APPENDIX F-1.
STORM WATER QUALITY MANAGEMENT PLAN

Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

ARE Science Village

PTS #: 647676

TBD

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

Leila Talebi PH.D. PE, 86123

Provide Wet Signature and Stamp Above Line

Prepared For:

Alexandria Estate Equities, Inc.

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Date:

02-15-2022

Approved by: City of San Diego Date

The City of SAN DIEGO

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Project Name: ARE Science Village

Table of Contents

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

Project Name: ARE Science Village

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

Certification Page

Project Name: ARE Science Village
Permit Application Pending

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

93528 — PE#

06-30-2022 — Expiration Date

Jing Liu, PE, QSD

Print Name

Michael Baker International

Company

02/15/2022

Date

Engineer's Stamp

Project Name: ARE Science Village

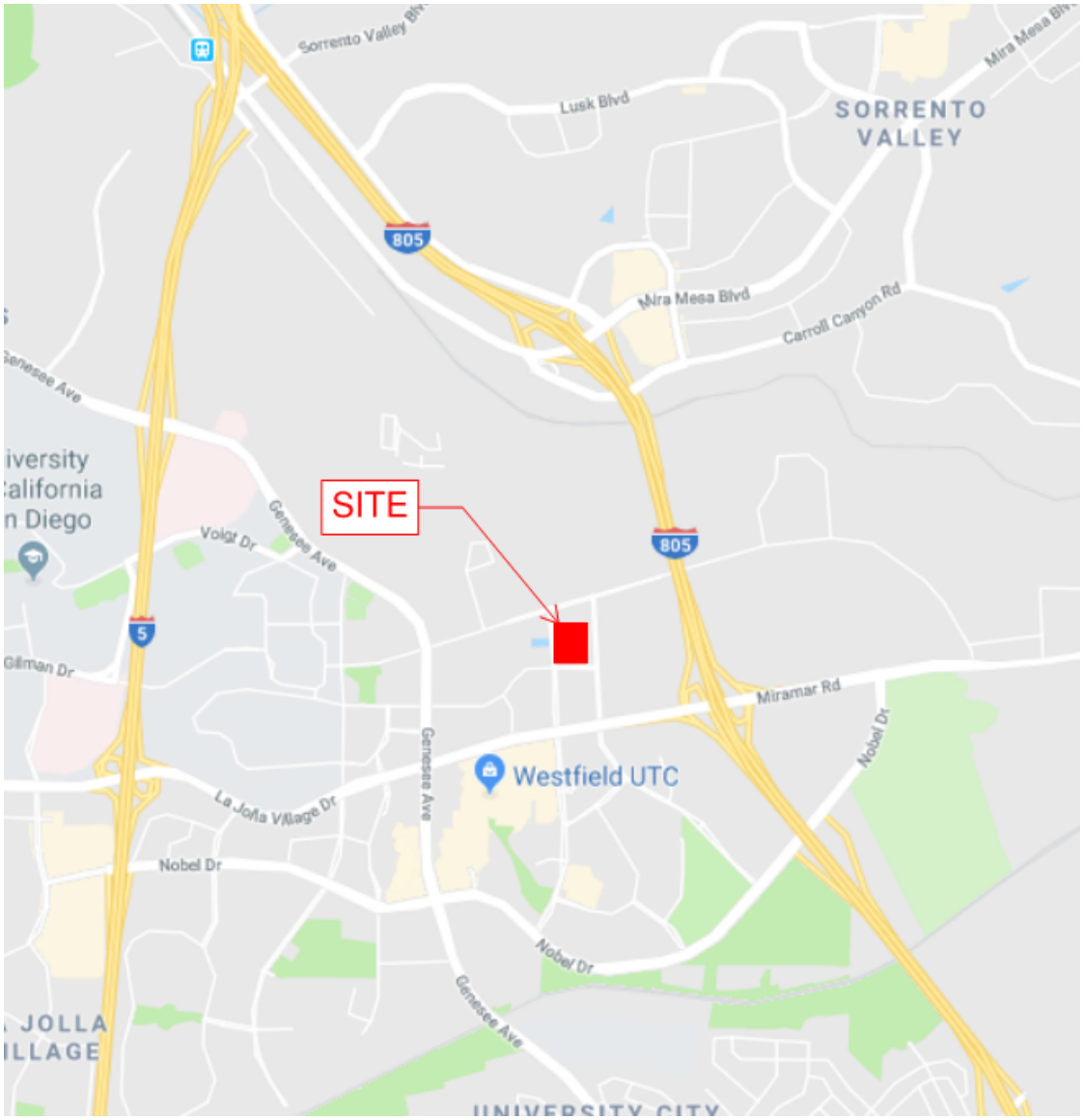
Submittal Record

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	02-15-2022	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
3		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: ARE Science Village
Permit Application TBD



City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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FORM
DS-560
September 2021

Stormwater Requirements Applicability Checklist

Project Address: 9393 Towne Center Drive, San Diego, CA 92121 **Project Number:** PTS #: 647676

SECTION 1: Construction Stormwater Best Management Practices (BMP) Requirements

All construction sites are required to implement construction BMPs per the performance standards in the Stormwater Standards Manual. Some sites are also required to obtain coverage under the State Construction General Permit (CGP)[1], administered by the California State Water Resources Control Board.

For all projects, complete Part A - If the project is required to submit a Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Plan (WPCP), continue to Part B.

PART A – Determine Construction Phase Stormwater Requirements

1. Is the project subject to California's statewide General National Pollutant Discharge Elimination System (NPDES) permit for Stormwater 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 is required; skip questions 2-4. ○ No; proceed to the next question.

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with stormwater?

   ○ Yes, WPCP is required; skip questions 3-4. ○ No; proceed to the next question.

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

   ○ Yes, WPCP is required; skip question 4. ○ No; proceed to the 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 only ONE of the following activities: water service, sewer lateral, or 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, potholing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes, no document is required.

Check one of the boxes below and continue to Part B

◉ **If you checked "Yes" for question 1**, an 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 proposes 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 check "No" for all questions 1-3 and checked "Yes" for question 4,** Part B does not apply, and no document is required. **Continue to Section 2.**

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at http://www.sandiego.gov/stormwater/regulations/index.shtml

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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 State 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 continue to Section 2

☐ **1. ASBS**

A. Projects located in the ASBS watershed.

☐ **2. High Priority**

A. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and are not located in the ASBS watershed.
B. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and are not located in the ASBS watershed.

☐ **3. Medium Priority**

A. Projects that are not located in an ASBS watershed or designated as a High priority site.
B. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and are not located in an ASBS watershed.
C. WPCP projects (>5,000 square feet of ground disturbance) located within the Los Peñasquitos watershed management area.

☐ **4. Low Priority**

A. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

Section 2: Construction Stormwater BMP Requirements

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

PART C – Determine if Not Subject to Permanent Stormwater Requirements

Projects that are considered maintenance or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Stormwater Standards Manual are not subject to Permanent Stormwater BMPs.

- **If "yes" is checked for any number in Part C**: Proceed to Part F and check "Not Subject to Permanent Stormwater BMP Requirements."
- **If "no" is checked for all 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 stormwater?

   ○ 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

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PART D – PDP Exempt Requirements

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

- **If "yes" is checked for any questions in Part D**, continue to Part F and check the box labeled "PDP Exempt."
- **If "no" is 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 stormwater 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 Stormwater Standards manual?

   ○ Yes, PDP exempt requirements apply ○ No, proceed to 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 Stormwater Standards Manual?

   ○ Yes, PDP exempt requirements apply ○ No, proceed to next question

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 Stormwater 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 Development 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 beverages for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) 5812), and where the land development creates and/or replaces 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

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

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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 the 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 retail gasoline outlet (RGO) that create 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 (ADT) of 100 or more vehicles per day. ○ Yes ○ No

9. **New development or redevelopment projects of an automotive repair shop 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.** These projects are not covered in any of the categories above but involve the disturbance of one or more acres of land and are expected to generate post-construction phase pollutants, including fertilizers and pesticides. This category does not include projects creating less than 5,000 square feet of impervious area and projects containing landscaping without a requirement for the regular use of fertilizers and pesticides (such as a slope stabilization project using native plants). Impervious area calculations need not include linear pathways for infrequent vehicle use, such as emergency maintenance access or bicycle and pedestrian paths if the linear pathways are built with pervious surfaces or if runoff from the pathway sheet flows to adjacent pervious areas. ○ 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 PERMANENT STORMWATER REQUIREMENTS** ○ Yes ○ No

2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Stormwater Standards Manual for guidance. ○ Yes ○ No

3. The Project is **PDP EXEMPT**. Site design and source control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance. ○ Yes ○ No

4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control and structural pollutant control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance on determining if the project requires hydromodification plan management. ◉ Yes ○ No

Brian K. Oliver
Name of Owner or Agent

Brian Oliver
Signature

Vice President, Land Development
Title

01/20/2022
Date

CLEAR FORM

Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: ARE Science Village	
Permit Application Number: PTS #: 647676	Date: 02-15-2022

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 the manual 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 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, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, 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:		

Project Name: ARE Science Village

Form I-1 Page 2 of 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 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 (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the 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 not apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the 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 not apply:		

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Project Name: ARE Science Village

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	ARE Science Village
Project Address	9393 Towne Center Drive, San Diego, CA 92121
Assessor's Parcel Number(s) (APN(s))	343-200-04, 343-200-05
Permit Application Number	PTS #: 647676
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)	906.40 Penasquitos, Miramar, Undefined
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	3.97 acres (gross) Acres (169499 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.89 Acres (169499 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	3.7 Acres (161024 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.19 Acres (8475 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	74 %

Project Name: ARE Science Village

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

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

- [x] Existing development
- [ ] Previously graded but not built out
- [ ] Agricultural or other non-impervious use
- [ ] Vacant, undeveloped/natural

Description / Additional Information:

The site is currently occupied by office buildings and parking area.

Existing Land Cover Includes (select all that apply):

- [x] Vegetative Cover
- [ ] Non-Vegetated Pervious Areas
- [x] Impervious Areas

Description / Additional Information:

Landscape area exists around the perimeter of the site and within medians in the parking area.
the impervious area consists of sidewalks, hardscapes, parking lots, driveways, and roofs

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

- [ ] NRCS Type A
- [ ] NRCS Type B
- [ ] NRCS Type C
- [x] NRCS Type D

Approximate Depth to Groundwater:

- [ ] Groundwater Depth < 5 feet
- [ ] 5 feet < Groundwater Depth < 10 feet
- [ ] 10 feet < Groundwater Depth < 20 feet
- [ ] Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- [ ] Watercourses
- [ ] Seeps
- [ ] Springs
- [ ] Wetlands
- [x] None

Description / Additional Information:

There are no 'natural' hydrologic features found on the site.

Project Name: ARE Science Village

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.
Descriptions/Additional Information
1. The existing drainage system is entirely urban. 2. Offsite flows are not anticipated to enter the project area. 3. The existing drainage network consists of catch basins and area drains which collect runoff from the existing parking area and roof area. 4. Runoff collected by the existing drainage system is conveyed to the southwest corner of the property where it is discharged to a public main with Executive Drive through an 18" RCP. Existing site runoff to this discharge point is expected to be ~14.7 CFS.

Project Name: ARE Science Village

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 to demolish the current structure at 9393 Towne Centre Drive and construct a new sub-terranean parking structure with surface level office space.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Roofs, hardscape, driveways
List/describe proposed pervious features of the project (e.g., landscape areas): Landscape areas, turf areas
Does the project include grading and changes to site topography? ☐ Yes ☐ No Description / Additional Information:

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 parking structure will be constructed close to the property lines on all sides of the project. The majority of runoff will be collected from the roof of the structure. Proposed storm drain around the perimeter of the site will collect the remaining runoff which will confluence with the roof top runoff and flow through the onsite HMP vault and Water Quality treatment facility (Modular Wetland units) at southeast corner then leave the site to the public storm drain on Executive Drive.

One (1) DMA is delineated around the project boundary line within which the site grading can collect and route the storm water runoff to the downstream Pollutant Control and HMP facilities.

After being detained, runoff from detention structures discharges the site through an 18” RCP storm drain in the southeast corner of the property. This is discharge point is consistent with the existing condition.

There are also improvements (sidewalks & landscapes) occurred along the west and south edge of the project boundary within the public Right of Way. These improvements are considered as Public Improvements and subject to City's Green Street requirement. The Public Improvement work is not included in this report.

Project Name: ARE Science Village

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):

- ☑ Onsite storm drain inlets
- ☑ Interior floor drains and elevator shaft sump pumps
- ☑ Interior parking garages
- ☑ Need for future indoor & structural pest control
- ☑ Landscape/outdoor pesticide use
- ☐ Pools, spas, ponds, decorative fountains, and other water features
- ☑ Food service
- ☑ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and equipment cleaning
- ☐ Vehicle/equipment repair and maintenance
- ☐ Fuel dispensing areas
- ☐ Loading docks
- ☑ Fire sprinkler test water
- ☑ Miscellaneous drain or wash water
- ☑ Plazas, sidewalks, and parking lots

Description/Additional Information:

Project Name: ARE Science Village

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) After entering the public storm drain system project site runoff is conveyed south to Rose Creek. Rose Creek flows southwards before discharging into Mission Bay. Mission Bay discharges to the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Rose Creek - COLD, IND, REC1, REC2, WARM, WILD Mission Bay - COMM, EST, IND, MAR, MIGR, RARE, REC1, REC2, SHELL, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations None
Provide distance from project outfall location to impaired or sensitive receiving waters Approximately 1 mile
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 0.5 miles north of the project a section of Sorrento Valley Canyon is an environmentally sensitive land

Project Name: ARE Science Village

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 (Refer to Appendix K)	**Pollutant(s)/Stressor(s) (Refer to Appendix K)**	**TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)**
Rose Creek	Benthic community effects	Bacteria
	Selenium, Toxicity	
Mission Bay	Mercury, PCBs Eutrophic	Sediment
	Lead, Indicator 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 Appendix B.6):			
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: ARE Science Village

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ Yes, hydromodification management flow control structural BMPs required.

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

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

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

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

Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.

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

Discussion / Additional Information:

Per WMAA maps the critical coarse sediment areas do not exist on site or in any upstream areas.

Project Name: ARE Science Village

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.   One POC exists for the project. POC-1 is located in the southwest corner of the property where the private storm drain connect to the public storm drain within Executive Drive.
Has a geomorphic assessment been performed for the receiving channel(s)?   ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)   ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

Project Name: ARE Science Village

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.
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.

Project Name: ARE Science Village

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

All development projects must implement source control BMPs 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?		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.3 not implemented: The project does not propose outdoor material storage areas			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.4 not implemented: The project does not propose outdoor work areas			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented:			

Project Name: ARE Science Village

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 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 Facilities	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name: ARE Science Village

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

All development projects must implement site design BMPs 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?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented: Natural drainage pathways or hydrologic features do not currently exist on site.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☐ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.2 not implemented:			

Project Name: ARE Science Village

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☑ Yes	☐ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☑ Yes	☐ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☑ Yes	☐ No	☐ N/A

Project Name: ARE Science Village

Form I-5B Page 3 of 4				
Site Design Requirement		Applied?		
4.3.6 Runoff Collection		☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented: The project is not anticipated to have adequate need for runoff collection to make it practical				
6a-1	Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
6a-2	Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
6b-1	Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
6b-2	Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species		☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:				
4.3.8 Harvest and Use Precipitation		☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: The project is not anticipated to have adequate need for harvest and reuse to make it practical				
8-1	Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
8-2	Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A

Project Name: ARE Science Village

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

Project Name: ARE Science Village

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.

The DMA boundary delineation takes account the site topo and grading and include all areas (onsite and offsite) that hydraulically connect to the proposed BMP. One (1) DMA was defined and the runoff/runon were conveyed /collected by overland flow or storm drains/inlets onsite. All storm water then will be detained/treated by the proposed underground vault and Modular Wetlands.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 6

(Continued from page 1)

STEP 1:
1a: After delineating the DMAs, break down pervious and impervious area.
1b: DCV for DMAs were calculated using worksheet B.2-1
STEP 2:
2a: Harvest and use is infeasible according to Form I-7.
STEP 3:
3a: Using Form I-8 or infiltration letter to conduct a feasibility screening determined that no infiltration to be feasible.
3b: Site conditions allows the implementation of Compact Biofiltration BMPs, under ground storage tanks. County's BMP Sizing Spreadsheet V3.1 was utilized for HMP volume sizing. Compute the DCV drawdown time. Select the value of Fraction of DCV per drawdown time and Figure B.4-1. The BMP is also sized to treat 1.5 DCV.
STEP 4:
4a: Project meets pollutant control standards.
STEP 5:
5a: N/A
STEP 6: SWQMP prepared as step 6.
STEP 7:Maintenance agreements associated with this project are also attached in this SWQMP

The large footprint of the proposed structure and underground parking structure presented a constraint on the type of stormwater BMPs the project would be able to use. Water quality basins would require too large a footprint than the building design would allow. For that reason, underground storage vaults with Modular Wetland systems for treatment have been selected.

Project Name: ARE Science Village

Form I-6 Page 3 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BF-3-1	
Construction Plan Sheet No. C200	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below) BF-3-1 Compact Biofiltration BMP (MWS unit)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Brian Oliver, PE 9755 Clairemont Mesa Blvd San Diego, CA 92124 858.614.5000 RCE 45045
Who will be the final owner of this BMP?	ARE-SD Region No. 44, LLC 10996 Torreyana Rd, Suite 250 San Diego, CA 92121 (858) 638-2800
Who will maintain this BMP into perpetuity?	ARE-SD Region No. 44, LLC 10996 Torreyana Rd, Suite 250 San Diego, CA 92121 (858) 638-2800
What is the funding mechanism for maintenance?	Owners on-going maintenance funding

Form I-6 Page 4 of 6 (Copy as many as needed)
Structural BMP ID No. BF-3-1
Construction Plan Sheet No. C200
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BF-3-1 is located downstream of proposed vault-1 and is volume-based Modular Wetland. It has treatment capacity of 18000cf.

Project Name: ARE Science Village

Form I-6 Page 5 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. Vault-1	
Construction Plan Sheet No. C200	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Brian Oliver, PE 9755 Clairemont Mesa Blvd San Diego, CA 92124 858.614.5000 RCE 45045
Who will be the final owner of this BMP?	ARE-SD Region No. 44, LLC 10996 Torreyana Rd, Suite 250 San Diego, CA 92121 (858) 638-2800
Who will maintain this BMP into perpetuity?	ARE-SD Region No. 44, LLC 10996 Torreyana Rd, Suite 250 San Diego, CA 92121 (858) 638-2800
What is the funding mechanism for maintenance?	Owners on-going maintenance funding

Project Name: ARE Science Village

Form I-6 Page 6 of 6 (Copy as many as needed)
Structural BMP ID No. Vault-1
Construction Plan Sheet No. C200
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): The underground Vault-1 is sized by using County's BMP Sizing Sheet v3.1 to satisfy HMP requirements as well as store the water quality volume for downstream pollutant control BMPs (Modular Wetland units). It provides 18000cf HMP/WQ volume and additional 5000cf flood control volume.

Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: ARE Science Village

Indicate which Items are Included:

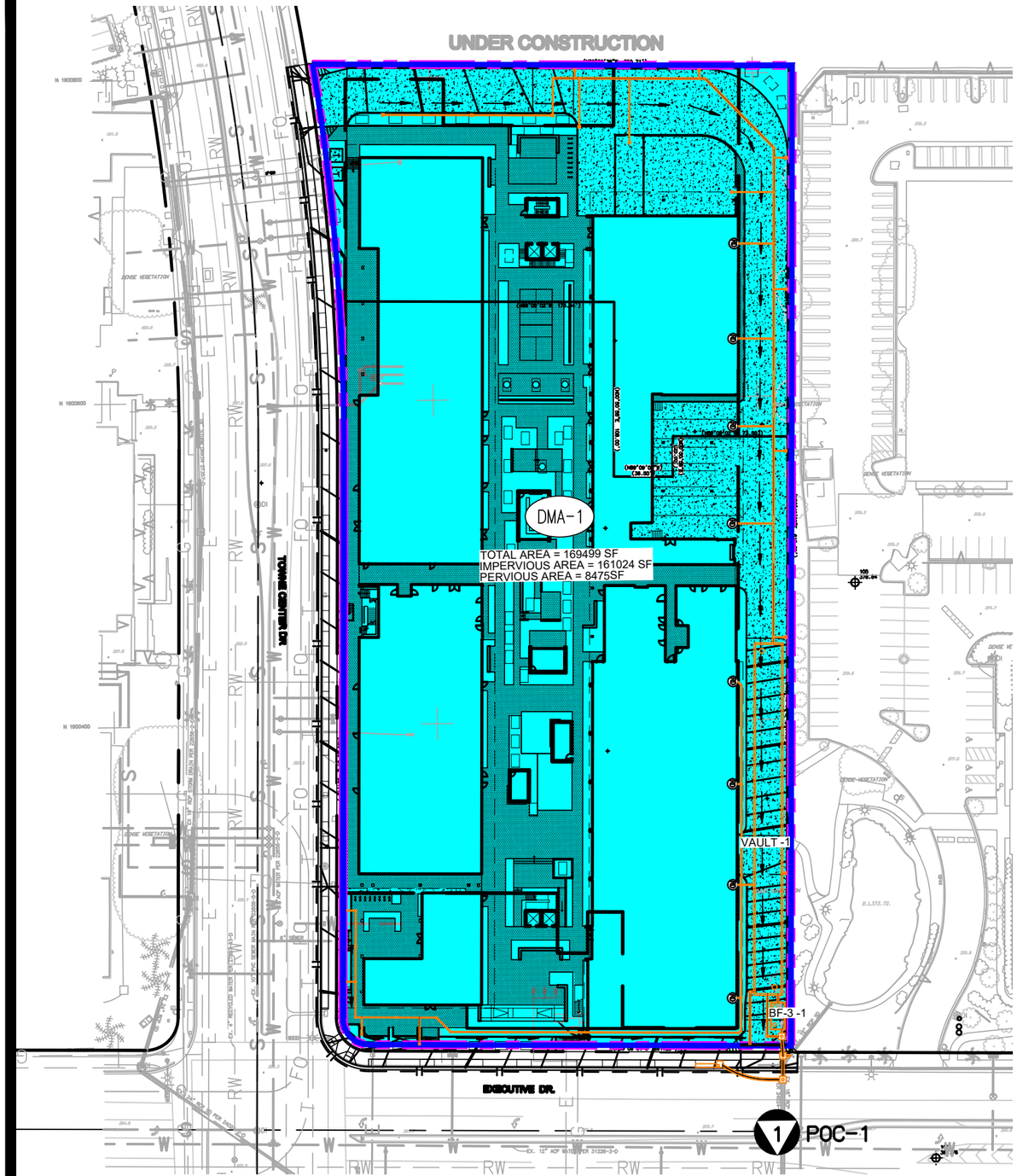
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☐ Included 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	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ 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: ARE Science Village

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

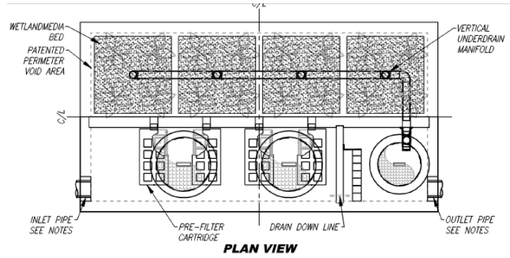
The DMA Exhibit must identify:

- ☑ 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, size/detail, and include cross-section)

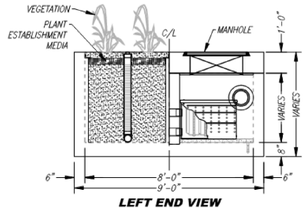


LEGEND

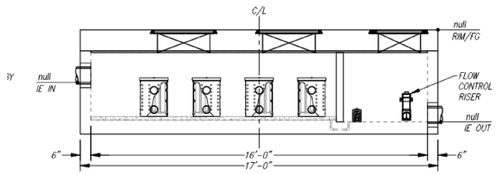
DMA BOUNDARY	PROPOSED STORM DRAIN
DMA ID (DMA-X)	EXISTING STORM DRAIN
BMP ID (BF-X)	POC (1)
FLOW DIRECTION	DMA 1
	PROJECT BOUNDARY



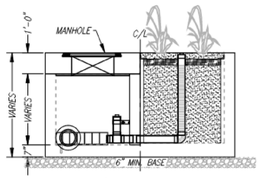
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

SITE DESIGN BMPS (APPLY TO THE ENTIRE PROJECT)

1. CONSERVE NATURAL AREAS (4.3.2)
2. MINIMIZE IMPERVIOUS AREAS (4.3.3)
3. MINIMIZE SOIL COMPACTION (4.3.4)
4. RUNOFF COLLECTION (4.3.6)
5. LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES (4.3.7)

NOTES

1. NO NATURAL HYDROLOGIC FEATURES CURRENTLY EXIST ON SITE.
2. ALL SOILS URBAN LANDS SOIL TYPE "D".
3. GROUNDWATER DEPTH EXCEEDS 20 FEET.
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS EXIST ON SITE.
5. REFER TO ATTACHMENT 1B FOR DMA SUMMARY.

SOURCE CONTROL BMPS (APPLY TO THE ENTIRE PROJECT)

1. PREVENTION OF ILLICIT DISCHARGES INTO MS4 (4.2.1) (SC-A)
2. STORM DRAIN STENCILING OR SIGNAGE (4.2.2)
3. PLAZAS, SIDEWALKS, PARKING LOTS (4.2.6) (SC-P)

SCALE 1"=80'

80 40 0 80

SCALE: 1"=80'

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

ARE Science Village
DMA/HMP EXHIBIT

Attachment 1b

Tabular Summary of DMAs

DMA 1 AREA BREAKDOWN

Surface Type	Runoff Factor	Surface Area (ac)	Factored Area (ac)
Roofs/Pavements	0.9	3.70	3.33
Unit Pavers (Grouted)	0.9	0	0
Decomposed Granite	0.3	0	0
Cobbles or Crushed Aggregate	0.3	0	0
Amended, Mulched Soils or Landscape	0.1	0.19	0.019
Compacted Soils	0.3	0	0

Total Factored Area	3.35
Total Area	3.89
% Imp	95.00
Factored 'C' Value	0.86
DMA Type	Drains to BMP

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Attachment 1c

Form I-7, Harvest and Use Feasibility Screening Checklist

Worksheet B.3-1: Harvest and Use Feasibility Screening

Harvest and Use Feasibility Screening	Worksksheet B.3-1

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
   - ☐ Toilet and urinal flushing
   - ☒ Landscape irrigation
   - ☐ Other:_____

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

0.23AC * 1470 g/AC = 338 gallons
338 gallons = 45 cubic feet

3. Calculate the DCV using worksheet B-2.1.
[Provide a results here]

DCV = 6429 cubic feet

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

Note: 36-hour demand calculations are for feasibility analysis only, once the feasibility analysis is complete the applicant may be allowed to use a different drawdown time provided they meet the 80 percent of average annual (long term) runoff volume performance standard.

Attachment 1d

Infiltration Feasibility Information

INFILTRATION
FEASIBILITY CONDITION LETTER

PODIUM 93
9363, 9373, AND 9393
TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA®

JUNE 19, 2020
PROJECT NO. G2101-52-01

Project No. G2101-52-01
June 19, 2020

Alexandria Real Estate Equities
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Michael D'Ambrosia

Subject: INFILTRATION FEASIBILITY CONDITION LETTER
PODIUM 93
9363, 9373, AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Podium 93, 9363, 9373 and 9393 Towne Centre Drive, San Diego, California*, prepared by Geocon Incorporated, dated July 11, 2017 (Project No. G2101-52-01).
2. *Update Geotechnical Letter, Podium 93, 9363, 9373 and 9393 Towne Centre Drive, San Diego, California*, prepared by Geocon Incorporated, dated September 5, 2019 (Project No. G2101-52-01).
3. *Grading Plans for: Podium 93, 9393 Towne Centre Drive, San Diego, California*, prepared by Michael Baker International, dated August 14, 2019 (Project No. 19128, Sheets C-1.0 and C-2.0).
4. *Site Plan and Building Section for Podium 93, 9393 Towne Centre Drive, San Diego, California*, prepared by DGA, received on September 4, 2019.

Dear Mr. D'Ambrosia:

In accordance with your request and to respond to City of San Diego review comments, we prepared this report regarding storm water management for the subject project. Previous recommendations specific to storm water management, as well as a summary of expected soil conditions, are provided in the referenced geotechnical reports. Due to the presence of compacted fills, we are recommending the site be classified as a "No Infiltration" condition.

PREVIOUS GRADING

The subject site is located at the northeast corner of Towne Centre Drive and Executive Drive in the University Towne Center area of the City of San Diego, California (see Vicinity Map, Figure 1). Our fieldwork indicates the site is underlain by previously placed fill overlying Very Old Paralic Deposits and the Scripps Formation (See Geologic Map, Figure 2 and Geologic Cross-section, Figure 3). The area below the southeastern portion of the property was previously underlain by a finger of a canyon that sloped from approximate elevation 385 feet MSL near the center of existing Building 3 down to

about elevation 350 feet MSL at the southeast corner of the property. We assume that the area below the southeast corner of existing Building 3 was removed of surficial soil and alluvium prior to filling in the canyon, but we do not have documentation of the previous grading operations at this time. We estimate that the southeast corner of the property may be underlain by as much as 35 feet of fill. The previously placed fill consists of medium dense, damp to moist, brown to reddish brown, silty to clayey, fine to coarse sand. The fill materials located outside the limits of the proposed structure are adequate to support surface improvements and additional fill; however, the upper 1 to 2 feet would require remedial grading.

SITE AND PROJECT DESCRIPTION

The site consists of Lots 4 and 5 of Parcel 011876. The total area of both parcels is approximately 3.97 acres and currently consists of three, two-story office buildings which are connected below grade by one continuous level of subterranean parking. The buildings were constructed around 1989. Building 1 is located at the north end of the site, Building 2 is located along the western side, and Building 3 is located at the southern end. Buildings 2 and 3 are connected above grade by a two-story lobby. Surface parking exists east of Building 2 on the roof of the subterranean parking level. Access to the parking garage is provided from a driveway at the southeast corner of Building 3 on Executive Drive and from a ramp from the surface parking at the southeast corner of Building 1. The finish floor elevations of the existing buildings are unknown. The subterranean level finish floor is approximately 11 feet below the main level finish floor. The existing grade adjacent to the buildings range from approximate elevation 400 feet above Mean Sea Level (MSL) at the northwest corner of Building 1 to about 385 feet MSL at the southeast corner of Building 3. Grades at the south and west sides of Building 3 descend from the building edge to the streets below about 15 feet, and the grade at the western edge of Building 2 descends to the street up to 5 feet. The grades at the western and northern edges of Building 3 ascend toward the street and property to the north up to 3 and 8 feet, respectively. The eastern edge of the site descends toward the adjacent parking lot approximately 6 feet. An existing pond is located on the neighboring property about 30 feet east of Building 3.

We understand, based on the referenced plans, that the proposed project consists of demolishing the existing office buildings and subterranean parking garage and constructing two new office buildings overlying 5 levels of subterranean parking garage. The northern office building will be 8 stories, and the southern office building will be 6 stories. Several mechanical yards will be located at the northern edge of the site. We understand the office buildings and mechanical yards will be supported entirely on the parking structure. Access to the parking structure will be from Executive Drive near the southeast corner of the site and from Towne Centre Drive near the northwest corner of the site. The finish floor elevation for the lowest level of subterranean parking is planned at elevation 333 feet above Mean Sea Level (MSL). The first floor building finish floor elevations are planned to be approximately 397.5 feet MSL. We assume cuts on the order of 75 feet will be required for the parking garage and foundation excavations.

PREVIOUS GEOTECHNICAL STUDIES

The site was originally analyzed for infiltration in 2017 during our geotechnical report (Reference 1) during preliminary design. We prepared an update geotechnical letter in 2019 (Reference 2) to update our recommendations for the referenced grading and site plans (References 3 and 4). The site is underlain by previously placed fill and Very Old Paralic Deposits overlying Scripps Formation. A Geologic Map and cross-sections are presented on Figures 2 and 3.

Below is the specific information requested from Section C.1.1 of the City's Storm Water Standards.

- **The Phase of the Project In which the geotechnical engineer first analyzed the site for infiltration feasibility:**

  The current design is for preliminary evaluation (discretionary).

- **Results of previous geotechnical analyses conducted in the project area, if any.**

  See discussion herein and Reference 1.

- **The development status of the site prior to the project application.**

  The property was previously graded to fill in a canyon on the southeast side of the site. The property currently consists of three, two-story office buildings which are connected below grade by one continuous level of subterranean parking, which was constructed around 1989.

- **The history of design discussion for the project footprint, resulting the final design determination.**

  Based on discussions with the project civil engineer, the BMP location is set to maintain existing drainage patterns and is located at applicable points on the property.

  A majority of the site possesses a subtrerranean garage. The proposed project would extend the subterranean garage deeper up to about 5 levels. Therefore, infiltration would not be feasible on the site.

- **Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.**

  New utilities will be constructed within the site boundaries, and existing utilities are located within the adjacent public right-of-way and roadways. Full or partial infiltration should not be allowed in the areas of the utilities to help prevent potential damage/distress to improvements. Mitigation measures to prevent water from infiltrating the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners. The horizontal and vertical setbacks for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility, respectively.

  Existing commercial structures exist near the northern and eastern edges of the site. The property to the east possesses a retaining wall and is at a lower elevation than the subject

property. Existing roadways border the western and southern edges of the site. An existing building with one level of subterranean parking currently sits within the site. A planned building with 5 levels of subterranean parking is planned on the site. Water should not be allowed to infiltrate in areas where it could affect the existing or proposed subterranean garage retaining walls, neighboring properties, or proposed roadways. Water should not be allowed to infiltrate within a lateral distance of at least 10 feet from the existing roadways and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent building foundations.

- **Physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.**

  There are existing improvements and structures located adjacent to the property margin. Infiltration near these structures and improvements should not be allowed.

- **Consideration of site design alternative to achieve partial/full infiltration within the DMA.**

  Based on the existing topography, existing fill materials and subterranean garage levels, the BMPs would be required to not allow infiltration.

- **The extent site design BMPs requirements were included in the overall design.**

  BMPs are being incorporated into the site design for storm water management.

- **Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.**

  The property is mostly occupied by an existing building with subterranean levels. In addition, the southeast potion of the site possesses fill materials that are thicker than 5 feet. The eastern side of the site descends to the neighboring property where a retaining wall exists. Based the discussion herein, we opine full and partial infiltration is considered infeasible at the site, and we recommend storm water management BMPs be designed so that infiltration does not occur.

- **An Exhibit for all applicable DMA's that clearly labels:**

  - **Proposed development areas and development type.**

  - **All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.**

  - **Potential locations for structural BMPs.**

  - **Areas where full/partial infiltration BMPs cannot be proposed.**

  The Geologic Map, Figure 2, presents the grading plan as a base map. The figure shows the development area and proposed buildings and improvements. We did not include setbacks on the map due to the existing conditions and our opinion that the entire project site is infeasible for infiltration.

