APPENDIX H

Storm Water Quality Management Plan

The City of San Diego	**PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR**

Campus Point SDP
Project Number: 336364

ENGINEER OF WORK:

Richard S Tomlinson, Jr. PE
Provide Wet Signature and Stamp Above Line

PREPARED FOR:

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, CA 92121
858-638-2800

PREPARED BY:

Michael Baker International
9755 Clairemont Mesa Blvd.
San Diego, CA 92124
858-614-5000

DATE:

October 25, 2016

Approved by: City of San Diego Date

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Project Name: Campus Point SDP

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ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

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CERTIFICATION PAGE

Project Name: **Campus Point SDP**
Permit Application Number: PTS 336364

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

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 Storm Water Standards. 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 source control and site design 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.

____
Engineer of Work's Signature, PE Number & Expiration Date

Richard S Tomlinson, Jr. PE QSD QSP CPSWQ
Print Name

Michael Baker International
Company

October 25, 2016
Date

Engineer's Stamp

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Project Name: Campus Point SDP

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 last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	3/29/16	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2	6/23/16	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Resubmittal
3	8/31/16	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Resubmittal
4	10/25/16	☒ Preliminary Design/Planning/CEQA ☐ Final Design	Resubmittal

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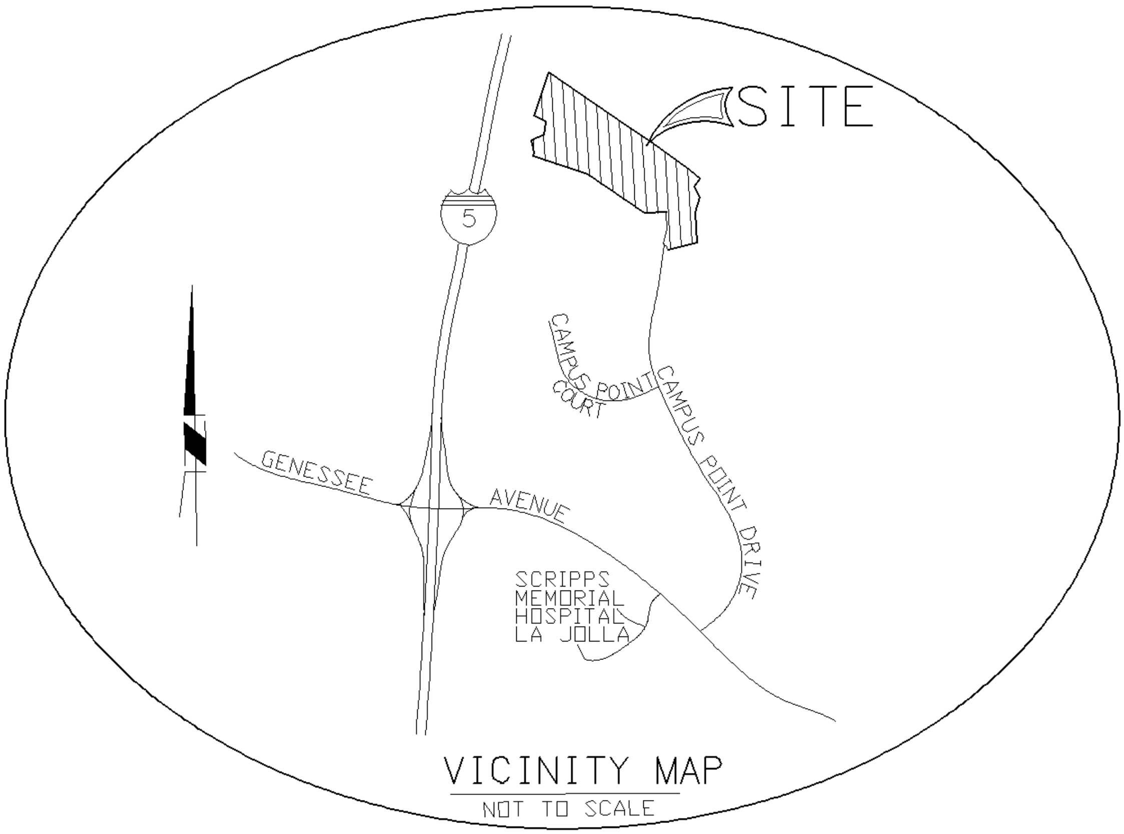
PROJECT VICINITY MAP

Project Name: **Campus Point SDP**
Permit Application Number: PTS 336364



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Project Name: Campus Point SDP

THE CITY OF SAN DIEGO	□it□o□San □ie□o **Development Services** □□□□ □ir□t □□e.□M□ □□□ San □ie□o□□□ □□□□□ □□□□□□□□□□□□	**Storm Water Requirements Applicability Checklist**	□□ □M **DS-560** □e□ruar□ □□□□

Project Address: 10290 Campus Point Dr.	Project Number *(for the City Use Only)*: 336364

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administrated by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with construction activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ☒Yes; SWPPP required, skip questions 2-4 ☐No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity that results in ground disturbance and contact with storm water runoff?

   ☐Yes; WPCP required, skip questions 2-4 ☐No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (projects such as pipeline/utility replacement)

   ☐Yes; WPCP required, skip questions 2-4 ☐No; next question

4. Does the project only include the following Permit types listed below?
   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include one of the following activities and associated curb/ sidewalk repair: water services, sewer lateral, storm drain lateral, or dry utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes to the right, and continue to PART B:

☒ If you checked "Yes" for question 1,
a SWPPP is REQUIRED. Continue to PART B

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3,
a WPCP is REQUIRED. If the project processes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all question 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

More information on the City's construction BMP requirements as well as CGP requirements can be found at:
www.sandiego.gov/stormwater/regulations/swguide/constructing.shtml

PART B: Determine Construction Site Priority.
This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk. Determination approach of the Stat e Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed. A map of the ASBS watershed can he found here *<placeholder for ASBS map link>*

2. ☒ **High Priority**
   a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**
   a. Projects not subject to ASBS, high or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.
Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐Yes ☒No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐Yes ☒No

Project Name: Campus Point SDP

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."
If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

   • Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   • Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   • Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?

   ☐Yes, PDP exempt requirements apply ☒No, next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐Yes, PDP exempt requirements apply ☒No; PDP not exempt PDP requirements apply

PART E: Determine if Project is a Priority Development Project (PDP). Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".
If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☐Yes ☒ No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces 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
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐Yes ☒ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☐Yes ☒ No

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5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☒Yes ☐No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☒Yes ☐No
7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges 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).	☐Yes ☒No
8. **New development or redevelopment projects of a retail gasoline outlet that creates and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic of 100 or more vehicles per day.	☐Yes ☒No
9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐Yes ☒No
10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces.	☐Yes ☒No
PART F: Select the appropriate category based on the outcomes of PART C through PART E.	
1. The project is **NOT SUBJECT TO STORM WATER REQUIREMENTS**.	☐
2. The project is a **STANDARD PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires hydromodification management.	☒
Name of Owner or Agent *(Please Print):* Richard S Tomlinson, Jr	Title: Project Manager II
Signature:	Date: March 31, 2016

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)		Form I-1
Project Identification		
Project Name: Campus Point SDP		
Permit Application Number: 336364		Date: 8/31/16
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒Yes	Go to Step 2.
	☐No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
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, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete Storm Water Requirements Applicability Checklist.	☐Standard Project	Stop. Standard Project requirements apply.
	☒PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐PDP Exempt	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2		
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☐No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) 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.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: A review of region 9 Critical Coarse Sediment Yield Area Maps show that there are no CCYSA on site. In addition, the project is on an existing paved area. No new natural areas are to be disturbed.		

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Campus Point SDP
Project Address	10290 Campus Point Drive.
Assessor's Parcel Number(s) (APN(s))	343-230-13-00
Permit Application Number	336364
Project Watershed	Select One: ☐San Dieguito River ☒Penasquitos ☐Mission Bay ☐San Diego River ☐San Diego Bay ☐Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	906.10
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	41.66 Acres (1,814,700 Square Feet)
Area to be disturbed by the project (Project Footprint)	11.55 Acres (333,670 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	8.06 Acres (267,900 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	3.49 Acres (67,100 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	19.4 % decrease in impervious area

Project Name: Campus Point SDP

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☒ Existing development ☐ Previously graded but not built out ☐ Agricultural or other non-impervious use ☐ Vacant, undeveloped/natural Description / Additional Information: The project site consists of a fully developed commercial site. The project area has a high proportion of pavement with interspaced ornamental landscaping. The project site consists of an access road and parking for the project. The road currently does not have landscaped medians except for in the southeast corner of the project. Although not part of the project site, the site has two buildings that are to remain as is.
Existing Land Cover Includes (select all that apply): ☒ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☒ Impervious Areas Description / Additional Information: As stated above, there is a majority of pavement on the project, with ornamental landscaping within curbed islands (islands do not accept flow from the roadway.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☐ NRCS Type C ☒ NRCS Type D
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 Soils report states ground water is greater than 100 feet below surface.
Existing Natural Hydrologic Features (select all that apply): ☐ Watercourses ☐ Seeps ☐ Springs ☐ Wetlands ☒ None Description / Additional Information: There are no existing natural hydrologic features on site.

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage:
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. If runoff from offsite is conveyed through the site? If yes, quantification of 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 storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the 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 / Additional Information:
Although the perimeter of the campus has slopes up to 130 feet tall, the core of the campus is relatively flat. The site has a maximum elevation of approximately 320 feet mean sea level (MSL). The lowest part of the graded area is at the southwest corner of the site at around elevation 295. Slopes surround the site on both the west and north sides of the site. . 1. All drainage on-site is urban. No natural conveyances exist on site. 2. No off-site runoff is conveyed through the site. 3. The site currently drains through a network of pipes after being picked up in catch basins located around the site. Catch basins are located in various areas of the site and drain to the points of connection listed below. 4. The site currently drains to three directions, however, drainage from the project flows to only two of the three POC. The PDP project, in the existing and proposed condition flow to one of two points of connection, one to the west and the other two the southwest. The first point of concentration is to the west. Drainage from the westerly side of the site flows into a 24" RCP storm drain. The storm drain flows to the west down the slope, before being discharge at the bottom of the canyon. The second point of connection is to the southeast. Drainage from the southwest portion of the site, flows to the south, where it enters a storm drain that runs along southerly side of the property. This drainage then flows to the east where it flows into the canyon.

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The project proposes the construction of a parking structure, office building, restaurant, surface parking and utilities. The land-use for the proposed project is similar to that of the existing site, with the addition of the new facilities. Grades in the proposed condition change minimally from the existing to the proposed condition.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): New impervious areas include roadways, sidewalks and parking lots. In addition, new building construction is proposed including a ten story office building, a restaurant building and a parking garage.
List/describe proposed pervious features of the project (e.g., landscape areas): New landscaped areas are proposed around the site. Pervious areas include landscaped islands in the parking fields as well as landscaping around the building. The project proposes the sea of parking that currently exists be transformed into a more walkable landscaped area.
Does the project include grading and changes to site topography? ☒Yes ☐No Description / Additional Information: The site is a fully graded site in the existing condition. Small changes are being made to the topography to change the site to a lower impact style of development. This includes changing the roads to a 'V' section, so that drainage flow to the middle of the road, and adjustments to the grades so that drainage flows to the biofiltration. In addition, minor changes to the grade are being made to ensure compliance with the Americans with Disabilities Act.

Form I-3B Page 5 of 11

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 and 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.

Description / Additional Information:
The proposed drainage system consists of a system of catch basins and PVC and HDPE pipe. The site has been drained into two drainage management areas. The first DMA includes the majority of the site and includes the new buildings, parking structure, and the existing soccer field, as well as some ancillary areas. These areas flow towards the infiltration trench that has been located under the soccer filed.

The second DMA includes flows from a small portion of the road. Flows from the road flow to the center of the road where there is a biofiltration basin. Flows are treated within the biofiltration basin that is within the median of the road. Because the infiltration rates in this area of the site are lower, infiltration is not the primary means of treatment.

Form I-3B Page 6 of 11
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 ☐ Large Trash Generating Facilities ☐ Animal Facilities ☐ Plant Nurseries and Garden Centers ☐ Automotive-related Uses
Description / Additional Information: Of the items above, the project proposes two of the items, on-site storm drain inlets and plazas, sidewalks and parking lots. As stated above, the project proposes new storm drain to including the construction of an infiltration basin, to be located under the soccer field, and the addition of a Biofiltration basin within the new access road. Plazas, sidewalks and parking lots are being reconfigured for two reasons. The primary reason is to provide a more visually appealing site, and secondly, to facilitate the site, is the reconfiguration of the parking to ensure compliance with the Storm Water Permit. The building construction, which includes a ten story building and a parking garage are being constructed to minimize the impacts to raw land by reusing the existing site. In addition, a small restaurant is being proposed for the site. This restaurant is for the use of the local businesses, and will therefore reduce the amount of traffic of cars leaving the site to procure food.

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) The project drains to a series of storm drains around the site. Storm drain is piped to the canyons located to the east and west of the site. Drainage then surface flow from the site north to the Soledad Canyon Creek, north to the Penasquitos Creek, before flowing to the Los Penasquitos Creek, Los Penasquitos Lagoon and the Beautiful Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations. Agriculture Supply Industrial Service Supply Non-Contact Water Recreation Warm Freshwater Habitat Cold Freshwater Habitat Wildlife Habitat Rare Species
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. None, based on a review of the Region 9, RWQCB ASBS maps.
Provide distance from project outfall location to impaired or sensitive receiving waters. Approximately 0.50 miles
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands The project lies approximate 1 mile upstream of Environmentally Sensitive Lands.

Project Name: **Campus Point SDP**

Form I-3B Page 8 of 11		
Identification of Receiving Water Pollutants of Concern		
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
Los Penasquitos Creek	*Enterococcus,* Fecal Coliform, Selenium, Total Nitrogen N, TDS, Toxicity	Draft Sediment and Bacteria
Los Penasquitos Lagoon	Sedimentation/Siltation	Draft Sediment and Bacteria
Soledad Canyon	Sedimentation Toxicity, Selenium	Draft Sediment and Bacteria

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 anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6): **Project proposes infiltration and Biofiltration BMP's, therefore the following table is not required.**			
Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☒	☒
Nutrients	☐	☒	☒
Heavy Metals	☐	☒	☒
Organic Compounds	☐	☒	☐
Trash & Debris	☐	☒	☐
Oxygen Demanding Substances	☐	☒	☐
Oil & Grease	☐	☒	☐
Bacteria & Viruses	☐	☒	☒
Pesticides	☐	☒	☐

Project Name: **Campus Point SDP**

Form I-3B Page 9 of 11
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 embayment's, 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 embayment's, 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):
Critical Coarse Sediment Yield Areas* *This Section only required if hydromodification management requirements apply
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☒ No, No critical coarse sediment yield areas to be protected based on WMAA maps Discussion / Additional Information: Please see CCYSA map below.

Form I-3B Page 10 of 11
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. The project has two points of compliance. POC-1 This POC drains to the west. It encompasses DMA-1. These DMA combine and exit the site to the south and then to the east. This POC drains into an unnamed creek to the west of the site and then flows into the Los Penasquitos Creek. POC 2, drains the east through a storm drain that runs along the east side of the project. This POC drains into an unnamed creek to the west of the site and then flows into the Los Penasquitos Creek.
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:
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11
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. The biggest site constraint on this projects include the existing improvements and grading as well as all of the existing improvements that must be matched and maintained during the phasing of the project. Because this is an existing site and the site is to remain in service during construction, the improvements and the BMP's must be phased. This phasing includes a large exiting building that is to remain, an existing soccer field that is currently under construction, and the existing access roads. In addition, just to north of the project is another large existing building that is remaining. This has made it very difficult to get the required biofiltration areas and hydro modification volumes. Therefore, we had to be very creative with our storm water solutions as well as digging very deep into our BMP tool box. In addition to these issues, we had to make sure the site would constantly comply with the requirements of the fire department, including maintaining access. In addition, providing minimum pavement widths and turning radii as dictated by the Fire Department have made the removal of additional pavement necessary, beyond what would normally be required.

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.

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Project Name: Campus Point SDP

Source Control BMP Checklist for All Development Projects	Form I-4		
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 BMP Design Manual (Part 1 of the Storm Water Standards) 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 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: No new outdoor material storage areas are proposed.			
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: No new outdoor material storage areas are proposed.			
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: Trash enclosures will be covered or will be enclosed.			

Project Name: Campus Point SDP

Form I-4 Page 2 of 2	
Source Control Requirement	Applied?
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	
On-site storm drain inlets	☒ Yes ☐ No ☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes ☐ No ☒ N/A
Interior parking garages	☐ Yes ☐ No ☒ N/A
Need for future indoor & structural pest control	☐ Yes ☐ No ☒ N/A
Landscape/Outdoor Pesticide Use	☒ Yes ☐ No ☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes ☐ No ☒ N/A
Food service	☒ Yes ☐ No ☐ N/A
Refuse areas	☒ Yes ☐ No ☐ N/A
Industrial processes	☐ Yes ☐ No ☒ N/A
Outdoor storage of equipment or materials	☐ Yes ☐ No ☒ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes ☐ No ☒ N/A
Fuel Dispensing Areas	☐ Yes ☐ No ☒ N/A
Loading Docks	☐ Yes ☐ No ☒ N/A
Fire Sprinkler Test Water	☐ Yes ☐ No ☒ N/A
Miscellaneous Drain or Wash Water	☐ Yes ☐ No ☒ N/A
Plazas, sidewalks, and parking lots	☒ Yes ☐ No ☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes ☐ No ☒ N/A
SC-6B: Animal Facilities	☐ Yes ☐ No ☒ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes ☐ No ☒ N/A
SC-6D: Automotive-related Uses	☐ 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 <u>all</u> "No" answers shown above.	

Site Design BMP Checklist for All Development Projects			Form I-5
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 BMP Design Manual (Part 1 of Storm Water Standards) 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 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. A site map with implemented site design BMPs must be included at the end of this checklist.			
Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-1 not implemented: No existing natural drainage areas on-site to protect.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☒ N/A
1-2 Are street trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
1-3 Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☒ N/A
1-4 Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A
SD-2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-2 not implemented: There are no natural areas within the project area to preserve. Existing natural soils and vegetative cover outside the project area is being conserved.			

Project Name: Campus Point SDP

Form I-5 Page 2 of 4			
Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented: All roadways are being built to Fire Department and code minimum widths. Building construction has several elements that help minimize impervious areas. These include the commercial building being proposed has be proposed as a 10 story building, instead of a less tall building with a larger floor plate. . In addition, the parking has been proposed as a structure, once again reducing sprawl. These site design BMP's effectively reduce the amount of new land that would have to be developed by tens of acres. The final element is the soccer field. This like park element serves two functions. Not only does the soccer field minimize the impervious areas, it provides an amenities element for the employees, while at the same time providing additional green space in a developed environment			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented: In landscaped areas.			
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented: The new portion of the roadway drains to the biofiltration area located within the median of the project. Where possible the paving drains to a landscaped area before being put in the underground storm drain. In addition, all areas of the site that do not drain to the median drain to the infiltration/hydro modification basin. This basin has been constructed under the existing soccer field. This basin, which is approximately 14,500 square feet has an unlined bottom where approximately 46% of all flows are infiltrated.			
5-1 Is the pervious area receiving run on from impervious area identified on the site map?	☒ Yes	☐ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☒ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	☐ Yes	☒ No	

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-6 not implemented: The buildings do not propose green roofs. The green roof is infeasible on a building as tall as is proposed. In addition, the construction method being used for the restaurant, stick framing is not compatible with green roofs. In addition, the parking garage will have a parking deck, therefore the green roof is not possible. As for the permeable pavements, the high traffic areas are not compatible with this type of pavement.			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	☐ N/A
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐ Yes	☒ No	☐ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	☐ N/A
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐ Yes	☒ No	☐ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented: Landscaping is with native and drought tolerant plants.			
SD-8 Harvesting and Using Precipitation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-8 not implemented: The project proposes to infiltrate much of the storm water (approximately 46%). In addition, there is no reliable use for the storm water that could dispose of the rainfall. The site does not have a reliable use for the storm water between the hours of 5:00 pm Friday to 7:00 am Monday as the facilities have limited staffing during those hours. In addition, the site does not have a use for the rainfall for irrigation during the winter, as no irrigation water is required during these times.			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A

Project Name: Campus Point SDP

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
See Next Page

Project Name: Campus Point SDP

Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). 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 City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 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.

Our first choice in BMP's is to use infiltration BMP's. Infiltration BMP's are the most economical and the most effective BMP's. In order to determine if infiltration BMP's were feasible, we looked at the site topographic maps, which showed that the central portions of the site would probably be best for BMP's because they were away from the slopes which we would like to avoid. We also looked for formational materials, as we would prefer not to introduce water into fill.

The second step in this process was to send our geotechnical engineer to the site to complete infiltration testing in the areas we felt would be best for the infiltration BMP's. Our hunches turned out to be correct, as the location we felt was best from an engineering stand point, was also best from an infiltration standpoint.

Preliminary infiltration rates showed the best area for infiltration was in the area of the soccer field. Therefore, our initial strategy was to use a large infiltration basin, centrally located to infiltrate the 85th percentile rainfall. Our initial design was to provide infiltration for all of the flows.

However, once the site had been excavated we ran a new series of infiltration tests. Those tests showed that the average infiltration was insufficient for full infiltration (verified by the City of San Diego Geology Section,) so the site is proposed to use partial infiltration in all areas (rates between 0.08 and 1.08 in/hr).

In addition to the partial infiltration, a pair of Bio-clean Modular Wetland was selected to complete the treatment train (see Feasibility Analysis Below.) The San Diego Hydromodification calculations show we exceed the 40% volume reduction with a reduction of 46% reduction in volume from all storms from 0.1Q2 to Q25, whereas the bioretention basin has a volume reduction of approximately 70% per SDHM

Because the site had two locations adjacent to the slopes that we could not gravity drain to, the project is proposing two pump stations. These pump stations will pump storm water to the infiltration basin area. This has been done to maximize the infiltration of the site.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 8
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1) The roadway design was slightly different. Because of access considerations, the road needed to be located where the road was located. Unfortunately, infiltration rates in the area of the roadway were not as good as within the Central Portion of the site. Therefore, we decided to use biofiltration. The biofiltration basin is sized for both treatment and hydromodification. Feasibility Analysis The BMP's chosen are a combination of a 14,500 sf partial infiltration basin and a Modular Wetland System. The BMP has a large footprint, 3% of the total project area, and 4.6% of the effective area, so the BMP does have a large area. The existing site has a large existing building, access roads, a soccer field and an existing central plant. These elements are to remain, so the area that is available for BMP's is limited. A series of infiltration tests were performed to determine the best area for infiltration. In order to optimize the infiltration, a basin would need to be located where the soccer field is located. This soccer field, an existing ministerial project, would need to be the location of the basin. However, since this soccer field is an existing site amenity, it was not possible to put a surface BMP in this location. In order to maximize the infiltration (as required by the Permit) the basin would need to be located in this area. Because this is an existing ministerial improvement, it was not possible to eliminate this improvement Because of the required depth of this facility, being under the soccer field, it was not possible to send the flows to a surface BMP, even if there were sufficient space on site for the BMP. Therefore, the only option to achieve the goals of maximum infiltration as well as maximum treatment was to use the MWS system. The MWS system is a TAPE approved system and is highly efficient in removing the pollutants of concern. This strategy has ensured maximum infiltration as well as maximum treatment efficiency.

○ Retention by infiltration basin (INF-1)

Project Name: **Campus Point SDP**

Form I-6 Page 3 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. Basin 1	
Construction Plan Sheet No. C2.7	
Type of structural BMP: ☐Retention by Harvest and use HU-1 ☐Retention by infiltration basin (NF-1) ☐Retention by Biofiltration (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type / description in discussion below) ☐Flow-thru treatment control included as pre-treatment / forebay for an onsite retention of biofiltration BMP (provide BNP 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) ☒Detention pond of 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 (descibe in discussion below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Michael Baker International
Who will be the final owner of this BMP?	Alexandria Real Estate
Who will maintain this BMP into perpetuity?	Alexandria Real Estate
What is the funding mechanism for maintenance?	Alexandria Real Estate's on-going funding

Form I-6 Page 4 of 8 (Copy as many as needed)
Structural BMP ID No. INF-1
Construction Plan Sheet No. C2.7
Discussion (as needed): This DMA includes the majority of the site. It includes just over 10 acres of the site that flow to the centrally located partial infiltration basin. This infiltration basin is located approximately 3 to 5 feet below finish grade and is 9 feet tall. The basin is filled with a crushed gravel which has porosity. The basin approximately 16,000 sf and has dimensions 60 feet by 233' feet. The facility is sized to infiltrate approximately 50% of the storm water. In order to increase the volume stored by the basin, the project proposes the addition of the StormTech chambers. These StormTech chambers are approximately 100" wide and 5 feet tall, sting on 12" of gravel and having 18" of gravel above them.

Form I-6 Page 5 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BFB-1	
Construction Plan Sheet No. Sheet 5	
Type of structural BMP: ☐Retention by Harvest and use HU-1 ☐Retention by infiltration basin (NF-1) ☐Retention by Biofiltration (INF-2) ☐Retention by permeable pavement (INF-3) ☒Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type / description in discussion below) ☐Flow-thru treatment control included as pre-treatment / forebay for an onsite retention of biofiltration BMP (provide BNP 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) ☐Detention pond of 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 (descibe in discussion below)F	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Michael Baker International
Who will be the final owner of this BMP?	Alexandria Real Estate
Who will maintain this BMP into perpetuity?	Alexandria Real Estate
What is the funding mechanism for maintenance?	Alexandria Real Estate's on-going funding

Structural BMP ID No BFB-1
Construction Plan Sheet No. Sheet 5
Discussion (as needed): This BMP covers the westerly portion of the access road that is not being constructed per the 'Boulevard Plans' a ministerial project being constructed under PTS 466031. This portion of the project drains to a median located within the center of the roadway. This median, accommodates 12" of ponding, 24" of Biofiltration basin soil mix and 24" of gravel. The bottom of the basin has not been lined, and the basin does passively infiltrate. In fact, approximately 71% of the 0.2Q2 to Q25 infiltrates.

○ Retention by infiltration basin (INF-1)

Project Name: Campus Point SDP

Form I-6 Page 3 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. MWS-1	
Construction Plan Sheet No. C2.7	
Type of structural BMP: ☐Retention by Harvest and use HU-1 ☐Retention by infiltration basin (NF-1) ☐Retention by Biofiltration (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☒Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type / description in discussion below) ☐Flow-thru treatment control included as pre-treatment / forebay for an onsite retention of biofiltration BMP (provide BNP 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) ☐Detention pond of 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 (descibe in discussion below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Michael Baker International
Who will be the final owner of this BMP?	Alexandria Real Estate
Who will maintain this BMP into perpetuity?	Alexandria Real Estate
What is the funding mechanism for maintenance?	Alexandria Real Estate's on-going funding

Form I-6 Page 4 of 8 (Copy as many as needed)
Structural BMP ID No. MWS-1
Construction Plan Sheet No. C2.7
Discussion (as needed): Once the flows leave the partial infiltration basin, the flows enter a pair of 8' x 16' Modular Wetland System. These two modular wetland system were sized to treat 1.5 times the 80th percentile rainfall as a 'Flow Based Sizing'. Because the BMP is being sized based on flow through criteria (Section F.2.2), the criteria of B.5.3 are not applicable, as these are for volume based sizing. Sizing for this BMP was based on flow based methodology which is only applicable to TAPE certified BMP's. The Modular Wetland System is a TAPE approved device and can therefore be sized using the Flow Through Criteria which is 1.5 times the 80th percentile rainfall. The sizing of the device exceeds the sizing required. In addition, in combination with the partial infiltration hydromodification basin, the project infiltrates approximately 46% of all flows.

THE CITY OF SAN DIEGO	□it□o□San □ie□o **Development Services** □□□□ □ir□t □□e. □M□ □□□□ San □ie□o□□ □□□□□ □□□□□□□□□□□□□	**Permanent BMP Construction** **Self Certification Form**	□□ □M □S□□□□ □anuar□ □□□□

Date Prepared: July 29th, 2016	Project No.: 336364
Project Applicant: Michael Baker International	Phone: 858-614-5000
Project Address: 10290 Campus Point Blvd.	
Project Engineer: Richard S Tomlinson, Jr. PE	Phone: 858-614-5065

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:
As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ________________________________

Date of Signature: ______________________

Printed Name: ______________________

Title: ______________________

Phone No. ______________________

Engineer's Stamp

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ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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Project Name: Campus Point SDP

Indicate which Items are Included:

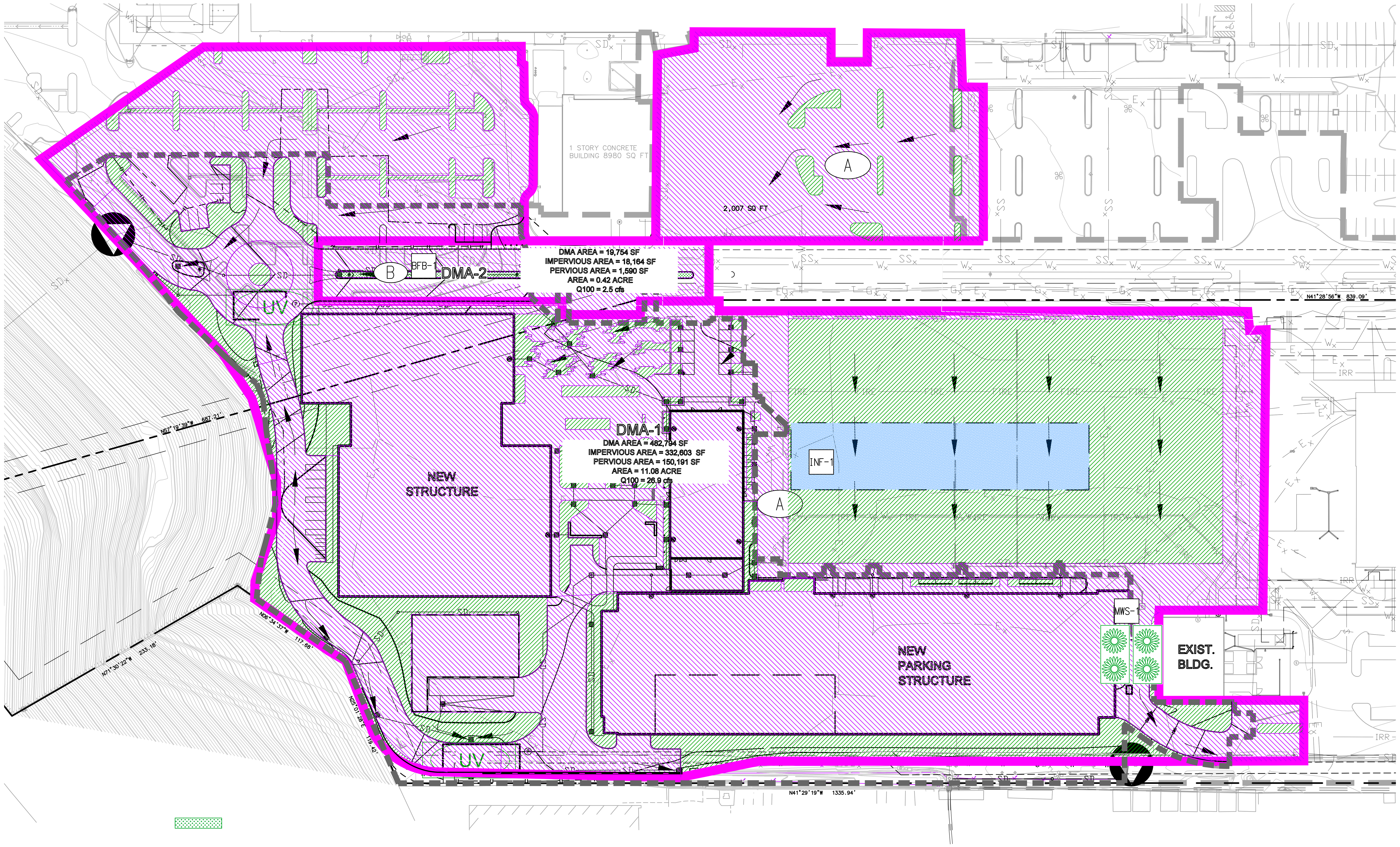
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒Included 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 and site design credit calculations	☒ Included

Project Name: Campus Point SDP

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 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)



LEGEND

- LIMITS OF OVERALL DRAINAGE BASIN
- BASIN (X-X)
- IMPERVIOUS AREA
- PERVIOUS AREA
- BIORETENTION BASIN
- INFILTRATION BASIN w/STORM TECH CHANBERS
- DRAINAGE BASIN
- FLOW PATH
- POINT COMPLIANCE
- MODULAR WETLANDS SYSTEM
- BMP ID NUMBER #

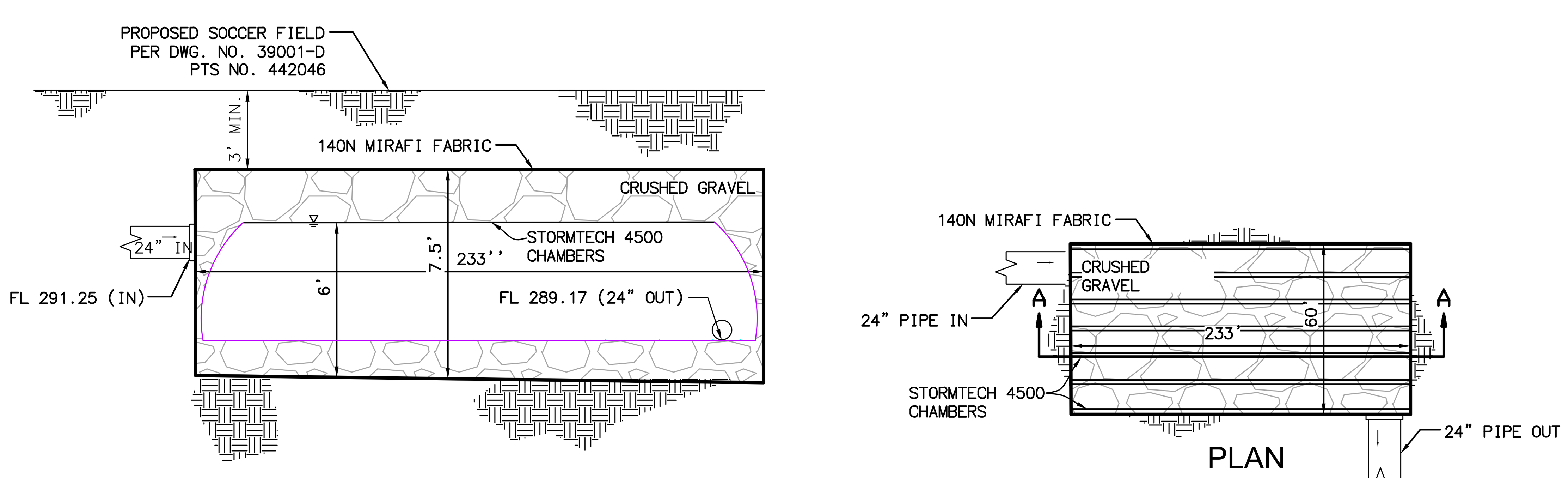
NOTE:
ALL SOILS URBAN LANDS SOIL TYPE "D"

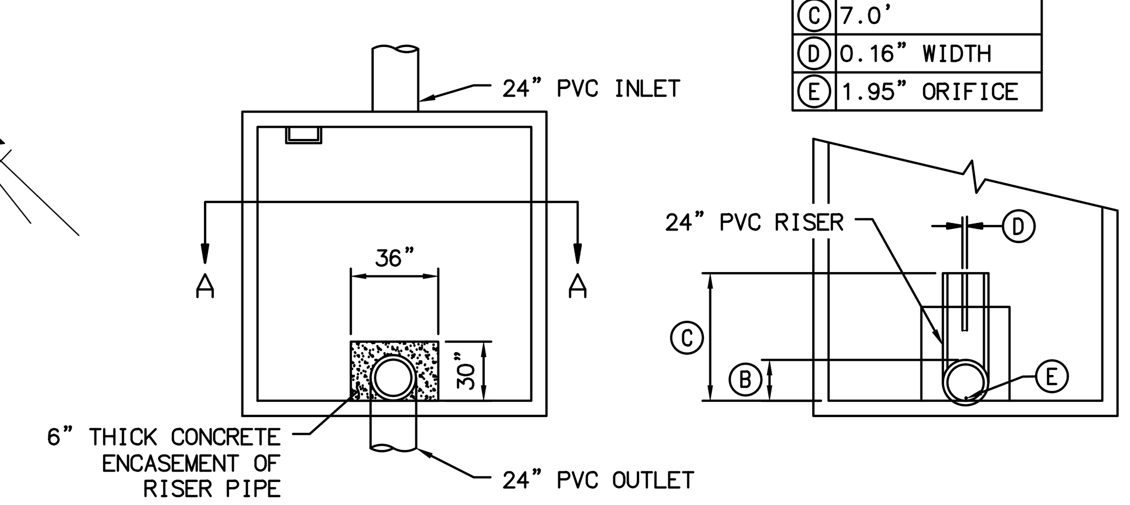
GROUNDWATER DEPTH EXCEEDS 20 FEET

SEE ATTACHMENT 2b FOR CRITICAL COARSE SEDIMENT YIELD AREAS

DMA SUMMARY

DMA-ID	SIZE (SF)	BMP AREA (SF)	BMP TYPE
DMA-1	482,794	14,600	PARTIAL INFILTRATION AND MODULAR WETLAND SYSTEM.
DMA-2	18,754	1063 SF	BIOFILTRATION





SECTION A-A
N.T.S

INFILTRATION BASIN
N.T.S

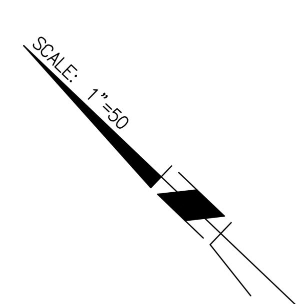
PLAN
N.T.S

PLAN
N.T.S

SECTION A-A
N.T.S

RISER
N.T.S

A	3.5' FROM TOP
B	24"
C	7.0'
D	0.16" WIDTH
E	1.95" ORIFICE



50 0 50 100 150
SCALE: 1"=50'

CAMPUS POINT
10290 CAMPUS POINT DR.
SAN DIEGO, CA
DMA MAP

10/16/16

Michael Baker INTERNATIONAL
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

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:_______________

This facility is a business facility and has no reliably present use for water during the weekends. In addition, during the rainy season there is no reliably present use for irrigation during the rainy season. Therefore harvest and reuse is not feasible.

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.

[Provide a summary of calculations here]

3. Calculate the DCV using worksheet B-2.1.

DCV = __________ (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV? ☐ Yes / ☐ No ⇨	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes / ☐ No ⇨	3c. Is the 36 hour demand less than 0.25DCV? ☐ 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.

Project No. 07850-42-15
September 20, 2016

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, California 92122

Attention: Mr. Michael Barbera

Subject: ADDENDUM TO STORM WATER MANAGEMENT RECOMMENDATIONS
CAMPUS POINT BOULEVARD
10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

References:

1. *Storm Water Management Recommendations, 10290 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated June 7, 2016 (Project No. 07850-42-15).

2. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 5, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).

3. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 11, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).

4. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 22, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).

5. *Preliminary Geotechnical Investigation, 10290 Campus Pointe Drive San Diego, California*, dated June 11, 2015, prepared by Geocon Incorporated (Project No. 07850-42-15).

6. *Second Addendum to Geotechnical Investigation, 10290 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated March 15, 2016 (Project No. 07850-42-15).

Dear Mr. Barbera:

We have prepared this addendum letter with respect to storm water management recommendations for the subject site. Recommendations for storm water management are provided in Reference 1 and in the response letters to City review comments (References 2 through 4). As required by the City of San Diego, we have performed additional infiltration tests within the bottom of the basin excavation. Based on the test results, it is our opinion that the recommendations contained in the previous correspondence remain applicable. Full infiltration is considered infeasible; however, the site is considered feasible for partial infiltration provided design measures are taken to ensure seepage water from the basin does not impact the proposed adjacent below grade retaining walls and structures.

In-Situ Testing

We performed 2 field-saturated, hydraulic conductivity tests at depths of approximately 16 inches below the basin bottom using a Soil Moisture Corp Aardvark Permeameter. Table 1 presents the results of the infiltration test. The Aardvark Permeameter test data is attached.

TABLE 1
UNFACTORED, FIELD-SATURATED, HYDRAULIC CONDUCTIVITY TEST RESULTS USING THE SOILMOISTURE CORP AARDVARK PERMEAMETER

Location	Depth (inches)	Geologic Unit	Field Infiltration Rate, I (inches/hour)	Field Saturated Hydraulic Conductivity, K (inches/hour)
A-1	17	Ardath/Scripps Formation	0.08	0.05
A-2	16	Ardath/Scripps Formation	0.22	0.12

We also performed three excavation percolation tests at depths between 17 and 24 inches below the basin bottom. Table 2 presents the calculated infiltration rates.

TABLE 2
UNFACTORED INFILTRATION TEST RESULTS FROM EXCAVATION PERCOLATION TEST PITS

Test No.	Depth (inches)	Geologic Unit	Infiltration Rate, I (inches/hour)
P-1	17	Ardath/Scripps Formation	1.08
P-2	24	Ardath/Scripps Formation	0.09
P-3	19	Ardath/Scripps Formation	0.42

Soil permeability values from in-situ tests can vary significantly from one location to another due to the non-homogeneous characteristics inherent to most soil. However, if a sufficient amount of field and laboratory test data is obtained, a general trend of soil permeability can usually be evaluated. For this project and for storm water purposes, the test results presented herein should be considered approximate values.

STORM WATER MANAGEMENT CONCLUSIONS

Infiltration Rates

The results of the testing show 4 of the 5 infiltration tests had rates less than 0.5 inches per hour. Boring logs and the geologic history of the bedrock units show the on-site soils are highly variable. It is our opinion that there is a high probability for lateral water migration because of variable soil conditions and interlayered siltstone and claystone beds within the formational bedrock units. Therefore, based on the results of the field infiltration tests, full infiltration is considered infeasible because of the varying infiltration rates and potential for lateral water migration and ground water mounding. However, partial infiltration is considered feasible provided precautions are taken to reduce impacts to adjacent below grade retaining walls and structures.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table 3 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE 3
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table 4 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table 3 and the results of our geotechnical investigation. Table 4 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE 4
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.5
Predominant Soil Texture	0.25	2	0.5
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2

1 The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has highly variable sub-surface permeability conditions and infiltration characteristics. Because of these site conditions, it is our opinion that there is a high probability for lateral water migration and in our opinion full infiltration is infeasible on this site. However, partial infiltration is considered feasible. Side liners should be installed to reduce the potential for lateral migration of seepage within the basin area.

Should you have any questions regarding the letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

RCM:dmc

Attachments: Figure 1
Worksheet C.4-1
Aardvark Permeameter Data Analysis
Boring Logs

(e-mail) Addressee
(e-mail) Gensler
Attention: Mr. Steve Schrader
(e-mail) Michael Baker International
Attention: Mr. Brian Oliver

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	▯▯▯	▯▯
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:

The infiltration test results were as follows:
A-1: 0.08 in/hr
A-2: 0.22 in/hr
P-1: 1.08 in/hr
P-2: 0.09 in/hr
P-3: 0.42 in/hr

Four of the five tests indicated test results less than 0.5 inches per hour. This shows the soil is variable and a reliable design infiltration rate below proposed facility locations is not greater than 0.5 inches/hour. Additionally, based on the USGS Soil Survey, 100 percent of the site consists of a unit that possess a Hydrologic Soil Group D classification with an estimated k_{SAT} of 0.10 to 1.3 inches per hour.

Criteria	Screening Question	▯▯▯	▯▯
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:

The specific geologic or geotechnical hazard for this site is the potential for groundwater mounding and lateral migration of infiltration water. The area of the proposed basin is underlain by dense formational soils of the Scripps Formation and Ardath Formation (see Geocon report dated June 11, 2015 and March 15, 2016). Four of the five tests performed at the bottom of the basin have a factored infiltration rate less than 0.5 iph. The variability observed in these test results is a reflection of the heterogeneous, anisotropic nature of the site hydrological properties. Since the site geology is composed of interbedded sandstone and siltstone/claystone (as geotechnical borings performed show) we expect that infiltration of storm water will be carried by the more permeable sandstone layers and occluded by the siltstone/claystone layers; therefore, the site is highly prone to groundwater mounding beneath basins and lateral migration of infiltrated groundwater. Therefore, it is our opinion that the site is not feasible for full infiltration.

Due to the layering of the soils as is evident on the boring longs in the referenced reports, we are not aware of any reasonable mitigation methods that could be performed to mitigate the geologic conditions to an acceptable level where groundwater mounding and lateral migration will not occur under full infiltration conditions.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is expected to be deeper than 100 feet.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

There are no known contaminants at the site and groundwater is in excess of 20 feet below the bottom of the basin. Response provided by Michael Baker International, the project’s civil engineer.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">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</td><td></td></tr>
</table>

*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 the City 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:

Based on our study, appreciable infiltration rates were measured.

A-1: 0.08 in/hr
A-2: 0.22 in/hr
P-1: 1.08 in/hr
P-2: 0.09 in/hr
P-3: 0.42 in/hr

Criteria	Screening Question	Yes	No
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:

The specific geologic or geotechnical hazard for this site is the potential for groundwater mounding and lateral migration of infiltration water. The area of the proposed basin is underlain by dense formational soils of the Scripps Formation and Ardath Formation (see Geocon report dated June 11, 2015 and March 15, 2016). The infiltration test results performed on the property very widely across the site. The variability observed in the test results is a reflection of the heterogeneous, anisotropic nature of the site hydrological properties. Since the site geology is composed of interbedded sandstone and siltstone/claystone (as geotechnical borings performed show) we expect that infiltration of storm water will be carried by the more permeable sandstone layers and occluded by the siltstone/claystone layers; therefore, the site is highly prone to groundwater mounding beneath basins and lateral migration of infiltrated groundwater.

Under partial infiltration, mitigation measures should be taken to reduce potential impacts as a result of groundwater mounding and lateral water migration. Proposed below grade retaining walls for the parking structure and other proposed adjacent structures should be constructed with wall drains to intercept seepage and outlet it from behind the walls. The existing building west of the infiltration basin is supported on drilled piers so we do not expect lateral migration of infiltration to impact the building structure. There are no slopes or known existing utilities within the proposed area of the basin that are expected to be impacted by partial infiltration.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is expected to be at depths greater than 100 feet.

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.</td></tr>
<tr><td>8</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

There are no known downstream water rights. Response provided by Michael Baker International, the project's civil engineer.

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.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 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.</td><td></td></tr>
</table>

*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 the City to substantiate findings.

GEOCON

Aardvark Permeameter Data Analysis

Project Name:	Campus Point	Date:	9/19/2016
Project Number:	07850-42-15	By:	JTL
Borehole Location:	A-1	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

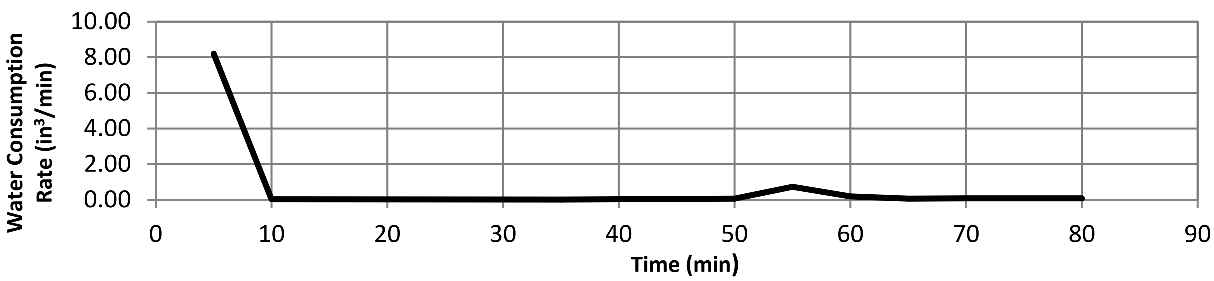
Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	1.42
Distance Between Reservoir & Top of Borehole (feet):	2.42
Depth to Water Table, **s** (feet):	1000
Height APM Raised from Bottom (inches):	0.00

Wetted Area, **A** (in^2): 58.18

Distance Between Resevoir and APM, **D** (feet):	3.24
Head Height, **h** (inches):	3.63
Distance Between Constant Head and Water Table, **L** (inches):	11987

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			22.045			
2	5.00	5.00		20.565	1.48	1.48	8.20
3	10.00	5.00		20.560	0.01	1.49	0.03
4	35.00	25.00		20.550	0.01	1.50	0.01
5	50.00	15.00		20.520	0.03	1.53	0.06
6	55.00	5.00		20.390	0.13	1.66	0.72
7	60.00	5.00		20.355	0.04	1.69	0.19
8	65.00	5.00		20.345	0.01	1.70	0.06
9	70.00	5.00		20.330	0.02	1.72	0.08
10	75.00	5.00		20.315	0.01	1.73	0.08
11	80.00	5.00		20.300	0.02	1.75	0.08

Steady Flow Rate, Q (in^3/min): 8.32E-02



Field-Saturated Hydraulic Conductivity (Infiltration Rate)

Case 1: L/h > 3 K_{sat} = 7.71E-04 in/min 0.05 in/hr

GEOCON

Aardvark Permeameter Data Analysis

Project Name:	Campus Point	Date:	9/19/2016
Project Number:	07850-42-15	By:	JTL
Borehole Location:	A-2	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

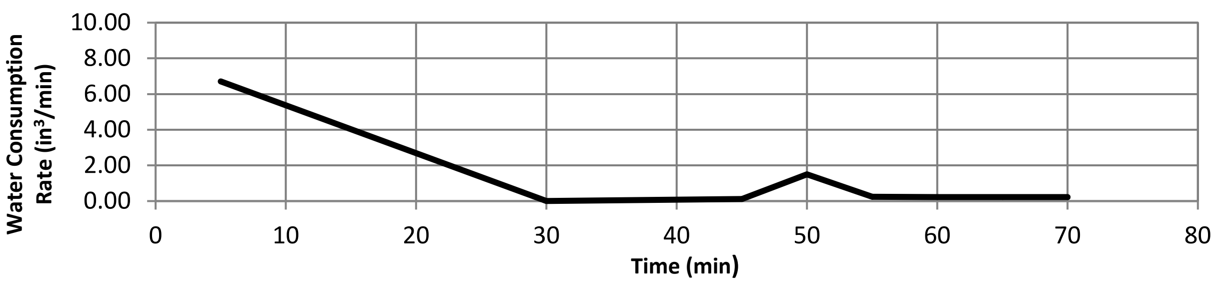
Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	1.29
Distance Between Reservoir & Top of Borehole (feet):	2.42
Depth to Water Table, **s** (feet):	1000
Height APM Raised from Bottom (inches):	0.00

Wetted Area, **A** (in^2): 58.11

Distance Between Resevoir and APM, **D** (feet):	3.10
Head Height, **h** (inches):	3.62
Distance Between Constant Head and Water Table, **L** (inches):	11988

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			19.155			
2	5.00	5.00		17.945	1.21	1.21	6.71
3	30.00	25.00		17.940	0.00	1.22	0.01
4	45.00	15.00		17.875	0.07	1.28	0.12
5	50.00	5.00		17.605	0.27	1.55	1.50
6	55.00	5.00		17.560	0.05	1.60	0.25
7	60.00	5.00		17.520	0.04	1.64	0.22
8	65.00	5.00		17.480	0.04	1.68	0.22
9	70.00	5.00		17.440	0.04	1.72	0.22

Steady Flow Rate, Q (in^3/min): 2.22E-01



Field-Saturated Hydraulic Conductivity (Infiltration Rate)

Case 1: L/h > 3 K_{sat} = 2.06E-03 in/min 0.12 in/hr

DMA-1

Index

<table>
<tr><th colspan="2">Onsite Proprietary Biofiltration BMP Checklist</th><th>Form I-10</th></tr>
<tr><td colspan="3">A proprietary biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA <u>and</u> the performance certification/data of the proprietary biofiltration BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite alternative compliance program to meet its pollutant control obligations.

