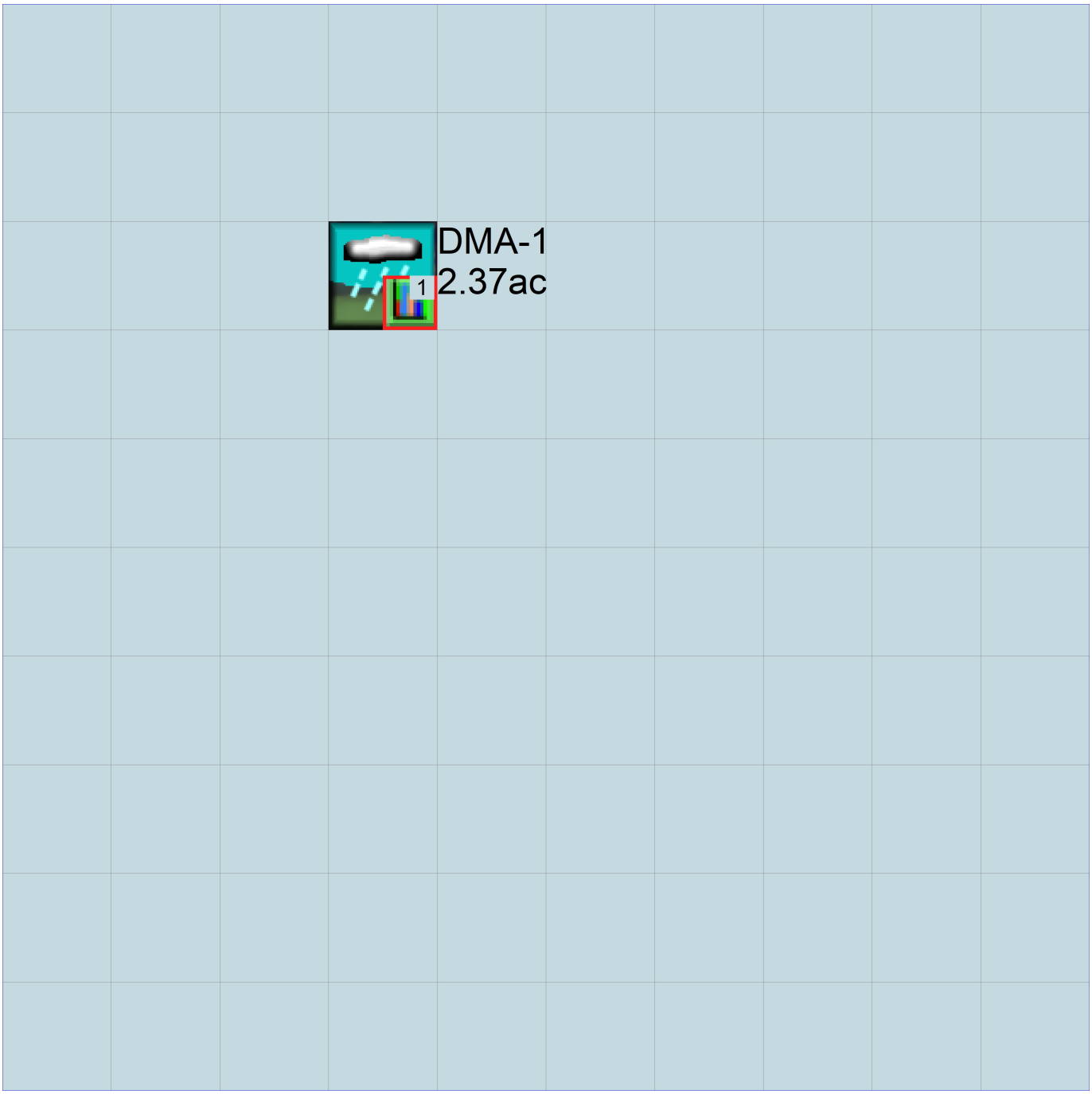
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01         END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2020.02.14_Creekside Assisted Living.wdm
MESSU       25   Pre2020.02.14_Creekside Assisted Living.MES
            27   Pre2020.02.14_Creekside Assisted Living.L61
            28   Pre2020.02.14_Creekside Assisted Living.L62
            30   POC2020.02.14_Creekside Assisted Living1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      19
      PERLND      28
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        DMA-1                       MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   19      C,NatVeg,Flat          1    1    1    1   27    0
   28      D,NatVeg,Flat          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   19          0    0    1    0    0    0    0    0    0    0    0    0
   28          0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   19         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   28         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   19         0    1    1    1    0    0    0    0    1    1    0
   28         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   19              0       3.8     0.035       100      0.05       2.5     0.915
   28              0       3.3      0.03       100      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   19              0         0         2         2         0      0.05      0.05
   28              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   19              0       0.6      0.04         1       0.3         0
   28              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   19       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   28       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   19       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   28       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   19              0         0      0.01         0       0.4      0.01          0
   28              0         0      0.01         0       0.4      0.01          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA-1***
PERLND  19                       1.636     COPY   501     12
PERLND  19                       1.636     COPY   501     13
PERLND  28                       0.738     COPY   501     12
PERLND  28                       0.738     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1
```