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

Very truly yours,

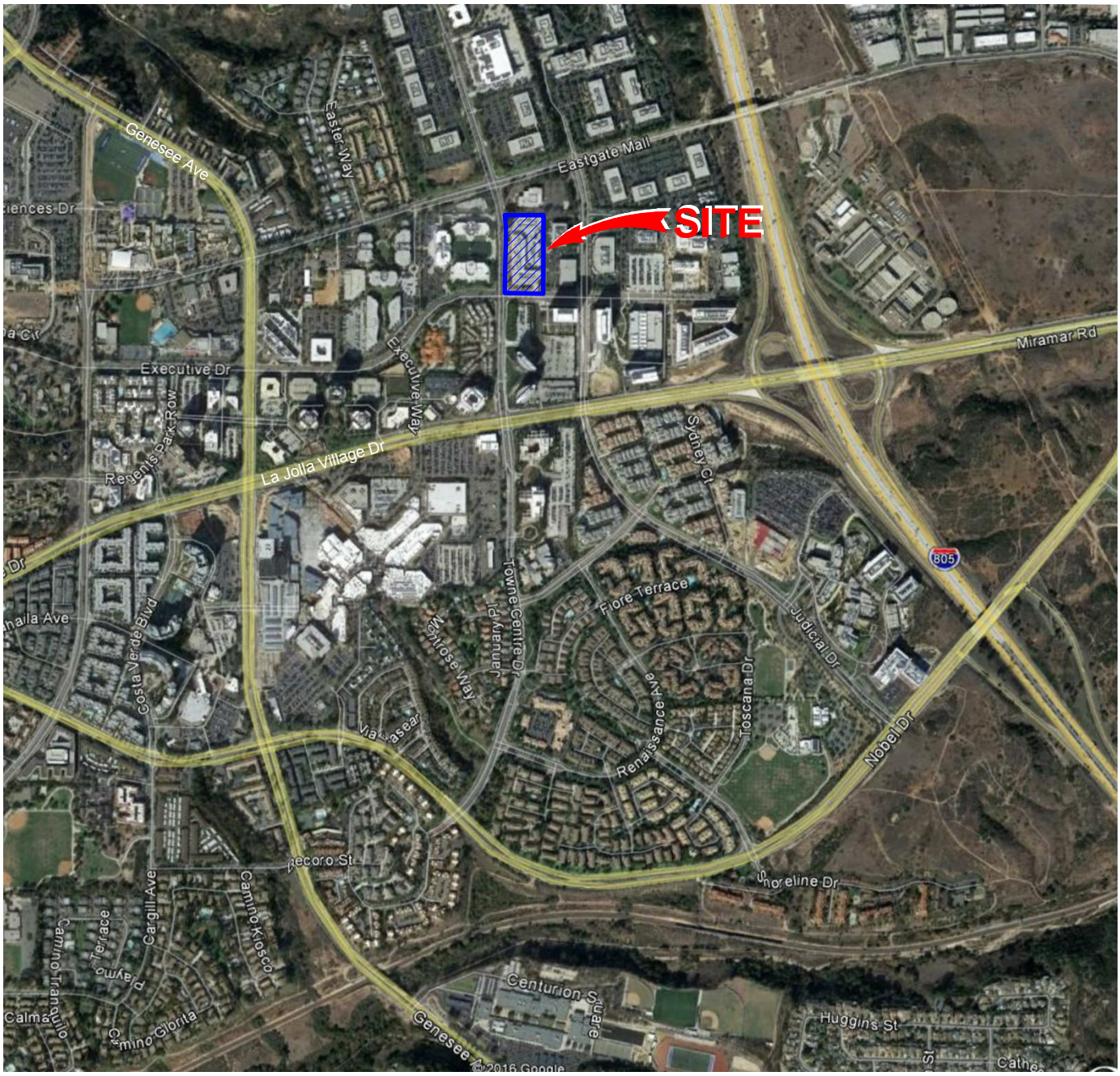
GEOCON INCORPORATED

Shawn Foy Weedon
GE 2714

SFW:arm

Enclosures: Figures 1 through 3

(e-mail) Addressee
(e-mail) DGA
Attention: Kyle Duvernay
(e-mail) Michael Baker International
Attention: Brian Oliver



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N

NO SCALE

VICINITY MAP

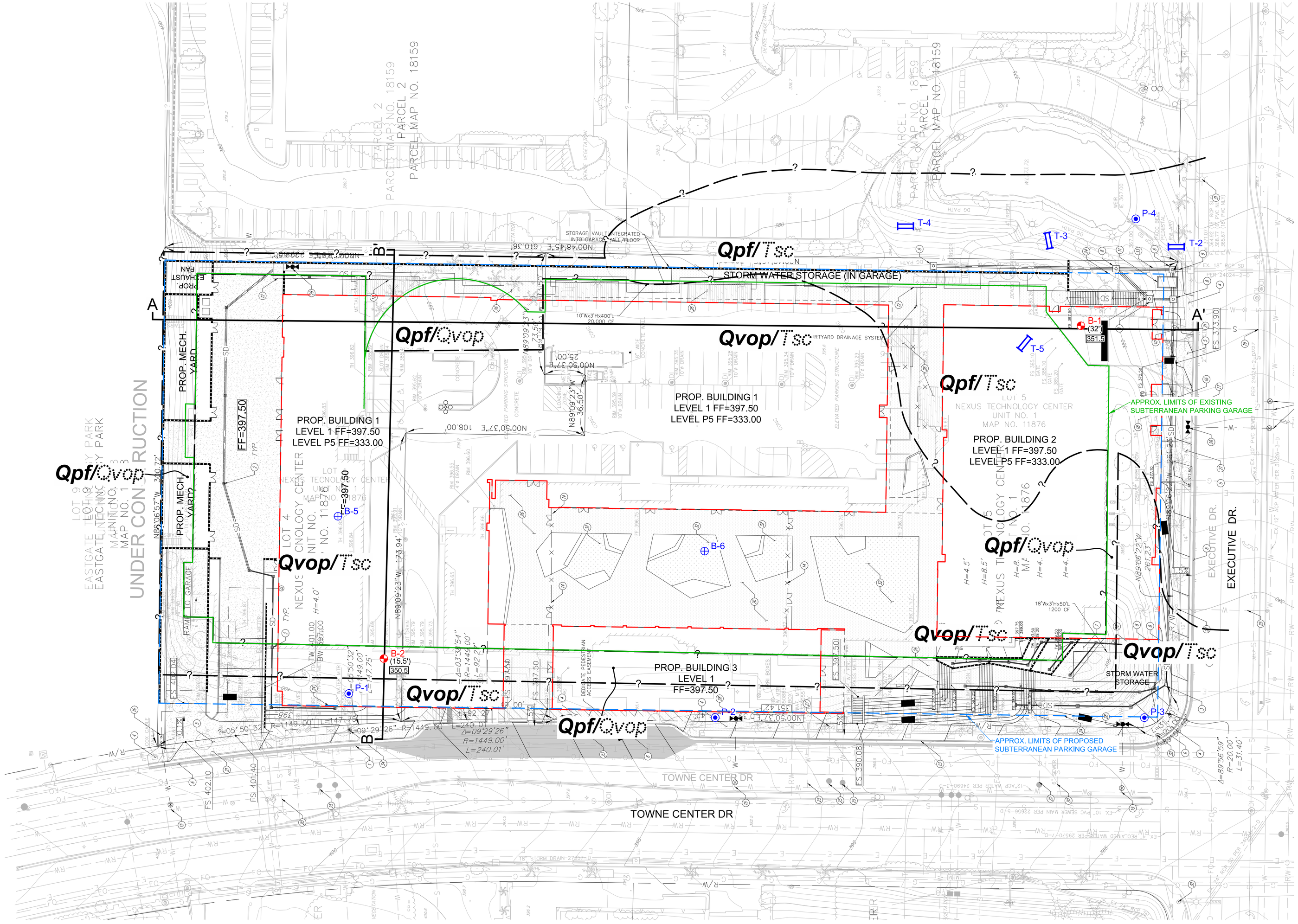
GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PODIUM 93
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

KJ / AML		DSK/GTYPD

DATE 06-18-2020	PROJECT NO. G2101 - 52 - 01	FIG. 1

Plotted:09/17/2019 10:17AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2101-52-01 (Podium 93)\DETAILS\G2101-52-01 Vic Map.dwg



GEOCON LEGEND

- **Qpf** .....PREVIOUSLY PLACED FILL
- **Qvop** .....VERY OLD PARALIC DEPOSITS (Dotted Where Buried)
- **Tsc** .....SCRIPPS FORMATION (Dotted Where Buried)
- .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- B-2 .....APPROX. LOCATION OF BORING
- P-4 .....APPROX. LOCATION OF INFILTRATION TEST
- B-5 & B-6 .....APPROX. LOCATION OF PREVIOUS BORING (Geocon, 1985)
- T-2 - T-5 .....APPROX. LOCATION OF PREVIOUS TRENCH (Geocon, 1985)
- (32') .....APPROX. DEPTH TO FORMATION BELOW EXISTING GRADE (In Feet, MSL)
- 351.5 .....APPROX. ELEVATION OF FORMATION (In Feet, MSL)
- A — A' .....GEOTECHNICAL CROSS - SECTION

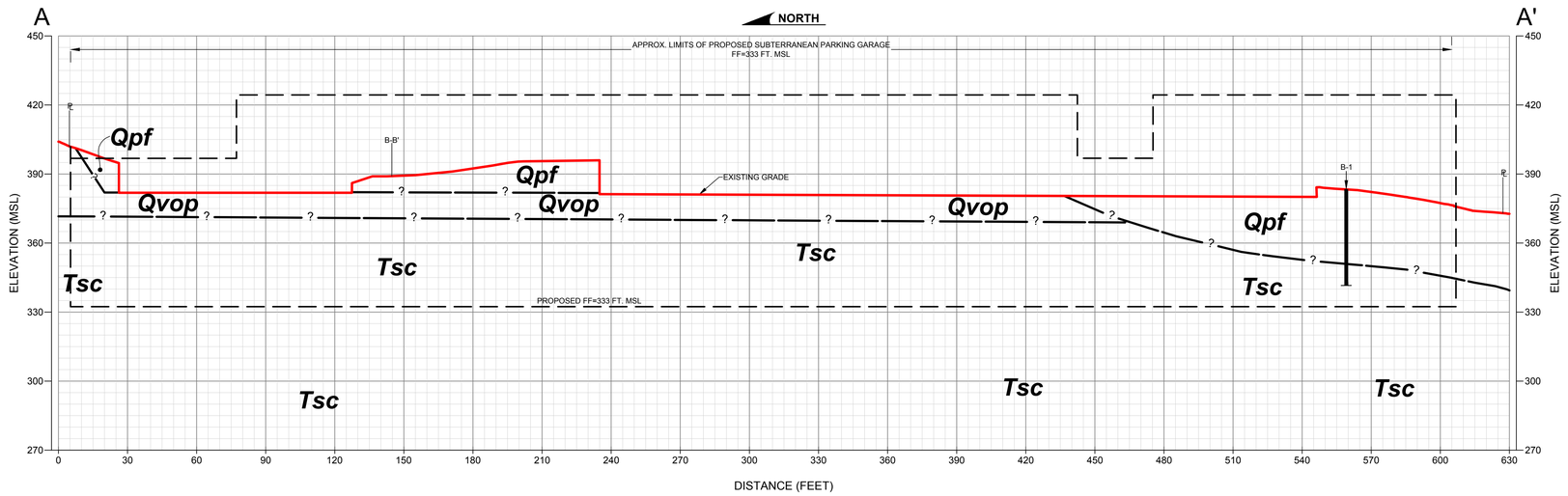
GEOLOGIC MAP

PODIUM 93
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

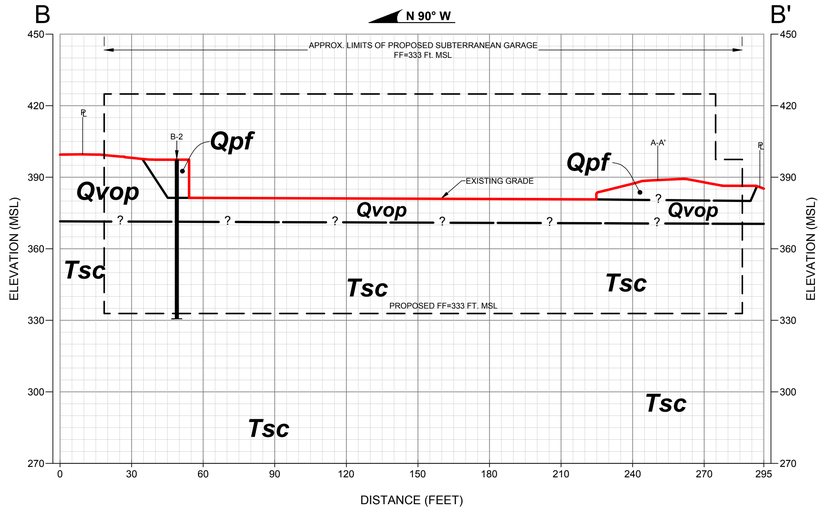
SCALE	1" = 30'	DATE	06-18-2020
PROJECT NO.	G2101 - 52 - 01	FIGURE	2
SHEET	1 OF 1		

Plotted:09/17/2019 10:10AM | By:ALVIN.LADRILLONO | File Location:Y:\PROJECTS\G2101-52-01 (Podium 93)\SHEETS\G2101-52-01 Geo Map.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

- ***Qpf*** .....PREVIOUSLY PLACED FILL
- ***Qvop*** .....VERY OLD PARALIC DEPOSITS
- ***Tsc*** .....SCRIPPS FORMATION
- B-2 .....APPROX. LOCATION OF GEOTECHNICAL BORING
- ? .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTION

PODIUM 93
9363, 9373 AND 9393 TOWN CENTER DRIVE
SAN DIEGO, CALIFORNIA

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PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 30'	DATE 06-18-2020		
PROJECT NO. G2101 - 52 - 01		FIGURE 3	
SHEET 1 OF 1			

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Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Podium 93 – 9363, 9373, and 9393 Towne Centre Drive	Design
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data include site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

The tested infiltration rates are as follows:
P-1: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-2: 0.003 inches/hour (0.0015 inches/hour including a factor of safety of 2).
P-3: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-4: 0.001 inches/hour (0.0005 inches/hour including a factor of safety of 2).

These result in an average of 0.004 inches/hour (0.002 inches/hour including a factor of safety of 2).

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A–1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☒ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☒ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☒ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☒ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☒ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☒ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☒ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☒ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☒ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☒ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No
Summarize findings and basis; provide references to related reports or exhibits.			
Part 1 Result – Full Infiltration Geotechnical Screening[12]		**Result**	
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.		☐ Full infiltration Condition ☒ Complete Part 2	

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Podium 93 – 9363, 9373, and 9393 Towne Centre Drive	Design

Criteria 3: Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3–1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.

Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).

The site is underlain by varying depths of fill overlying formational material. Infiltration should be considered infeasible within the existing fill soils.

The tested infiltration rates within the previously placed fill are as follows:
P-1: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-2: 0.003 inches/hour (0.0015 inches/hour including a factor of safety of 2).
P-3: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-4: 0.001 inches/hour (0.0005 inches/hour including a factor of safety of 2).

These result in an average of 0.004 inches/hour (0.002 inches/hour including a factor of safety of 2).

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 4B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A–1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No

Summarize findings and basis; provide references to related reports or exhibits.

The site is underlain by varying depths of fill overlying formational material. Infiltration should be considered infeasible within the existing fill soils.

The tested infiltration rates within the previously placed fill are as follows:
P-1: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-2: 0.003 inches/hour (0.0015 inches/hour including a factor of safety of 2).
P-3: 0.006 inches/hour (0.003 inches/hour including a factor of safety of 2).
P-4: 0.001 inches/hour (0.0005 inches/hour including a factor of safety of 2).

These result in an average of 0.004 inches/hour (0.002 inches/hour including a factor of safety of 2).

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

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

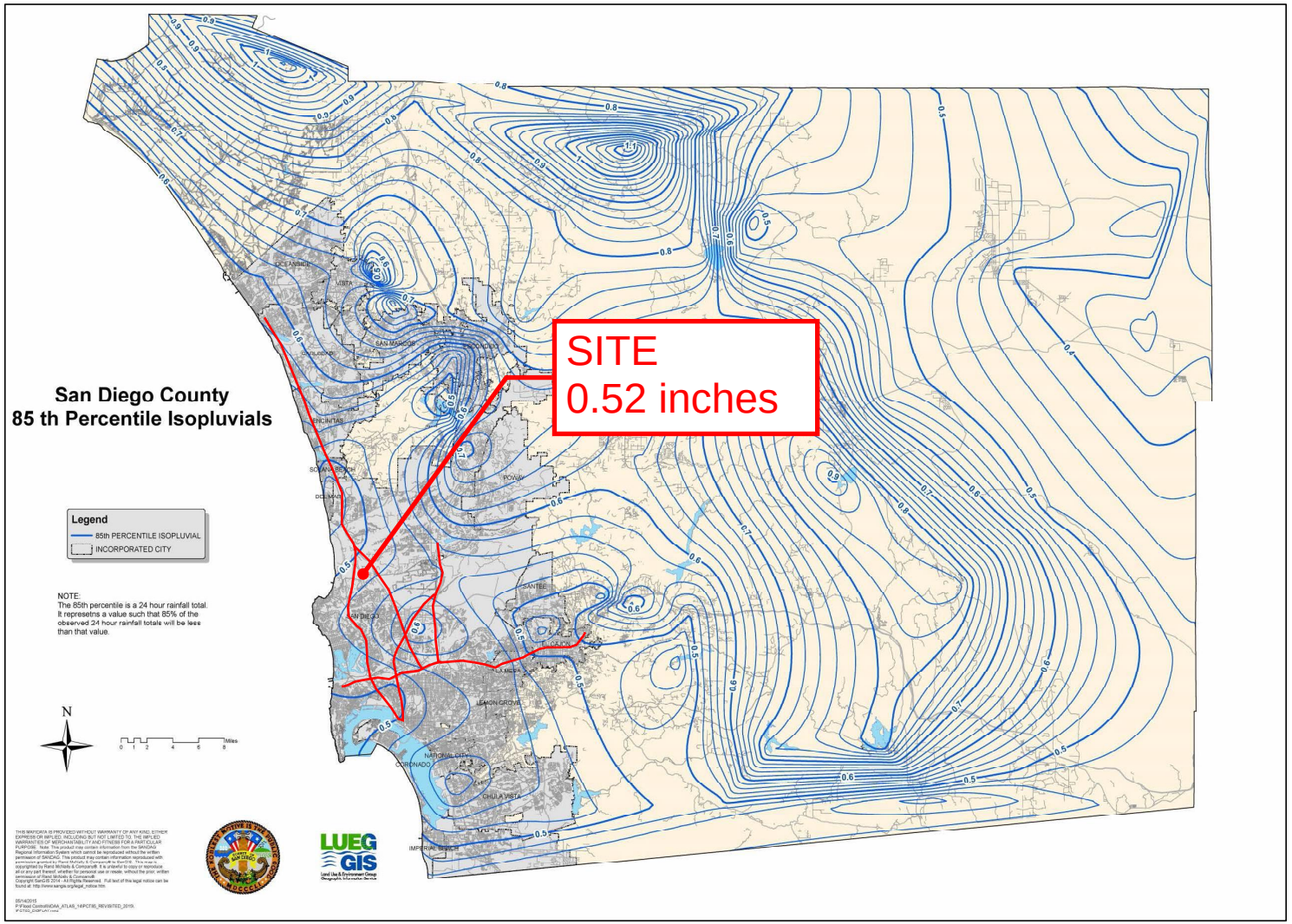

Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

Attachment 1e

Pollutant Control BMP Design Worksheets/Calculations

DCV for DMA-1 to be Treated by BF-3-1

Design Capture Volume		Worksheet B-2.1		
1	85th Percentile 24-hr storm depth from Figure B.1-1	d=	0.52	inches
2	Areas tributary to BMP(s)	A=	3.89	acres
3	Area weighted runoff factor (estimated using Appendix B.1.1 and B.2.1)	C=	0.86	unitless
4	Street Trees Reduction Volume	TCV=	0	cubic-feet
5	Rain Barrels Reduction Volume	RCV=	0	cubic-feet
6	Calculate DCV = (C x d x A) - TCV - RCV	DCV=	6317	cubic-feet

The City of SAN DIEGO	Project Name	ARE Science Village	
	BMP ID	BF-3-1	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	169499.00	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	85th percentile 24-hour rainfall depth	0.52	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	6317	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	145	cu. ft.

MWS Linear 2.0 Volume Based Sizing Calculations - *All States*

Model #	Physical Depth of Model from TC, FS, TC to INVERT OUT	Wetland Perimiter (ft)	**Wetland Chamber Max HGL Height (ft)	Wetland Surface Area (sq ft)	Treatment Capacity (cu ft) for Volume Based Design **VOLUME DESIGN**	
					24 Hour Drain Down	48 Hour Drain Down
MWS-L-4-4	4.13'	6.7	3.40	22.78	**1139.96**	**2279.93**
MWS-L-4-6	4.13'	9.4	3.40	31.96	**1599.35**	**3198.71**
MWS-L-4-8	4.13'	14.8	3.40	50.32	**2518.13**	
MWS-L-4-13	4.13'	18.4	3.40	62.56	**3130.65**	
MWS-L-4-15	4.13'	22.4	3.40	76.16	**3811.22**	
MWS-L-4-17	4.13'	26.4	3.40	89.76	**4491.80**	
MWS-L-4-19	4.13'	30.4	3.40	103.36	**5172.37**	
MWS-L-4-21	4.13'	34.4	3.40	116.96	**5852.95**	**11705.90**
MWS-L-8-12	4.13'	44.4	3.40	150.96	**7554.39**	**15108.78**
MWS-L-8-16	4.13'	59.2	3.40	201.28	**10072.52**	**20145.04**
MWS-L-8-20	4.13'	74.0	3.40	251.60	**12590.65**	**25181.30**
MWS-L-8-24	4.13'	88.8	3.40	301.92	**15108.78**	**30217.56**

Shallow or Deeper Units Available. Change in Height Will Affect Treatment Capacity

** Not the physical height of the unit but the max HGL in the system at peak treatment flow

Based on loading rate of 25 in/hr or 0.26 gpm/sq ft

Per Attachment 2, the vault provides 18000cf volume and draws down in 46hrs. Choose one (1) volume-based MWS-L-8-16 in downstream of the vault to satisfy the water quality requirement.

Target volume retention performance per unit:

Volume retained = media surface A * Media thickness (20in) * void ratio 0.48 = 161 cf > 145 cf

The retention requirement is met.

Modular Wetland Systems, Inc. **Copyright 2013** **www.modularwetlands.com**

info@modularwetlands.com **P: 760-433-7640** **2972 San Luis Rey Rd, Oceanside CA 92058**

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact 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.

Section 1: Biofiltration Criteria Checklist (Appendix F)

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.

Criteria	Answer	Progression
Criteria 1 and 3: 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. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	○ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

Worksheets B.5-2 and retention volume calculation have been provided.

Criteria	Answer	Progression
Criteria 2: Is the compact 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.2.2** to size the compact biofiltration 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 compact 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**. Compact biofiltration BMP is not allowed.

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).
See attached TAPE.

Criteria	Answer	Progression
Criteria 4: Does the compact 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 compact 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 compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact 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 compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.
See attached TAPE.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
<u>Criteria 5</u>: Is the compact 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 compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.
Provide basis for Criteria 5: Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process. See attached TAPE.		
Criteria	**Answer**	**Progression**
<u>Criteria 6</u>: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	○ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact 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 TAPE.		

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	○ Yes, and the compact 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 compact 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**. Compact 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. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.
See attached TAPE.

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

WASHINGTON STATE DEPARTMENT OF ECOLOGY

July 2017

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 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. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. 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:

<u>Laboratory Testing</u>

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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Oceanside, CA 92058
zach.kent@forterrabp.com

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
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

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 Pollutants 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:

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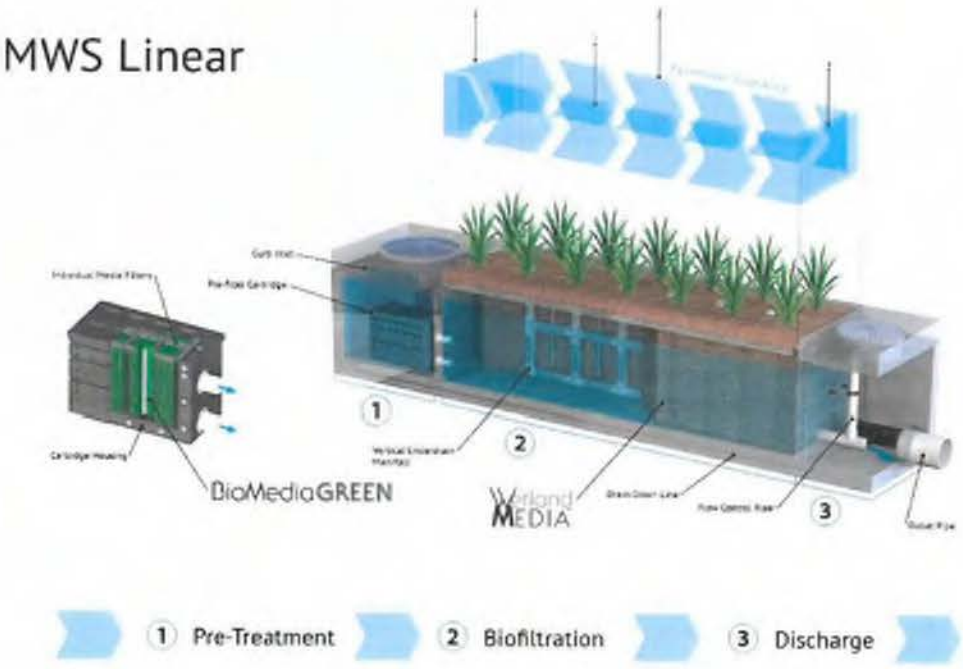
6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

    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

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TAPE PERFORMANCE SUMMARY

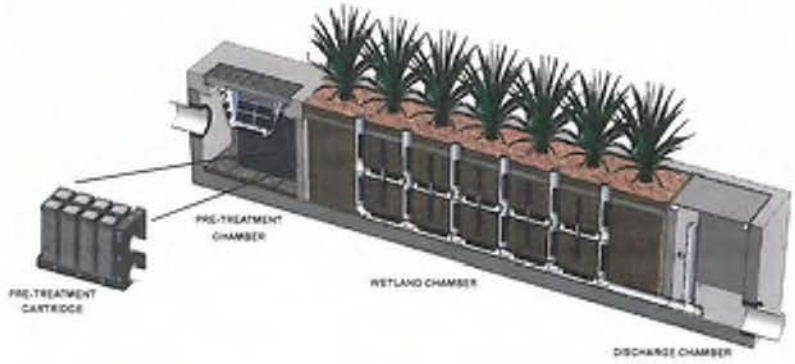
MWS-LINEAR 2.0

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.

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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

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.

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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.

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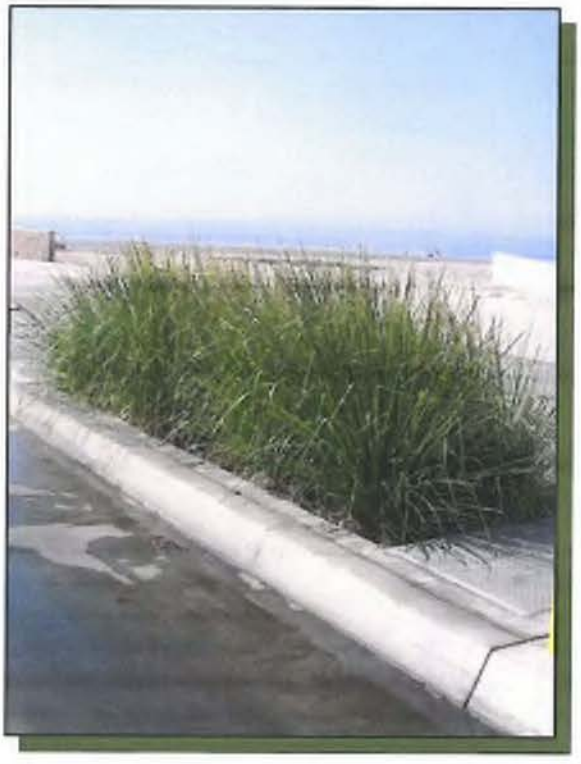
Trim Vegetation

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.



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Inspection Form

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Inspection Report
Modular Wetlands System

MODULAR WETLANDS

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: _____

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

MODULAR WETLANDS

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:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

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.

Project Name: ARE Science Village

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.	☑ Not Performed ☐ Included ☐ Submitted as separate 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

Project Name: ARE Science Village

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 OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
- ☑ 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).

Please refer to the Attachment 1a for HMP exhibit

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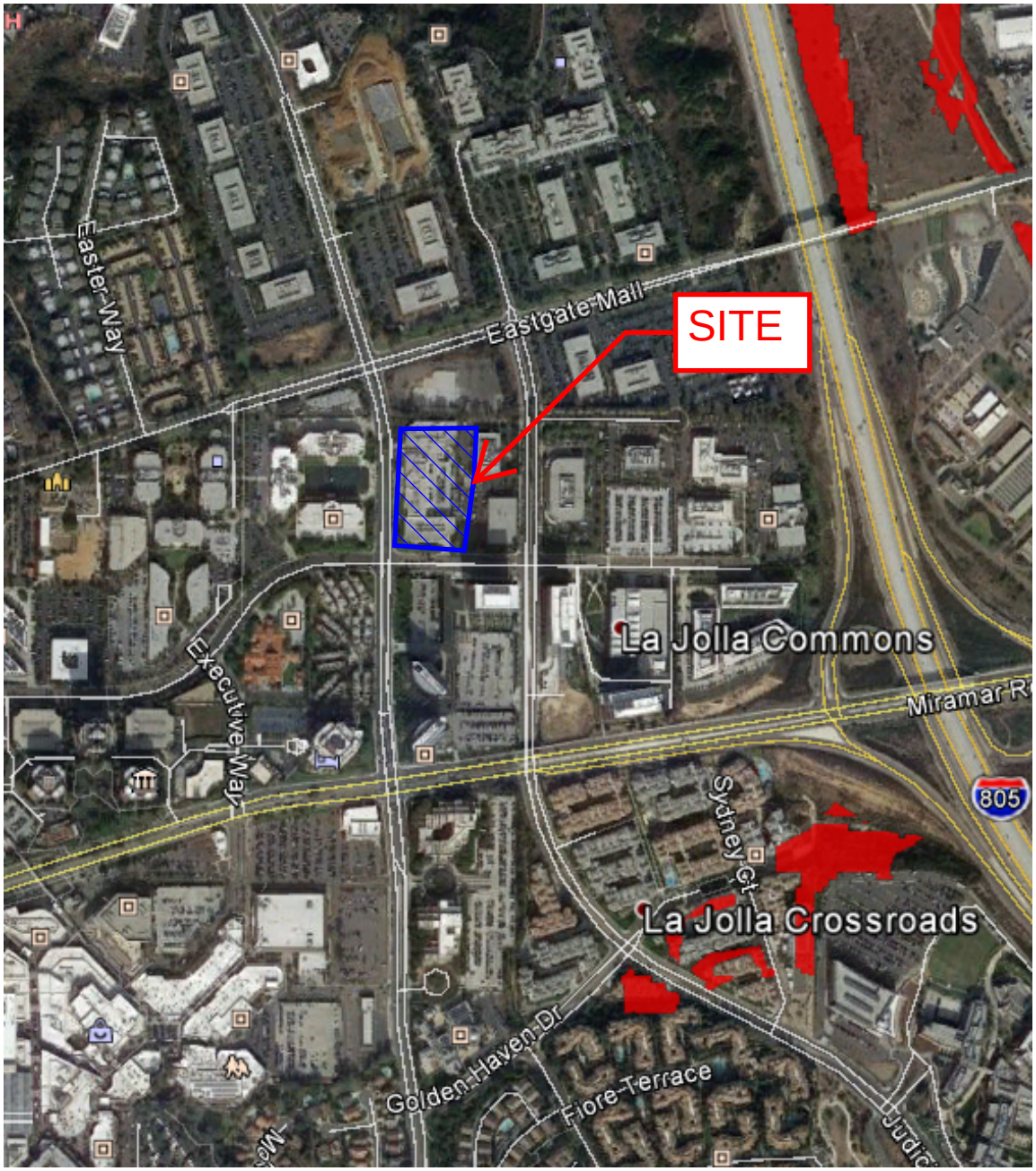
ATTACHMENT 2b
Critical Coarse Sediment Yield Areas



Legend

Areas of CCSY

Project Boundary

Michael Baker INTERNATIONAL

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

BMP Sizing Spreadsheet V3.1

Project Name:	ARE SCIENCE VILLAGE
Project Applicant:	MBI
Jurisdiction:	CITY OF SAN DIEGO
Parcel (APN):	
Hydrologic Unit:	
Rain Gauge:	Oceanside
Total Project Area (sf):	169,499
Channel Susceptibility:	High

BMP Sizing Spreadsheet V3.1			
Project Name:	ARE SCIENCE VILLAGE	Hydrologic Unit:	0
Project Applicant:	MBI	Rain Gauge:	Oceanside
Jurisdiction:	CITY OF SAN DIEGO	Total Project Area:	169,499
Parcel (APN):	0	Low Flow Threshold:	0.1Q2
BMP Name:	HMP Vault	BMP Type:	Cistern
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	NA

Areas Draining to BMP						HMP Sizing Factors	Minimum BMP Size
DMA Name	Area (sf)	Pre Project Soil Type	Pre-Project Slope	Post Project Surface Type	Area Weighted Runoff Factor (Table G.2-1)[1]	Volume	Volume (CF)
imp paving	161,024	D	Flat	Concrete	0.9	0.12	17391
permeable	8,475	D	Flat	Landscape	0.1	0.12	102
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
BMP Tributary Area	169,499					Minimum BMP Size	17492
						Proposed BMP Size*	18000

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	5.1	ft
Minimum Required Cistern Footprint)	3430	CF

Proposed HMP volume. The total vault-1 volume shall include additional 5000cf for detention purposes.

Depth correlated to the HMP volume.

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, May 2018. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V3.1			
Project Name:	ARE SCIENCE VILLAGE	Hydrologic Unit:	0
Project Applicant:	MBI	Rain Gauge:	Oceanside
Jurisdiction:	CITY OF SAN DIEGO	Total Project Area:	169,499
Parcel (APN):	0	Low Flow Threshold:	0.1Q2
BMP Name	HMP Vault	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition		Unit Runoff Ratio (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Slope				
imp paving	Oceanside	D	Flat	0.571	3.697	0.211	**2.58**
permeable	Oceanside	D	Flat	0.571	0.195	0.011	**0.14**

5.10	**0.222**	**2.72**	**1.86**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

Provide Hand Calc.	**0.222**	**2.72**	**1.860**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation

Vault 1 Drawdown @		5.1	ft =	43.8
Elevation	Q_{AVG} (CFS)	$\Delta V_{n, n+1}$ (CF)	ΔT (HR)	Total T
0.00	0.002	172.8	0.00	0.00
0.05	0.007	172.8	0.00	0.00
0.10	0.017	172.8	2.75	0.00
0.15	0.028	172.8	1.73	2.75
0.20	0.035	172.8	1.36	4.48
0.25	0.041	172.8	1.17	5.84
0.30	0.046	172.8	1.05	7.01
0.35	0.050	172.8	0.95	8.06
0.40	0.054	172.8	0.88	9.01
0.45	0.058	172.8	0.82	9.89
0.50	0.062	172.8	0.78	10.72
0.55	0.065	172.8	0.74	11.49
0.60	0.068	172.8	0.70	12.23
0.65	0.071	172.8	0.67	12.93
0.70	0.074	172.8	0.65	13.60
0.75	0.077	172.8	0.62	14.25
0.80	0.080	172.8	0.60	14.87
0.85	0.082	172.8	0.58	15.47
0.90	0.085	172.8	0.56	16.06
0.95	0.087	172.8	0.55	16.62
1.00	0.090	172.8	0.53	17.17
1.05	0.092	172.8	0.52	17.70
1.10	0.095	172.8	0.51	18.22
1.15	0.097	172.8	0.50	18.73
1.20	0.099	172.8	0.49	19.23
1.25	0.101	172.8	0.47	19.71
1.30	0.103	172.8	0.47	20.19
1.35	0.105	172.8	0.46	20.65
1.40	0.107	172.8	0.45	21.11
1.45	0.109	172.8	0.44	21.56
1.50	0.111	172.8	0.43	22.00
1.55	0.113	172.8	0.42	22.43
1.60	0.115	172.8	0.42	22.85
1.65	0.117	172.8	0.41	23.27
1.70	0.119	172.8	0.40	23.68
1.75	0.120	172.8	0.40	24.09
1.80	0.122	172.8	0.39	24.49
1.85	0.124	172.8	0.39	24.88
1.90	0.126	172.8	0.38	25.27
1.95	0.127	172.8	0.38	25.65
2.00	0.129	172.8	0.37	26.03
2.05	0.131	172.8	0.37	26.40
2.10	0.132	172.8	0.36	26.77
2.15	0.134	172.8	0.36	27.13
2.20	0.135	172.8	0.35	27.49
2.25	0.137	172.8	0.35	27.84
2.30	0.138	172.8	0.35	28.19
2.35	0.140	172.8	0.34	28.54
2.40	0.142	172.8	0.34	28.88
2.45	0.143	172.8	0.34	29.22
2.50	0.145	172.8	0.33	29.56
2.55	0.146	172.8	0.33	29.89
2.60	0.147	172.8	0.33	30.22
2.65	0.149	172.8	0.32	30.54
2.70	0.150	172.8	0.32	30.87
2.75	0.152	172.8	0.32	31.19
2.80	0.153	172.8	0.31	31.50
2.85	0.154	172.8	0.31	31.82
2.90	0.156	172.8	0.31	32.13
2.95	0.157	172.8	0.31	32.43
3.00	0.159	172.8	0.30	32.74
3.05	0.160	172.8	0.30	33.04
3.10	0.161	172.8	0.30	33.34
3.15	0.163	172.8	0.30	33.64
3.20	0.164	172.8	0.29	33.94
3.25	0.165	172.8	0.29	34.23
3.30	0.166	172.8	0.29	34.52
3.35	0.168	172.8	0.29	34.81
3.40	0.169	172.8	0.28	35.09
3.45	0.170	172.8	0.28	35.38
3.50	0.172	172.8	0.28	35.66
3.55	0.173	172.8	0.28	35.94
3.60	0.174	172.8	0.28	36.22
3.65	0.175	172.8	0.27	36.49
3.70	0.176	172.8	0.27	36.77
3.75	0.178	172.8	0.27	37.04
3.80	0.179	172.8	0.27	37.31
3.85	0.180	172.8	0.27	37.58
3.90	0.181	172.8	0.26	37.84
3.95	0.182	172.8	0.26	38.11
4.00	0.184	172.8	0.26	38.37

HMP Drawdown, less than 96hrs

4.05	0.185	172.8	0.26	38.63
4.10	0.186	172.8	0.26	38.89
4.15	0.187	172.8	0.26	39.15
4.20	0.188	172.8	0.26	39.41
4.25	0.189	172.8	0.25	39.66
4.30	0.190	172.8	0.25	39.92
4.35	0.191	172.8	0.25	40.17
4.40	0.193	172.8	0.25	40.42
4.45	0.194	172.8	0.25	40.67
4.50	0.195	172.8	0.25	40.92
4.55	0.196	172.8	0.25	41.16
4.60	0.197	172.8	0.24	41.41
4.65	0.198	172.8	0.24	41.65
4.70	0.199	172.8	0.24	41.89
4.75	0.200	172.8	0.24	42.14
4.80	0.201	172.8	0.24	42.38
4.85	0.202	172.8	0.24	42.61
4.90	0.203	172.8	0.24	42.85
4.95	0.204	172.8	0.23	43.09
5.00	0.205	172.8	0.23	43.32
5.05	0.206	172.8	0.23	43.56
5.10	0.208	172.8	0.23	43.79
5.15	0.209	172.8	0.23	44.02
5.20	0.210	172.8	0.23	44.25
5.25	0.211	172.8	0.23	44.48
5.30	0.212	172.8	0.23	44.71
5.35	0.213	172.8	0.23	44.93
5.40	0.214	172.8	0.22	45.16
5.45	0.215	172.8	0.22	45.38
5.50	0.216	172.8	0.22	45.61
5.55	0.217	172.8	0.22	45.83
5.60	0.218	172.8	0.22	46.05
5.65	0.219	172.8	0.22	46.27
5.70	0.220	172.8	0.22	46.49
5.75	0.220	172.8	0.22	46.71
5.80	0.221	172.8	0.22	46.93
5.85	0.222	172.8	0.22	47.15
5.90	0.223	172.8	0.21	47.36
5.95	0.224	172.8	0.21	47.58
6.00	0.225	172.8	0.21	47.79
6.05	0.822	172.8	0.06	48.00
6.10	2.508	172.8	0.02	48.06
6.15	5.008	172.8	0.01	48.08
6.20	8.090	172.8	0.01	48.09
6.25	11.655	172.8	0.00	48.10
6.30	15.646	172.8	0.00	48.10
6.35	20.019	172.8	0.00	48.10
6.40	24.744	172.8	0.00	48.11
6.45	29.796	172.8	0.00	48.11
6.50	35.155	172.8	0.00	48.11
6.55	40.805	172.8	0.00	48.11
6.60	46.731	172.8	0.00	48.11
6.65	52.921	172.8	0.00	48.11
6.70	59.363	172.8	0.00	48.11
6.75	66.049	172.8	0.00	48.11
6.80	72.970	172.8	0.00	48.12
6.85	80.118	172.8	0.00	48.12
6.90	87.486	172.8	0.00	48.12
6.95	95.068	172.8	0.00	48.12
7.00	102.858	172.8	0.00	48.12
7.05	110.850	172.8	0.00	48.12
7.10	119.039	172.8	0.00	48.12
7.15	127.422	172.8	0.00	48.12
7.20	135.992	172.8	0.00	48.12
7.25	144.747	172.8	0.00	48.12
7.30	153.683	172.8	0.00	48.12
7.35	162.795	172.8	0.00	48.12
7.40	172.082	172.8	0.00	48.12
7.45	181.538	172.8	0.00	48.12
7.50	191.162	172.8	0.00	48.12
7.55	200.951	172.8	0.00	48.12
7.60	210.901	172.8	0.00	48.12
7.65	221.011	172.8	0.00	48.12
7.70	231.277	172.8	0.00	48.12
7.75	241.698	172.8	0.00	48.12
7.80	252.271	172.8	0.00	48.12
7.85	262.994	172.8	0.00	48.12
7.90	273.864	172.8	0.00	48.12
7.95	284.881	172.8	0.00	48.12
8.00				48.12

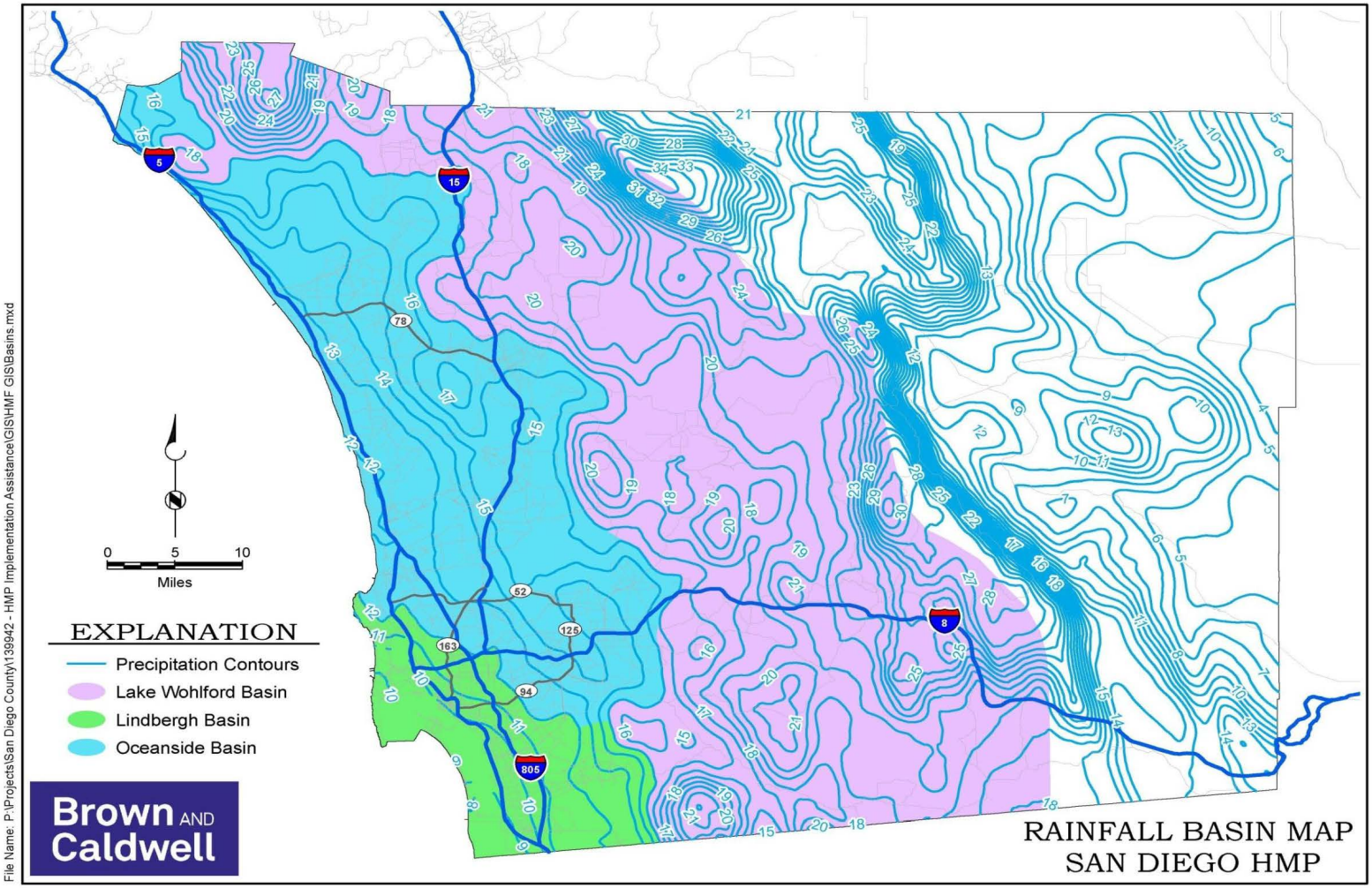

0
5
10
Miles
EXPLANATION
Precipitation Contours
Lake Wohlford Basin
Lindbergh Basin
Oceanside Basin
Brown AND Caldwell
RAINFALL BASIN MAP
SAN DIEGO HMP
File Name: P:\Projects\San Diego County\139942 - HMP Implementation Assistance\GIS\HMF GIS\Basins.mxd

Table G.2-6: Sizing Factors for Hydromodification Flow Control Cistern Facilities Designed Using Sizing Factor Method				
Lower Flow Threshold	**Soil Group**	**Slope**	**Rain Gauge**	**V**
0.1Q2	A	Flat	Lindbergh	0.54
0.1Q2	A	Moderate	Lindbergh	0.51
0.1Q2	A	Steep	Lindbergh	0.49
0.1Q2	B	Flat	Lindbergh	0.19
0.1Q2	B	Moderate	Lindbergh	0.18
0.1Q2	B	Steep	Lindbergh	0.18
0.1Q2	C	Flat	Lindbergh	0.11
0.1Q2	C	Moderate	Lindbergh	0.11
0.1Q2	C	Steep	Lindbergh	0.11
0.1Q2	D	Flat	Lindbergh	0.09
0.1Q2	D	Moderate	Lindbergh	0.09
0.1Q2	D	Steep	Lindbergh	0.09
0.1Q2	A	Flat	Oceanside	0.26
0.1Q2	A	Moderate	Oceanside	0.25
0.1Q2	A	Steep	Oceanside	0.25
0.1Q2	B	Flat	Oceanside	0.16
0.1Q2	B	Moderate	Oceanside	0.16
0.1Q2	B	Steep	Oceanside	0.16
0.1Q2	C	Flat	Oceanside	0.14
0.1Q2	C	Moderate	Oceanside	0.14
0.1Q2	C	Steep	Oceanside	0.14
0.1Q2	D	Flat	Oceanside	0.12
0.1Q2	D	Moderate	Oceanside	0.12
0.1Q2	D	Steep	Oceanside	0.12
0.1Q2	A	Flat	Lake Wohlford	0.53
0.1Q2	A	Moderate	Lake Wohlford	0.49
0.1Q2	A	Steep	Lake Wohlford	0.49
0.1Q2	B	Flat	Lake Wohlford	0.28
0.1Q2	B	Moderate	Lake Wohlford	0.28
0.1Q2	B	Steep	Lake Wohlford	0.28
0.1Q2	C	Flat	Lake Wohlford	0.14
0.1Q2	C	Moderate	Lake Wohlford	0.14
0.1Q2	C	Steep	Lake Wohlford	0.14
0.1Q2	D	Flat	Lake Wohlford	0.12
0.1Q2	D	Moderate	Lake Wohlford	0.12
0.1Q2	D	Steep	Lake Wohlford	0.12

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: ARE Science Village

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not applicable

Project Name: ARE Science Village

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

Attachment 3: For private entity operation and maintenance, Attachment 3 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:

San Diego Foundry 2 LLC
9330 Scranton Road
San Diego, CA 92121

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSOR'S PARCEL NUMBER:	PROJECT NUMBER:
	345-200-04 & 05	

This agreement is made by and between the City of San Diego, a municipal corporation [City] and

San Diego Foundry 2 LLC;

the owner or duly authorized representative of the owner [Property Owner] of property located at

9393 Towne Center Drive, San Diego, CA 92121
(PROPERTY ADDRESS)

and more particularly described as:

Lot 4 & 5 of Parcel Map No. 11876
(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 BMPs] prior to the issuance of construction/grading permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMPs on site, 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): _____.