An applicant using a proprietary biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.</td></tr>
<tr><th colspan="3">Section 1: Biofiltration Criteria Checklist (Appendix F)</th></tr>
<tr><td colspan="3">Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.</td></tr>
<tr><th>Criteria</th><th>Answer</th><th>Progression</th></tr>
<tr><td rowspan="3"><u>Criteria 1 and 3</u>:

What is the infiltration condition of the DMA?

Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.

Complete and attach Worksheet C.4-1: Categorization of Infiltration Feasibility Condition to support the feasibility determination.</td><td>☐ Full Infiltration Condition</td><td>Stop. Proprietary biofiltration BMP is not allowed.</td></tr>
<tr><td>☒ Partial Infiltration Condition</td><td>Proprietary biofiltration BMP is only allowed, if 40% (average annual capture) volume reduction is achieved within the BMP or downstream of the BMP.

If the 40% volume reduction is achieved from within the BMP or downstream of the BMP proceed to Criteria 2.

If the 40% of the volume reduction is not achieved, proprietary biofiltration BMP is not allowed. Stop.</td></tr>
<tr><td>☐ No Infiltration Condition</td><td>Proprietary biofiltration BMP is allowed if one of the two criteria listed below are met:

☐ Documentation is provided to the satisfaction of the City Engineer that a larger footprint biofiltration BMP (i.e. minimum sizing factor calculated using worksheet B.5.2) is not feasible onsite; or
☐ Documentation is provided that volume reduction achieved by the larger footprint biofiltration BMP can be achieved through other measures (e.g., downstream site design BMPs, evapotranspiration from proprietary BMP, etc.)

If one of the two criteria listed above is met proceed to Criteria 2.

If neither criteria are met, proprietary biofiltration BMP is not allowed. Stop.</td></tr>
</table>

Onsite Proprietary Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:
Summarize findings and attach Worksheet C.4-1

If Partial Infiltration Condition:
Provide documentation that 40% (average annual capture; or 0.375*DCV when using a 36-hour drawdown BMP) volume reduction is achieved within the BMP or downstream of the BMP. This could be achieved through downstream site design BMPs, downstream infiltration BMP, incidental retention by having an open bottom in the proprietary BMP or other similar measures.

If No Infiltration Condition:
Provide documentation that the alternative minimum sizing factor (attach Worksheet B.5-2) BMP is not feasible onsite or the volume reduction achieved by a non-proprietary BMP sized to the alternative minimum sizing factor can be achieved through downstream site design BMPs, downstream evapotranspiration BMPs, incidental evapotranspiration from the proprietary BMP or other similar measures.

Criteria	Answer	Progression
Criteria 2: Is the proprietary biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Meets Flow based Criteria	Use guidance from Appendix F.2 to size the proprietary BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft cannot be designed using a loading rate of 1.5 gpm/sq. ft) **Proceed to Criteria 4.**
	☐ Meets Volume based Criteria	Provide documentation that the proprietary biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	☐ Does not Meet either criteria	**Stop**. Proprietary biofiltration BMP is not allowed.

Onsite Proprietary Biofiltration BMP Checklist		Form I-10
Provide basis for Criteria 2: Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).		
Criteria	**Answer**	**Progression**
<u>**Criteria 4**</u>: Does the proprietary biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes, meets the TAPE certification.	Provide documentation that the proprietary BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	☐ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a proprietary biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 4: Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the proprietary biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern. See attached documentation.		

Onsite Proprietary Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the proprietary biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	Provide documentation that the proprietary biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 5: Provide documentation that appropriate biological activity is supported by the proprietary biofiltration BMP to maintain treatment process. See attached documentation.		
Criteria	**Answer**	**Progression**
Criteria 6: Is the proprietary biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	☒ Yes	Provide documentation that the proprietary biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.
Provide basis for Criteria 6: Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable). See attached documentation		

Onsite Proprietary Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the proprietary biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	☒ Yes, and the proprietary BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The proprietary biofiltration BMP meets the required criteria.
	☐ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	☐ No	**Stop**. Proprietary biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. Attachment 3A of the PDP SWQMP must include a statement that the proprietary BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

See attached documentation.

Onsite Proprietary Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed proprietary BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	☒ Yes ☐ No, See explanation below
Explanation/reason if the proprietary BMP is not accepted by the City for onsite pollutant control compliance:	

April 20th, 2016

Project: All Related

Subject: MWS Linear BMP Classification Per San Diego Manual

To Whom It May Concern:

It is the intention of this document to use the MWS Linear as a biofiltration BMP. Based upon definitions of Biofiltration as found in Section 2.2.1 and Appendix F of the manual the MWS Linear meets the criteria to be classified as biofiltration and therefore is not flow through treatment and thus does not trigger the need for alternative compliance. The MWS Linear has GULD approval for basic, phosphorus and enhanced treatment under the TAPE approval. The system is certified under the TAPE approval at a loading rate of 1 gpm/sq ft for all three pollutant categories. This is consistent with the performance criteria related to the performance of Appendix F.

Let us first address the comment regarding the MWS (referring to the Modular Wetland System Linear) being flow through treatment. To do so let us look at the definition of biofiltration as provided by the Design Manual which states:

> *"For situations where onsite retention of the 85th percentile storm volume is not feasible, biofiltration must be provided to satisfy specific "biofiltration standards" i.e. a set of selection, sizing, design and operation and maintenance (O&M) criteria that must be met for a BMP to be considered a "biofiltration BMP" – see Section 2.2.1 and Appendix F."*

If we look at section 2.2.2 Storm Water Pollutant Control Performance Standard it states:

> *"(i) If it is not technically feasible to implement retention BMPs for the full DCV onsite for a PDP, then the PDP shall utilize biofiltration BMPs for the remaining volume not reliably retained. Biofiltration BMPs must be designed as described in Appendix F to have an appropriate hydraulic loading rate to maximize storm water retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP, and must be sized to:*
>
> > *[a]. Treat 1.5 times the DCV not reliably retained onsite, OR*
> >
> > *[b]. Treat the DCV not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the DCV not reliably retained onsite."*

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As the manual states Biofiltration BMPs must be designed as described in Appendix F which states:

> *"A project applicant must be able to affirmatively demonstrate that a given BMP is designed and sized in a manner consistent with this definition to be considered as a "biofiltration BMP" as part of a compliant storm water management plan."*
>
> *"This appendix contains a checklist of the key underlying criteria that must be met for a BMP to be considered a biofiltration BMP. The purpose of this checklist is to facilitate consistent review and approval of biofiltration BMPs that meet the "biofiltration standard" defined by the MS4 Permit."*
>
> *"This checklist includes specific design criteria that are essential to defining a system as a biofiltration BMP; however it does not present a complete design basis. This checklist was used to develop BMP Fact Sheets for PR-1 biofiltration with partial retention and BF-1 biofiltration, which do present a complete design basis. Therefore, biofiltration BMPs that substantially meet all aspects of the Fact sheets PR-1 or BF-1 should be able to complete this checklist without additional documentation beyond what would already be required for a project submittal."*
>
> *"Other biofiltration BMP designs (including both non-proprietary and proprietary designs) may also meet the underlying MS4 Permit requirements to be considered biofiltration BMPs. These BMPs may be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of the [City Engineer]. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met."*

As stated the Biofiltration BMP must meet three objectives. The following outlines how the Modular Wetland System Linear meets these criteria.

Minimum Design Criteria

1. Biofiltration BMPs shall be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).

    a. The Modular Wetland System Linear (MWS Linear) is only being proposed on plans when retention via infiltration or reuse is proven infeasible. Conditions such as soils with little to no infiltration rate or sites in which insufficient landscaping warrant to successful implementation of reuse systems.

2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.

    a. Section B.5.2 Basis for Minimum Sizing Factor for Biofiltration BMPs states:

    "The MS4 Permit describes conceptual performance goals for biofiltration BMPs and specifies numeric criteria for sizing biofiltration BMPs (See Section 2.2.1 of this Manual). However, the MS4 Permit does not define a specific footprint sizing factor or design profile that must be provided for the BMP to be considered "biofiltration."

    "Additionally, it does not apply to alternative biofiltration designs that utilize the checklist in Appendix F (Biofiltration Standard and Checklist). Acceptable alternative designs (such as proprietary systems meeting Appendix F criteria) typically include design features intended to allow acceptable performance with a smaller footprint and have undergone field scale testing to evaluate performance and required O&M frequency."

    As stated in the Manual alternative biofiltration designs are allowed. The MWS Linear therefore qualifies as a biofiltration BMP under this definition as it has both undergone field scale testing (TAPE tested and approved with a GULD) and provides requirements on O&M frequency. In addition, the MWS Linear can be sized to treat either 1.5 times the DCV not reliably retained onsite OR 1.0 times the portion of the DCV not reliably retained onsite; and additionally check that the system has a total static (i.e. non-routed) storage volume, including pore spaces and pre-filter detention volume to at least 0.75 times the portion of the DCV not reliably retained onsite.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

    a. The MWS Linear is utilized and placed in the same manner as other types of biofiltration systems. As with other biofiltration systems the MWS Linear includes and underdrain for the remaining portion of the DCV that is not retained via incidental infiltration (as biofiltration if infiltration is not feasible due to poor soils) and evapotranspiration. The MWS Linear can be designed with an open bottom to maximize this incidental infiltration. The only exception to this, as with other biofiltration BMPs, is when the geotechnical consultant recommends an impervious liner be used due to specific soil conditions such as expansive clays. Additionally, the MWS Linear utilizes an amended media that is much more porous than the standard prescribed biofiltration media which is a mix of sand and compost. 100% of the media used in the MWS Linear has interparticle voids of 48% plus and 24% internal void space for each media particle. This is much greater than the sand which has interparticle voids of 35% and internal voids of 0%. As such, the MWS Linear retains greater moisture which allows for greater volume retention and ultimately evapotranspiration via respiration of the contained vegetation.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.

   a. The manual states:

      "Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below."

      The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1, as shown below, requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. A copy of the TAPE approval has been attached to this document.

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

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

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

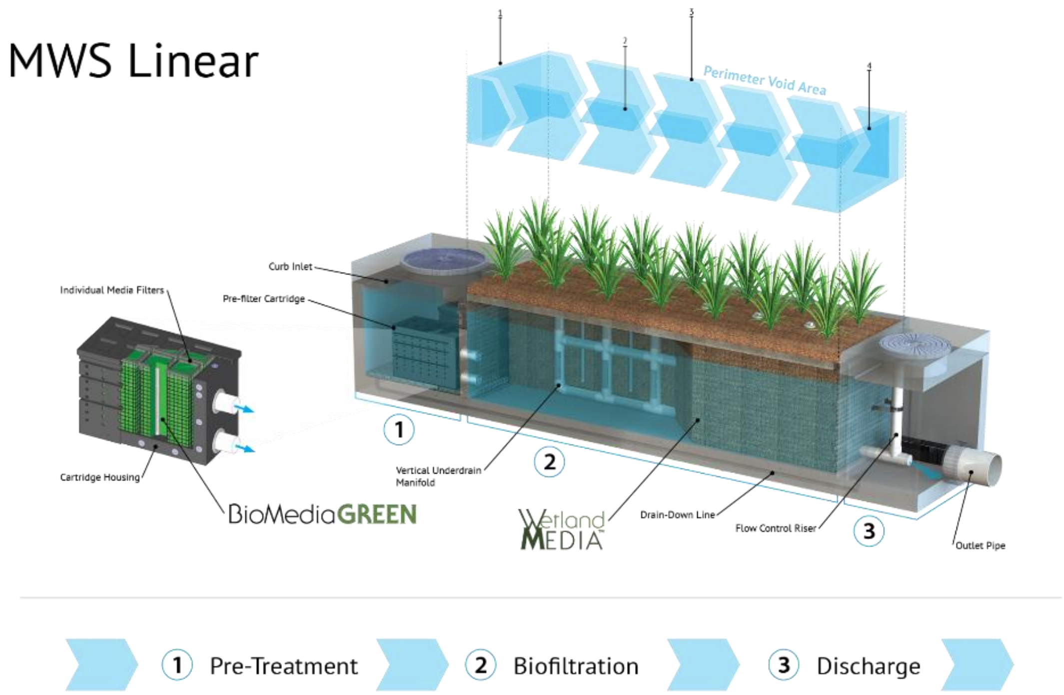
    a. The MWS Linear an advanced vegetated biofiltration promotes biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

    b. Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994). Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

    c. Following are pictures from the plants pulled from a MWS Linear after only 14 months of growth. The media used in the system is designed to maximize biological activity:


6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

    a. The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling with in the BMP is not an issue. Following is a diagram of the BMP. The system pre-treatment chamber prevent any erosion or scour. The system downstream orifice control prevents channeling of the media:



7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

    a. The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the county of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used to gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. Attached is a copy of the maintenance manual for the MWS Linear.

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Designed & Maintained Consistent with their Performance Certifications

We are in agreement that all BMPs should be designed in a manner consistent with the TAPE certification. The MWS Linear is sized in accordance with the TAPE GULD approval which provides certification at a loading rate of 1 gpm/sq ft (100 in/hr) for Basic, Phosphorus and Enhanced treatment. In addition, as stated previously, Modular Wetland System, Inc. provide activation of all system installed in San Diego County along with the first year of inspections and maintenance to ensure appropriate function. As previously stated, a copy of the TAPE GULD approval is attached to support this claim.

Additionally, it should be noted that the manual allows for biofiltration BMPs to be sized in either volume based (DCV) or flow based design. The manual states in section F.2.2 Sizing of Flow-Based Biofiltration *BMPs:*

> *"This sizing method is only available when the BMP meets the pollutant treatment performance standard in Appendix F.1."*
>
> *"Proprietary biofiltration BMPs are typically designed as a flow-based BMPs (i.e., a constant treatment capacity with negligible storage volume). Additionally, proprietary biofiltration is only acceptable if no infiltration is feasible and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible. The applicable sizing method for biofiltration is therefore reduced to: Treat 1.5 times the DCV."*
>
> *"The following steps should be followed to demonstrate that the system is sized to treat 1.5 times the DCV."*
>
> > *1. Calculate the flow rate required to meet the pollutant treatment performance standard without scaling for the 1.5 factor. Options include either:*
> >
> > - *Calculate the runoff flow rate from a 0.2 inch per hour uniform intensity precipitation event (See methodology Appendix B.6.3), or*
> > - *Conduct a continuous simulation analysis to compute the size required to capture and treat 80 percent of average annual runoff; for small catchments, 5-minute precipitation data should be used to account for short time of concentration. Nearest rain gage with 5-minute precipitation data is allowed for this analysis.*

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2. Multiply the flow rate from Step 1 by 1.5 to compute the design flow rate for the biofiltration system.

3. Based on the conditions of certification/verification (discussed above), establish the design capacity, as a flow rate, of a given sized unit.

4. Demonstrates that an appropriate unit size and number of units is provided to provide a flow rate that meets the required flow rate from Step 2.

In conclusion, we have closely followed the process and protocol for showing the MWS Linear meets all the criteria to be accepted as Biofiltration as found in Appendix F.

If you have any questions please feel free to contact us directly.

Sincerely,

Zachariha J. Kent

Director of Engineering

Bio Clean Environmental Services, Inc.

April 2014

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
4. Ecology approves monitoring for the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic

loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

- Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
- Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
- Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	*PO. Box 869* *Oceanside, CA 92054*

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.

- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

Laboratory Testing

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system’s influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).

- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

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Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment

TAPE PERFORMANCE SUMMARY

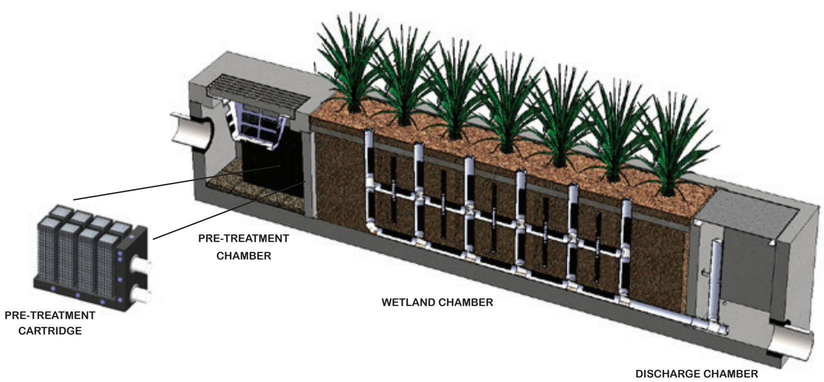
MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

Pollutant	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Total Suspended Solids	75.0	15.7	85%	Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns.
Total Phosphorus	0.227	0.074	64%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Ortho Phosphorus	0.093	0.031	67%	Summary of all data meeting TAPE parameters for total phosphorus.
Nitrogen	1.40	0.77	45%	Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing.
Dissolved Zinc	0.062	0.024	66%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Dissolved Copper	0.0086	0.0059	38%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Total Zinc	0.120	0.038	69%	Summary of all data during testing.
Total Copper	0.017	0.009	50%	Summary of all data during testing.
Motor Oil	24.157	1.133	95%	Summary of all data during testing.

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

PERFORMANCE SUMMARY

MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

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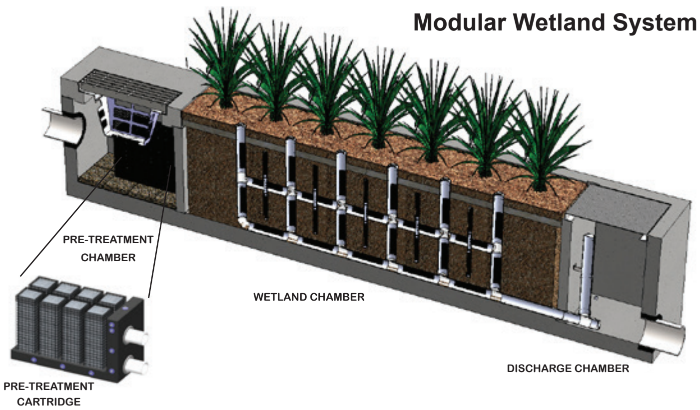

Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.

Oceanside Test Site

Portland Test Site

HEAVY METALS: Copper / Zinc

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.76 / .95	.06 / .19	92% / 80%	Majority Dissolved Fraction
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.04 / .24	< .02 / < .05	>50% / >79%	Effluent Concentrations Below Detectable Limits
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.058 / .425	.032 / .061	44% / 86%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	.017/ .120	.009 / .038	50% / 69%	Total Metals

TOTAL SUSPENDED SOLIDS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	270	3	99%	Sil-co-sil 106 - 20 micron mean particle size
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	45.67	8.24	82%	Mean Particle Size by Count < 8 Microns
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	676	39	94%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	75.0	15.7	85%	Means particle size of 8 microns

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PERFORMANCE SUMMARY

MWS-LINEAR 2.0

PHOSPHORUS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
TAPE Field Testing / Portland, OR 2011/2012	Field	.227	.074	64%	TOTAL P
TAPE Field Testing / Portland, OR 2011/2012	Field	.093	.031	67%	ORTHO P

BACTERIA:

Description	Type	Avg. Influent (MPN)	Avg. Effluent (MPN)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	1600 / 1600	535 / 637	67% / 60%	Fecal / E. Coli
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	31666 / 6280	8667 / 1058	73% / 83%	Fecal / E. Coli

LEAD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.54	.10	82%	Total
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.01 / .043	.004 / .014	60% / 68%	Both Test Units
TAPE Field Testing / Portland, OR 2011/2012	Field	.011	.003	70%	Total

All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

NITROGEN:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.85	.21	75%	NITRATE
TAPE Field Testing / Portland, OR 2011/2012	Field	1.40	0.77	45%	TKN

HYDROCARBONS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	10	1.625	84%	Oils & Grease
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.83	0	100%	TPH Motor Oil
TAPE Field Testing / Portland, OR 2011/2012	Field	24.157	1.133	95%	Motor Oil

TURBIDITY:

Description	Type	Avg. Influent (NTU)	Avg. Effluent (NTU)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	21	1.575	93%	Field Measurement
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	21	6	71%	Field Measurement

COD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	516 / 1450	90 / 356	83% / 75%	Both Test Units

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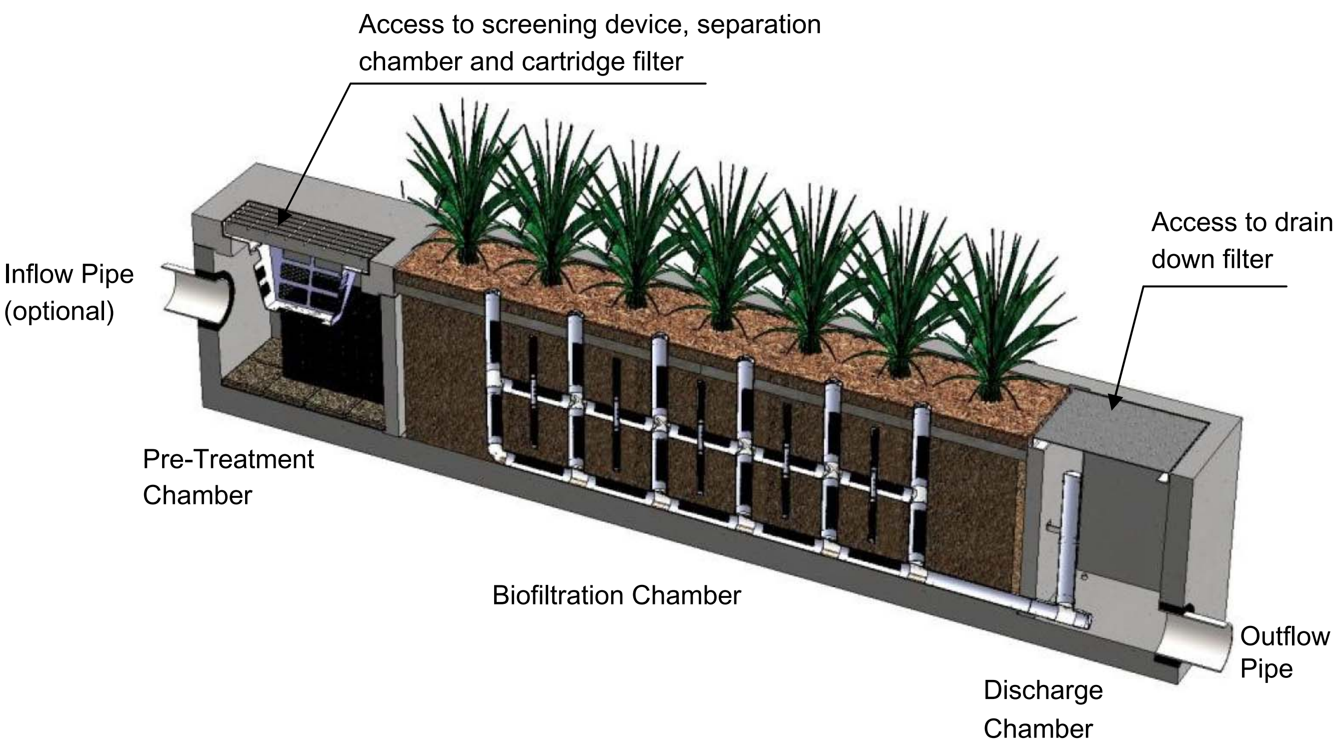
Maintenance Guidelines for
Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



MODULAR WETLANDS

Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

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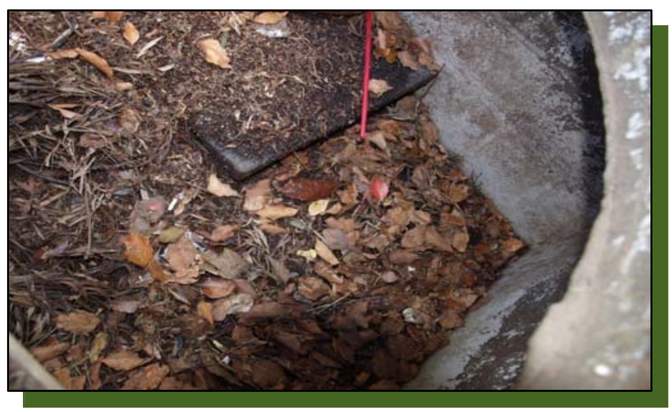
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the pre-treatment chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the pre-treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the discharge chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

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www.modularwetlands.com

Inspection Report
Modular Wetlands System

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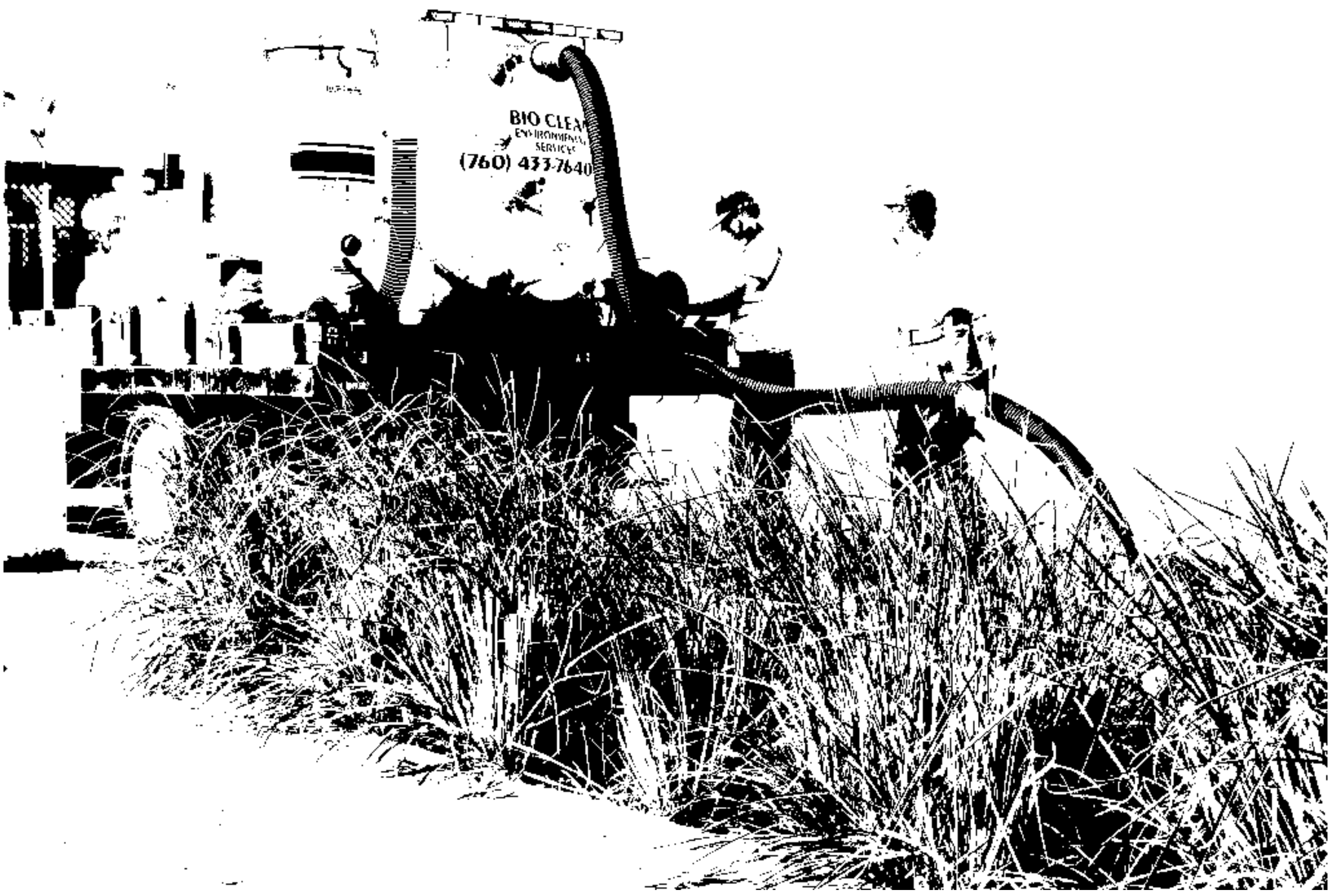
Maintenance Report



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Cleaning and Maintenance Report
Modular Wetlands System

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Factor of Safety and Design Infiltration Worksheet			Worksheet D.5.1		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p=w*v
A	Sustainability Assesment	Soil Assessment Methods	0.25	2	0.5
		Predominant Soil Texture	0.25	2	0.5
		Site Soil Variability	0.25	3	0.75
		Depth to ground water/impervious Layer	0.25	1	0.25
		Suitability Assesment Safety Factor			2
B	Design	Level if pretreatment/Expected Sediment Loads	0.5	2	1
		Redundancy/Resilincy	0.25	2	0.5
		Compaction During Construction	0.25	2	0.5
		Design Safety Facot			2
Combined Safety Factor					4
Observed Infiltration Rate inch/hr					0.38
Design Infiltration Rate					0.095
Supporting Data:					

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INTERNATIONAL

PROJECT NAME: CAMPUS POINT
BY: RST
CHECKED: BKO
DATE: 10/25/2016
SHEET NO. 1 OF 2 SHEETS

DMA-1 FLOW THROUGH SIZING

STEP 1 - CALCULATE the flow rate USING SDHM OUTPUT.

EXIST. TOTAL STORMS IS 1105, 80TH percentile IS 884 STORMS, 221 > 80TH PERCENTILE PER SDHM, 80TH FLOW IS 0.5336 cfs

PROP TOTAL STORMS IS 1170, 80TH Percentile IS 936 STORM, 234 > 80TH Percenecentile Per SDHM, 80TH FLOW IS 0.5023 cfs

use greater of the 2, use $\boxed{0.5336\ cfs}$

Step 2 - Multiply flow rate by 1.5

1.5 × 0.5336 cfs = 0.8004

Step 3 - Determine flow rate of each BMP.

Per BioClean (See ATTACHED) EACH 8'x16' unit has A MAX FLOW RATE OF 0.462 cfs

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PROJECT NAME: Campus Point
BY: RST
CHECKED: BKO
DATE: 10/25/2016
SHEET NO. 2 OF 2 SHEETS

Step 4 - Show flow rate exceeds Design rate.

USING 2-8'X16' MWS, MAX FLOW RATE IS:

0.462 X 2 = 0.924 cfs

REQUIRED FLOW RATE = 0.8004 cfs
PROVIDED FLOW RATE = 0.9240 cfs

Therefore, Flow rate exceeds REQUIRED.

✓ OK

DMA - 1

Flow through Design Worksheet				
1	80th Percentile Flow Rate**	$Q_{80th\ Percentile}$	0.5336	cfs
2	Multiplication Factor for 150%		1.5	Unitless
3	Required flow rate for BMP		0.8004	cubic-feet
4	Flow rate of each BMP Proposed	Q=	0.462	cfs
5	Number of BMP's Proposed	n	2	unitless
6	Total flow rate proposed (Line 4 times Line 5)	Q=	0.924	cfs
7	Excess flow rate (Line 6-Line 4)	Q=	0.1236	cfs

**80th Percentile rainfall based on output of SDHM, see next page

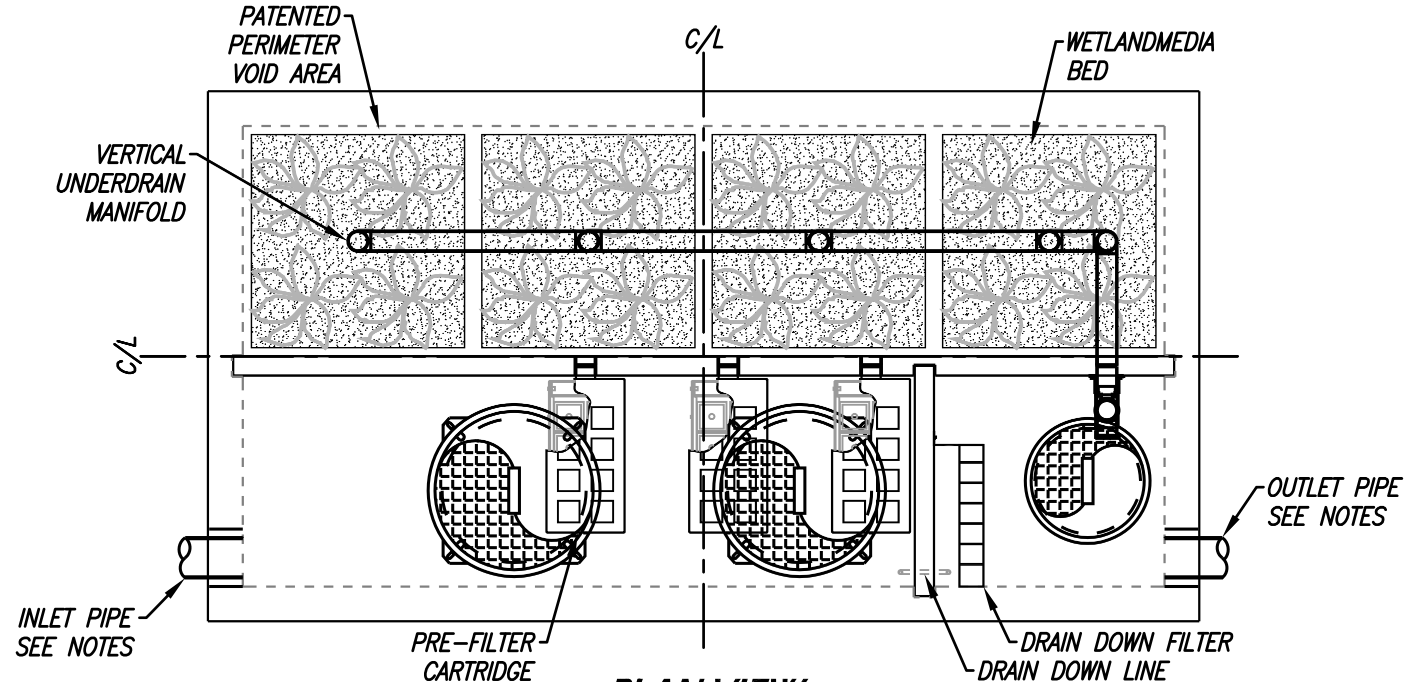
Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1575	1105	1170	105	Pass
0.1888	916	924	100	Pass
0.2202	750	773	103	Pass
0.2515	637	660	103	Pass
0.2829	521	566	108	Pass
0.3142	450	484	107	Pass
0.3456	405	413	101	Pass
0.3769	359	372	103	Pass
0.4083	321	328	102	Pass
0.4396	285	292	102	Pass
0.4709	255	265	103	Pass
0.5023	237	234	98	Pass
0.5336	221	213	96	Pass
0.5650	204	190	93	Pass
0.5963	190	166	87	Pass
0.6277	174	153	87	Pass
0.6590	159	140	88	Pass
0.6904	144	128	88	Pass
0.7217	140	114	81	Pass
0.7530	131	108	82	Pass
0.7844	123	104	84	Pass
0.8157	114	98	85	Pass
0.8471	103	95	92	Pass
0.8784	97	90	92	Pass
0.9098	92	86	93	Pass
0.9411	90	77	85	Pass
0.9725	89	71	79	Pass
1.0038	89	69	77	Pass
1.0352	86	67	77	Pass
1.0665	85	62	72	Pass
1.0978	78	62	79	Pass
1.1292	75	59	78	Pass
1.1605	73	54	73	Pass
1.1919	72	51	70	Pass
1.2232	69	47	68	Pass
1.2546	62	44	70	Pass
1.2859	60	38	63	Pass
1.3173	56	35	62	Pass
1.3486	54	31	57	Pass
1.3799	50	28	56	Pass
1.4113	48	28	58	Pass
1.4426	47	22	46	Pass
1.4740	47	22	46	Pass
1.5053	45	22	48	Pass
1.5367	38	21	55	Pass
1.5680	36	20	55	Pass
1.5994	35	20	57	Pass
1.6307	34	19	55	Pass
1.6621	32	18	56	Pass
1.6934	31	17	54	Pass
1.7247	30	16	53	Pass
1.7561	29	16	55	Pass
1.7874	26	16	61	Pass

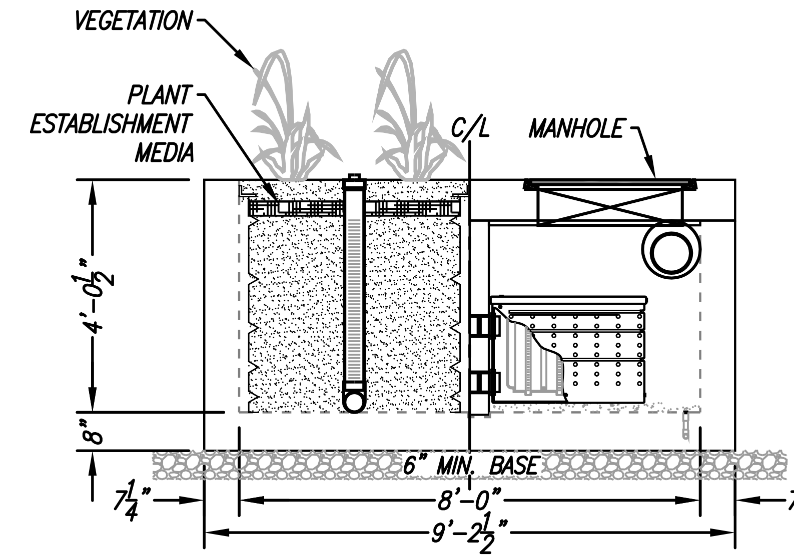
Total number of storms is 1105 in the existing condition. Therefore, 80th percentile would be 1105 * 80% or 884 storms. 1105 minus the 884 storms below the 80th percentile shows 221 storms below the 80th percentile and 884 above the 80th percentile, therefore 80th percentile storm is 0.5336 cfs.
80th percentile storm for existing conditions is 1170 * 80% = 936.
1170 - 936 = 234, therefore the 80th percentile storm for the proposed condition is 0.5023 cfs.
We are using the greated of the two 0.5336 cfs as the 80th percentile rainfall per Appendix F.2

1.8188	26	15	57	Pass
1.8501	24	13	54	Pass
1.8815	21	12	57	Pass
1.9128	20	10	50	Pass
1.9442	19	9	47	Pass
1.9755	19	8	42	Pass
2.0068	19	7	36	Pass
2.0382	19	7	36	Pass
2.0695	17	7	41	Pass
2.1009	16	7	43	Pass
2.1322	15	6	40	Pass
2.1636	14	6	42	Pass
2.1949	13	6	46	Pass
2.2263	13	6	46	Pass
2.2576	12	6	50	Pass
2.2890	12	6	50	Pass
2.3203	12	6	50	Pass
2.3516	12	6	50	Pass
2.3830	12	6	50	Pass
2.4143	10	6	60	Pass
2.4457	10	6	60	Pass
2.4770	9	6	66	Pass
2.5084	8	6	75	Pass
2.5397	8	6	75	Pass
2.5711	8	6	75	Pass
2.6024	8	6	75	Pass
2.6337	8	6	75	Pass
2.6651	7	6	85	Pass
2.6964	7	6	85	Pass
2.7278	6	6	100	Pass
2.7591	6	5	83	Pass
2.7905	5	5	100	Pass
2.8218	5	5	100	Pass
2.8532	5	5	100	Pass
2.8845	5	5	100	Pass
2.9159	5	5	100	Pass
2.9472	5	4	80	Pass
2.9785	5	4	80	Pass
3.0099	5	3	60	Pass
3.0412	4	3	75	Pass
3.0726	4	3	75	Pass
3.1039	4	3	75	Pass
3.1353	4	3	75	Pass
3.1666	4	2	50	Pass
3.1980	4	2	50	Pass
3.2293	4	2	50	Pass
3.2606	4	2	50	Pass

SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			7.26
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø3.07"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			

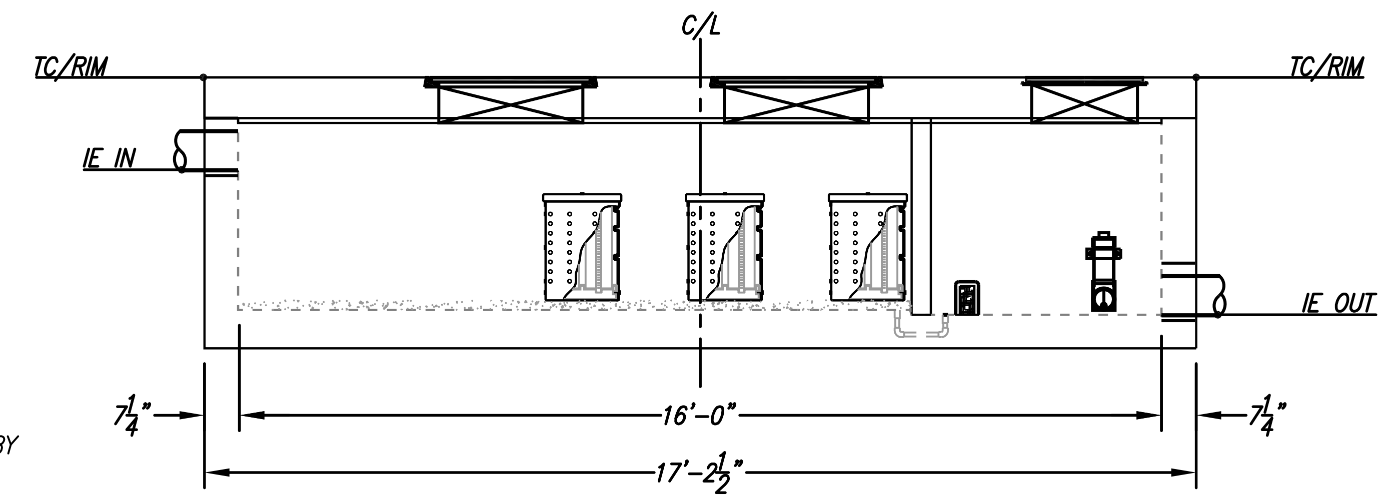


PLAN VIEW

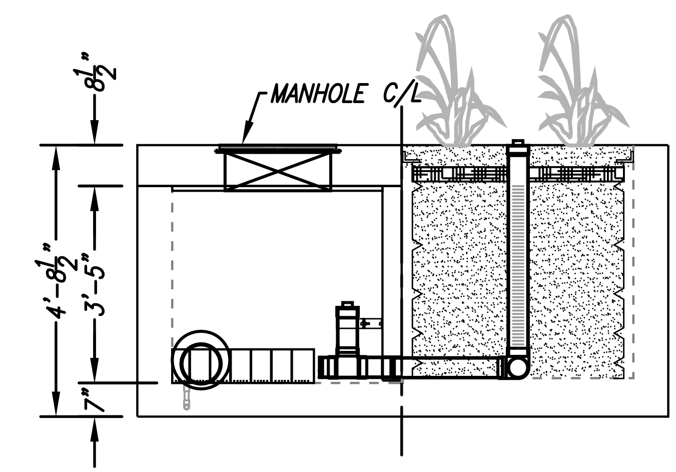


LEFT END VIEW

BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW

DISCHARGE/BIOFILTRATION

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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

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 MANUFACTURER.

TREATMENT FLOW (CFS)	0.462
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

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MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

DMA-2

Index

DMA-2

User Input
Regional Value
Cells updated automatically

Simple Sizing Method for Biofiltration			
1	Remaining DCV after implementing retention BMPs	777	ft^3
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 is partial infiltration is feasbile	0.08	in/hr
3	Allowable drawdown time for aggregate storage below underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	3	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain, min. 3 in. [Line 4 / Line 5]	7	inches
7	Assumed surface area of the bioretention BMP	1,063	ft^2
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	468	ft^3
10	DCV that requires biofiltration [Line 1 - Line 9]	309	ft^3
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum]	24	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	12	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	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)]	22	inches
19	Total Depth Treated [Line 17 + Line 18]	52	inches
Option 1 - Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	463	ft^3
21	Required Footprint [Line 20 / Line 19] x 12	108	ft^2
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	232	ft^3
23	Required Footprint [Line 22 / Line 18] x 12	129	ft^2
Footprint of the BMP			
24	Area draining to the BMP	20,038	ft^2
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 & B.2)	0.83	n/a
26	BMP Footprint Sizing Factor (Default 0.03)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	499	ft^2
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23, Line 26)	499	ft^2
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line1]	0.60	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375?	Yes	No

***Note** : Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until it's equivalent to the required biofiltration footprint (either Line 21 or Line 23)*

DMA-2

Surface Type	Runoff Factor	Surface Area (ac)	Factored Area (ac)
Roofs/Pavements	0.9	0	0
Unit Pavers (Grouted)	0.9	0.42	0.378
Decomposed Granite	0.3	0	0
Cobbles or Crushed Aggregate	0.3	0	0
Amended, Mulched Soils or Landscape	0.1	0.04	0.004
Compacted Soils	0.3	0	0

Total Factored Area	0.382
Total Area	0.460
Factored 'C' Value	0.830

DMA-2

Design Capture Volume		Worksheet B-2.1		
1	85th Percentile 24-hr storm depth from Figure B.1-1	d=	0.56	inches
2	Areas tributary to BMP(s)	A=	0.46	acres
3	Area weighted runoff factor (estimated using Appendix B.1.1 and B.2.1) See previous page	C=	0.830435	unitless
4	Street Trees Reduction Volume	TCV=	0	cubic-feet
5	Rain Barrels Reduction Volume	RCV=	0	cubic-feet
6	Calculated DCV	DCV=	776.5296	cubic-feet

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.