```
  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2020.02.14_Creekside Assisted Living.wdm
MESSU       25   Mit2020.02.14_Creekside Assisted Living.MES
            27   Mit2020.02.14_Creekside Assisted Living.L61
            28   Mit2020.02.14_Creekside Assisted Living.L62
            30   POC2020.02.14_Creekside Assisted Living1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND       46
      PERLND       47
      PERLND       48
      IMPLND        1
      PERLND       43
      PERLND       45
      RCHRES        1
      RCHRES        2
      RCHRES        3
      RCHRES        4
      RCHRES        5
      RCHRES        6
      COPY          1
      COPY        501
      COPY        601
      DISPLY        1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  2                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  601          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   46      D,Urban,Flat           1    1    1    1   27    0
   47      D,Urban,Moderate       1    1    1    1   27    0
```

```
 48      D,Urban,Steep          1    1    1    1   27    0
 43      C,Urban,Flat           1    1    1    1   27    0
 45      C,Urban,Steep          1    1    1    1   27    0
END GEN-INFO
*** Section PWATER***

ACTIVITY
  <PLS > ************* Active Sections ******************************
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 46         0    0    1    0    0    0    0    0    0    0    0    0
 47         0    0    1    0    0    0    0    0    0    0    0    0
 48         0    0    1    0    0    0    0    0    0    0    0    0
 43         0    0    1    0    0    0    0    0    0    0    0    0
 45         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags **************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 47         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 48         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 46         0    1    1    1    0    0    0    0    1    1    0
 47         0    1    1    1    0    0    0    0    1    1    0
 48         0    1    1    1    0    0    0    0    1    1    0
 43         0    1    1    1    0    0    0    0    1    1    0
 45         0    1    1    1    0    0    0    0    1    1    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 46              0       3.8      0.03        50      0.05       2.5     0.915
 47              0       3.5     0.025        50       0.1       2.5     0.915
 48              0       3.2      0.02        50      0.15       2.5     0.915
 43              0       3.8      0.04        50      0.05       2.5     0.915
 45              0       3.2      0.03        50      0.15       2.5     0.915
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 46              0         0         2         2         0      0.05      0.05
 47              0         0         2         2         0      0.05      0.05
 48              0         0         2         2         0      0.05      0.05
 43              0         0         2         2         0      0.05      0.05
 45              0         0         2         2         0      0.05      0.05
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                              ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 46              0       0.6      0.03         1       0.3         0
 47              0       0.6      0.03         1       0.3         0
 48              0       0.6      0.03         1       0.3         0
 43              0       0.6      0.03         1       0.3         0
 45              0       0.6      0.03         1       0.3         0
END PWAT-PARM4
MON-LZETPARM
  <PLS >      PWATER input info: Part 3         ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
 47       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
 48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
```

```
   43       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   45       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   47       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   43       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   45       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   46             0         0      0.15         0         1      0.05         0
   47             0         0      0.15         0         1      0.05         0
   48             0         0      0.15         0         1      0.05         0
   43             0         0      0.15         0         1      0.05         0
   45             0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      IMPERVIOUS-FLAT        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1               0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA-1***
PERLND  46                       0.009     RCHRES   1      2
PERLND  46                       0.009     RCHRES   1      3
PERLND  47                       0.021     RCHRES   1      2
PERLND  47                       0.021     RCHRES   1      3
PERLND  48                       0.033     RCHRES   1      2
PERLND  48                       0.033     RCHRES   1      3
IMPLND   1                       0.239     RCHRES   1      5
DMA-2***
PERLND  43                       0.011     RCHRES   3      2
PERLND  43                       0.011     RCHRES   3      3
IMPLND   1                       0.288     RCHRES   3      5
DMA-3***
PERLND  43                       0.251     RCHRES   5      2
PERLND  43                       0.251     RCHRES   5      3
PERLND  45                       0.007     RCHRES   5      2
PERLND  45                       0.007     RCHRES   5      3
PERLND  46                       0.078     RCHRES   5      2
PERLND  46                       0.078     RCHRES   5      3
PERLND  48                       0.015     RCHRES   5      2
PERLND  48                       0.015     RCHRES   5      3
IMPLND   1                       1.391     RCHRES   5      5