Property Owner wishes to obtain a building/engineering/grading permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): _____.

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 BMPs, 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): _____.

2. Property Owner shall install, maintain, and repair or replace all Permanent Storm Water BMPs within the property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP, and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) _____.

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 Exhibit(s): A-E

_____
(PROPERTY OWNER SIGNATURE)

_____
(PRINT NAME AND TITLE)

_____
(COMPANY/ORGANIZATION NAME)

_____
(DATE)

THE CITY OF SAN DIEGO

APPROVED:

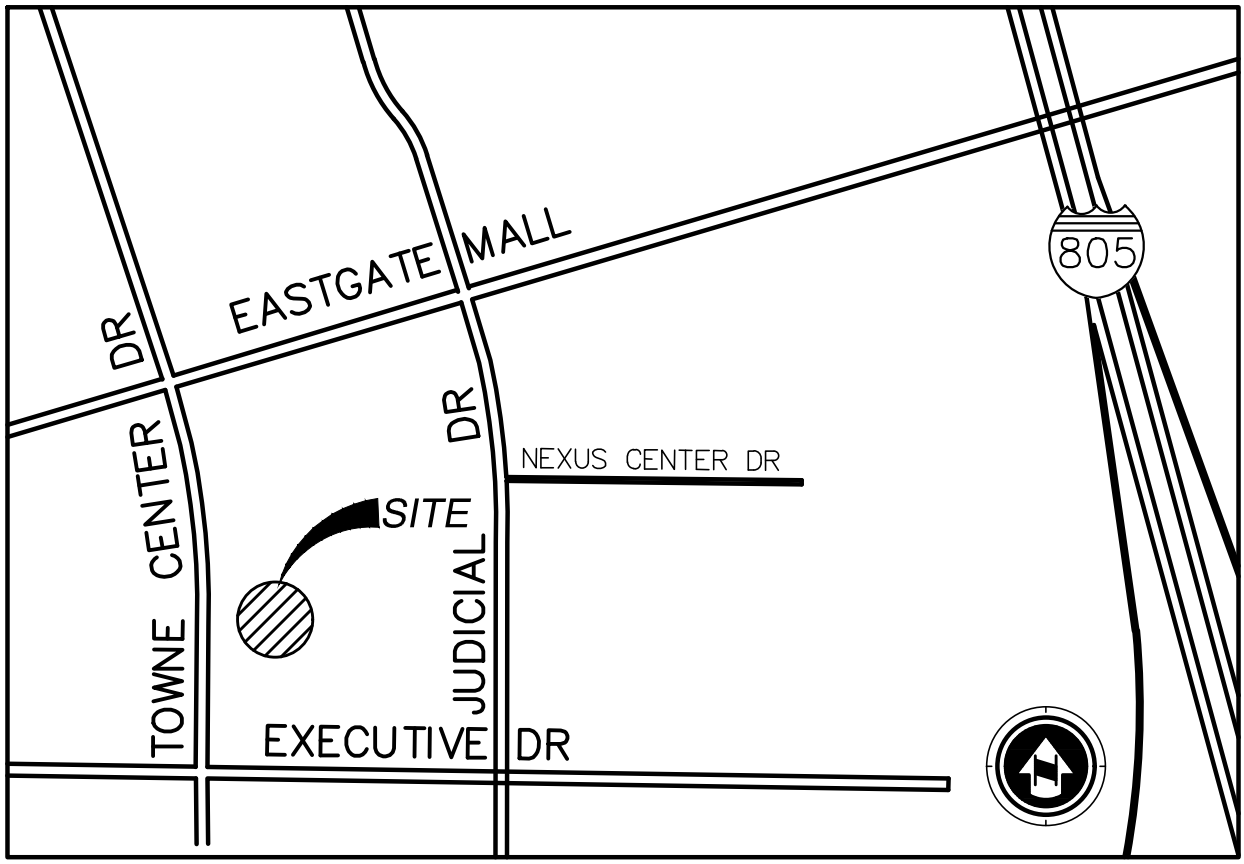
_____
(DEPUTY CITY ENGINEER SIGNATURE)

_____
(PRINT NAME)

_____
(DATE)

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

EXHIBIT A



VICINITY MAP

SCALE: N.T.S.

EXHIBIT B

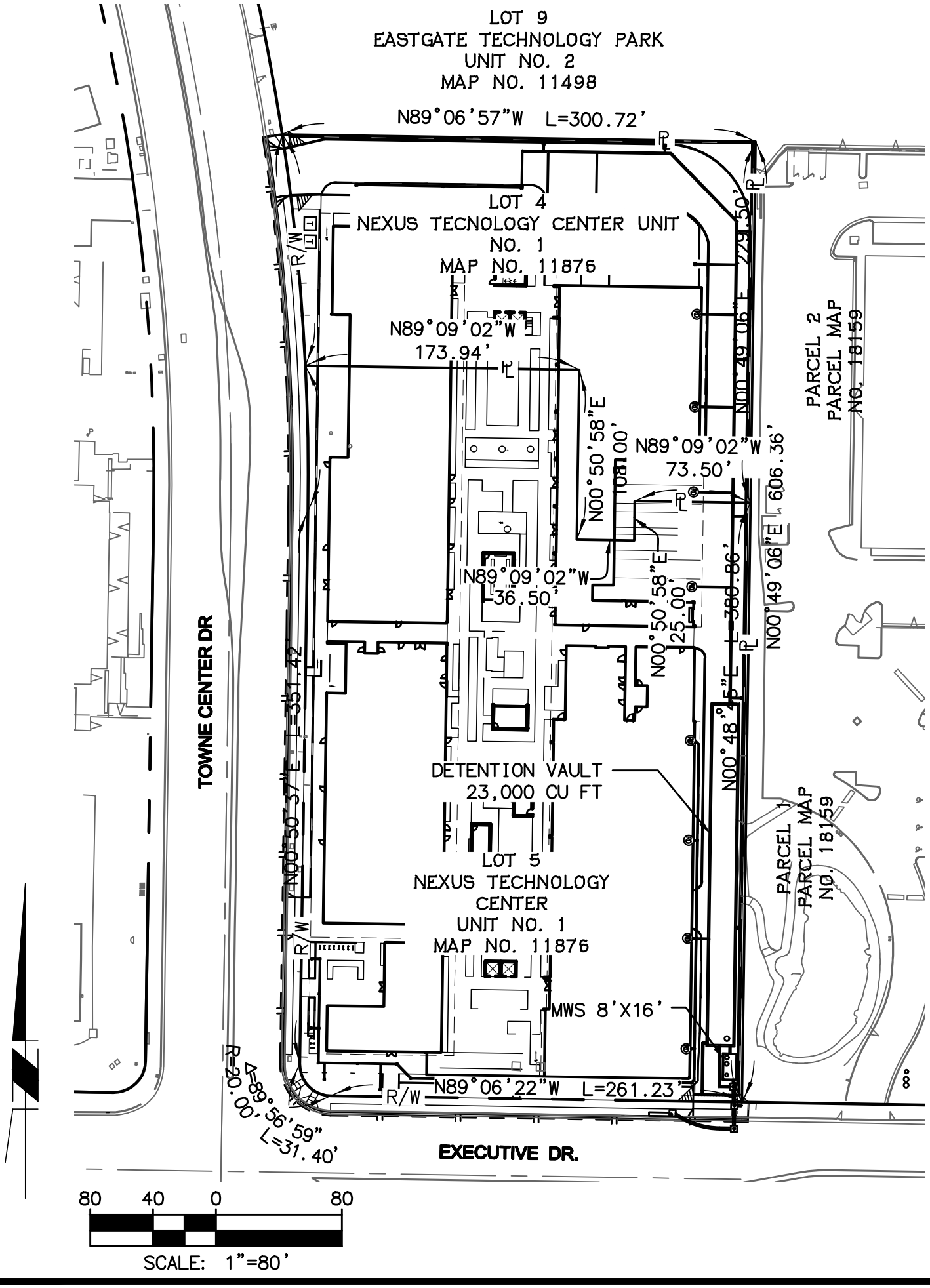

LOT 9
EASTGATE TECHNOLOGY PARK
UNIT NO. 2
MAP NO. 11498
N89°06'57"W L=300.72'
LOT 4
NEXUS TECNOLOGY CENTER UNIT
NO. 1
MAP NO. 11876
N89°09'02"W
173.94'
N00°50'58"E
108.00'
N89°09'02"W
73.50'
N00°49'06"E 229.50'
PARCEL 2
PARCEL MAP
NO. 18159
N00°49'06"E 606.36'
N89°09'02"W
36.50'
N00°50'58"E
25.00'
N00°49'06"E 380.86'
N00°48'45"E
TOWNE CENTER DR
N00°50'37"E L=351.42'
DETENTION VAULT
23,000 CU FT
LOT 5
NEXUS TECHNOLOGY
CENTER
UNIT NO. 1
MAP NO. 11876
PARCEL
PARCEL MAP
NO. 18159
MWS 8'X16'
R/W
N89°06'22"W L=261.23'
R=20.00'
Δ=89°56'59"
L=31.40'
EXECUTIVE DR.
80 40 0 80
SCALE: 1"=80'

EXHIBIT C

MODULAR WETLAND DETAIL

MANUFACTURE'S DETAILS TO BE PROVIDED

EXHIBIT D

DETENTION VAULT DETAIL

MANUFACTURE'S DETAILS TO BE PROVIDED

SITE DESIGN, SOURCE CONTROL AND POLLUTANT CONTROL BMP OPERATION & MAINTENANCE PROCEDURE

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.:

O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER

BMP DESCRIPTION	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	QUANTITY	INCLUDED IN O&M MANUAL				SHEET NUMBER(S)
SITE DESIGN ELEMENTS: TREES, LANDSCAPING	2 TIMES/MO	2 TIMES/MO	MAINTAIN LANDSCAPE AND TREES	76 TREES	X	YES		NO	C200
SOURCE CONTROL ELEMENTS: INLET STENCILING	2 TIMES/YR	2 TIMES/YR	REMOVE TRASH AND DEBRIS, RE-STENCIL INLETS	35	X	YES		NO	C200
POLLUTANT CONTROL BMP(S): MODULAR WETLAND	2 TIME/YR	12-24 MONTHS	REMOVE SEDIMENT FROM SEPARATION CHAMBER, REPLACE CARTRIDGE FILTER MEDIA, REPLACE DRAIN DOWN FILTER MEDIA	1	X	YES		NO	C200
TREES	2 TIMES/YR	1 TIMES/YR	INSPECT TREE HEALTH	76 TREES	X	YES		NO	C200
HMP FACILITY: DETENTION VAULT	2 TIME/YR	1 TIME/YR	REMOVE SEDIMENT AND DEBRIS	1	X	YES		NO	C200

HMP EXEMPT	NO

EXHIBIT E

POST CONSTRUCTION PERMANENT BMP TABLE

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Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

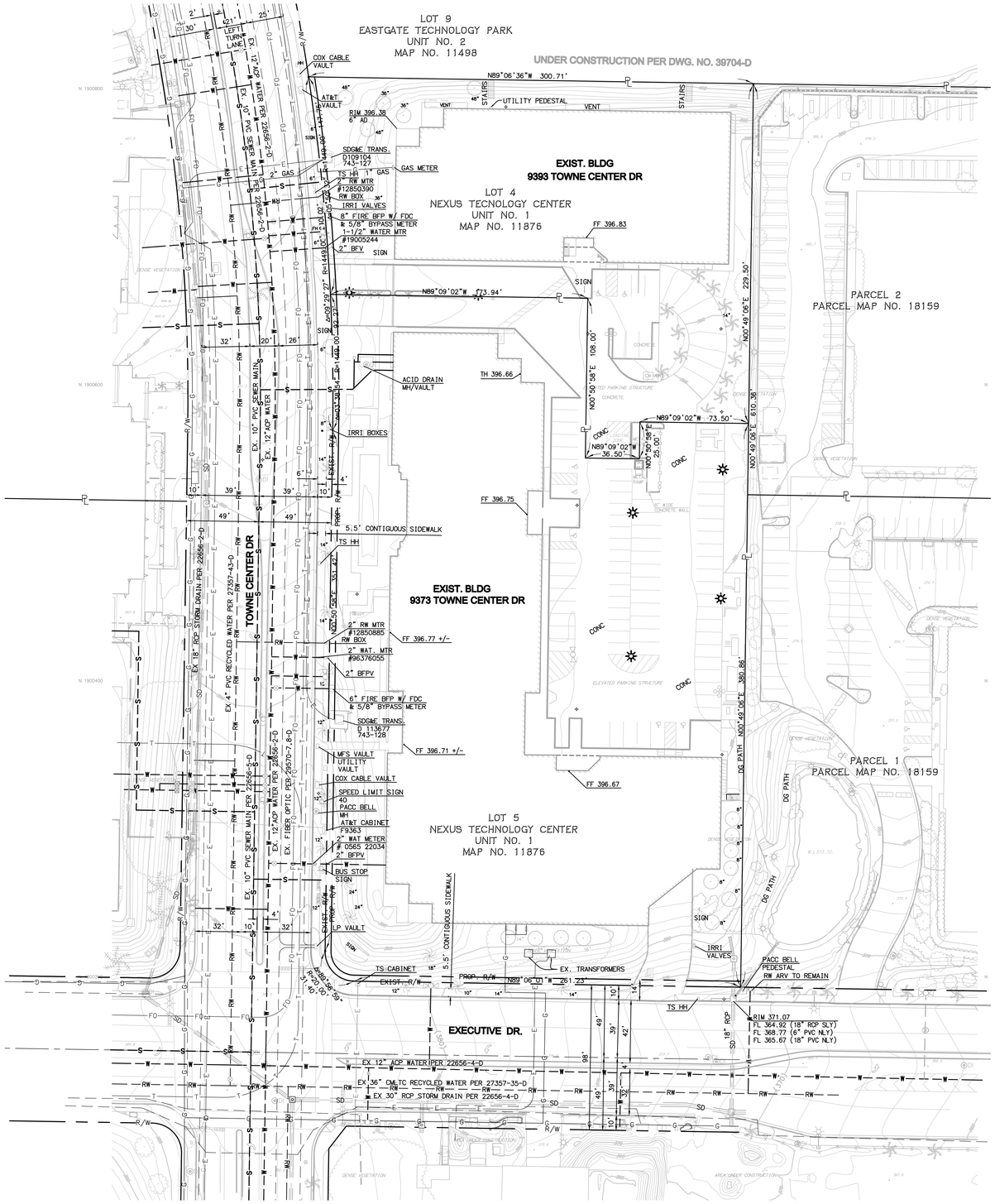
This is the cover sheet for Attachment 4.

Project Name: ARE Science Village

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.



BASIS OF COORDINATES

THE BASIS OF COORDINATES FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM NAD83, ZONE 6,(EPOCH 1991.35)

BENCHMARK

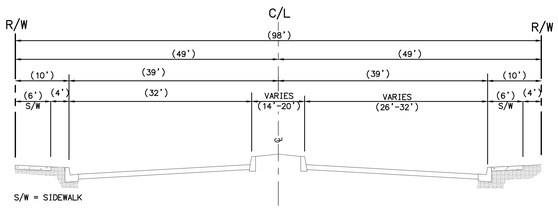
THE BASIS OF ELEVATIONS FOR THIS SURVEY IS THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) PER THE CITY OF SAN DIEGO VERTICAL CONTROL NETWORK. SEBP LOCATED AT LA JOLLA VILLAGE DRIVE & TOWNE CENTER DRIVE. ELEVATION: 371.617 (ft.)

SOURCE OF TOPOGRAPHY

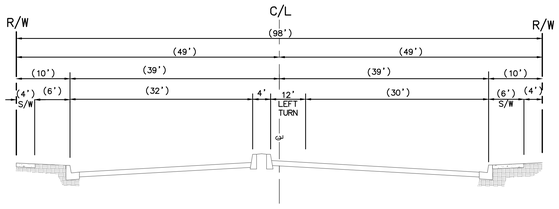
AERIAL PHOTOGRAMMETRY PROVIDED BY AEROTECH MAPPING, INC., FLOWN FEBRUARY 5, 2014 AND SUPPLEMENTED BY FIELD CREW SURVEY BY MICHAEL BAKER INTERNATIONAL ON JULY 22, 2019

LEGEND

- RIGHT OF WAY — R/W
- PROPERTY LINE
- EXIST. WATER LINE — W —
- EXIST. RECYCLED WATER — RW —
- EXIST. SEWER LINE — S —
- EXIST. STORM DRAIN — SD —
- EXIST. ELECTRIC LINE — E —
- EXIST. TELECOMMUNICATION — T —
- EXIST. GAS LINE — G —
- EXIST. CONTOUR (380)
- EXIST. FIRE HYDRANT
- EXIST. FIRE MANIFOLD
- EXIST. WATER VALVE
- EXIST. WATER METER
- EXIST. WATER MANHOLE
- EXIST. AIR RELEASE VALVE
- EXIST. CP TEST
- EXIST. IRRIGATION PEDESTAL
- EXIST. SEWER MANHOLE
- EXIST. SEWER CLEAN OUT
- EXIST. ELECTRIC PULL BOX
- EXIST. ELECTRIC METER
- EXIST. ELECTRIC JUNCTION BOX
- EXIST. STREET LIGHT
- EXIST. LIGHT STANDARD
- EXIST. POWER POLE
- EXIST. GUY WIRE
- EXIST. UTILITY PULL BOX
- EXIST. GAS VALVE
- EXIST. TRAFFIC PULL BOX
- EXIST. TRAFFIC SIGN
- EXIST. TRAFFIC SIGNAL
- EXIST. TELEPHONE MANHOLE
- EXIST. TELEPHONE PEDESTAL
- EXIST. TELEPHONE
- EXIST. STORM DRAIN MANHOLE
- EXIST. CURB DRAIN
- EXIST. ROOF DRAIN
- EXIST. POST
- EXIST. PALM TREE
- EXIST. TREE



TOWNE CENTER DR.
EXISTING STREET SECTION
N.T.S.



EXECUTIVE DR.
EXISTING STREET SECTION
N.T.S.

ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/22

30 15 0 30 60 90
SCALE: 1"=30'

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104
Phone: 206.682.6837
Contact: Name

ALEXANDRIA.

STAMP
REGISTERED PROFESSIONAL ENGINEER
BRIAN K. OLIVER
No. 45045
Exp. 3-31-22
CIVIL
STATE OF CALIFORNIA

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

Alexandria Science Village

9393 Towne Centre Drive,
San Diego, California 92121

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SUBMITTAL PACKAGE
02/16/2022

REVISIONS

No.	Description	Date

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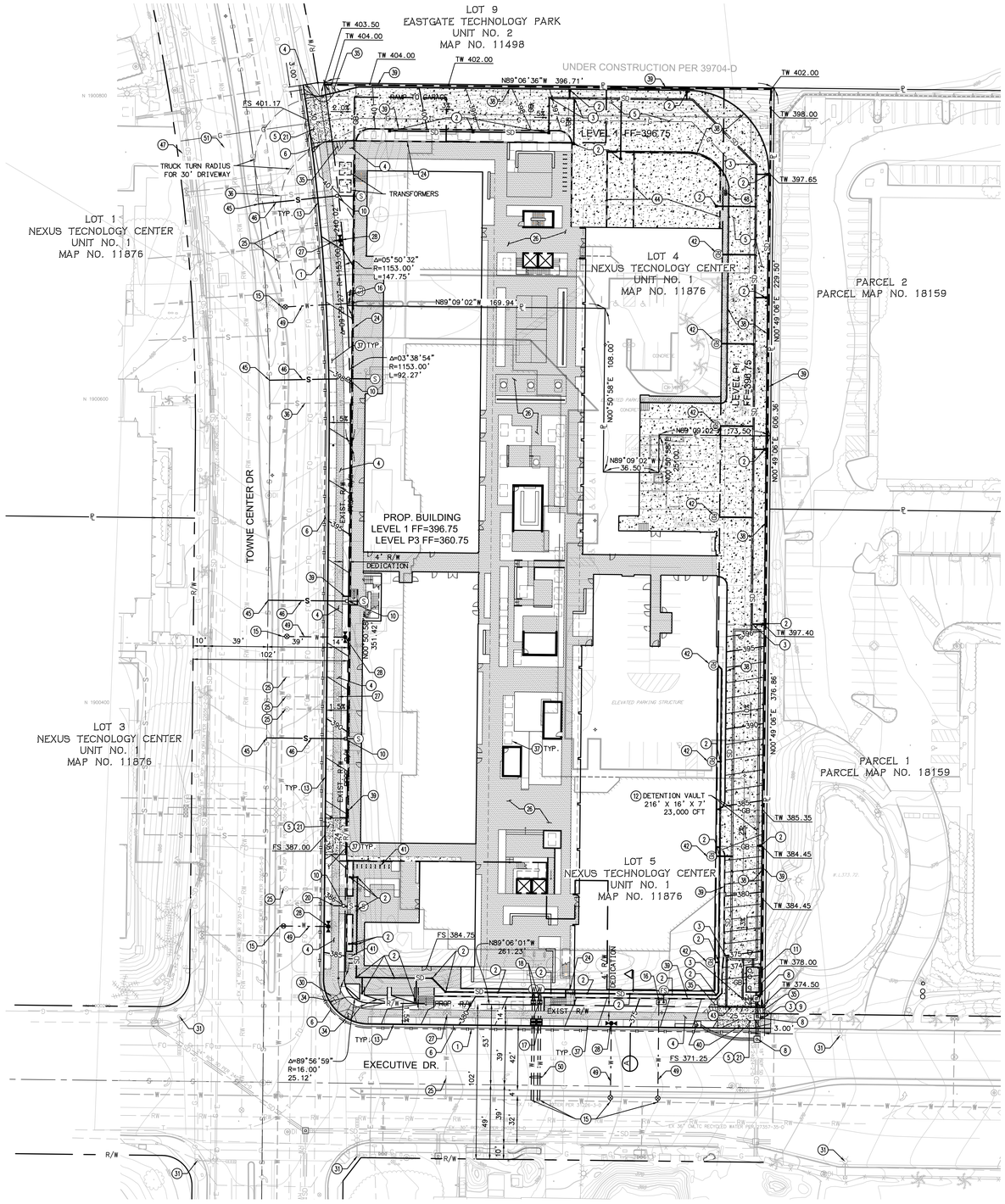
Issue Date: 02/16/2022

SHEET
TOPOGRAPHIC MAP

C100

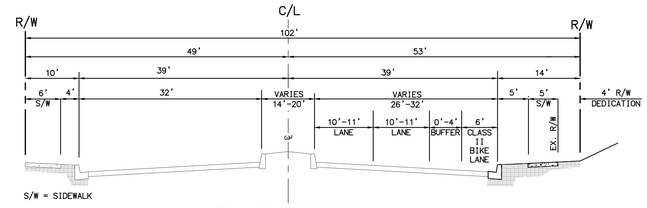


GRADING LEGEND

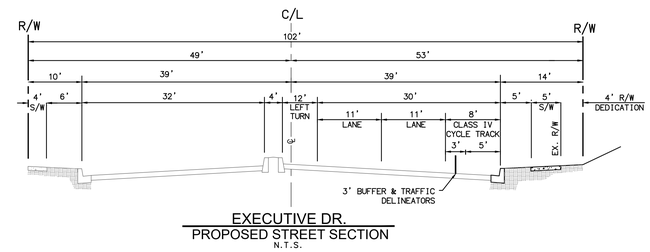
- RIGHT OF WAY LINE ..... R/W
- PROPERTY LINE ..... P
- GRADING LIMITS/SAWCUT .....
- EXISTING CONTOUR ..... (372)
- PROPOSED CONTOUR 380
- GRADE BREAK ..... GB
- PROPOSED ASPHALT .....
- PROPOSED CONCRETE SIDEWALK .....
- PROPOSED VEHICULAR CONC. .....
- FIRE SERVICE ..... F
- SEWER SERVICE ..... S
- WATER SERVICE ..... W
- PROPOSED FIRE HYDRANT .....
- MODULAR WETLAND .....
- FLOW DIRECTION .....
- STORM DRAIN LINE ..... SD
- CATCH BASIN .....
- 'A-4' CLEANOUT .....
- SEWER/STORM DRAIN TYPE CLEANOUT .....
- PROPOSED STORM WATER DETENTION VAULT .....
- TREE ROOT ZONE (40 SF) .....

CONSTRUCTION NOTES

1. LIMIT OF GRADING/ LIMIT OF WORK/ SAWCUT LINE
2. CATCH BASIN
3. SEWER-TYPE STORM DRAIN CLEANOUT (SDCO)
4. CONCRETE SIDEWALK
5. VEHICULAR CONCRETE PAVEMENT
6. AC PAVEMENT
7. TYPE 'A-4' STORM DRAIN CLEANOUT
8. CONNECT TO EX. STORM DRAIN
9. SEWER-TYPE CLEANOUT
10. MODULAR WETLAND SYSTEM
11. STORM WATER DETENTION VAULT
12. REMOVE AND REPLACE CURB & GUTTER
13. CONNECT TO EX. WATER MAIN
15. FIRE SERVICE BACKFLOW PREVENTER
16. DUAL WATER METER
17. DUAL WATER BACKFLOW PREVENTER
18. CONNECT TO EX. 8" SEWER LATERAL
20. PROPOSED DRIVEWAY
21. LIMITS OF UNDERGROUND PARKING
24. EX. WATER SERVICE TO BE KILLED AT MAIN
25. HARDSCAPE PER LANDSCAPE PLANS
26. EX. FIRE HYDRANT TO BE RELOCATED
27. RELOCATED FIRE HYDRANT
28. RELOCATE EX. TRAFFIC SIGNAL & STREET LIGHT
31. EX. STREET LIGHT
34. CURB RAMP
35. VISIBILITY TRIANGLE, NO OBSTRUCTION INCLUDING LANDSCAPING OR SOLID WALLS IN THE VISIBILTY AREA SHALL EXCEED 24" IN HEIGHT
36. EX. SEWER LATERAL TO BE ABANDONED AT P/L
37. TREE ROOT ZONE (40 SF)
38. 6" PCC CURB
39. RETAINING WALL
40. RELOCATED CURB INLET
41. BIKE RACKS
42. ROOF DRAIN POC, SEE PLUMBING PLANS FOR CONTINUATION
43. 12" TRENCH DRAIN
44. ENCLOSURE WALL
45. CONNECT TO EXIST. SEWER
46. PROPOSED 6" SEWER LATERAL
47. CONNECT TO EXIST. GAS
48. GAS METER PER PLUMBING PLANS
49. PROPOSED FIRE SERVICE
50. PROPOSED WATER SERVICE
51. PROPOSED GAS SERVICE



TOWNE CENTER DR.
PROPOSED STREET SECTION
N.T.S.



EXECUTIVE DR.
PROPOSED STREET SECTION
N.T.S.

APPROVAL NUMERS

- PDP APPROVAL NO. 2342720
- LAND USE APPROVAL NO. 2342723
- NDP APPROVAL NO. 2367484
- SDP APPROVAL NO. 2367485
- REZONE APPROVAL NO. 2367486

GENERAL NOTES

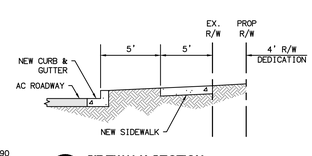
1. ALL EXISTING CURB, GUTTER, SIDEWALK, & DRIVEWAY IMPROVEMENTS ALONG TOWNE CENTER DRIVE & EXECUTIVE DRIVE FRONTAGE TO BE REMOVED & REPLACED.
2. ALL EXISTING UTILITY STRUCTURES IN RIGHT OF WAY FRONTAGE TO BE RELOCATED, REMOVED, OR ADJUSTED TO GRADE.
3. NO EXISTING OR PROPOSED EASEMENTS ONSITE

DEVIATIONS FROM STANDARDS:

1. MAXIMUM DRIVEWAY WIDTH:
   PROJECT PROPOSES ONE 30' WIDE DRIVEWAY IN LIEU OF THE CITY OF SAN DIEGO'S MAXIMUM 25' WIDE DRIVEWAY IN PARKING IMPACT ARE TO ALLOW FOR FULL SIZE DELIVERY TRUCKS TO ACCESS THE DELIVERY/SERVICE AREA. THE 30' DRIVEWAY WILL LESSEN THE REQUIRED TURNING RADIUS FOR DELIVERY TRUCKS ENTERING FROM TOWNE CENTER DR.

ENGINEER OF WORK:
Brian K. Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/22

SCALE: 1"=30'



A SIDEWALK SECTION
N.T.S.

GRADING QUANTITIES

TOTAL AMOUNT OF SITE TO BE GRADED: 3.97 ACRES
PERCENT OF TOTAL SITE GRADED: 100%
AMOUNT OF SITE WITH 25 PERCENT SLOPES OR GREATER: 0.08 ACRES
PERCENT OF TOTAL SITE WITH 25 PERCENT SLOPES OR GREATER: 2%
AMOUNT OF SITE WITHIN HILLSIDE REVIEW: 0%
PERCENT OF TOTAL SITE WITHIN HILLSIDE REVIEW: 0%
AMOUNT OF CUT: 315,000 CY
AMOUNT OF FILL: 100 CY
MAXIMUM HEIGHT OF FILL SLOPE 3 FEET 2: 1 SLOPE RATIO
MAXIMUM HEIGHT OF CUT SLOPE 4 FEET 2: 1 SLOPE RATIO
AMOUNT OF EXPORT SOIL: 314,900 CY
RETAINING WALLS: HOW MANY: 18
MAXIMUM LENGTH: 900'
MAXIMUM HEIGHT: 14.5'
MAXIMUM DEPTH OF CUT: 71 FT

ALL EXCAVATED MATERIALS TO BE EXPORTED SHALL BE EXPORTED TO A LEGAL DISPOSAL SITE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION "GREEN BOOK", 2018 EDITION AND REGIONAL SUPPLEMENT AMENDMENTS ADOPTED BY REGIONAL STANDARDS COMMITTEE

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104

Phone: 206.682.6837
Contact: Name

ALEXANDRIA.

STAMP
REGISTERED PROFESSIONAL ENGINEER BRIAN K. OLIVER No. 45045 Exp. 3-31-22 CIVIL STATE OF CALIFORNIA

Michael Baker INTERNATIONAL
9755 Clairemont Mesa Blvd.
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Phone: (858) 614-5000
MBAKERINTL.COM

Alexandria Science Village

9393 Towne Centre Drive,
San Diego, California 92121

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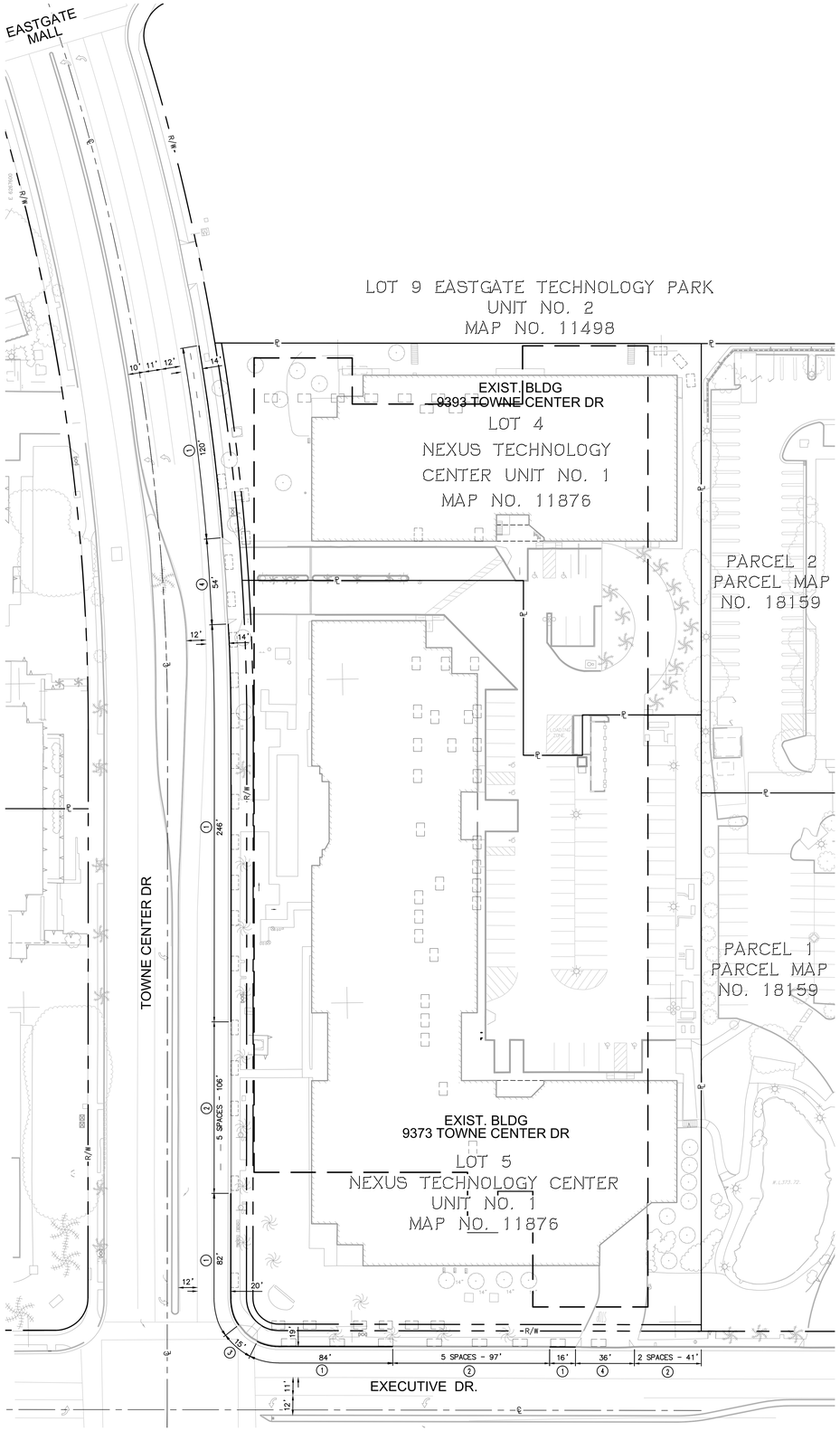
SHEET
PRELIMINARY GRADING AND UTILITY PLAN

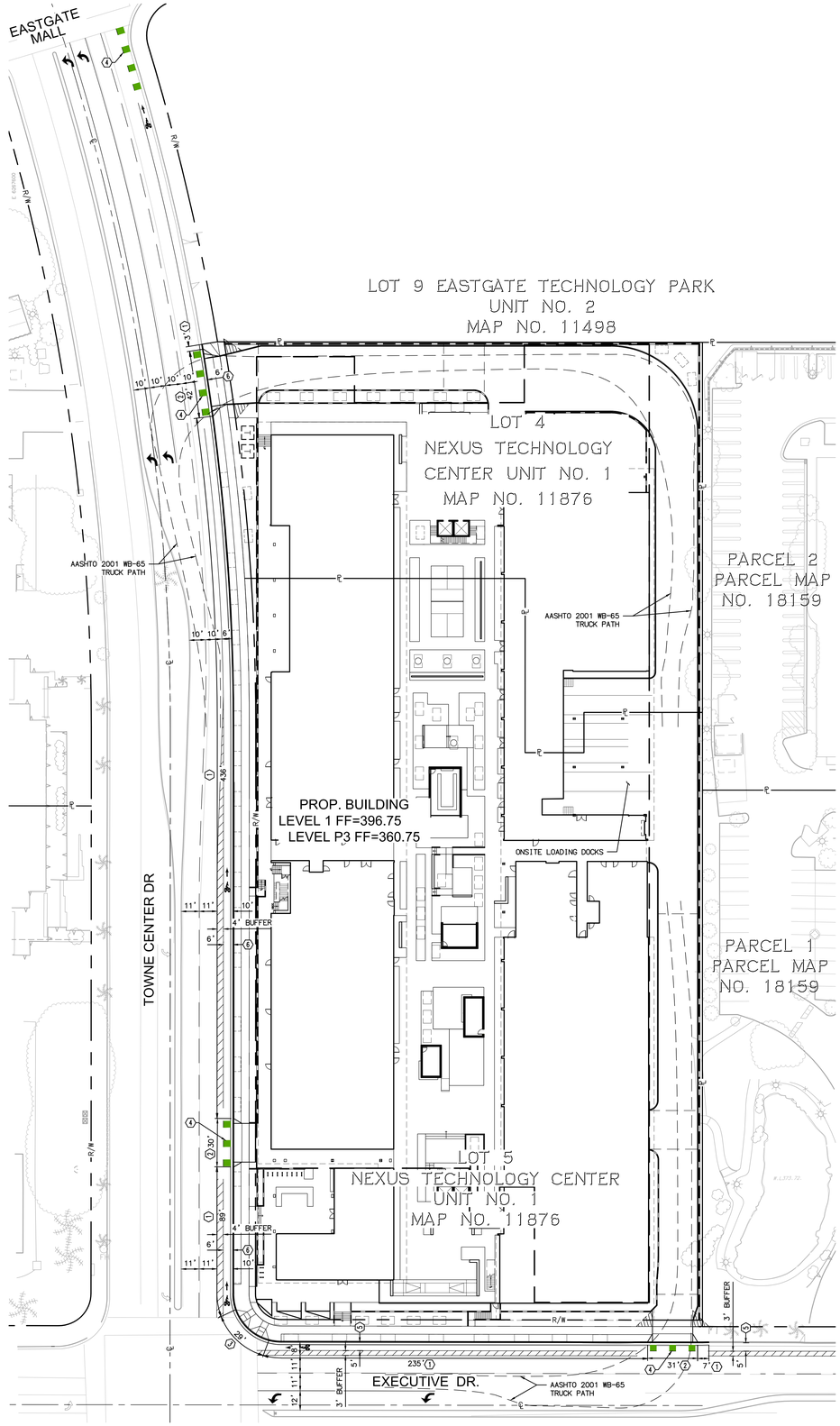
C200



EXISTING
CURB UTILIZATION

STRIPING NOTES (EXISTING)