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Project Name: Campus Point SDP

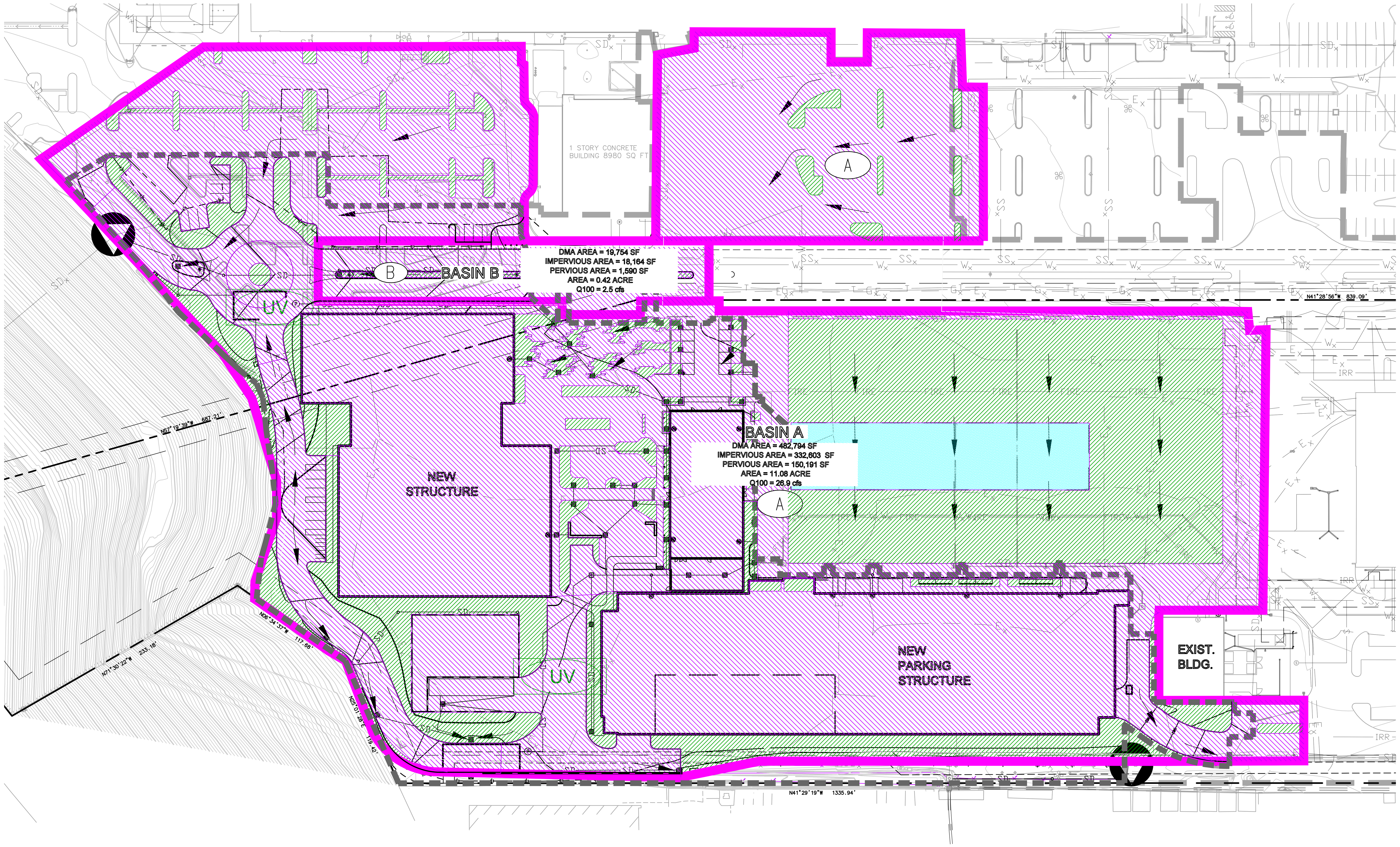
Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist.
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.	☒NotPerformed ☐Included ☐Sumitted as separarte stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP 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)



LEGEND

LIMITS OF OVERALL DRAINAGE BASIN	
BASIN	X-X
IMPERVIOUS AREA	
PERVIOUS AREA	
INFILTRATION BASIN	
DRAINAGE BASIN	
FLOW PATH	
POINT COMPLIANCE	

SCALE: 1"=50'

50 0 50 100 150

SCALE: 1"=50'

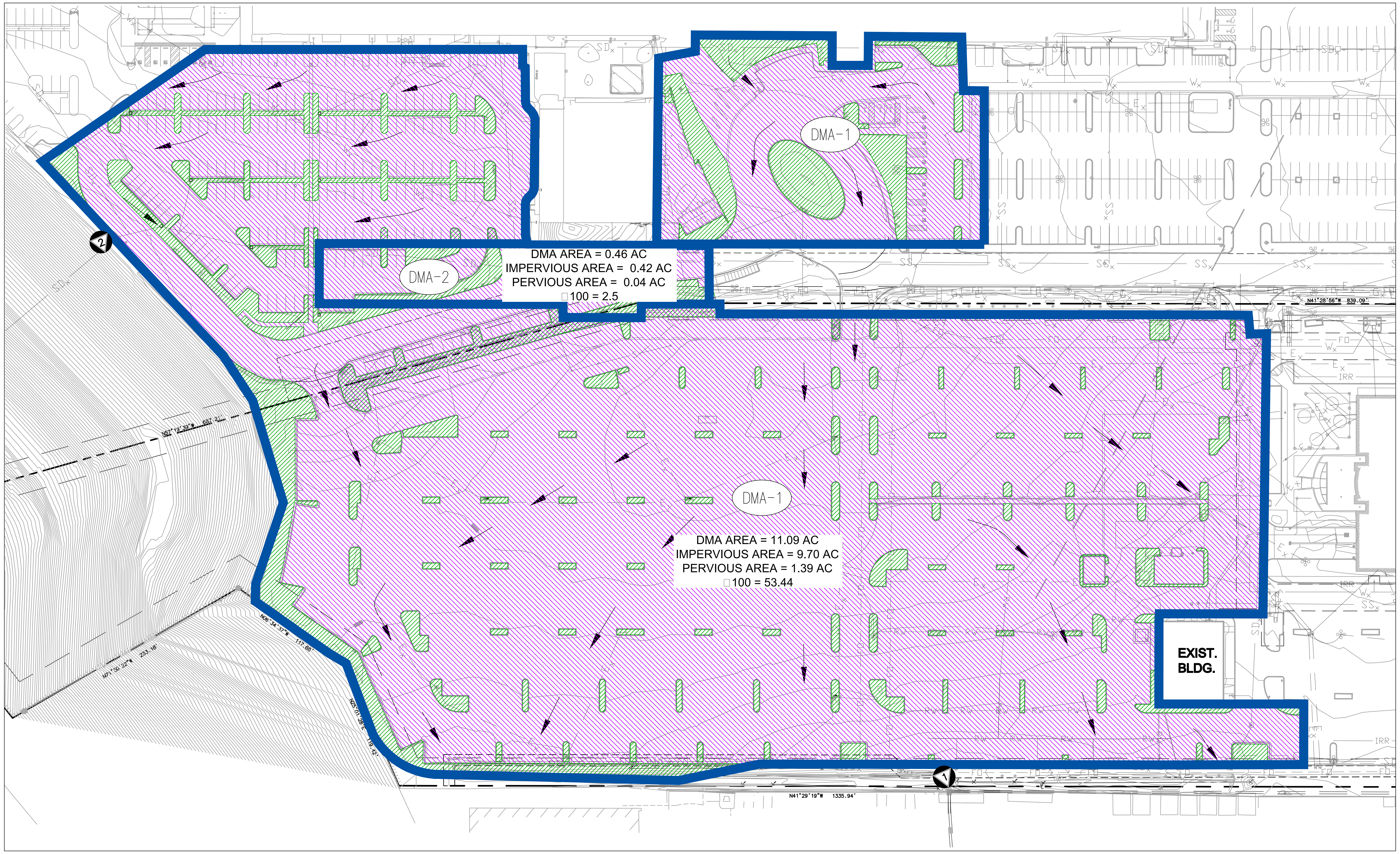
CAMPUS POINT

10290 CAMPUS POINT DR. SAN DIEGO, CA

PROPOSED CONDITIONS IMPERVIOUS AREAS

10 / 16 / 16

Michael Baker INTERNATIONAL
9755 C□aire□ont Mesa Bou□e□ard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM



LEGEND

- BASIN BOUNDARY
- MODULAR WETLANDS SYSTEM — MW
- STORM DRAIN STENCILING
- PERVIOUS AREA
- IMPERVIOUS AREA
- BIORETENTION BASIN
- POINT OF COMPLIANCE
- DMA ID NUMBER — DMA-#

NOTE:
ALL SOILS URBAN LANDS SOIL TYPE "D"

GROUNDWATER DEPTH EXCEEDS 20 FEET

SEE ATTACHMENT 2b FOR CRITICAL COARSE SEDIMENT YIELD AREAS

SCALE: 1"=50'

50 25 0 50 100 150

SCALE: 1"=50'

Campus Point SDP

HMP Existing Conditions

8/1/2016

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San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM


10300 Campus Point Dr
Project Boundary
CCSY Areas

SDHM 3.0

PROJECT REPORT

General Model Information

Project Name:	Stormtech that works better
Site Name:	Campus Point
Site Address:	10290 Campus Point Drive
City:	Kearny Mesa
Report Date:	10/15/2016
Gage:	KEARNY M
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2016/08/31

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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Gravel,Flat(0-5)	9.7
Pervious Total	9.7
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.39
Impervious Total	1.39
Basin Total	11.09

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Grass,FLAT(0-5%)	3.45
Pervious Total	3.45
Impervious Land Use	acre
IMPERVIOUS-FLAT	7.64
Impervious Total	7.64
Basin Total	11.09

Element Flows To:

Surface	Interflow	Groundwater
StormTech 1	StormTech 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech 1

Chamber Model:	4500	
Dimensions		
Max Row Length:	222.47	
Number of Chambers:	324	
Number of Endcaps:	12	
Top Stone Depth:	18	
Bottom Stone Depth:	12	
Infiltration On		
Infiltration rate:	0.38	
Infiltration safety factor:	0.25	
Total Volume Infiltrated (ac-ft.):		105.482
Total Volume Through Riser (ac-ft.):		119.5
Total Volume Through Facility (ac-ft.):		224.982
Percent Infiltrated:		46.88
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Discharge Structure		
Riser Height:	7 ft.	
Riser Diameter:	24 in.	
Notch Type:	Rectangular	
Notch Width:	0.160 ft.	
Notch Height:	3.500 ft.	
Orifice 1 Diameter:	1.95 in.	Elevation:1.4 ft.
Element Flows To:		
Outlet 1	Outlet 2	

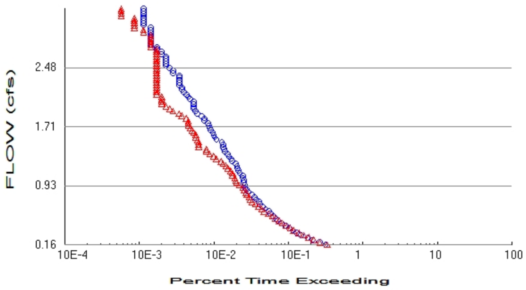
StormTech Hydraulic Table

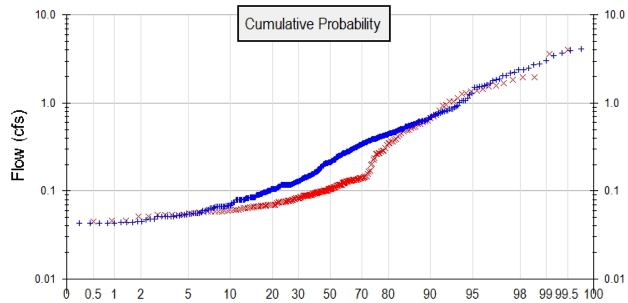
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
4.0000	1.654	0.000	0.000	0.000
4.1333	1.654	0.220	0.000	0.158
4.2667	1.654	0.441	0.000	0.158
4.4000	1.654	0.661	0.000	0.158
4.5333	1.654	0.882	0.000	0.158
4.6667	1.654	1.103	0.000	0.158
4.8000	1.654	1.323	0.000	0.158
4.9333	1.654	1.544	0.000	0.158
5.0667	1.654	1.765	0.000	0.158
5.2000	1.654	1.985	0.000	0.158
5.3333	1.654	2.206	0.000	0.158
5.4667	1.654	2.426	0.026	0.158
5.6000	1.654	2.647	0.046	0.158
5.7333	1.654	2.868	0.059	0.158
5.8667	1.654	3.088	0.070	0.158
6.0000	1.654	3.309	0.079	0.158
6.1333	1.654	3.530	0.088	0.158
6.2667	1.654	3.750	0.096	0.158
6.4000	1.654	3.971	0.103	0.158
6.5333	1.654	4.192	0.109	0.158
6.6667	1.654	4.412	0.116	0.158
6.8000	1.654	4.633	0.122	0.158
6.9333	1.654	4.853	0.127	0.158
7.0667	1.654	5.074	0.133	0.158

7.2000	1.654	5.295	0.138	0.158
7.3333	1.654	5.515	0.143	0.158
7.4667	1.654	5.736	0.148	0.158
7.6000	1.654	5.957	0.169	0.158
7.7333	1.654	6.177	0.214	0.158
7.8667	1.654	6.398	0.271	0.158
8.0000	1.654	6.618	0.335	0.158
8.1333	1.654	6.839	0.405	0.158
8.2667	1.654	7.060	0.477	0.158
8.4000	1.654	7.280	0.551	0.158
8.5333	1.654	7.501	0.630	0.158
8.6667	1.654	7.722	0.723	0.158
8.8000	1.654	7.942	0.822	0.158
8.9333	1.654	8.163	1.159	0.158
9.0667	1.654	8.384	1.301	0.158
9.2000	1.654	8.604	1.448	0.158
9.3333	1.654	8.825	1.601	0.158
9.4667	1.654	9.045	1.760	0.158
9.6000	1.654	9.266	1.924	0.158
9.7333	1.654	9.487	2.093	0.158
9.8667	1.654	9.707	2.266	0.158
10.000	1.654	9.928	2.445	0.158
10.133	1.654	10.14	2.629	0.158
10.267	1.654	10.37	2.817	0.158
10.400	1.654	10.59	3.009	0.158
10.533	1.654	10.81	3.206	0.158
10.667	1.654	11.03	3.407	0.158
10.800	1.654	11.25	3.613	0.158
10.933	1.654	11.47	3.822	0.158
11.067	1.654	11.69	4.295	0.158
11.200	1.654	11.91	5.819	0.158
11.333	1.654	12.13	7.915	0.158
11.467	1.654	12.35	10.24	0.158
11.600	1.654	12.57	12.48	0.158
11.733	1.654	12.79	14.32	0.158
11.867	1.654	13.01	15.60	0.158
12.000	1.654	13.23	16.54	0.158
12.133	1.654	13.45	17.36	0.158
12.267	1.654	13.67	18.13	0.158
12.400	1.654	13.90	18.86	0.158
12.533	1.654	14.12	19.56	0.158
12.667	1.654	14.34	20.22	0.158
12.800	1.654	14.56	20.86	0.158
12.933	1.654	14.78	21.48	0.158
13.067	1.654	15.00	22.08	0.158
13.200	1.654	15.22	22.66	0.158
13.333	1.654	15.44	23.22	0.158
13.467	1.654	15.66	23.76	0.158
13.600	1.654	15.88	24.29	0.158
13.733	1.654	16.10	24.81	0.158
13.867	1.654	16.32	25.31	0.158
14.000	1.654	16.54	25.80	0.158
14.133	1.654	16.76	26.29	0.158
14.267	1.654	16.98	26.76	0.158
14.400	1.654	17.20	27.22	0.158
14.533	1.654	17.43	27.67	0.158
14.667	1.654	17.65	28.12	0.158
14.800	1.654	17.87	28.56	0.158

14.933	1.654	18.09	28.99	0.158
15.067	1.654	18.31	29.41	0.158
15.200	1.654	18.53	29.82	0.158
15.333	1.654	18.75	30.23	0.158
15.467	1.654	18.97	30.63	0.158
15.600	1.654	19.19	31.03	0.158
15.733	1.654	19.41	31.42	0.158
15.867	1.654	19.63	31.81	0.158
16.000	1.654	19.85	32.19	0.158
16.133	1.654	20.07	32.56	0.158
16.267	0.000	0.000	32.93	0.026

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 9.7
Total Impervious Area: 1.39

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.45
Total Impervious Area: 7.64

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.57491
5 year	2.443881
10 year	3.260648
25 year	3.943535

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.726053
5 year	1.485453
10 year	1.896718
25 year	3.582304

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1575	1105	1170	105	Pass
0.1888	916	924	100	Pass
0.2202	750	773	103	Pass
0.2515	637	660	103	Pass
0.2829	521	566	108	Pass
0.3142	450	484	107	Pass
0.3456	405	413	101	Pass
0.3769	359	372	103	Pass
0.4083	321	328	102	Pass
0.4396	285	292	102	Pass
0.4709	255	265	103	Pass
0.5023	237	234	98	Pass
0.5336	221	213	96	Pass
0.5650	204	190	93	Pass
0.5963	190	166	87	Pass
0.6277	174	153	87	Pass
0.6590	159	140	88	Pass
0.6904	144	128	88	Pass
0.7217	140	114	81	Pass
0.7530	131	108	82	Pass
0.7844	123	104	84	Pass
0.8157	114	98	85	Pass
0.8471	103	95	92	Pass
0.8784	97	90	92	Pass
0.9098	92	86	93	Pass
0.9411	90	77	85	Pass
0.9725	89	71	79	Pass
1.0038	89	69	77	Pass
1.0352	86	67	77	Pass
1.0665	85	62	72	Pass
1.0978	78	62	79	Pass
1.1292	75	59	78	Pass
1.1605	73	54	73	Pass
1.1919	72	51	70	Pass
1.2232	69	47	68	Pass
1.2546	62	44	70	Pass
1.2859	60	38	63	Pass
1.3173	56	35	62	Pass
1.3486	54	31	57	Pass
1.3799	50	28	56	Pass
1.4113	48	28	58	Pass
1.4426	47	22	46	Pass
1.4740	47	22	46	Pass
1.5053	45	22	48	Pass
1.5367	38	21	55	Pass
1.5680	36	20	55	Pass
1.5994	35	20	57	Pass
1.6307	34	19	55	Pass
1.6621	32	18	56	Pass
1.6934	31	17	54	Pass
1.7247	30	16	53	Pass
1.7561	29	16	55	Pass
1.7874	26	16	61	Pass

1.8188	26	15	57	Pass
1.8501	24	13	54	Pass
1.8815	21	12	57	Pass
1.9128	20	10	50	Pass
1.9442	19	9	47	Pass
1.9755	19	8	42	Pass
2.0068	19	7	36	Pass
2.0382	19	7	36	Pass
2.0695	17	7	41	Pass
2.1009	16	7	43	Pass
2.1322	15	6	40	Pass
2.1636	14	6	42	Pass
2.1949	13	6	46	Pass
2.2263	13	6	46	Pass
2.2576	12	6	50	Pass
2.2890	12	6	50	Pass
2.3203	12	6	50	Pass
2.3516	12	6	50	Pass
2.3830	12	6	50	Pass
2.4143	10	6	60	Pass
2.4457	10	6	60	Pass
2.4770	9	6	66	Pass
2.5084	8	6	75	Pass
2.5397	8	6	75	Pass
2.5711	8	6	75	Pass
2.6024	8	6	75	Pass
2.6337	8	6	75	Pass
2.6651	7	6	85	Pass
2.6964	7	6	85	Pass
2.7278	6	6	100	Pass
2.7591	6	5	83	Pass
2.7905	5	5	100	Pass
2.8218	5	5	100	Pass
2.8532	5	5	100	Pass
2.8845	5	5	100	Pass
2.9159	5	5	100	Pass
2.9472	5	4	80	Pass
2.9785	5	4	80	Pass
3.0099	5	3	60	Pass
3.0412	4	3	75	Pass
3.0726	4	3	75	Pass
3.1039	4	3	75	Pass
3.1353	4	3	75	Pass
3.1666	4	2	50	Pass
3.1980	4	2	50	Pass
3.2293	4	2	50	Pass
3.2606	4	2	50	Pass

Water Quality

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

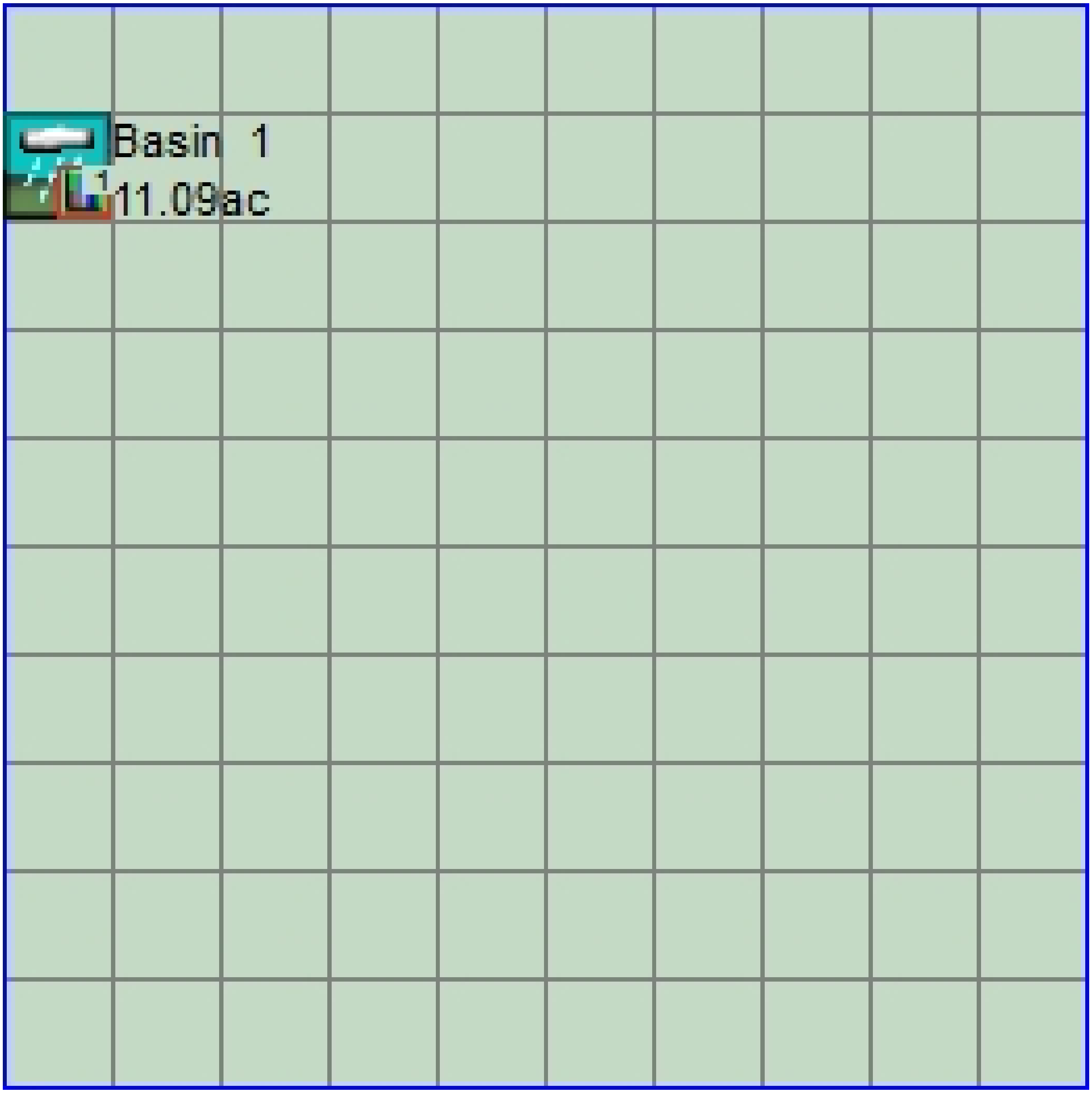
PERLND Changes

No PERLND changes have been made.

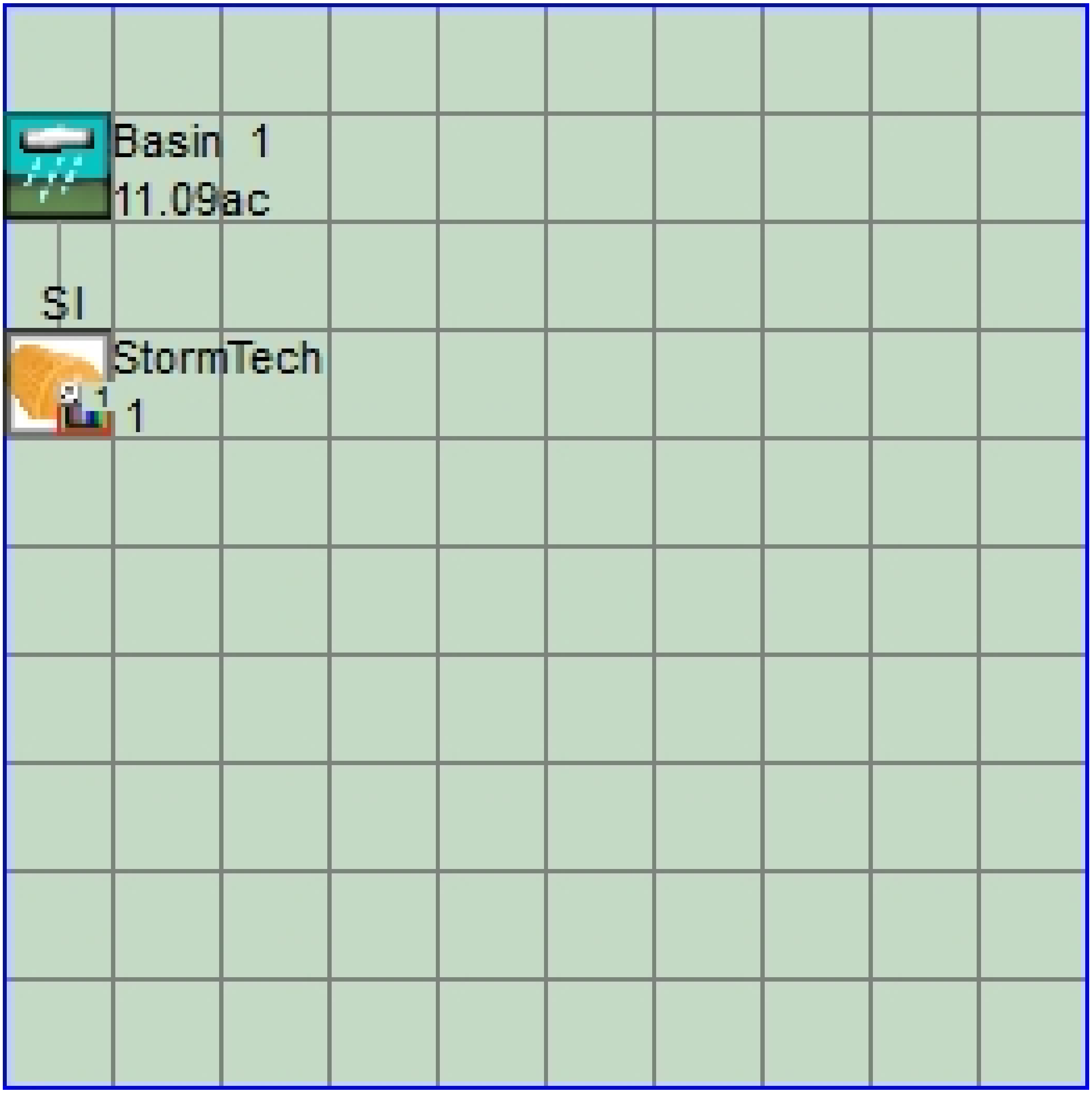
IMPLND Changes

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   Stormtech that works better.wdm
MESSU      25   PreStormtech that works better.MES
           27   PreStormtech that works better.L61
           28   PreStormtech that works better.L62
           30   POCStormtech that works better1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      34
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  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           ***
   34      D,Gravel,Flat(0-5)     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 ***
   34         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  *********
   34         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 ***
   34         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
   34              0       2.4     0.022       400      0.05         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   34             35        30         2         2       0.4      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   34              0       1.6      0.35         0       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   34       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  ***
   34       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
   34              0         0      0.01         0       0.5       0.3      0.01
  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     0.035      0.05       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#   ***
Basin  1***
PERLND  34                        9.7     COPY   501     12
PERLND  34                        9.7     COPY   501     13
IMPLND   1                       1.39     COPY   501     15

******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

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


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   Stormtech that works better.wdm
MESSU      25   MitStormtech that works better.MES
           27   MitStormtech that works better.L61
           28   MitStormtech that works better.L62
           30   POCStormtech that works better1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      28
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  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           ***
   28      D,Grass,FLAT(0-5%)     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 ***
   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  *********
```

```
  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 ***
  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
  28              0       4.8      0.04       200      0.05         3      0.92
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  28             35        30         2         2       0.4      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  28            0.08       0.6       0.2       1.5       0.7       0.5
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
  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  ***
  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
  28              0         0      0.15         0         4      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     0.035      0.05       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#   ***
Basin  1***
PERLND  28                        3.45     RCHRES   1      2
PERLND  28                        3.45     RCHRES   1      3
IMPLND   1                        7.64     RCHRES   1      5

******Routing******
PERLND  28                        3.45     COPY     1     12
IMPLND   1                        7.64     COPY     1     15
PERLND  28                        3.45     COPY     1     13
RCHRES   1                           1     COPY   501     17
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     StormTech  1            2    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
  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
  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
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.04       0.0       4.0       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
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.280841  0.000000  0.000000  0.000000
  0.083333  0.280841  0.009369  0.000000  0.026902
  0.166667  0.280841  0.018738  0.000000  0.026902
  0.250000  0.280841  0.028074  0.000000  0.026902
  0.333333  0.280841  0.037446  0.000000  0.026902
  0.416667  0.280841  0.046808  0.000000  0.026902
  0.500000  0.280841  0.056169  0.000000  0.026902
  0.583333  0.280841  0.065531  0.000000  0.026902
  0.666667  0.280841  0.074892  0.000000  0.026902
  0.750000  0.280841  0.084254  0.000000  0.026902
  0.833333  0.280841  0.093615  0.000000  0.026902
  0.916667  0.280841  0.102977  0.000000  0.026902
  1.000000  0.280841  0.112338  0.000000  0.026902
  1.083333  0.280841  0.133153  0.000000  0.026902
  1.166667  0.280841  0.153901  0.000000  0.026902
  1.250000  0.280841  0.174616  0.000000  0.026902
  1.333333  0.280841  0.195287  0.000000  0.026902
  1.416667  0.280841  0.215921  0.013321  0.026902
  1.500000  0.280841  0.236506  0.032631  0.026902
  1.583333  0.280841  0.257042  0.044182  0.026902
  1.666667  0.280841  0.277527  0.053286  0.026902
  1.750000  0.280841  0.297958  0.061047  0.026902
  1.833333  0.280841  0.318330  0.067926  0.026902
  1.916667  0.280841  0.338643  0.074171  0.026902
  2.000000  0.280841  0.358892  0.079929  0.026902
  2.083333  0.280841  0.379074  0.085299  0.026902
  2.166667  0.280841  0.399187  0.090351  0.026902
  2.250000  0.280841  0.419226  0.095134  0.026902
  2.333333  0.280841  0.439189  0.099689  0.026902
  2.416667  0.280841  0.459073  0.104044  0.026902
  2.500000  0.280841  0.478874  0.108224  0.026902
  2.583333  0.280841  0.498589  0.112249  0.026902
  2.666667  0.280841  0.518214  0.116134  0.026902
  2.750000  0.280841  0.537744  0.119893  0.026902
  2.833333  0.280841  0.557177  0.123538  0.026902
  2.916667  0.280841  0.576509  0.127079  0.026902
  3.000000  0.280841  0.595736  0.130523  0.026902
  3.083333  0.280841  0.614853  0.133879  0.026902
  3.166667  0.280841  0.633857  0.137153  0.026902
  3.250000  0.280841  0.652743  0.140350  0.026902
  3.333333  0.280841  0.671508  0.143477  0.026902
  3.416667  0.280841  0.690146  0.146536  0.026902
```

```
  3.500000  0.280841  0.708653  0.149533  0.026902
  3.583333  0.280841  0.727024  0.165075  0.026902
  3.666667  0.280841  0.745253  0.190398  0.026902
  3.750000  0.280841  0.763335  0.221454  0.026902
  3.833333  0.280841  0.781265  0.256666  0.026902
  3.916667  0.280841  0.799036  0.295056  0.026902
  4.000000  0.280841  0.816642  0.335921  0.026902
  4.083333  0.280841  0.834075  0.378714  0.026902
  4.166667  0.280841  0.851330  0.422986  0.026902
  4.250000  0.280841  0.868399  0.468355  0.026902
  4.333333  0.280841  0.885273  0.514492  0.026902
  4.416667  0.280841  0.901943  0.561101  0.026902
  4.500000  0.280841  0.918400  0.607921  0.026902
  4.583333  0.280841  0.934633  0.664721  0.026902
  4.666667  0.280841  0.950631  0.723624  0.026902
  4.750000  0.280841  0.966381  0.784553  0.026902
  4.833333  0.280841  0.981870  0.847439  0.026902
  4.916667  0.280841  0.997081  1.142374  0.026902
  5.000000  0.280841  1.011994  1.229597  0.026902
  5.083333  0.280841  1.026588  1.319187  0.026902
  5.166667  0.280841  1.040837  1.411081  0.026902
  5.250000  0.280841  1.054706  1.505221  0.026902
  5.333333  0.280841  1.068148  1.601553  0.026902
  5.416667  0.280841  1.081098  1.700028  0.026902
  5.500000  0.280841  1.093447  1.800597  0.026902
  5.583333  0.280841  1.104844  1.903217  0.026902
  5.666667  0.280841  1.115414  2.007848  0.026902
  5.750000  0.280841  1.125715  2.114449  0.026902
  5.833333  0.280841  1.135816  2.222985  0.026902
  5.916667  0.280841  1.145697  2.333420  0.026902
  6.000000  0.280841  1.155241  2.445722  0.026902
  6.083333  0.280841  1.164907  2.559860  0.026902
  6.166667  0.280841  1.174276  2.675804  0.026902
  6.250000  0.280841  1.183612  2.793525  0.026902
  6.333333  0.280841  1.192984  2.912998  0.026902
  6.416667  0.280841  1.202346  3.034195  0.026902
  6.500000  0.280841  1.211708  3.157093  0.026902
  6.583333  0.280841  1.221069  3.281667  0.026902
  6.666667  0.280841  1.230431  3.407895  0.026902
  6.750000  0.280841  1.239792  3.535756  0.026902
  6.833333  0.280841  1.249154  3.665228  0.026902
  6.916667  0.280841  1.258515  3.796291  0.026902
  7.000000  0.280841  1.267877  3.928926  0.026902
  7.083333  0.280841  1.277238  4.440798  0.026902
  7.166667  0.280841  1.286599  5.371024  0.026902
  7.250000  0.280841  1.295961  6.557389  0.026902
  7.333333  0.280841  1.305322  7.915299  0.026902
  7.416667  0.280841  1.314684  9.365684  0.026902
  END FTABLE  1
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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1016 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1018 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1019 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
```

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

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SDHM 3.0

PROJECT REPORT

General Model Information

Project Name:	New 2 DMAs
Site Name:	Campus Point
Site Address:	10290 Campus Point Drive
City:	Kearny Mesa
Report Date:	10/15/2016
Gage:	KEARNY M
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2016/08/31

POC Thresholds

Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Grass,FLAT(0-5%)	0.41
Pervious Total	0.41
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.05
Impervious Total	0.05
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Grass,FLAT(0-5%)	0.05
Pervious Total	0.05
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.41
Impervious Total	0.41
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	5.00 ft.
Bottom Width:	265.00 ft.
Trench bottom slope 1:	0.000001 To 1
Trench Left side slope 0:	0.000001 To 1
Trench right side slope 2:	0.000001 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.4
Material thickness of second layer:	3
Pour Space of material for second layer:	0.4
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	0.38
Infiltration safety factor:	0.33
Total Volume Infiltrated (ac-ft.):	9.583
Total Volume Through Riser (ac-ft.):	2.172
Total Volume Through Facility (ac-ft.):	11.755
Percent Infiltrated:	81.52
Total Precip Applied to Facility:	0
Total Evap From Facility:	0

Discharge Structure

Riser Height: 6 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.35 in. Elevation:2 ft.

Element Flows To:
Outlet 1 Outlet 2

Gravel Trench Bed Hydraulic Table

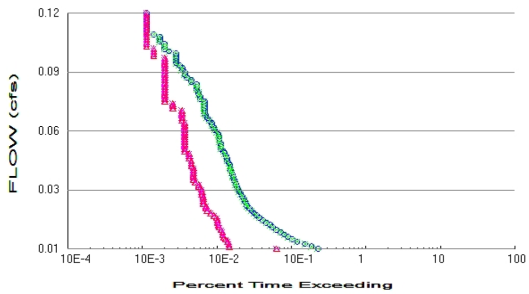
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.030	0.000	0.000	0.000
0.0722	0.030	0.000	0.000	0.003
0.1444	0.030	0.001	0.000	0.003
0.2167	0.030	0.002	0.000	0.003
0.2889	0.030	0.003	0.000	0.003
0.3611	0.030	0.004	0.000	0.003
0.4333	0.030	0.005	0.000	0.003
0.5056	0.030	0.006	0.000	0.003
0.5778	0.030	0.007	0.000	0.003
0.6500	0.030	0.007	0.000	0.003
0.7222	0.030	0.008	0.000	0.003
0.7944	0.030	0.009	0.000	0.003
0.8667	0.030	0.010	0.000	0.003
0.9389	0.030	0.011	0.000	0.003
1.0111	0.030	0.012	0.000	0.003
1.0833	0.030	0.013	0.000	0.003
1.1556	0.030	0.014	0.000	0.003
1.2278	0.030	0.014	0.000	0.003
1.3000	0.030	0.015	0.000	0.003
1.3722	0.030	0.016	0.000	0.003
1.4444	0.030	0.017	0.000	0.003
1.5167	0.030	0.018	0.000	0.003
1.5889	0.030	0.019	0.000	0.003

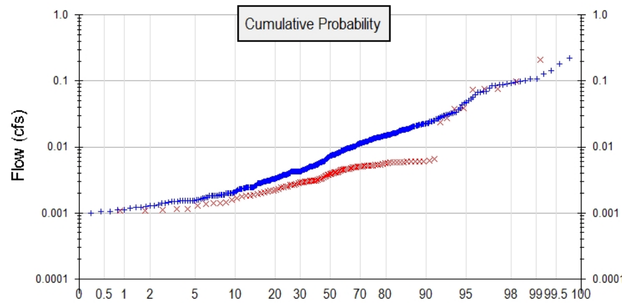
1.6611	0.030	0.020	0.000	0.003
1.7333	0.030	0.021	0.000	0.003
1.8056	0.030	0.022	0.000	0.003
1.8778	0.030	0.022	0.000	0.003
1.9500	0.030	0.023	0.000	0.003
2.0222	0.030	0.024	0.000	0.003
2.0944	0.030	0.025	0.001	0.003
2.1667	0.030	0.026	0.001	0.003
2.2389	0.030	0.027	0.001	0.003
2.3111	0.030	0.028	0.001	0.003
2.3833	0.030	0.029	0.002	0.003
2.4556	0.030	0.029	0.002	0.003
2.5278	0.030	0.030	0.002	0.003
2.6000	0.030	0.031	0.002	0.003
2.6722	0.030	0.032	0.002	0.003
2.7444	0.030	0.033	0.002	0.003
2.8167	0.030	0.034	0.003	0.003
2.8889	0.030	0.035	0.003	0.003
2.9611	0.030	0.036	0.003	0.003
3.0333	0.030	0.036	0.003	0.003
3.1056	0.030	0.037	0.003	0.003
3.1778	0.030	0.038	0.003	0.003
3.2500	0.030	0.039	0.003	0.003
3.3222	0.030	0.040	0.003	0.003
3.3944	0.030	0.041	0.003	0.003
3.4667	0.030	0.042	0.004	0.003
3.5389	0.030	0.043	0.004	0.003
3.6111	0.030	0.043	0.004	0.003
3.6833	0.030	0.044	0.004	0.003
3.7556	0.030	0.045	0.004	0.003
3.8278	0.030	0.046	0.004	0.003
3.9000	0.030	0.047	0.004	0.003
3.9722	0.030	0.048	0.004	0.003
4.0444	0.030	0.049	0.004	0.003
4.1167	0.030	0.050	0.004	0.003
4.1889	0.030	0.051	0.004	0.003
4.2611	0.030	0.051	0.005	0.003
4.3333	0.030	0.052	0.005	0.003
4.4056	0.030	0.053	0.005	0.003
4.4778	0.030	0.054	0.005	0.003
4.5500	0.030	0.055	0.005	0.003
4.6222	0.030	0.056	0.005	0.003
4.6944	0.030	0.057	0.005	0.003
4.7667	0.030	0.058	0.005	0.003
4.8389	0.030	0.058	0.005	0.003
4.9111	0.030	0.059	0.005	0.003
4.9833	0.030	0.060	0.005	0.003
5.0556	0.030	0.062	0.005	0.003
5.1278	0.030	0.065	0.005	0.003
5.2000	0.030	0.067	0.005	0.003
5.2722	0.030	0.069	0.006	0.003
5.3444	0.030	0.071	0.006	0.003
5.4167	0.030	0.073	0.006	0.003
5.4889	0.030	0.076	0.006	0.003
5.5611	0.030	0.078	0.006	0.003
5.6333	0.030	0.080	0.006	0.003
5.7056	0.030	0.082	0.006	0.003
5.7778	0.030	0.084	0.006	0.003

5.8500	0.030	0.087	0.006	0.003
5.9222	0.030	0.089	0.006	0.003
5.9944	0.030	0.091	0.006	0.003
6.0667	0.030	0.093	0.188	0.003
6.1389	0.030	0.095	0.547	0.003
6.2111	0.030	0.098	0.983	0.003
6.2833	0.030	0.100	1.422	0.003
6.3556	0.030	0.102	1.793	0.003
6.4278	0.030	0.104	2.052	0.003
6.5000	0.030	0.106	2.210	0.003

Analysis Results
POC 1
POC #1 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 2





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.41
Total Impervious Area: 0.05

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.05
Total Impervious Area: 0.41

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.06489
5 year	0.097477
10 year	0.118817
25 year	0.181208

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.005826
5 year	0.02563
10 year	0.07448
25 year	0.097251

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0065	801	223	27	Pass
0.0076	655	52	7	Pass
0.0088	538	51	9	Pass
0.0099	422	49	11	Pass
0.0110	363	46	12	Pass
0.0122	316	43	13	Pass
0.0133	282	42	14	Pass
0.0144	252	42	16	Pass
0.0156	221	40	18	Pass
0.0167	197	38	19	Pass
0.0178	183	37	20	Pass
0.0190	163	36	22	Pass
0.0201	145	36	24	Pass
0.0212	131	35	26	Pass
0.0224	120	32	26	Pass
0.0235	110	29	26	Pass
0.0246	103	26	25	Pass
0.0258	95	25	26	Pass
0.0269	89	25	28	Pass
0.0280	87	23	26	Pass
0.0292	83	23	27	Pass
0.0303	81	23	28	Pass
0.0315	77	23	29	Pass
0.0326	74	22	29	Pass
0.0337	70	22	31	Pass
0.0349	68	22	32	Pass
0.0360	65	20	30	Pass
0.0371	63	20	31	Pass
0.0383	62	18	29	Pass
0.0394	60	17	28	Pass
0.0405	58	17	29	Pass
0.0417	57	17	29	Pass
0.0428	56	17	30	Pass
0.0439	54	17	31	Pass
0.0451	53	17	32	Pass
0.0462	53	16	30	Pass
0.0473	51	16	31	Pass
0.0485	48	16	33	Pass
0.0496	48	15	31	Pass
0.0507	47	15	31	Pass
0.0519	45	15	33	Pass
0.0530	43	13	30	Pass
0.0541	40	13	32	Pass
0.0553	40	13	32	Pass
0.0564	40	13	32	Pass
0.0575	38	13	34	Pass
0.0587	38	13	34	Pass
0.0598	38	13	34	Pass
0.0610	37	13	35	Pass
0.0621	35	13	37	Pass
0.0632	33	13	39	Pass
0.0644	32	13	40	Pass
0.0655	30	13	43	Pass

0.0666	30	13	43	Pass
0.0678	28	12	42	Pass
0.0689	26	12	46	Pass
0.0700	25	12	48	Pass
0.0712	24	12	50	Pass
0.0723	24	12	50	Pass
0.0734	24	9	37	Pass
0.0746	24	9	37	Pass
0.0757	24	9	37	Pass
0.0768	24	7	29	Pass
0.0780	21	7	33	Pass
0.0791	21	7	33	Pass
0.0802	20	7	35	Pass
0.0814	20	7	35	Pass
0.0825	19	7	36	Pass
0.0836	19	7	36	Pass
0.0848	19	7	36	Pass
0.0859	16	7	43	Pass
0.0870	16	7	43	Pass
0.0882	14	7	50	Pass
0.0893	13	7	53	Pass
0.0905	13	7	53	Pass
0.0916	12	7	58	Pass
0.0927	12	7	58	Pass
0.0939	11	7	63	Pass
0.0950	10	7	70	Pass
0.0961	10	7	70	Pass
0.0973	10	7	70	Pass
0.0984	10	5	50	Pass
0.0995	10	5	50	Pass
0.1007	8	5	62	Pass
0.1018	7	5	71	Pass
0.1029	7	4	57	Pass
0.1041	7	4	57	Pass
0.1052	6	4	66	Pass
0.1063	6	4	66	Pass
0.1075	6	4	66	Pass
0.1086	5	4	80	Pass
0.1097	4	4	100	Pass
0.1109	4	4	100	Pass
0.1120	4	4	100	Pass
0.1131	4	4	100	Pass
0.1143	4	4	100	Pass
0.1154	4	4	100	Pass
0.1165	4	4	100	Pass
0.1177	4	4	100	Pass
0.1188	4	4	100	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

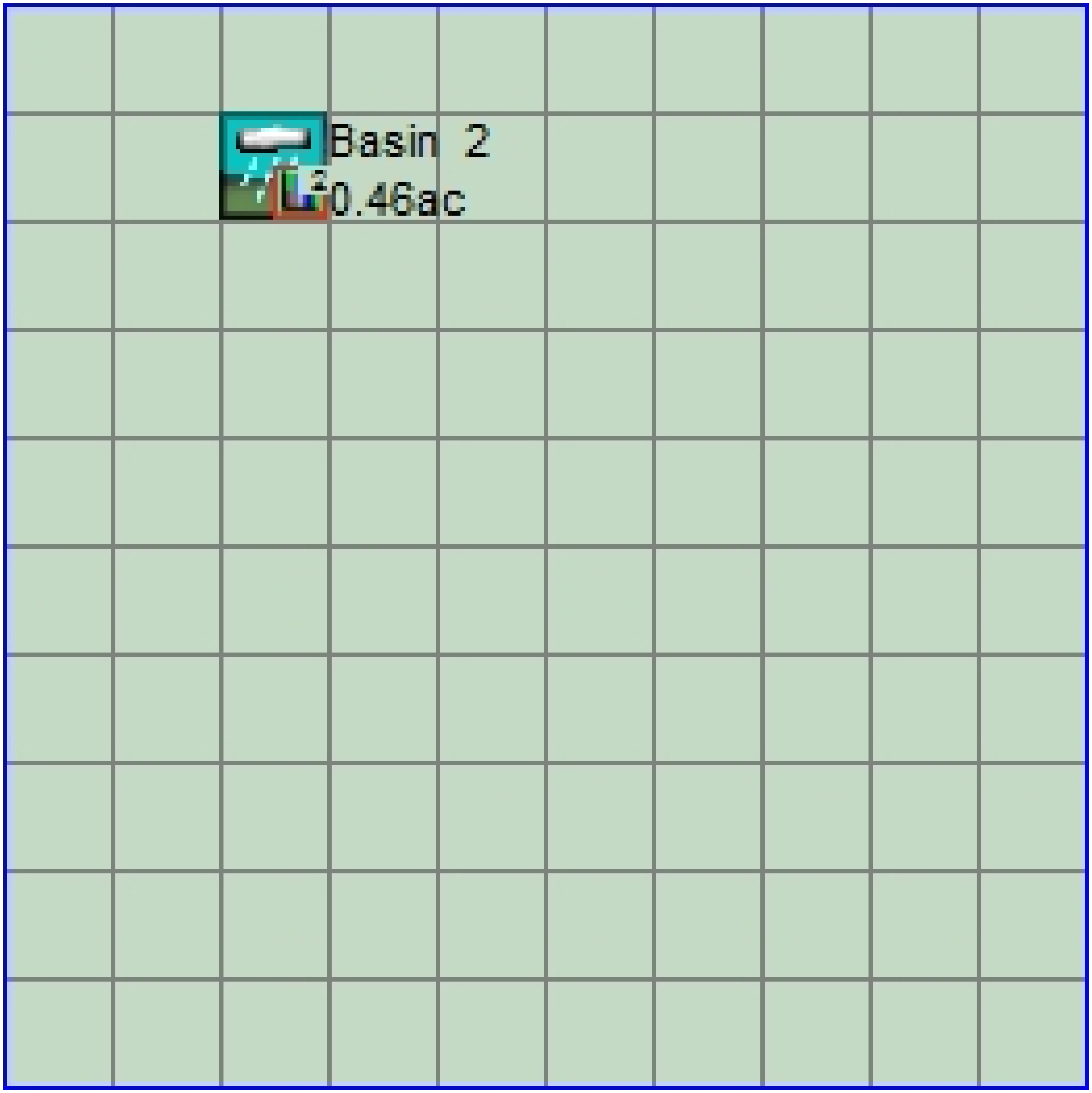
PERLND Changes

No PERLND changes have been made.

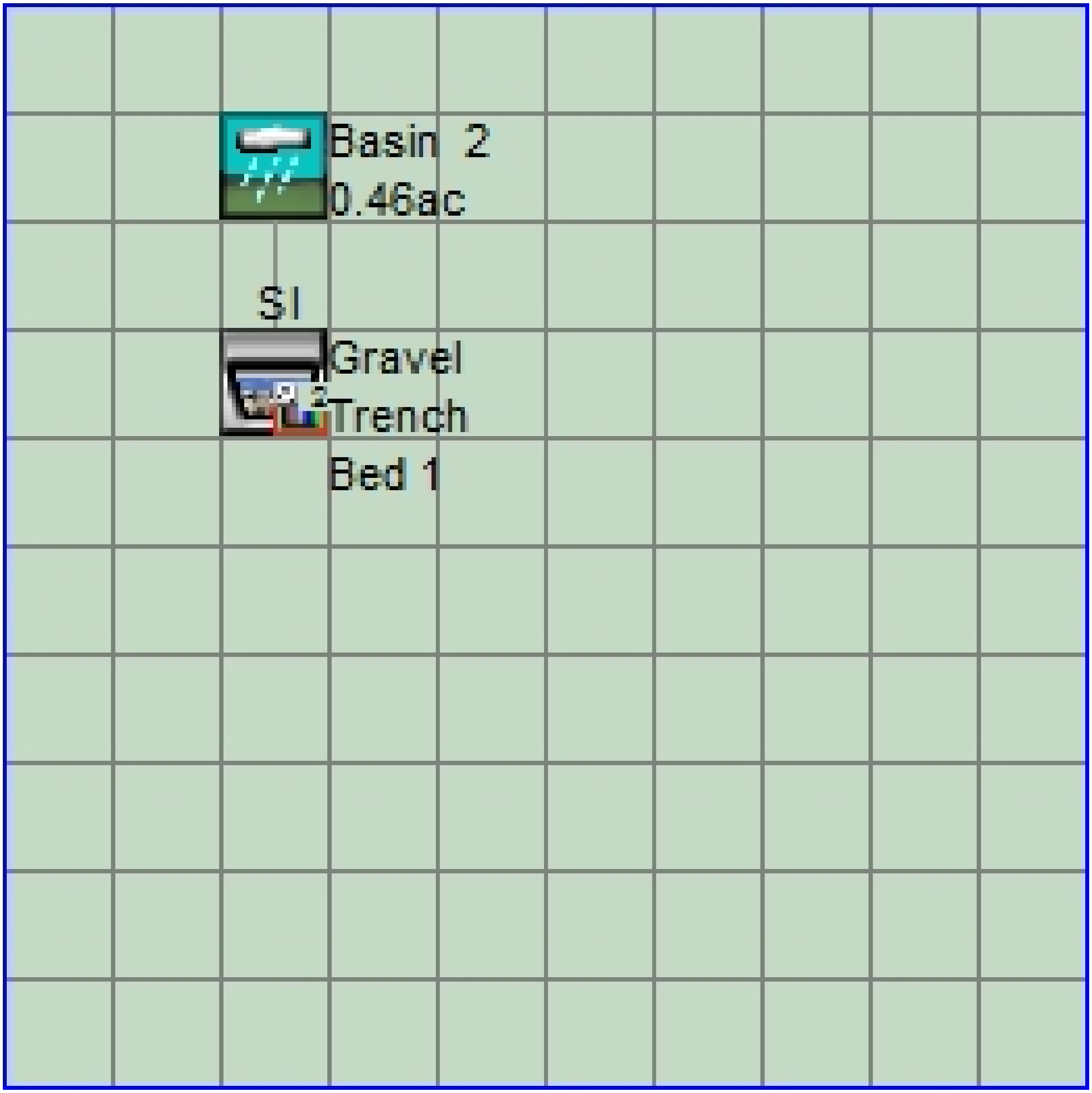
IMPLND Changes

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   New 2 DMAs.wdm
MESSU      25   PreNew 2 DMAs.MES
           27   PreNew 2 DMAs.L61
           28   PreNew 2 DMAs.L62
           31   POCNew 2 DMAs2.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      28
      IMPLND       1
      COPY       502
      DISPLY       2
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    2        Basin  2                    MAX                      1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  502         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           ***
   28      D,Grass,FLAT(0-5%)     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 ***
   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  *********
   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 ***
   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
   28              0       4.8      0.04       200      0.05         3      0.92
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   28             35        30         2         2       0.4      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   28           0.08       0.6       0.2       1.5       0.7       0.5
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   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  ***
   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
   28              0         0      0.15         0         4      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     0.035      0.05       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#   ***
Basin  2***
PERLND  28                        0.41     COPY   502     12
PERLND  28                        0.41     COPY   502     13
IMPLND   1                        0.05     COPY   502     15

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

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   502 OUTPUT MEAN   1 1   12.1        DISPLY   2     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   502 OUTPUT MEAN   1 1     12.1      WDM    502 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

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


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   New 2 DMAs.wdm
MESSU      25   MitNew 2 DMAs.MES
           27   MitNew 2 DMAs.L61
           28   MitNew 2 DMAs.L62
           30   POCNew 2 DMAs1.dat
           31   POCNew 2 DMAs2.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      28
      IMPLND       1
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      COPY         2
      COPY       502
      DISPLY       1
      DISPLY       2
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  1                MAX                     1    2   30    9
    2        Gravel Trench Bed 1         MAX                     1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
    2         1    1
  502         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          ***
   28      D,Grass,FLAT(0-5%)     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 ***
   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  *********
   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 ***
   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
   28              0       4.8      0.04       200      0.05         3      0.92
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   28             35        30         2         2       0.4      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   28           0.08       0.6       0.2       1.5       0.7       0.5
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   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  ***
   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
   28              0         0      0.15         0         4      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     0.035      0.05       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#   ***
Basin  1***
PERLND  28                        3.45     RCHRES   1      2
PERLND  28                        3.45     RCHRES   1      3
IMPLND   1                        7.64     RCHRES   1      5
Basin  2***
PERLND  28                        0.05     RCHRES   2      2
PERLND  28                        0.05     RCHRES   2      3
IMPLND   1                        0.41     RCHRES   2      5

******Routing******
PERLND  28                        3.45     COPY     1     12
IMPLND   1                        7.64     COPY     1     15
PERLND  28                        3.45     COPY     1     13
PERLND  28                        0.05     COPY     2     12
IMPLND   1                        0.41     COPY     2     15
PERLND  28                        0.05     COPY     2     13
RCHRES   1                           1     COPY   501     17
RCHRES   2                           1     COPY   502     17
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
COPY   502 OUTPUT MEAN   1 1   12.1        DISPLY   2     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     StormTech  1            2    1    1    1   28    0    1
    2     Gravel Trench Be-014    2    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
  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
  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  5  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      0.04       0.0       4.0       0.5       0.0
    2             2      0.01       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  5.0  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      1
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)     (cfs)     (cfs)  (ft/sec)    (Minutes)***
  0.000000  1.654736  0.000000  0.000000  0.000000
  0.133333  1.654736  0.220631  0.000000  0.158510
  0.266667  1.654736  0.441263  0.000000  0.158510
  0.400000  1.654736  0.661894  0.000000  0.158510
  0.533333  1.654736  0.882526  0.000000  0.158510
  0.666667  1.654736  1.103157  0.000000  0.158510
  0.800000  1.654736  1.323788  0.000000  0.158510
  0.933333  1.654736  1.544420  0.000000  0.158510
  1.066667  1.654736  1.765051  0.000000  0.158510
  1.200000  1.654736  1.985683  0.000000  0.158510
  1.333333  1.654736  2.206314  0.000000  0.158510
  1.466667  1.654736  2.426945  0.026643  0.158510
  1.600000  1.654736  2.647577  0.046147  0.158510
  1.733333  1.654736  2.868208  0.059575  0.158510
  1.866667  1.654736  3.088840  0.070491  0.158510
  2.000000  1.654736  3.309471  0.079929  0.158510
  2.133333  1.654736  3.530102  0.088365  0.158510
  2.266667  1.654736  3.750734  0.096063  0.158510
  2.400000  1.654736  3.971365  0.103188  0.158510
```