******Routing******
PERLND  43                       0.251     COPY     1     12
PERLND  45                       0.007     COPY     1     12
PERLND  46                       0.078     COPY     1     12
PERLND  48                       0.015     COPY     1     12
IMPLND   1                       1.391     COPY     1     15
PERLND  43                       0.251     COPY     1     13
PERLND  45                       0.007     COPY     1     13
PERLND  46                       0.078     COPY     1     13
PERLND  48                       0.015     COPY     1     13
RCHRES   2                           1     RCHRES   6      6
RCHRES   2                                 COPY     1     16
RCHRES   1                           1     RCHRES   6      7
RCHRES   1                                 COPY     1     17
RCHRES   1                           1     RCHRES   2      8
RCHRES   4                           1     RCHRES   6      6
RCHRES   4                                 COPY     1     16
RCHRES   3                           1     RCHRES   6      7
RCHRES   3                                 COPY     1     17
RCHRES   3                           1     RCHRES   4      8
RCHRES   6                           1     COPY   501     16
RCHRES   5                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Surface Biofilte-009    2    1    1    1   28    0    1
```

```
    2     Biofilter  1            1    1    1    1   28    0    1
    3     Surface Biofilte-011    2    1    1    1   28    0    1
    4     Biofilter  2            1    1    1    1   28    0    1
    5     Vault  2                1    1    1    1   28    0    1
    6     Vault  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
    2       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
    3       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
    4       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
    5       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
    6       0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR       KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.0       0.0
    2              2      0.01       0.0       0.0       0.0       0.0
    3              3      0.01       0.0       0.0       0.0       0.0
    4              4      0.01       0.0       0.0       0.0       0.0
    5              5      0.01       0.0       0.0       0.5       0.0
    6              6      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
```

FTABLE 2
65 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.036983	0.000000	0.000000		
0.043077	0.036504	0.000089	0.000000		
0.086154	0.035936	0.000183	0.000000		
0.129231	0.035370	0.000281	0.000000		
0.172308	0.034808	0.000385	0.000000		
0.215385	0.034249	0.000494	0.000000		
0.258462	0.033693	0.000608	0.000000		
0.301538	0.033140	0.000727	0.000000		
0.344615	0.032590	0.000851	0.000000		
0.387692	0.032043	0.000980	0.000000		
0.430769	0.031499	0.001114	0.000000		
0.473846	0.030959	0.001254	0.000000		
0.516923	0.030421	0.001399	0.000000		
0.560000	0.029886	0.001549	0.000000		
0.603077	0.029355	0.001705	0.000000		
0.646154	0.028826	0.001866	0.000000		
0.689231	0.028301	0.002033	0.000000		
0.732308	0.027779	0.002205	0.000000		
0.775385	0.027259	0.002383	0.000000		
0.818462	0.026743	0.002566	0.000000		
0.861538	0.026230	0.002755	0.000000		
0.904615	0.025720	0.002950	0.000000		
0.947692	0.025213	0.003150	0.000000		
0.990769	0.024709	0.003356	0.000000		
1.033846	0.024208	0.003568	0.000000		
1.076923	0.023710	0.003785	0.000000		
1.120000	0.023215	0.004009	0.000000		
1.163077	0.022724	0.004238	0.000000		
1.206154	0.022235	0.004473	0.000000		
1.249231	0.021750	0.004714	0.007826		
1.292308	0.021267	0.004962	0.008846		
1.335385	0.020788	0.005215	0.008904		
1.378462	0.020311	0.005475	0.009942		
1.421538	0.019838	0.005740	0.011118		
1.464615	0.019368	0.006012	0.012376		
1.507692	0.018901	0.006290	0.013716		
1.550769	0.018437	0.006574	0.015140		
1.593846	0.017976	0.006864	0.015805		
1.636923	0.017518	0.007161	0.016651		
1.680000	0.017063	0.007465	0.018249		
1.723077	0.016611	0.007774	0.019935		
1.766154	0.016162	0.008211	0.021712		
1.809231	0.015717	0.008658	0.023579		
1.852308	0.015274	0.009113	0.025321		
1.895385	0.014835	0.009577	0.025321		
1.938462	0.014398	0.010051	0.048831		
1.981538	0.013965	0.010533	0.052821		
2.024615	0.013534	0.011025	0.057728		
2.067692	0.013107	0.011527	0.061818		
2.110769	0.012683	0.012037	0.061818		