1. EXISTING RED CURB MARKING
2. EXISTING PARKING TO BE REMOVED
3. EXISTING CURB RAMP
4. EXISTING DRIVEWAY CURB CUT



PROPOSED
CURB UTILIZATION

STRIPING NOTES (PROPOSED)

1. NEW RED CURB MARKING
2. NEW DRIVEWAY CURB CUT
3. NEW CURB RAMP CUT
4. NEW CONFLICT STRIPING - WHITE DASHED LINE WITH GREEN INFILL ACROSS ENTIRE LENGTH OF BIKE LANE/CYCLE TRACK
5. CLASS IV CYCLE TRACK
6. CLASS II BIKE LANE

PARKING SUMMARY

EXISTING SPACES	12 SPACES
PROPOSED SPACES	0 SPACES
NET LOSS	12 SPACES

30 15 0 30 60 90
SCALE: 1"=30'
1" SCALE: 1"=30'

ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/22

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104
Phone: 206.682.6837
Contact: Name

ALEXANDRIA

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REGISTERED PROFESSIONAL ENGINEER
BRIAN K. OLIVER
No. 45045
Exp. 3-31-22
CIVIL
STATE OF CALIFORNIA

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Alexandria Science Village

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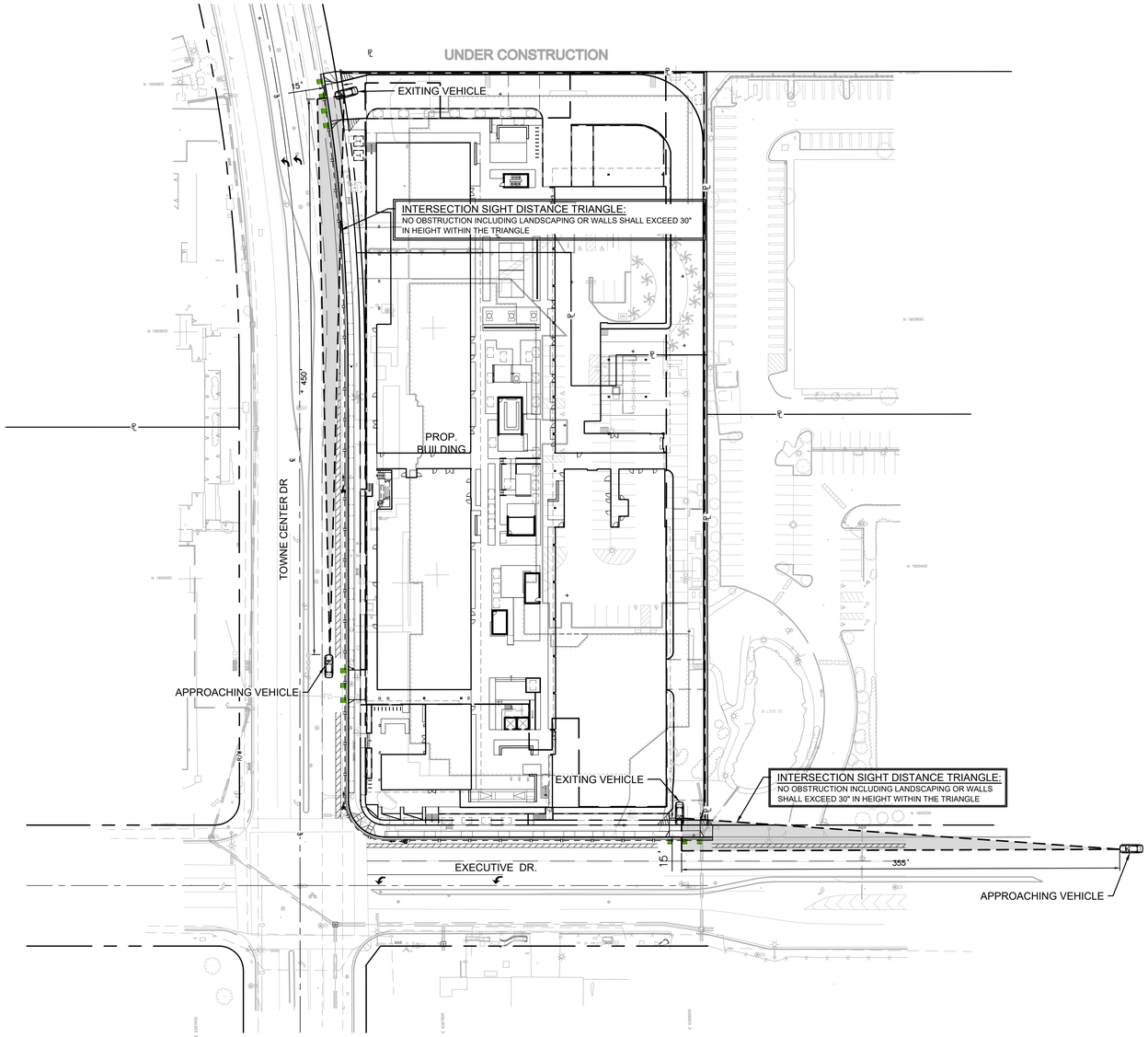
SHEET
CURB UTILIZATION PLAN

C300



SIGHT DISTANCE TABLE		
DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE (FT) (RIGHT TURNS)
30	200	290
35	250	335
37	272**	355***
40	305	385
45	360	430
47	386**	450***
50	425	480

SIGHT DISTANCE

EXECUTIVE DRIVE

POSTED SPEED LIMIT	30 MPH
85TH PERCENTILE SPEED	37 MPH*
STOPPING SIGHT DISTANCE	272'
INTERSECTION SIGHT DISTANCE	355'

TOWNE CENTER DRIVE

POSTED SPEED LIMIT	40 MPH
85TH PERCENTILE SPEED	47 MPH*
STOPPING SIGHT DISTANCE	386'
INTERSECTION SIGHT DISTANCE	450'

* ASSUMED 85TH PERCENTILE SPEED IS 7 MPH GREATER THAN POSTED SPEED

** INTERPOLATED FROM AASHTO STOPPING SIGHT DISTANCE TABLE EXHIBIT 3-1

*** INTERPOLATED FROM AASHTO INTERSECTION SIGHT DISTANCE TABLE EXHIBIT 9-57

SCALE 1"=40'

ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/22

40 20 0 40 80 120
SCALE: 1"=40'

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104

Phone: 206.682.6837
Contact: Name

ALEXANDRIA.

STAMP
BRIAN K. OLIVER No. 45045 Exp. 3-31-22 PROFESSIONAL ENGINEER STATE OF CALIFORNIA

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

Alexandria Science Village

9393 Towne Centre Drive,
San Diego, California 92121

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02/16/2022

REVISIONS

No.	Description	Date

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Issue Date: 02/16/2022

SHEET
SIGHT DISTANCE PLAN

C310

Attachment 5
Drainage Report

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

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Preliminary Drainage Study for

ARE Science Village

PTS#: 647676

XXXXX-D

Prepared For:

Alexandria Estate Equities, Inc.
San Diego, CA 92121
(858) 638-2800

Project Location:

9396 Towne Center Drive
San Diego, CA 92121
APN No. 343-200-04, 343-200-05
Parcel Map No. 11786, in the
City of San Diego, County of San Diego, CA

Prepared By:

Michael Baker
INTERNATIONAL
9755 Clairemont Mesa Blvd
San Diego, CA 92124
(858) 614-5000
Jay Sullivan, PE, CFM, QSD

Michael Baker JN:
181315

Prepared:
July 2022

Table of Contents

List of Tables

List of Appendices

Section 1 Project Information

1.1 Project Data

Project Owner:	ARE-SD Region No. 57, LLC
	10996 Torreyana Rd, Suite 250
Project Site Address:	9396 Towne Center Drive, San Diego, CA 92121
APN Number(s):	343-200-04, 343-200-05
Parcel Area:	3.89-acres
Project Disturbed Area:	3.89-acres

1.2 Scope of Report

This report includes analyses of 100-year project-site peak flow under existing and proposed conditions. This report documents the hydrologic impact of the proposed improvements, as compared to the existing condition; and includes preliminary sizing for attenuation measures required to mitigate peak flow.

This report does not address temporary Best Management Practices (BMPs) required during construction, refer to the project Storm Water Pollution Prevention Plan (SWPPP). Post Construction BMPs are addressed in the project Storm Water Quality Management Plan (SWQMP).

1.3 Project Description

Proposed improvements include demolition of an existing building and construction of a new parking structure and new office buildings. Total project-site impervious area will be slightly increased as a result of the proposed improvements; however, peak flow will not be diverted and will be mitigated to less than existing rates via a proposed detention vault.

Based on the Natural Resources Conservation Service's (NRCS) Websoil Survey, the project site is comprised of approximately 86-percent Chesterton fine sandy loam (CfB), with slopes ranging from 2 to 5 percent (hydrologic soil type D); and approximately 14-percent terrace encarpments (TeF) (hydrologic soil type D).

The Federal Emergency Management Agency (FEMA) has not mapped a Special Flood Hazard Area (SFHA) within the project site vicinity. The entire project site lies within un-shaded Zone X, which correlates with areas determined to be outside the 500-year floodplain. An exhibit is provided in Appendix A of this report.

1.4 Existing Conditions

The project site is entirely built out in the existing condition and has been hydrologically analyzed as a single drainage basin. The site drains southeasterly via a combination of surface flow and pipe flow via existing area drains. The project site does not receive run-on from the neighboring property; project site runoff is ultimately discharged from the site in the SE corner as pipe flow (18" RCP) to the public storm drain system within Executive Drive (24" RCP).

Impervious area is comprised of the concrete walkways, parking stalls, drive isles and roofing. Pervious area is comprised of landscape located within parking islands and adjacent to the existing building. Refer to Appendix B for an exhibit detailing the existing condition.

1.5 Proposed Conditions

The proposed structures will be located close to the property lines on all sides of the project site. Roof leaders, area drains, and new on-site private storm drain will direct project site runoff to a proposed storage vault, described in more detail below. The project site is entirely built out in the proposed condition and has been hydrologically analyzed as one drainage basin, similar to the existing condition analysis.

The storage vault has been designed as a "Conjunctive-Use" BMP, as defined by the City of San Diego. As such, the Design Capture Volume (with a 1.5 multiplier) has been made NOT available when analyzing 100-year peak flow mitigation (i.e. no overlap of WQ volume and 100-year Volume). Additionally, the Hydromodification volume has been ensured to draw-down within 96 hours, allowing overlap with 100-year volume when using Conjunctive-Use BMPs.

Project site runoff is collected via new on-site infrastructure and directed to a proposed subterranean vault located in the southwest corner of the site. The vault dimensions are 216'(L) x 16'(W) x 7'(H), with a weir 5.1" above the vault bottom and a 1.86" orifice.

A Modular Wetland System (MWS), or similar, is proposed downstream of the vault and provides water quality treatment. Refer to the project specific SWQMP, found under separate cover, for additional information.

Mitigated discharge from the project site will connect to the City's Municipal Separate Storm Sewer System (MS4) within Executive Drive (24" RCP), consistent with existing conditions.

Refer to Appendix C for an exhibit detailing the proposed condition.

Section 2 Study Objectives

The specific objectives of this study are as follows:

- Quantify 100-year peak flow rates under existing and proposed conditions;
- Develop measures to mitigate any increase in peak flow associated with proposed improvements;
- Demonstrate the proposed improvements will not increase the potential for erosion on the project site or downstream area.

Section 3 Methodology

3.1 Hydrology

The Rational Method has been utilized to perform the hydrologic analyses. The following formula conforms to the hydrologic methodologies outlined in the City of San Diego Drainage Design Manual (January 2017).

$$Q = C * I * A$$

Where, **Q** = Peak Discharge - *(cfs)*

C = Runoff Coefficient

I = Average Rainfall Intensity - *(in/hr)*

A = Drainage Area - *(acres)*

A runoff coefficient has been determined for the existing and proposed conditions per Section A.1.2 of the City of San Diego Drainage Design Manual. The tabulated impervious area chosen for the project site is 85% (commercial use) for the existing and proposed condition.

Intensity has been calculated per the IDF Curve in Figure A-1 of the City of San Diego Drainage Design Manual. A time of concentration of 5 minutes has been assumed for the project area under existing and proposed conditions.

3.2 Hydraulics

The Hydraflow Hydrographs Extension within AutoCAD has been used to model peak flows from the project as they are mitigated by the proposed detention vault. A hydrograph was generated using Rick Engineering Company's RatHydro software and has been routed through storage vault modeled in Hydraflow Hydrographs. The storage vault has been modeled to match the vault documented in the project specific SWQMP, designed as a conjunctive-used BMP. Refer to Appendix C for the modelling input and output.

Proposed storm drains have been preliminary sized to convey 100-year peak flow using Bentley's Flow Master. This software solves for normal depth under steady state flow conditions.

Section 4 Results

4.1 Hydrologic Results

The table below summarizes the hydrologic results under existing and proposed conditions. Calculations are included in Appendices B (existing) and C (proposed).

Table 4-1 - Hydrologic Summary

Discharge Location	C -	I* (in/hr)	A (ac)	Q_{100} (cfs)
Existing Condition				
Basin 1	0.76	4.5	3.89	13.3
Proposed Condition (Unmitigated)				
Basin 1	0.95	4.5	3.89	16.6
Proposed Condition (Mitigated)				
Basin 1	0.95	4.5	3.89	6.8

*A time in concentration of 5 minutes has been assumed for the vault. Per Figure A-1 of the Drainage Design Manual this will result in a similar intensity for all basins. Refer to Appendices B and C for hydrologic calculations.

4.2 Hydraulic Results

The table below summarizes the hydraulic performance of the proposed storage vault. Calculations are included in Appendix C.

Vault ID	Length	Wide	Height	Weir Height	Low Flow Orifice	Q100 (in)	Q100 (out)
	(ft)	(ft)	(ft)	(ft)	(in)	(cfs)	(cfs)
Vault -1	216	16	7	5.1	1.86	16.6	6.8

Section 5 Conclusions

Proposed improvements will not result in an increase to 100-year peak flow discharge from the site, as compared to the existing condition. Increases in peak flow associated with new impervious area have been mitigated below existing conditions through the use of a proposed storage vault. The vault has also been designed to provide hydromodification mitigation as a Conjunctive Use BMP, discussed in more detail within the SWQMP.

This project will not discharge, dredge, or fill material into any Water of The United States, thus the project is not required to obtain a Section 401 certification or Section 404 permit from the State or U.S. Army Corps of Engineers.

Section 6 Declaration of Responsible Charge

I, hereby declare that I am the Civil Engineer of work for this project, 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 current design.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for the project design.

Jay Sullivan RCE 77445

7-7-2022

Date

Section 7 Bibliography

City of San Diego. (January 2017). *Drainage Design Manual.* San Diego.

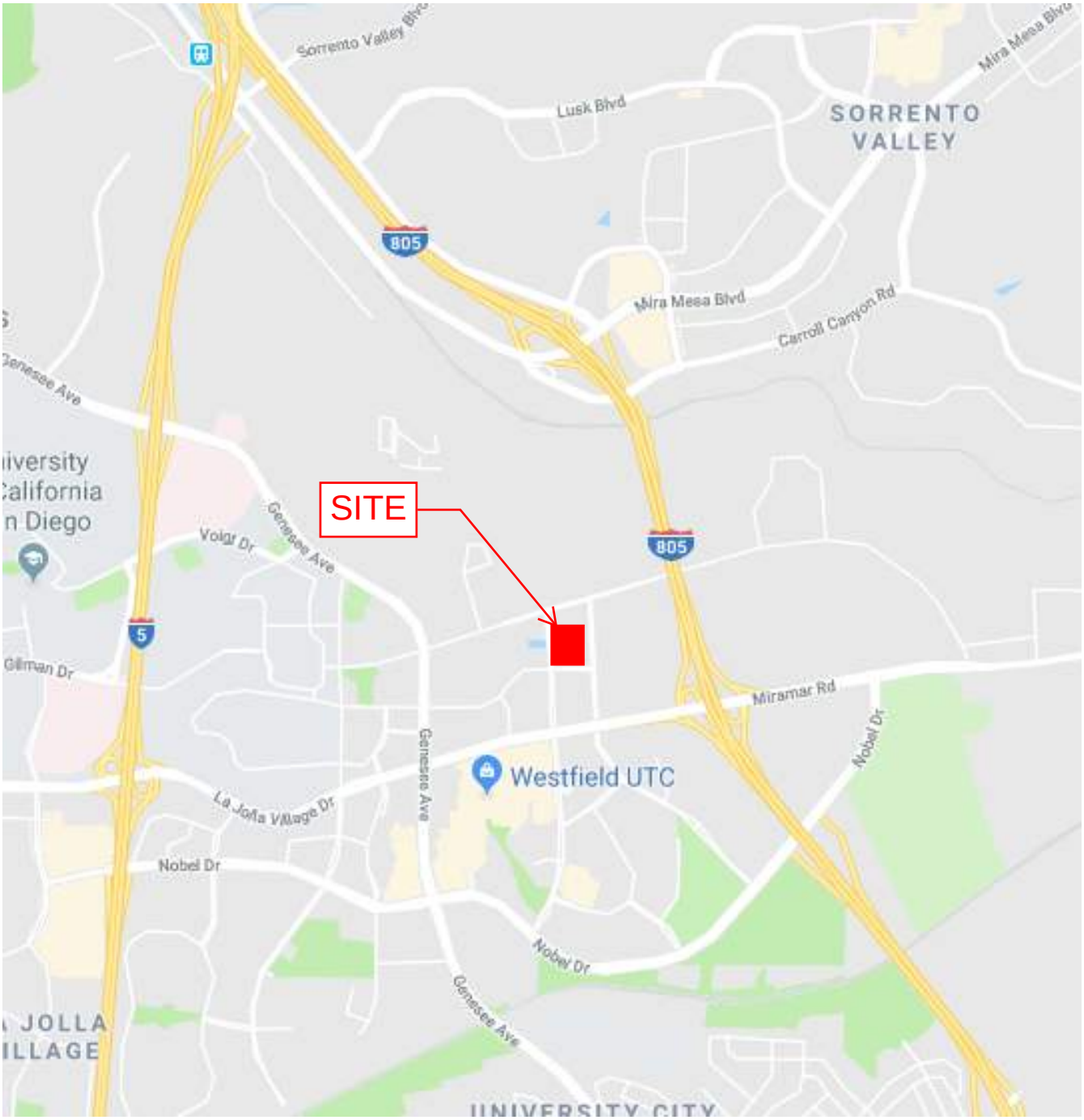
City of San Diego. (January 2018). *Storm Water Standards.* San Diego.

FEMA. (1997). *Flood Insurance Rate Map.* San Diego.

Soil Survey Staff, N. R. (2018, September 24). *Web Soil Survey.* Retrieved from Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/

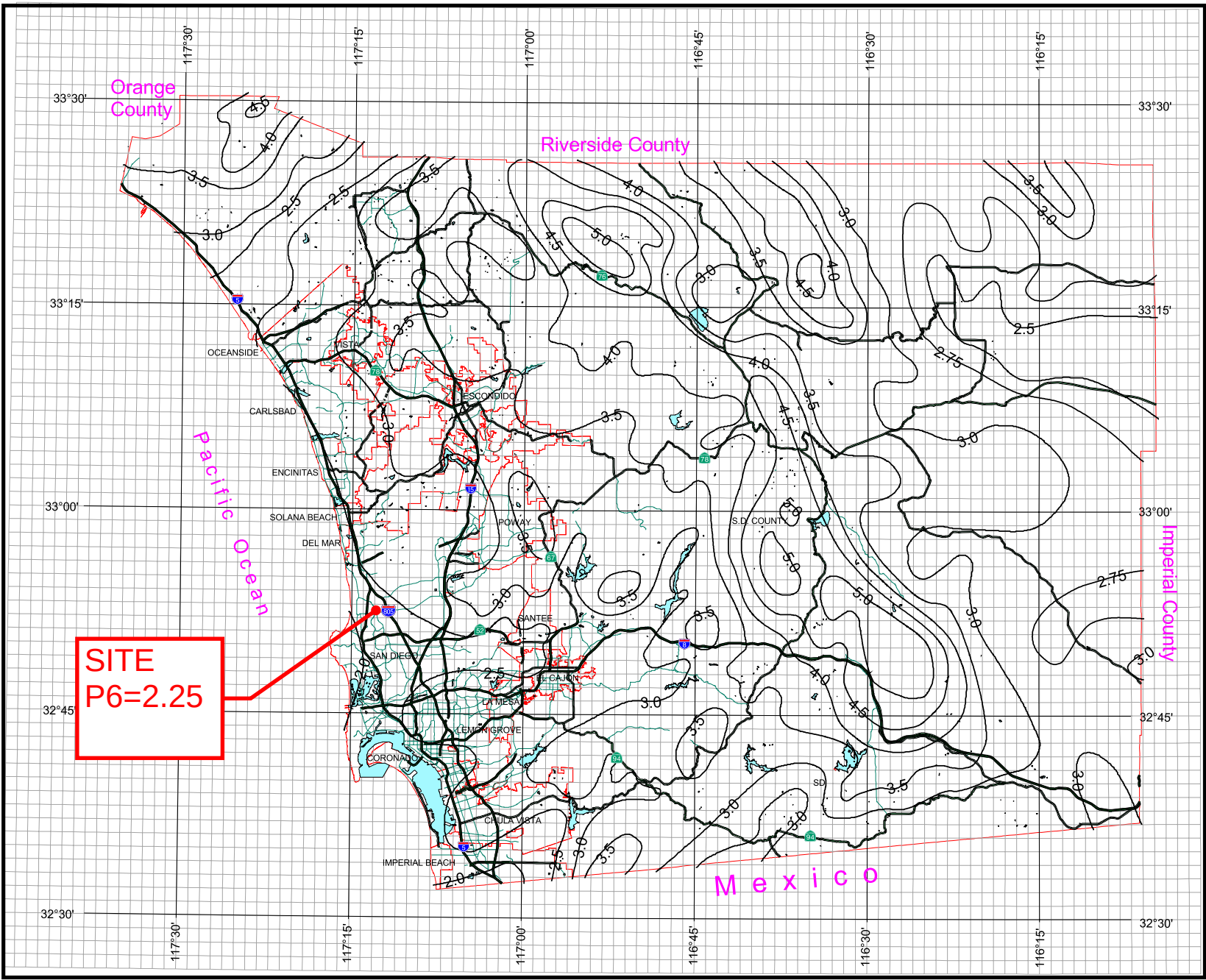
Appendix A – Site Information

Vicinity Map
Rainfall Isopluvials
FEMA FIRM
NRCS WebSoil Survey



VICINITY MAP

NO SCALE



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

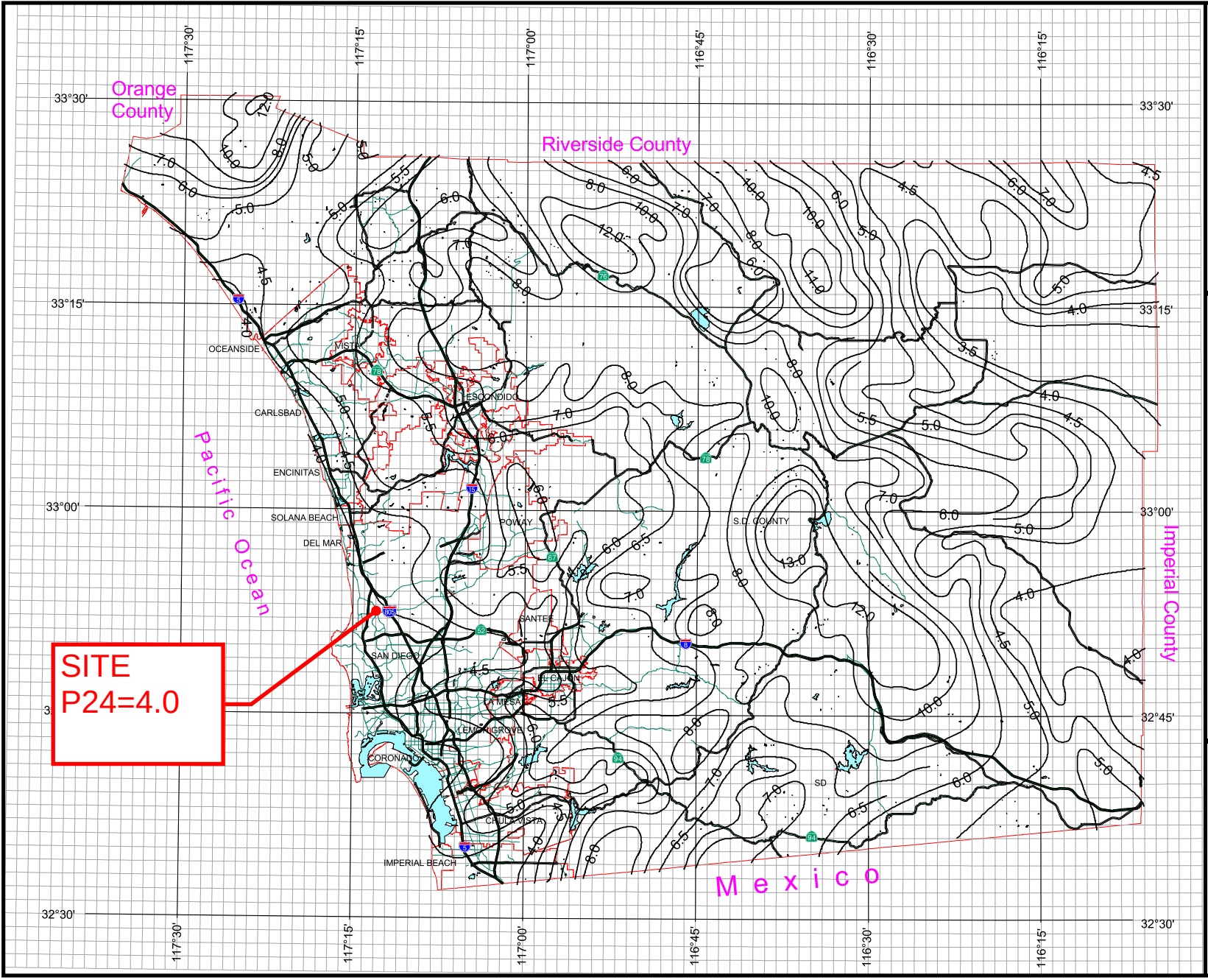
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

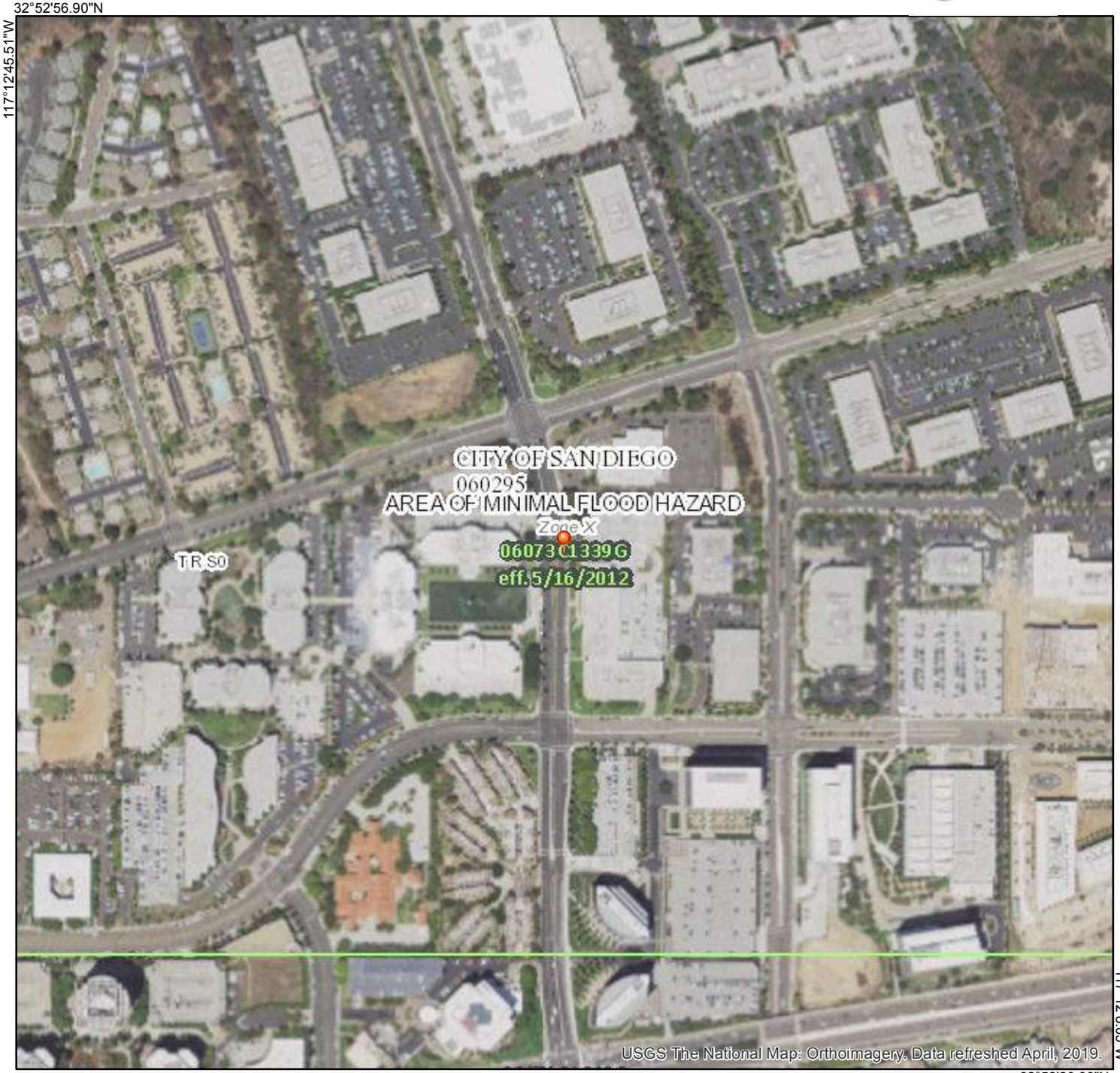
3 0 3 Miles

National Flood Hazard Layer FIRMette

FEMA

32°52'56.90"N

117°12'45.51"W



117°12'8.05"W

32°52'26.69"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

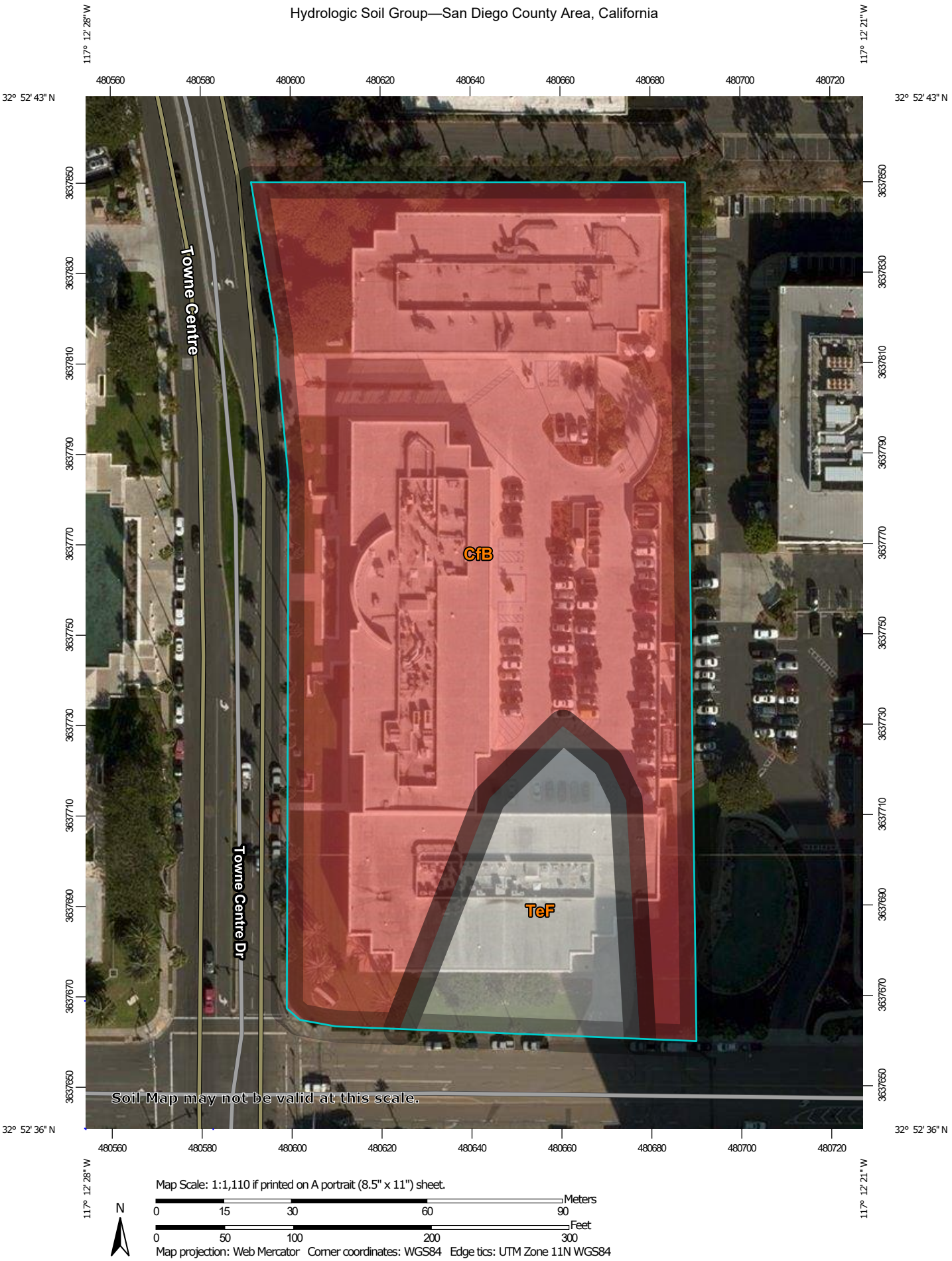
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/10/2019 at 11:04:31 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.


117° 12' 28" W
117° 12' 21" W
480560
480580
480600
480620
480640
480660
480680
480700
480720
32° 52' 43" N
32° 52' 36" N
3637850
3637830
3637810
3637790
3637770
3637750
3637730
3637710
3637690
3637670
3637650
Towne Centre
Towne Centre Dr
CfB
TeF
Soil Map may not be valid at this scale.
Map Scale: 1:1,110 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 15 30 60 90
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CfB	Chesterton fine sandy loam, 2 to 5 percent slopes	D	3.6	85.6%
TeF	Terrace escarpments		0.6	14.4%
Totals for Area of Interest			**4.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Appendix B –Existing Hydrology

Figure A-1 from the City DDM (Jan. 2017)
On-Site Hydrology Work Map
Hydrology Calculations

Table A-1. Runoff Coefficients for Rational Method

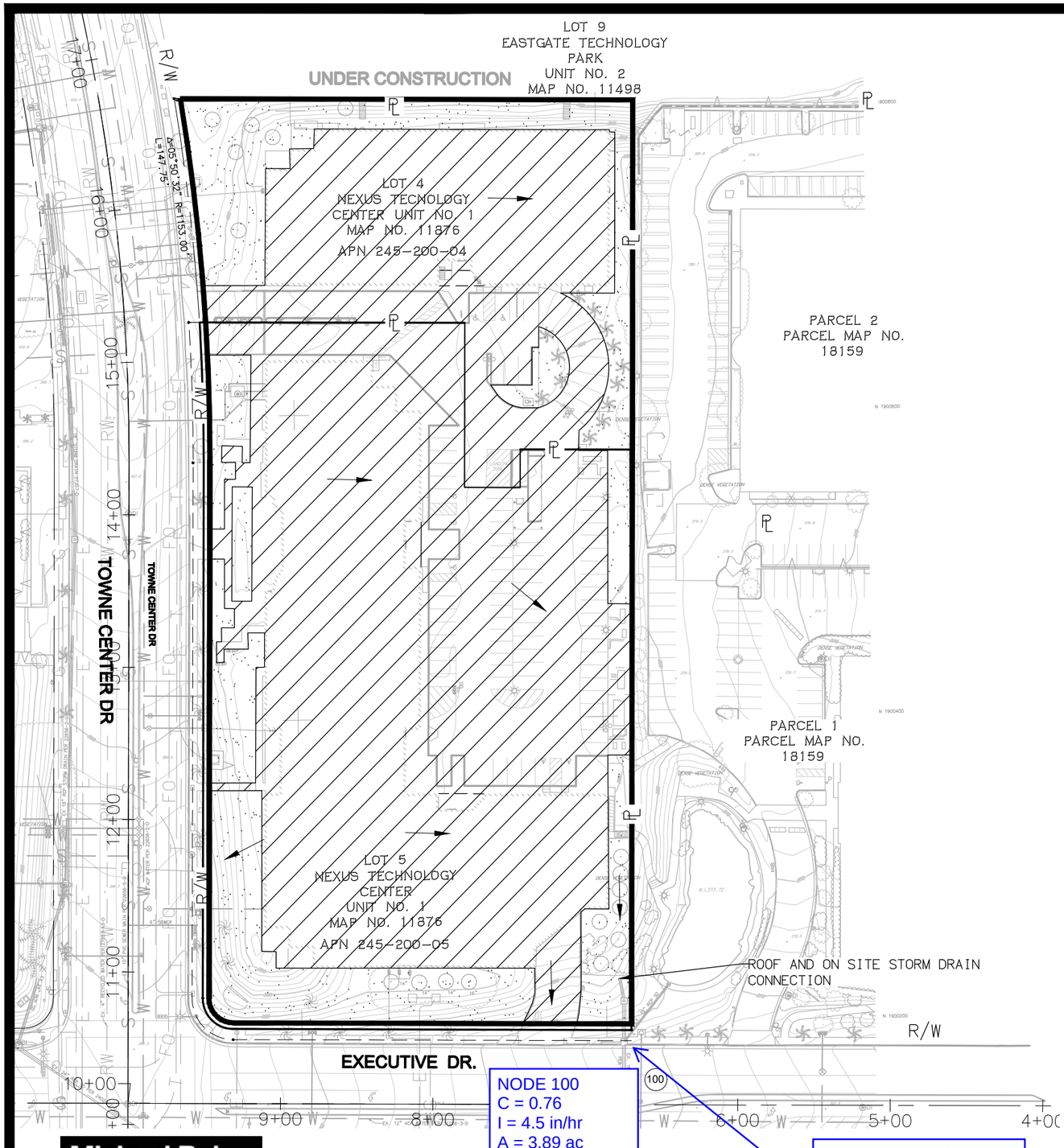
Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A-1.2 Rainfall Intensity



LEGEND

PROJECT AREA

IMPERVIOUS AREA

PERVIOUS AREA

FLOW DIRECTION

EXISTING STORM DRAIN

NODE 100 (100)

EXISTING AREA		
Ex. Impervious Area	129,115 SF	2.96 ac
Ex. Pervious Area	40,384 SF	0.93 ac
Total	169,499 SF	3.89 ac
Actual Impervious 76%	0.76	
C Value Per City of San Diego DDM Section A.1.2		
Commercial Property		
Tabulated Impervious 80 %	0.85	
Weighted C Value = (Actual / Tabluated) x 0.85	0.76	
Peak Flow Calculation		
Q=CIA		
Intensity determined using Figure A.1 of the DDM		
Q = (0.76)*(4.5)*(3.89)		
Q100 = 13.3 CFS		

80 40 0 80

SCALE: 1"=80'

SCALE 1"=80'

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ARE Science Village
On-Site Hydrologic Work Map Existing

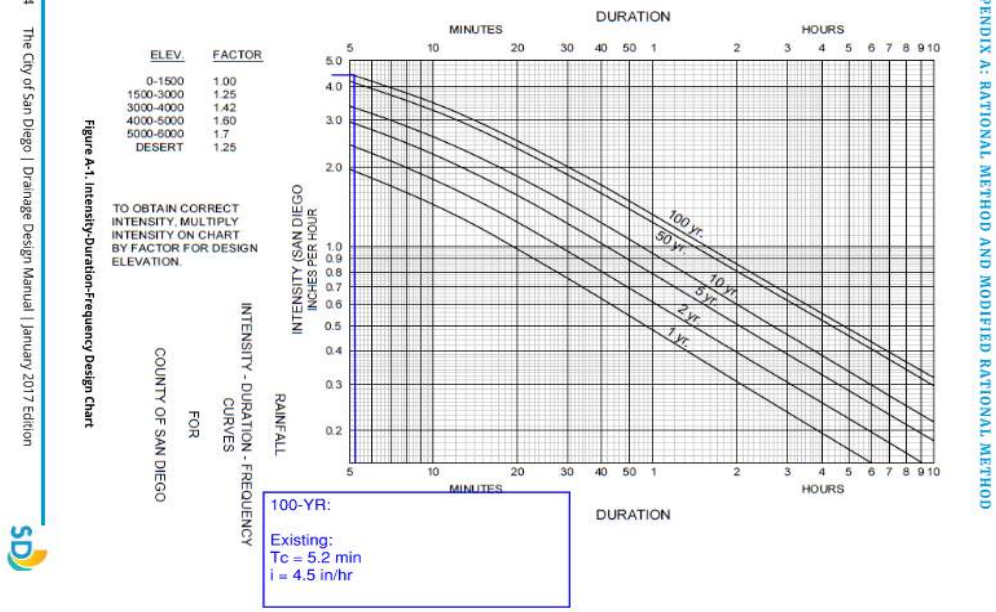


Figure A-1. Intensity-Duration-Frequency Design Chart

ARE Science Village

Existing Conditions

Time of Concentration Calculations

Natural Areas

Land Use = Commercial

C = 0.76

Dist. = 673.00 ft.

slope = 4.00 %

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

T_c = 10.02 min.