2.533333	1.654736	4.191997	0.109852	0.158510
2.666667	1.654736	4.412628	0.116134	0.158510
2.800000	1.654736	4.633260	0.122093	0.158510
2.933333	1.654736	4.853891	0.127775	0.158510
3.066667	1.654736	5.074522	0.133215	0.158510
3.200000	1.654736	5.295154	0.138441	0.158510
3.333333	1.654736	5.515785	0.143477	0.158510
3.466667	1.654736	5.736417	0.148342	0.158510
3.600000	1.654736	5.957048	0.169564	0.158510
3.733333	1.654736	6.177679	0.214872	0.158510
3.866667	1.654736	6.398311	0.271684	0.158510
4.000000	1.654736	6.618942	0.335921	0.158510
4.133333	1.654736	6.839574	0.405125	0.158510
4.266667	1.654736	7.060205	0.477531	0.158510
4.400000	1.654736	7.280836	0.551755	0.158510
4.533333	1.654736	7.501468	0.630383	0.158510
4.666667	1.654736	7.722099	0.723624	0.158510
4.800000	1.654736	7.942731	0.822054	0.158510
4.933333	1.654736	8.163362	1.159626	0.158510
5.066667	1.654736	8.383993	1.301082	0.158510
5.200000	1.654736	8.604625	1.448470	0.158510
5.333333	1.654736	8.825256	1.601553	0.158510
5.466667	1.654736	9.045888	1.760121	0.158510
5.600000	1.654736	9.266519	1.923984	0.158510
5.733333	1.654736	9.487150	2.092973	0.158510
5.866667	1.654736	9.707782	2.266933	0.158510
6.000000	1.654736	9.928413	2.445722	0.158510
6.133333	1.654736	10.14904	2.629212	0.158510
6.266667	1.654736	10.36968	2.817281	0.158510
6.400000	1.654736	10.59031	3.009819	0.158510
6.533333	1.654736	10.81094	3.206722	0.158510
6.666667	1.654736	11.03157	3.407895	0.158510
6.800000	1.654736	11.25220	3.613247	0.158510
6.933333	1.654736	11.47283	3.822693	0.158510
7.066667	1.654736	11.69346	4.295468	0.158510
7.200000	1.654736	11.91410	5.819925	0.158510
7.333333	1.654736	12.13473	7.915300	0.158510
7.466667	1.654736	12.35536	10.24649	0.158510
7.600000	1.654736	12.57599	12.48167	0.158510
7.733333	1.654736	12.79662	14.32210	0.158510
7.866667	1.654736	13.01725	15.60047	0.158510
8.000000	1.654736	13.23788	16.54835	0.158510
8.133333	1.654736	13.45852	17.36465	0.158510
8.266667	1.654736	13.67915	18.13430	0.158510
8.400000	1.654736	13.89978	18.86452	0.158510
8.533333	1.654736	14.12041	19.56081	0.158510
8.666667	1.654736	14.34104	20.22752	0.158510
8.800000	1.654736	14.56167	20.86813	0.158510
8.933333	1.654736	14.78230	21.48549	0.158510
9.066667	1.654736	15.00294	22.08197	0.158510
9.200000	1.654736	15.22357	22.65955	0.158510
9.333333	1.654736	15.44420	23.21994	0.158510
9.466667	1.654736	15.66483	23.76458	0.158510
9.600000	1.654736	15.88546	24.29473	0.158510
9.733333	1.654736	16.10609	24.81149	0.158510
9.866667	1.654736	16.32672	25.31584	0.158510
10.00000	1.654736	16.54736	25.80862	0.158510
10.13333	1.654736	16.76799	26.29060	0.158510
10.26667	1.654736	16.98862	26.76247	0.158510
10.40000	1.654736	17.20925	27.22483	0.158510
10.53333	1.654736	17.42988	27.67823	0.158510
10.66667	1.654736	17.65051	28.12318	0.158510
10.80000	1.654736	17.87114	28.56014	0.158510
10.93333	1.654736	18.09178	28.98953	0.158510
11.06667	1.654736	18.31241	29.41171	0.158510
11.20000	1.654736	18.53304	29.82705	0.158510
11.33333	1.654736	18.75367	30.23587	0.158510
11.46667	1.654736	18.97430	30.63846	0.158510
11.60000	1.654736	19.19493	31.03511	0.158510
11.73333	1.654736	19.41556	31.42607	0.158510

11.86667	1.654736	19.63620	31.81157	0.158510
12.00000	1.654736	19.85683	32.19184	0.158510
12.13333	1.654736	20.07746	32.56709	0.158510