2.153846	0.012262	0.012557	0.061818		
2.196923	0.011844	0.013087	0.061818		
2.240000	0.011429	0.013626	0.061818		
2.283077	0.011017	0.014175	0.061818		
2.326154	0.010608	0.014733	0.061818		
2.369231	0.010202	0.015301	0.061818		
2.412308	0.009799	0.015879	0.061818		
2.455385	0.009400	0.016466	0.061818		
2.498462	0.009003	0.017063	0.061818		
2.541538	0.008610	0.017671	0.061818		
2.584615	0.008219	0.018288	0.061818		
2.627692	0.007832	0.018915	0.061818		
2.670769	0.007447	0.019553	0.061818		
2.713846	0.007066	0.020200	0.061818		
2.750000	0.006688	0.025860	0.061818		

END FTABLE 2

FTABLE 1
29 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.006688	0.000000	0.000000	0.000000		
0.043077	0.037557	0.001605	0.000000	0.033719		
0.086154	0.038135	0.003236	0.000000	0.041275		
0.129231	0.038715	0.004891	0.000000	0.042244		
0.172308	0.039298	0.006571	0.000000	0.043212		
0.215385	0.039884	0.008277	0.000000	0.044180		
0.258462	0.040473	0.010008	0.000000	0.045149		
0.301538	0.041066	0.011764	0.000000	0.046117		
0.344615	0.041661	0.013546	0.000000	0.047085		
0.387692	0.042260	0.015353	0.000000	0.048054		
0.430769	0.042861	0.017186	0.000000	0.049022		
0.473846	0.043466	0.019046	0.000000	0.049990		
0.516923	0.044074	0.020931	0.000000	0.050959		
0.560000	0.044685	0.022843	0.000000	0.051927		
0.603077	0.045298	0.024781	0.000000	0.052895		
0.646154	0.045915	0.026746	0.000000	0.053864		
0.689231	0.046535	0.028737	0.000000	0.054832		
0.732308	0.047158	0.030755	0.000000	0.055800		
0.775385	0.047785	0.032800	0.000000	0.056769		
0.818462	0.048414	0.034872	0.000000	0.057737		
0.861538	0.049046	0.036971	0.000000	0.058705		
0.904615	0.049681	0.039097	0.000000	0.059674		
0.947692	0.050320	0.041251	0.000000	0.060642		
0.990769	0.050961	0.043433	0.000000	0.061610		
1.033846	0.051606	0.045642	0.066034	0.061818		
1.076923	0.052253	0.047879	0.225672	0.061818		
1.120000	0.052904	0.050144	0.436694	0.061818		
1.163077	0.053558	0.052437	0.681932	0.061818		
1.170000	0.053663	0.052808	0.945945	0.061818		

END FTABLE 1
FTABLE 4
65 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.018406	0.000000	0.000000		
0.043077	0.018265	0.000120	0.000000		
0.086154	0.018098	0.000242	0.000000		
0.129231	0.017931	0.000365	0.000000		
0.172308	0.017766	0.000489	0.000000		
0.215385	0.017601	0.000616	0.000000		
0.258462	0.017436	0.000743	0.000000		
0.301538	0.017273	0.000873	0.000000		
0.344615	0.017110	0.001004	0.000000		
0.387692	0.016948	0.001137	0.000000		
0.430769	0.016787	0.001271	0.000000		
0.473846	0.016627	0.001407	0.000000		
0.516923	0.016467	0.001545	0.000000		
0.560000	0.016309	0.001684	0.000000		
0.603077	0.016151	0.001825	0.000000		
0.646154	0.015993	0.001967	0.000000		
0.689231	0.015837	0.002112	0.000000		
0.732308	0.015681	0.002258	0.000000		
0.775385	0.015526	0.002406	0.000000		
0.818462	0.015372	0.002555	0.000000		
0.861538	0.015218	0.002706	0.000000		
0.904615	0.015066	0.002859	0.000000		
0.947692	0.014914	0.003014	0.000000		
0.990769	0.014763	0.003170	0.000000		
1.033846	0.014612	0.003328	0.000000		
1.076923	0.014463	0.003488	0.000000		
1.120000	0.014314	0.003650	0.000000		
1.163077	0.014166	0.003814	0.000000		
1.206154	0.014018	0.003979	0.000000		
1.249231	0.013872	0.004146	0.010796		
1.292308	0.013726	0.004315	0.012202		
1.335385	0.013581	0.004486	0.012283		

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1.378462  0.013437  0.004659  0.013715
1.421538  0.013293  0.004834  0.015338
1.464615  0.013151  0.005010  0.017072
1.507692  0.013009  0.005188  0.018921
1.550769  0.012868  0.005369  0.020886
1.593846  0.012727  0.005551  0.021803
1.636923  0.012588  0.005735  0.022969
1.680000  0.012449  0.005921  0.025173
1.723077  0.012311  0.006108  0.027500
1.766154  0.012173  0.006371  0.029951
1.809231  0.012037  0.006636  0.032527
1.852308  0.011901  0.006904  0.034930
1.895385  0.011766  0.007175  0.034930
1.938462  0.011632  0.007448  0.067362
1.981538  0.011498  0.007725  0.072866
2.024615  0.011365  0.008004  0.079635
2.067692  0.011233  0.008285  0.085276
2.110769  0.011102  0.008570  0.085276
2.153846  0.010972  0.008857  0.085276
2.196923  0.010842  0.009147  0.085276
2.240000  0.010713  0.009440  0.085276
2.283077  0.010585  0.009736  0.085276
2.326154  0.010458  0.010035  0.085276
2.369231  0.010331  0.010336  0.085276
2.412308  0.010205  0.010641  0.085276
2.455385  0.010080  0.010948  0.085276
2.498462  0.009956  0.011258  0.085276