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

Area (acres)	
Pervious	0.93
Impervious	2.96
Total	3.89

Actual Impervious	0.76
Tabulated Impervious	0.85
Coefecient	0.85
Revised 'C'	0.76
Use 'C'	0.76

***C value cannot exeed 1 or be less than 0.50**

Basin Intensity Calculations

Selected Frequency, **100** year

I = 4.50 in/hr

Basin Flow Calculations

Q = 13.3 cfs

$$Q = C * I * A$$

C = 0.76

I = 4.50 in/hr

A = 3.89 ac.

Job No. 181315

Appendix C – Proposed Hydrology

Figure A-1 from the City DDM (Jan. 2017)
On-Site Hydrology Work Map
Hydrology Calculations

Table A-1. Runoff Coefficients for Rational Method

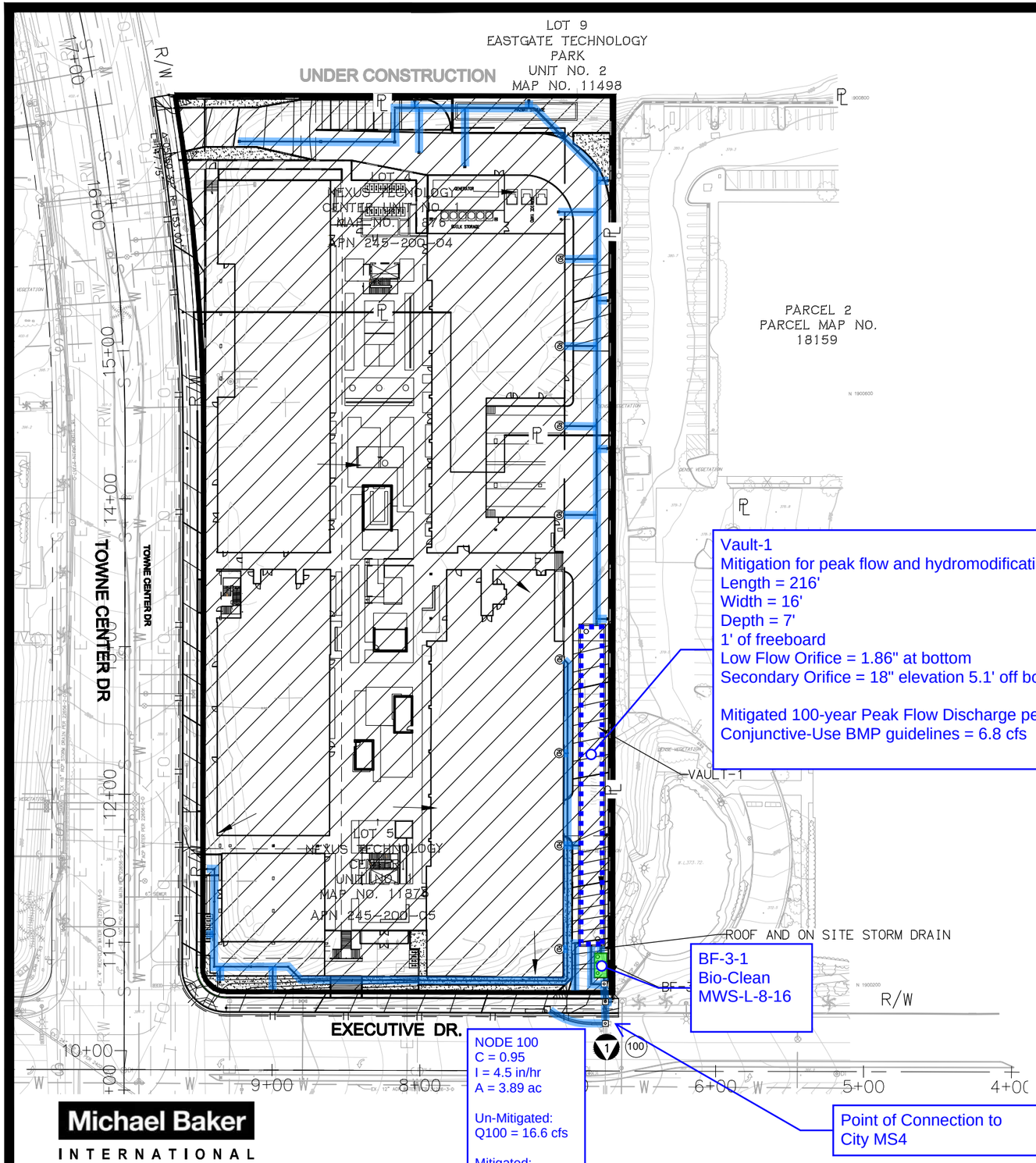
Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A-1.2 Rainfall Intensity



LEGEND

- PROJECT AREA
- IMPERVIOUS AREA
- PERVIOUS AREA
- FLOW DIRECTION
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- MODULAR WETLAND SYSTEM
- VAULT
- POINT OF CONNECTION (1)
- NODE 100 (100)

PROPOSED AREA		
Impervious Area	161,024 SF	3.70 ac
Pervious Area	8,475 SF	0.19 ac
Total	169,499 SF	3.89 ac
Actual Impervious 95%	0.95	
C Value Per City of San Diego DDM Section A.1.2		
Commercial Property		
Tabulated Impervious 80%	0.85	
Weighted C Value = (Actual / Tabluated) x 0.85	0.95	
Peak Flow Calculation		
Q=CIA		
Intensity determined using Figure A.1 of the DDM		
Q = (0.95)*(4.5)*(3.89)		
Q100 = 16.6 CFS		

80 40 0 80
SCALE: 1"=80'

SCALE 1"=80'

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ARE Science Village
On-Site Hydrologic Work Map Proposed

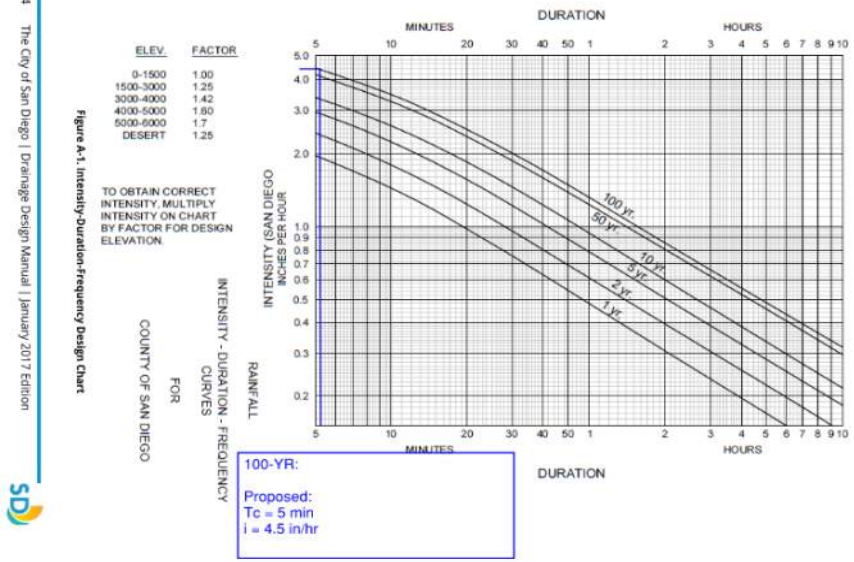


Figure A-1. Intensity-Duration-Frequency Design Chart

ARE Science Village

Proposed Conditions

Time of Concentration Calculations

Natural Areas

Land Use = Commercial

C = 0.95

Dist. = 673.00 ft.

slope = 4 %

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

T_c = 4.43 min.

* Minimum T_c = 5 Minutes

Weighted C Value Calculation

	Area (acres)
Pervious	0.19
Impervious	3.70
Total	3.89

Actual Impervious	0.95
Tabulated Impervious	0.85
Coefecient	0.85
Revised 'C'	0.95
Use 'C'	0.95

***C value cannot exeed 1 or be less than 0.50**

Basin Intensity Calculations

Selected Frequency, **100** year

I = 4.50 in/hr

Basin Flow Calculations

Q = 16.63 cfs

$$Q = C * I * A$$

C = 0.95

I = 4.50 in/hr

A = 3.89 ac.

Job No. 181315

Appendix D – Hydraulics

Proposed Q100 Hydrograph
Hydraflow Hydrographs Input & Output
Drawdown Calculations

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 7/6/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.25 INCHES
BASIN AREA 3.89 ACRES
RUNOFF COEFFICIENT 0.95
PEAK DISCHARGE 16.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.5
TIME (MIN) = 10	DISCHARGE (CFS) = 0.5
TIME (MIN) = 15	DISCHARGE (CFS) = 0.5
TIME (MIN) = 20	DISCHARGE (CFS) = 0.5
TIME (MIN) = 25	DISCHARGE (CFS) = 0.5
TIME (MIN) = 30	DISCHARGE (CFS) = 0.5
TIME (MIN) = 35	DISCHARGE (CFS) = 0.5
TIME (MIN) = 40	DISCHARGE (CFS) = 0.5
TIME (MIN) = 45	DISCHARGE (CFS) = 0.6
TIME (MIN) = 50	DISCHARGE (CFS) = 0.6
TIME (MIN) = 55	DISCHARGE (CFS) = 0.6
TIME (MIN) = 60	DISCHARGE (CFS) = 0.6
TIME (MIN) = 65	DISCHARGE (CFS) = 0.6
TIME (MIN) = 70	DISCHARGE (CFS) = 0.6
TIME (MIN) = 75	DISCHARGE (CFS) = 0.6
TIME (MIN) = 80	DISCHARGE (CFS) = 0.6
TIME (MIN) = 85	DISCHARGE (CFS) = 0.6
TIME (MIN) = 90	DISCHARGE (CFS) = 0.7
TIME (MIN) = 95	DISCHARGE (CFS) = 0.7
TIME (MIN) = 100	DISCHARGE (CFS) = 0.7
TIME (MIN) = 105	DISCHARGE (CFS) = 0.7
TIME (MIN) = 110	DISCHARGE (CFS) = 0.7
TIME (MIN) = 115	DISCHARGE (CFS) = 0.7
TIME (MIN) = 120	DISCHARGE (CFS) = 0.8
TIME (MIN) = 125	DISCHARGE (CFS) = 0.8
TIME (MIN) = 130	DISCHARGE (CFS) = 0.8
TIME (MIN) = 135	DISCHARGE (CFS) = 0.8
TIME (MIN) = 140	DISCHARGE (CFS) = 0.8
TIME (MIN) = 145	DISCHARGE (CFS) = 0.9
TIME (MIN) = 150	DISCHARGE (CFS) = 0.9
TIME (MIN) = 155	DISCHARGE (CFS) = 0.9
TIME (MIN) = 160	DISCHARGE (CFS) = 1
TIME (MIN) = 165	DISCHARGE (CFS) = 1
TIME (MIN) = 170	DISCHARGE (CFS) = 1
TIME (MIN) = 175	DISCHARGE (CFS) = 1.1
TIME (MIN) = 180	DISCHARGE (CFS) = 1.1
TIME (MIN) = 185	DISCHARGE (CFS) = 1.2
TIME (MIN) = 190	DISCHARGE (CFS) = 1.3
TIME (MIN) = 195	DISCHARGE (CFS) = 1.4
TIME (MIN) = 200	DISCHARGE (CFS) = 1.5
TIME (MIN) = 205	DISCHARGE (CFS) = 1.6
TIME (MIN) = 210	DISCHARGE (CFS) = 1.7
TIME (MIN) = 215	DISCHARGE (CFS) = 2
TIME (MIN) = 220	DISCHARGE (CFS) = 2.1
TIME (MIN) = 225	DISCHARGE (CFS) = 2.6
TIME (MIN) = 230	DISCHARGE (CFS) = 3
TIME (MIN) = 235	DISCHARGE (CFS) = 4.3
TIME (MIN) = 240	DISCHARGE (CFS) = 11.4
TIME (MIN) = 245	DISCHARGE (CFS) = 16.6
TIME (MIN) = 250	DISCHARGE (CFS) = 3.5
TIME (MIN) = 255	DISCHARGE (CFS) = 2.3
TIME (MIN) = 260	DISCHARGE (CFS) = 1.8
TIME (MIN) = 265	DISCHARGE (CFS) = 1.5
TIME (MIN) = 270	DISCHARGE (CFS) = 1.3
TIME (MIN) = 275	DISCHARGE (CFS) = 1.2
TIME (MIN) = 280	DISCHARGE (CFS) = 1.1
TIME (MIN) = 285	DISCHARGE (CFS) = 1
TIME (MIN) = 290	DISCHARGE (CFS) = 0.9
TIME (MIN) = 295	DISCHARGE (CFS) = 0.9
TIME (MIN) = 300	DISCHARGE (CFS) = 0.8
TIME (MIN) = 305	DISCHARGE (CFS) = 0.8
TIME (MIN) = 310	DISCHARGE (CFS) = 0.7
TIME (MIN) = 315	DISCHARGE (CFS) = 0.7
TIME (MIN) = 320	DISCHARGE (CFS) = 0.7
TIME (MIN) = 325	DISCHARGE (CFS) = 0.6
TIME (MIN) = 330	DISCHARGE (CFS) = 0.6
TIME (MIN) = 335	DISCHARGE (CFS) = 0.6
TIME (MIN) = 340	DISCHARGE (CFS) = 0.6
TIME (MIN) = 345	DISCHARGE (CFS) = 0.6
TIME (MIN) = 350	DISCHARGE (CFS) = 0.5
TIME (MIN) = 355	DISCHARGE (CFS) = 0.5
TIME (MIN) = 360	DISCHARGE (CFS) = 0.5
TIME (MIN) = 365	DISCHARGE (CFS) = 0

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	16.60	5	245	29,970	------	------	------	Inflow
2	Reservoir	4.586	5	250	29,600	1	106.12	21,140	Actual Vault
3	Reservoir	6.838	5	250	22,016	1	104.42	15,260	Vault w/o WQ
4	Reservoir	1.226	5	275	5,089	1	107.35	25,404	Vault (Emer. Weir)

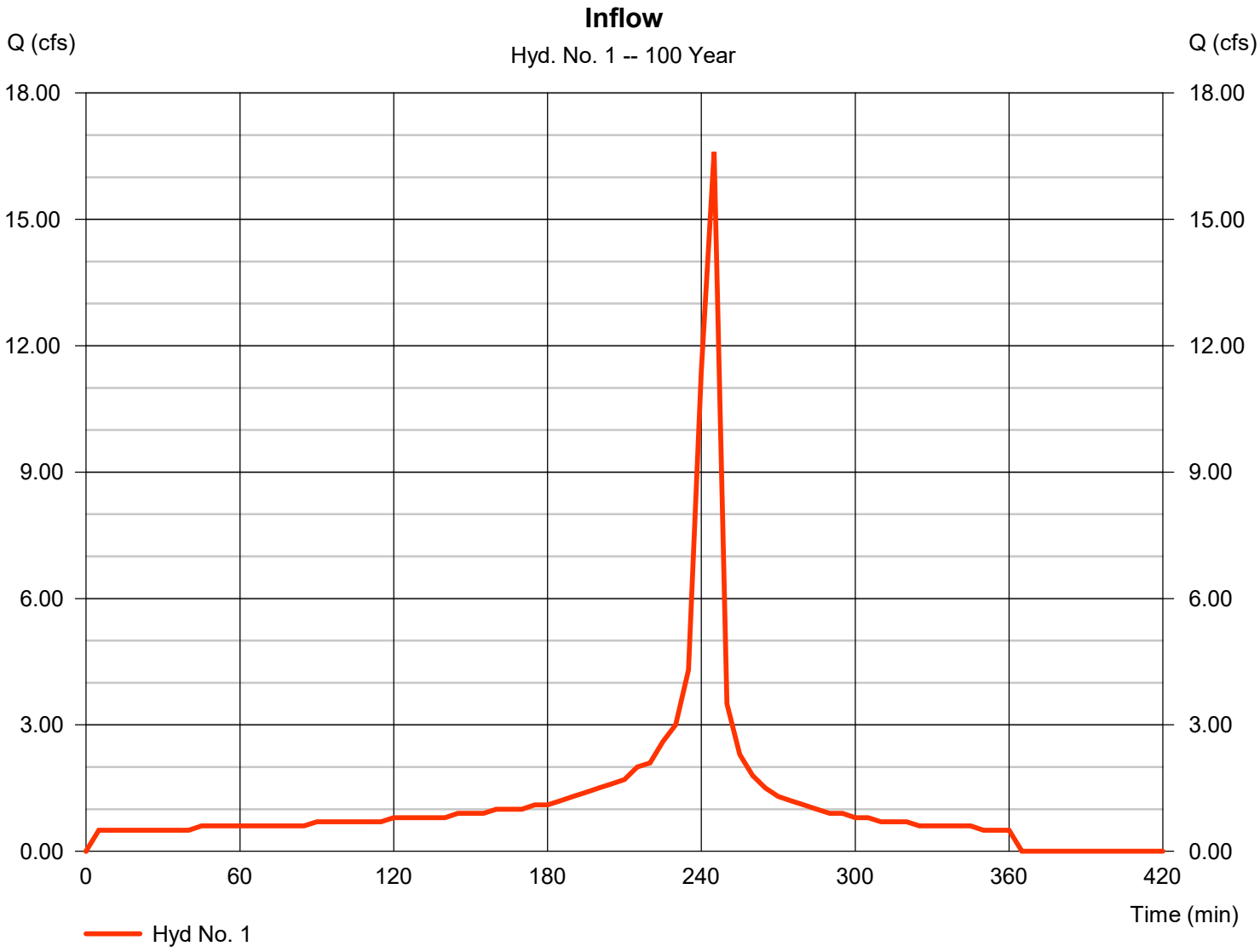
Mitigated 100-year Peak Flow Discharge per Conjunctive-Use BMP guidelines.

Hydrograph Report

Hyd. No. 1

Inflow

Hydrograph type	= Manual	Peak discharge	= 16.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 29,970 cuft



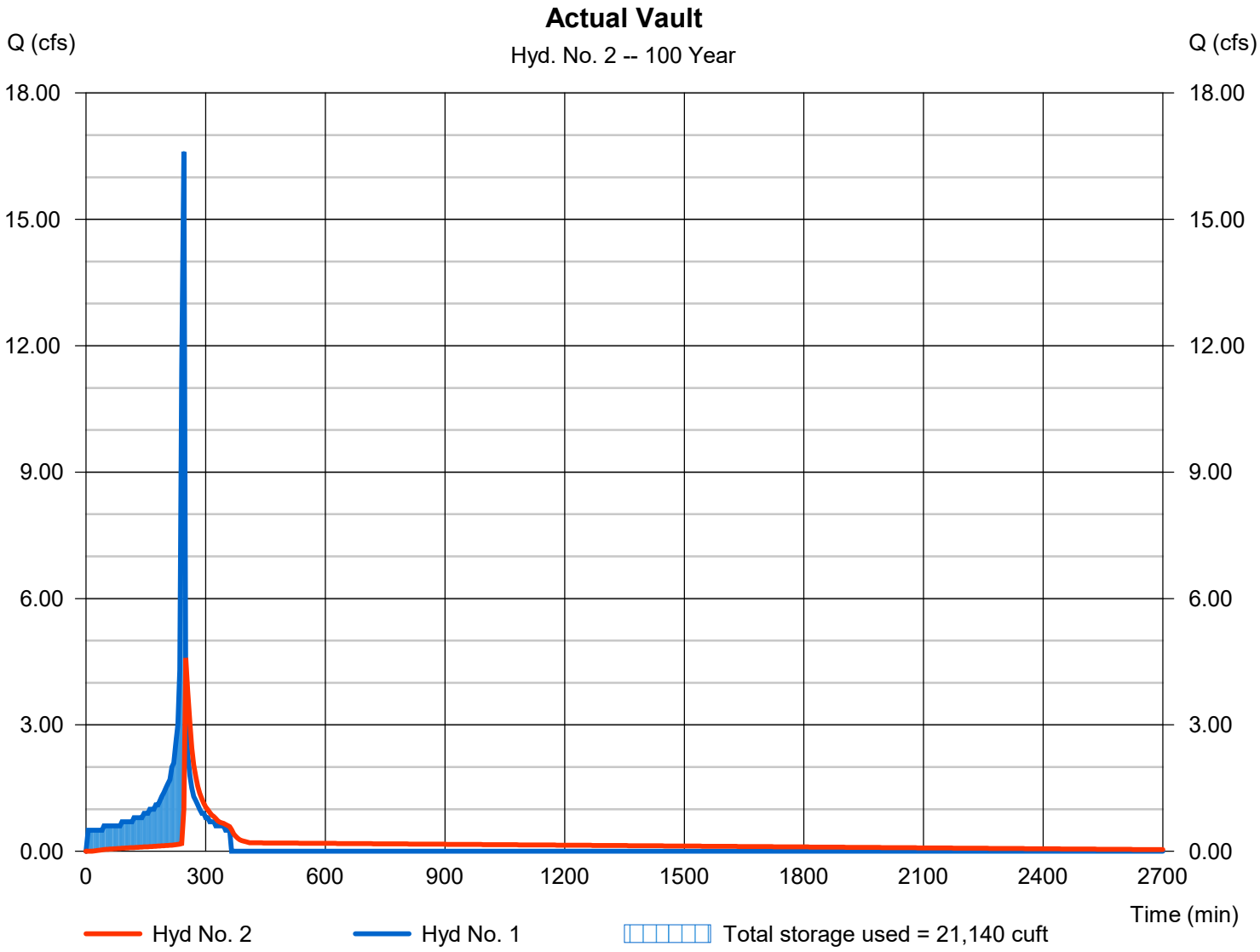
Hydrograph Report

Hyd. No. 2

Actual Vault

Hydrograph type	=	Reservoir	Peak discharge	=	4.586 cfs
Storm frequency	=	100 yrs	Time to peak	=	250 min
Time interval	=	5 min	Hyd. volume	=	29,600 cuft
Inflow hyd. No.	=	1 - Inflow	Max. Elevation	=	106.12 ft
Reservoir name	=	Actual Vault	Max. Storage	=	21,140 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Actual Vault

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Matches HMP orifice found in SWQMP

Matches elevation of secondary release found in SWQMP

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	3,456	0	0
1.00	101.00	3,456	3,456	3,456
2.00	102.00	3,456	3,456	6,911
3.00	103.00	3,456	3,456	10,367
4.00	104.00	3,456	3,456	13,823
5.00	105.00	3,456	3,456	17,278
6.00	106.00	3,456	3,456	20,734
7.00	107.00	3,456	3,456	24,190

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.86	18.00	0.00
Span (in)	= 12.00	1.86	18.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.10	105.10	0.00
Length (ft)	= 10.00	1.00	10.00	0.00
Slope (%)	= 1.00	1.00	1.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	---	---	---	---	---	---	0.000
0.10	346	100.10	0.00	0.00	0.00	---	---	---	---	---	---	---	0.000
0.20	691	100.20	0.01 ic	0.01 ic	0.00	---	---	---	---	---	---	---	0.014
0.30	1,037	100.30	0.03 ic	0.03 ic	0.00	---	---	---	---	---	---	---	0.032
0.40	1,382	100.40	0.04 ic	0.04 ic	0.00	---	---	---	---	---	---	---	0.043
0.50	1,728	100.50	0.05 ic	0.05 ic	0.00	---	---	---	---	---	---	---	0.052
0.60	2,073	100.60	0.06 ic	0.06 ic	0.00	---	---	---	---	---	---	---	0.059
0.70	2,419	100.70	0.07 ic	0.07 ic	0.00	---	---	---	---	---	---	---	0.066
0.80	2,765	100.80	0.07 ic	0.07 ic	0.00	---	---	---	---	---	---	---	0.072
0.90	3,110	100.90	0.08 ic	0.08 ic	0.00	---	---	---	---	---	---	---	0.077
1.00	3,456	101.00	0.08 ic	0.08 ic	0.00	---	---	---	---	---	---	---	0.082
1.10	3,801	101.10	0.09 ic	0.09 ic	0.00	---	---	---	---	---	---	---	0.087
1.20	4,147	101.20	0.09 ic	0.09 ic	0.00	---	---	---	---	---	---	---	0.092
1.30	4,492	101.30	0.10 ic	0.10 ic	0.00	---	---	---	---	---	---	---	0.096
1.40	4,838	101.40	0.11 ic	0.10 ic	0.00	---	---	---	---	---	---	---	0.100
1.50	5,183	101.50	0.11 ic	0.10 ic	0.00	---	---	---	---	---	---	---	0.104
1.60	5,529	101.60	0.11 ic	0.11 ic	0.00	---	---	---	---	---	---	---	0.108
1.70	5,875	101.70	0.11 ic	0.11 ic	0.00	---	---	---	---	---	---	---	0.112
1.80	6,220	101.80	0.12 ic	0.12 ic	0.00	---	---	---	---	---	---	---	0.116
1.90	6,566	101.90	0.12 ic	0.12 ic	0.00	---	---	---	---	---	---	---	0.119
2.00	6,911	102.00	0.12 ic	0.12 ic	0.00	---	---	---	---	---	---	---	0.123
2.10	7,257	102.10	0.13 ic	0.13 ic	0.00	---	---	---	---	---	---	---	0.126
2.20	7,602	102.20	0.13 ic	0.13 ic	0.00	---	---	---	---	---	---	---	0.129
2.30	7,948	102.30	0.14 ic	0.13 ic	0.00								0.132
2.40	8,294	102.40	0.14 ic	0.14 ic	0.00								0.135
2.50	8,639	102.50	0.14 ic	0.14 ic	0.00								0.138
2.60	8,985	102.60	0.15 ic	0.14 ic	0.00								0.141
2.70	9,330	102.70	0.15 ic	0.14 ic	0.00								0.144
2.80	9,676	102.80	0.15 ic	0.15 ic	0.00								0.147
2.90	10,021	102.90	0.15 ic	0.15 ic	0.00								0.150
3.00	10,367	103.00	0.16 ic	0.15 ic	0.00								0.152
3.10	10,713	103.10	0.16 ic	0.16 ic	0.00								0.155
3.20	11,058	103.20	0.16 ic	0.16 ic	0.00								0.158
3.30	11,404	103.30	0.17 ic	0.16 ic	0.00	---	---	---	---	---	---	---	0.160
3.40	11,749	103.40	0.17 ic	0.16 ic	0.00	---	---	---	---	---	---	---	0.163

DCV = 6,317 CF
DCV X 1.5 = 9,475.5 CF

Stage that correlates to DCV is 2.8 ft.
Draw-down = 43.69 hours

Continues on next page...

Actual Vault

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.50	12,095	103.50	0.17 ic	0.17 ic	0.00	---	---	---	---	---	---	---	0.165
3.60	12,440	103.60	0.17 ic	0.17 ic	0.00	---	---	---	---	---	---	---	0.168
3.70	12,786	103.70	0.18 ic	0.17 ic	0.00	---	---	---	---	---	---	---	0.170
3.80	13,131	103.80	0.18 ic	0.17 ic	0.00	---	---	---	---	---	---	---	0.172
3.90	13,477	103.90	0.18 ic	0.17 ic	0.00	---	---	---	---	---	---	---	0.175
4.00	13,823	104.00	0.18 ic	0.18 ic	0.00	---	---	---	---	---	---	---	0.177
4.10	14,168	104.10	0.18 ic	0.18 ic	0.00	---	---	---	---	---	---	---	0.179
4.20	14,514	104.20	0.19 ic	0.18 ic	0.00	---	---	---	---	---	---	---	0.182
4.30	14,859	104.30	0.19 ic	0.18 ic	0.00	---	---	---	---	---	---	---	0.184
4.40	15,205	104.40	0.19 ic	0.19 ic	0.00	---	---	---	---	---	---	---	0.186
4.50	15,550	104.50	0.19 ic	0.19 ic	0.00	---	---	---	---	---	---	---	0.188
4.60	15,896	104.60	0.19 ic	0.19 ic	0.00	---	---	---	---	---	---	---	0.190
4.70	16,242	104.70	0.20 ic	0.19 ic	0.00	---	---	---	---	---	---	---	0.192
4.80	16,587	104.80	0.20 ic	0.19 ic	0.00	---	---	---	---	---	---	---	0.195
4.90	16,933	104.90	0.20 ic	0.20 ic	0.00	---	---	---	---	---	---	---	0.197
5.00	17,278	105.00	0.20 ic	0.20 ic	0.00								0.199
5.10	17,624	105.10	0.20 ic	0.20 ic	0.00								0.201
5.20	17,969	105.20	0.26 ic	0.20 ic	0.06 ic								0.260
5.30	18,315	105.30	0.42 oc	0.20 ic	0.22 ic								0.421
5.40	18,661	105.40	0.69 oc	0.20 ic	0.49 ic								0.692
5.50	19,006	105.50	1.04 oc	0.20 ic	0.84 ic								1.042
5.60	19,352	105.60	1.46 oc	0.20 ic	1.27 ic								1.462
5.70	19,697	105.70	1.97 oc	0.20 ic	1.78 ic								1.973
5.80	20,043	105.80	2.51 oc	0.20 ic	2.32 ic								2.511
5.90	20,388	105.90	3.15 oc	0.19 ic	2.96 ic	---	---	---	---	---	---	---	3.153
6.00	20,734	106.00	3.78 oc	0.19 ic	3.59 ic	---	---	---	---	---	---	---	3.777
6.10	21,079	106.10	4.47 ic	0.19 ic	4.28 ic	---	---	---	---	---	---	---	4.467
6.20	21,425	106.20	5.14 ic	0.18 ic	4.96 ic	---	---	---	---	---	---	---	5.142
6.30	21,771	106.30	5.82 ic	0.17 ic	5.65 ic	---	---	---	---	---	---	---	5.822
6.40	22,116	106.40	6.49 ic	0.16 ic	6.33 ic	---	---	---	---	---	---	---	6.491
6.50	22,462	106.50	7.06 ic	0.14 ic	6.92 ic	---	---	---	---	---	---	---	7.063
6.60	22,807	106.60	7.05 ic	0.15 ic	0.00	---	---	---	---	---	---	---	0.147
6.70	23,153	106.70	7.96 ic	0.12 ic	7.84 ic	---	---	---	---	---	---	---	7.964
6.80	23,498	106.80	8.40 ic	0.11 ic	8.29 ic	---	---	---	---	---	---	---	8.398
6.90	23,844	106.90	8.76 ic	0.09 ic	8.66 ic	---	---	---	---	---	---	---	8.756
7.00	24,190	107.00	8.82 ic	0.09 ic	8.73 ic	---	---	---	---	---	---	---	8.825

HMP Volume achieved after secondary outflow (located at 5.1') = 17, 625 cf

Draw-down = 56.1 hrs

...End

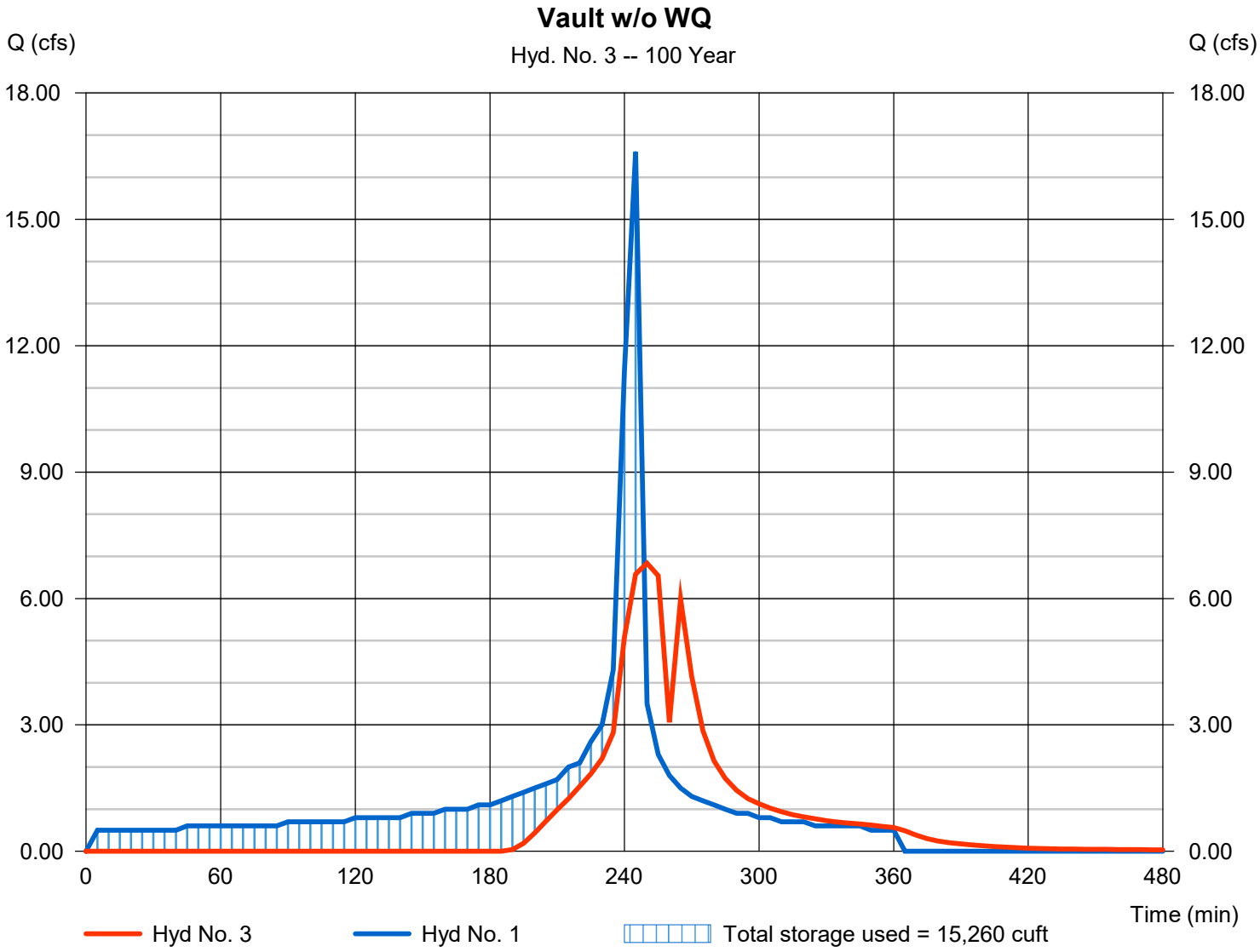
Hydrograph Report

Hyd. No. 3

Vault w/o WQ

Hydrograph type	=	Reservoir	Peak discharge	=	6.838 cfs
Storm frequency	=	100 yrs	Time to peak	=	250 min
Time interval	=	5 min	Hyd. volume	=	22,016 cuft
Inflow hyd. No.	=	1 - Inflow	Max. Elevation	=	104.42 ft
Reservoir name	=	Vault w/o WQ	Max. Storage	=	15,260 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - Vault w/o WQ

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00

WQ Volume (Stage 2.8') not accounted for in this model. Thus, secondary release is 5.1 - 2.8 = 2.3' from bottom of tank when WQ volume is ignored per Conjunctive-Use BMP guidelines.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	3,456	0	0
1.00	101.00	3,456	3,456	3,456
2.00	102.00	3,456	3,456	6,911
3.00	103.00	3,456	3,456	10,367
4.00	104.00	3,456	3,456	13,823
5.00	105.00	3,456	3,456	17,278
6.00	106.00	3,456	3,456	20,734
7.00	107.00	3,456	3,456	24,190

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	18.00	0.00	0.00
Span (in)	= 12.00	18.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	102.30	0.00	0.00
Length (ft)	= 10.00	10.00	0.00	0.00
Slope (%)	= 1.00	1.00	1.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.10	346	100.10	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.20	691	100.20	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.30	1,037	100.30	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.40	1,382	100.40	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.50	1,728	100.50	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.60	2,073	100.60	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.70	2,419	100.70	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.80	2,765	100.80	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.90	3,110	100.90	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.00	3,456	101.00	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.10	3,801	101.10	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.20	4,147	101.20	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.30	4,492	101.30	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.40	4,838	101.40	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.50	5,183	101.50	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.60	5,529	101.60	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.70	5,875	101.70	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.80	6,220	101.80	0.00	0.00	---	---	---	---	---	---	---	---	0.000
1.90	6,566	101.90	0.00	0.00	---	---	---	---	---	---	---	---	0.000
2.00	6,911	102.00	0.00	0.00	---	---	---	---	---	---	---	---	0.000
2.10	7,257	102.10	0.00	0.00	---	---	---	---	---	---	---	---	0.000
2.20	7,602	102.20	0.00	0.00	---	---	---	---	---	---	---	---	0.000
2.30	7,948	102.30	0.00	0.00	---	---	---	---	---	---	---	---	0.000
2.40	8,294	102.40	0.06 ic	0.06 ic	---	---	---	---	---	---	---	---	0.058
2.50	8,639	102.50	0.22 ic	0.22 ic	---	---	---	---	---	---	---	---	0.218
2.60	8,985	102.60	0.50 oc	0.49 ic	---	---	---	---	---	---	---	---	0.490
2.70	9,330	102.70	0.85 oc	0.84 ic	---	---	---	---	---	---	---	---	0.842
2.80	9,676	102.80	1.27 oc	1.27 ic	---	---	---	---	---	---	---	---	1.265
2.90	10,021	102.90	1.78 oc	1.78 ic	---	---	---	---	---	---	---	---	1.778
3.00	10,367	103.00	2.32 oc	2.32 ic	---	---	---	---	---	---	---	---	2.316
3.10	10,713	103.10	2.96 oc	2.96 ic	---	---	---	---	---	---	---	---	2.959
3.20	11,058	103.20	3.59 oc	3.59 ic	---	---	---	---	---	---	---	---	3.586
3.30	11,404	103.30	4.28 ic	4.28 ic	---	---	---	---	---	---	---	---	4.280
3.40	11,749	103.40	4.96 ic	4.96 ic	---	---	---	---	---	---	---	---	4.964