END FTABLE 1
FTABLE 2
92 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.030418	0.000000	0.000000	0.000000		
0.072222	0.030418	0.000879	0.000000	0.003846		
0.144444	0.030418	0.001757	0.000000	0.003846		
0.216667	0.030418	0.002636	0.000000	0.003846		
0.288889	0.030418	0.003515	0.000000	0.003846		
0.361111	0.030418	0.004394	0.000000	0.003846		
0.433333	0.030418	0.005272	0.000000	0.003846		
0.505556	0.030418	0.006151	0.000000	0.003846		
0.577778	0.030418	0.007030	0.000000	0.003846		
0.650000	0.030418	0.007909	0.000000	0.003846		
0.722222	0.030418	0.008787	0.000000	0.003846		
0.794444	0.030418	0.009666	0.000000	0.003846		
0.866667	0.030418	0.010545	0.000000	0.003846		
0.938889	0.030418	0.011424	0.000000	0.003846		
1.011111	0.030418	0.012302	0.000000	0.003846		
1.083333	0.030418	0.013181	0.000000	0.003846		
1.155556	0.030418	0.014060	0.000000	0.003846		
1.227778	0.030418	0.014939	0.000000	0.003846		
1.300000	0.030418	0.015817	0.000000	0.003846		
1.372222	0.030418	0.016696	0.000000	0.003846		
1.444444	0.030418	0.017575	0.000000	0.003846		
1.516667	0.030418	0.018453	0.000000	0.003846		
1.588889	0.030418	0.019332	0.000000	0.003846		
1.661111	0.030418	0.020211	0.000000	0.003846		
1.733333	0.030418	0.021090	0.000000	0.003846		
1.805556	0.030418	0.021968	0.000000	0.003846		
1.877778	0.030418	0.022847	0.000000	0.003846		
1.950000	0.030418	0.023726	0.000000	0.003846		
2.022222	0.030418	0.024605	0.000496	0.003846		
2.094444	0.030418	0.025483	0.001022	0.003846		
2.166667	0.030418	0.026362	0.001357	0.003846		
2.238889	0.030418	0.027241	0.001625	0.003846		
2.311111	0.030418	0.028120	0.001854	0.003846		
2.383333	0.030418	0.028998	0.002058	0.003846		
2.455556	0.030418	0.029877	0.002244	0.003846		
2.527778	0.030418	0.030756	0.002415	0.003846		
2.600000	0.030418	0.031635	0.002575	0.003846		
2.672222	0.030418	0.032513	0.002726	0.003846		
2.744444	0.030418	0.033392	0.002868	0.003846		
2.816667	0.030418	0.034271	0.003004	0.003846		
2.888889	0.030418	0.035149	0.003134	0.003846		
2.961111	0.030418	0.036028	0.003259	0.003846		
3.033333	0.030418	0.036907	0.003379	0.003846		
3.105556	0.030418	0.037786	0.003495	0.003846		
3.177778	0.030418	0.038664	0.003608	0.003846		
3.250000	0.030418	0.039543	0.003717	0.003846		
3.322222	0.030418	0.040422	0.003822	0.003846		
3.394444	0.030418	0.041301	0.003926	0.003846		
3.466667	0.030418	0.042179	0.004026	0.003846		
3.538889	0.030418	0.043058	0.004124	0.003846		
3.611111	0.030418	0.043937	0.004219	0.003846		
3.683333	0.030418	0.044816	0.004313	0.003846		
3.755556	0.030418	0.045694	0.004405	0.003846		
3.827778	0.030418	0.046573	0.004494	0.003846		
3.900000	0.030418	0.047452	0.004582	0.003846		
3.972222	0.030418	0.048331	0.004668	0.003846		
4.044444	0.030418	0.049209	0.004753	0.003846		
4.116667	0.030418	0.050088	0.004836	0.003846		
4.188889	0.030418	0.050967	0.004918	0.003846		
4.261111	0.030418	0.051846	0.004999	0.003846		
4.333333	0.030418	0.052724	0.005078	0.003846		
4.405556	0.030418	0.053603	0.005156	0.003846		

```
  4.477778  0.030418  0.054482  0.005233  0.003846
  4.550000  0.030418  0.055360  0.005308  0.003846
  4.622222  0.030418  0.056239  0.005383  0.003846
  4.694444  0.030418  0.057118  0.005457  0.003846
  4.766667  0.030418  0.057997  0.005529  0.003846
  4.838889  0.030418  0.058875  0.005601  0.003846
  4.911111  0.030418  0.059754  0.005672  0.003846
  4.983333  0.030418  0.060633  0.005742  0.003846
  5.055556  0.030418  0.062830  0.005811  0.003846
  5.127778  0.030418  0.065027  0.005879  0.003846
  5.200000  0.030418  0.067223  0.005947  0.003846
  5.272222  0.030418  0.069420  0.006013  0.003846
  5.344444  0.030418  0.071617  0.006079  0.003846
  5.416667  0.030418  0.073814  0.006145  0.003846
  5.488889  0.030418  0.076011  0.006209  0.003846
  5.561111  0.030418  0.078208  0.006273  0.003846
  5.633333  0.030418  0.080405  0.006336  0.003846
  5.705556  0.030418  0.082601  0.006399  0.003846
  5.777778  0.030418  0.084798  0.006461  0.003846
  5.850000  0.030418  0.086995  0.006523  0.003846
  5.922222  0.030418  0.089192  0.006584  0.003846
  5.994444  0.030418  0.091389  0.006644  0.003846
  6.066667  0.030418  0.093586  0.188938  0.003846
  6.138889  0.030418  0.095782  0.547687  0.003846
  6.211111  0.030418  0.097979  0.983640  0.003846
  6.283333  0.030418  0.100176  1.422609  0.003846
  6.355556  0.030418  0.102373  1.793867  0.003846
  6.427778  0.030418  0.104570  2.052027  0.003846
  6.500000  0.030418  0.106767  2.210387  0.003846
  6.572222  0.030418  0.108964  2.389658  0.003846
  END FTABLE  2
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***
RCHRES   1 HYDR   RO     1 1         1     WDM   1016 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1         1     WDM   1017 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1         1     WDM   1018 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1         1     WDM   1019 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
RCHRES   2 HYDR   RO     1 1         1     WDM   1020 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1         1     WDM   1022 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1         1     WDM   1023 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1         1     WDM   1021 STAG     ENGL      REPL
COPY     2 OUTPUT MEAN   1 1      12.1     WDM    702 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1      12.1     WDM    802 FLOW     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       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       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: 1967/ 6/30 24: 0

RCHRES :    2

RELERR       STORS        STOR       MATIN      MATDIF
-1.0000      0.00000  0.0000E+00     0.00000  1.3475E-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: 1970/ 4/30 24: 0

RCHRES :    2

RELERR       STORS        STOR       MATIN      MATDIF
-1.000E+00     0.00000  0.0000E+00     0.00000  1.9521E-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: 1981/ 5/31 24: 0

RCHRES : 2

RELERR	STORS	STOR	MATIN	MATDIF
-1.000E+00	0.00000	0.0000E+00	0.00000	5.2327E-13

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: 1992/ 7/31 24: 0

RCHRES : 2

RELERR	STORS	STOR	MATIN	MATDIF
-1.000E+00	0.00000	0.0000E+00	0.00000	5.3928E-13

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.

Disclaimer

Legal Notice

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Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

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Project Name: Campus Point SDP

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	☐Included ☒Not Applicable

Project Name: Campus Point SDP

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)
☐ When applicable, frequency of Biofiltration soil media replacement
☐ 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 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

☐ Vicinity map
☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
☐ BMP and HMP location and dimensions
☐ BMP and HMP specifications/cross section/model
☐ Maintenance recommendations and frequency
☐ LID features such as (permeable paver and LS location, dim, SF).

THE CITY OF SAN DIEGO
RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO
AND WHEN RECORDED MAIL TO:

Click or tap here to enter text.
Click or tap here to enter text.
Click or tap here to enter text.

(THIS SPACE IS FOR THE RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSOR'S PARCEL NUMBER:	PROJECT NUMBER:
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

This agreement is made by and between the City of San Diego, a municipal corporation [City] and Click or tap here to enter text.

the owner or duly authorized representative of the owner [Property Owner] of property located at:
Click or tap here to enter text.

(Property Address)

And more particularly described as: Click or tap here to enter text.

(Legal Description of Property)

In the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): Click or tap here to enter text.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): Click or tap here to enter text.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):Click or tap here to enter text..

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's WQTR and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) Click or tap here to enter text..

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibits(s): Click or tap here to enter text.

(Owner Signature)

Click or tap here to enter text.
(Print Name and Title)

Click or tap here to enter text.
(Company/Organization Name)

Click or tap to enter a date.
(Date)

THE CITY OF SAN DIEGO

APPROVED:

(City Control engineer Signature

(Print Name)

(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDMENTS PER CIVIL CODE SEC. 1180 ET.SEQ

Maintenance Program for Biofiltration Area

Inspection Frequency/Indications:	Regular Inspections ❑ Before wet season begins (September); ❑ Every 60 days during wet season (September-April); ❑ After wet season (April). Performance Inspections ❑ After rainfall events greater than 0.5 inch
Maintenance Indications Connections	**Maintenance Activities Connections**
❑ Damage to inlet/outlet, sideslopes, headwall, or other structures	❑ Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility.
❑ Over-grown vegetation, emergent woody vegetation and/or weeds	❑ Trim vegetation to average height of 12 inches and remove trimmings. ❑ Remove emergent trees and other vegetation that are not part of Biofiltration basin plan and weeds ❑ Re-seed and re-plan barren areas prior to rainy season ❑ Install erosion blanket on barrent spots if re-vegetation is not successful
❑ Sediment accumulation over 3 inches	❑ Remove sediment accumulation at or near plant height
❑ Trash, debris, and vegetative litter	❑ Remove trash, debris, and vegetative litter
❑ Rodents or other vectors	❑ Abate and control rodents as necessary to maintain performance of the facility ❑ Drain standing water

Maintenance Program for Inlet Stenciling

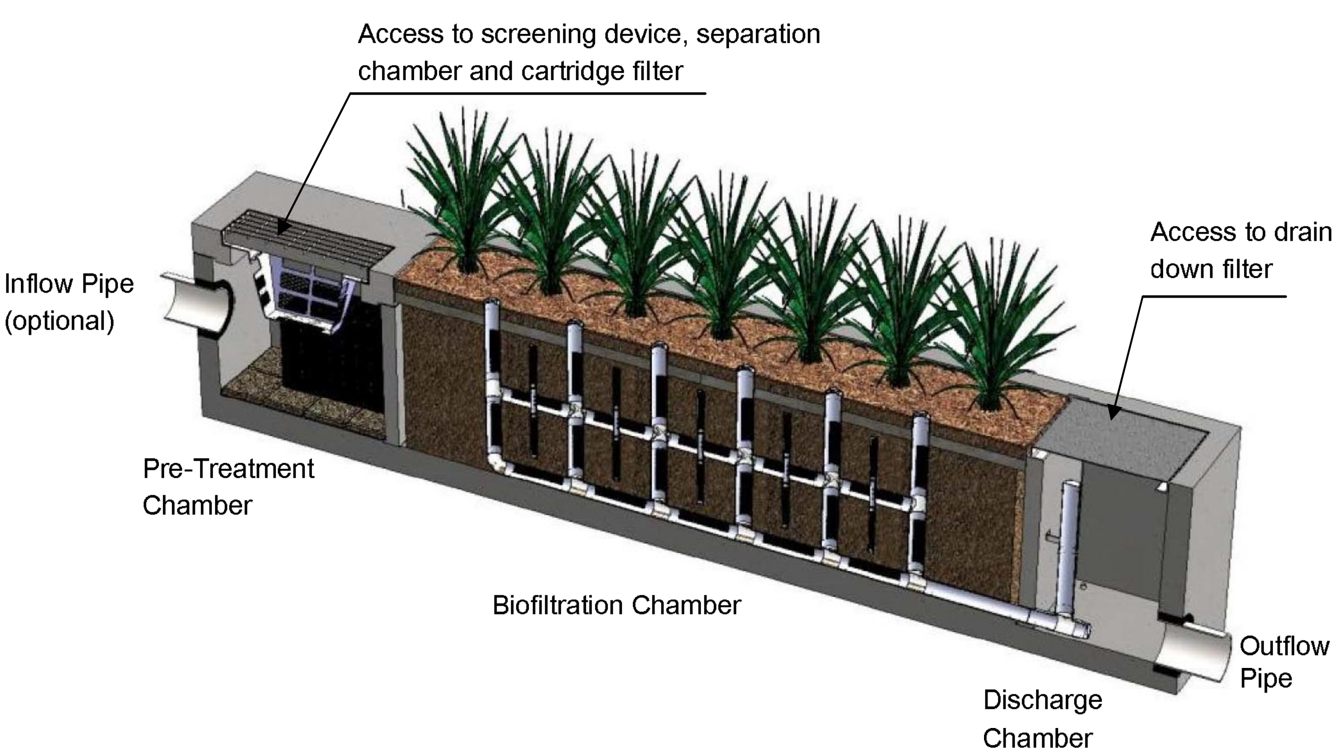
Inspection Frequency/Indications:	Regular Maintenance Inspections ❑ Before wet season begins (September); ❑ After wet season (April).
Maintenance Indications	**Maintenance Activities**
❑ Inlet stenciling/signage begins to weather or fade	❑ Re-stamp signage
❑ Broken or damaged structure	❑ Repair or replace signage structure

Maintenance Guidelines for
Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



www.modularwetlands.com

Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

MODULAR WETLANDS

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

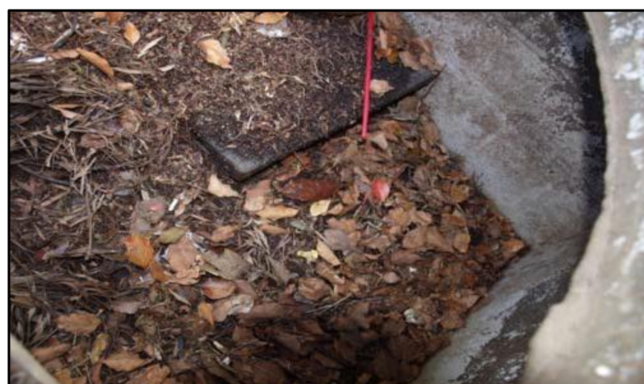
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name ______________________

Project Address ______________________ (city) (Zip Code)

Owner / Management Company ______________________

Contact ______________________ Phone ( ) –

Inspector Name ______________________ Date ___/___/_____ Time ________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________ Additional Notes ______________________

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): __________ Size (22', 14' or etc.): __________

Structural Integrity:	Yes	No	Comments	
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?				
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?				
Working Condition:				
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?				
Is there standing water in inappropriate areas after a dry period?				
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?				
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.				Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:	
Any signs of improper functioning in the discharge chamber? Note issues in comments section.				
Other Inspection Items:				
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?				
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.				
Is there a septic or foul odor coming from inside the system?				

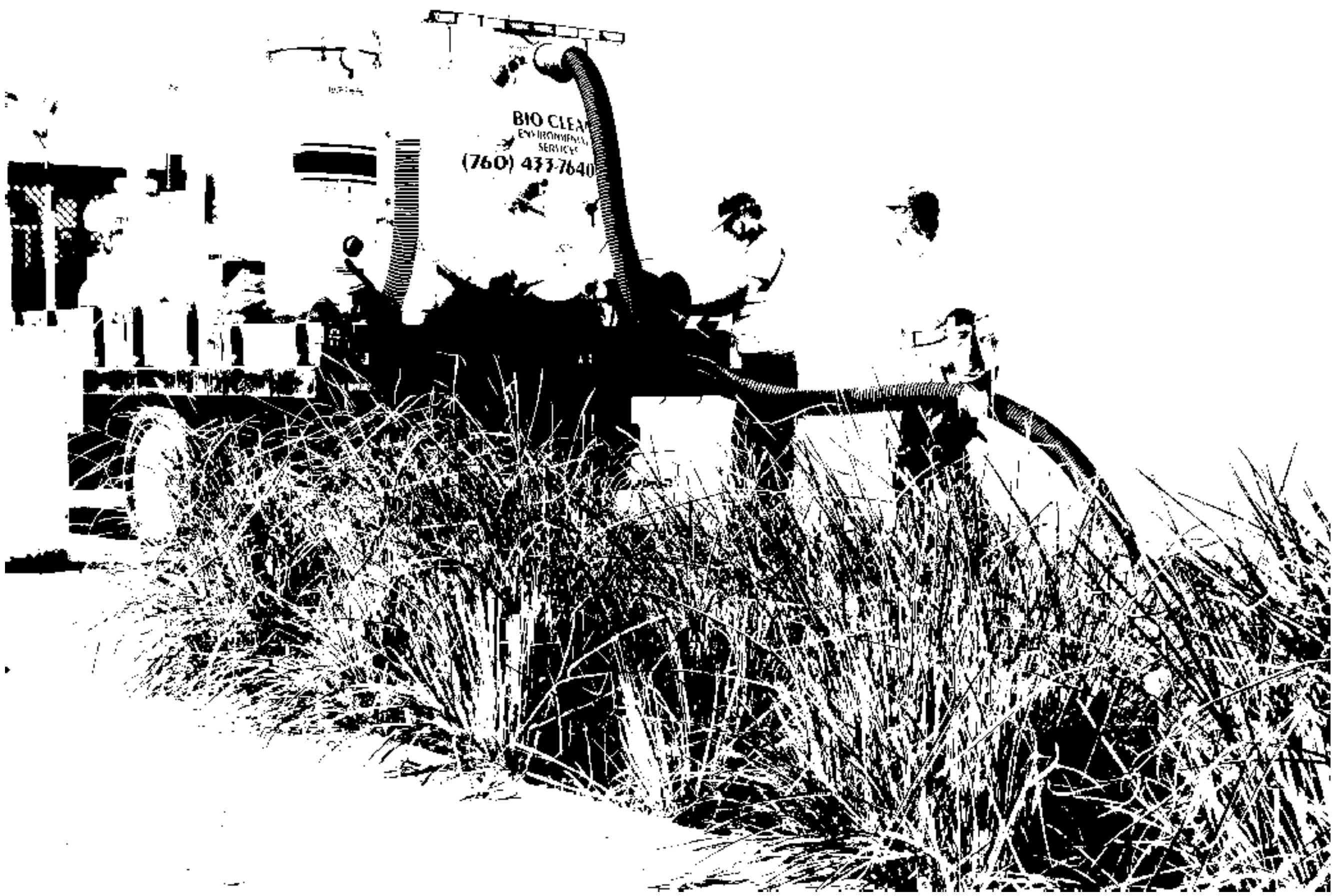
Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: ______________________

Maintenance Report



Modular Wetland System, Inc.

P. 760.433-7640

F. 760-433-3176

E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name ______________________________

Project Address ______________________________
(city) (Zip Code)

Owner / Management Company ______________________________

Contact ____________________ Phone (   )   –

Inspector Name ____________________ Date ____/____/______ Time __________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm   Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ____________________ Additional Notes ____________________

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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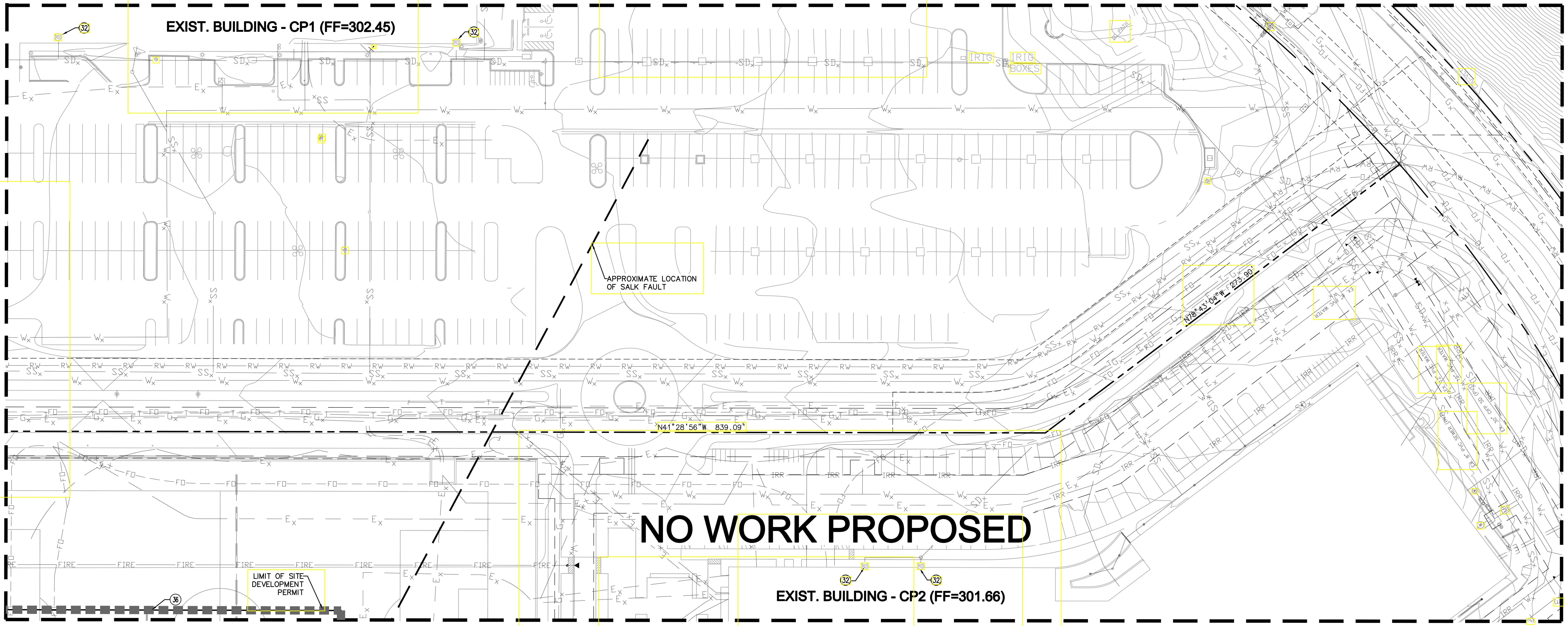
Use this checklist to ensure the required information has been included on the plans:

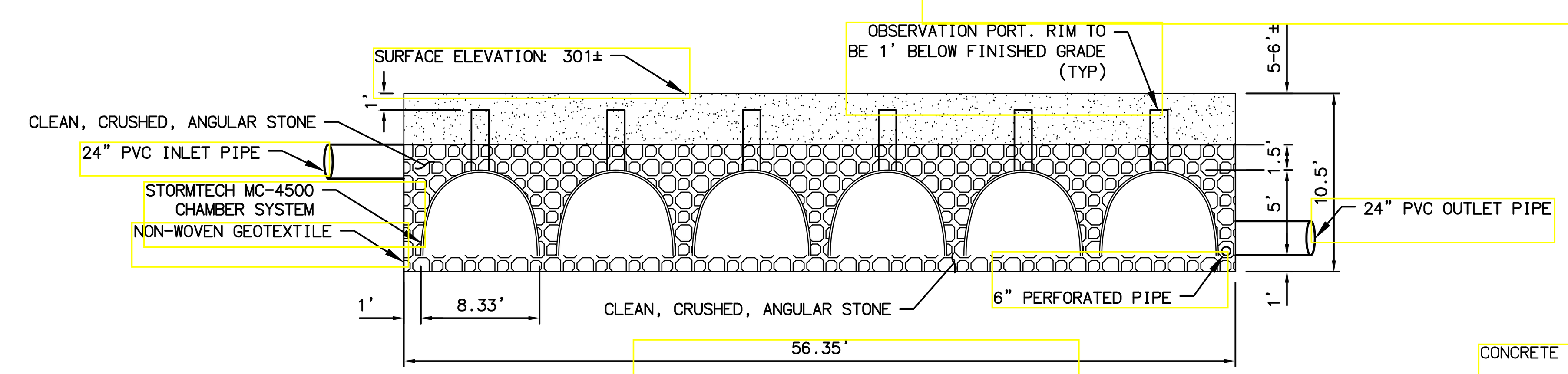
The plans must identify:

- ☒ 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. Broucher photocopies are not allowed.

MATCHLINE SEE SHEET C2.2

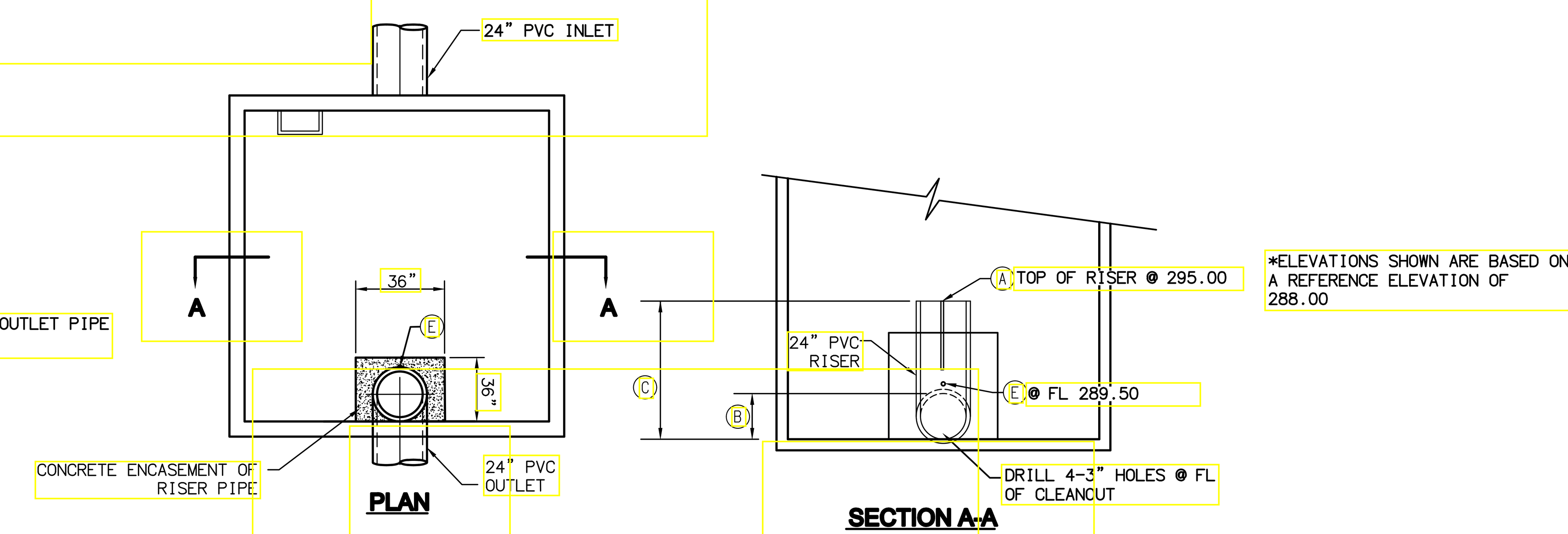


MATCHLINE SEE SHEET C2.6



1. INFILTRATION BASIN

N.T.S

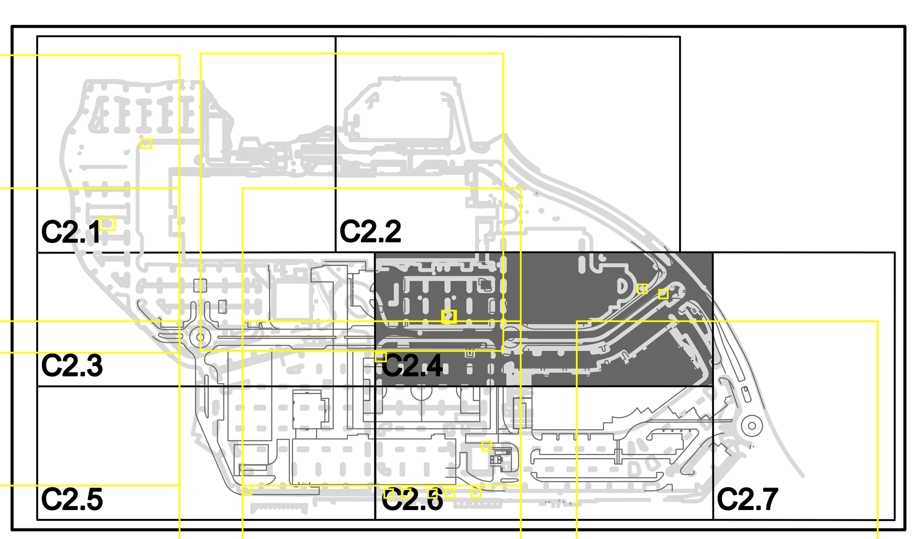


2. RISER AND ORIFICE DETAIL

N.T.S.

NOTE:

1. PRIOR TO ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE.



KEYMAP

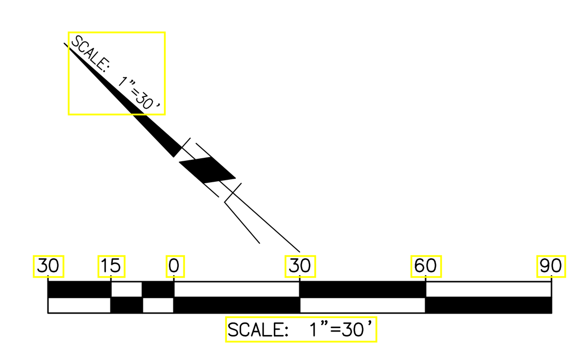
NTS

CONSTRUCTION NOTES

32 EXISTING ROOF DRAIN
36 INFILTRATION BASIN PER DETAILS ON SHEET C2.4

ENGINEER OF WORK:

BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/18



ALEXANDRIA.

ALEXANDRIA REAL ESTATE EQUITIES
10996 Torreyana Road Suite 250
San Diego, CA 92121

CAMPUS POINT SITE DEVELOPMENT PERMIT
10290 &10300 CAMPUS POINT DRIVE
SAN DIEGO, CA 92112

Gensler

225 Broadway
Suite 1600
San Diego CA 92101
Tel: 619.557.2500
Fax: 619.557.2520

Δ	Date	Issue/Revision	By	To
	11/30/2015	CYCLE 27		
	04/01/2016	CYCLE 32		
	06/24/2016	CYCLE 35		
	08/24/2016	CYCLE 38		
	09/29/2016	CYCLE 40		
	10/27/2016	CYCLE 42	KD	SS

Seal/Signature

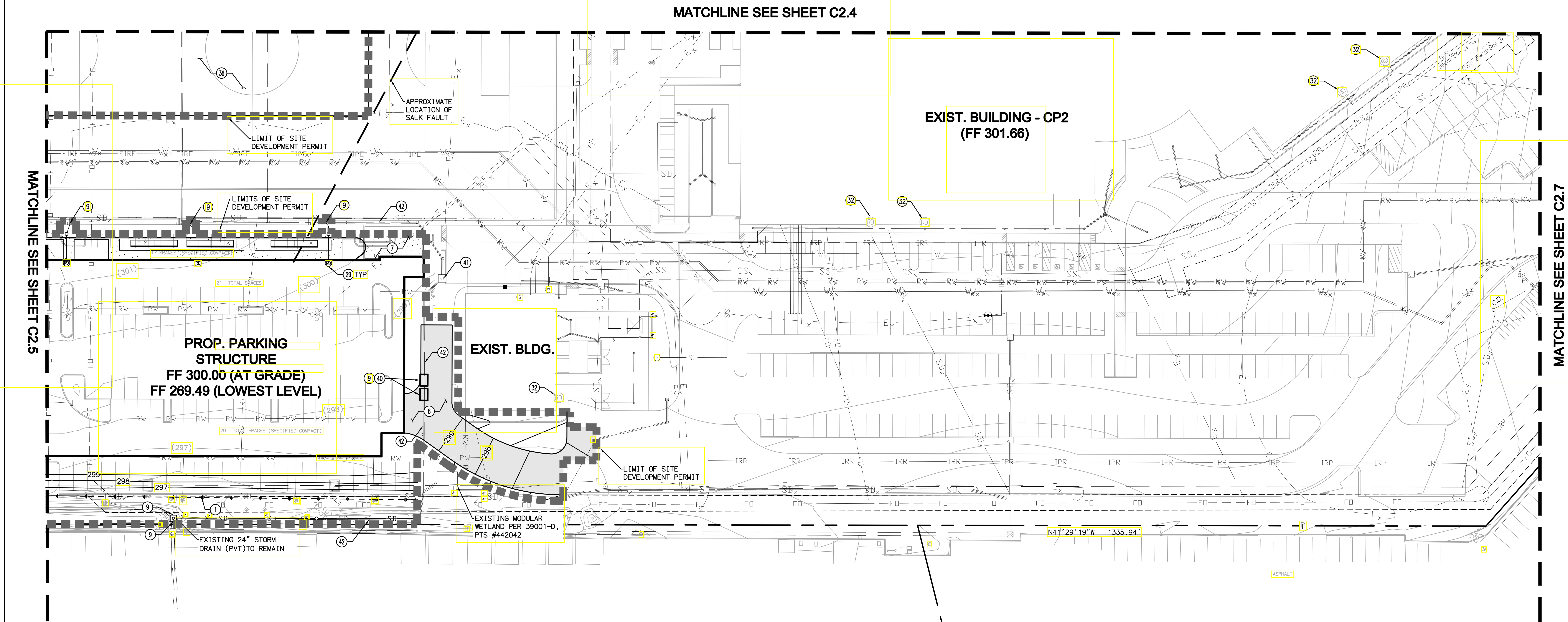
Project Name
CAMPUS POINT SITE DEVELOPMENT PERMIT

Project Number
55.7538.000

Description
GRADING PLAN

Scale
As indicated

C2.4

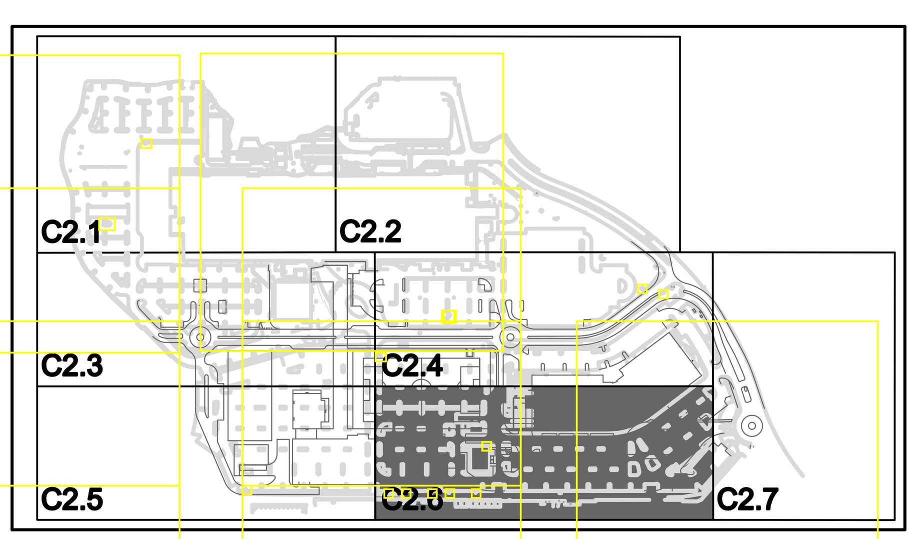


CONSTRUCTION NOTES

1. LIMIT OF GRADING/ LIMIT OF WORK/ SAWCUT LINE
6. AC PAVEMENT
7. CONCRETE SIDEWALK
9. CONNECT TO EX STORM DRAIN
29. ROOF DRAIN
32. EXISTING ROOF DRAIN
36. INFILTRATION BASIN PER DETAILS ON SHEET C2.4
40. 2-MODULAR WETLAND SYSTEMS
41. CLEANOUT WITH RISER AND ORIFICE PER DETAIL 2 ON SHEET C2.4
42. STORM DRAIN PER DRAWING NO. 39001-6D, CONSTRUCTION CHANGE 'B', PTS NO. 499236

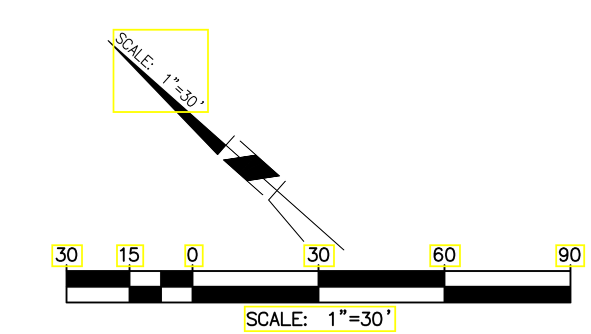
NOTE:

1. PRIOR TO ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE.



KEYMAP
NTS

ENGINEER OF WORK:
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/18



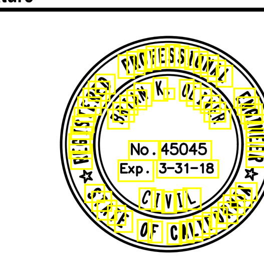
ALEXANDRIA.
ALEXANDRIA REAL ESTATE EQUITIES
10996 Torreyana Road Suite 250
San Diego, CA 92121

CAMPUS POINT SITE DEVELOPMENT PERMIT
10290 &10300 CAMPUS POINT DRIVE
SAN DIEGO, CA 92121

Gensler
225 Broadway
Suite 1600
San Diego CA 92101
Tel: 619.557.2500
Fax: 619.557.2520

Δ	Date	Issue/Revision	By	To
	11/30/2015	CYCLE 27		
	04/01/2016	CYCLE 32		
	06/24/2016	CYCLE 35		
	08/24/2016	CYCLE 38		
	09/29/2016	CYCLE 40		
	10/27/2016	CYCLE 42	KD	SS

Seal/Signature



Project Name
CAMPUS POINT SITE DEVELOPMENT PERMIT

Project Number
55.7538.000

Description
GRADING PLAN

Scale
As indicated

C2.6

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ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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Hydrology and Hydraulic Study

For

ARE Campus Point PDP

Prepared For:

□lexandria □ea□□tate □□uitie□
□□□□□ □orre□ana □oad□Suite □□□
San □ie□o□□□ □□□□□

City of San Diego

□□S□□□□□□□□

Prepared By:

Michae□□a□er □nternationa□
□□□□ □airemont Me□a □□d
San □ie□o□□□ □□□□□
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Michael Baker
INTERNATIONAL

Job Number:

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Prepared:

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Revised:

September □9□□□□□

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List of Figures

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Section 1 Project Description and Scope

1.1. Project Data

Project Owner: Alexandria Real Estate Equities
10996 Torreyanna Road, Suite 250
San Diego, CA 92121

Project Site Address: Campus Pointe Boulevard

Planning Area/
Community Area/
Development Name: University City

APN Number(s): 343-230-13-00

Project Location: Latitude: 32.892777°
Longitude:-117.22298°

Project Site Area: 4.12 Acres

Adjacent Streets:

North:	Roselle Street
South:	Genesee Avenue
East:	Towne Center Drive
West:	Genesee Avenue

Adjacent Land Uses:

North:	Open Space
South:	Commercial
East:	Commercial
West:	Commercial

1.2. Scope of Report

This report addresses the Hydrologic and Hydraulic aspects of the project. This report does not discuss required water quality measures to be implemented on a permanent basis, nor does it address construction storm water issues. Post construction storm water issue discussions can be found under separate cover in the project “Water Quality Technical Report.”

In addition, because this project proposes to disturb over one acre, a Storm Water Pollution Protection Plan for construction activities has been prepared and an NOI will be filed with the State of California prior to the start of construction.

Because this project is discharging into the City of San Diego MS-4 system, and not into directly into the Waters of The United States or any other regulated natural system, the project is not required to obtain a 401 or 404 permit.

The 401 or 404 permit is only required for projects that extend into the waters of the US and wetlands. This project is entirely within built up areas, and is reducing the flows from the site by as much as 99%.

1.3. Project Site Information

1.3.1 Project Location

The project is located on at 10300 Campus Pointe Drive in the City and County of San Diego, in the Sorrento Valley Community of the City of San Diego. The project is located just to the east of Interstate 5, west of Interstate 805, and just south of the 5/805 merge. The project is located northerly of Genesee Avenue. Please refer to Figure 1 below for a Vicinity Map.

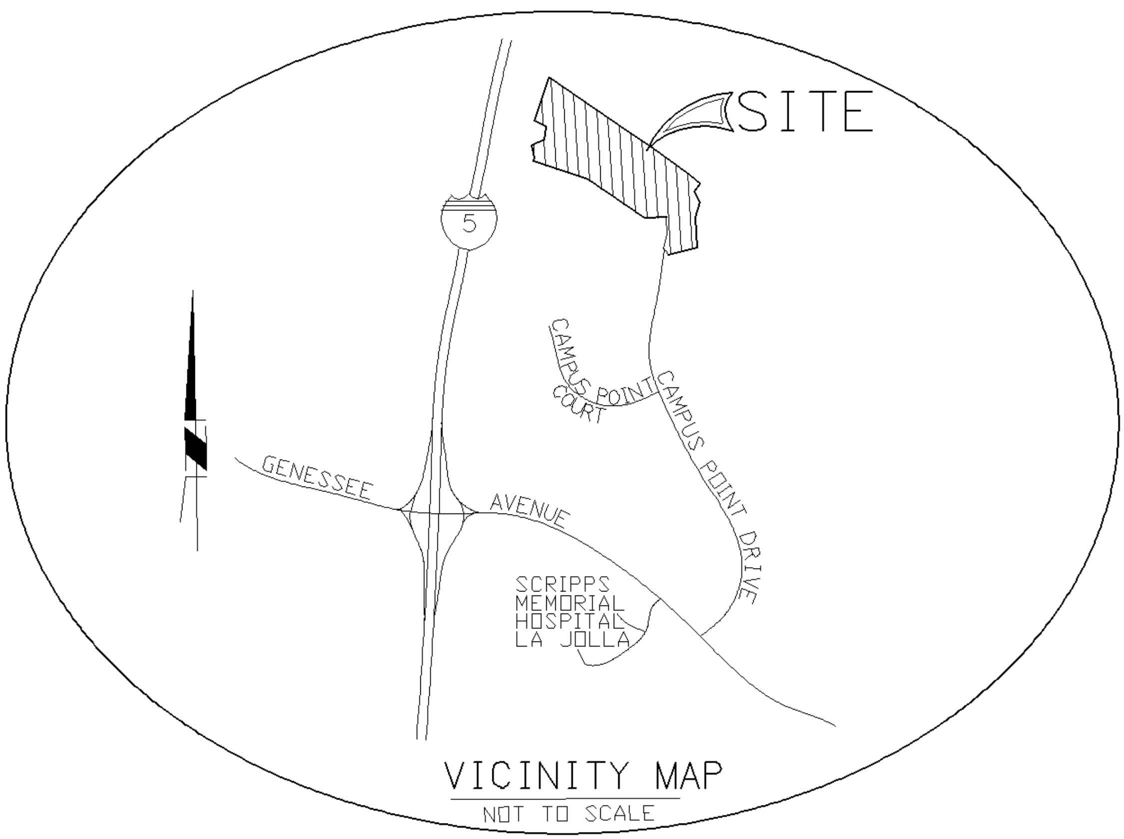


Figure 1: Vicinity Map

1.3.2 Project Description

The project proposes the completion of a new driveway and entry road called the Boulevard. The project also proposes the construction of new hardscape and landscape. In addition, underground storm drain, catch basins, curb inlets and biofiltration basins are proposed. In order to accomplish the construction, the project proposes the demolition of existing parking, hardscape and landscape.

1.3.3 Site Topography

Although the perimeter of the campus has slopes up to 130 feet tall, the core of the campus is relatively flat. The site has a maximum elevation of approximately 320 feet mean sea level (MSL). The lowest part of the graded area is at the southwest corner of the site at around elevation 295. Slopes surround the site on both the west and north sides of the site.

1.3.4 Land Use and Vegetation

The majority of the 22.8 acre site is currently project site is currently developed. The site is designated as commercial land use and is currently made up of a very large building along with associated hardscape, and landscape. The vegetation in the landscaped areas consists of primarily lawn and trees.

1.3.5 FEMA Information

The Federal Emergency Management Agency (FEMA) has mapped the floodplain of Soledad Canyon as a special flood hazard area, Zone AE (FIRM Panel 06073C-1338G). The project site does not lie within the mapped floodplain.

a) Flood Zone Definitions

Zone A -- Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Zone AE -- Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations

(BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Zone X (Shaded) – Areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.

Zone X (Unshaded) Areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood

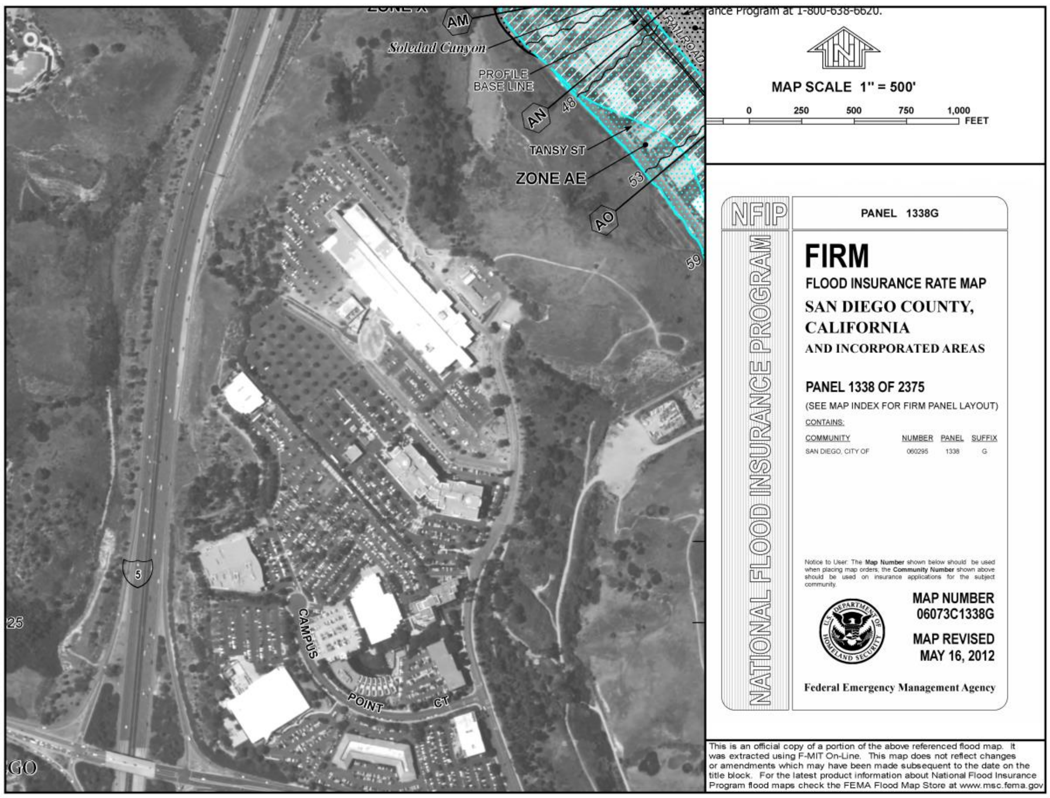


Figure 2: FEMA Firmette

1.3.6 Existing Drainage Improvements

The site currently drains to three directions, however, drainage from the project flows to only two of the three POC. The PDP project, in the existing and proposed condition flow to one of two points of connection, one to the west and the other two the southwest.

The first point of concentration is to the west. Drainage from the westerly side of the site flows into a 24" RCP storm drain. The storm drain flows to the west down the slope, before being discharge at the bottom of the canyon.

The second point of connection is to the southeast. Drainage from the southwest portion of the site, flows to the south, where it enters a storm drain that runs along southerly side of the property. This drainage then flows to the east where it flows into the canyon.

1.3.7 Proposed Improvements

The proposed drainage system includes a series of catch basins and PVC and HDPE pipe. The project also proposes two pump stations. The pump stations, one located in the northwest corner of the project and one located to the south west corner of the project pump the storm drainage to the proposed infiltration basin. The infiltration basin will infiltrate the flows from the majority of the PDP site, with the SDHM estimating that 98.77% of the runoff will be infiltrated.

Basin B, includes a portion of the road not being constructed under the Boulevard project, a ministerial project that is being processed under a separate permit. This roadway drains to a biofiltration basin which uses passive infiltration. The passive infiltration does not meet the 85th percentile requirement, hence it has been designed as an infiltration basin.

Because the use of the project does not change from commercial to commercial, there is no change in runoff co-efficient. With no change in runoff co-efficient and area, it is anticipated that the runoff will not change.

However, in the mitigated condition, the flows are drastically reduced. In fact, 69.3% of runoff is infiltrated in Basin B and 98.8% in Basin A.

Through careful design of the site, minimal off-site flows enter the site. Basin A has offsite flows that enter the site from the north. These flows are being captured and treated within the Infiltration Basin within Basin A.

Section 2 Study Objectives

The specific objectives of this study are as follows:

- To provide hydrologic analysis of the project site for the 100-year, 6-hour storm event under existing and proposed conditions,
- To provide a hydraulic analysis of the project to ensure that the correct sizes of pipes and inlets have been chosen,
- And to ensure that no additional runoff or downstream impacts occur due to this project.

Section 3 Methodology

3.1. Hydrology

Hydrologic analysis has been completed using the Rational Method (Q = CIA). Whereas,

Q = rate of flow in cubic feet per second

C = Coefficient of runoff,

I = intensity of rainfall based on the time of concentration and the 6-hour, 100-year precipitation

A=Area of the basin.

For this project, a composite coefficient of runoff was used. Data was entered into an Excel Spreadsheet which calculates the runoff based on the County of San Diego methodology electronically, therefore reducing errors.

The following software packages were used in the analysis of the project:

- Microsoft Excel (Rational Method Hydrology)
- AutoCAD Civil 3d Hydraflow Hydragraph Extension 2013 (Storm Routing)
- RatHydro (Rational Method Hydragraphs)
- Flowmaster (Hydraulic Analysis for Open Channels and Pipes for Storm Routing)

3.2. Hydraulics

Proposed improvements include new grated storm drain inlets in paved areas, and a new underground storm drain system. Private underground storm drain will consist of PVC or HDPE pipe with watertight joints. Public storm drain, if applicable, will consist of reinforced concrete pipe, with a minimum strength of 2000-D.

Capacity calculations for the inlets have been performed using the standard weir and orifice equations. Grate perimeter and open area values have been reduced to account for the bars, and an additional 50-percent to account for potential clogging.

Runoff will ultimately be discharged from the project site at the same location as the existing condition, to the existing cleanout at the southwest corner of the project site.

Proposed improvements will not increase the total peak flow runoff, as compared to existing conditions, through the removal of pavement and installation of vegetation.

Manning's equation was used to calculate the depth of flow being conveyed through proposed pipes and for existing pipes which experience additional flows as a result of the proposed improvements. Proposed pipes with diameters of less than 12 inches were not individually calculated for depth and velocity, however, the capacity was verified against tables showing the maximum flow in the smaller pipes.

The following software packages were used in the analysis of the project:

- Hydraflow Hydragraph Extension for AutoCAD Civil 3d 2013 (Storm Routing)
- Hydraflow Storm Sewer Extension for AutoCAD Civil 3d 2013 (Hydraulic and Energy Grade Lines)
- Hydraflow Express Extensions Extension for AutoCAD Civil 3d 2013 (Storm Routing)
- RatHydro (Rational Method Hydrographs)
- Bentley Flowmaster (Hydraulic Analysis for Open Channels and Pipes for Storm Routing)

3.3. Hydromodification

Flow control is considered a storm water management issue, and is therefore addressed in the Water Quality Technical Report.

However, the preconditions for the Hydromodification on all of the new surfaces is pervious condition. In those areas where there is run on, the run on surface used for Hydromodification is the surface in the existing condition.

Section 4 Results

4.1. Hydrologic Results

The following tables summarize the hydrologic analysis of the project.

- **Table 1 – Existing Condition**, summarizes the existing hydrologic properties of the project site.

Sub Basin No.	Runoff Coefficient	Basin Intensity	Basin Area (acres)	Runoff (cfs)
Basin A	0.93	5.18	11.09	53.44
Basin B	0.76	4.46	0.52	1.42
TOTALS			**11.61**	**55.86**

- **Table 2 – Proposed Condition (Unmitigated)**, summarizes the proposed condition hydrology of the site in the unmitigated condition.
-

Table 3 – Comparison of Existing and Proposed Flows (100-year) compares existing flows to the proposed flows.

Table 1 – Existing Condition (100-year)

Sub Basin No.	Runoff Coefficient	Basin Intensity	Basin Area (acres)	Runoff (cfs)
Basin A	0.93	5.18	11.09	53.44
Basin B	0.76	4.46	0.52	1.42
TOTALS			**11.61**	**54.86**

Table 2 – Proposed Condition (Unmitigated) (100-year)

Sub Basin No.	Runoff Coefficient	Basin Intensity	Basin Area (acres)	Runoff (cfs)
Basin A	0.73	3.24	11.09	26.29
Basin B	0.86	5.57	0.52	2.49
TOTALS			**11.61**	**28.78**

Table 3 – Comparison of Existing and Proposed Flows (100-year)

Sub Basin No.	Existing Condition (cfs)	Proposed Condition (cfs)	Difference
Basin A	53.44	26.29	-27.15
Basin B	1.42	2.49	+1.07
TOTALS	**54.86**	**28.78**	**-26.08**

Section 5. Conclusions

As indicated in the Table of Hydrologic Results, the proposed improvements will not increase the total 100-year, 6-hour peak flow rate.

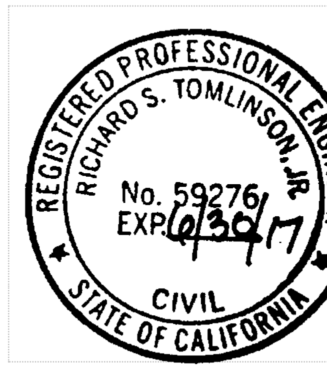
Proposed private grated inlets, all of which are in a sump condition, shall capture the generated flows without significant ponding. In the unlikely event that grated inlets become completely clogged, the proposed site grades shall provide overland release to adjacent drainage areas.

There is not a significant concern for erosion as the site is previously developed. Potential for erosion for the proposed condition shall be minimized by following items listed in the Erosion Control Plan (part of the Rough Grading Plans). Runoff shall flow over relatively flat areas where scour is not a concern. Runoff is not proposed over any sloped areas.

Because the flows in the 100-year event and all flows from the Q2 to Q25 have been reduced, some by as much as 99%, no downstream effects are anticipated. The reduction has been obtained by the addition of pervious areas, an infiltration basin and a biofiltration basin.

Section 5 Certification

This Hydrology and Hydraulics report has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based. The plans and specifications in this Hydrology and Hydraulics report are not for construction purposes; the contractor shall refer to final approved construction documents for plans and specifications.



Richard S. Tomlinson, Jr. RCE 59276 June 23, 2016

Section 6 References

San Diego Municipal Code, 2008. Land Development Manual (March 2008). Storm Water Standards.

County of San Diego, 1984. Drainage Design Manual (April 1984)

FEMA, 1997. FEMA. (June 17, 1997). Flood Insurance Study, San Diego County.

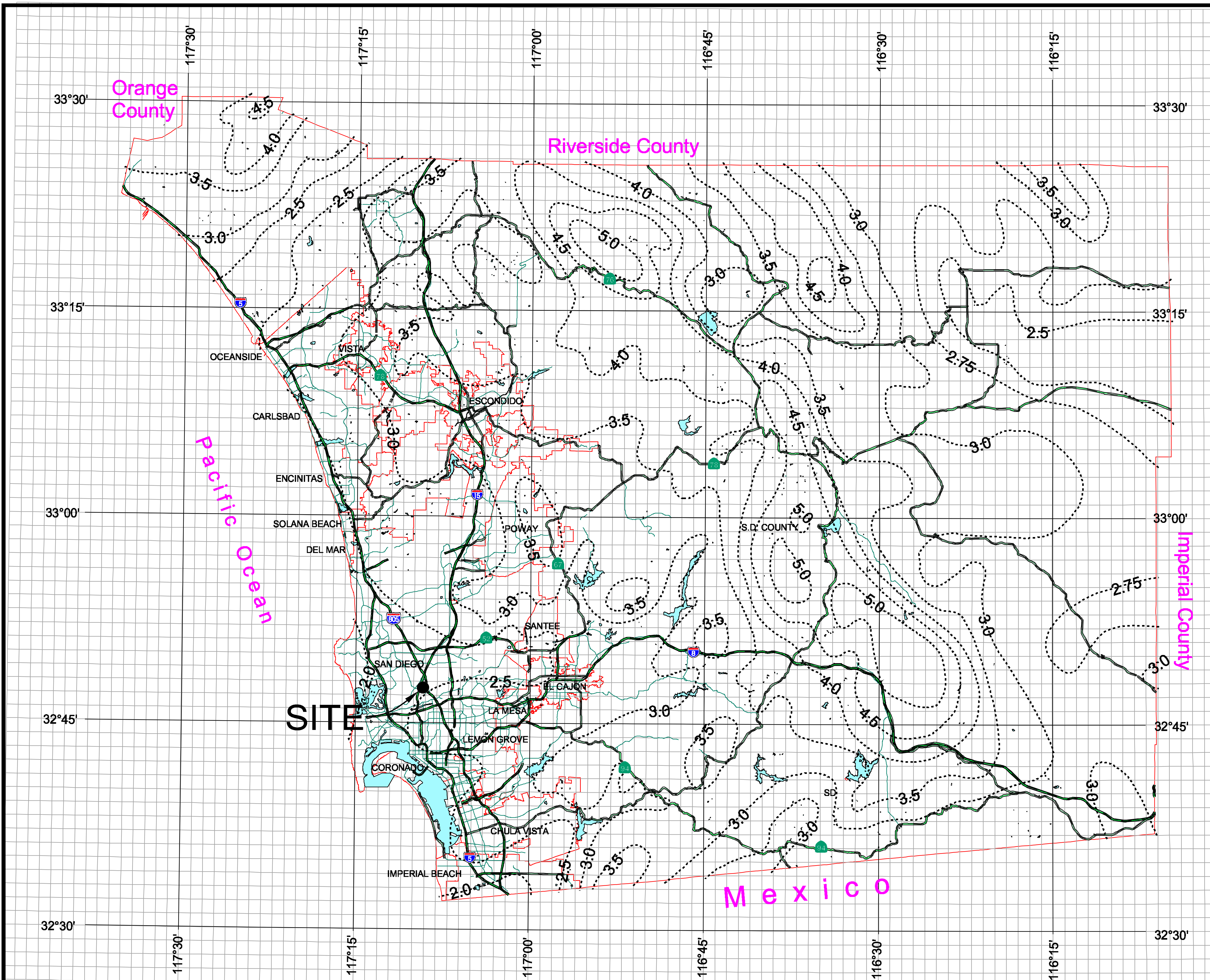
Appendix A
Rainfall Isopluvials

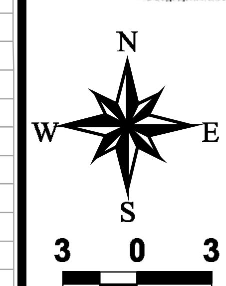
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

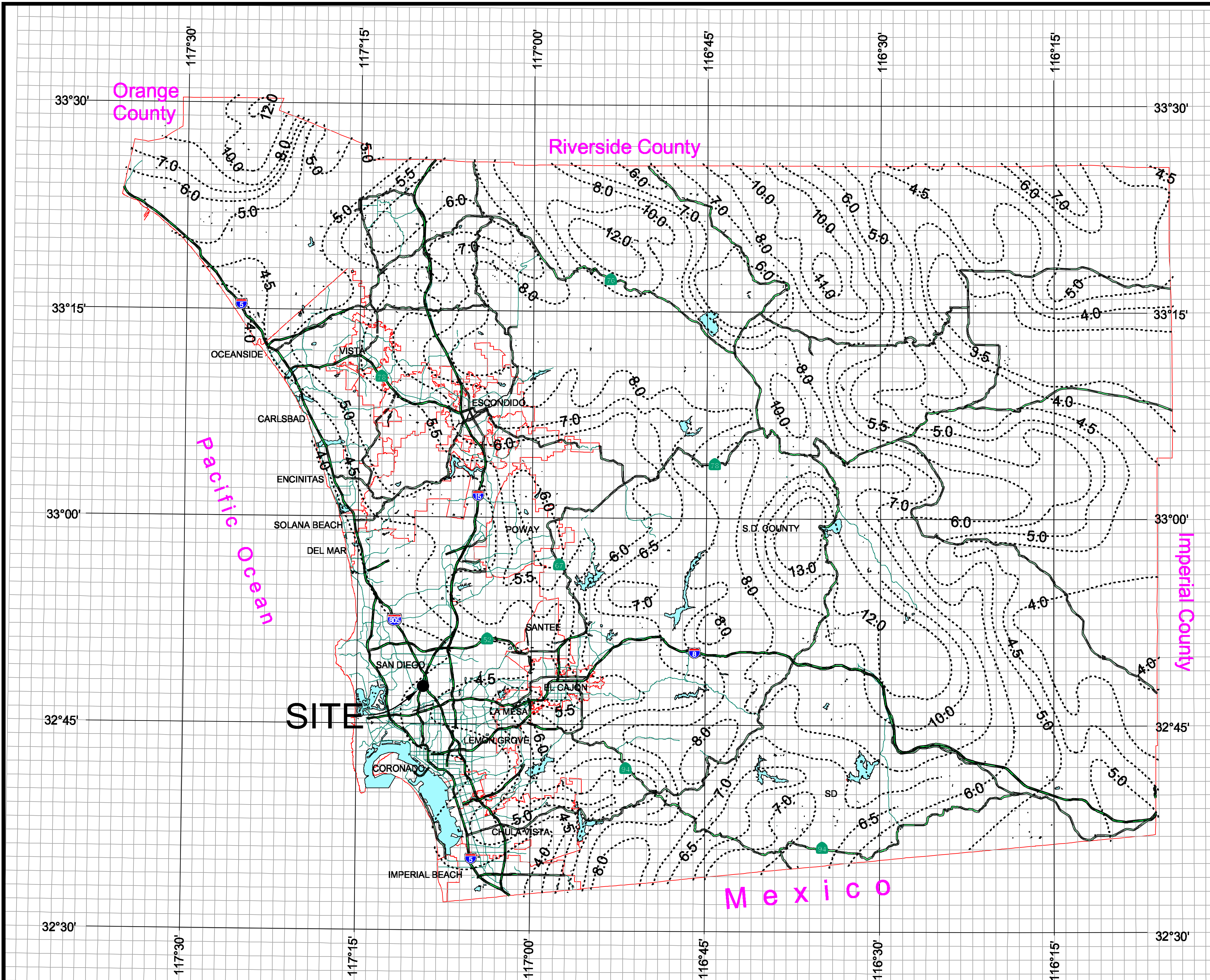




County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours



········	Isopluvial (inches)

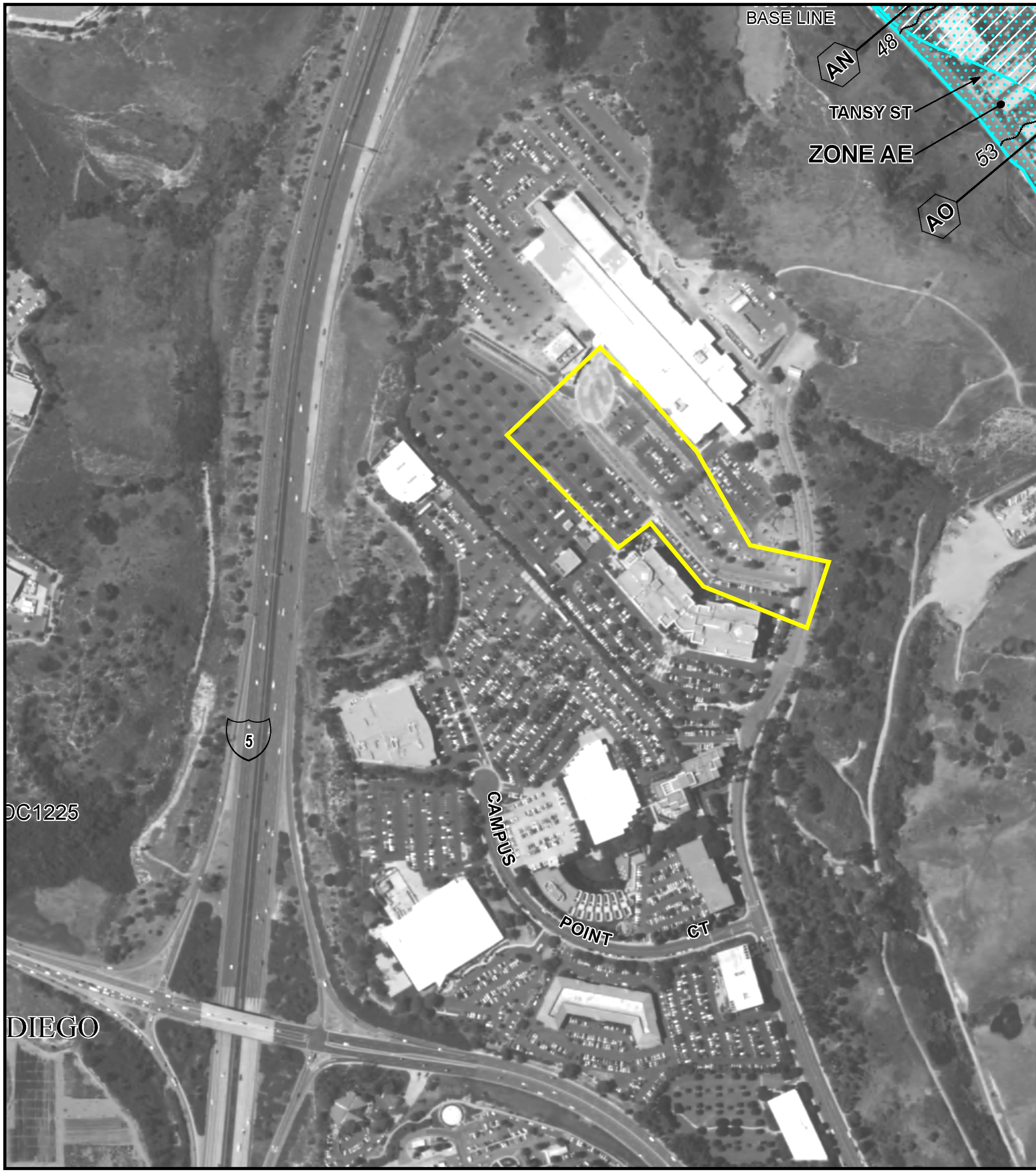
Department of Public Works Geographic Information Services

SanGIS We Have San Diego Covered!

N S W E

3 0 3 Miles

Appendix B
FEMA Flood Plain Maps



ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1338G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1338 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1338	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1338G

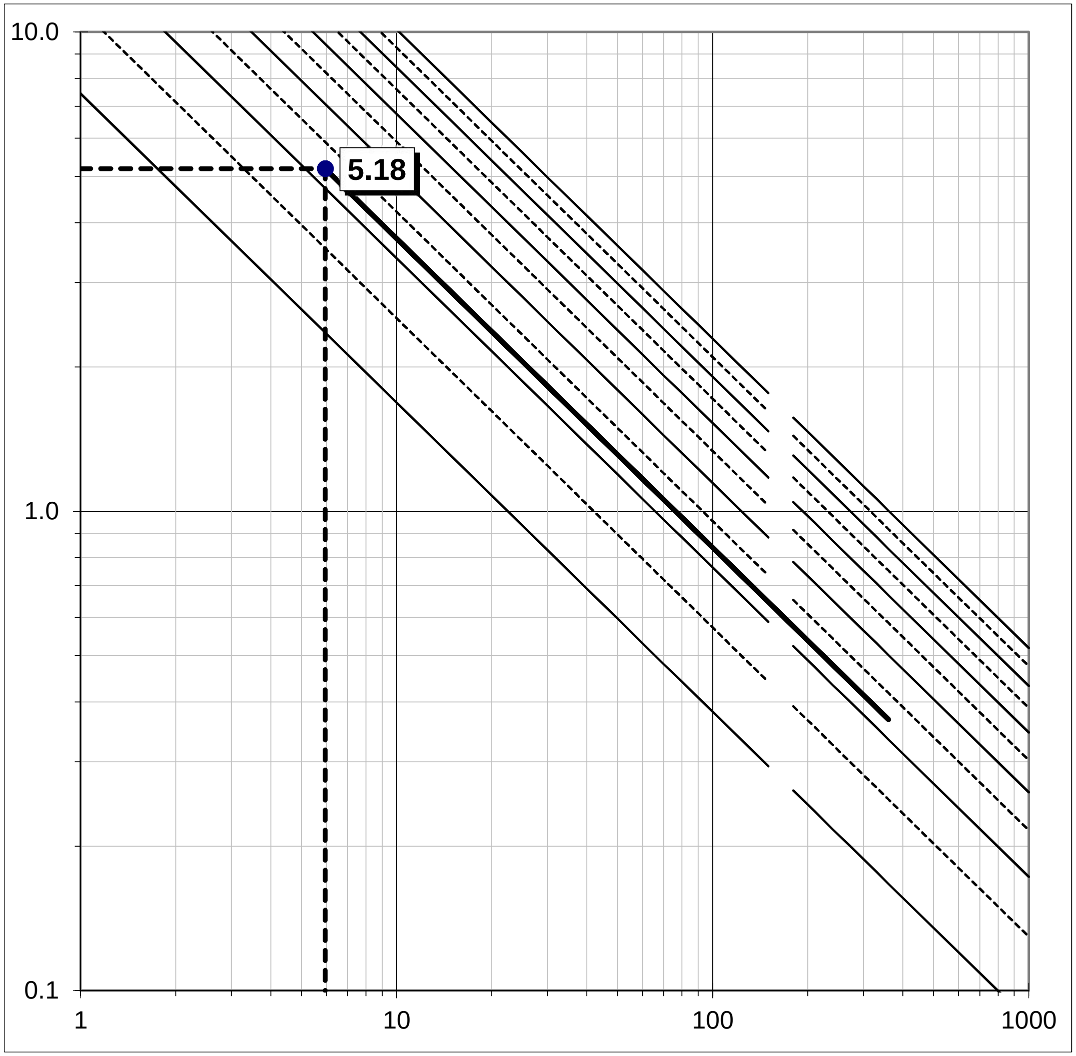
MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Michael Baker
INTERNATIONAL

Appendix C
Existing Condition Hydrologic Work Map & Calculations



Campus Point SDP