2.541538  0.009832  0.011571  0.085276
2.584615  0.009709  0.011888  0.085276
2.627692  0.009587  0.012207  0.085276
2.670769  0.009466  0.012529  0.085276
2.713846  0.009346  0.012854  0.085276
2.750000  0.009226  0.020176  0.085276
END FTABLE  4
FTABLE      3
 29    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.009226  0.000000  0.000000  0.000000
0.043077  0.018575  0.000797  0.000000  0.046514
0.086154  0.018744  0.001600  0.000000  0.056938
0.129231  0.018914  0.002411  0.000000  0.058274
0.172308  0.019085  0.003230  0.000000  0.059610
0.215385  0.019257  0.004056  0.000000  0.060946
0.258462  0.019429  0.004889  0.000000  0.062282
0.301538  0.019603  0.005730  0.000000  0.063617
0.344615  0.019777  0.006578  0.000000  0.064953
0.387692  0.019951  0.007433  0.000000  0.066289
0.430769  0.020127  0.008297  0.000000  0.067625
0.473846  0.020303  0.009167  0.000000  0.068961
0.516923  0.020480  0.010046  0.000000  0.070296
0.560000  0.020658  0.010932  0.000000  0.071632
0.603077  0.020837  0.011826  0.000000  0.072968
0.646154  0.021016  0.012727  0.000000  0.074304
0.689231  0.021196  0.013636  0.000000  0.075640
0.732308  0.021377  0.014553  0.000000  0.076975
0.775385  0.021559  0.015478  0.000000  0.078311
0.818462  0.021742  0.016411  0.000000  0.079647
0.861538  0.021925  0.017351  0.000000  0.080983
0.904615  0.022109  0.018300  0.000000  0.082319
0.947692  0.022293  0.019256  0.000000  0.083654
0.990769  0.022479  0.020220  0.000000  0.084990
1.033846  0.022665  0.021193  0.066034  0.085276
1.076923  0.022852  0.022173  0.225672  0.085276
1.120000  0.023040  0.023162  0.436694  0.085276
1.163077  0.023229  0.024158  0.681932  0.085276
1.170000  0.023259  0.024319  0.945945  0.085276
END FTABLE  3
FTABLE      6
 92    4
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Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.029385	0.000000	0.000000		
0.055556	0.029385	0.001632	0.003001		
0.111111	0.029385	0.003265	0.004244		
0.166667	0.029385	0.004897	0.005198		
0.222222	0.029385	0.006530	0.006003		
0.277778	0.029385	0.008162	0.006711		
0.333333	0.029385	0.009795	0.007352		
0.388889	0.029385	0.011427	0.007941		
0.444444	0.029385	0.013060	0.008489		
0.500000	0.029385	0.014692	0.009004		
0.555556	0.029385	0.016325	0.009491		
0.611111	0.029385	0.017957	0.009954		
0.666667	0.029385	0.019590	0.010397		
0.722222	0.029385	0.021222	0.010821		
0.777778	0.029385	0.022855	0.011230		
0.833333	0.029385	0.024487	0.011624		
0.888889	0.029385	0.026120	0.012005		
0.944444	0.029385	0.027752	0.012375		
1.000000	0.029385	0.029385	0.012733		
1.055556	0.029385	0.031017	0.013082		
1.111111	0.029385	0.032650	0.013422		
1.166667	0.029385	0.034282	0.013754		
1.222222	0.029385	0.035915	0.014077		
1.277778	0.029385	0.037547	0.014394		
1.333333	0.029385	0.039180	0.014703		
1.388889	0.029385	0.040812	0.015006		
1.444444	0.029385	0.042445	0.015303		
1.500000	0.029385	0.044077	0.015595		
1.555556	0.029385	0.045710	0.015881		
1.611111	0.029385	0.047342	0.016162		
1.666667	0.029385	0.048975	0.016439		
1.722222	0.029385	0.050607	0.016710		
1.777778	0.029385	0.052240	0.016978		
1.833333	0.029385	0.053872	0.017241		
1.888889	0.029385	0.055505	0.017500		
1.944444	0.029385	0.057137	0.017756		
2.000000	0.029385	0.058770	0.018008		
2.055556	0.029385	0.060402	0.018256		
2.111111	0.029385	0.062034	0.018501		
2.166667	0.029385	0.063667	0.018743		
2.222222	0.029385	0.065299	0.018982		
2.277778	0.029385	0.066932	0.019217		
2.333333	0.029385	0.068564	0.019450		
2.388889	0.029385	0.070197	0.019681		
2.444444	0.029385	0.071829	0.019908		
2.500000	0.029385	0.073462	0.020133		
2.555556	0.029385	0.075094	0.020356		
2.611111	0.029385	0.076727	0.020576		
2.666667	0.029385	0.078359	0.020793		
2.722222	0.029385	0.079992	0.021009		
2.777778	0.029385	0.081624	0.021222		
2.833333	0.029385	0.083257	0.021433		
2.888889	0.029385	0.084889	0.021642		
2.944444	0.029385	0.086522	0.021850		
3.000000	0.029385	0.088154	0.022055		
3.055556	0.029385	0.089787	0.022258		
3.111111	0.029385	0.091419	0.022459		
3.166667	0.029385	0.093052	0.022659		
3.222222	0.029385	0.094684	0.022857		
3.277778	0.029385	0.096317	0.023053		
3.333333	0.029385	0.097949	0.023248		
3.388889	0.029385	0.099582	0.023441		
3.444444	0.029385	0.101214	0.023632		
3.500000	0.029385	0.102847	0.023822		
3.555556	0.029385	0.104479	0.024010		
3.611111	0.029385	0.106112	0.024197		
3.666667	0.029385	0.107744	0.024382		
3.722222	0.029385	0.109377	0.024566		