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Vault w/o WQ

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.50	12,095	103.50	5.65 ic	5.65 ic	---	---	---	---	---	---	---	---	5.654
3.60	12,440	103.60	6.00 ic	6.00 ic	---	---	---	---	---	---	---	---	5.999
3.70	12,786	103.70	6.15 ic	6.15 ic	---	---	---	---	---	---	---	---	6.151
3.80	13,131	103.80	6.14 ic	0.00	---	---	---	---	---	---	---	---	0.000
3.90	13,477	103.90	6.37 ic	6.37 ic	---	---	---	---	---	---	---	---	6.371
4.00	13,823	104.00	6.46 ic	6.46 ic	---	---	---	---	---	---	---	---	6.464
4.10	14,168	104.10	6.56 ic	6.56 ic	---	---	---	---	---	---	---	---	6.556
4.20	14,514	104.20	6.65 ic	6.65 ic	---	---	---	---	---	---	---	---	6.646
4.30	14,859	104.30	6.74 ic	6.74 ic	---	---	---	---	---	---	---	---	6.736
4.40	15,205	104.40	6.82 ic	6.82 ic	---	---	---	---	---	---	---	---	6.824
4.50	15,550	104.50	6.91 ic	6.91 ic	---	---	---	---	---	---	---	---	6.910
4.60	15,896	104.60	7.00 ic	7.00 ic	---	---	---	---	---	---	---	---	6.996
4.70	16,242	104.70	7.08 ic	7.08 ic	---	---	---	---	---	---	---	---	7.081
4.80	16,587	104.80	7.17 ic	7.16 ic	---	---	---	---	---	---	---	---	7.165
4.90	16,933	104.90	7.25 ic	7.25 ic	---	---	---	---	---	---	---	---	7.247
5.00	17,278	105.00	7.33 ic	7.33 ic	---	---	---	---	---	---	---	---	7.329
5.10	17,624	105.10	7.41 ic	7.41 ic	---	---	---	---	---	---	---	---	7.411
5.20	17,969	105.20	7.49 ic	7.49 ic	---	---	---	---	---	---	---	---	7.491
5.30	18,315	105.30	7.57 ic	7.57 ic	---	---	---	---	---	---	---	---	7.570
5.40	18,661	105.40	7.65 ic	7.65 ic	---	---	---	---	---	---	---	---	7.648
5.50	19,006	105.50	7.73 ic	7.73 ic	---	---	---	---	---	---	---	---	7.726
5.60	19,352	105.60	7.80 ic	7.80 ic	---	---	---	---	---	---	---	---	7.803
5.70	19,697	105.70	7.88 ic	7.88 ic	---	---	---	---	---	---	---	---	7.879
5.80	20,043	105.80	7.95 ic	7.95 ic	---	---	---	---	---	---	---	---	7.955
5.90	20,388	105.90	8.03 ic	8.03 ic	---	---	---	---	---	---	---	---	8.029
6.00	20,734	106.00	8.10 ic	8.10 ic	---	---	---	---	---	---	---	---	8.103
6.10	21,079	106.10	8.18 ic	8.18 ic	---	---	---	---	---	---	---	---	8.177
6.20	21,425	106.20	8.25 ic	8.25 ic	---	---	---	---	---	---	---	---	8.249
6.30	21,771	106.30	8.32 ic	8.32 ic	---	---	---	---	---	---	---	---	8.321
6.40	22,116	106.40	8.39 ic	8.39 ic	---	---	---	---	---	---	---	---	8.392
6.50	22,462	106.50	8.46 ic	8.46 ic	---	---	---	---	---	---	---	---	8.463
6.60	22,807	106.60	8.53 ic	8.53 ic	---	---	---	---	---	---	---	---	8.534
6.70	23,153	106.70	8.60 ic	8.60 ic	---	---	---	---	---	---	---	---	8.603
6.80	23,498	106.80	8.67 ic	8.67 ic	---	---	---	---	---	---	---	---	8.672
6.90	23,844	106.90	8.74 ic	8.74 ic	---	---	---	---	---	---	---	---	8.741
7.00	24,190	107.00	8.81 ic	8.81 ic	---	---	---	---	---	---	---	---	8.809

...End

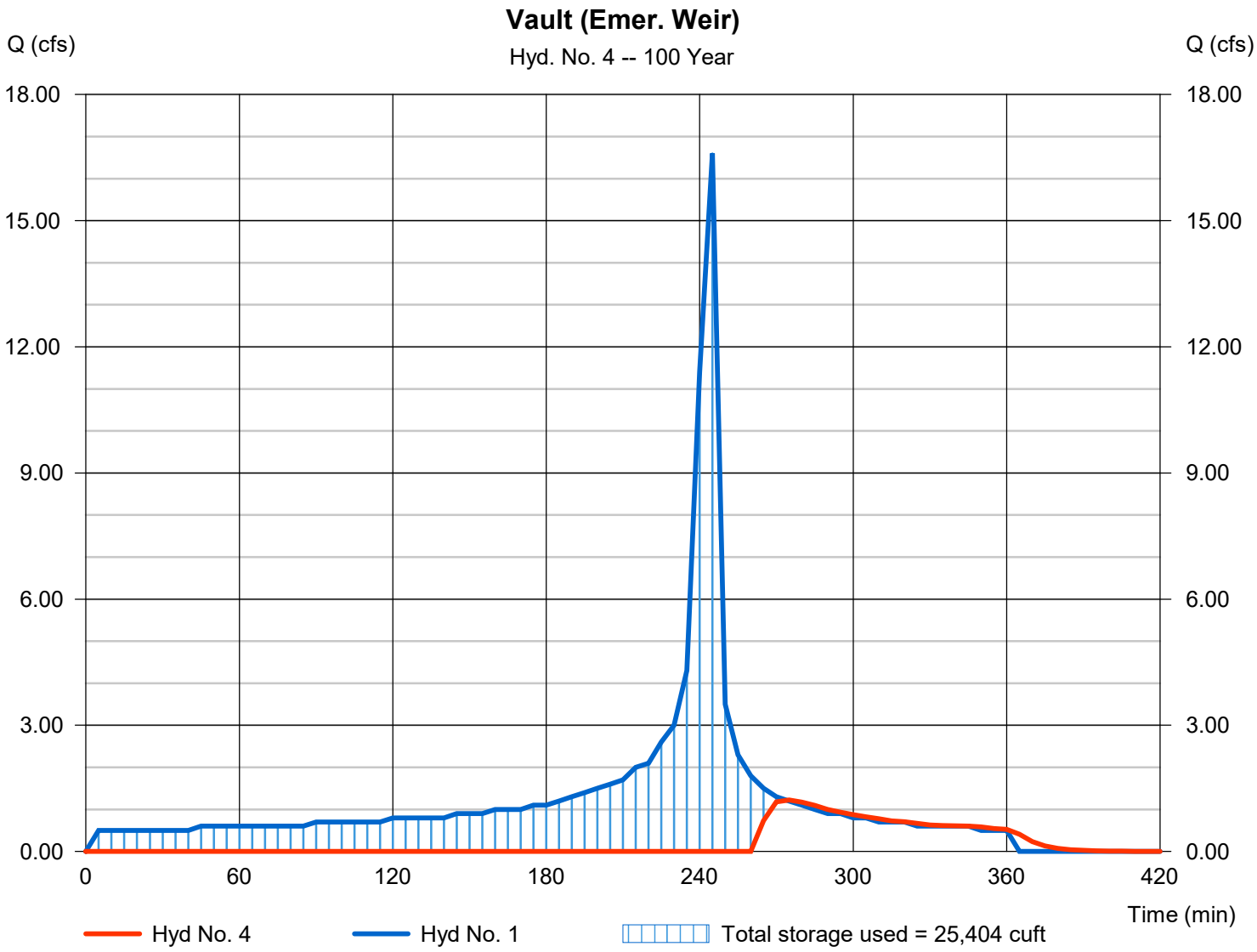
Hydrograph Report

Hyd. No. 4

Vault (Emer. Weir)

Hydrograph type	=	Reservoir	Peak discharge	=	1.226 cfs
Storm frequency	=	100 yrs	Time to peak	=	275 min
Time interval	=	5 min	Hyd. volume	=	5,089 cuft
Inflow hyd. No.	=	1 - Inflow	Max. Elevation	=	107.35 ft
Reservoir name	=	Vault (Emer. Weir)	Max. Storage	=	25,404 cuft

Storage Indication method used.



Pond No. 3 - Vault (Emer. Weir)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	3,456	0	0
1.00	101.00	3,456	3,456	3,456
2.00	102.00	3,456	3,456	6,911
3.00	103.00	3,456	3,456	10,367
4.00	104.00	3,456	3,456	13,823
5.00	105.00	3,456	3,456	17,278
6.00	106.00	3,456	3,456	20,734
7.00	107.00	3,456	3,456	24,190
8.00	108.00	3,456	3,456	27,645

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	Inactive	Inactive
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	1.00	1.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 107.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.10	346	100.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	691	100.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.30	1,037	100.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	1,382	100.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.50	1,728	100.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.60	2,073	100.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.70	2,419	100.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.80	2,765	100.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.90	3,110	100.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	3,456	101.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.10	3,801	101.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.20	4,147	101.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.30	4,492	101.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.40	4,838	101.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.50	5,183	101.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.60	5,529	101.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.70	5,875	101.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.80	6,220	101.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.90	6,566	101.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	6,911	102.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.10	7,257	102.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.20	7,602	102.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.30	7,948	102.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.40	8,294	102.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.50	8,639	102.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.60	8,985	102.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.70	9,330	102.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.80	9,676	102.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.90	10,021	102.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	10,367	103.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.10	10,713	103.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.20	11,058	103.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.30	11,404	103.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000

Continues on next page...

Vault (Emer. Weir)

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.40	11,749	103.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.50	12,095	103.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.60	12,440	103.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.70	12,786	103.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.80	13,131	103.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.90	13,477	103.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.00	13,823	104.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.10	14,168	104.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.20	14,514	104.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.30	14,859	104.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.40	15,205	104.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.50	15,550	104.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.60	15,896	104.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.70	16,242	104.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.80	16,587	104.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.90	16,933	104.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.00	17,278	105.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.10	17,624	105.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.20	17,969	105.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.30	18,315	105.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.40	18,661	105.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.50	19,006	105.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.60	19,352	105.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.70	19,697	105.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.80	20,043	105.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.90	20,388	105.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.00	20,734	106.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.10	21,079	106.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.20	21,425	106.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.30	21,771	106.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.40	22,116	106.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.50	22,462	106.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.60	22,807	106.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.70	23,153	106.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.80	23,498	106.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
6.90	23,844	106.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
7.00	24,190	107.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
7.10	24,535	107.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
7.20	24,881	107.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
7.30	25,226	107.30	0.65 oc	---	---	---	0.63	---	---	---	---	---	0.632
7.40	25,572	107.40	1.79 oc	---	---	---	1.79	---	---	---	---	---	1.787
7.50	25,917	107.50	3.28 oc	---	---	---	3.28	---	---	---	---	---	3.283
7.60	26,263	107.60	5.05 ic	---	---	---	5.05	---	---	---	---	---	5.055
7.70	26,609	107.70	7.06 ic	---	---	---	7.06	---	---	---	---	---	7.064
7.80	26,954	107.80	9.29 ic	---	---	---	9.29	---	---	---	---	---	9.286
7.90	27,300	107.90	10.03 ic	---	---	---	10.03 s	---	---	---	---	---	10.03
8.00	27,645	108.00	10.19 ic	---	---	---	10.19 s	---	---	---	---	---	10.19

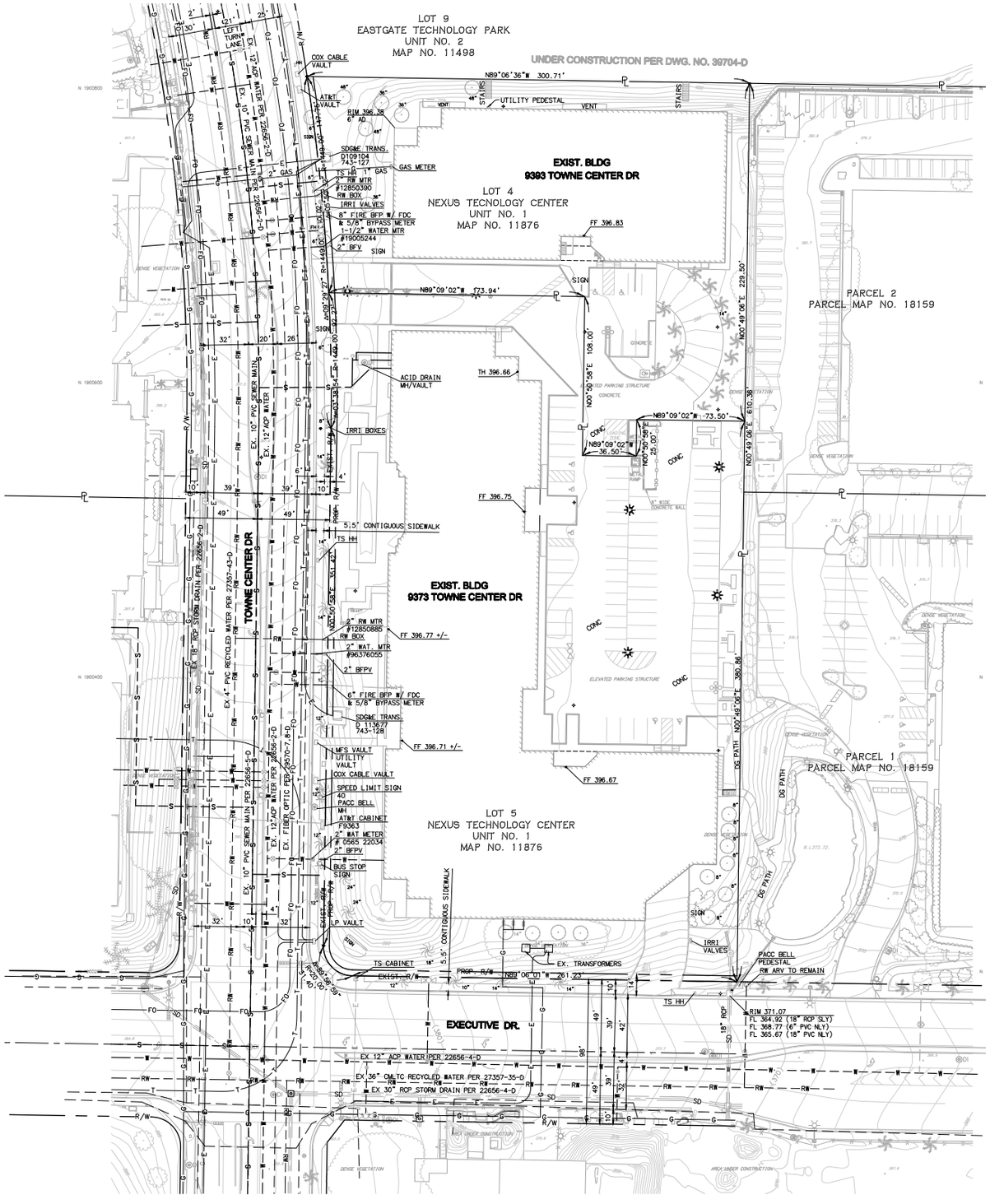
...End

ARE Science Village						
HMP Storage Drawdown						
Stage (ft)	**Storage (ft3)**	**Discharge (cfs)**	**Incremental Vol. (ft3)**	**Avg. Discharge (cfs)**	**Incremental Time (sec)**	**Incremental Time (hr)**
5.10	17,624	0.20	-	-		
4.60	15,896	0.19	1,728	0.195	8861.54	2.46
4.00	13,823	0.18	2,073	0.185	11205.41	3.11
3.00	10,021	0.16	3,802	0.17	22364.71	6.21
2.00	6,911	0.12	3,110	0.14	22214.29	6.17
1.60	5,529	0.11	1,382	0.115	12017.39	3.34
1.00	3,456	0.08	2,073	0.095	21821.05	6.06
0.80	2,765	0.07	691	0.075	9213.33	2.56
0.40	1,382	0.04	1,383	0.055	25145.45	6.98
0.00	0.00	0.00	1,382	0.02	69100.00	19.19
					Total Time =	**56.10**
State, Storage, and Discharge derived from Hydroflow Hydrographs routing analysis.						

ARE Science Village						
WQ Storage Drawdown						
Stage (ft)	**Storage (ft3)**	**Discharge (cfs)**	**Incremental Vol. (ft3)**	**Avg. Discharge (cfs)**	**Incremental Time (sec)**	**Incremental Time (hr)**
2.80	9,676	0.15	-	-		
2.00	6,911	0.12	2,765.00	0.135	20481.48	5.69
1.60	5,529	0.11	1,382.00	0.115	12017.39	3.34
1.40	4,838	0.11	691.00	0.11	6281.82	1.74
1.30	4,492	0.1	346.00	0.105	3295.24	0.92
1.20	4,147	0.09	345.00	0.095	3631.58	1.01
1.00	3,456	0.08	691.00	0.085	8129.41	2.26
0.80	2,765	0.07	691.00	0.075	9213.33	2.56
0.40	1,382	0.04	1,383.00	0.055	25145.45	6.98
0.00	0.00	0.00	1,382.00	0.02	69100.00	19.19
					Total Time =	**43.69**
State, Storage, and Discharge derived from Hydroflow Hydrographs routing analysis.						

Appendix E – Plan Sheets

Improvement Plans



ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/24

BASIS OF COORDINATES

THE BASIS OF COORDINATES FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM NAD83, ZONE 6,(EPOCH 1991.35)

BENCHMARK

THE BASIS OF ELEVATIONS FOR THIS SURVEY IS THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) PER THE CITY OF SAN DIEGO VERTICAL CONTROL NETWORK. SEBP LOCATED AT LA JOLLA VILLAGE DRIVE & TOWNE CENTER DRIVE. ELEVATION: 371.617 (ft.)

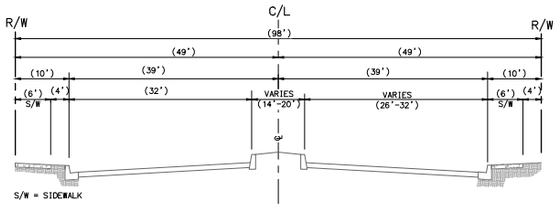
SOURCE OF TOPOGRAPHY

AERIAL PHOTOGRAMMETRY PROVIDED BY AEROTECH MAPPING, INC., FLOWN FEBRUARY 5, 2014 AND SUPPLEMENTED BY FIELD CREW SURVEY BY MICHAEL BAKER INTERNATIONAL ON JULY 22, 2019

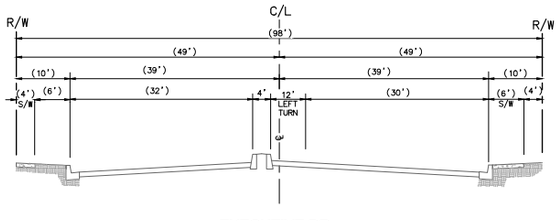
LEGEND

RIGHT OF WAY — R/W —
PROPERTY LINE — P —
EXIST. WATER LINE — W —
EXIST. RECYCLED WATER — RW —
EXIST. SEWER LINE — S —
EXIST. STORM DRAIN — SD —
EXIST. ELECTRIC LINE — E —
EXIST. TELECOMMUNICATION — T —
EXIST. GAS LINE — G —
EXIST. CONTOUR (380)

EXIST. FIRE HYDRANT
EXIST. FIRE MANIFOLD
EXIST. WATER VALVE
EXIST. WATER METER
EXIST. WATER MANHOLE
EXIST. AIR RELEASE VALVE
EXIST. CP TEST
EXIST. IRRIGATION PEDESTAL
EXIST. SEWER MANHOLE
EXIST. SEWER CLEAN OUT
EXIST. ELECTRIC PULL BOX
EXIST. ELECTRIC METER
EXIST. ELECTRIC JUNCTION BOX
EXIST. STREET LIGHT
EXIST. LIGHT STANDARD
EXIST. POWER POLE
EXIST. GUY WIRE
EXIST. UTILITY PULL BOX
EXIST. GAS VALVE
EXIST. TRAFFIC PULL BOX
EXIST. TRAFFIC SIGN
EXIST. TRAFFIC SIGNAL
EXIST. TELEPHONE MANHOLE
EXIST. TELEPHONE PEDESTAL
EXIST. TELEPHONE
EXIST. STORM DRAIN MANHOLE
EXIST. CURB DRAIN
EXIST. ROOF DRAIN
EXIST. POST
EXIST. PALM TREE
EXIST. TREE



TOWNE CENTER DR.
EXISTING STREET SECTION
N.T.S.



EXECUTIVE DR.
EXISTING STREET SECTION
N.T.S.

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104

Phone: 206.682.6837
Contact: Name

ALEXANDRIA.

STAMP
BRIAN K. OLIVER No. 45045 Exp. 3-31-24 REGISTERED PROFESSIONAL ENGINEER STATE OF CALIFORNIA CIVIL

Michael Baker INTERNATIONAL
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San Diego, CA 92124
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Alexandria Science Village

9393 Towne Centre Drive,
San Diego, California 92121

SUBMITTAL
SUBMITTAL PACKAGE

04/18/2022

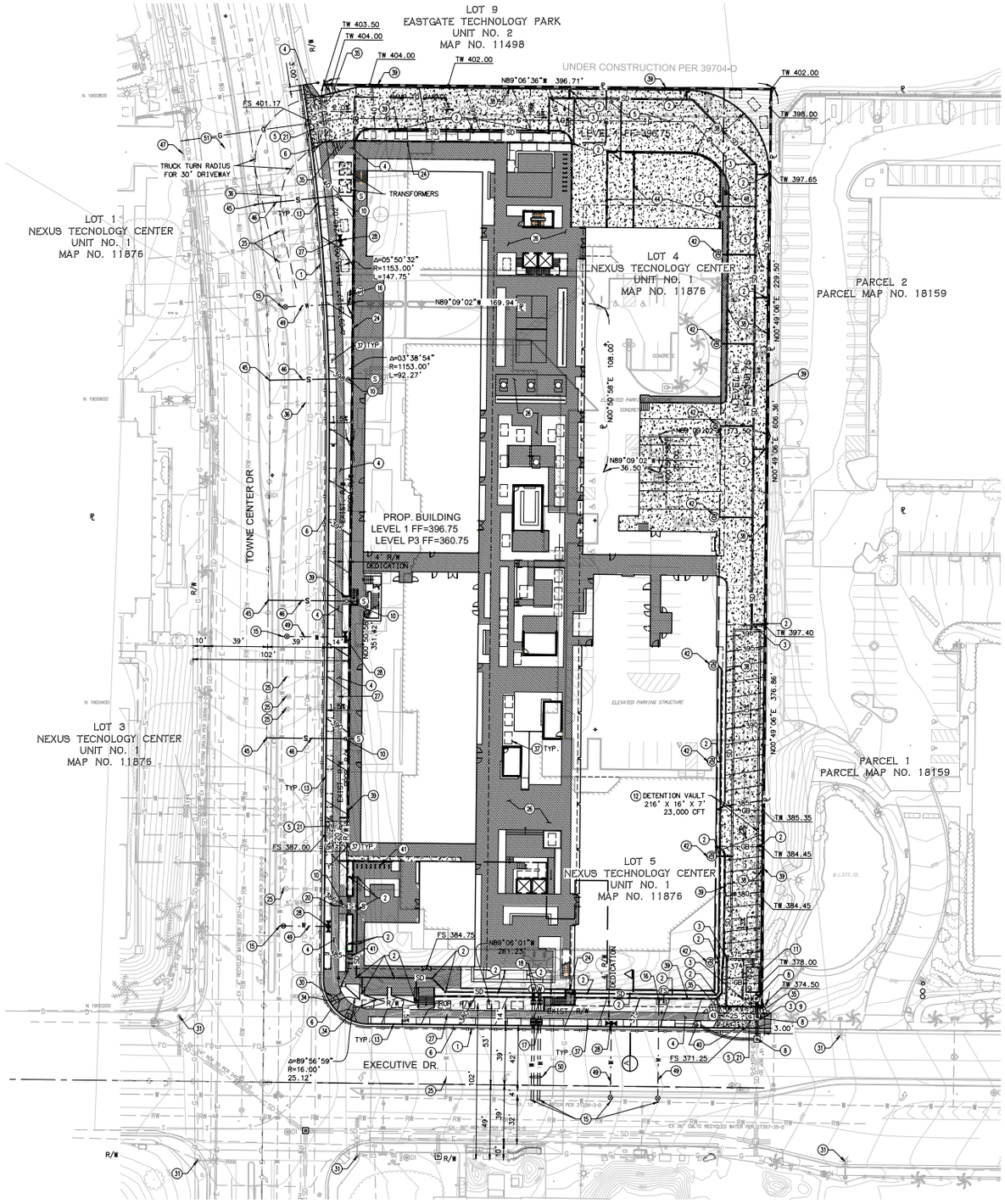
REVISIONS

No.	Description	Date

Drawn: CJ
Checked: BO
MJH Proj No.: A19.0087.00
Issue Date: 04/18/2022

SHEET
TOPOGRAPHIC MAP

C101

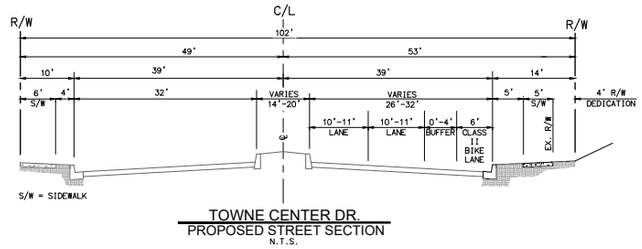


GRADING LEGEND

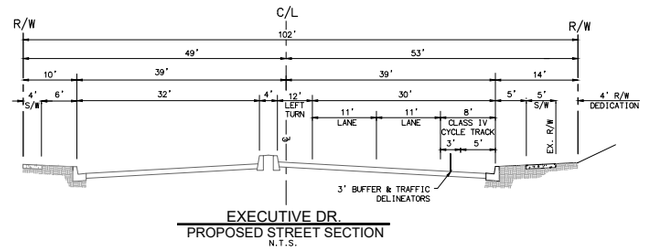
- RIGHT OF WAY LINE ····· R/W
- PROPERTY LINE ····· ℄
- GRADING LIMITS/SAWCUT ····· GB
- EXISTING CONTOUR ····· (372)
- PROPOSED CONTOUR ····· 380
- GRADE BREAK ····· GB
- PROPOSED ASPHALT
- PROPOSED CONCRETE SIDEWALK
- PROPOSED VEHICULAR CONC.
- FIRE SERVICE ····· F
- SEWER SERVICE ····· S
- WATER SERVICE ····· W
- PROPOSED FIRE HYDRANT
- MODULAR WETLAND
- FLOW DIRECTION
- STORM DRAIN LINE ····· SD
- CATCH BASIN
- 'A-4' CLEANOUT
- SEWER/STORM DRAIN TYPE CLEANOUT
- PROPOSED STORM WATER DETENTION VAULT
- TREE ROOT ZONE (40 SF)

CONSTRUCTION NOTES

1. LIMIT OF GRADING/ LIMIT OF WORK/ SAWCUT LINE
2. CATCH BASIN
3. SEWER-TYPE STORM DRAIN CLEANOUT (SDCO)
4. CONCRETE SIDEWALK
5. VEHICULAR CONCRETE PAVEMENT
6. AC PAVEMENT
7. TYPE 'A-4' STORM DRAIN CLEANOUT
8. CONNECT TO EX. STORM DRAIN
9. SEWER-TYPE CLEANOUT
10. MODULAR WETLAND SYSTEM
11. STORM WATER DETENTION VAULT
12. REMOVE AND REPLACE CURB & GUTTER
13. CONNECT TO EX. WATER MAIN
14. FIRE SERVICE BACKFLOW PREVENTER
15. DUAL WATER METER
16. DUAL WATER BACKFLOW PREVENTER
17. CONNECT TO EX. 8" SEWER LATERAL
18. PROPOSED DRIVEWAY
19. LIMITS OF UNDERGROUND PARKING
20. EX. WATER SERVICE TO BE KILLED AT MAIN
21. HARDSCAPE PER LANDSCAPE PLANS
22. EX. FIRE HYDRANT TO BE RELOCATED
23. RELOCATED FIRE HYDRANT
24. RELOCATE EX. TRAFFIC SIGNAL & STREET LIGHT
25. EX. STREET LIGHT
26. CURB RAMP
27. VISIBILITY TRIANGLE, NO OBSTRUCTION INCLUDING LANDSCAPING OR SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 24" IN HEIGHT
28. EX. SEWER LATERAL TO BE ABANDONED AT P/L
29. TREE ROOT ZONE (40 SF)
30. 6" PCC CURB
31. RETAINING WALL
32. RELOCATED CURB INLET
33. BIKE RACKS
34. ROOF DRAIN POC, SEE PLUMBING PLANS FOR CONTINUATION
35. 12" TRENCH DRAIN
36. ENCLOSURE WALL
37. CONNECT TO EXIST. SEWER
38. PROPOSED 6" SEWER LATERAL
39. CONNECT TO EXIST. GAS
40. GAS METER PER PLUMBING PLANS
41. PROPOSED FIRE SERVICE
42. PROPOSED WATER SERVICE
43. PROPOSED GAS SERVICE



TOWNE CENTER DR.
PROPOSED STREET SECTION
N.T.S.



EXECUTIVE DR.
PROPOSED STREET SECTION
N.T.S.

APPROVAL NUMERS

PDP APPROVAL NO. 2342720
LAND USE APPROVAL NO. 2342723
NDP APPROVAL NO. 2367484
SDP APPROVAL NO. 2367485
REZONE APPROVAL NO. 2367486

GENERAL NOTES

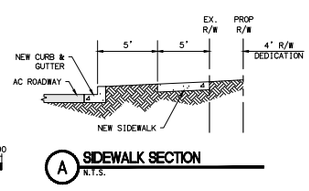
1. ALL EXISTING CURB, GUTTER, SIDEWALK, & DRIVEWAY IMPROVEMENTS ALONG TOWNE CENTER DRIVE & EXECUTIVE DRIVE FRONTAGE TO BE REMOVED & REPLACED.
2. ALL EXISTING UTILITY STRUCTURES IN RIGHT OF WAY FRONTAGE TO BE RELOCATED, REMOVED, OR ADJUSTED TO GRADE.
3. NO EXISTING OR PROPOSED EASEMENTS ONSITE

DEVIATIONS FROM STANDARDS:

1. MAXIMUM DRIVEWAY WIDTH:
   PROJECT PROPOSES ONE 30' WIDE DRIVEWAY IN LIEU OF THE CITY OF SAN DIEGO'S MAXIMUM 25' WIDE DRIVEWAY IN PARKING IMPACT ARE TO ALLOW FOR FULL SIZE DELIVERY TRUCKS TO ACCESS THE DELIVERY/SERVICE AREA. THE 30' DRIVEWAY WILL LESSEN THE REQUIRED TURNING RADIUS FOR DELIVERY TRUCKS ENTERING FROM TOWNE CENTER DR.

ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/24

SCALE: 1"=30'
30 15 0 30 60 90



A SIDEWALK SECTION
N.T.S.

GRADING QUANTITIES

TOTAL AMOUNT OF SITE TO BE GRADED: 3.97 ACRES
PERCENT OF TOTAL SITE GRADED: 100%
AMOUNT OF SITE WITH 25 PERCENT SLOPES OR GREATER: 0.08 ACRES
PERCENT OF TOTAL SITE WITH 25 PERCENT SLOPES OR GREATER: 2%
AMOUNT OF SITE WITHIN HILLSIDE REVIEW: 0%
PERCENT OF TOTAL SITE WITHIN HILLSIDE REVIEW: 0%
AMOUNT OF CUT: 315,000 CY
AMOUNT OF FILL: 100 CY
MAXIMUM HEIGHT OF FILL SLOPE 3 FEET 2: 1 SLOPE RATIO
MAXIMUM HEIGHT OF CUT SLOPE 4 FEET 2: 1 SLOPE RATIO
AMOUNT OF EXPORT SOIL: 314,900 CY
RETAINING WALLS: HOW MANY: 18
MAXIMUM LENGTH: 900'
MAXIMUM HEIGHT: 14.5'
MAXIMUM DEPTH OF CUT: 71 FT

ALL EXCAVATED MATERIALS TO BE EXPORTED SHALL BE EXPORTED TO A LEGAL DISPOSAL SITE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION "GREEN BOOK", 2018 EDITION AND REGIONAL SUPPLEMENT AMENDMENTS ADOPTED BY REGIONAL STANDARDS COMMITTEE

The Miller Hull Partnership, LLP
Architecture and Planning
Polson Building
71 Columbia, Sixth Floor
Seattle, WA 98104

Phone: 206.682.6837
Contact: Name

ALEXANDRIA.

STAMP
REGISTERED PROFESSIONAL ENGINEER BRIAN K. OLIVER No. 45045 Exp. 3-31-24 CIVIL STATE OF CALIFORNIA

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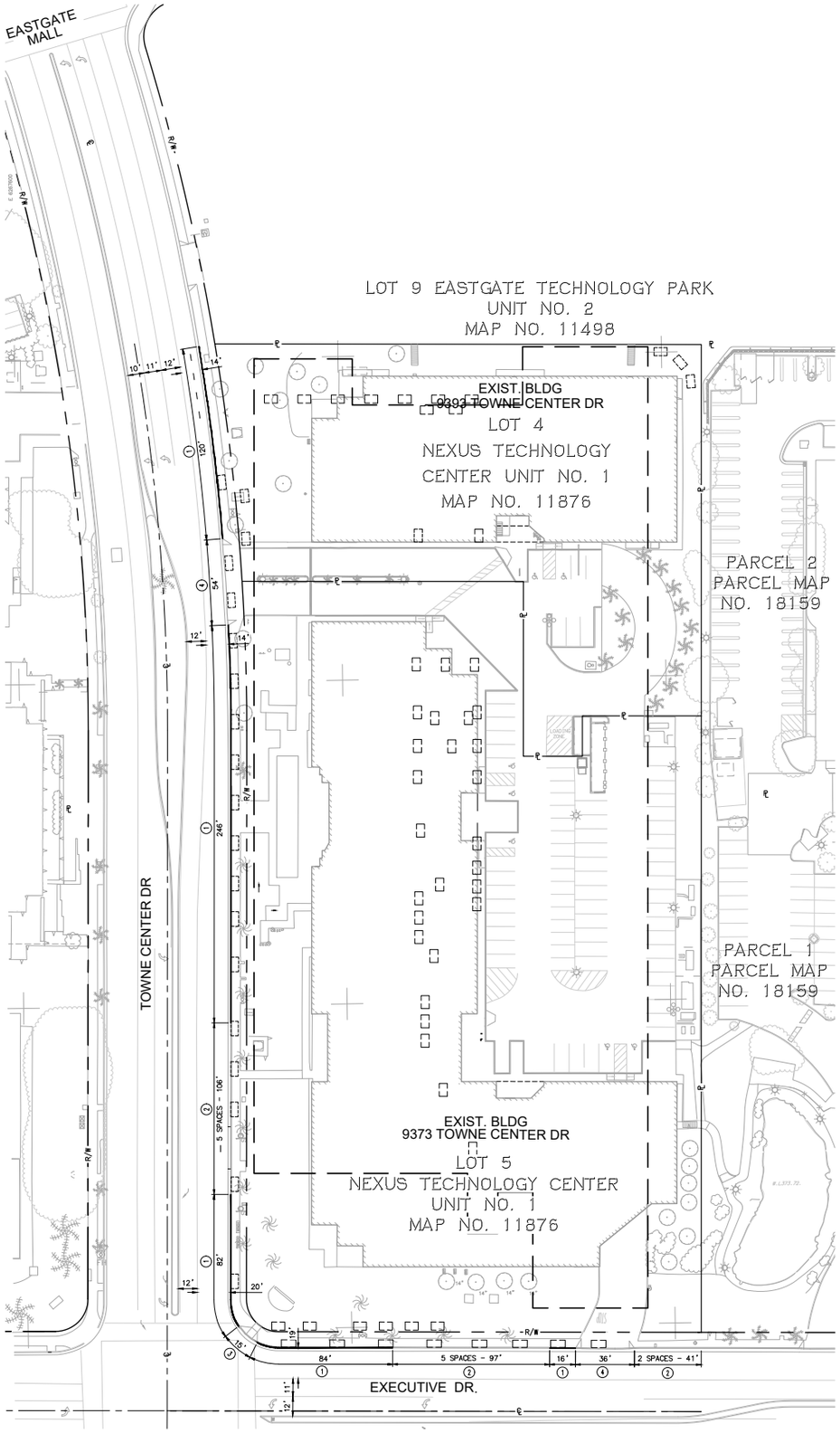
SHEET
PRELIMINARY GRADING AND UTILITY PLAN

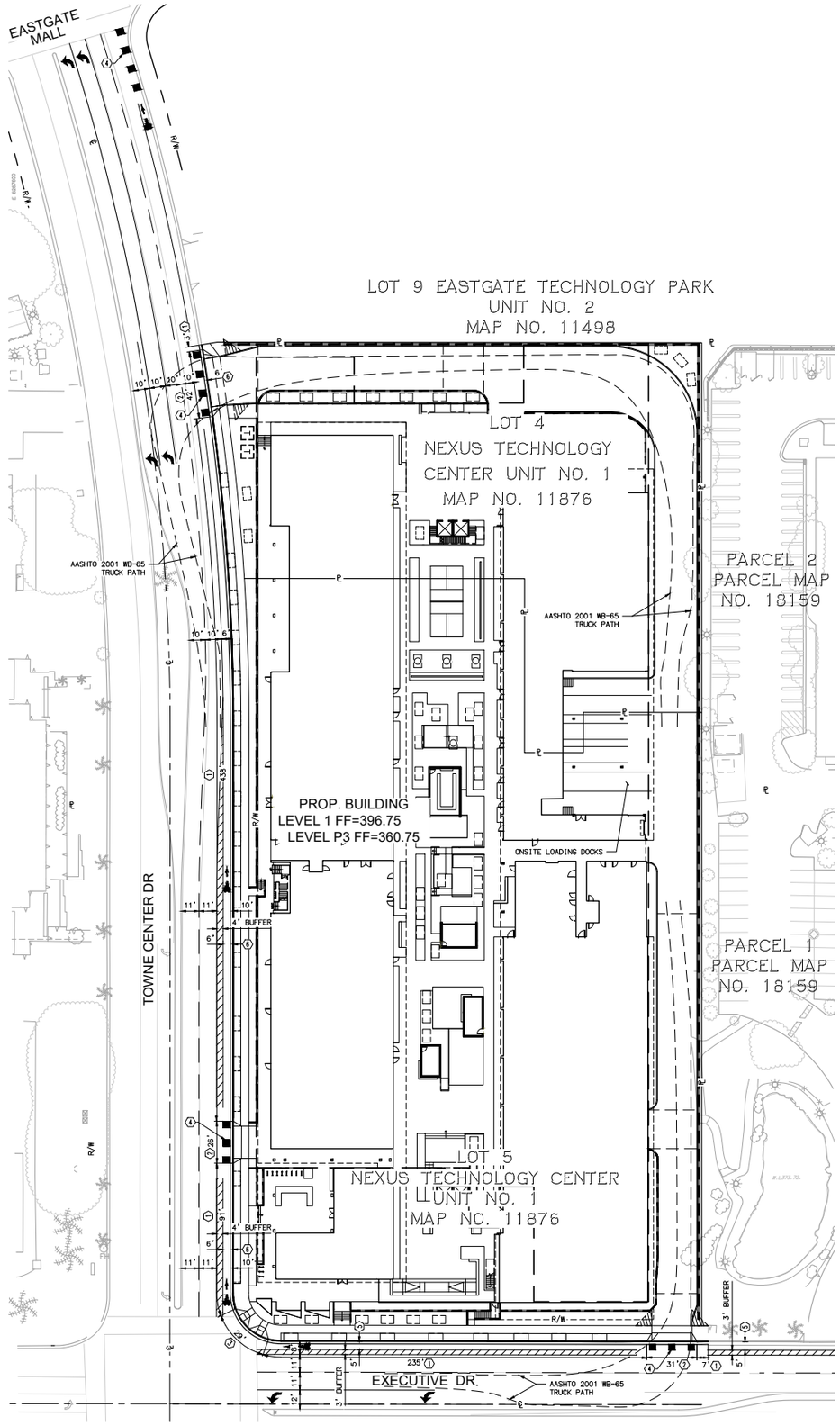
C201



EXISTING
CURB UTILIZATION

STRIPING NOTES (EXISTING)

1. EXISTING RED CURB MARKING
2. EXISTING PARKING TO BE REMOVED
3. EXISTING CURB RAMP
4. EXISTING DRIVEWAY CURB CUT



PROPOSED
CURB UTILIZATION

STRIPING NOTES (PROPOSED)

1. NEW RED CURB MARKING
2. NEW DRIVEWAY CURB CUT
3. NEW CURB RAMP CUT
4. NEW CONFLICT STRIPING - WHITE DASHED LINE WITH GREEN INFILL ACROSS ENTIRE LENGTH OF BIKE LANE/CYCLE TRACK
5. CLASS IV CYCLE TRACK
6. CLASS II BIKE LANE

PARKING SUMMARY

EXISTING SPACES	12 SPACES
PROPOSED SPACES	0 SPACES
NET LOSS	12 SPACES

30 15 0 30 60 90
SCALE: 1"=30'

ENGINEER OF WORK:
Brian Oliver 2/10/2022
BRIAN K. OLIVER, R.C.E. 45045 DATE
EXP. 3/31/24

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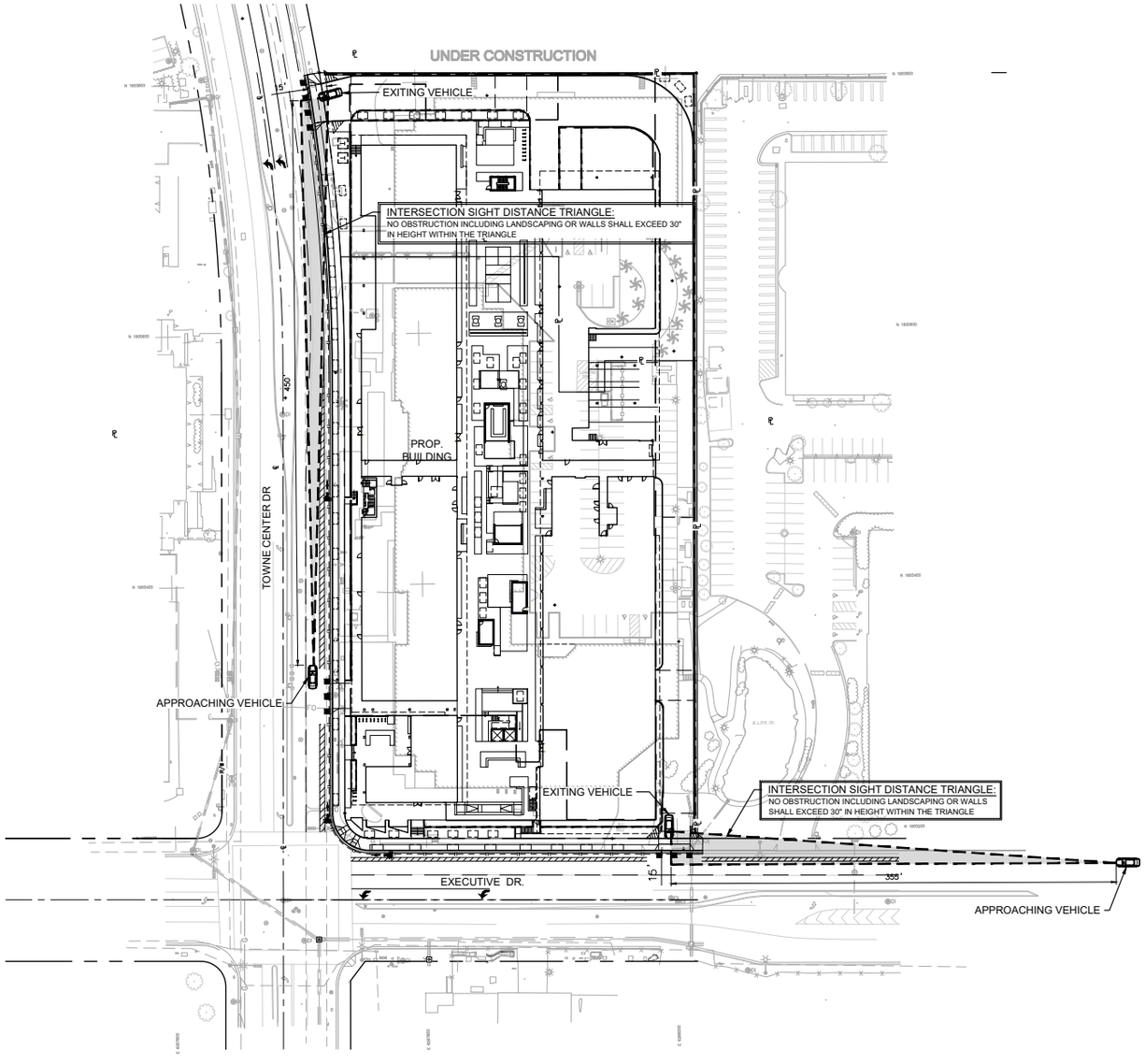
SHEET
CURB UTILIZATION PLAN

C301



SIGHT DISTANCE TABLE		
DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE (FT)	INTERSECTION SIGHT DISTANCE (FT) (RIGHT TURNS)
30	200	290
35	250	335
37	272**	355***
40	305	385
45	360	430
47	386**	450***
50	425	480

SIGHT DISTANCE

EXECUTIVE DRIVE
- POSTED SPEED LIMIT ..... 30 MPH
- 85TH PERCENTILE SPEED ..... 37 MPH*
- STOPPING SIGHT DISTANCE ..... 272'
- INTERSECTION SIGHT DISTANCE ..... 355'

TOWNE CENTER DRIVE
- POSTED SPEED LIMIT ..... 40 MPH
- 85TH PERCENTILE SPEED ..... 47 MPH*
- STOPPING SIGHT DISTANCE ..... 386'
- INTERSECTION SIGHT DISTANCE ..... 450'

* ASSUMED 85TH PERCENTILE SPEED IS 7 MPH GREATER THAN POSTED SPEED

** INTERPOLATED FROM AASHTO STOPPING SIGHT DISTANCE TABLE EXHIBIT 3-1

*** INTERPOLATED FROM AASHTO INTERSECTION SIGHT DISTANCE TABLE EXHIBIT 9-57

ENGINEER OF WORK:
BRIAN K. OLIVER, R.C.E. 45045 EXP. 3/31/22
2/10/2022 DATE

40 20 0 40 80 120
SCALE: 1"=40'

SCALE 1"=40'

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SHEET
SIGHT DISTANCE PLAN

C311

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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UPDATE
GEOTECHNICAL INVESTIGATION

ALEXANDRIA SCIENCE VILLAGE
9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA®

OCTOBER 15, 2021
PROJECT NO. G2101-52-02

Project No. G2101-52-02
October 15, 2021

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Christopher Clement

Subject: UPDATE GEOTECHNICAL INVESTIGATION
ALEXANDRIA SCIENCE VILLAGE
9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Clement:

In accordance with your request and our Proposal No. LG-19340, dated December 10, 2019, and Change Order dated October 11, 2021, we prepared this update geotechnical investigation report for the subject project. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of proposed project. We opine the proposed project can be constructed from a geotechnical engineering standpoint if the recommendation presented herein are incorporated into the design and construction operations.