Basin A Existing

Time of Concentration Calculations

Natural Areas

Land Use =	Commercial	
C =	0.93	
Dist. =	600.00	ft.
slope =	2.000	%
$\mathbf{T_c}$ =	5.94	min.

$$T_C = \frac{1.8(1.1 - C)\sqrt{D}}{\sqrt[3]{s}}$$

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

	Area	
Pervious	1.380	
Impervious	9.700	
Total	11.080	
Actual Impervious		0.88
Tabulated Impervious		0.80
Coeefecient		0.85
Revised 'C'		0.93
Use 'C'		0.93

Basin Intensity Calculations

Selected Frequency,		**100**	year
P_6 =	2.2	in.	P_6 must be within
P_{24} =	3.8	in.	45% to 65% of P_{24}.
P_6 / P_{24} =	58%		Adjust P_6 as needed.
Adjusted $\mathbf{P_6}$=	2.20	in.	
T_c (**D**) =	5.94	min.	
I =	5.18	in/hr	

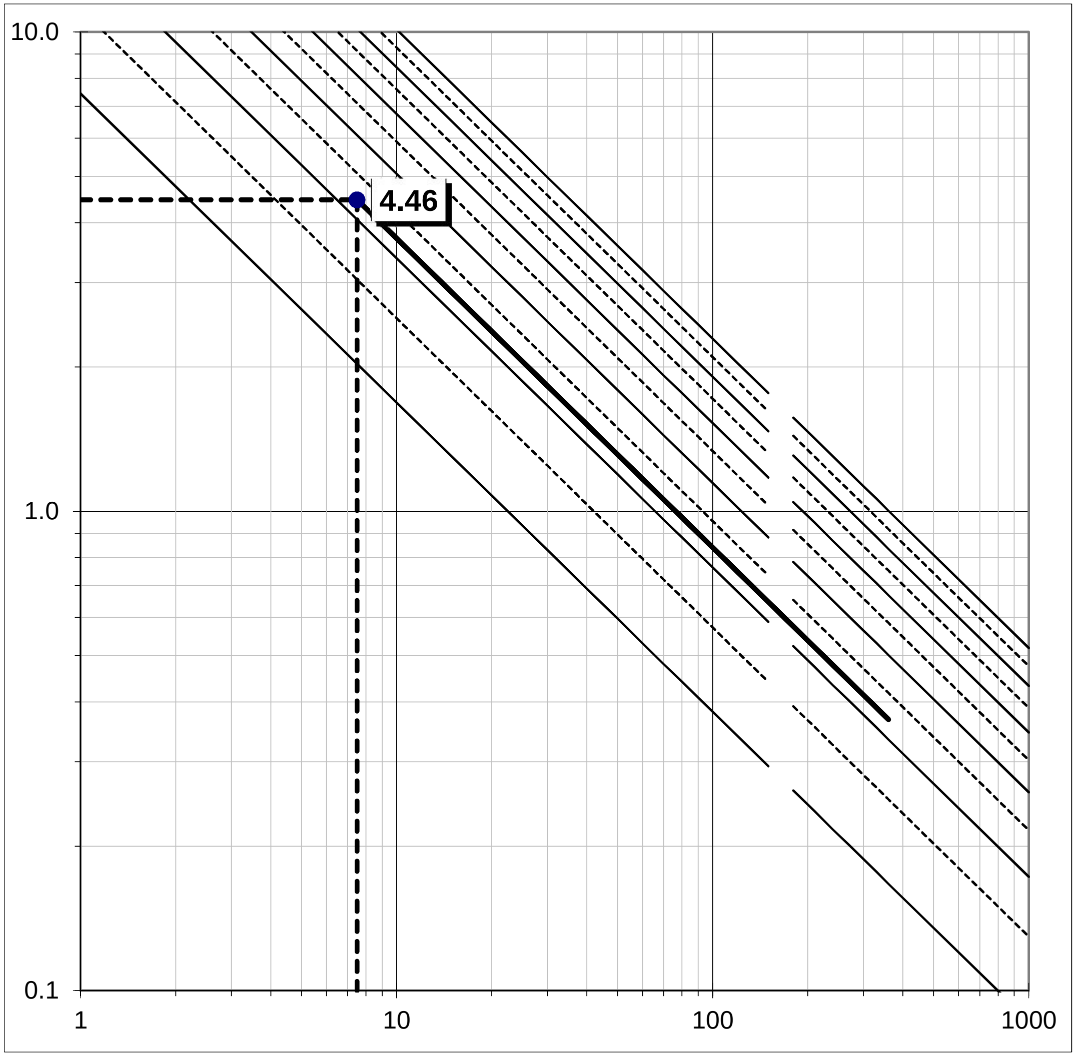
$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q =	**53.438**	**cfs**
C =	0.93	
I =	5.18	in/hr
A =	11.080	ac.

$$Q = C * I * A$$

RBF Job No. 139861



Campus Point SDP

Basin B Existing

Time of Concentration Calculations

Natural Areas

Land Use =	Commercial	
C =	0.76	
Dist. =	310.00	ft.
slope =	3.000	%
T_c =	7.49	min.

$$T_C = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

	Area
Pervious	0.120
Impervious	0.300
Total	0.420

Actual Impervious	0.71
Tabulated Impervious	0.80
Coeefecient	0.85
Revised 'C'	0.76
Use 'C'	0.76

Basin Intensity Calculations

Selected Frequency,	**100**	year	
P_6 =	2.2	in.	P_6 must be within
P_{24} =	3.8	in.	45% to 65% of P_{24}.
P_6 / P_{24} =	58%		Adjust P_6 as needed.
Adjusted $\mathbf{P_6}$=	2.20	in.	
T_c (**D**) =	7.49	min.	
I =	4.46	in/hr	

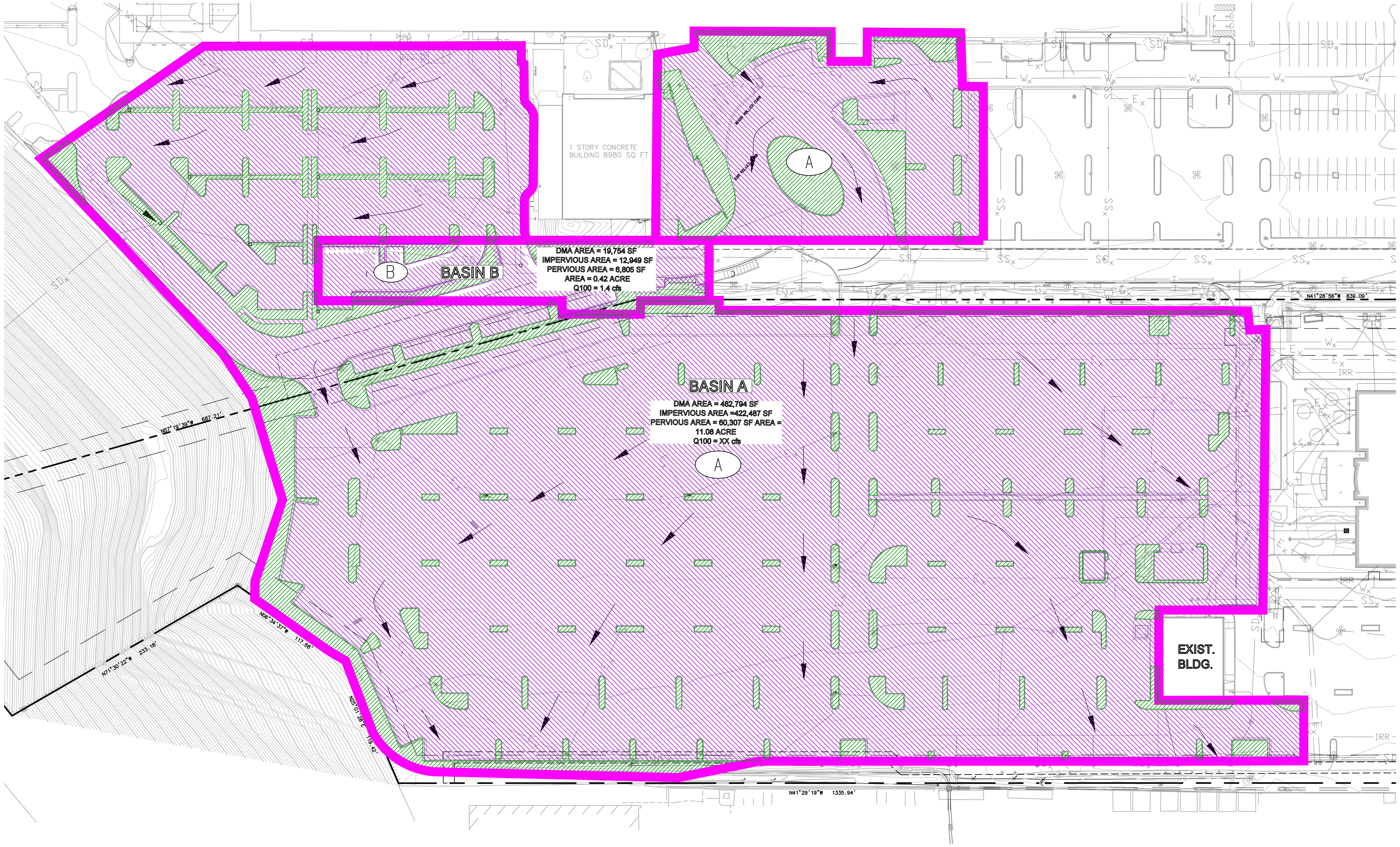
$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q =	**1.423**	**cfs**
C =	0.76	
I =	4.46	in/hr
A =	0.420	ac.

$$Q = C * I * A$$

RBF Job No. 139861



LEGEND

LIMITS OF OVERALL DRAINAGE BASIN
BASIN
IMPERVIOUS AREA
PERVIOUS AREA
BIORETENTION BASIN
DRAINAGE BASIN
FLOW PATH
POINT COMPLIANCE
MODULAR WETLAND SYSTEM
UNDERGROUND VAULT — UV

SCALE: 1"=50'

50 0 50 100 150
SCALE: 1"=50'

CAMPUS POINT

10290 CAMPUS POINT DR.
SAN DIEGO, CA

EXISTING CONDITIONS
IMPERVIOUS AREAS

06 / 22 / 16

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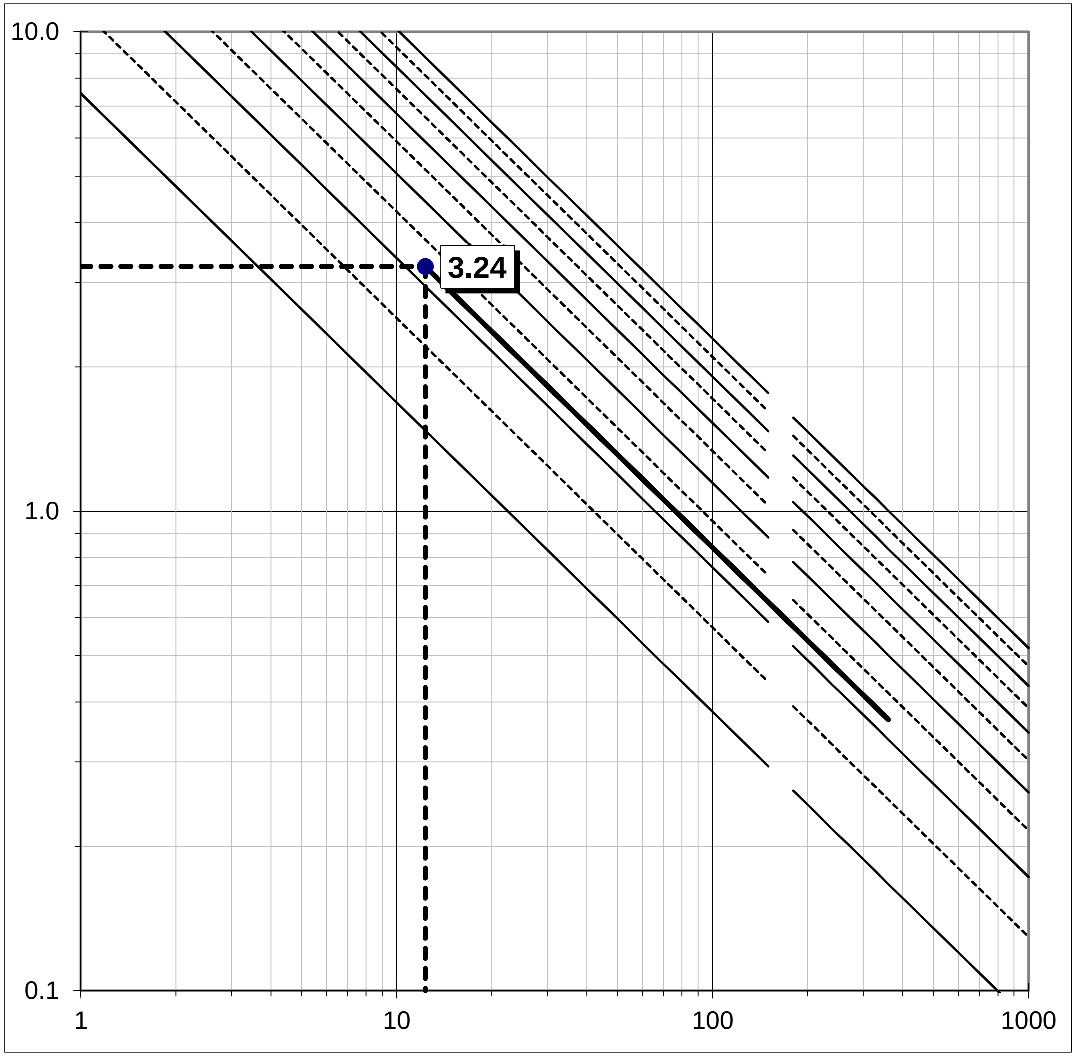
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

Michael Baker
INTERNATIONAL

Appendix D
Proposed Condition Hydrologic Work Map & Calculations



Campus Point SDP

Basin A Proposed

Time of Concentration Calculations

Natural Areas

Land Use =	Commercial	
C =	0.73	
Dist. =	550.00	ft.
slope =	2.000	%
$\mathbf{T_c}$ =	12.33	min.

$$T_C = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

	Area	
Pervious	3.448	
Impervious	7.640	
Total	11.088	
Actual Impervious		0.69
Tabulated Impervious		0.80
Coeefecient		0.85
Revised 'C'		0.73
Use 'C'		0.73

Basin Intensity Calculations

Selected Frequency,	**100**	year
P_6 =	2.2	in.
P_{24} =	3.8	in.
P_6 / P_{24} =	58%	
Adjusted $\mathbf{P_6}$=	2.20	in.
T_c (**D**) =	12.33	min.
I =	3.24	in/hr

P_6 must be within 45% to 65% of P_{24}. Adjust P_6 as needed.

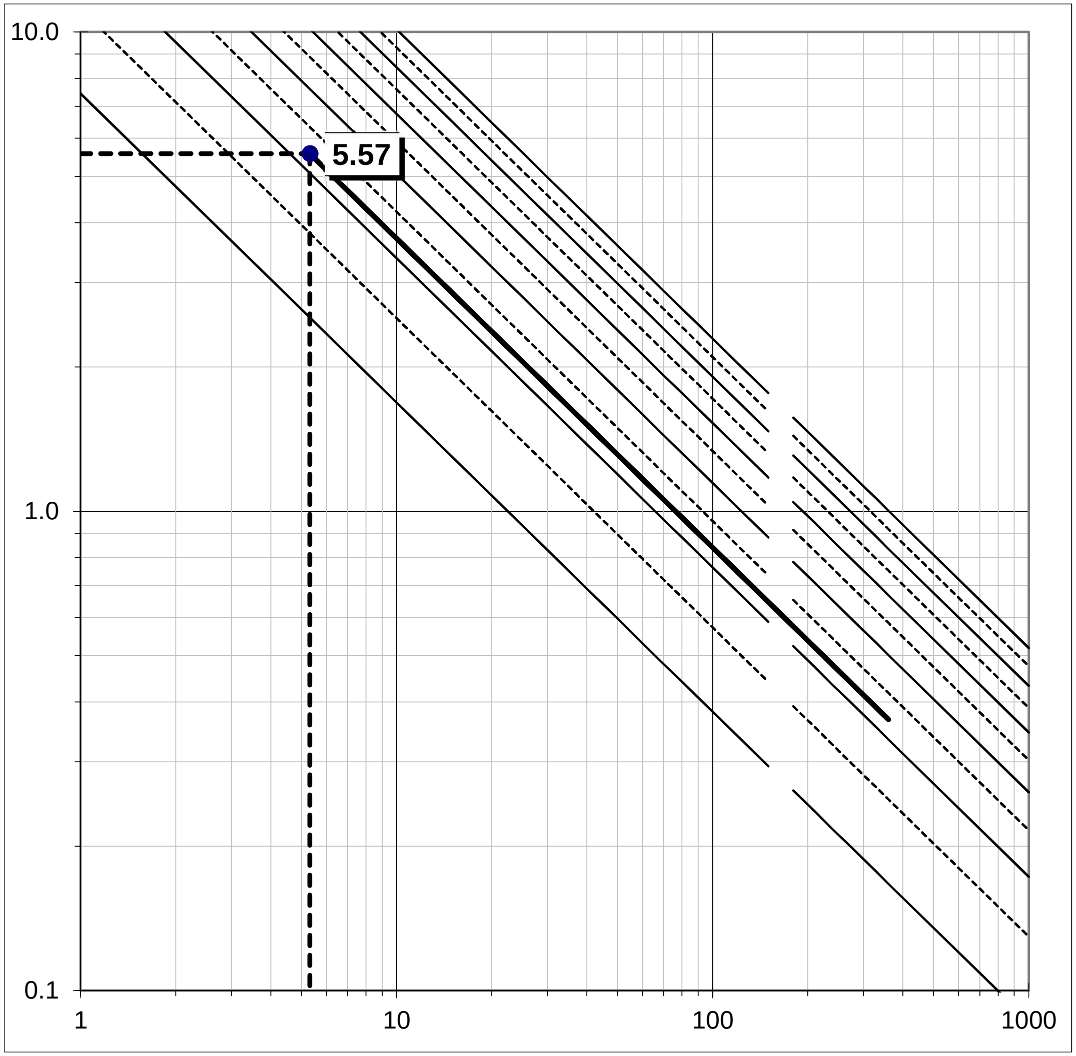
$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q =	**26.292**	**cfs**
C =	0.73	
I =	3.24	in/hr
A =	11.088	ac.

$$Q = C * I * A$$

RBF Job No. 139861



Campus Point SDP

Basin B Proposed

Time of Concentration Calculations

Natural Areas

Land Use = Commercial

C = 0.86

Dist. = 310.00 ft.

slope = 3.000 %

T_c = 5.31 min.

$$T_C = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

	Area
Pervious	0.100
Impervious	0.420
Total	0.520

Actual Impervious	0.81
Tabulated Impervious	0.80
Coeefecient	0.85
Revised 'C'	0.86
Use 'C'	0.86

Basin Intensity Calculations

Selected Frequency, **100** year

P_6 = 2.2 in. — P_6 must be within 45% to 65% of P_{24}. Adjust P_6 as needed.

P_{24} = 3.8 in.

P_6 / P_{24} = 58%

Adjusted **P_6**= 2.20 in.

T_c (**D**) = 5.31 min.

I = 5.57 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q = **2.487** **cfs**

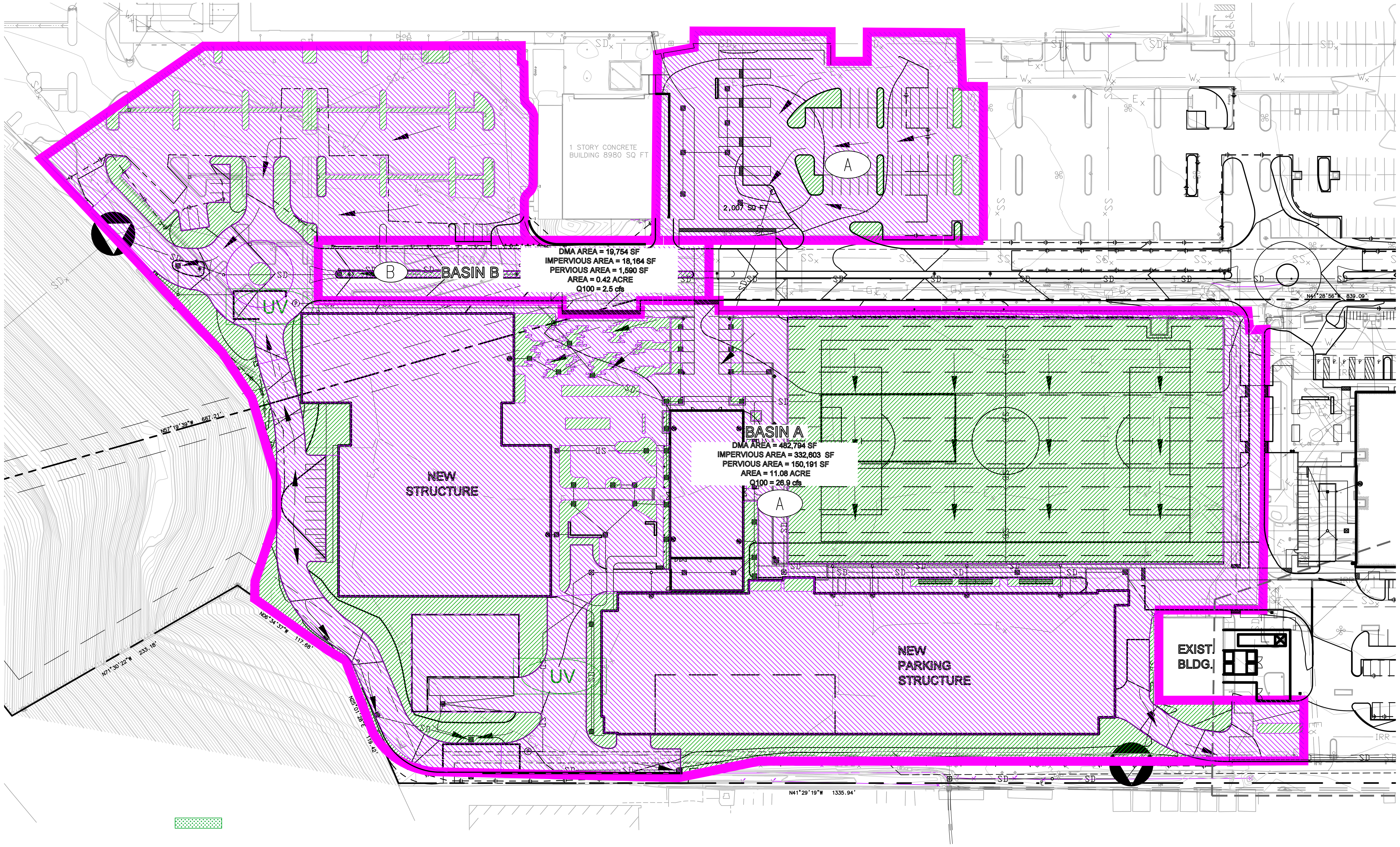
C = 0.86

I = 5.57 in/hr

A = 0.520 ac.

$$Q = C * I * A$$

RBF Job No. 139861



LEGEND

LIMITS OF OVERALL DRAINAGE BASIN	
BASIN	X-X
IMPERVIOUS AREA	
PERVIOUS AREA	
BIORETENTION BASIN	
DRAINAGE BASIN	
FLOW PATH	
POINT COMPLIANCE	
UNDERGROUND VAULT	UV

SCALE: 1"=50'

50 0 50 100 150

SCALE: 1"=50'

CAMPUS POINT

10290 CAMPUS POINT DR.
SAN DIEGO, CA

PROPOSED CONDITIONS IMPERVIOUS AREAS

06 / 22 / 16

Michael Baker INTERNATIONAL
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

ATTACHMENT 6
GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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Project No. 07850-42-15
September 20, 2016

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, California 92122

Attention: Mr. Michael Barbera

Subject: ADDENDUM TO STORM WATER MANAGEMENT RECOMMENDATIONS
CAMPUS POINT BOULEVARD
10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

References:

1. *Storm Water Management Recommendations, 10290 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated June 7, 2016 (Project No. 07850-42-15).
2. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 5, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).
3. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 11, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).
4. *Response to Geotechnical Review Comments, 10290 Campus Pointe Drive, San Diego, California*, dated August 22, 2016, prepared by Geocon Incorporated (Project No. 07850-42-15).
5. *Preliminary Geotechnical Investigation, 10290 Campus Pointe Drive San Diego, California*, dated June 11, 2015, prepared by Geocon Incorporated (Project No. 07850-42-15).
6. *Second Addendum to Geotechnical Investigation, 10290 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated March 15, 2016 (Project No. 07850-42-15).

Dear Mr. Barbera:

We have prepared this addendum letter with respect to storm water management recommendations for the subject site. Recommendations for storm water management are provided in Reference 1 and in the response letters to City review comments (References 2 through 4). As required by the City of San Diego, we have performed additional infiltration tests within the bottom of the basin excavation. Based on the test results, it is our opinion that the recommendations contained in the previous correspondence remain applicable. Full infiltration is considered infeasible; however, the site is considered feasible for partial infiltration provided design measures are taken to ensure seepage water from the basin does not impact the proposed adjacent below grade retaining walls and structures.

In-Situ Testing

We performed 2 field-saturated, hydraulic conductivity tests at depths of approximately 16 inches below the basin bottom using a Soil Moisture Corp Aardvark Permeameter. Table 1 presents the results of the infiltration test. The Aardvark Permeameter test data is attached.

TABLE 1
UNFACTORED, FIELD-SATURATED, HYDRAULIC CONDUCTIVITY TEST RESULTS USING THE SOILMOISTURE CORP AARDVARK PERMEAMETER

Location	Depth (inches)	Geologic Unit	Field Infiltration Rate, I (inches/hour)	Field Saturated Hydraulic Conductivity, K (inches/hour)
A-1	17	Ardath/Scripps Formation	0.08	0.05
A-2	16	Ardath/Scripps Formation	0.22	0.12

We also performed three excavation percolation tests at depths between 17 and 24 inches below the basin bottom. Table 2 presents the calculated infiltration rates.

TABLE 2
UNFACTORED INFILTRATION TEST RESULTS FROM EXCAVATION PERCOLATION TEST PITS

Test No.	Depth (inches)	Geologic Unit	Infiltration Rate, I (inches/hour)
P-1	17	Ardath/Scripps Formation	1.08
P-2	24	Ardath/Scripps Formation	0.09
P-3	19	Ardath/Scripps Formation	0.42

Soil permeability values from in-situ tests can vary significantly from one location to another due to the non-homogeneous characteristics inherent to most soil. However, if a sufficient amount of field and laboratory test data is obtained, a general trend of soil permeability can usually be evaluated. For this project and for storm water purposes, the test results presented herein should be considered approximate values.

STORM WATER MANAGEMENT CONCLUSIONS

Infiltration Rates

The results of the testing show 4 of the 5 infiltration tests had rates less than 0.5 inches per hour. Boring logs and the geologic history of the bedrock units show the on-site soils are highly variable. It is our opinion that there is a high probability for lateral water migration because of variable soil conditions and interlayered siltstone and claystone beds within the formational bedrock units. Therefore, based on the results of the field infiltration tests, full infiltration is considered infeasible because of the varying infiltration rates and potential for lateral water migration and ground water mounding. However, partial infiltration is considered feasible provided precautions are taken to reduce impacts to adjacent below grade retaining walls and structures.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table 3 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE 3
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table 4 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table 3 and the results of our geotechnical investigation. Table 4 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE 4
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.5
Predominant Soil Texture	0.25	2	0.5
Site Soil Variability	0.25	3	0.75
Depth to Groundwater/Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2

1 The project civil engineer should complete Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS

Our results indicate the site has highly variable sub-surface permeability conditions and infiltration characteristics. Because of these site conditions, it is our opinion that there is a high probability for lateral water migration and in our opinion full infiltration is infeasible on this site. However, partial infiltration is considered feasible. Side liners should be installed to reduce the potential for lateral migration of seepage within the basin area.

Should you have any questions regarding the letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

RCM:dmc

Attachments: Figure 1
Worksheet C.4-1
Aardvark Permeameter Data Analysis
Boring Logs

(e-mail) Addressee
(e-mail) Gensler
Attention: Mr. Steve Schrader
(e-mail) Michael Baker International
Attention: Mr. Brian Oliver

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	□□□	□□
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:

The infiltration test results were as follows:
A-1: 0.08 in/hr
A-2: 0.22 in/hr
P-1: 1.08 in/hr
P-2: 0.09 in/hr
P-3: 0.42 in/hr

Four of the five tests indicated test results less than 0.5 inches per hour. This shows the soil is variable and a reliable design infiltration rate below proposed facility locations is not greater than 0.5 inches/hour. Additionally, based on the USGS Soil Survey, 100 percent of the site consists of a unit that possess a Hydrologic Soil Group D classification with an estimated k_{SAT} of 0.10 to 1.3 inches per hour.

Criteria	Screening Question	□□□	□□
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:

The specific geologic or geotechnical hazard for this site is the potential for groundwater mounding and lateral migration of infiltration water. The area of the proposed basin is underlain by dense formational soils of the Scripps Formation and Ardath Formation (see Geocon report dated June 11, 2015 and March 15, 2016). Four of the five tests performed at the bottom of the basin have a factored infiltration rate less than 0.5 iph. The variability observed in these test results is a reflection of the heterogeneous, anisotropic nature of the site hydrological properties. Since the site geology is composed of interbedded sandstone and siltstone/claystone (as geotechnical borings performed show) we expect that infiltration of storm water will be carried by the more permeable sandstone layers and occluded by the siltstone/claystone layers; therefore, the site is highly prone to groundwater mounding beneath basins and lateral migration of infiltrated groundwater. Therefore, it is our opinion that the site is not feasible for full infiltration.

Due to the layering of the soils as is evident on the boring longs in the referenced reports, we are not aware of any reasonable mitigation methods that could be performed to mitigate the geologic conditions to an acceptable level where groundwater mounding and lateral migration will not occur under full infiltration conditions.

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Groundwater is expected to be deeper than 100 feet.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>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.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

There are no known contaminants at the site and groundwater is in excess of 20 feet below the bottom of the basin. Response provided by Michael Baker International, the project’s civil engineer.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">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</td><td></td></tr>
</table>

*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 the City 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:

Based on our study, appreciable infiltration rates were measured.

A-1: 0.08 in/hr
A-2: 0.22 in/hr
P-1: 1.08 in/hr
P-2: 0.09 in/hr
P-3: 0.42 in/hr

Criteria	Screening Question	Yes	No
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:

The specific geologic or geotechnical hazard for this site is the potential for groundwater mounding and lateral migration of infiltration water. The area of the proposed basin is underlain by dense formational soils of the Scripps Formation and Ardath Formation (see Geocon report dated June 11, 2015 and March 15, 2016). The infiltration test results performed on the property very widely across the site. The variability observed in the test results is a reflection of the heterogeneous, anisotropic nature of the site hydrological properties. Since the site geology is composed of interbedded sandstone and siltstone/claystone (as geotechnical borings performed show) we expect that infiltration of storm water will be carried by the more permeable sandstone layers and occluded by the siltstone/claystone layers; therefore, the site is highly prone to groundwater mounding beneath basins and lateral migration of infiltrated groundwater.

Under partial infiltration, mitigation measures should be taken to reduce potential impacts as a result of groundwater mounding and lateral water migration. Proposed below grade retaining walls for the parking structure and other proposed adjacent structures should be constructed with wall drains to intercept seepage and outlet it from behind the walls. The existing building west of the infiltration basin is supported on drilled piers so we do not expect lateral migration of infiltration to impact the building structure. There are no slopes or known existing utilities within the proposed area of the basin that are expected to be impacted by partial infiltration.

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: Groundwater is expected to be at depths greater than 100 feet. 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: There are no known downstream water rights. Response provided by Michael Baker International, the project's civil engineer. 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 1-4 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.**		

*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 the City to substantiate findings.

GEOCON

Aardvark Permeameter Data Analysis

Project Name:	Campus Point	Date:	9/19/2016
Project Number:	07850-42-15	By:	JTL
Borehole Location:	A-1	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

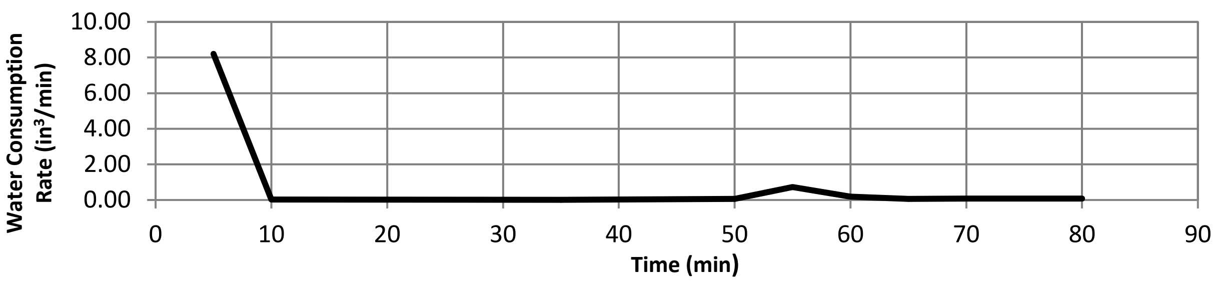
Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	1.42
Distance Between Reservoir & Top of Borehole (feet):	2.42
Depth to Water Table, **s** (feet):	1000
Height APM Raised from Bottom (inches):	0.00

Wetted Area, **A** (in^2): 58.18

Distance Between Resevoir and APM, **D** (feet):	3.24
Head Height, **h** (inches):	3.63
Distance Between Constant Head and Water Table, **L** (inches):	11987

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			22.045			
2	5.00	5.00		20.565	1.48	1.48	8.20
3	10.00	5.00		20.560	0.01	1.49	0.03
4	35.00	25.00		20.550	0.01	1.50	0.01
5	50.00	15.00		20.520	0.03	1.53	0.06
6	55.00	5.00		20.390	0.13	1.66	0.72
7	60.00	5.00		20.355	0.04	1.69	0.19
8	65.00	5.00		20.345	0.01	1.70	0.06
9	70.00	5.00		20.330	0.02	1.72	0.08
10	75.00	5.00		20.315	0.01	1.73	0.08
11	80.00	5.00		20.300	0.02	1.75	0.08

Steady Flow Rate, Q (in^3/min): 8.32E-02



Field-Saturated Hydraulic Conductivity (Infiltration Rate)

Case 1: L/h > 3 K_{sat} = 7.71E-04 in/min 0.05 in/hr

GEOCON

Aardvark Permeameter Data Analysis

Project Name: Campus Point
Date: 9/19/2016
Project Number: 07850-42-15
By: JTL
Borehole Location: A-2
Ref. EL (feet, MSL):
Bottom EL (feet, MSL):

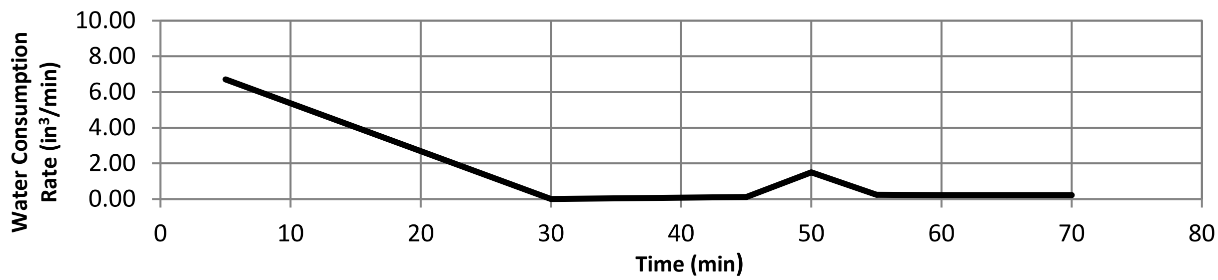
Borehole Diameter (inches): 4.00
Borehole Depth, **H** (feet): 1.29
Distance Between Reservoir & Top of Borehole (feet): 2.42
Depth to Water Table, **s** (feet): 1000
Height APM Raised from Bottom (inches): 0.00

Wetted Area, **A** (in^2): 58.11

Distance Between Resevoir and APM, **D** (feet): 3.10
Head Height, **h** (inches): 3.62
Distance Between Constant Head and Water Table, **L** (inches): 11988

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			19.155			
2	5.00	5.00		17.945	1.21	1.21	6.71
3	30.00	25.00		17.940	0.00	1.22	0.01
4	45.00	15.00		17.875	0.07	1.28	0.12
5	50.00	5.00		17.605	0.27	1.55	1.50
6	55.00	5.00		17.560	0.05	1.60	0.25
7	60.00	5.00		17.520	0.04	1.64	0.22
8	65.00	5.00		17.480	0.04	1.68	0.22
9	70.00	5.00		17.440	0.04	1.72	0.22

Steady Flow Rate, Q (in^3/min): 2.22E-01



Field-Saturated Hydraulic Conductivity (Infiltration Rate)

Case 1: L/h > 3 K_{sat} = 2.06E-03 in/min 0.12 in/hr

PRELIMINARY
GEOTECHNICAL INVESTIGATION

10290 CAMPUS POINTE DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA REAL ESTATE EQUITIES, INC.
SAN DIEGO, CALIFORNIA

JUNE 11, 2015
PROJECT NO. 07850-42-15

Project No. 07850-42-15
June 11, 2015

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, California 92122

Attention: Mr. Michael Barbera

Subject: PRELIMINARY GEOTECHNICAL INVESTIGATION
10290 CAMPUS POINTE DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Barbera:

In accordance with your request, we have prepared this preliminary geotechnical investigation for the subject property. This study was prepared for the purpose of identifying site soil and geologic conditions and potential geotechnical constraints that could impact development, as well as to provide preliminary geotechnical recommendations for design and construction.

The accompanying report presents findings from our study relative to geotechnical engineering aspects of developing the site. No soil or geologic conditions were encountered which would preclude development.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

Garry W. Cannon
CEG 2201
RCE 56468

REGISTERED PROFESSIONAL ENGINEER
RODNEY C. MIKESELL
No.2533
GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
GARRY WELLS CANNON
No. C 056468
CIVIL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
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No. 2201
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

RCM:GWC:dmc

(4/del) Addressee

TABLE OF CONTENTS

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PRELIMINARY GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the findings of our preliminary geotechnical investigation for the proposed development located at 10290 Campus Point Drive, in San Diego, California (see Vicinity Map, Figure 1). The purpose of this investigation was to observe site soil and geologic conditions, identify potential geotechnical constraints, to provide recommendations pertaining to geotechnical aspects of developing the property.

The scope of our study consisted of reviewing previous geotechnical reports that have been prepared for the site and adjacent projects, analyses of the data obtained from the previous investigations and fault studies, exploratory borings, and preparation of this report. Previous reports and maps reviewed for this study include the following:

1. Geocon Incorporated, (2015), *Preliminary Fault Study, 10290 Campus Point Drive, San Diego, California*, (Project No. 07850-42-15);
2. Geocon Incorporated, (2014), *Geotechnical and Geologic Fault Investigation, Campus Pointe Master Plan, 10300 Campus Point Drive, San Diego, California*, (Project No. 07850-42-11);
3. Geocon Incorporated, (2011), *Due Diligence Review of Geotechnical Reports, Qualcomm Building A, 10290 Campus Point Drive, San Diego, California*, (Project No. 07850-42-05);
4. Southern California Soil & Testing, Inc, (1995a), *Report of Preliminary Geotechnical Investigation, Qualcomm Office Building, Eli Lillie Property, Campus Point Drive, San Diego, California*, (SCS&T 9511205).
5. Southern California Soil & Testing, Inc, (1995b), *Report of Fault Investigation, Qualcomm Office Building, Eli Lillie Property, Campus Point Drive, San Diego, California*, (SCS&T 9511205).
6. California Geological Survey, (2008), *Geologic Map of the San Diego 30' x 60' Quadrangle, California*, Regional Geologic Map No. 3;
7. City of San Diego Development Services Department, (2008), *City of San Diego, Seismic Safety Study, Geologic Hazards and Faults*, Grid Tile: 34.

Other reports reviewed as part of this study are summarized on the *List of References* at the end of this report.

Details of the field investigation performed by Geocon Incorporated and boring logs are presented in Appendix A. A summary of laboratory tests performed on selected soil samples obtained during the field investigation are presented in Appendix B. Fault trench logs performed under References 1 and

4 are provided in Appendix C. Boring logs and laboratory test results performed previously by Geocon and others on the property are provided in Appendix D. The approximate locations of the borings and fault trenches are provided on Figure 2. The base map used to depict site conditions, boring and fault trenches, and site geology was taken from an AutoCAD file of the proposed site plan.

2. SITE AND PROJECT DESCRIPTION

The subject site occupies approximately 16.5 acres located at 10290 Campus Point Drive in San Diego, California. The property has been developed into a four-story office building and ancillary parking lots. Nearby development consists of office buildings and parking lots. The property is generally flat with drainage to the southwest.

Based on information contained in SCS&T (1995a), we expect the existing building is supported on shallow, conventional foundations for the portion of the structure founded on formational soils and drilled piers for the portions overlying previously placed fill

We understand that the proposed project consists of the construction of a new multi-story (1,200 car) parking structure with one to two stories of subterranean parking and a multi-story office building in the existing parking lot areas west of the existing office building. Additional improvements will include a soccer field with bleachers, ball courts, new parking areas, and improvements to existing surface improvements. A new 5-story entry addition is also planned for the existing building.

The site description and proposed development are based on a site reconnaissance and review of the conceptual plan. If development plans differ significantly from those described herein, Geocon Incorporated should be contacted for review and possible revisions to this report.

3. SOIL AND GEOLOGIC CONDITIONS

We encountered previously placed fill and the Scripps and Ardath formations during our field investigation. The occurrence and distribution of the units are presented on the boring logs in Appendix A and the approximate lateral extent of the units is shown on the Geologic Map, Figure 2 and Geologic Cross Sections, Figures 3 and 4. The previously placed fill and Scripps and Ardath formations are described below.

3.1 Previously Placed Fill (Qpf)

Based on our field investigation and previous fault trenches performed on the property, we expect previously placed fill ranging from less than 5 feet to greater than 20 feet exists within portions of the property. The deepest fills are located at the north and southeast ends of the site. The fills daylight within the south and central portions of the property. Based on our review of previous reports, the fill was placed during mass grading in 1979 to 1980 under the observation and compaction testing of Woodward-Clyde Consultants (WCC). Compaction reports documenting the fill could not be obtained.

Based on information obtained during our field investigation, the previously placed fill consists of medium dense silty sand and stiff sandy silt and clay. Laboratory consolidation tests indicate the fill has a low to moderate potential for loading induced compression. The fill is also expected to have a low to medium expansion potential.

We expect fill within the parking structure building pad will be removed to achieve below grade parking levels. With respect to the office building, because of the cut to fill transition within the building pad, we recommend the portion of the building pad underlain by fill be supported on deepened conventional foundations and drilled piers. The portion of the building pad underlain by formational soils can be founded on conventional shallow foundations.

3.2 Scripps Formation (Tsc)

The Scripps Formation was encountered within the eastern portion of the site during our study and previous field studies. This unit consists predominantly medium-grained, yellowish brown sandstone containing cobble-conglomerate beds (Kennedy and Tan, 2008). The Scripps Formation also typically contains localized areas of highly cemented concretionary beds. The Scripps Formation is expected to have a low to medium expansion potential. The Scripps Formation is suitable for support of the planned improvements. The basal contact of the Scripps Formation is conformable with the Tertiary-age Ardath Formation.

3.3 Ardath Formation (Ta)

The Tertiary-age Ardath Formation underlies the western portion of the site. The Ardath Formation consists an olive-gray and yellowish brown silty shale. The upper portion may contain thin beds of medium-grained sandstone similar to the overlying Scripps Formation (Kennedy and Tan, 2008). The Ardath Formation may contain localized areas of highly cemented concretionary beds. The Ardath Formation is expected to have a low to medium expansion potential and is suitable for support of structural loading in its existing condition.

4. GROUNDWATER

We did not observe groundwater during our field investigation. We do not anticipate that groundwater will be an issue during development of the property given the nature of the site geology, topography and our experience on the property. It is not uncommon for saturated conditions to develop where none existed previously, especially perched groundwater at the contact between fill and formational units.

5. GENERAL GEOLOGY AND GEOLOGIC SETTING

The San Diego area is located in the Coastal Plain sub-province of the Peninsular Ranges Physiographic Provence. In San Diego County the coastal plain runs parallel to the coast flanking the Peninsular Range and is characterized by a broad wedge of Tertiary sedimentary deposits that thicken from east to west capped by Quaternary marine terrace deposits.

The site is underlain by Tertiary-age Ardath and Scripps formations representing sedimentation in a transgressive/regressive, shallow-marine environment. The Ardath Formation grades conformably and alternately into the Scripps Formation, as such, the mapped contact between the two formations may be broad and diffuse. As shown in our boring logs and in reports by others, the stratigraphic position of the Scripps and Ardath formations can be inverted or juxtaposed while exhibiting conformable depositional contacts.

Bedding attitudes observed during previous geotechnical investigations for the surrounding property are generally horizontal or subhorizontal, exceptions being localized undulations and cross-laminations within a horizontally bedded unit.

Faulting along the present trend of the Rose Canyon fault zone began during the Pliocene, approximately 7 million years before present, and resulted in the formation of structural depressions occupied by San Diego Bay and Mission Bay. North of Mission Bay, compression and uplift occurring south of the fault resulted in the uplift of Mount Soledad. The Rose Canyon fault is considered a southerly extension of the Newport-Inglewood fault zone that may include the Descanso segment of the Agua Blanca fault zone in northern Baja California (Treiman, 1993). The onshore portion of the fault system extends from La Jolla on the north to San Diego Bay on the south.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

City of San Diego Seismic Safety Study (2008) shows the site within Geologic Hazard Category 25, 52, and 12. Geologic Hazard Category 25 is defined as *Slide-Prone Formations – Ardath: neutral or favorable geologic structure*. Geologic Hazard Category 52 is defined as *Other level areas, gently sloping to steep terrain, favorable geologic structure, Low risk*. Geologic Hazard Category 12 is defined under *Fault Zones* as *Potentially Active, Inactive, Presumed Inactive, or Activity Unknown.*

6.2 Faulting

The site is not located within a State of California Earthquake Special Study Zone; however, based on published geologic literature (Kennedy and Tan, 2008) and the City of San Diego Seismic Safety Study (City of San Diego, 2008), the east-west trending, Salk Fault crosses the property. The Salk Fault is described as a down-to-the-south, normal fault juxtaposing the Tertiary age Scripps Formation against the older Ardath Formation leaving the overlying very old terrace deposits (formerly Lindavista Formation) un-deformed and is categorized as potentially active, inactive, presumed inactive, or activity unknown (City of San Diego, 2008).