```
3.777778  0.029385  0.111009  0.024749
3.833333  0.029385  0.112642  0.024930
3.888889  0.029385  0.114274  0.025110
3.944444  0.029385  0.115907  0.025289
4.000000  0.029385  0.117539  0.025467
4.055556  0.029385  0.119172  0.025643
4.111111  0.029385  0.120804  0.025818
4.166667  0.029385  0.122436  0.025992
4.222222  0.029385  0.124069  0.026164
4.277778  0.029385  0.125701  0.037898
4.333333  0.029385  0.127334  0.086587
4.388889  0.029385  0.128966  0.155948
4.444444  0.029385  0.130599  0.240985
4.500000  0.029385  0.132231  0.339199
4.555556  0.029385  0.133864  0.617161
4.611111  0.029385  0.135496  1.124299
4.666667  0.029385  0.137129  1.778186
4.722222  0.029385  0.138761  2.545119
4.777778  0.029385  0.140394  3.399949
4.833333  0.029385  0.142026  4.319393
4.888889  0.029385  0.143659  5.280009
4.944444  0.029385  0.145291  6.257740
5.000000  0.029385  0.146924  7.228192
5.055556  0.029385  0.148556  8.167367
END FTABLE  6
FTABLE      5
 92    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.027916  0.000000  0.000000
0.088889  0.027916  0.002481  0.003418
0.177778  0.027916  0.004963  0.004834
0.266667  0.027916  0.007444  0.005921
0.355556  0.027916  0.009926  0.006837
0.444444  0.027916  0.012407  0.007644
0.533333  0.027916  0.014888  0.008373
0.622222  0.027916  0.017370  0.009044
0.711111  0.027916  0.019851  0.009668
0.800000  0.027916  0.022332  0.010255
0.888889  0.027916  0.024814  0.010810
0.977778  0.027916  0.027295  0.011337
1.066667  0.027916  0.029777  0.011841
1.155556  0.027916  0.032258  0.012325
1.244444  0.027916  0.034739  0.012790
1.333333  0.027916  0.037221  0.013239
1.422222  0.027916  0.039702  0.013673
1.511111  0.027916  0.042183  0.014094
1.600000  0.027916  0.044665  0.014503
1.688889  0.027916  0.047146  0.014900
1.777778  0.027916  0.049628  0.015287
1.866667  0.027916  0.052109  0.015665
1.955556  0.027916  0.054590  0.016033
2.044444  0.027916  0.057072  0.016394
2.133333  0.027916  0.059553  0.016746
2.222222  0.027916  0.062034  0.017091
2.311111  0.027916  0.064516  0.017430
2.400000  0.027916  0.066997  0.017762
2.488889  0.027916  0.069479  0.018088
2.577778  0.027916  0.071960  0.018408
2.666667  0.027916  0.074441  0.018723
2.755556  0.027916  0.076923  0.019032
2.844444  0.027916  0.079404  0.019337
2.933333  0.027916  0.081886  0.019637
3.022222  0.027916  0.084367  0.019932
3.111111  0.027916  0.086848  0.020223
3.200000  0.027916  0.089330  0.020510
3.288889  0.027916  0.091811  0.020793
3.377778  0.027916  0.094292  0.021072
3.466667  0.027916  0.096774  0.021347
3.555556  0.027916  0.099255  0.021619
```