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

Kelli A. James
RCE 79438

Shawn Foy Weedon
GE 2714

John Hoobs
CEG 1524

KAJ:SFW:JH:am

(e-mail) Addressee

TABLE OF CONTENTS

UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our update geotechnical investigation for the proposed Alexandria Science Village project. The property is located at 9393 Towne Centre Drive, northeast of Towne Centre Drive and Executive Drive in the City of San Diego, California (see Vicinity Map).

Vicinity Map

The purpose of this study is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may impact development of the property. In addition, the purpose of this report is to provide foundation design criteria, preliminary pavement recommendations, 2019 CBC seismic design criteria, retaining wall recommendations, concrete flatwork design criteria, and excavation considerations. We used an electronic version of the site plan, provided by Michael Baker International, as the base for our Geologic Map (Figure 1). We also reviewed readily available published and unpublished geologic literature (see *List of References*).

The scope of the study also included a review of:

1. *Geotechnical Investigation, Podium 93, 9363, 9737, and 9393 Towne Centre Drive, San Diego, California,* prepared by Geocon Incorporated, dated July 11, 2017 (Project No. G2101-52-01).

2. *Schematic Design Package, Alexandria Science Village, 9363, 9373 & 9393 Towne Centre Drive, San Diego, California,* architectural plans prepared by Miller Hull, civil plans prepared

by Michael Baker International, structural plans by DCI Engineers, dated September 7, 2021 (Project No. A19.0087.00).

3. *Preliminary Soil and Geologic Investigation, Nexus Technology Center, San Diego, California*, prepared by Geocon Incorporated, dated December 9, 1985 (Project No. D-3592-M01).

4. *Final Soil and Geologic Investigation, Nexus Technology Center, San Diego, California*, prepared by Geocon Incorporated, dated January 20, 1986 (Project No. D-3592-M01).

5. *Geotechnical Report Update, Nexus Technology Center, Northeast Lot, San Diego, California*, prepared by Geocon Incorporated, dated June 2, 1999 (Project No. 06322-22-01).

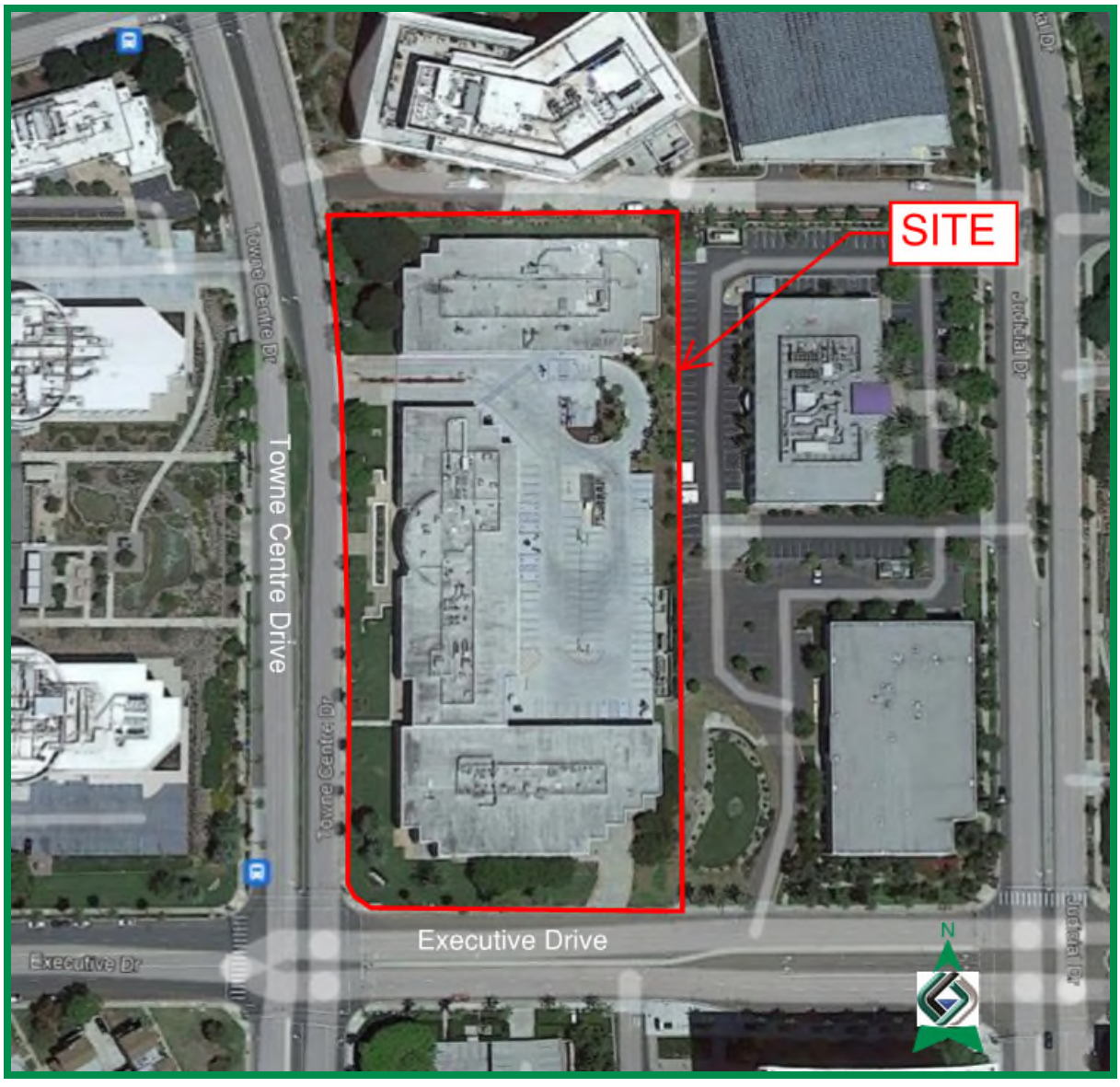
We performed a field investigation that included excavating 2 small-diameter exploratory borings (in 2017) to a maximum depth of approximately 67 feet. The Geologic Map (Figure 1) presents the approximate locations of the borings. Appendix A presents the boring logs and other details of the field investigation. We tested selected soil samples obtained during the field investigation to evaluate pertinent physical and chemical soil properties for engineering analyses and to assist in providing recommendations for site grading and development. Details of the laboratory tests and a summary of the test results are presented in Appendix B and on the boring logs in Appendix A. We previously performed exploratory borings and trenches on the subject site in 1985, for the above referenced report. Logs of these previous borings and trenches are presented in Appendix C.

The Geologic Map, Figure 2, depicts the existing soil and geologic conditions. The plan depicts the proposed building location and mapped geologic contacts based on our site reconnaissance and field excavations. The conclusions and recommendations presented herein are based on analyses of the data reviewed as part of this study and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The subject site is located at the northeast corner of Towne Centre Drive and Executive Drive in the University Towne Center area of the City of San Diego, California. The site consists of Lots 4 and 5 of Parcel 011876. The total area of both parcels is approximately 3.97 acres and currently consists of three, two-story office buildings which are connected below grade by one continuous level of subterranean parking. The buildings were constructed around 1989. Building 1 is located at the north end of the site, Building 2 is located along the western side, and Building 3 is located at the southern end. Buildings 2 and 3 are connected above grade by a two-story lobby. Surface parking exists east of Building 2 on the roof of the subterranean parking level. Access to the parking garage is provided from a driveway at the southeast corner of Building 3 on Executive Drive and from a ramp from the surface parking at the southeast corner of Building 1. The finish floor elevations of the existing buildings are unknown. The subterranean level finish floor is approximately 11 feet below the main level finish floor. The existing grade adjacent to the buildings range from approximate elevation 400 feet above Mean Sea Level (MSL) at the northwest corner of Building 1 to about 385 feet MSL at the southeast corner of Building 3.

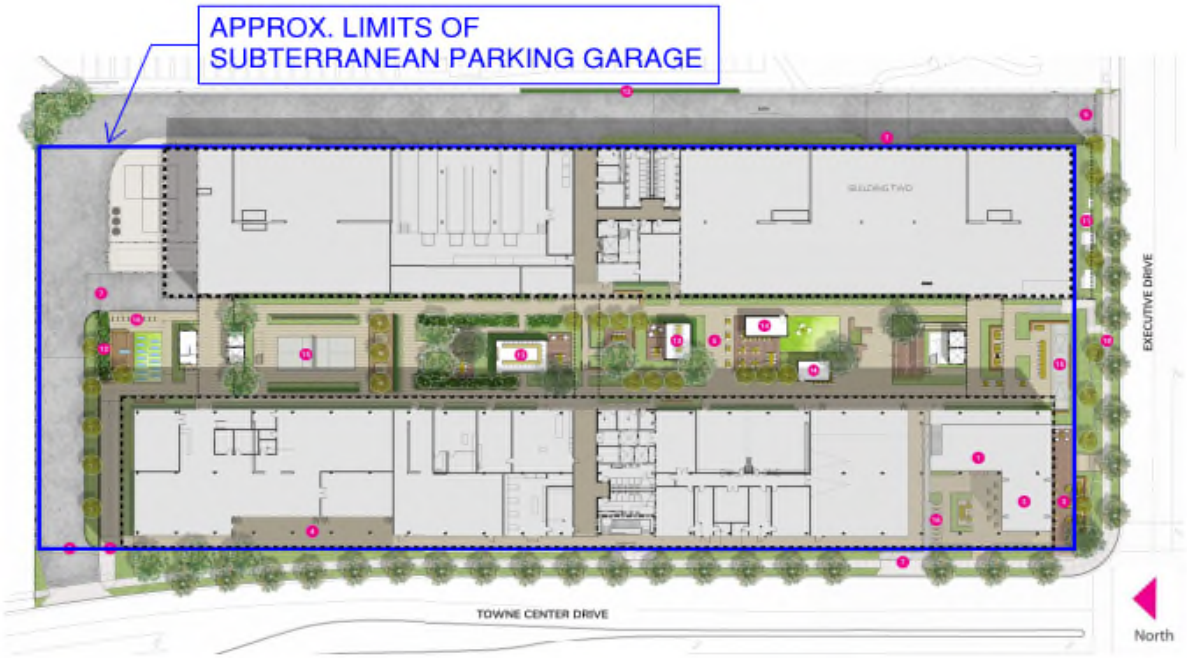
Grades at the south and west sides of Building 3 descend from the building edge to the streets below about 15 feet, and the grade at the western edge of Building 2 descends to the street up to 5 feet. The grades at the western and northern edges of Building 3 ascend toward the street and property to the north up to 3 and 8 feet, respectively. The eastern edge of the site descends toward the adjacent parking lot approximately 6 feet. An existing pond is located on the neighboring property about 30 feet east of Building 3. The site is located east of Town Centre Drive, north of Executive Drive, and west and south of existing commercial office buildings. The existing building located the north of the subject site was recently constructed in 2019 through 2020, since we issued our previous geotechnical investigation report in 2017. Based on available aerial photos, the existing building appears to be as close as approximately 35 feet from the northern edge of the site, and a drive lane runs along the northern edge of the project site. The Existing Site Plan shows the current site conditions.



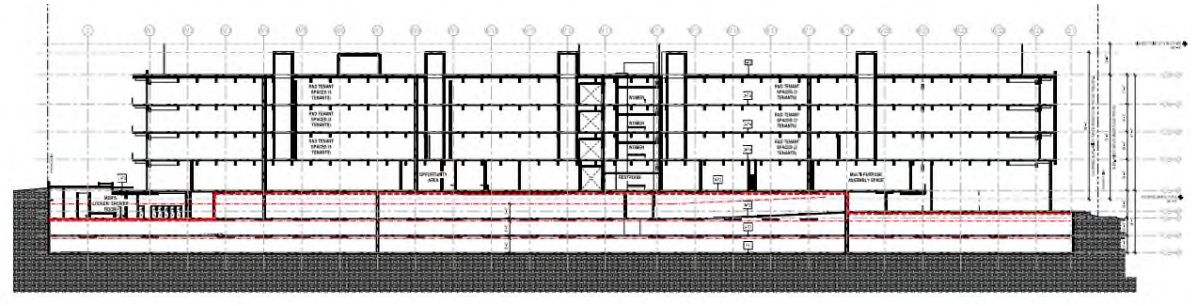
Existing Site Plan

Based on our review of readily available historical topographic surveys, it appears that the majority of the existing buildings on the project site are underlain by Very Old Paralic Deposits. The area below the southeastern portion of the property was previously underlain by a finger of a canyon that sloped from approximate elevation 385 feet MSL near the center of existing Building 3 down to about elevation 350 feet MSL at the southeast corner of the property. We assume that the area below the southeast corner of existing Building 3 was removed of surficial soil and alluvium prior to filling in the canyon, but we do not have documentation of the previous grading operations at this time. We estimate that the southeast corner of the properly may be underlain by as much as 35 feet of previously placed fill.

We understand, based on the referenced plans dated September 7, 2021, that the proposed project consists of demolishing the existing office buildings and subterranean parking garage and constructing a new science complex consisting of 4 stories above grade overlying 3 levels of parking. A courtyard corridor will separate the eastern and western buildings. We understand 3 levels of parking will be subterranean at the northern end of the site, and 2 levels will be subterranean at the south end where the first level of parking will daylight above grade. We understand the office buildings will be supported entirely on the parking structure, but the eastern drive lane will be supported on soil outside of the limits of the subterranean parking. Access to the property will be from Executive Drive and Towne Centre Drive. The finish floor elevation for the lowest level of subterranean parking is proposed at 360.75 feet MSL. The level 1 building finish floor elevations are planned to be 396.75 feet MSL. We assume cuts on the order of 45 feet will be required for the parking garage and foundation excavations and fills of up to about 10 feet will be required to construct the eastern drive lane and a retaining wall along the drive lane at the eastern edge of the site. The Proposed Site Plan and Proposed Building Cross-section show the planned building and improvements.



Proposed Site Plan



Proposed Building Cross-section (Looking East)

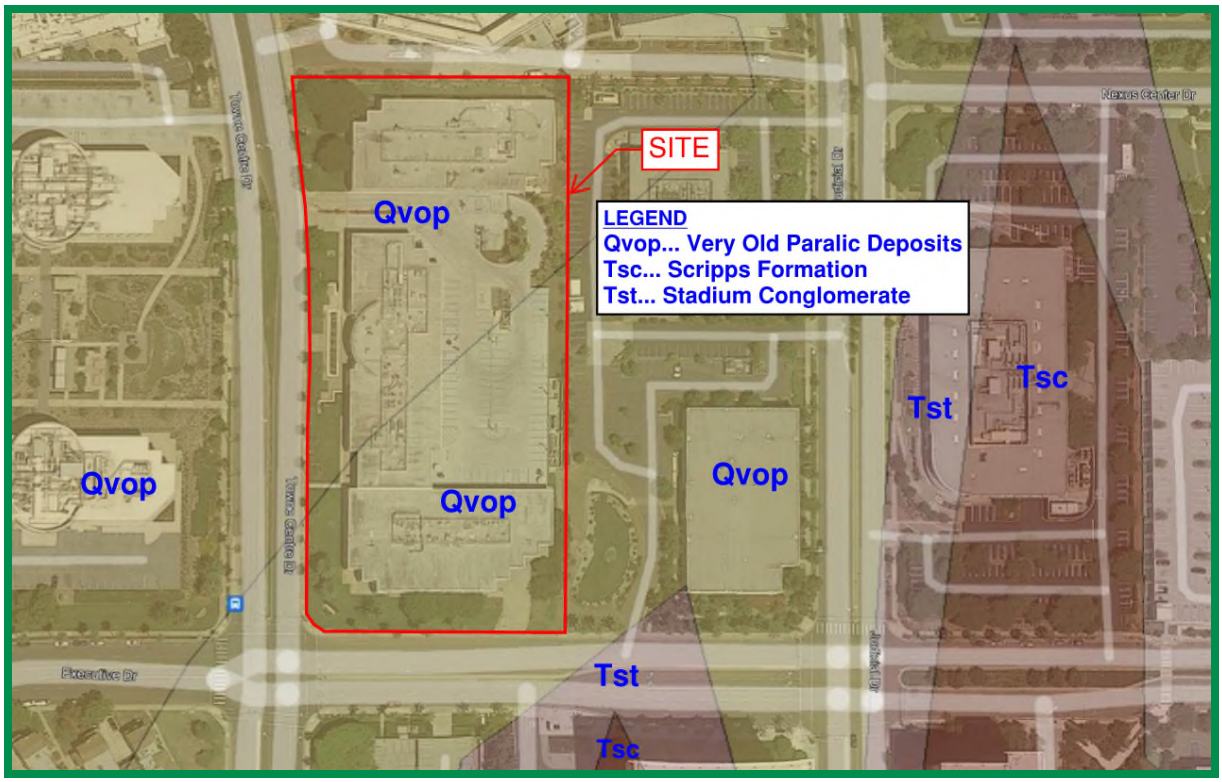
The locations and descriptions of the site and proposed development are based on the referenced grading plans and our understanding of project development. If project details vary significantly from those described herein, Geocon Incorporated should be contacted to evaluate the necessity for review and revision of this report.

3. GEOLOGIC SETTING

The site is located in a coastal plain environment within the southern portion of the Peninsular Ranges Geomorphic Province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that thicken to the west and range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. The sedimentary units are deposited on bedrock, Cretaceous to Jurassic age igneous and metavolcanic rocks. Geomorphically, the coastal plain is characterized by a series of 21 stair-stepped, marine terraces which are younger to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges Province is also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

The site is located within the western portion of the coastal plain geologic province on the western slope of a former south flowing canyon drainage that has dissected a terrace. The drainage flows to Rose Canyon drainage channel and enters the Pacific Ocean at Pacific Beach and Mission Bay. Shallow to deep fill soils are present across the site underlain by Very Old Paralic Deposits Unit 9 and Eocene-age Scripps Formation. The Very Old Paralic Deposits are middle to late Pleistocene age, roughly 855,000 years old, and is a shallow marine unit that has been designated as the Linda Vista Terrace. The Scripps Formation was deposited in a marine environment where sandstones and

siltstones where formed and uncomformably underlies the terrace. The Regional Geologic Map shows the geologic units in the area of the site.



Regional Geologic Map

4. SOIL AND GEOLOGIC CONDITIONS

We encountered one surficial material consisting of previously placed fill and two geologic units consisting of Very Old Paralic Deposits (formerly called the Lindavista Formation) and the Scripps Formation during our field investigation. The occurrence and distribution of the units encountered, including descriptions of the units, are shown on the exploratory boring logs in Appendix A. The approximate lateral extent of the geologic conditions is presented on the Geologic Map, Figure 1. The subsurface relationship between the geologic units is presented on the Geologic Cross-Sections, Figure 2. We prepared the geologic cross-sections using interpolation between exploratory borings; therefore, actual geologic conditions between the borings may vary from those illustrated and should be considered approximate.

4.1 Previously Placed Fill (Qpf)

We encountered fill materials to a depth of 32 feet below existing grade in Boring B-1 and to a depth of 15½ feet in Boring B-2. We expect fill in the area of Boring B-1 was placed during the filling of a previous existing canyon. The fill we encountered in Boring B-2 is likely the retaining wall backfill

for the subterranean garage. The area below the southeastern portion of the property was previously underlain by a finger of a canyon that sloped from approximate elevation 385 feet MSL near the center of existing Building 3 down to about elevation 350 feet MSL at the southeast corner of the property. We expect the area below the southeast corner of existing Building 3 was removed of surficial soil and alluvium prior to filling in the canyon (we do not have documentation of the previous grading operations). We estimate that the southeast corner of the property may be underlain by as much as 35 feet of fill. The previously placed fill consists of medium dense, damp to moist, brown to reddish brown, silty to clayey, fine to coarse sand. The fill materials located outside the limits of the proposed structure are adequate to support surface improvements and additional fill; however, the upper 1 to 2 feet would require remedial grading.

4.2 Very Old Paralic Deposits, Unit 9 (Qvop)

We encountered Quaternary-age Very Old Paralic Deposits (Unit 9) below the fill in Boring B-2. The Very Old Paralic Deposits were formerly called the Lindavista Formation. The Very Old Paralic Deposits in our Boring B-2 extended from below the previously placed fill to a depth of approximately 25 feet below existing grade at an elevation of 371 feet MSL. The Very Old Paralic Deposits generally consists of medium dense to very dense, damp, reddish brown, silty and clayey, fine to coarse sandstone. Some cemented areas exist within the deposits which may require very heavy effort to excavate and occasional refusal. The Very Old Paralic Deposits are considered suitable to support the planned improvements.

4.3 Scripps Formation (Tsc)

The Eocene-age Scripps Formation is mapped by Kennedy and Tan (2008) and exists below the Very Old Paralic Deposits and previously placed fill. The Scripps Formation generally consists of medium dense to very dense, damp to dry, olive brown to light yellowish brown, siltstone and claystone. The Scripps Formation can contain gypsum crystals that elevate the water-soluble sulfate content of the soil and may require special concrete requirements. In addition, cemented zones exist within the Scripps Formation that can cause very difficult excavations and rock breakers may be necessary. The Scripps Formation possesses adequate soil support characteristics for support of properly compacted fill and structural loading.

5. GROUNDWATER

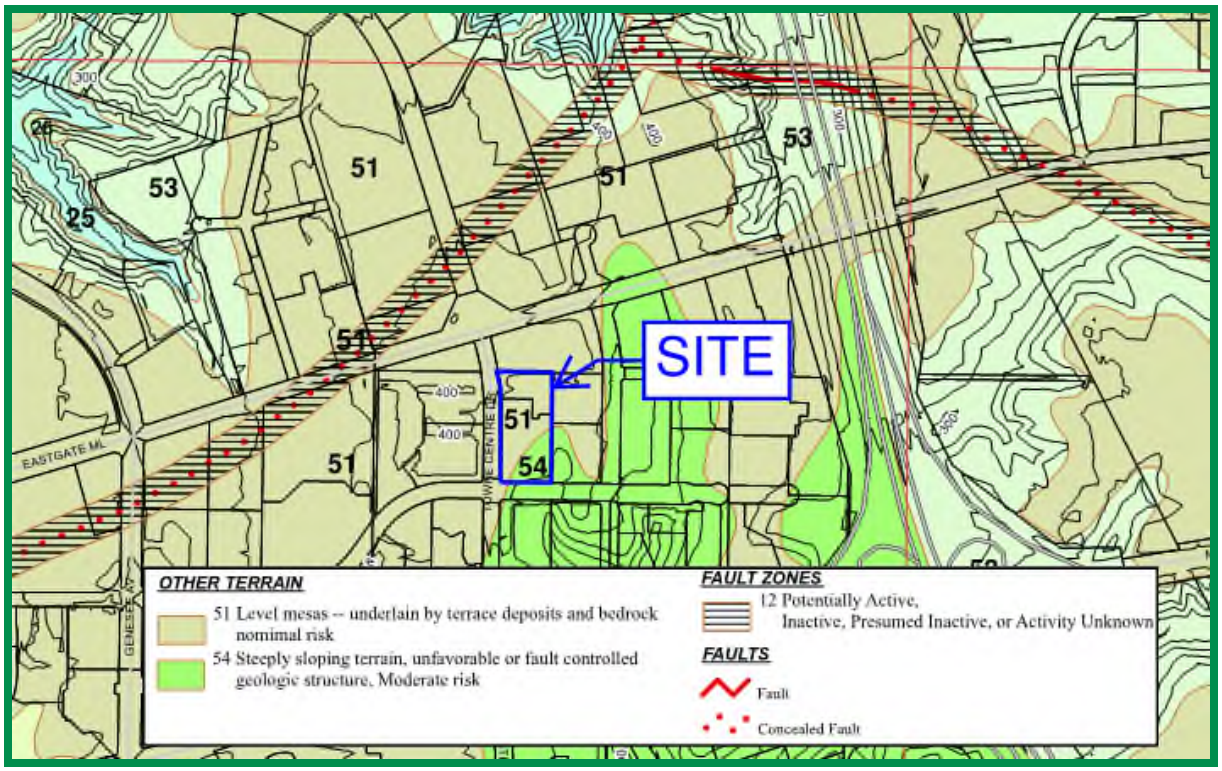
We did not encounter groundwater or seepage in our exploratory excavations. We do not expect groundwater would significantly affect project development. We expect that groundwater would be at least 100 feet below existing grades. It is not uncommon for groundwater or seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered on site. During the rainy season, seepage conditions may develop that would require special consideration during grading and shoring operations. Groundwater elevations are dependent on

seasonal precipitation, irrigation and land use, among other factors, and vary as a result. Proper surface drainage will be critical to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 34 defines the northwestern portion of the site with a Hazard Category 51*: Level mesas – Underlain by terrace deposits and bedrock – Nominal risk* and the southeastern portion of the site as Hazard Category 54: *Steeply sloping terrain, unfavorable or fault controlled geologic structure – Moderate Risk.* (as shown on the Hazard Category Map).



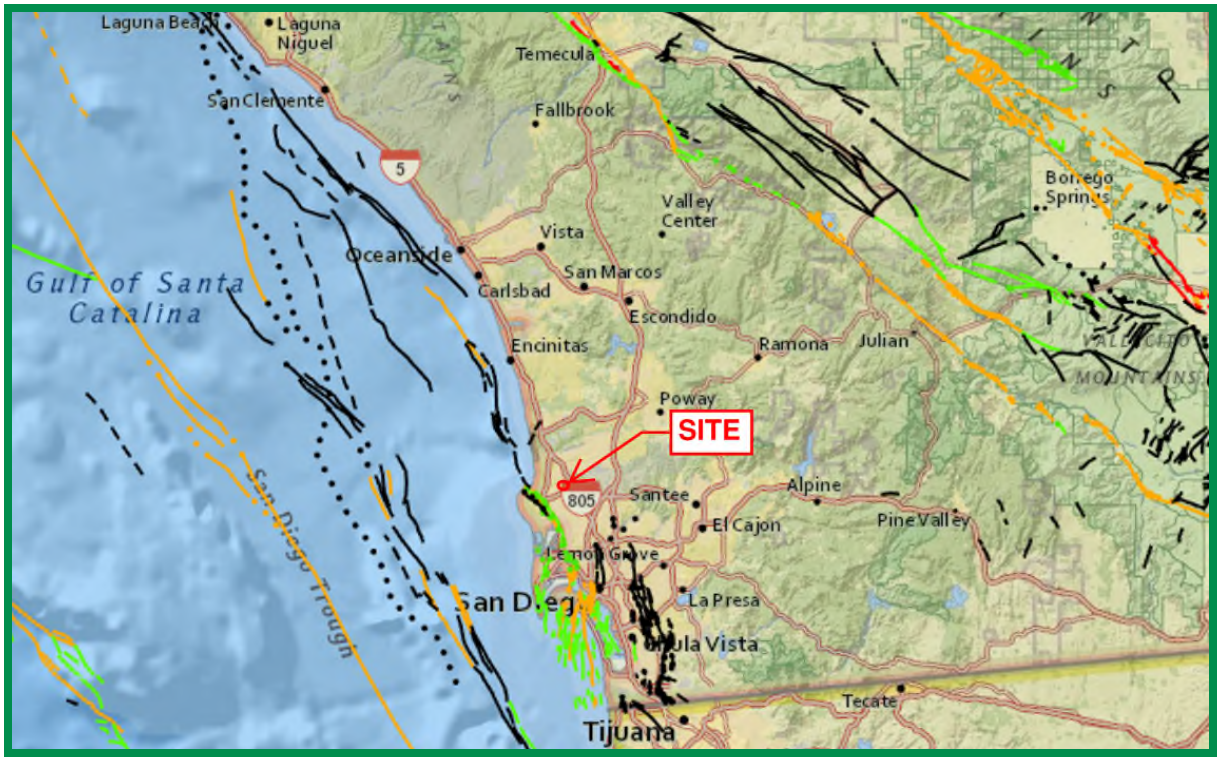
Hazard Category Map

6.2 Faulting and Seismicity

A review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faults. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,700 years. The site is not located within a State of California Earthquake Fault Zone.

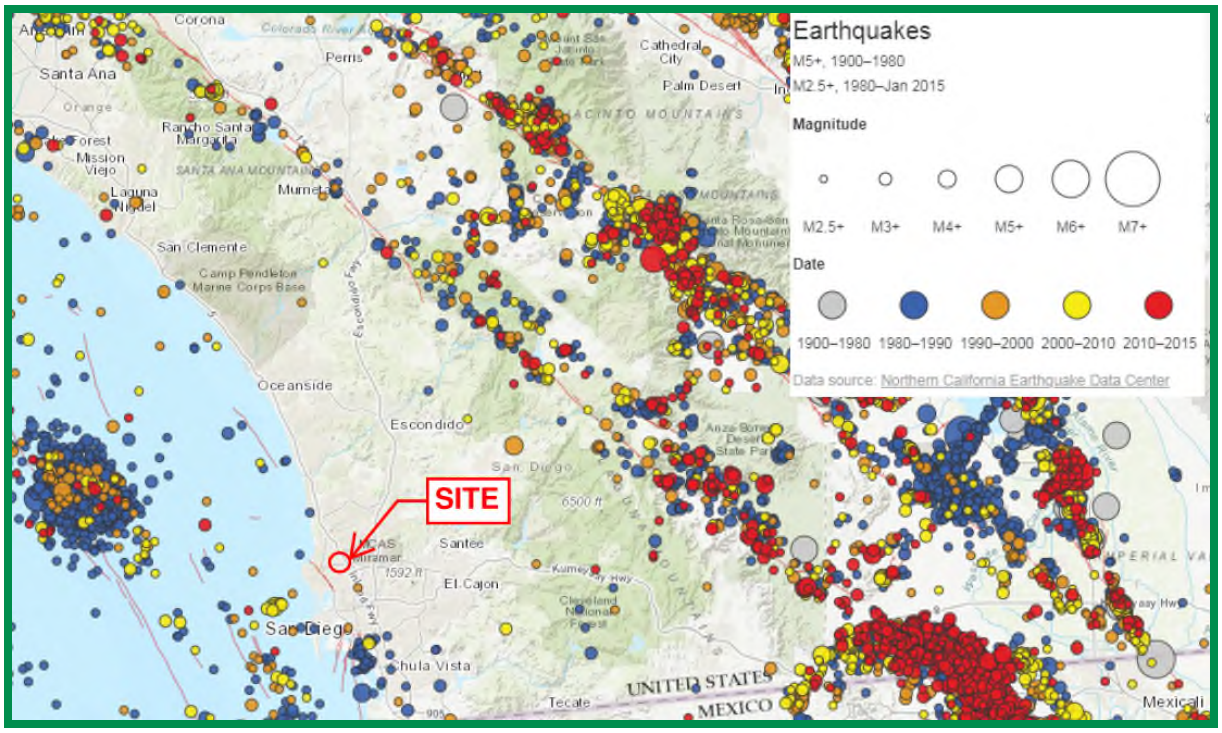
Based on the City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 34, A concealed fault defined as *Fault Zone 12: Potentially Active, Inactive, Presumed Inactive, or Activity Unknown* is mapped approximately 525 feet northwest of the project site, trending in a northeast to southwest direction, and a fault/concealed fault defined as *Fault Zone 12: Potentially Active, Inactive, Presumed Inactive, or Activity Unknown* is mapped approximately 1,850 feet northeast of the site trending in a northwest to southeast direction. These faults/concealed faults will not impact the proposed development of the site.

The USGS has developed a program to evaluate the approximate location of faulting in the area of properties. The following figure shows the location of the existing faulting in the San Diego County and Southern California region. The fault traces are shown as solid, dashed and dotted that represent well-constrained, moderately constrained and inferred, respectively. The fault line colors represent faults with ages less than 150 years (red), 15,000 years (orange), 130,000 years (green), 750,000 years (blue) and 1.6 million years (black).



Faults in Southern California

The San Diego County and Southern California region is seismically active. The following figure presents the occurrence of earthquakes with a magnitude greater than 2.5 from the period of 1900 through 2015 according to the Bay Area Earthquake Alliance website.



Earthquakes in Southern California

Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency.

6.3 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soil is cohesionless/silt or clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four of the previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not. The potential for liquefaction and seismically induced settlement occurring within the site soil is considered to be very low due to the dense nature of the fill, Very Old Paralic Deposits and Scripps Formation and lack of groundwater within 50 feet of the ground surface.

6.4 Storm Surge, Tsunamis, and Seiches

Storm surges are large ocean waves that sweep across coastal areas when storms make landfall. Storm surges can cause inundation, severe erosion and backwater flooding along the water front. The site is located approximately 2½ miles from the Pacific Ocean and is at an elevation of about 380 to 400 feet or

greater above Mean Sea Level (MSL). Therefore, the potential of storm surges affecting the site is considered low.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is located approximately 2½ miles from the Pacific Ocean at an elevation of approximately 380 to 400 feet above Mean Sea Level. Therefore, the risk of tsunamis affecting the site is negligible.

Seiches are caused by the movement of an inland body of water due to the movement from seismic forces. The potential of seiches to occur is considered to be very low due to the absence of a nearby inland body of water.

6.5 Erosion

The site is relatively flat and is not located adjacent to the Pacific Ocean coast or a free-flowing drainage where active erosion is occurring. Provided the engineering recommendations herein are followed and the project civil engineer prepares the grading plans in accordance with generally-accepted regional standards, we do not expect erosion to be a major impact to site development. In addition, we expect the proposed development would not increase the potential for erosion if properly designed.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, we opine the site is suitable for development provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 With the exception of possible moderate to strong seismic shaking, we did not observe or know of significant geologic hazards to exist on the site that would adversely affect the proposed project.

7.1.3 Our fieldwork indicates the site is underlain by previously placed fill overlying Very Old Paralic Deposits and the Scripps Formation. The fill materials are considered suitable for the support of additional fill and/or settlement-sensitive structures. However, we expect the fill will be removed for a majority of the area of the planned structure during the excavation of the subterranean garage levels. Existing fill materials will likely be left in-place on the southeastern portion of the site. The Very Old Paralic Deposits and Scripps Formation are considered suitable for the support of compacted fill and settlement-sensitive structures.

7.1.4 During our investigation, we did not observe significant signs of distress on the exterior of the existing buildings and the parking areas. We have not been informed of distress occurring within the property.

7.1.5 We do not expect groundwater to be encountered during construction of the proposed development. During the rainy season, seepage conditions may develop that would require special consideration during grading and shoring operations.

7.1.6 The proposed structures can likely be supported on conventional shallow footings founded in Very Old Paralic Deposits or the Scripps Formation. Deepened shallow footings and/or deep foundations will be required for the proposed building where fill is exposed at finish grade where the existing fill soil extends deeper than the proposed finish grade elevation in the southeastern portion of the proposed building. The foundations should be extended into the formational materials or drilled piers should be installed if fill soils are present in excess of 10 feet at the bottom of the subterranean level. The drilled piers will help prevent differential settlement within the planned structures. Drilled pier recommendations are provided, herein.

7.1.7 Excavation of the fill materials, the Very Old Paralic Deposits and the Scripps Formation should generally be possible with moderate to heavy effort using conventional, heavy-duty

equipment during grading and trenching operations. We expect very heavy effort with possible refusal in localized areas for excavations into strongly cemented portions of the Very Old Paralic Deposits and Scripps Formation and rock breakers may be required. Oversize material may be generated which would require special handling or exportation from the site.

7.1.8 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties.

7.1.9 Surface settlement monuments and canyon subdrains will not be required on the project.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the in-situ fill soils should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the Very Old Paralic and Scripps Formation will require very heavy effort with possible refusal. The existing materials may generate oversized material using conventional heavy-duty equipment during the grading operations. Oversized rock (rocks greater than 12-inches in dimension) may be generated with these geologic units and may require export.