Southern California Soil & Testing, Inc, (SCS&T, 1995b) performed three fault trenches on the property. The locations of the fault trenches are shown on Figure 2. SCS&T's fault trench logs are provided in Appendix C. SCS&T reported observing and mapping the "Salk Fault". SCS&T did not differentiate between Scripps and Ardath formations in their logs, but do show the geologic contact between these formations at the fault line in their preliminary geotechnical investigation for the existing building (SCS&T, 1995a).

SCS&T found three fault traces with attitudes ranging from N72°E/70°W to N80°E/76°W. The fault traces were clay filled and/or jumbled ruptures. SCS&T concluded that these features were surface traces of the "Salk Fault"; however, the down-to-the-north orientation is not consistent with the Kennedy and Tan (2008) description. Based on our findings (Geocon Incorporated, 2014) the fault described by SCS&T is likely not the Salk Fault described by Kennedy and Tan, but is a minor, ancillary structure possibly related to the Salk Fault.

SCS&T also found several minor faults/features striking in a northeasterly direction (N20°E to N55°E) that are similar to the attitudes of a small unnamed fault noted in an earlier Woodward Clyde Consultants (WCC) report, dated April 6, 1979, referenced by SCS&T (1995b). A copy of WCC (1979) could not be obtained for review. The fault observed by WCC was purported to have displaced very old terrace deposits (formerly Lindavista Formation), but not Holocene soils. SCS&T (1995b) concluded that these splays are secondary faults associated with the easterly trending Salk Fault; however, because WCC had found the very old terrace deposits displaced, SCS&T considered the splays to be potentially active.

Based on a 3-foot vertical offset, SCS&T (1995b) provided an estimated strain rate ranging from approximately 0.001 to 0.0009 millimeters per year and concluded that this "…represents a very low strain rate and potential future movement along this fault is considered to be very low."

Geocon Incorporated (2014) excavated and logged a trench in the existing parking lot northeast of the subject site to evaluate the north eastward extension of the fault described by SCS&T (see Figure 2).

The trench was approximately 50 feet long and was excavated at least 5 feet into the underlying formational soil. Horizontally bedded sediments associated with the Scripps Formation were observed along with several minor shears and filled fractures. One fault, bearing N60°E, dipping 70°W, and showing approximately 3 inches of down-to-the-west movement was encountered in our fault trench. This fault appears to be the fault observed by SCS&T (1995b). A copy of the Geocon Incorporated (2014) fault trench log is provided in Appendix C.

Based on our review of previous fault studies performed on the property, faults likely cross the proposed parking structure building pad. It does not appear the faults cross the proposed office building pad.

Other minor faults, which strike in a northeasterly direction were found by SCS&T and are considered to be secondary faults associated with the fault identified by SCS&T as the Salk Fault.

Previous grading at the site has removed all Quaternary deposits from the site making a direct determination of fault activity impossible; however, the east-west orientation of the observed faults indicates they are not part of the current tectonic setting. The down-to-the-north sense of movement indicates that the faulting observed is likely not the Salk Fault described by Kennedy and Tan (2008). The minor displacements and poorly developed to non-existent fault gouge observed are indicative of low-risk fault rupture hazard.

It is our explicit opinion that the faulting described herein is at most potentially active and does not pose a risk of fault rupture hazard to the project. It is our express opinion that no setback zone is required to mitigate fault rupture hazard.

6.3 Seismicity

Six known active faults are located within a search radius of 50 miles from the property using the computer program *EZ-FRISK (Version 7.62)*. We used the 2008 USGS fault database, which provides several models and combinations of fault data to evaluate the fault information. Based on this database, the Newport-Inglewood/Rose Canyon Fault Zone, located approximately 3 miles west of the site, are the nearest known active faults and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault Zone are 7.5 and 0.47g, respectively. Table 6.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008)

NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 6.3.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood/Rose Canyon	3	7.5	0.38	0.36	0.46
Rose Canyon	3	6.9	0.35	0.35	0.41
Coronado Bank	17	7.4	0.21	0.15	0.18
Palos Verdes/Coronado Bank	17	7.7	0.23	0.16	0.21
Elsinore	33	7.8	0.16	0.11	0.14
Earthquake Valley	42	6.8	0.09	0.06	0.05
Palos Verdes	48	7.3	0.10	0.07	0.07

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a site-specific probabilistic seismic hazard analysis using the computer program *EZ-FRISK*. Geologic parameters not addressed in the deterministic analysis are included in this analysis. The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program accounts for uncertainty in each of following: (1) earthquake magnitude; (2) rupture length for a given magnitude; (3) location of the rupture zone; (4) maximum possible magnitude of a given earthquake; and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.3.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.52	0.47	0.55
5% in a 50 Year Period	0.37	0.33	0.37
10% in a 50 Year Period	0.27	0.24	0.26

The California Geologic Survey (CGS) provides a program for calculating the ground motion for a 10 percent of probability of exceedence in a 50-year period based on an average of several attenuation relationships. Table 6.3.3 presents the calculated results from the Probabilistic Seismic Hazards Mapping Ground Motion Page from the CGS website.

TABLE 6.3.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.27	0.29	0.33

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be performed in accordance with the 2030 California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.4 Ground Rupture

The risk associated with ground rupture hazard is low due to the absence of active faults on the property.

6.5 Liquefaction

The risk associated with liquefaction hazard is low for the site due to the dense nature of the underlying sediments and the lack of permanent, near-surface groundwater.

6.6 Landslides

Landslides were not observed or mapped in a location that could impact the proposed development. It is our opinion that the risk associated with landsliding hazard on the property is low.

6.7 Tsunamis and Seiches

The site is approximately 1.5 miles from the Pacific Ocean at an elevation over 300 feet above MSL. The risk associated with inundation hazard due to tsunamis is low.

There site is not located downstream lake or reservoir. The risk associated with inundation hazard associated with seiche is low.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable to construct the proposed buildings and site improvements, provided the recommendations presented herein are implemented in the design and construction of the project.

7.1.2 Our field investigation indicates the site is underlain by previously placed fill, Tertiary age Ardath Formation, and Tertiary age Scripps Formation. It is anticipated that all of the previously placed fill will be removed to achieve pad grade for the proposed parking structure. Within the proposed office building, fill is expected to underlie the northeastern half of the building pad. Where previously placed fill exists at grade, we recommend deepened footings that extend through the fill and/or drilled piers be constructed such that the office building is founded entirely on formational soils. Additionally, the proposed 5-story entry addition to the existing building should be supported on drilled piers to match the foundation for the existing building.

7.1.3 The Ardath and Scripps formation may be difficult to excavate and could generate oversize material that may require special handling.

7.1.4 Groundwater was not observed in the exploratory borings to the depths explored and is not expected to be encountered during construction of proposed improvements.

7.1.5 Based on our review of previous fault studies performed on the property, faults likely cross the proposed parking structure building pad. It does not appear the faults cross the proposed office building pad. It is our explicit opinion that the faults crossing the building pad are at most potentially active and do not pose a risk of fault rupture hazard to the project. It is our express opinion that no setback zone is required to mitigate fault rupture hazard.

7.1.6 We did not observe or know of significant geologic hazards on the site that would adversely impact the proposed development.

7.1.7 Subsurface conditions observed may be extrapolated to reflect general soil/geologic conditions at the site; however, some variations in subsurface conditions between boring locations should be expected.

7.2 Excavation and Soil Characteristics

7.2.1 The soil encountered in the field investigation is considered to be "expansive" (expansion index [EI] of greater than 20) as defined by 2013 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. Based on laboratory testing, the on-site soils possess a "low" to "medium" expansion potential (expansion index of 90 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2013 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.2 Excavation of the *in situ* soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Strongly cemented formational materials could be encountered in excavations requiring a very heavy effort to excavate. The Ardath and Scripps Formations are known to contain isolated cemented zones that require very heavy effort to excavate. Excavation within the cemented zone will generate oversize material that will require special handling.

7.2.3 We performed laboratory tests on samples of the site soils to evaluate the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B. The test results indicate that the on-site materials at the locations tested possess "Not Applicable" (S0) sulfate exposure to concrete structures as defined by 2013 CBC Section 1904 and ACI 318-08 Sections 4.2 and 4.3. However, samples of soils tested for the adjacent Campus Point property to the northeast have exhibited "Moderate" (S1) characteristics. Table 7.2.2 presents a summary of concrete requirements set forth by 2013 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Exposure	Exposure Class	Water-Soluble Sulfate Percent by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	--	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V+Pozzolan or Slag	0.45	4,500

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of underground pipes and buried metal in direct contact with soil.

7.3 Subdrains

7.3.1 With the exception of wall drains, other subdrains are not required.

7.4 Grading

7.4.1 Grading should be performed in accordance with the *Recommended Grading Specifications* in Appendix E. Where the recommendations of this report conflict with Appendix E, the recommendations of this section take precedence.

7.4.2 Earthwork should be observed and compacted fill tested by representatives of Geocon Incorporated.

7.4.3 A pre-construction conference with the owner, contractor, civil engineer, and soil engineer in attendance should be held at the site prior to construction operations. Special soil handling requirements can be discussed at that time.

7.4.4 Grading of the site should commence with the removal of existing improvements, vegetation, and deleterious debris. Deleterious debris, if encountered, should be exported from the site and should not be mixed with the fill. Existing underground improvements within the proposed improvement areas that will be abandoned should be removed and the resulting excavations properly backfilled in accordance with the procedures described herein.

7.4.5 We expect the majority of grading will consist of excavations to achieve basement grade and minor cuts and fills from existing grade. In areas to receive fill, we recommend the upper 12 inches of existing fill or formational soil be scarified, moisture conditioned to at least optimum moisture content and recompacted to 90 percent relative compaction. Soil that is free of deleterious debris and contamination can then be placed as fill and compacted in layers to design finish-grade elevations. Fill and backfill materials should be placed and compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by the current version of ASTM Test Method D 1557. Rocks larger than 12 inches should not be placed in fill material or in utility trenches. The upper 12 inches of fill beneath pavement areas outside the building footprint should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.

7.5 Slope Stability

7.5.1 Slope stability analyses were performed for existing perimeter slope adjacent to the proposed office building. The deep-seated analysis was performed using the computer program Geoslope 2007 (see Figure 5). Surficial analysis for cut and fill slopes are shown on Figures 6 and 7. Our analyses utilized average drained direct shear strength parameters based on laboratory tests performed on the property and adjacent projects (Geocon 2014). The analyses indicate existing perimeter slope has calculated factors of safety in excess of 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions.

7.6 Slopes

7.6.1 It is recommended that all slope excavations be observed during grading by an engineering geologist to verify that soil and geologic conditions do not differ significantly from those anticipated.

7.6.2 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular *soil* fill to reduce the potential for surficial sloughing. All slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped.

7.6.3 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

7.7 Temporary Excavations

7.7.1 Temporary slopes should be constructed in conformance with OSHA requirements. Previously placed fill should be considered a Type B soil (Type C soil if seepage is encountered) and the Ardath and Scripps Formation can be considered Type A soil (Type B soil if seepage is encountered) in accordance with OSHA requirements. In general, no special shoring requirements will be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be laid back at an appropriate inclination. Surcharge loads should not be permitted within a distance equal to the depth of the excavation. The excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations. If vertical shoring will be required, Geocon Incorporated should be contacted to provide geotechnical parameters for design.

7.8 Seismic Design Criteria

7.8.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.8.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The parking structure should be designed using a Site Class C. The office building and 5-story entry addition should be designed using a Site Class D. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.8.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.8.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2010 CBC Reference
Site Class	D	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.140 g	1.140 g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.441 g	0.441 g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.044	1.000	Table 1613.3.3(1)
Site Coefficient, F_V	1.559	1.359	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.190 g	1.140 g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.687 g	0.599 g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.794 g	0.760 g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.458 g	0.399 g	Section 1613.3.4 (Eqn 16-40)

7.8.2 Table 7.8.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.8.2
2013 CBC SITE ACCELERATION PARAMETERS

Parameter	Value		ASCE 7-10 Reference
Site Class	D	C	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.488 g	0.488	Figure 22-7
Site Coefficient, F_{PGA}	1.012	1.000	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.494 g	0.488 g	Section 11.8.3 (Eqn 11.8-1)

7.8.3 Conformance to the criteria in Tables 7.8.1 and 7.8.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.9 Foundations

7.9.1 We recommend each of the proposed structures be founded on formational soil. We expect all of the previously placed fill will be removed to achieve pad grade within the parking structure building pad; however, within the proposed office building and the 5-story entry addition to the existing building, previously placed fill will be present below pad grade. Where fill is present, we recommend the footings be deepened to extend through the fill to bear entirely on native formational soil. Deepening the footing can be accomplished by drilled piers or conventional deepened footings that extend through the fill. Recommendations for both shallow and deep foundations are provided hereinafter.

7.10 Shallow Foundations

7.10.1 The following shallow foundation recommendations assume all new structural footings for the proposed structures will be founded directly on formational soils. Foundations can consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 18 inches wide and extend at least 24 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width and depth of 2 feet. Concrete reinforcement for continuous footings should consist of at least four, No. 5 steel, reinforcing bars placed horizontally in the footings; two near the top and two near the bottom. The project structural engineer should design the concrete reinforcement for the spread footings. A typical wall/column footing dimension detail is presented on Figure 8.

7.10.2 The minimum reinforcement recommended herein is based on soil characteristics only (EI of 90 or less) and is not intended to replace reinforcement required for structural considerations.

7.10.3 The recommended allowable bearing capacity for foundations with minimum dimensions described above and bearing on native formational soil is 4,000 psf. The allowable soil bearing pressure may be increased by an additional 500 psf for each additional foot of depth and 300 psf for each additional foot of width, to a maximum allowable bearing capacity of 8,000 psf.

7.10.4 The values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.10.5 Total and differential settlements under the imposed allowable loads are estimated to be 1 inch and ½ inch, respectively in 40 feet.

7.10.6 Footings should not be located within 7 feet of the tops of slopes. Footings that must be located within this zone should be extended in depth such that the outer bottom edge of the footing is at least 7 feet horizontally inside the face of the finished slope.

7.10.7 No special subgrade presaturation is deemed necessary prior to placement of concrete. However, the slab and foundation subgrade should be moistened as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.10.8 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

7.11 Drilled Piers Foundations

7.11.1 Drilled pier foundations can be utilized where structures are underlain by previously placed fill.

7.11.2 Figure 9 presents the theoretical single pier allowable axial capacity versus pier embedment depth into formational materials (not total pier length) for 24-inch, 30-inch, 36-inch, and 48-inch-diameter drilled piers. We recommend drilled piers have a minimum pier diameter of 2 feet, a minimum length of 10 feet, and a minimum embedment into formational materials of 5 feet.

7.11.3 Allowable axial capacities given on Figure 8 are based on end bearing and skin friction for the portion of the pier embedded in formational materials. The capacities provided are based on a Factor of Safety of 3.0 applied to the ultimate end bearing capacity and 2.0 for skin friction. Skin friction has been neglected for the portion of the pier in previously placed fill.

7.11.4 Because a significant portion of the pier capacity will be developed by end bearing, the bottom of the borehole should be cleaned of loose cuttings prior to the placement of steel and concrete. Experience indicates that backspinning the auger does not remove loose material and a flat cleanout plate or hand cleaning is necessary. Concrete should be placed within the excavation as soon as possible after the auger/cleanout plate is withdrawn to reduce the potential for discontinuities or caving. Borehole sidewall instability may randomly occur if cohesionless soil is encountered.

7.11.5 For resistance to uplift, an allowable unit skin friction of 300 psf can be utilized for the portion of the pier in formational soils.

7.11.6 The allowable downward capacity and allowable uplift capacity may be increased by one-third when considering transient wind or seismic loads.

7.11.7 If pile spacing is at least three times the maximum dimension of the pile, no reduction in axial capacity or lateral load capacity is considered necessary for group effects. If pile spacing is closer than three pile diameters, an evaluation for group effects including appropriate reductions should be performed by Geocon Incorporated based on pile dimension and spacing.

7.11.8 It is anticipated that the on-site soils can be excavated with typical pier drilling equipment. However, concretions are common in the Ardath and Scripps Formation, which if encountered, will be difficult to drill. Pier drilling should be observed by a representative of the geotechnical engineer to evaluate proper embedment depth into formational soil and whether appropriate drilling procedures are being used.

7.11.9 Concrete should be placed the same day the shafts are excavated to reduce the potential for caving. If pier holes are left open overnight or for extended periods of time, cleaning and/or re-drilling of the hole will be necessary. Initial set of the concrete should be achieved before an adjacent pier boring is drilled.

7.11.10 The concrete should be placed in such a way as to minimize segregation of the aggregate. Tremies should be utilized for concrete placed below a depth of 20 feet.

7.11.11 Pier settlement is expected to be on the order of 1-inch or less for drilled piers. The majority of settlement should occur during construction.

7.12 Concrete Slabs-on-Grade

7.12.1 Building interior concrete slabs-on-grade should be at least 5 inches thick. Slab reinforcement should consist of No. 4 steel reinforcing bars spaced 18 inches on center in both horizontal directions placed at the middle of the slab.

7.12.2 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06).

In addition, the membrane should be installed in a manner that prevents puncture in accordance with manufacturer's recommendations and ASTM requirements. The project architect or developer should specify the type vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

7.12.3 The project foundation engineer, architect, and/or developer should determine the bedding sand thickness below concrete slabs. Typically, 3 to 4 inches of bedding sand is used. Geocon Incorporated should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

7.12.4 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.12.5 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting vehicle, equipment and storage loads.

7.12.6 Exterior slabs not subject to vehicle loads should be at least 4 inches thick and reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh. The mesh should be placed within the upper one-third of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement. Prior to construction of slabs, the subgrade should be moisture conditioned to at least optimum moisture content and compacted to a dry density of at least 90 percent of the laboratory maximum dry density.

7.12.7 In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. The project structural engineer should determine crack control spacing based on slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing.

7.12.8 To reduce the potential for heaving of exterior concrete flatwork underlain by expansive soils, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork. Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. The project structural engineer should provide dowelling design and details.

7.12.9 The above slab-on-grade dimensions and minimum reinforcement recommendations are based upon soil conditions only and are not intended to be used in lieu of those required for structural purposes.

7.12.10 No special subgrade presaturation (i.e., flooding to saturate soils to mitigate highly expansive soils) is deemed necessary prior to placement of concrete. However, the slab subgrade should be sprinkled as necessary, to maintain a moist condition as would be expected in any concrete placement.

7.12.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soils (if present). However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade placed on such conditions may still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.13 Retaining Walls

7.13.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 52 pcf is recommended. These active pressures assume low expansive soil (Expansion Index less than 50) will be used as retaining wall backfill. Soils with a low expansion potential may require select grading or import.

7.13.2 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet.

7.13.3 Retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

7.13.4 Soil contemplated for use as retaining wall backfill, including import materials, should identified prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.13.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is provided on Figure 10. If conditions different than those described are expected, Geocon Incorporated should be contacted for additional recommendations.

7.13.6 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 22H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.494g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.13.7 In general, wall foundations having a minimum embedment depth of 24 inches and a width of 12 inches may be designed for an allowable soil bearing pressure of 2,500 psf for compacted fill and 4,000 psf for Ardath and Scripps Formations. The allowable soil bearing pressure may be increased by an additional 500 psf for each additional foot of depth and 300 psf for each additional foot of width to a maximum bearing capacity of

4,000 psf for fill and 8,000 psf for Ardath and Scripps Formation. The values presented above are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

7.13.8 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel and concrete to observe that the exposed soil conditions are consistent with those anticipated and that they have been extended to the appropriate bearing strata. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.14 Lateral Loading

7.14.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot (pcf) should be used for design of footings or shear keys poured neat against compacted fill. The allowable passive pressure assumes a horizontal surface extending at least 5 feet or three times the height of the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

7.14.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design for footings founded in compacted fill or formational materials. The recommended passive pressure may be used concurrently with frictional resistance and may be increased by one-third for transient wind or seismic loading.

7.15 Preliminary Pavement Recommendations

7.15.1 The following preliminary pavement design sections are based on our experience with soil conditions within the surrounding area and laboratory R-value testing performed on adjacent projects. The preliminary sections presented herein are for budgetary estimating purposes only and are not for construction. Final pavement sections should be determined after the grading operations are completed, subgrade soils are exposed, and additional R-Value tests are performed on actual pavement subgrade samples. For preliminary design, we used a resistance value (R-Value) of 20 for subgrade soils and 78 for aggregate base.

7.15.2 Asphalt concrete pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). Portland Cement concrete sections are based on methods suggested by the American Concrete Institute *Guide for Design and Construction of Concrete Parking Lots (ACI 330R-08)*.

7.15.3 The project civil engineer or traffic engineer should provide the actual TI that is appropriate for the project based on anticipated traffic loading and volumes. Tables 7.15.1 and 7.15.2 provide preliminary pavement design sections for varying Traffic Indices (TI).

TABLE 7.15.1
PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
4.5	3	5.5
5	3	7
5.5	3	9
6	4	8.5
6.5	4	10
7	5	10
7.5	5	11.5

TABLE 7.15.2
PRELIMINARY PAVEMENT SECTIONS FOR PORTLAND CEMENT CONCRETE

Location	Traffic Category	Estimated Average Daily Truck Traffic (ADTT)	Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Automobile Parking	A	1 or less	5	4
Automobile Driveways	A	10 or less	6	4
Heavy Truck Traffic/Fire Lanes	B	25 or less	7	4

7.15.4 Class 2 aggregate base materials should conform to Section 26-1.02B of the *Standard Specifications of the State of California, Department of Transportation* (Caltrans) or Sections 400-2 and 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*. The aggregate base specifications are found in the *Regional Supplemental to Greenbook*.