```
  3.644444  0.027916  0.101737  0.021888
  3.733333  0.027916  0.104218  0.022153
  3.822222  0.027916  0.106699  0.022415
  3.911111  0.027916  0.109181  0.022674
  4.000000  0.027916  0.111662  0.022931
  4.088889  0.027916  0.114143  0.023184
  4.177778  0.027916  0.116625  0.023435
  4.266667  0.027916  0.119106  0.023683
  4.355556  0.027916  0.121588  0.023928
  4.444444  0.027916  0.124069  0.024171
  4.533333  0.027916  0.126550  0.024411
  4.622222  0.027916  0.129032  0.024650
  4.711111  0.027916  0.131513  0.024886
  4.800000  0.027916  0.133994  0.025119
  4.888889  0.027916  0.136476  0.025351
  4.977778  0.027916  0.138957  0.025580
  5.066667  0.027916  0.141439  0.025808
  5.155556  0.027916  0.143920  0.026033
  5.244444  0.027916  0.146401  0.026256
  5.333333  0.027916  0.148883  0.026478
  5.422222  0.027916  0.151364  0.026698
  5.511111  0.027916  0.153846  0.026916
  5.600000  0.027916  0.156327  0.027132
  5.688889  0.027916  0.158808  0.027346
  5.777778  0.027916  0.161290  0.027559
  5.866667  0.027916  0.163771  0.027770
  5.955556  0.027916  0.166252  0.027980
  6.044444  0.027916  0.168734  0.028188
  6.133333  0.027916  0.171215  0.028394
  6.222222  0.027916  0.173697  0.028599
  6.311111  0.027916  0.176178  0.028803
  6.400000  0.027916  0.178659  0.029005
  6.488889  0.027916  0.181141  0.029206
  6.577778  0.027916  0.183622  0.029405
  6.666667  0.027916  0.186103  0.029603
  6.755556  0.027916  0.188585  0.056829
  6.844444  0.027916  0.191066  0.107267
  6.933333  0.027916  0.193548  0.170865
  7.022222  0.027916  0.196029  0.243912
  7.111111  0.027916  0.198510  0.324115
  7.200000  0.027916  0.200992  0.409826
  7.288889  0.027916  0.203473  0.499758
  7.377778  0.027916  0.205954  0.592857
  7.466667  0.027916  0.208436  0.688226
  7.555556  0.027916  0.210917  1.141381
  7.644444  0.027916  0.213399  2.470183
  7.733333  0.027916  0.215880  4.301268
  7.822222  0.027916  0.218361  6.504921
  7.911111  0.027916  0.220843  8.994175
  8.000000  0.027916  0.223324  11.69086
  8.088889  0.027916  0.225806  14.51661
  END FTABLE  5
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  47     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  43     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
```

```
WDM      1 EVAP     ENGL    0.5             RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   4     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   #  <Name>    tem strg strg***
RCHRES   6 HYDR   RO     1 1         1     WDM   1012 FLOW     ENGL      REPL
RCHRES   6 HYDR   STAGE  1 1         1     WDM   1015 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1      12.1     WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1      12.1     WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1      12.1     WDM    901 FLOW     ENGL      REPL
RCHRES   5 HYDR   RO     1 1         1     WDM   1016 FLOW     ENGL      REPL
RCHRES   5 HYDR   STAGE  1 1         1     WDM   1017 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1985/ 1/31 24: 0

RCHRES :    3

RELERR       STORS        STOR       MATIN      MATDIF
-0.00612     0.00000  0.0000E+00     0.00000  9.0853E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1999/ 1/31 24: 0

RCHRES :    3

RELERR       STORS        STOR       MATIN      MATDIF
-2.970E-03     0.00000  0.0000E+00     0.00000  4.9322E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

DATE/TIME: 1999/ 3/31 24: 0

RCHRES : 3

RELERR	STORS	STOR	MATIN	MATDIF
-4.252E-03	0.00000	0.0000E+00	0.00000	1.1715E-11

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

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ATTACHMENT 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☒ Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

☒ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

- ☒ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

☐ **Final Design level submittal:**

Attachment 3a must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the [City Engineer] to obtain the current maintenance agreement forms).

Summary of BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Biofiltration Basin BMP No. 1 BMP No. 2	Project Owner	Inspect for and remove accumulated trash, sediment, and debris as necessary. Inspect for poor vegetation establishment or erosion, and overgrown vegetation. Inspect for standing water and repair or de-clog as needed.	Maintain at least once per year. Inspect at least twice per year, prior to start of rainy season (Oct. 1st) and after significant storm events.
Underground Detention Vault BMP No. 3 BMP No. 4	Project Owner	Inspect for and remove accumulated trash, sediment, and debris as necessary. Clear obstructions if standing water or inlet clogged.	Maintain at least once per year. Inspect at least twice per year, prior to start of rainy season (Oct. 1st) and after significant storm events.
Modular Wetland System BMP No. 5	Project Owner	Inspect for and remove accumulated trash, sediment, and debris as necessary. Clear obstructions if standing water or inlet clogged.	Maintain at least once per year. Inspect at least twice per year, prior to start of rainy season (Oct. 1st) and after significant storm events.

ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☒ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☒ Details and specifications for construction of structural BMP(s)
- ☒ Signage indicating the location and boundary of structural BMP(s) as required by the [City Engineer]
- ☒ How to access the structural BMP(s) to inspect and perform maintenance
- ☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☒ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☒ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☒ Recommended equipment to perform maintenance
- ☒ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- ☒ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- ☒ All BMPs must be fully dimensioned on the plans
- ☒ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.

BMP ID #	BMP TYPE	SYMBOL	CASQA NO.	QUANTITY	DRAWING NO.	SHEET NO.(S)	INSPECTION* FREQUENCY	MAINTENANCE* FREQUENCY
HYDROMODIFICATION & TREATMENT CONTROL								
1	BIOFILTRATION AREA		TC-32	291 SF	TBD	TBD	SEMI-ANNUALLY	ANNUALLY
2	BIOFILTRATION AREA		TC-32	402 SF	TBD	TBD	SEMI-ANNUALLY	ANNUALLY
HYDROMODIFICATION								
3	DETENTION VAULT		MP-50	1,280 SF	TBD	TBD	SEMI-ANNUALLY	ANNUALLY
4	DETENTION VAULT		MP-50	1,216 SF	TBD	TBD	SEMI-ANNUALLY	ANNUALLY
TREATMENT CONTROL								
5	BIOFILTRATION: MODULAR WETLAND SYSTEM (MWS)		BF-3	1 EA.	TBD	TBD	SEMI-ANNUALLY	ANNUALLY
LOW IMPACT DESIGN (L.I.D.)								
6	LANDSCAPE W/ NATIVE/DROUGHT TOLERANT SPECIES		SD-10	19,875 SF	TBD	TBD	WEEKLY	WEEKLY
SOURCE CONTROL								
7	INLET STENCIL/ SIGNAGE		SD-13	30 EA.	TBD	TBD	AS-NEEDED	AS-NEEDED

20 0 20 40

GRAPHIC SCALE
SCALE: 1" = 20'

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SOLANA BEACH, CA 92075
CONTACT: AARON WHITFIELD
TEL: (858) 663-8215

SWQMP ATTACHMENT: BMP PLAN

CREEKSIDE ASSISTED LIVING
N TWIN OAKS VALLEY RD & RICHMAR AVE
SAN MARCOS, CA 92069