7.15.5 Pavement subgrade soils should be scarified, moisture conditioned as necessary, and compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557. The depth of compaction should be at least 12 inches. Base course material should be moisture conditioned near to slightly above optimum moisture content and compacted to a dry density of at least 95 percent of the laboratory maximum dry density. Asphalt concrete pavement should be compacted to at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.15.6 The following recommendations apply to the areas where Portland Cement Concrete pavement will be utilized to support vehicular traffic.

- Portland Cement concrete pavement should have a minimum concrete flexural strength (modulus of rupture, MR) of 500 pounds per square inch (psi) (compressive strength of 3,200 psi).

- To control the location and spread of concrete shrinkage cracks, it is recommended that crack control joints be included in the design of the concrete pavement slabs. Crack control joint spacing should not exceed 15 feet. The crack control joints should be created while the concrete is still fresh using a grooving tool or shortly thereafter using saw cuts. The joint should extend into the slab a minimum of one-fourth of the slab thickness.

- Construction joints should be provided at the interface between areas of concrete placed at different times during construction. Doweling is recommended between the joints to transfer anticipated truck traffic loading. Dowels should be located at the midpoint of the slab and be spaced at 12 inches on center.

- Joints should be filled with a joint filler or sealer to aid in preventing migration of water into subgrade and base materials. Appropriate fillers or sealers are discussed in the referenced ACI guide.

7.15.7 Where trash bin enclosures are planned, the pavement section should consist of 7 inches of Portland cement concrete reinforced with No. 3 bars spaced at 18 inches in each horizontal direction. The concrete loading area should extend out such that both the front and rear wheels of the truck will be located on reinforced concrete pavement when loading and unloading.

7.15.8 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Allowing water to pond on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent pavement distress. Where landscape or planter islands are planned adjacent to pavement surfaces, the perimeter curb should extend at least 6 inches below the bottom of the Class 2 aggregate base and into the underlying subgrade. Drainage from landscaped areas should be directed to controlled drainage structures.

7.16 Bio-Retention Basin and Bio-Swale Recommendations

7.16.1 The site is underlain by previously placed fill and Ardath and Scripps Formations that is generally composed of silty to clayey sand, clayey to sandy silt and silty clay. The on-site soils generally have a fine content (minus 200) of 25 to 80 percent. Based on our experience with the on-site soils, the compacted fill and Ardath and Scripps Formations have very low permeability and typically very low infiltration characteristics. It is our opinion the compacted fill and Ardath and Scripps Formations area unsuitable for infiltration of storm-water runoff.

7.16.2 Any bio-retention basins, bioswales and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Prior to discharging into the storm drain pipe, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drain pipe. The concrete cut-off wall should extend at least 6-inches beyond the perimeter of the gravel-packed subdrain system.

7.16.3 Distress may be caused to planned improvements and properties located hydrologically downstream or adjacent to these devices. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. Downstream and adjacent properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration. Due to site soil and geologic conditions (i.e., compacted fills and dense formational bedrock), permanent bio-retention basins should be lined with an impermeable barrier, such as a thick visqueen, to prevent water infiltration in to the underlying soils.

7.16.4 The landscape architect should be consulted to provide the appropriate plant recommendations. If drought resistant plants are not used, irrigation may be required.

7.17 Site Drainage and Moisture Protection

7.17.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2010 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.17.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.17.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.18 Grading and Foundation Plan Review

7.18.1 Geocon Incorporated should review the grading plans and foundation plans for the project prior to final design submittal to evaluate whether additional analyses and/or recommendations are required.

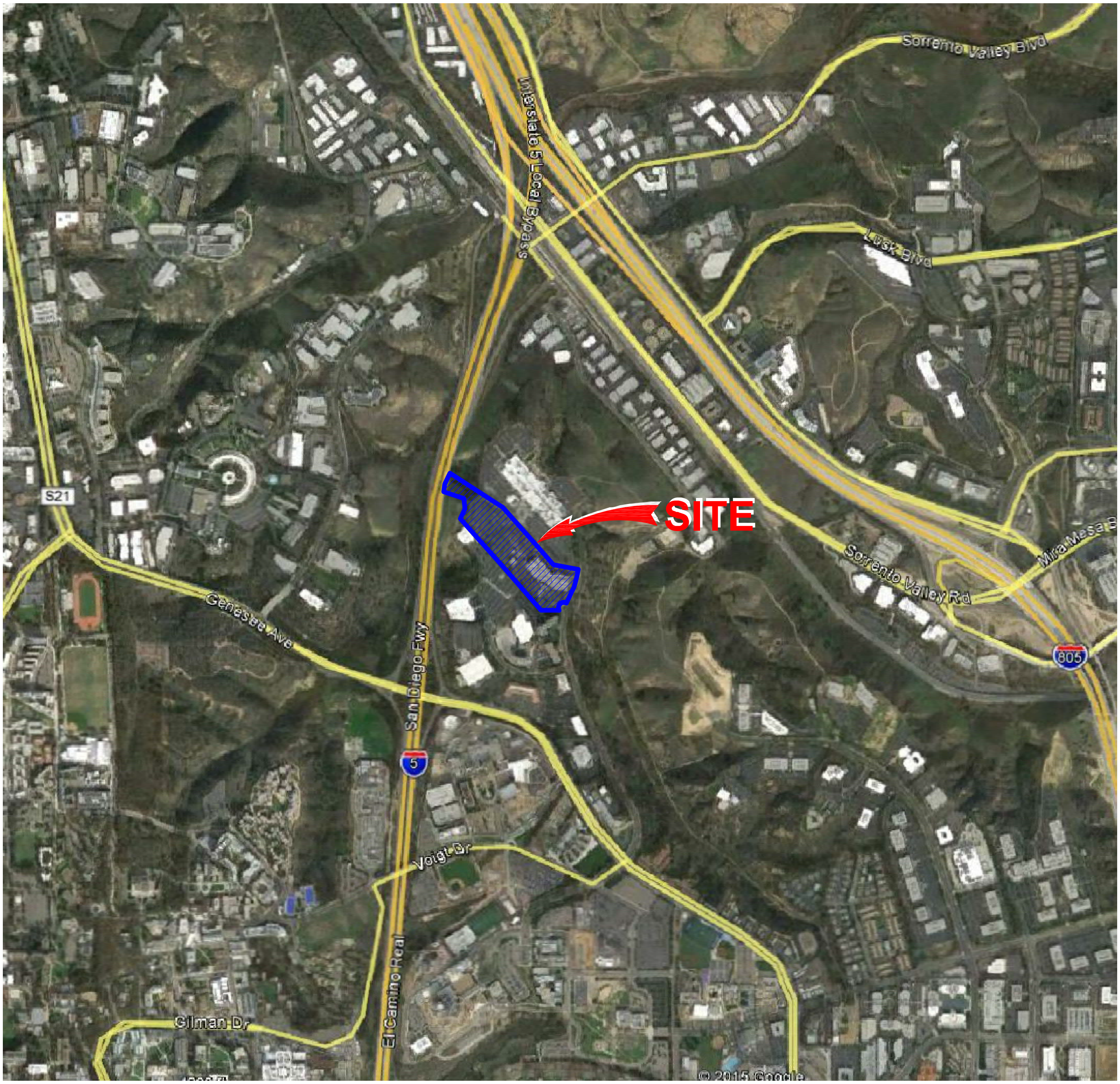
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

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



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VICINITY MAP

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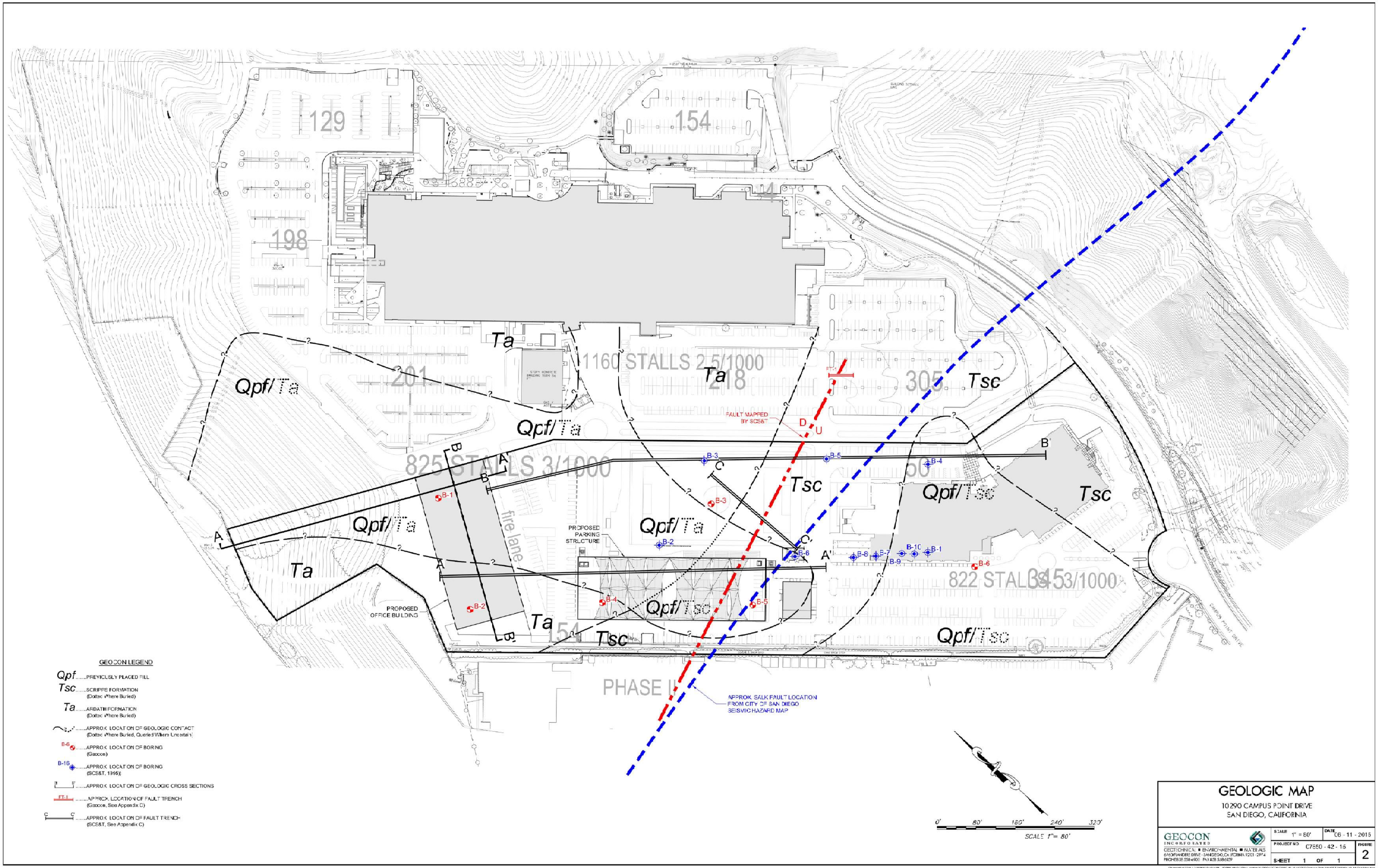
10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

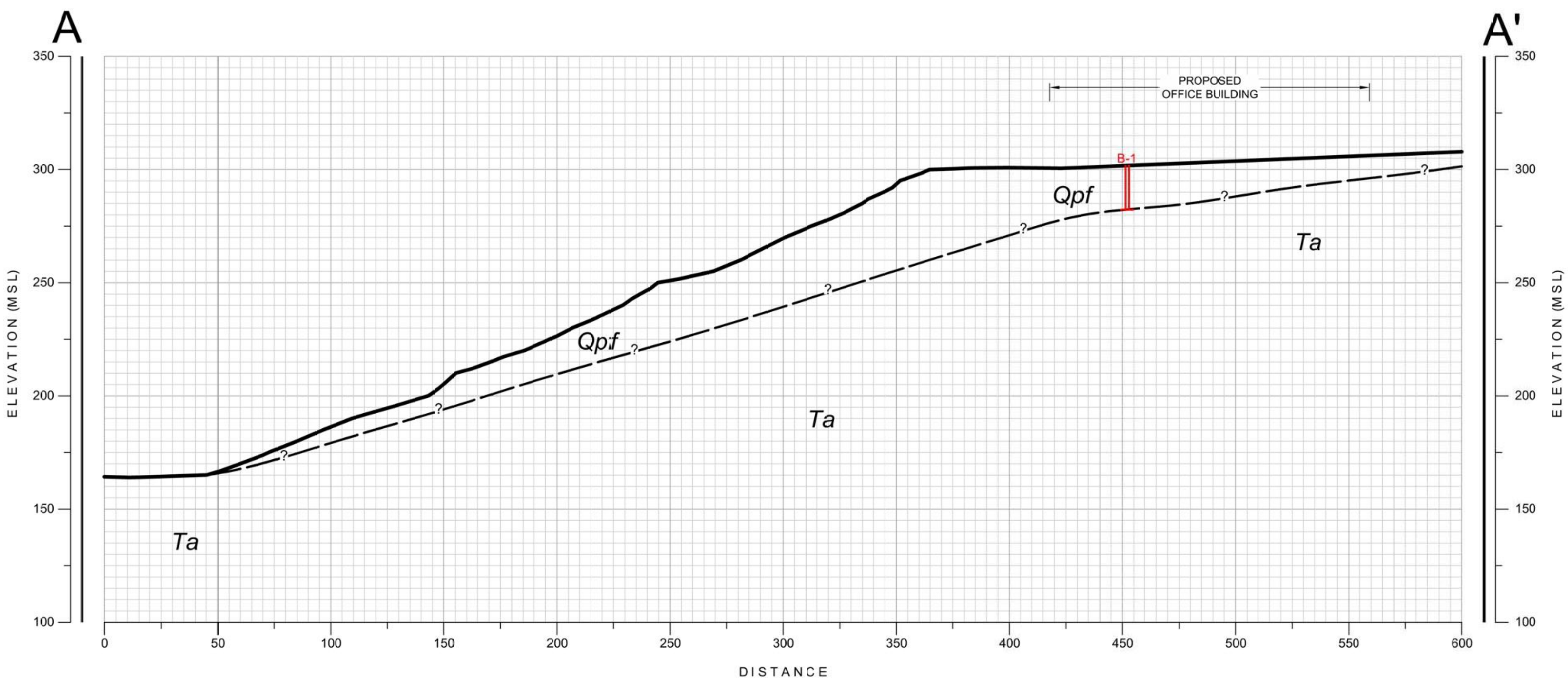
RM / AML		DSK/GTYPD	DATE 06 - 11 - 2015	PROJECT NO. 07850 - 42 - 15	FIG. 1

Plotted:06/12/2015 7:50AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\07850-42-15 (10290 Campus Point)\DETAILS\07850-42-15 Vic Map.dwg



GEOLOGIC MAP
10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA
GEOCON INCORPORATED
SCALE 1" = 80'
DATE 06 - 11 - 2015
PROJECT NO. C7550 - 42 - 15
FIGURE 2
SHEET 1 OF 1
GEOCON LEGEND
Qpf ......PREVIOUSLY PLACED FILL
Tsc ......SCRIPPS FORMATION (Dotted Where Buried)
Ta ......ARDATH FORMATION (Dotted Where Buried)
......APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
B-6 ......APPROX. LOCATION OF BORING (Geocon)
B-16 ......APPROX. LOCATION OF BORING (SCS&T, 1995)
......APPROX. LOCATION OF GEOLOGIC CROSS SECTIONS
FT-1 ......APPROX. LOCATION OF FAULT TRENCH (Geocon, See Appendix C)
......APPROX. LOCATION OF FAULT TRENCH (SCS&T, See Appendix C)
APPROX. SALK FAULT LOCATION FROM CITY OF SAN DIEGO SEISMIC HAZARD MAP
FAULT MAPPED BY SCS&T
PROPOSED PARKING STRUCTURE
PROPOSED OFFICE BUILDING
1160 STALLS 2.5/1000
825 STALLS 3/1000
822 STALLS 3/1000
PHASE II
fire lane
CAMPUS POINT DRIVE
0' 80' 160' 240' 320'
SCALE 1" = 80'

10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qpf........PREVIOUSLY PLACED FILL

Ta........ARDATH FORMATION

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

B-1 ....APPROX. LOCATION OF BORING

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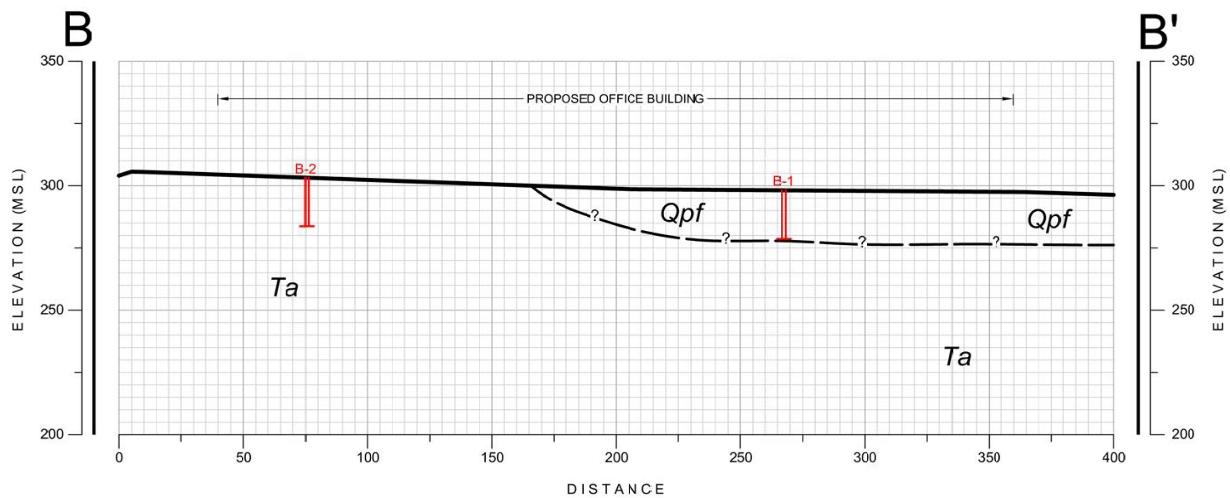
PROJECT NO. 07850 - 42 - 15

FIGURE 3

DATE 06 - 11 - 2015

10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

Qpf........PREVIOUSLY PLACED FILL

Ta........ARDATH FORMATION

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

B-2 ....APPROX. LOCATION OF BORING

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PROJECT NO. 07850 - 42 - 15
FIGURE 4
DATE 06 - 11 - 2015

10290 Campus Point
Project No. 07850-42-15
Section A-A'
Name: A-A'.gsz
Date: 6/11/2015

MATERIAL PROPERTIES:

Name: Qpf	Unit Weight: 125 pcf	Cohesion: 450 psf	Phi: 28 °
Name: Ta	Unit Weight: 125 pcf	Cohesion: 450 psf	Phi: 38 °

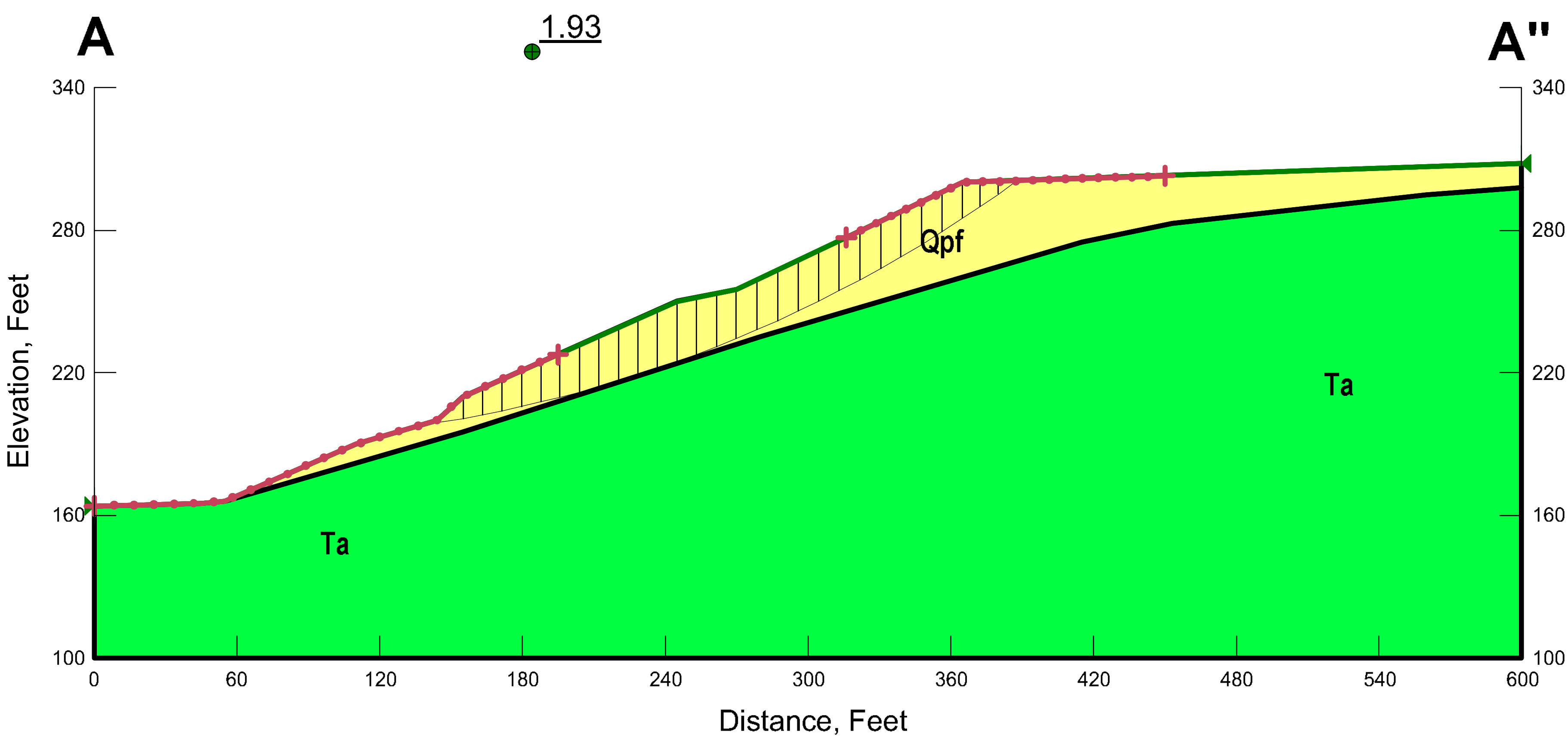

Figure 5

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	Infinite
DEPTH OF SATURATION	Z	=	3 feet
SLOPE INCLINATION	2 : 1		(Horizontal : Vertical)
SLOPE ANGLE	i	=	26.6 degrees
UNIT WEIGHT OF WATER	γ_w	=	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	38 degrees
APPARENT COHESION	C	=	450 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 3.8$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - CUT SLOPE

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	Infinite
DEPTH OF SATURATION	Z	=	3 feet
SLOPE INCLINATION	2 : 1		(Horizontal : Vertical)
SLOPE ANGLE	i	=	26.6 degrees
UNIT WEIGHT OF WATER	γ_w	=	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	125 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	28 degrees
APPARENT COHESION	C	=	450 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 3.5$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPE

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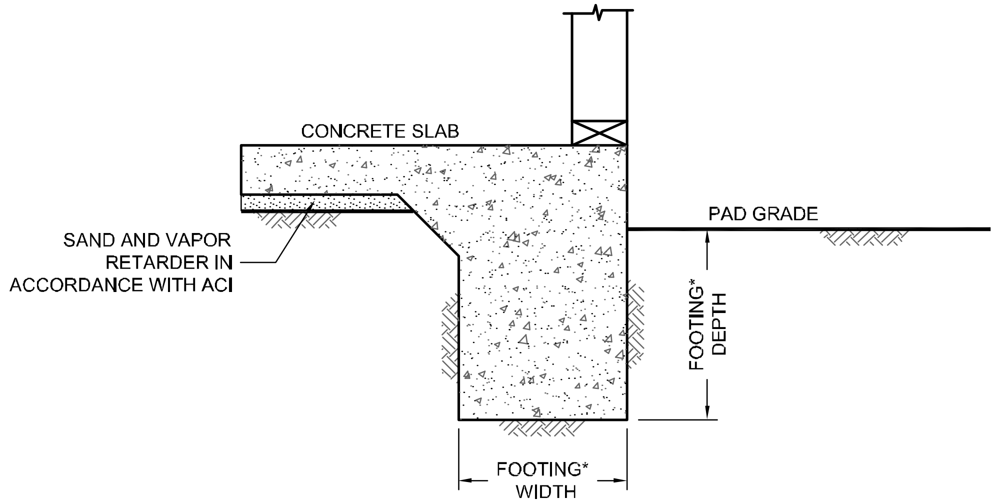
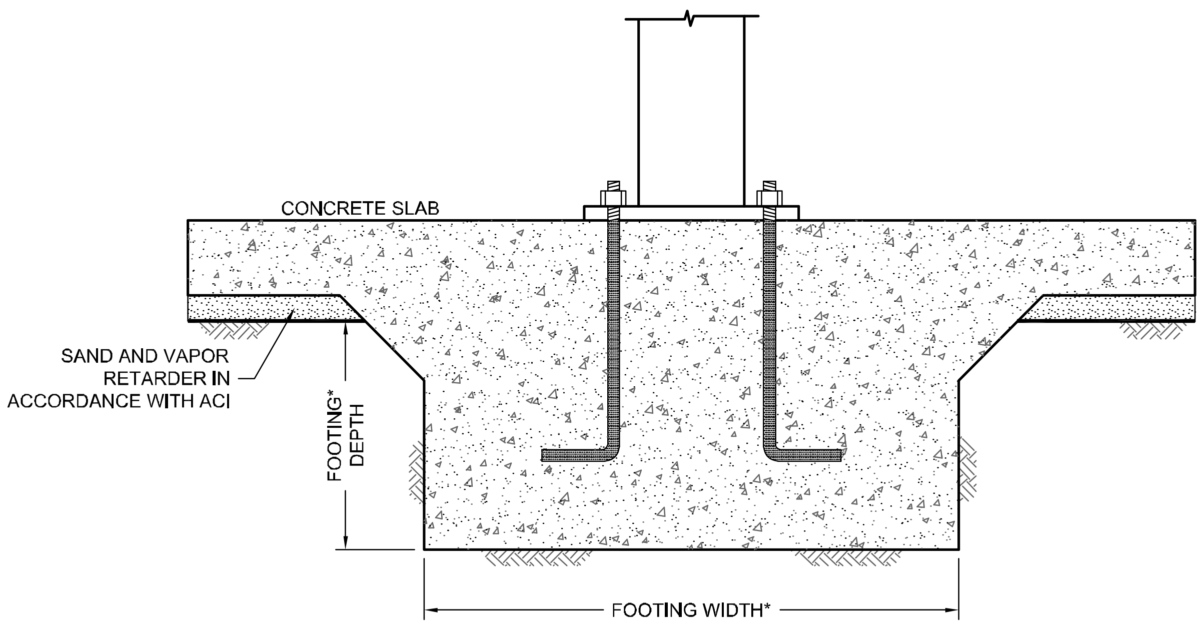
RM / AML		DSK/GTYPD	DATE 06 - 11 - 2015	PROJECT NO. 07850 - 42 - 15	FIG. 7





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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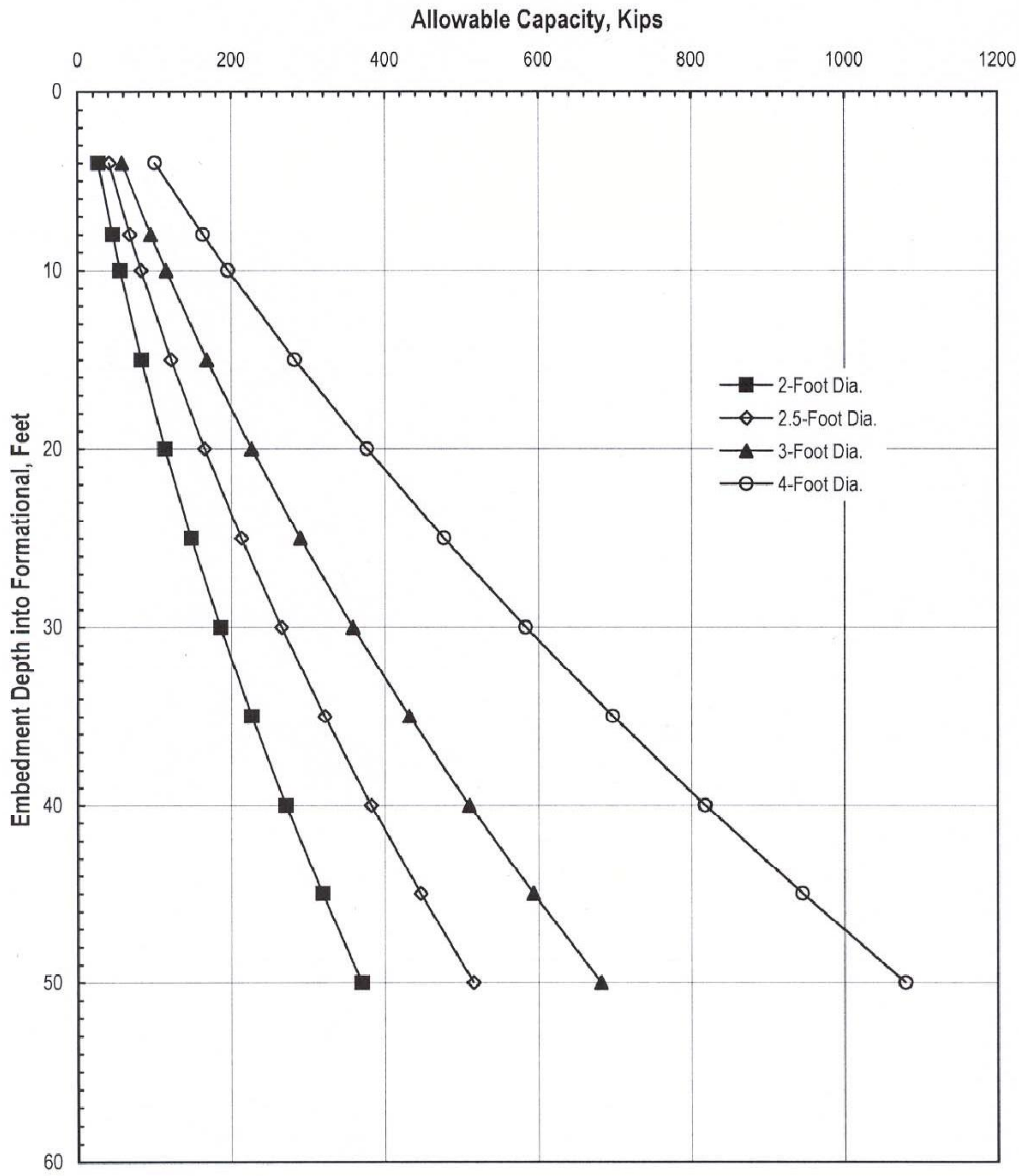
RM / AML		DSK/GTYPD	DATE 06 - 11 - 2015	PROJECT NO. 07850 - 42 - 15	FIG. 8



ALLOWABLE CAPACITY FOR DRILLED PIERS

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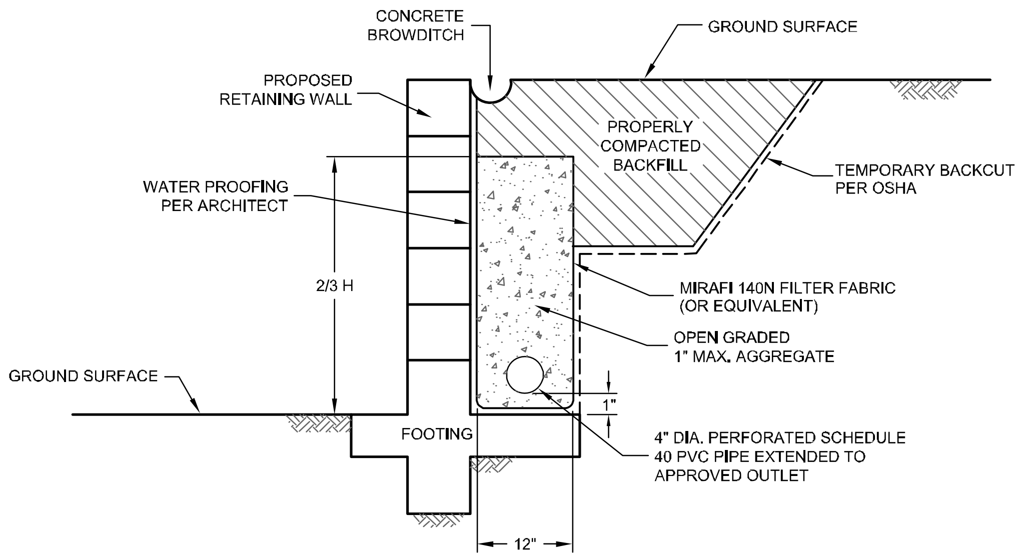
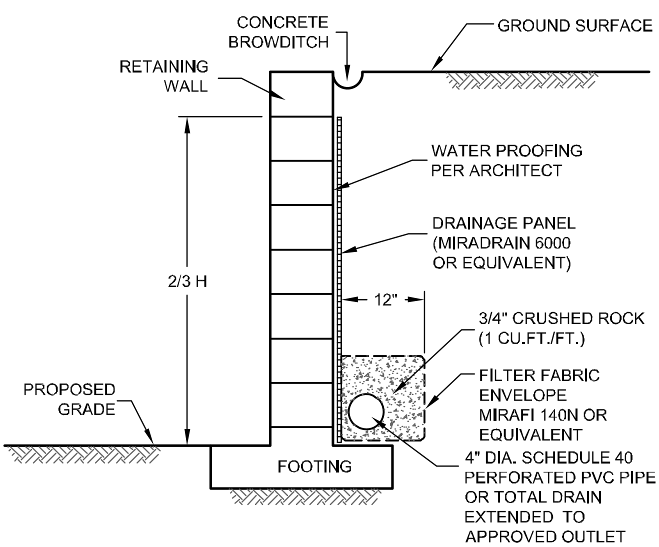
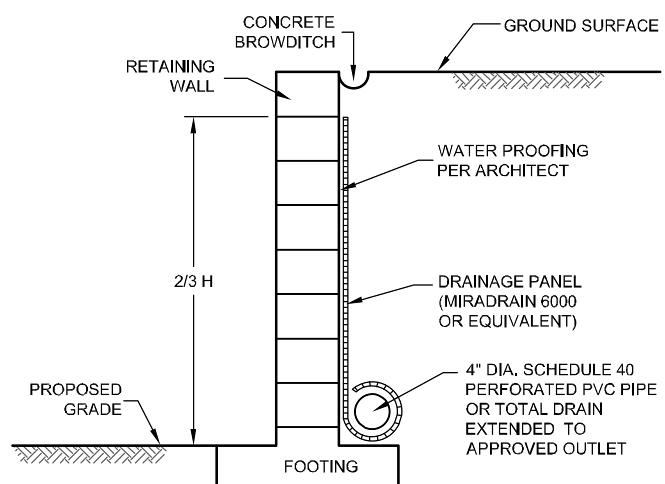
RM / AML		DSK/GTYPD	DATE 06 - 11 - 2015	PROJECT NO. 07850 - 42 - 15	FIG. 9







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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RM / AML		DSK/GTYPD	DATE 06 - 11 - 2015	PROJECT NO. 07850 - 42 - 15	FIG. 10

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on May 26, 2015 and consisted of a site reconnaissance and drilling 6 small–diameter-auger borings. The approximate locations of the borings are shown on the Geologic Map (Figure 2).

The exploratory borings were drilled using a CME 75 drill rig with 8-inch diameter hollow-stem augers. The borings extended to a maximum depth of approximately 20 feet below existing grade. Logs of the borings depicting soil and geologic conditions encountered and the depth at which samples were obtained are presented on Figures A-1 through A-6.

Relatively undisturbed, ring samples as well as bulk samples were obtained from selected depths within the borings for laboratory analysis. The soils encountered were visually examined, classified, and logged in general accordance with ASTM Test Method D-2488 *Description and Identification of Soils (Visual-Manual Method).*

PROJECT NO. 07850-42-15

BORING B 1

ELEV. (MSL.) 302' DATE COMPLETED 05-26-2015

EQUIPMENT CME 75 BY: N. BORJA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3/4" **ASPHALT CONCRETE** Over 6" **BASE**			
	B1-1			SM	**PREVIOUSLY PLACED FILL** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; few clay			
2								
				ML	Stiff, moist, yellowish brown to brown, Sandy SILT; few clay			
4								
	B1-2					22	105.8	20.5
6								
8				SM	Medium dense, moist, mottled yellowish brown and gray, Silty, fine to medium SAND; trace clay			
10	B1-3					21	104.2	21.3
12								
14								
	B1-4					21	100.1	24.6
16								
18								
	B1-5					25	102.8	22.6
				SM/ML	**ARDATH SHALE** Dense, moist, mottled yellowish brown, gray, and reddish brown, Silty, fine to medium SAND and Sandy SILT			

BORING TERMINATED AT 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

Figure A-1,
Log of Boring B 1, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 2

ELEV. (MSL.) **302'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3" **ASPHALT CONCRETE** Over 5.5" **BASE**			
	B2-1			SM	**ARDATH FORMATION** Very dense, damp, mottled yellowish brown and gray, Silty, fine to medium SAND			
2								
4								
	B2-2					50/3"		
6								
					-Becomes tan brown; encountered hard cemented zone; different drilling between 7' to 9'			
8								
10	B2-3					69/11"		
	B2-4							
12								
				SM	Very dense, damp, mottled brown and yellowish brown to reddish brown, Silty, fine to medium SAND; moderately cemented			
14								
	B2-5					50/5"		
16								
18					-Hard cemented zone or rock encountered; very difficult drilling below 18'; poor recovery at 18.5' sample			
	B2-6					50/2"		
					BORING TERMINATED AT 19.5 FEET No groundwater encountered Boring finished on 05/26/2015			

Figure A-2,
Log of Boring B 2, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

BORING B 3

ELEV. (MSL.) 305' DATE COMPLETED 05-26-2015

EQUIPMENT CME 75 BY: N. BORJA

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					4" **ASPHALT CONCRETE** Over 7" **BASE**			
				SM	**ARDATH FORMATION** Dense to very dense damp light grayish brown, Silty, fine to medium SAND			
2								
					-Becomes damp to moist light yellowish brown			
4								
	B3-1					71/10"		
6	B3-2							
8								
				SM	Medium dense, damp, light brown, Silty, fine to medium SAND			
10	B3-3					30		
				ML	Stiff, damp, light gray, Sandy SILT			
12								
14				SM	Very dense, damp, yellowish brown, Silty, fine to medium SAND			
	B3-4					82/10"		
16								
18					-Becomes dense			
	B3-5					71		
					BORING TERMINATED T 19.5 FEET No groundwater encountered Boring finished on 05/26/2015			

Figure A-3,
Log of Boring B 3, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 4

ELEV. (MSL.) **302'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					2.5" **ASPHALT CONCRETE** Over 4" **RECYCLED BASE**			
				ML/SM	**ARDATH FORMATION** Hard, damp, mottled, yellowish brown to tan and gray, Sandy SILT to Silty, fine-grained SAND			
2				SM/SP-SM	Dense, damp, light gray, fine to medium SAND; weakly cemented			
				SM	Dense to very dense, damp, mottled tan brown and gray, Silty, fine to medium grained SAND; weakly cemented; massive			
4								
	B4-1					71/11"		
6	B4-2							
8								
10	B4-3					77/10"	109.7	16.6
12								
14								
	B4-4				-Excavates with few gypsum	79/11"		
16								
18					-Poor recovery			
	B4-5					50/2"		

BORING TERMINATED AT 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

Figure A-4,
Log of Boring B 4, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 5 ELEV. (MSL.) 301' DATE COMPLETED 05-26-2015 EQUIPMENT CME 75 BY: N. BORJA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					4" **ASPHALT CONCRETE** Over 4" **RECYCLED BASE**			
				SM/ML	**PREVIOUSLY PLACED FILL** Medium dense, damp to moist, mottled tan and gray, Silty, fine to medium SAND to Sandy SILT			
2								
				SM	**SCRIPPS FORMATION** Dense, moist, mottled light brown and brown, Silty, fine-grained SAND			
4								
	B5-1				-Excavates with reddish brown and yellowish brown staining	57/11"		
6								
8								
10	B5-2					76/10"		
12								
14					-Becomes brown to light brown; excavates with black specs			
	B5-3					77/9"		
16								
18								
					-Becomes light grayish brown to light brown			
	B5-4				BORING TERMINATED AT 19.5 FEET No groundwater encountered Boring finished on 05/26/2015	77/8"		

Figure A-5,
Log of Boring B 5, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

BORING B 6

ELEV. (MSL.) **302'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					4" **ASPHALT CONCRETE** Over 8.5" **BASE**			
	B6-1			SM	**PREVIOUSLY PLACED FILL** Medium dense, moist, yellowish brown to brown, Silty, fine to medium SAND, trace gravel; trace concrete			
2								
4								
	B6-2					24	105.2	21.0
6				ML	Stiff, moist, mottled yellowish brown to brown and gray, Sandy SILT			
					-Encountered cemented zone from 7' to 8'; hard drilling due to rock			
8								
10	B6-3				-Becomes very stiff	49	112.8	17.5
				SM	Medium dense to dense, moist, tan brown to yellowish brown, Silty, fine to medium SAND; few clay; trace gravel			
12								
14				CL	Stiff, moist, mottled dark brown, dark gray, and gray, Sandy CLAY; trace gravel, trace organics, slight organic odor; sample chunk of formation in shoe			
	B6-4					25	109.7	14.8
16				SM	Medium dense, damp, mottled brown and gray, Silty, fine to medium SAND; little chunks of siltstone			
18								
	B6-5					32	104.6	10.0
					BORING TERMINATED AT 19.5 FEET No groundwater encountered Boring finished on 05/26/2015			

Figure A-6,
Log of Boring B 6, Page 1 of 1

07850-42-15.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their: in-place moisture density; expansion index (EI); shear strength; water-soluble sulfate; gradation; and consolidation characteristics. The results of our laboratory tests are presented on the following tables and figures.

TABLE B-I
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
B1-1	10.8	25.1	106.8	67	Medium
B4-2	11.1	20.3	106.7	28	Low

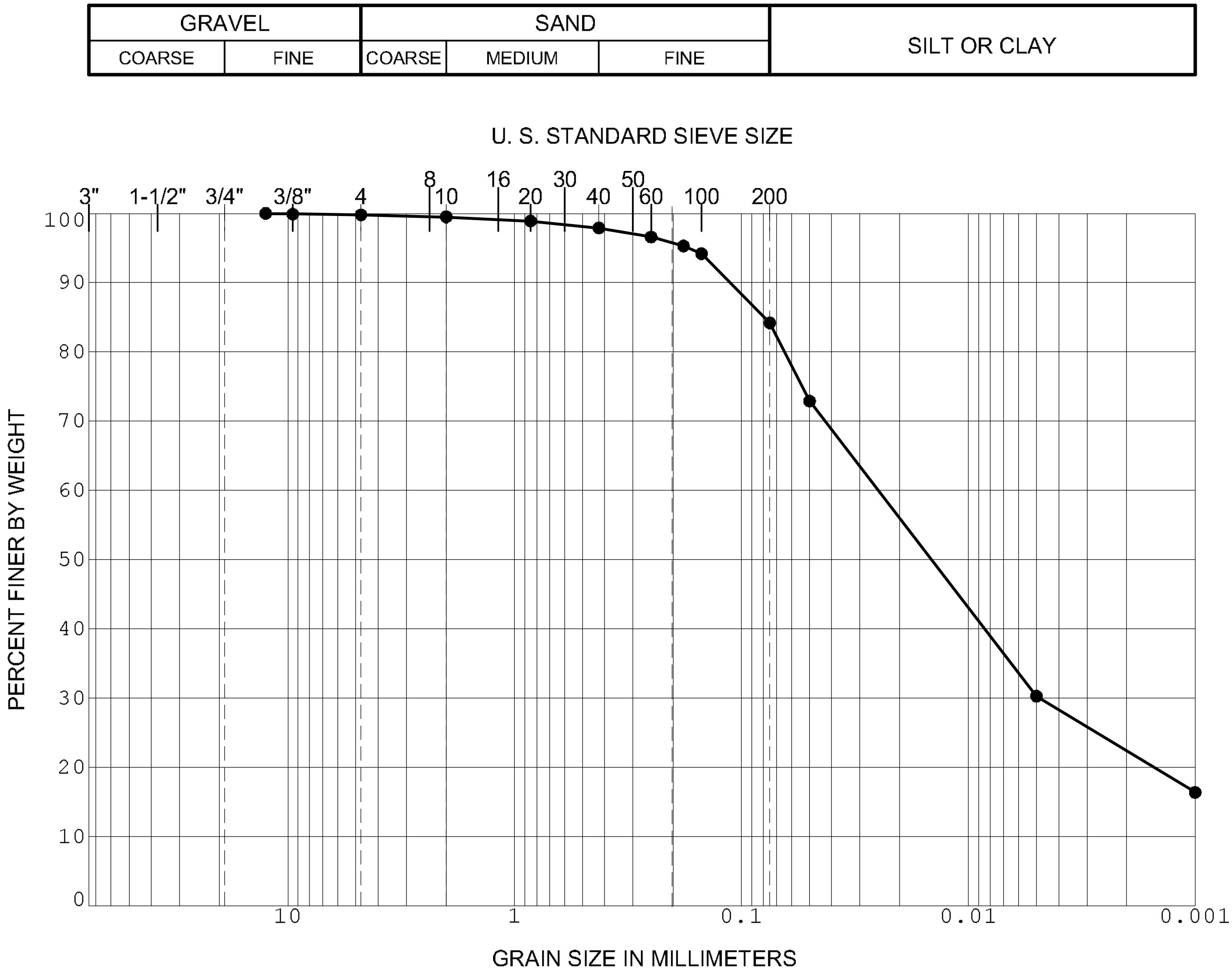
TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)		Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
		Initial	Final		
B4-3	109.7	16.6	18.8	1330	32

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)	Classification
B1-1	0.015	Negligible (S0)
B4-2	0.025	Negligible (S0)

PROJECT NO. 07850-42-15



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B2-1	1.0	ML - SILT with Sand				
⊠							
▲							

GRADATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

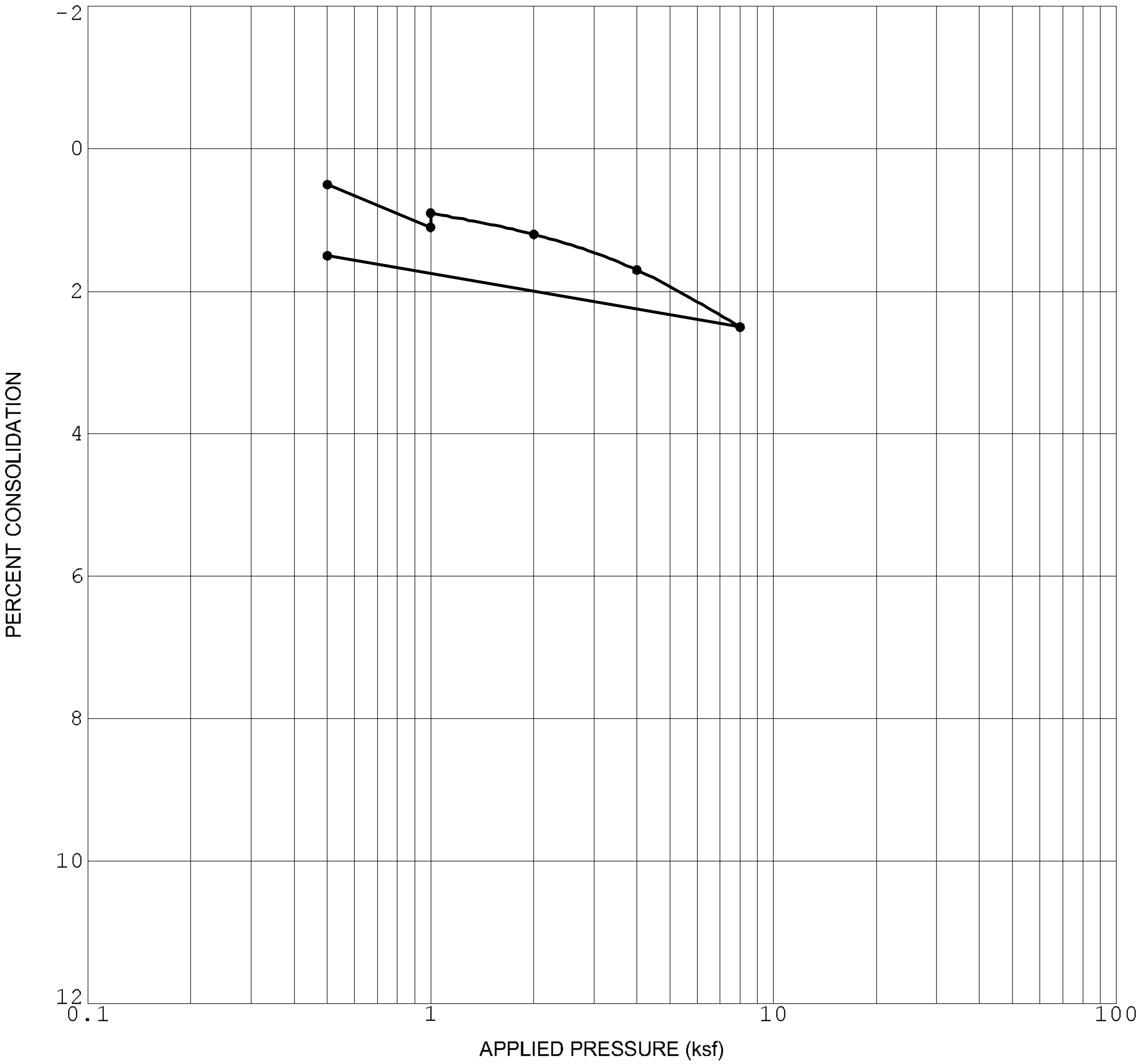
07850-42-15.GPJ

Figure B-1

GEOCON

PROJECT NO. 07850-42-15

SAMPLE NO. B1-2



Initial Dry Density (pcf)	105.8
Initial Water Content (%)	20.5

Initial Saturation (%)	95.6
Sample Saturated at (ksf)	1.0

CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

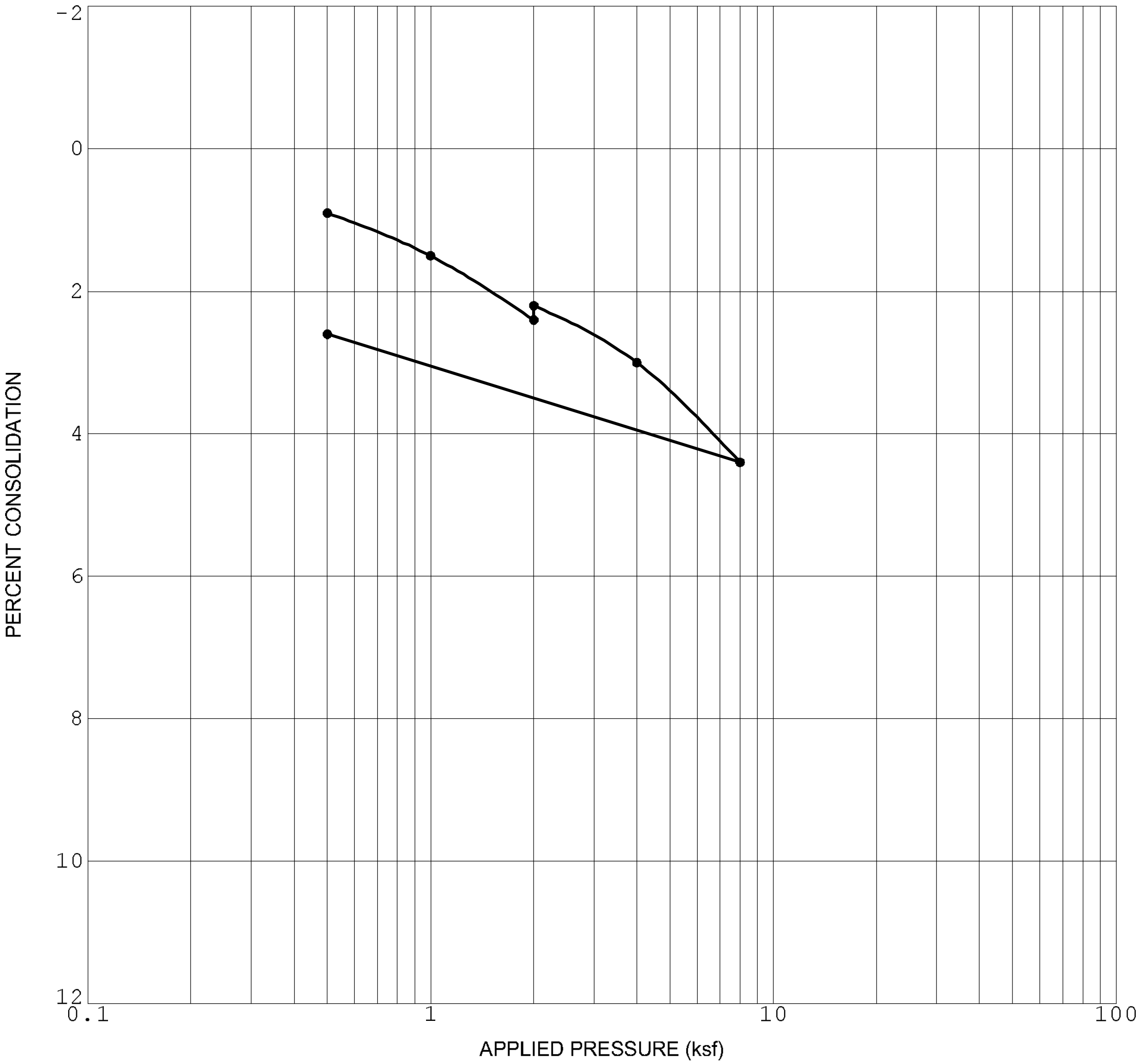
07850-42-15.GPJ

Figure B-2

GEOCON

PROJECT NO. 07850-42-15

SAMPLE NO. B1-4



Initial Dry Density (pcf)	100.1
Initial Water Content (%)	24.6

Initial Saturation (%)	99.5
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

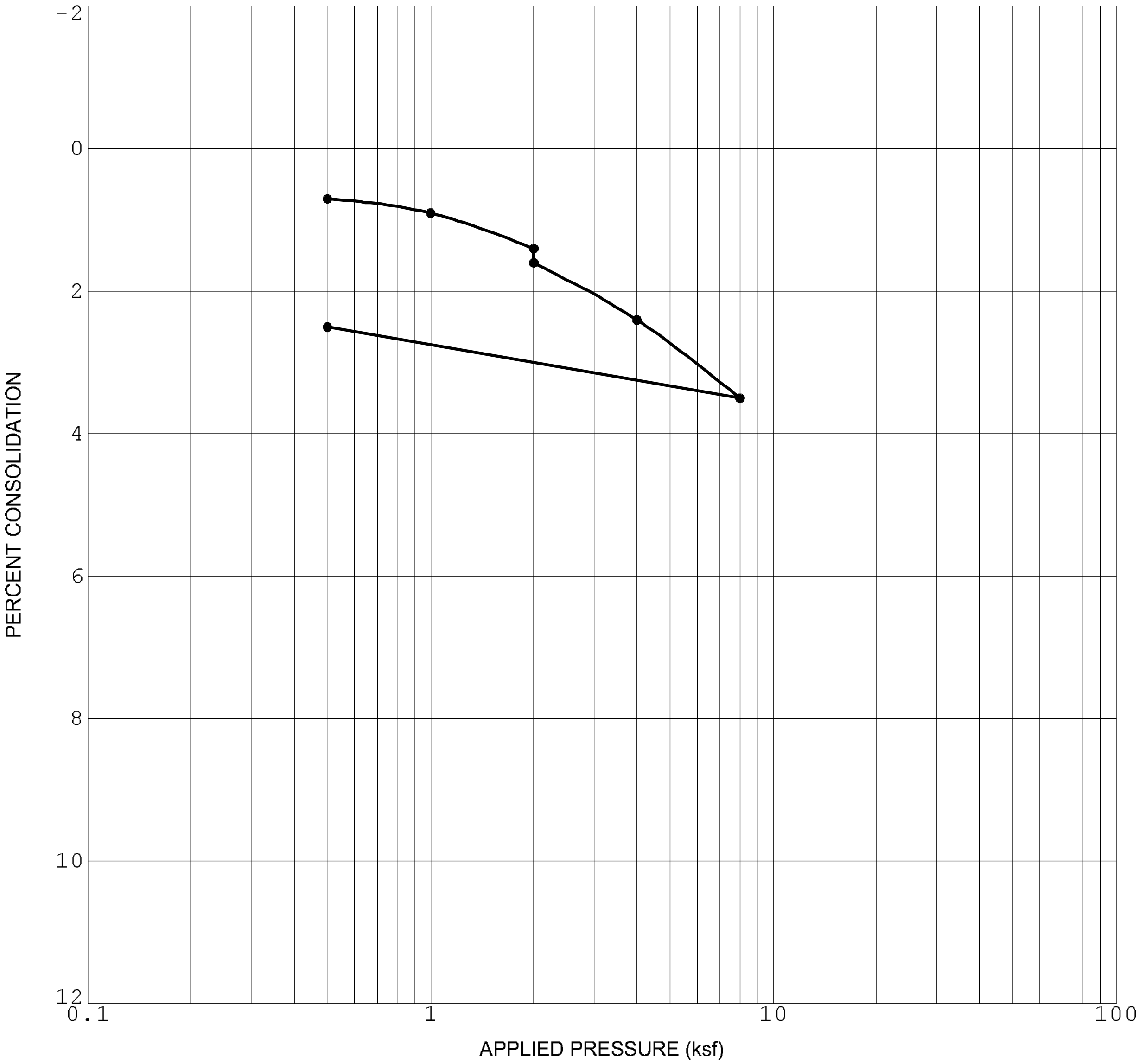
07850-42-15.GPJ

Figure B-3

GEOCON

PROJECT NO. 07850-42-15

SAMPLE NO. B6-4



Initial Dry Density (pcf)	109.7		**Initial Saturation (%)**	76.6
Initial Water Content (%)	14.8		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

07850-42-15.GPJ

Figure B-4

GEOCON

APPENDIX C

APPENDIX C

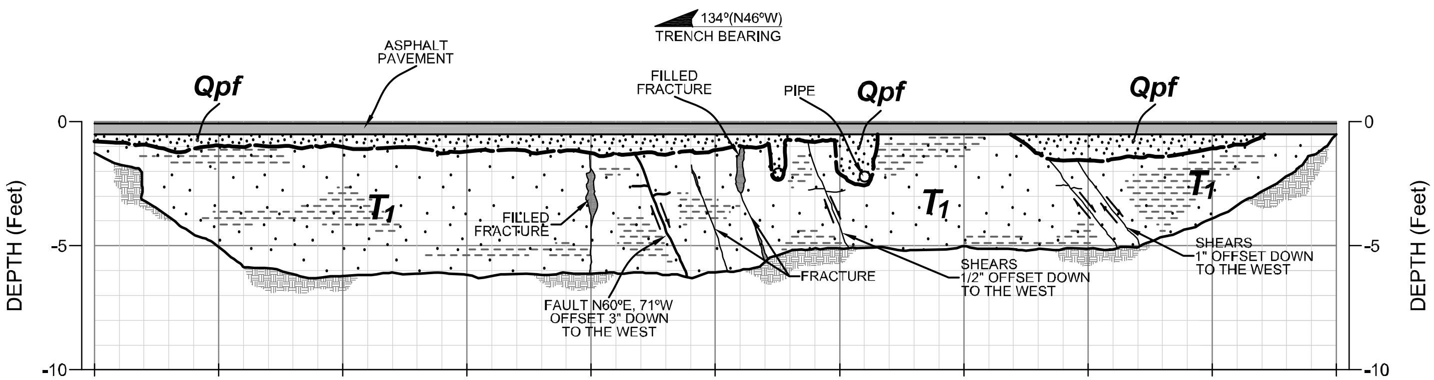
FAULT TRENCHES
PERFORMED BY GEOCON INCORPORATED AND SCS&T

FOR

10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. 07850-42-15

CAMPUS POINTE MASTER PLAN
10300 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA



FAULT TRENCH FT-1

SCALE: 1" = 5' (Vert. = Horiz.)

GEOCON LEGEND

Qpf ....PREVIOUSLY PLACED FILL

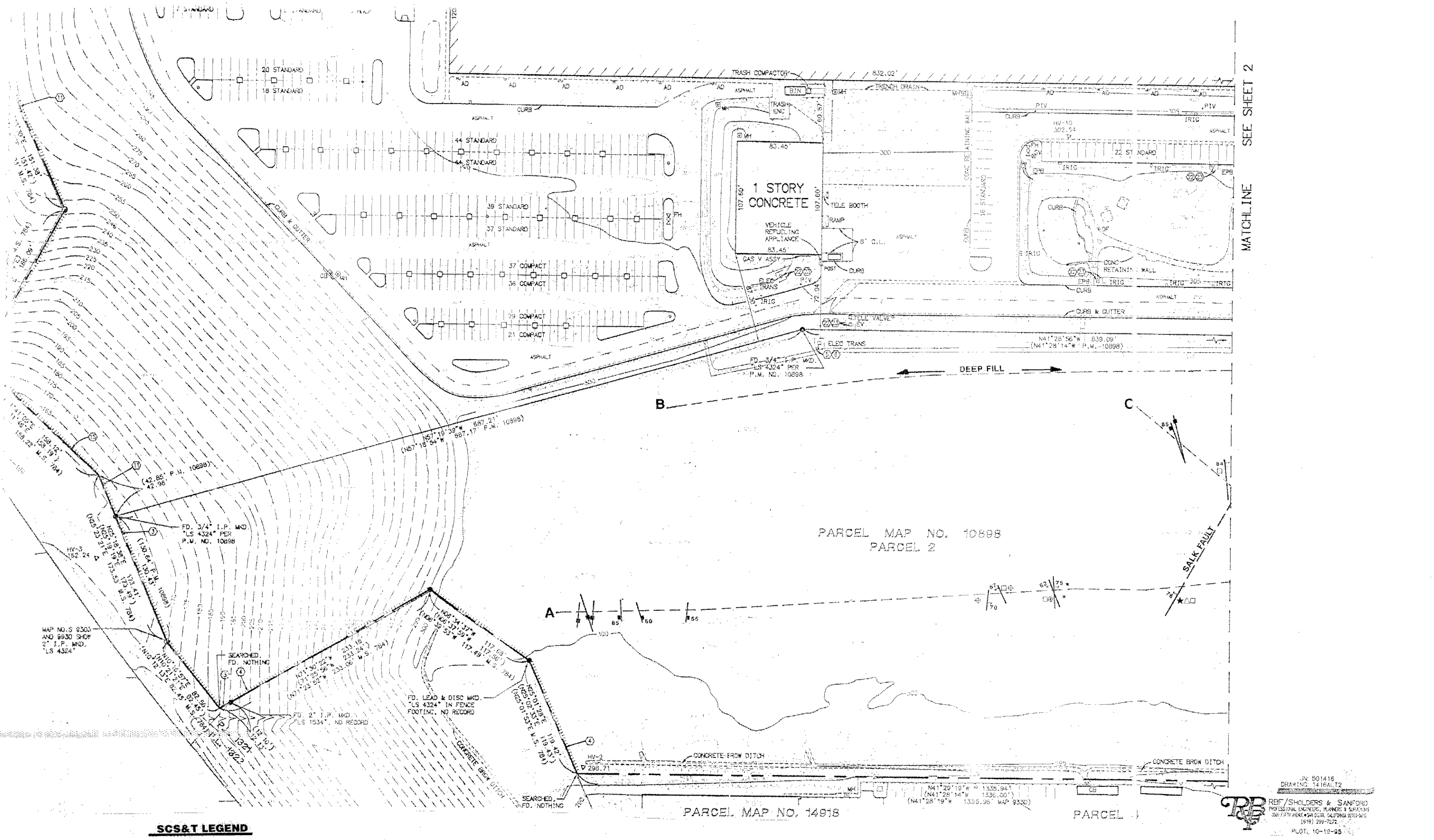
T_1 ....TERTIARY-AGE SCRIPPS FORMATION
Horizontally bedded, light gray and red brown banded, Clayey SANDSTONE

........APPROX. LOCATION OF GEOLOGIC CONTACT

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PROJECT NO. 07850 - 42 - 11
FIGURE 4
FAULT TRENCH FT-1
DATE 02 - 03 - 2014

Plotted:02/03/2014 3:00PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\07850-42-11 Campus Pointe Master Plan\SHEETS\07850-42-11 FaultTrench.dwg

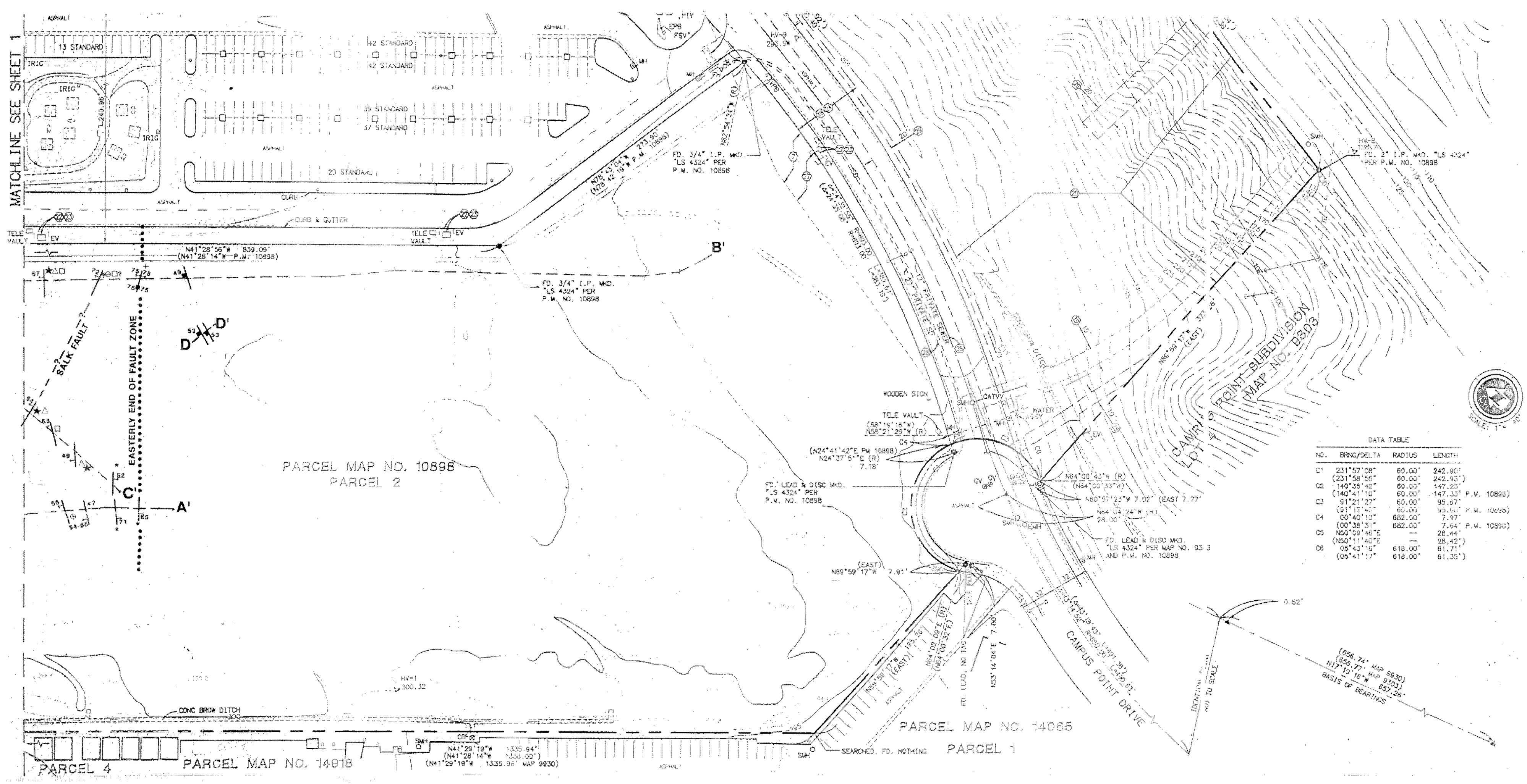


SCS&T LEGEND

- FRACTURES
- FAULTS
- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- □ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ⊕ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- \+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED

SCALE 1" = 40'

SOUTHERN CALIFORNIA SOIL & TESTING, INC.	
QUALCOMM	
BY: CHC/JRH/SD	DATE: 11-16-95
JOB No.: 9511205	PLATE No.: 1A



DATA TABLE

NO.	BRNG/DELTA	RADIUS	LENGTH
C1	231°57'08"	60.00'	242.90'
	(231°58'55"	60.00'	242.93')
C2	140°35'42"	60.00'	147.23'
	(140°41'10"	60.00'	147.33' P.M. 10898)
C3	91°21'27"	60.00'	95.67'
	(91°17'45"	60.00'	95.60' P.M. 10898)
C4	00°40'10"	682.00'	7.97'
	(00°38'31"	682.00'	7.64' P.M. 10898)
C5	N50°09'46"E	—	28.44'
	(N50°11'40"E	—	28.42')
C6	05°43'16"	618.00'	61.71'
	(05°41'17"	618.00'	61.35')

SCS&T LEGEND

- FRACTURES
- FAULTS
- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- □ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ⊕ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- \+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED
- ••••••• EASTERLY END OF FAULT ZONE

SCALE 1" = 40'

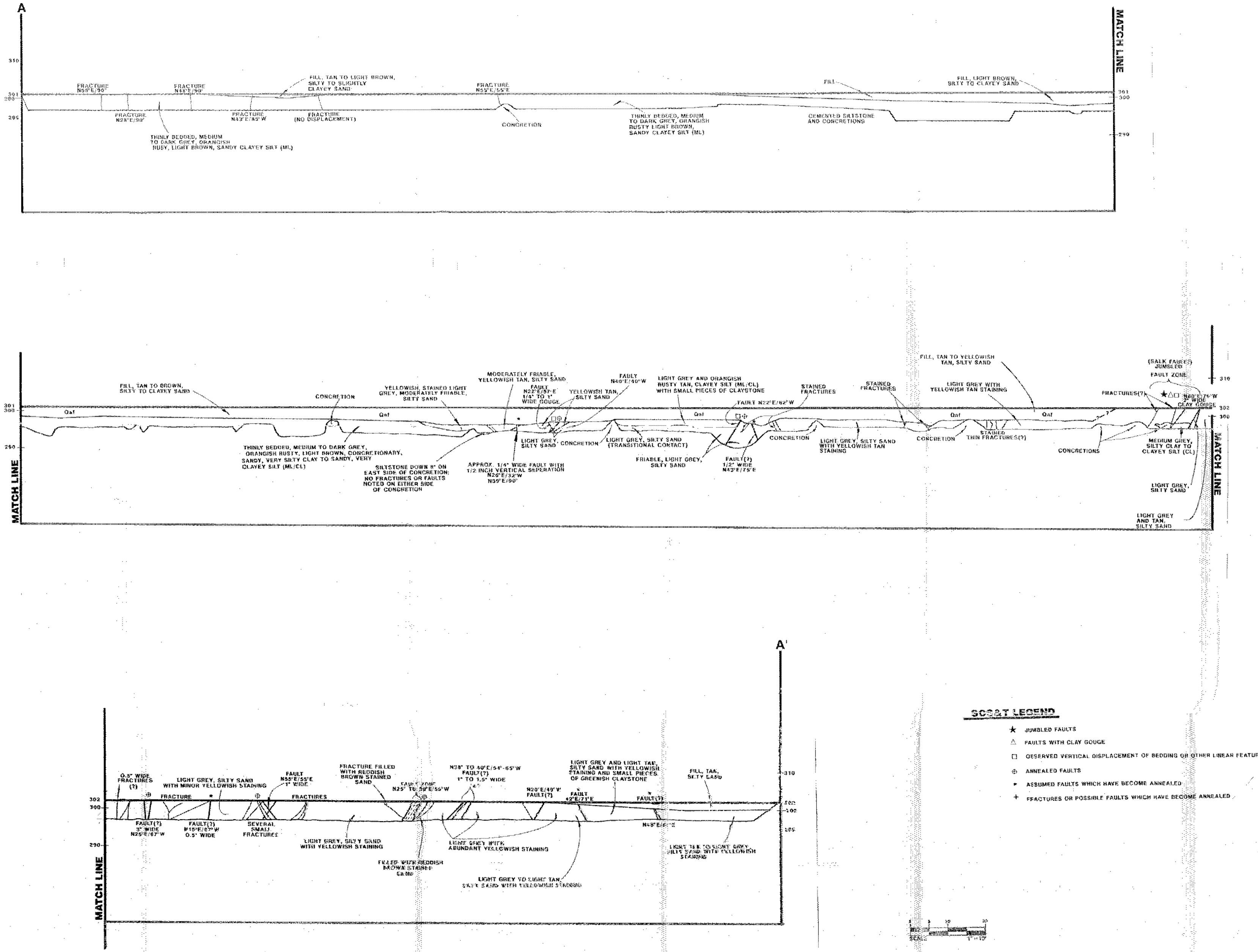
SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM

BY: CHC/JRH/SD	DATE: 11-15-95
JOB No.: 9511205	PLATE No.: 1B

CROSS SECTION A - A'

SCALE: 1" = 10'



SCS&T LEGEND

- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- □ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ⊕ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- \+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED

SCALE 1" = 10'

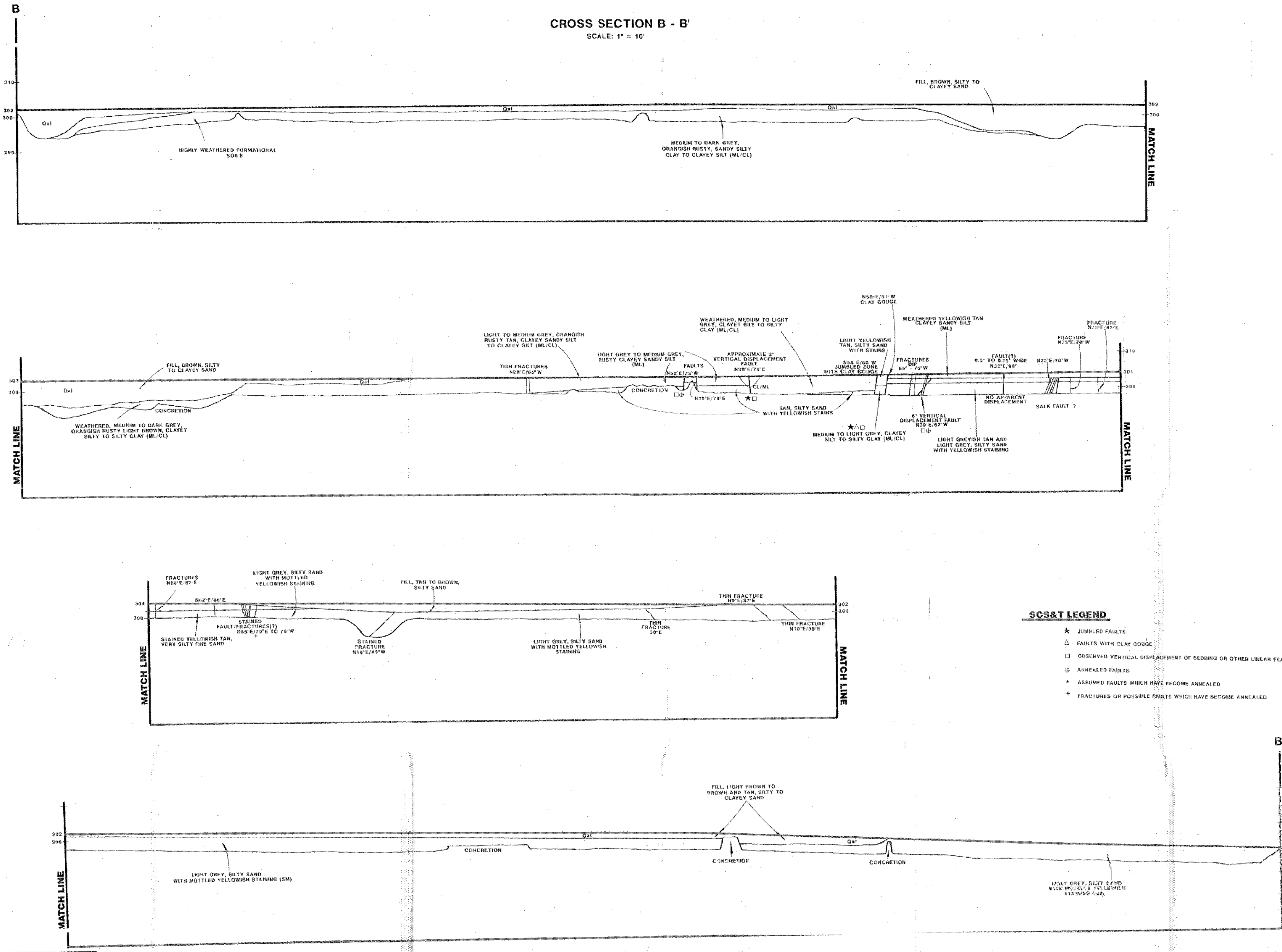
SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM

BY: CHC/JRH/SD	DATE: 11-16-95
JOB No.: 9511205-	PLATE No.: 2

CROSS SECTION B - B'

SCALE: 1" = 10'



SCS&T LEGEND

- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- □ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ◈ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- + FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED

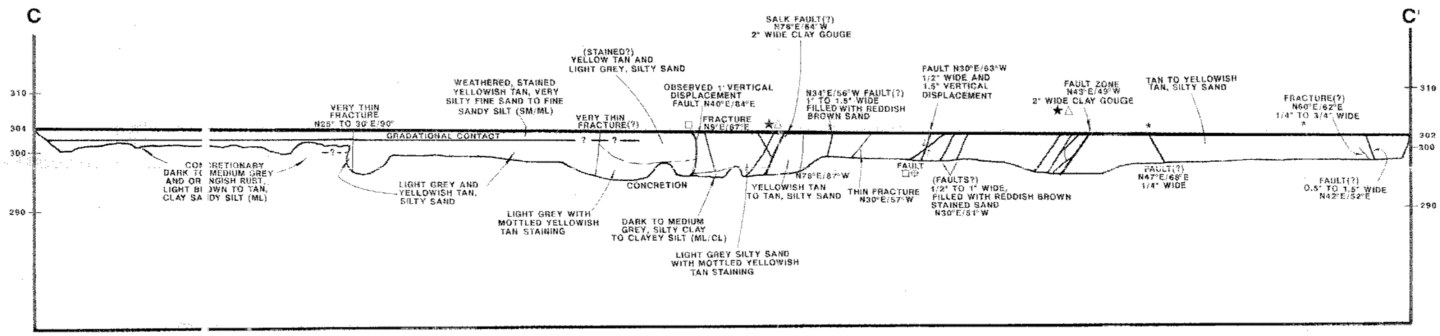
SCALE 1" = 10'

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM

BY: CHC/JRH/SD	DATE: 11-16-95
JOB NO.: 9511205-	PLATE NO.: 3

CROSS SECTION C - C'
SCALE: 1" = 10'



S(S&T LEGEND

- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- □ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ⊕ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- \+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED

0 5 10 20
SCALE 1" = 10'

SOUTHERN CALIFORNIA SOIL & TESTING, INC.	
QUALCOMM	
BY: CHC/JRH/SD	DATE: 11-16-95
JOB No.: 9511205-	PLATE No.: 4

APPENDIX D

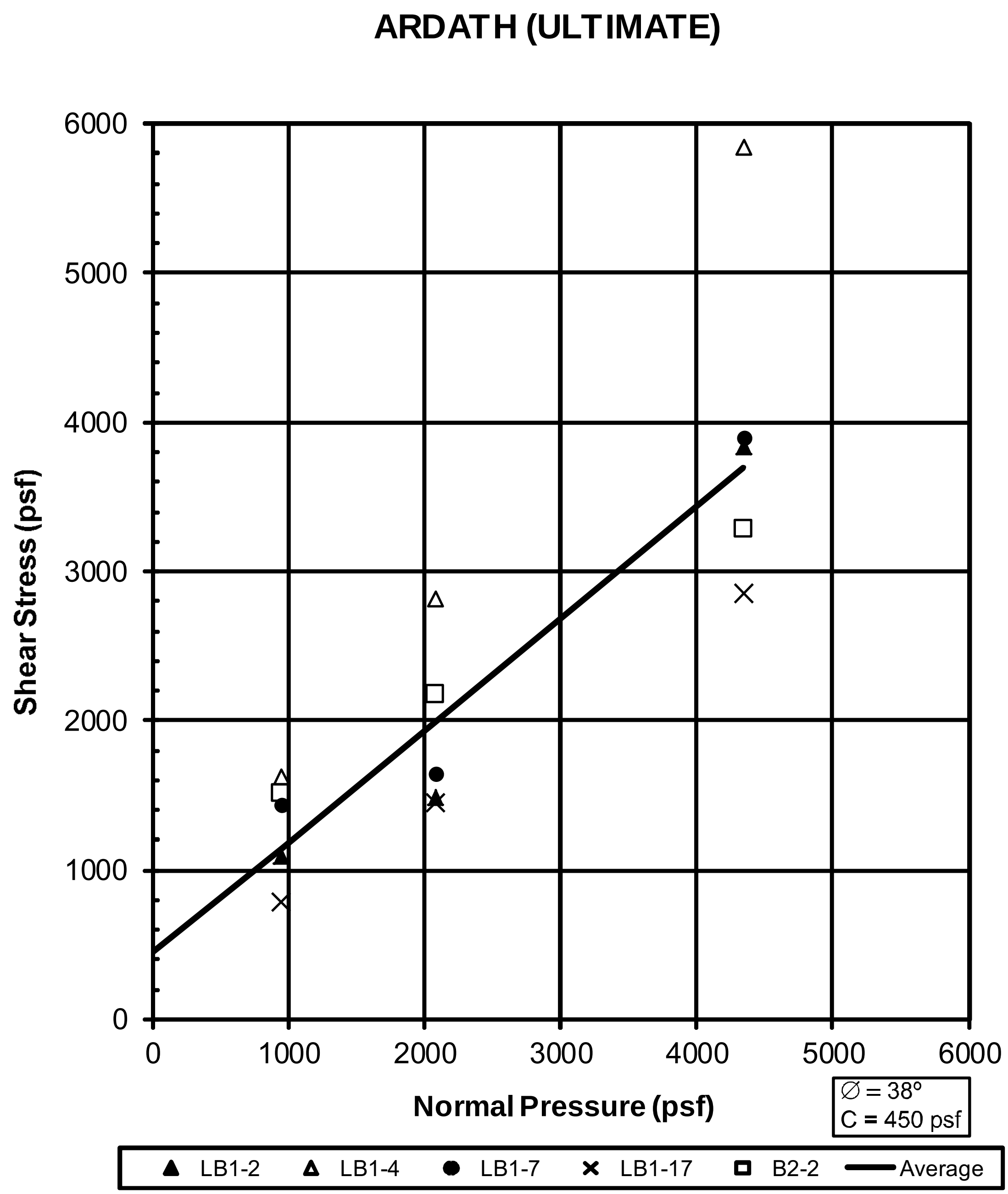
APPENDIX D

EXPLORATORY BORING AND
LABORATORY TESTING
PERFORMED PREVIOUSLY BY GEOCON AND OTHERS

FOR

10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. 07850-42-15



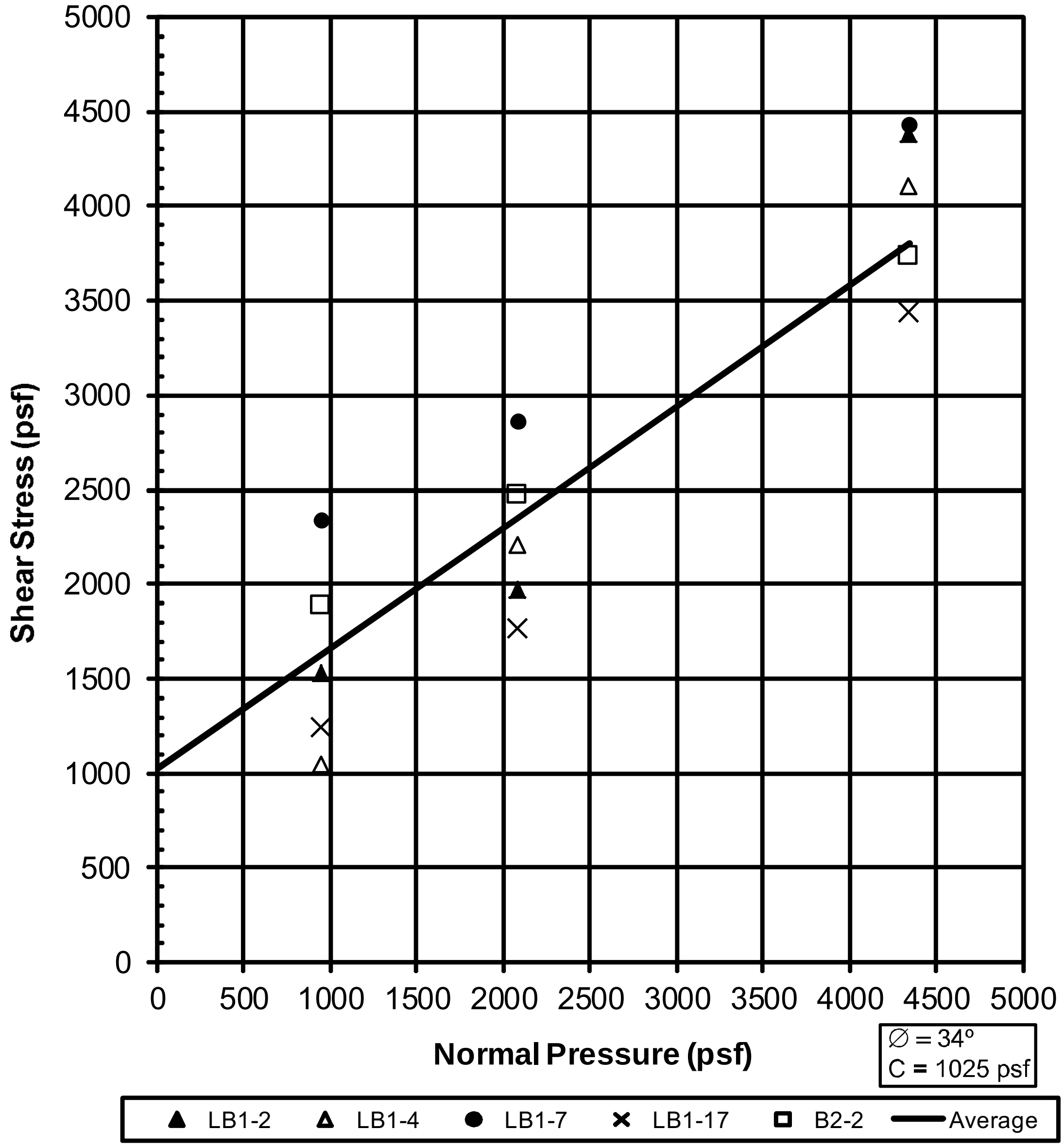
SHEAR STRENGTH TEST RESULTS (ULTIMATE VALUES)

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CAMPUS POINT MULTI-LEVEL PARKING STRUCTURE
10300 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

RA / RA		DSK/GTYPD	DATE 11 - 11 - 2014	PROJECT NO. 07850 - 42 - 14	FIG. C-4

ARDATH (PEAK)



SHEAR STRENGTH TEST RESULTS (PEAK VALUES)

GEOCON INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CAMPUS POINT MULTI-LEVEL PARKING STRUCTURE
10300 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

RA / RA		DSK/GTYPD	DATE 11 - 11 - 2014	PROJECT NO. 07850 - 42 - 14	FIG. C-5

Plotted:11/11/2014 3:26PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07850-42-14 Campus Pointe Master Plan\DETAILS\07850-42-14 ShearStrengthTestResults.dwg

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than half of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than half of material is smaller than No. 200 sieve size.			
SILTS AND CLAYS		ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
	Liquid Limit less than 50	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	Liquid Limit greater than 50	CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
	HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils.

— Water level at time of excavation or as indicated

US — Undisturbed, driven ring sample or tube sample

CK — Undisturbed chunk sample

BG — Bulk sample

SP — Standard penetration sample

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM/IVAC

BY: CHC	DATE: 10-10-95
JOB NUMBER: 9511205	Plate No. 2

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 1 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	FILL, Tan to Light Brown, SILTY SAND	Humid	Loose				
2	US			Moist	Dense	47	108.8	10.1	
4	BAG								
6	US	ML	Yellow-Green Tan and Medium Grey, SLIGHTLY CLAYEY, VERY SANDY SILT	Moist	Stiff	38	104.9	19.8	
8	BAG								
10	US	ML		Moist	Stiff	30	100.3	23.1	
12									
14									
16	US	SM	Tan to Reddish Tan, SILTY SAND	Moist	Dense	35	106.1	17.9	
18		SM	REWORKED ALLUVIUM, Grey to Dark Brown, SLIGHTLY CLAYEY SILTY SAND with Roots and Organic Odor, Topsoil and Subsoil	Moist	Medium Dense				
20	US					46	105.7 118.5	12.3 12.0	
22		SM-SC	SCRIPPS FORMATION, Light Reddish Tan, CLAYEY SILTY SAND	Moist	Dense				
24		SM	Tan, SILTY SAND	Moist	Very Dense				
26	US					50/5"	96.8	9.0	
28			Light Grey						
30	US		Bottom at 30.5 Feet			50/5"			

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH | DATE LOGGED: 09-28-95

JOB NUMBER: 9511205 | Plate No. 3

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 2 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	SCRIPPS FORMATION, Light Tan to Yellow Tan, SILTY SAND	Humid	Loose				
2	BAG			Moist	Dense				
4	US	SM-ML	VERY SILTY SAND	Moist	Dense/ Hard	44	101.3	8.0	
6	US	SM	Tan to Light Brown, SILTY SAND	Moist	Dense	68	101.7	7.8	
8									
10	US	SM	Tan, SILTY SAND	Moist	Dense	50/5"	103.7	7.9	
12									
14									
16	US	ML	Yellow Tan, SANDY SILT	Moist	Hard	86	109.8	18.2	
			Bottom at 16 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 4

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 3 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		ML-CL	SCRIPPS FORMATION, Medium Grey to Yellow Tan, SANDY SILT TO SILTY CLAY	Humid	Soft				
2	US			Moist	Hard	67	108.5	17.6	
4									
6	US	ML-SM	Yellow Tan to Light Grey, VERY SANDY SILT	Moist	Very Dense	50/6"	102.9	8.8	
8									
10	US	SM	Light Grey, SILTY SAND	Moist	Very Dense	50/5"	96.9	6.9	
12			Refusal at 12 Feet on Highly Cemented Concretion						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 5

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 4 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	FILL, Tan to Light Brown, SILTY SAND with Rock	Humid	Loose				
2	US BAG			Moist	Dense	50			
4									
6	US					30	103.1	9.9	
8	BAG	SM-ML	SCRIPPS FORMATION, Light Tan to Tan, SILTY SAND/SANDY SILT	Moist	Very				
10	US					50/5"	97.2	8.7	
12		SM	SILTY SAND						
14									
16	US	SM	SILTY SAND	Moist	Very Dense	50/5"	93.2	8.1	
18									
20			Bottom at 20 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 6

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 5 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0	BAG	SM	FILL OR WEATHERED FORMATIONAL, Yellow Tan, SILTY SAND	Humid Moist	Loose Dense				
2–4		SM	SCRIPPS FORMATION, Light Grey with Yellow Tan, SILTY SAND	Moist	Very Dense				
6	US					50/5"	98.9	6.4	
8	BAG								
10	US					50/4"			
12									
14	US	SM	SILTY SAND	Moist	Very Dense	50/4"	96.3	6.3	
16			Bottom at 15.5 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 7

BORING NUMBER 6

ELEVATION

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	SCRIPPS FORMATION, Yellow Tan, SILTY SAND	Humid	Loose				
2	US			Moist	Dense	50/4"	105.0	7.3	
4									
	US	SM				50/6"	96.6	10.3	
6									
8									
10									
	US	SM	Light Grey and Yellow Tan, SILTY SAND	Moist	Very Dense	50/2"	97.8	8.4	
12	BAG								
14									
			Bottom at 15 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 8

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 7 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	WEATHERED SCRIPPS FORMATION, TAN, SILTY SAND	Humid	Loose				
2		SM	SCRIPPS FORMATION, Yellow Tan to Tan, SILTY SAND	Moist	Dense				
4									
6			Bottom at 5 Feet						
			BORING NUMBER 8						
0		SM	SCRIPPS FORMATION, Light Tan to Yellow Tan, SILTY SAND	Humid Moist	Loose Dense				
2									
4									
6			Bottom at 5 Feet						
			BORING NUMBER 9						
0		SM	FILL, Tan to Yellow Tan, SILTY SAND	Humid Moist	Loose Dense				
2									
4		SM	SCRIPPS FORMATION, Yellow Tan, SILTY SAND	Moist	Very Dense				
6			Bottom at 5 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

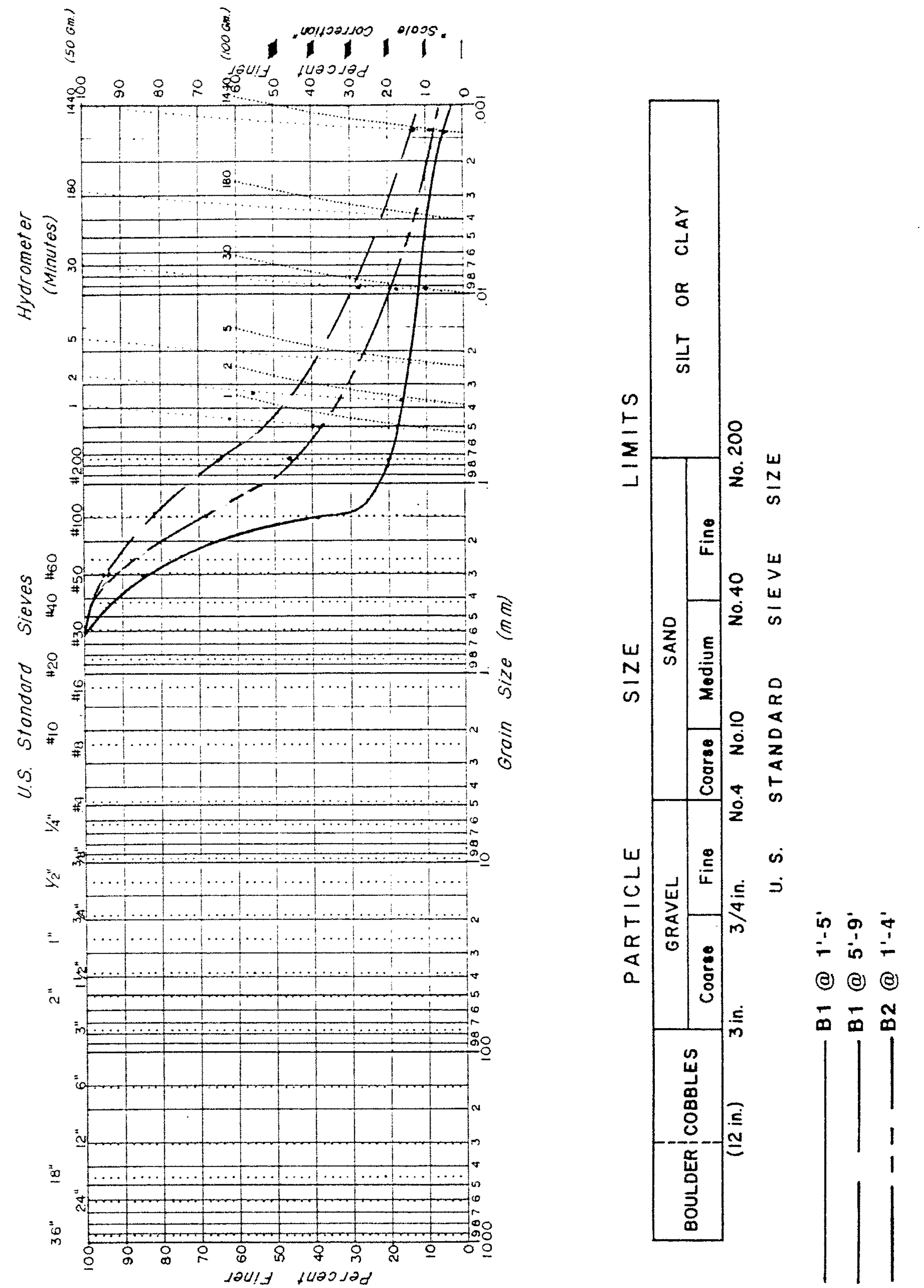
LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 9

DEPTH (ft.)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NUMBER 10 ELEVATION DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY OR DENSITY	PENETRATION RESISTANCE (blows/ft. of drive)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)
0		SM	FILL, Tan to Yellow Tan, SILTY SAND	Humid	Loose				
2				Moist	Dense				
4									
6		ML	SCRIPPS FORMATION, Yellow Tan, SANDY SILT	Moist	Hard				
8			Bottom at 7 Feet						

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

SUBSURFACE EXPLORATION LOG

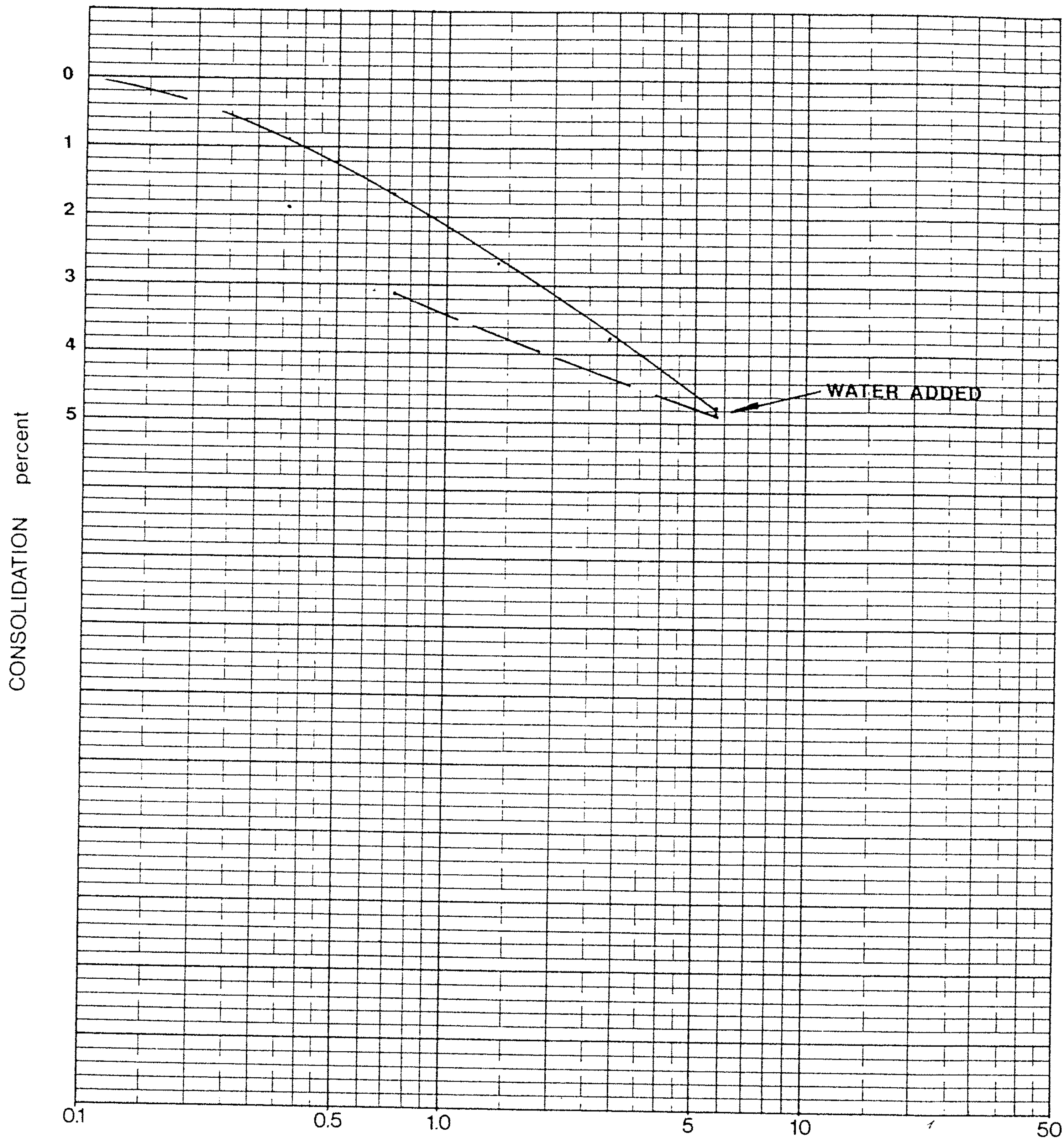
LOGGED BY: JRH	DATE LOGGED: 09-28-95
JOB NUMBER: 9511205	Plate No. 10



SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM/IVAC

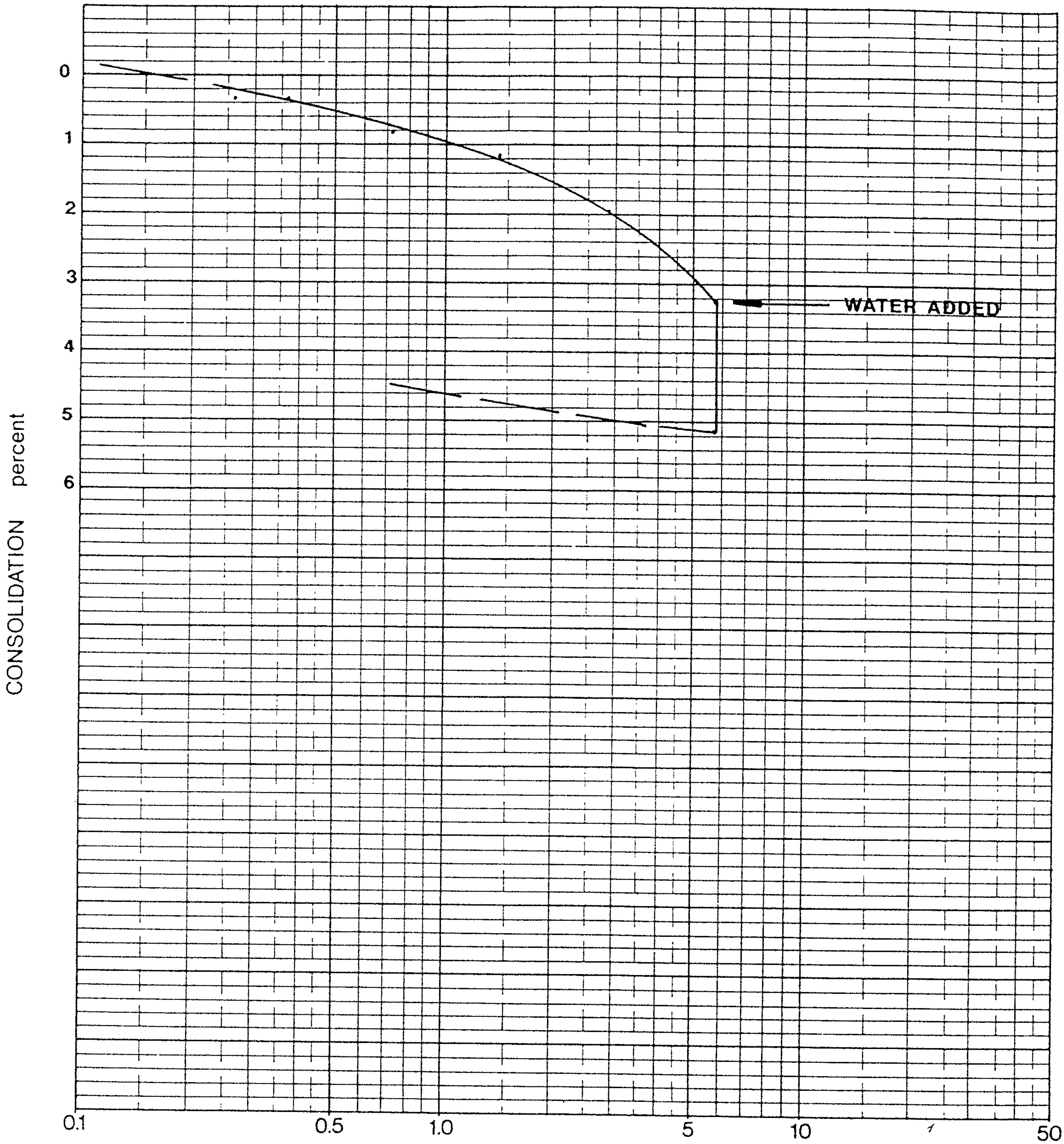
GRAIN SIZE DISTRIBUTION	BY CHC	DATE 10-13-95
	JOB NO. 9511205	Plate No. 11



B1 @ 10.5 FEET

SOUTHERN CALIFORNIA SOIL & TESTING LAB, INC.
6280 RIVERDALE STREET
SAN DIEGO, CALIFORNIA 92120

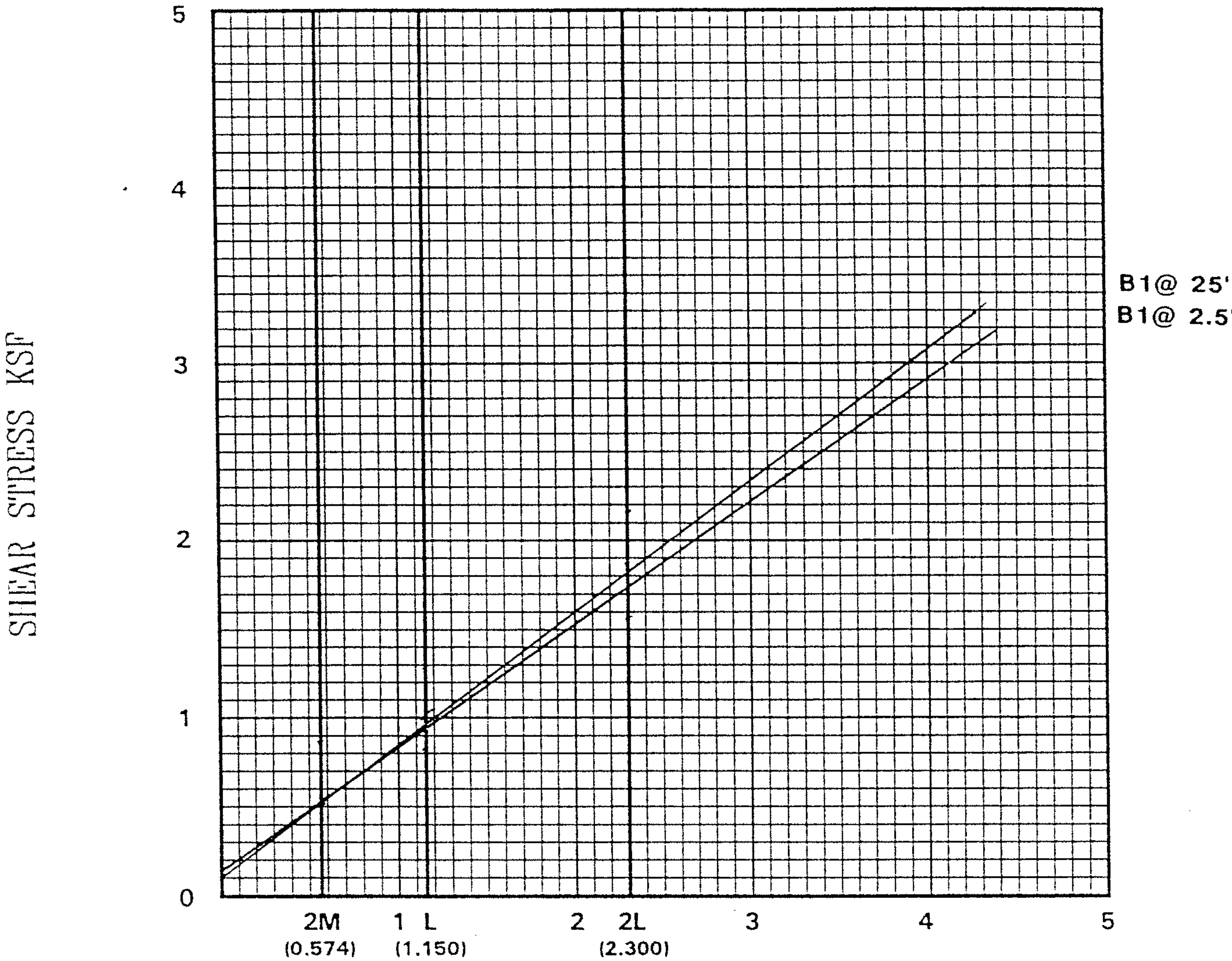
QUALCOMM/IVAC	
BY CHC	DATE 10-13-95
JOB NO. 9511205	Plate No. 12



B1 @ 20 FEET

SOUTHERN CALIFORNIA SOIL & TESTING LAB, INC. 6280 RIVERDALE STREET SAN DIEGO, CALIFORNIA 92120	QUALCOMM/IVAC	
	BY CHC	DATE 10-13-95
	JOB NO. 9511205	Plate No. 13

DIRECT SHEAR SUMMARY



NORMAL STRESS, KSF (2 ⅜" SAMPLE)

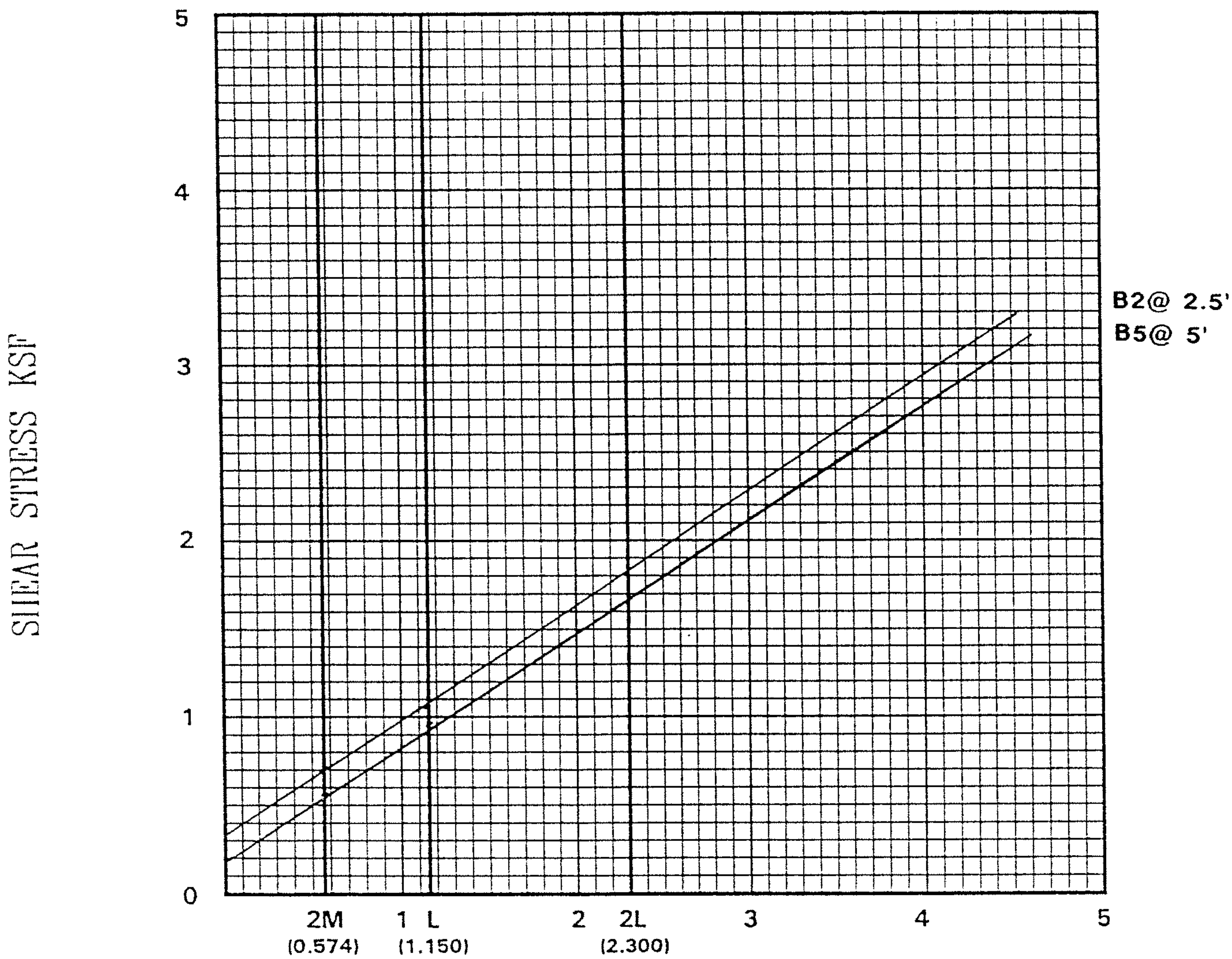
SAMPLE	DESCRIPTION	ANGLE OF INTERNAL FRICTION	COHESION INTERCEPT (PSF)
B1 @ 2.5'	Undisturbed	35 Degrees	150 psf
B1 @ 25'	Undisturbed	37 Degrees	100 psf

PROVING RING No. ____________

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM/IVAC	
BY: CHC	DATE: 10-13-95
JOB NUMBER: 9511205	PLATE No.: 14

DIRECT SHEAR SUMMARY



NORMAL STRESS, KSF (2 3/8" SAMPLE)

SAMPLE	DESCRIPTION	ANGLE OF INTERNAL FRICTION	COHESION INTERCEPT (PSF)
B2 @ 2.5'	Undisturbed	33 Degrees	350 psf
B5 @ 5'	Undisturbed	33 Degrees	175 psf

PROVING RING No. ______________

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

QUALCOMM/IVAC	
BY: CHC	DATE: 10-13-95
JOB NUMBER: 9511205	PLATE No.: 15

APPENDIX E

APPENDIX E

RECOMMENDED GRADING SPECIFICATIONS

FOR

10290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. 07850-42-15

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

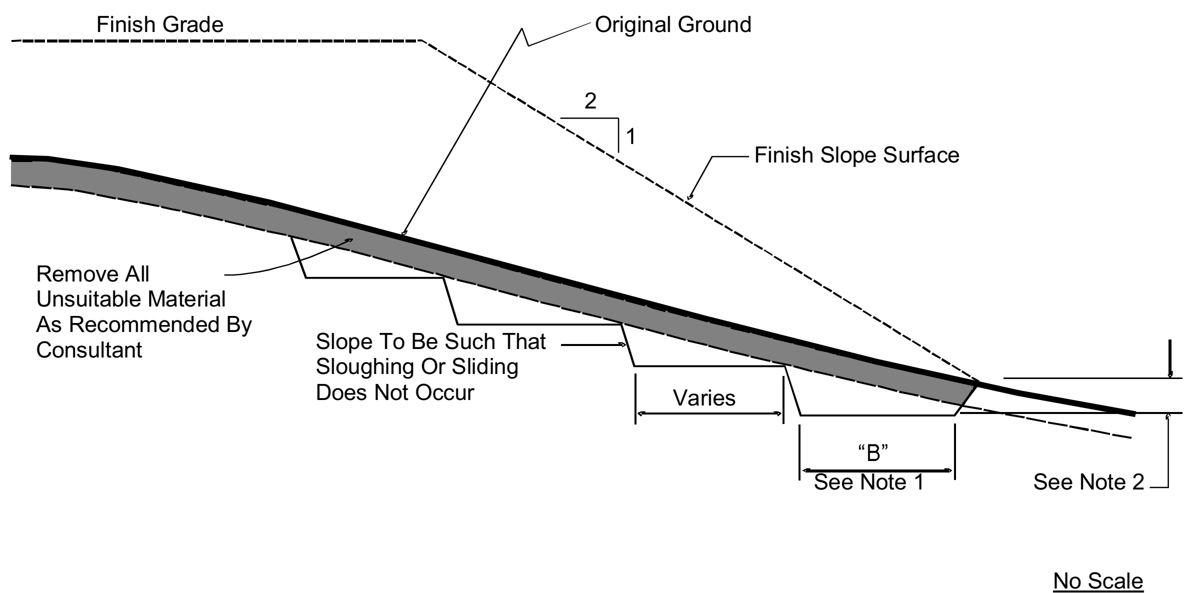
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-09.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557-09. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196-09, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. OBSERVATION AND TESTING

7.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 Soil and Soil-Rock Fills:

7.6.1.1 Field Density Test, ASTM D 1556-07, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D 1557-09, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

7.6.1.4. Expansion Index Test, ASTM D 4829-08A, *Expansion Index Test.*

7.6.2 Rock Fills

7.6.2.1 Field Plate Bearing Test, ASTM D 1196-09 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

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