7.2.2 The soil encountered in the field investigation is considered to be "non-expansive" and "expansive" (expansion index [EI] of 20 or less and greater than 20, respectively) as defined by 2019 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a "very low" to "medium" expansion potential (EI of 90 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble

sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" sulfate exposure to concrete structures as defined by 2019 CBC Section 1904 and ACI 318-14 Chapter 19. However, soil associated with the Scripps Formation has been known to possess water-soluble sulfate exposures of "S0" to "S2". We will provide additional testing of the exposed soil at the finish grade elevation to evaluate the water-soluble sulfate exposure which may require higher strength concrete. Table 7.2.2 presents a summary of concrete requirements set forth by 2016 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

Exposure Class		Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0		SO_4<0.10	No Type Restriction	n/a	2,500
S1		0.10≤SO_4<0.20	II	0.50	4,000
S2		0.20≤SO_4≤2.00	V	0.45	4,500
S3	Option 1	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500
	Option 2		V	0.40	5,000

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

7.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

7.3 Seismic Design Criteria – 2019 California Building Code

7.3.1 Table 7.3.1 summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *U.S. Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. Structures founded on a fill thickness of 20 feet and less can be designed using a Site Class C. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are

for the risk-targeted maximum considered earthquake (MCE_R). Sites designated as Site Class D, E and F may require additional analyses if requested by the project structural engineer and client.

TABLE 7.3.1
2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2019 CBC Reference
Site Class	C	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.144g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.403g	Figure 1613.2.1(2)
Site Coefficient, F_A	1.200	Table 1613.2.3(1)
Site Coefficient, F_V	1.500*	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.373g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.605g*	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.915g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.403g*	Section 1613.2.4 (Eqn 16-39)

***Note:** Using the code-based values presented in this table, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed.

7.3.2 Table 7.3.2 presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

TABLE 7.3.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.513g	Figure 22-9
Site Coefficient, F_{PGA}	1.200	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.616g	Section 11.8.3 (Eqn 11.8-1)

7.3.3 Conformance to the criteria in Tables 7.3.1 and 7.3.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.3.4 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D. Table 7.3.3 presents a summary of the risk categories in accordance with ASCE 7-16.

TABLE 7.3.3
ASCE 7-16 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk to Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

7.4 Grading

7.4.1 Grading should be performed in accordance with the attached *Recommended Grading Specifications* contained in Appendix D. Where the recommendations of this section conflict with those of Appendix D, the recommendations of this section shall take precedence. Earthwork should be observed and fill tested for dry density and moisture content by Geocon Incorporated.

7.4.2 A pre-construction conference with the owner, city inspector, general contractor, civil engineer, and geotechnical engineer in attendance should be held at the site prior to the beginning remedial grading. Special soil handling requirements can be discussed at that time. Earthwork should be observed and compacted fill tested by representatives of Geocon Incorporated.

7.4.3 Grading of the site should commence with the removal of existing improvements, vegetation, and deleterious debris. Deleterious debris should be exported from the site and should not be mixed with the fill. Existing underground improvements within and below the proposed building areas should be removed and the resulting depressions properly backfilled in accordance with the procedures described herein. Deeper removals and/or moisture conditioning should be expected within areas existing improvements and landscape areas. Asphalt and concrete should not be mixed with the fill soil unless approved by the Geotechnical Engineer.

7.4.4 The existing soil within the building pad and parking structure areas should be removed to the planned finish grade elevation. If fill materials or surficial soil are encountered within the pad area, the upper 3 feet of soil should be removed and replaced with properly compacted fill.

7.4.5 For ancillary structures, such as site retaining walls, material should be removed to a depth of 2 feet below bottom of footing and replaced with properly compacted fill. The removals should extend at least 3 feet outside of ancillary structures, where possible. The upper 2 feet of the existing soil or 2 feet below proposed grade, whichever results in a deeper removal, within the planned improvement areas outside of the building areas (e.g. pavement and landscape areas) should be removed and replaced with properly compacted fill. The removals can be limited to the Very Old Paralic Deposits.

7.4.6 Deeper removals may be required in areas where loose or saturated materials are encountered. The removals should extend at least 2 feet outside of the surface improvement area, where possible. Table 7.4.1 provides a summary of the recommended grading operations.

TABLE 7.4.1
SUMMARY OF GRADING RECOMMENDATIONS

Area	Foundation Type	Grading Recommendations
Office Building / Subterranean Parking	Founded in Formational Materials	Remove to Planned Pad Elevation. Process Upper 3 Feet of Existing Fill Below Pad Grade (Where Encountered
Ancillary Structures/Retaining Walls	Shallow Foundations	Removal to 2 Feet Below Bottom of Footings
Site Development	--	Process Upper 1 to 2 Feet of Existing Materials
Lateral Grading Limits		3 Feet Outside of Ancillary Structures
		2 Feet Outside of Improvement Areas

7.4.7 Excavated soil that is generally free of deleterious debris and contamination can be placed as fill and compacted in layers to the design finish-grade elevations. Fill and backfill materials should be 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 ASTM Test Method D 1557. The upper 12 inches of fill beneath pavement areas 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.

7.4.8 Import fill (if necessary) should consist of the characteristics presented in Table 7.4.2. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

TABLE 7.4.2
SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values
Expansion Potential	"Very Low" to "Medium" (Expansion Index of 90 or less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

7.4.9 We should be onsite to provide testing and observation services during the grading and improvement operations for the planned development. We should observe the base of the removals prior to placement of the planned compacted fill to evaluate if the geologic conditions are in accordance with the recommendations presented herein.

7.5 Subdrains

7.5.1 With the exception of retaining wall drains, we do not expect the installation of other subdrain for the proposed building.

7.6 Excavation Slopes, Shoring, and Tiebacks

7.6.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor and their competent person to ensure all excavations, temporary slopes and trenches are properly constructed and maintained in accordance with applicable OSHA guidelines in order to maintain safety and the stability of the excavations and adjacent improvements. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of 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.

7.6.2 The stability of the excavations is dependent on the design and construction of the shoring system and site conditions. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations.

7.6.3 The design of temporary shoring is governed by soil and groundwater conditions, and by the depth and width of the excavated area. Continuous support of the excavation face can be provided by a system of soldier piles and wood lagging. Excavations exceeding 15 feet may require soil nails, tieback anchors, or internal bracing to provide additional wall restraint.

7.6.4 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavation should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation and upon existing buildings. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter. Inclinometers should be installed and monitored behind any shoring sections that will be advanced deeper than 30 feet below the existing ground surface.

7.6.5 In general, ground conditions are moderately suited for soldier pile and tieback anchor wall construction techniques. However, gravel, cobble, and oversized material may be encountered in the Very Old Paralic Deposits and the formational materials that could be difficult to drill. Additionally, if cohesionless sands or gravels are encountered, some raveling may result along the unsupported portions of excavations.

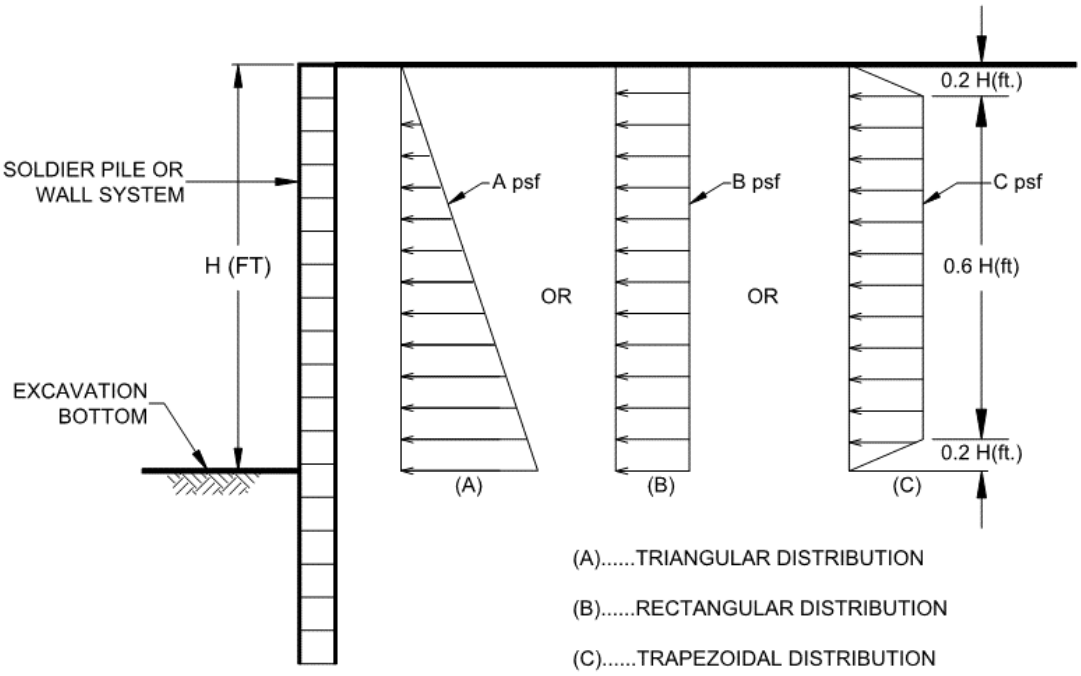
7.6.6 Temporary shoring should be designed using a lateral pressure envelope acting on the back of the shoring as presented in Table 7.6.1 assuming a level backfill. The distributions are shown on the Active Pressures for Temporary Shoring. Triangular distribution should be used for cantilevered shoring and, the trapezoidal and rectangular distribution should be used for multi-braced systems such as tieback anchors and rakers. The project shoring engineer should determine the applicable soil distribution for the design of the temporary shoring system. Additional lateral earth pressure due to the surcharging effects from

construction equipment, sloping backfill, planned stockpiles, adjacent structures and/or traffic loads should be considered, where appropriate, during design of the shoring system.

TABLE 7.6.1
SUMMARY OF TEMPORARY SHORING WALL RECOMMENDATIONS

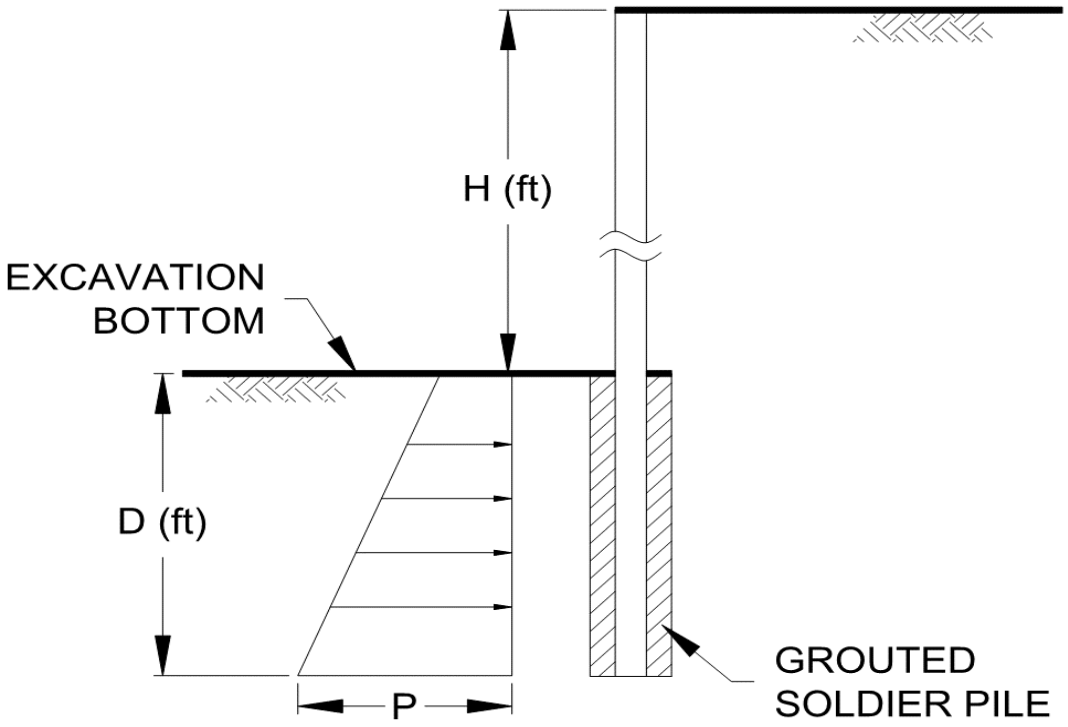
Parameter	Value
Triangular Distribution, A	28H psf
Rectangular Distribution, B	18H psf
Trapezoidal Distribution, C	22H psf
Passive Pressure, P	400D + 500 psf
Effective Zone Angle, E	30 degrees
Maximum Design Lateral Movement	1 Inch
Maximum Design Vertical Movement	½ Inch
Maximum Design Retained Height, H	45 Feet

H equals the height of the retaining portion of the wall in feet
D equals the embedment depth of the retaining wall in feet



Active Pressures on Temporary Shoring

7.6.7 The passive resistance can be assumed to act over a width of three pile diameters. Typically, soldier piles are embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project structural engineer should determine the actual embedment depth.



Passive Pressures on Temporary Shoring

7.6.8 We should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil conditions are encountered, foundation modifications may be required.

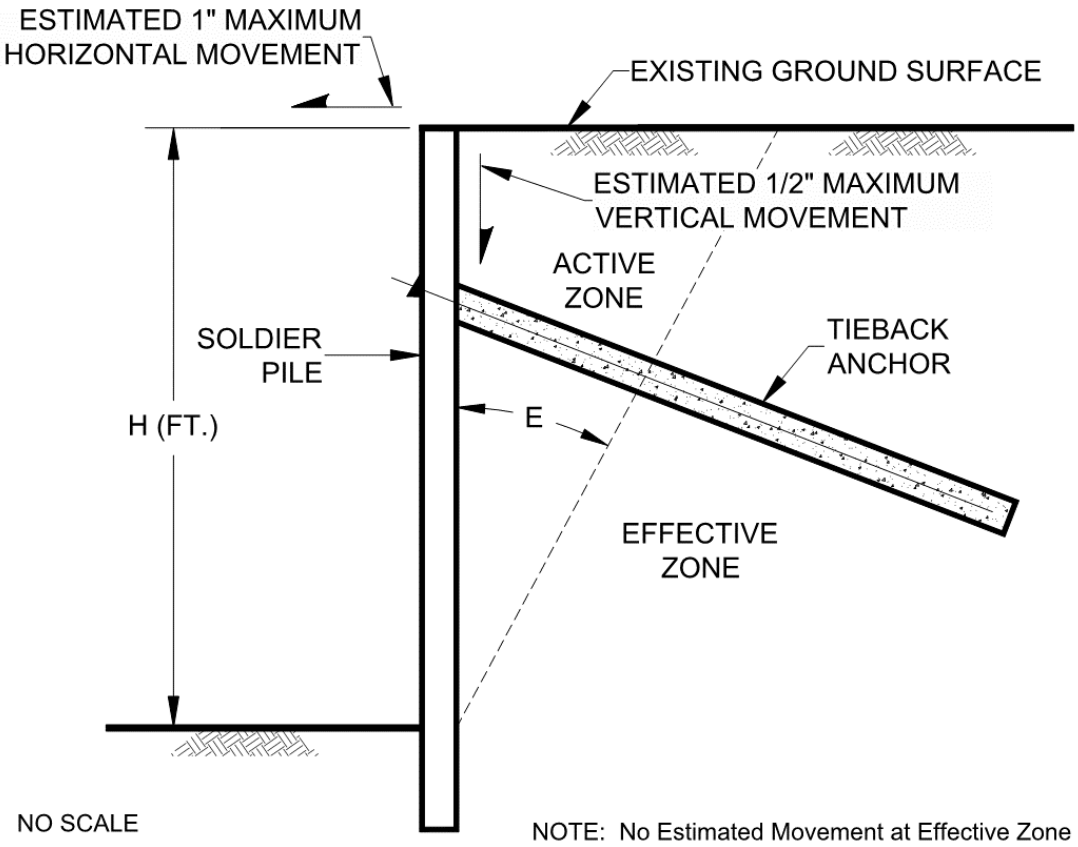
7.6.9 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and tieback system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.

7.6.10 Survey points should be established at the top of the pile on at least 20 percent of the soldier piles. An additional point located at an intermediate point between the top of the pile and the base of the excavation should be monitored on at least 20 percent of the piles if tieback anchors will be used. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter until the permanent support system is constructed.

7.6.11 The project civil engineer should provide the approximate location, depth, and pipe type of the underground utilities to the shoring engineer to help select the shoring type and shoring design.

The shoring system should be designed to limit horizontal soldier pile movement to a maximum of 1 inch. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary. The magnitude of movement for intermediate depths and distances from the shoring wall can be linearly interpolated. We understand the City of San Diego may require the developer to prepare a hold harmless agreement for the planned construction operations and development regarding the existing utilities and improvements.

7.6.12 Tieback anchors employed in shoring should be designed such that anchors fully penetrate the Active Zone behind the shoring. The Active Zone can be considered the wedge of soil from the face of the shoring to a plane extending upward from the base of the excavation as shown on the Active Zone Detail. Normally, tieback anchors are contractor-designed and installed, and there are numerous anchor construction methods available. Non-shrinkage grout should be used for the construction of the tieback anchors.



Active Zone Detail

7.6.13 Experience has shown that the use of pressure grouting during formation of the bonded portion of the anchor will increase the soil-grout bond stress. A pressure grouting tube should be installed during the construction of the tieback. Post grouting should be performed if adequate capacity cannot be obtained by other construction methods.

7.6.14 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section and the length of the bonded section. Anchor capacity should be evaluated using the strength parameters shown in Table 7.6.2.

TABLE 7.6.2
SOIL STRENGTH PARAMETERS FOR TEMPORARY SHORING

Description	Cohesion (psf)	Friction Angle (Degrees)
Previously Placed Fill	250	24
Very Old Paralic Deposits	500	31
Scripps Formation	500	31

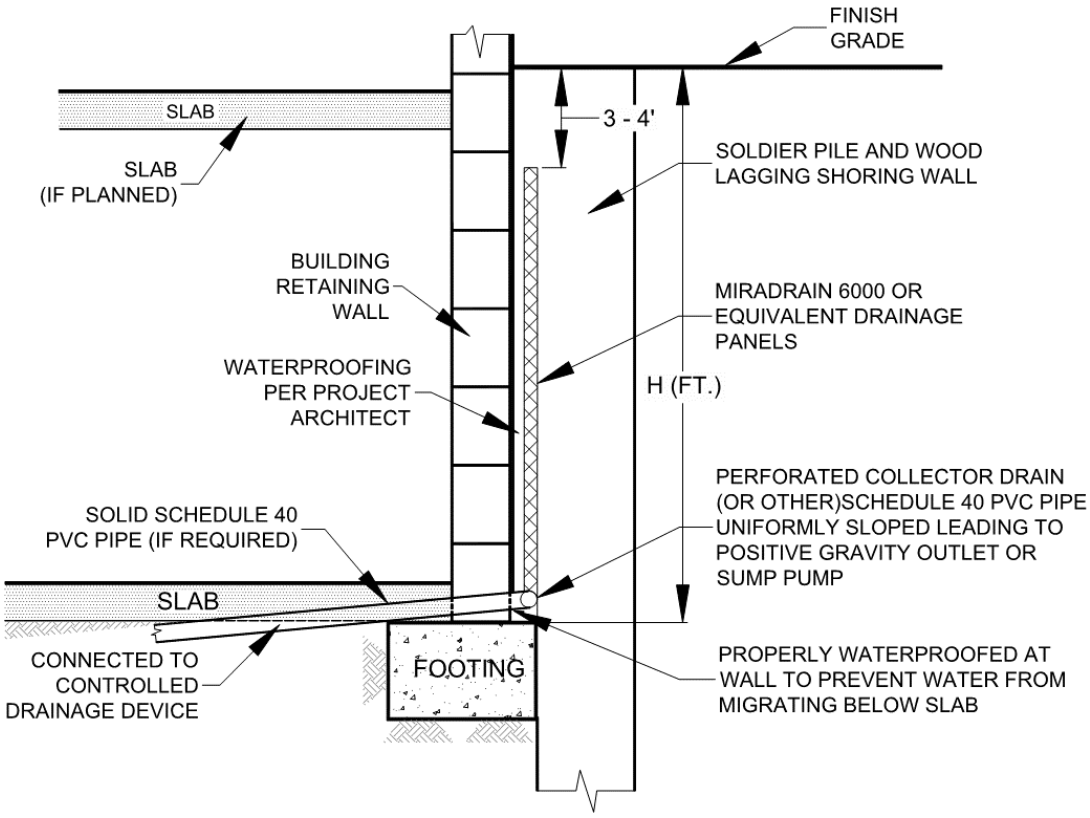
7.6.15 Grout should only be placed in the tieback anchor's bonded section prior to testing. Tieback anchors should be proof-tested to at least 130 percent of the anchor's design working load. Following a successful proof test, the tieback anchors should be locked off at 80 percent of the allowable working load. Tieback anchor test failure criteria should be established in project plans and specifications. The tieback anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor's working load (anchor creep) and a maximum residual displacement within the anchor following stressing. Tieback anchor stressing should only be conducted after sufficient hydration has occurred within the grout. Tieback anchors that fail to meet project specified test criteria should be replaced or additional anchors should be constructed.

7.6.16 Lagging should keep pace with excavation. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil instability and should never be unsupported overnight. Backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone and all voids should be filled by the end of each day. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off unless otherwise specific by the shoring engineer.

7.6.17 If tieback anchors are employed, an accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process to accommodate the existing and proposed utilities.

7.6.18 Tieback anchors within the City of San Diego right-of-way should be properly detentioned and removed where steel does not exist within the upper 20 feet from the existing grade. The Notice – Land Development Review/Shoring in City Right-Of-Way, prepared by the City of San Diego, dated July 1, 2003 should be reviewed and incorporated into the design of the tieback anchors. Procedures for removal of tieback anchors include unscrewing tendons using special couplings, use of explosives, or heat induction. Geocon Incorporated should be consulted if other methods of removal are planned.

7.6.19 The shoring system should incorporate a drainage system for the proposed retaining wall as shown herein.



Shoring Retaining Wall Drainage Detail

7.7 Soil Nail Wall

7.7.1 As an alternative to temporary shoring followed by construction of a permanent basement wall, a soil nail wall can be used. Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails, drains, waterproofing and wall reinforcing steel are placed and shotcrete applied to create a final wall.

7.7.2 Soil nail walls should not be considered a permanent design to support the seismic lateral loads and soil pressures on a building wall. Therefore, the proposed building should be designed to support the expected lateral loads.

7.7.3 The wall should be designed by an engineer familiar with the design of soil nail walls.

7.7.4 In general, ground conditions are moderately suited to soil nail wall construction techniques. However, localized gravel, cobble, cemented materials and oversized material could be encountered in the existing materials that could be difficult to drill. Additionally, relatively clean sands may be encountered within the existing soil that may result in some raveling of the unsupported excavation. Casing or specialized drilling techniques should be planned where raveling exists (e.g. casing).

7.7.5 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested and a minimum of 4 sacrificial nails should be tested at the discretion of Geocon Incorporated. Consideration should be given to testing sacrificial nails with an adjusted bond length rather than testing production nails. Geocon Incorporated should observe the nail installation and perform the nail testing.

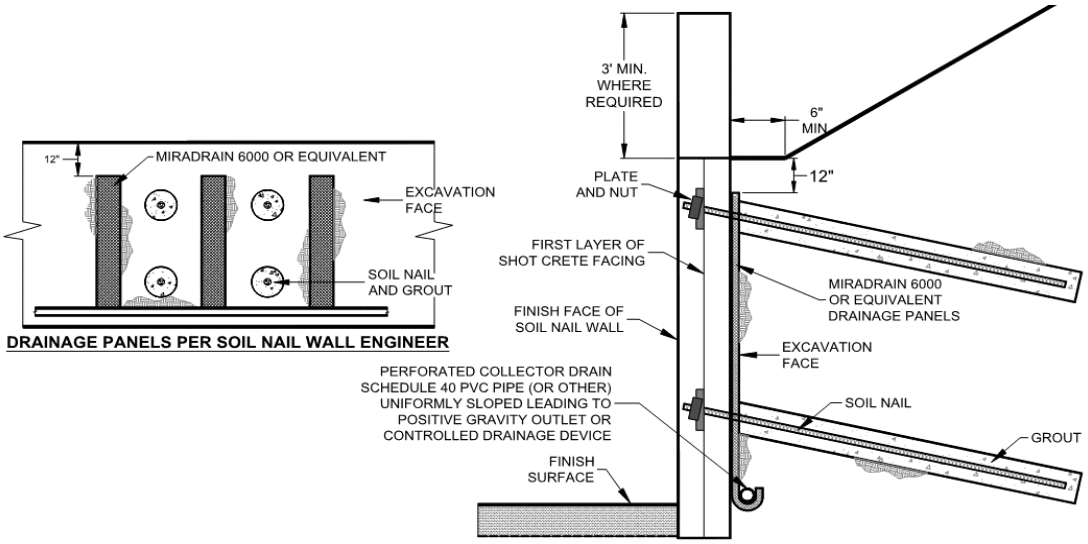
7.7.6 The soil strength parameters listed in Table 7.7 can be used in design of the soil nails. The bond stress is dependent on drilling method, diameter, and construction method (i.e. pressure grouting can increase the bond stress). Therefore, the designer should evaluate the bond stress based on the existing soil conditions and the construction method.

TABLE 7.7
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion (psf)	Friction Angle (degrees)	Estimated Ultimate Bond Stress (psi)
Previously Placed Fill	200	26	5
Very Old Paralic Deposits	500	31	20
Scripps Formation/Ardath Shale	500	31	20

*Assuming gravity fed, open hole drilling techniques.

7.7.7 A wall drain system should be incorporated into the design of the soil nail wall as shown herein. Corrosion protection should be provided for the nails if the wall will be a permanent structure.



Soil Nail Wall Drainage Detail

7.8 Shallow Foundation Recommendations – Building/Parking Structure

7.8.1 The proposed building with subterranean parking can be supported on a shallow foundation system founded in formational materials. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. In addition, the foundations should extend at least 6 inches into the Very Old Paralic Deposits or Scripps Formation. Table 7.8.1 provides a summary of the foundation design recommendations.

TABLE 7.8.1
SUMMARY OF FOUNDATION RECOMMENDATIONS – BUILDING WITH SUBTERRANEAN PARKING

Parameter	Value
Minimum Continuous Foundation Width, W_C	12 inches
Minimum Isolated Foundation Width, W_I	24 inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity	8,000 psf (in Formation)
Bearing Capacity Increase	500 psf per Foot of Depth
	500 psf per Foot of Width
Maximum Allowable Bearing Capacity	11,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	14-Foot Square
Design Expansion Index	90 or less

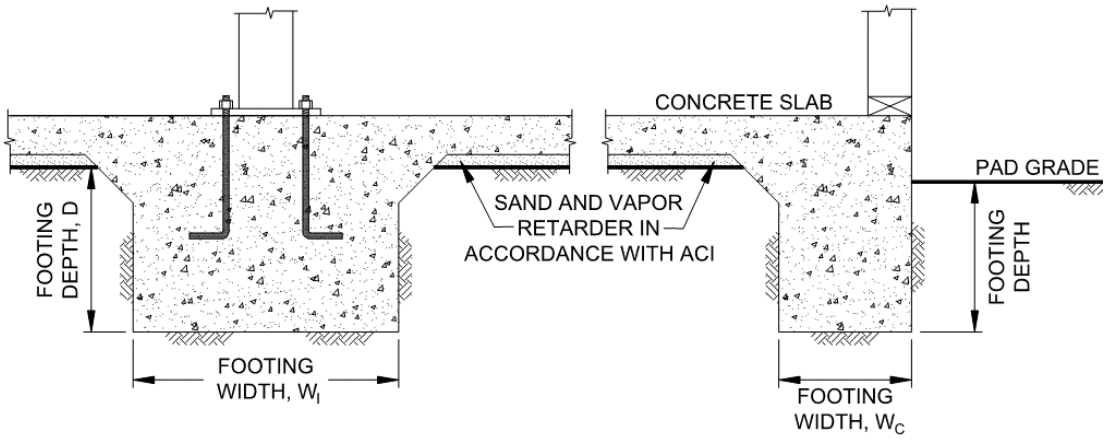
7.8.2 Overexcavation of the footings and replacement with slurry should be performed in areas where the Very Old Paralic Deposits or Scripps Formation is not encountered at the bottom of the footing. Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation. Drilled piers may be required where the excavation depth exceeds about 10 feet. The depth of the overexcavation will likely exceed 10 feet in the southeastern portion of the site.

7.8.3 We understand ancillary structures and retaining walls may be planned for the property. The proposed ancillary structures can be supported on a shallow foundation system founded in the compacted fill/formational materials. Foundations for the ancillary structures should consist of continuous strip footings and/or isolated spread footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope. Table 7.8.2 provides a summary of the foundation design recommendations for footings embedded in compacted fill.

TABLE 7.8.2
SUMMARY OF FOUNDATION RECOMMENDATIONS – ANCILLARY STRUCTURES

Parameter	Value
Minimum Continuous Foundation Width	12 inches
Minimum Isolated Foundation Width	12 inches
Minimum Foundation Depth	12 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	Per Structural
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	3,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	5-Foot Square
Design Expansion Index	90 or less

7.8.4 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

7.8.5 The bearing capacity 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.

7.8.6 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal to vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- Building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support.
- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

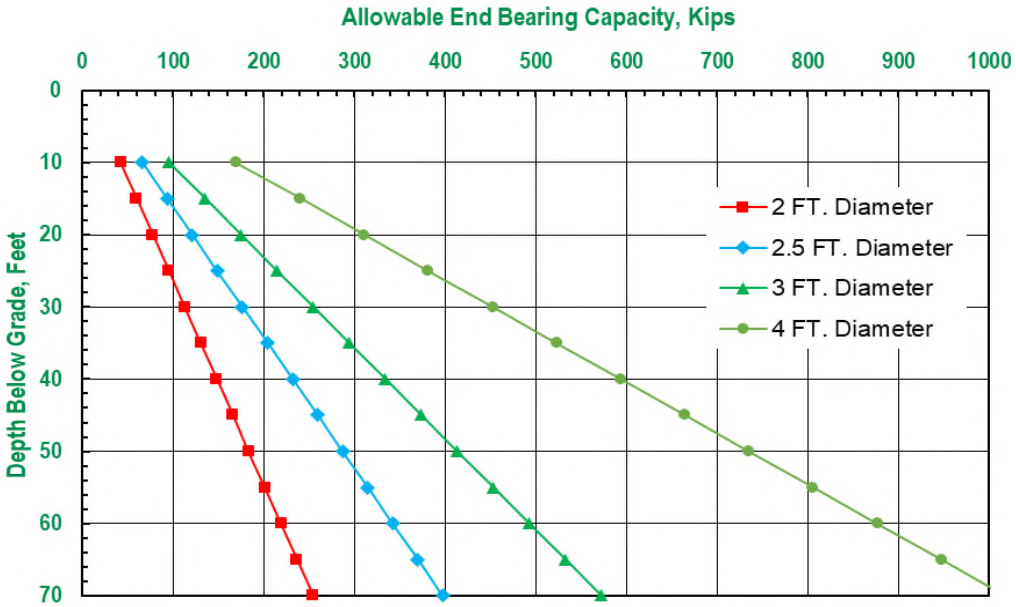
7.8.7 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.

7.8.8 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Drilled Pier Recommendations

7.9.1 Deep foundations can be utilized in areas if previously placed fill is present at the base of the building excavation, likely where the fill extends deeper than about 5 to 10 feet in the southeastern portion of the proposed building.

7.9.2 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil. The end bearing capacity can be determined by the End Bearing Capacity Chart. These allowable values possess a factor of safety of at least 2 for skin friction and end bearing, respectively. The chart assumes the piles will be embedded at least 5 feet into the formational materials.



End Bearing Capacity Chart

7.9.3 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil using the design parameters presented in Table 7.9.

TABLE 7.9
SUMMARY OF DRILLED PIER RECOMMENDATIONS

Parameter	Value
Minimum Pile Diameter	2 Feet
Minimum Pile Spacing	3 Times Pile Diameter
Minimum Foundation Embedment Depth	5 Feet in Formational Materials
Allowable End Bearing Capacity	Per Chart
Allowable Skin Friction Capacity	500 psf (Formational Materials)
Estimated Total Settlement	½ Inch
Estimated Differential Settlement	½ Inch in 40 Feet

7.9.4 The design length of the drilled piers should be determined by the designer based on the elevation of the pile cap or grade beam and the elevation of the top of the formational materials obtained from the Geologic Map and Geologic Cross-Sections presented herein. It is difficult to evaluate the exact length of the proposed drilled piers due to the variable thickness of the existing fill; therefore, some variation should be expected during drilling operations.

7.9.5 If pier spacing is at least three times the maximum dimension of the pier, no reduction in axial capacity for group effects is considered necessary. If piles are spaced between 2 and 3 pile diameters (center to center), the single pile axial capacity should be reduced by 25 percent. Geocon Incorporated should be contacted to provide single-pile capacity if piers are spaced closer than 2 diameters.

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

7.9.7 The existing materials may contain gravel and cobble and may possess very dense zones; therefore, the drilling contractor should expect difficult drilling conditions during excavations for the piers. Because a significant portion of the piers 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 is necessary. We expect localized seepage may be encountered during the drilling operations and casing may be required to maintain the integrity of the pier excavation, particularly if seepage or sidewall instability is encountered. 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.

7.9.8 Pile settlement of production piers is expected to be on the order of ½ inch if the piers are loaded to their allowable capacities. Geocon should provide updated settlement estimates once the foundation plans are available. Settlements should be essentially complete shortly after completion of the building superstructure.

7.10 Concrete Slabs-On-Grade Recommendations

7.10.1 Concrete slabs-on-grade for the structures should be constructed in accordance with Table 7.10.1.

TABLE 7.10
MINIMUM CONCRETE SLAB-ON-GRADE RECOMMENDATIONS

Parameter	Value
Minimum Concrete Slab Thickness	5 inches
Minimum Steel Reinforcement	No. 3 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel/Base
Design Expansion Index	90 or less

7.10.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. 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 accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

7.10.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade in the southern California area. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. 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.

7.10.4 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

7.10.5 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.10.6 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 expected loads.

7.10.7 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. 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, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.11 Concrete Flatwork Recommendations

7.11.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in Table 7.11. The recommended steel reinforcement would help reduce the potential for cracking.

TABLE 7.11
MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EI $\leq$ 90	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 18 inches on center, Both Directions	

*In excess of 8 feet square.

7.11.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.

7.11.3 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some uplift due to expansive soil beneath grade; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

7.11.4 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

7.11.5 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. Dowelling details should be designed by the project structural engineer.

7.11.6 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting 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. Crack control joints should be spaced at intervals no greater than 12 feet. 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.

7.12 Retaining Walls

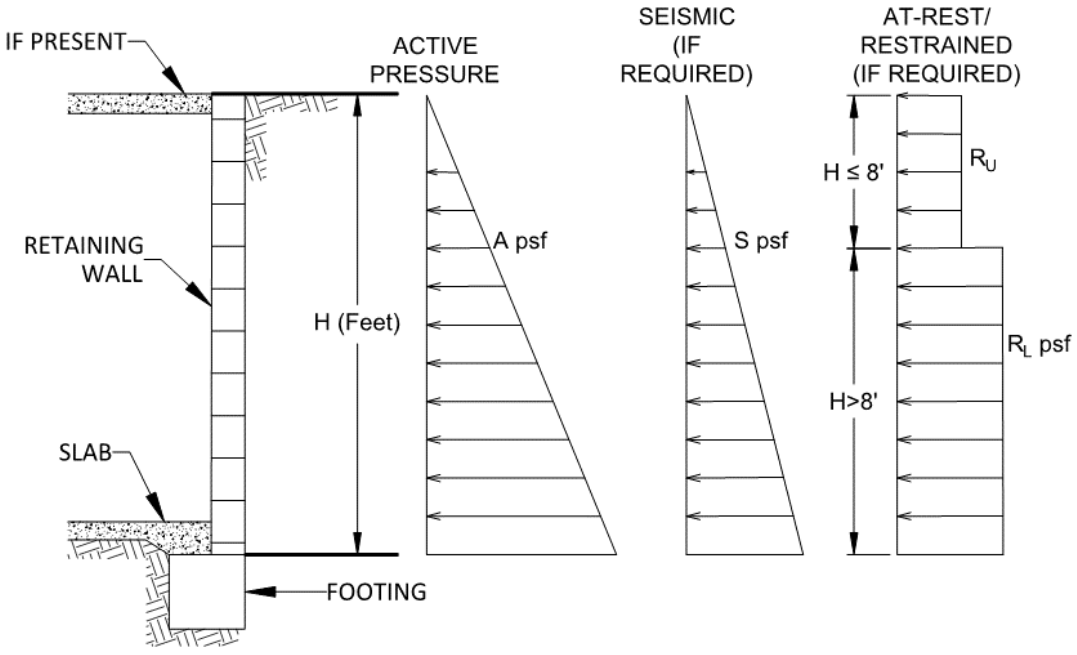
7.12.1 Retaining walls should be designed using the values presented in Table 7.12.1. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

TABLE 7.12.1
RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	40 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	55 pcf
Seismic Pressure, S	17H psf
At-Rest/Restrained Walls Additional Uniform Pressure (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	EI≤90

H equals the height of the retaining portion of the wall

7.12.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



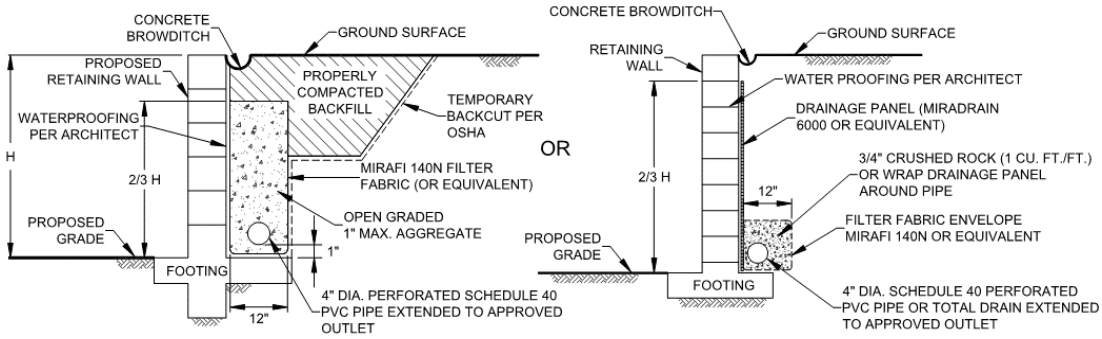
Retaining Wall Loading Diagram

7.12.3 Unrestrained walls are those 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. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For 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.

7.12.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2019 CBC or Section 11.6 of ASCE 7-10. For structures assigned to 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 1803.5.12 of the 2019 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.

7.12.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.12.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

7.12.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

7.12.8 In general, wall foundations should be designed in accordance with Table 7.11.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

TABLE 7.12.2
SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Steel Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	3,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet

7.12.9 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.12.10 It is common to see retaining walls constructed in the areas of the elevator pits. The retaining walls should be properly drained and designed in accordance with the recommendations presented herein. If the elevator pit walls are not drained, the walls should be designed with an increased active pressure with an equivalent fluid density of 90 pcf. It is also common to see seepage and water collection within the elevator pit. The pit should be designed and properly waterproofed to prevent seepage and water migration into the elevator pit.

7.12.11 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.12.12 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field 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 Lateral Loading

7.13.1 Table 7.13 should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

TABLE 7.13
SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

7.13.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

7.14 Preliminary Pavement Recommendations

7.14.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We assumed an R-Value of 6 and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis, based on our laboratory test results. Table 7.14.1 presents the preliminary flexible pavement sections.

TABLE 7.14.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking stalls for automobiles and light-duty vehicles	5.0	6	3	10
Driveways for automobiles and light-duty vehicles	5.5	6	3	12
Medium Truck Traffic Areas	6.0	6	3.5	13
Driveways for heavy truck traffic	7.0	6	4	16

7.14.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base materials 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. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

7.14.3 Base materials should conform to Section 26-1.028 of the *Standard Specifications for the State of California Department of Transportation (Caltrans)* with a ¾-inch maximum size aggregate. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

7.14.4 The base thickness can be reduced if a reinforcement geogrid or cement-treated base materials are used during the installation of the pavement. Geocon should be contact for additional recommendations, if required.

7.14.5 A rigid Portland Cement concrete (PCC) pavement section should be placed in driveway entrance aprons, trash bin loading/storage areas and loading dock areas. The concrete pad for trash truck areas should be large enough such that all the truck wheels will be positioned on the concrete during loading. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 Guide for Design and Construction of Concrete Parking Lots using the parameters presented in Table 7.14.2.

TABLE 7.14.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	50 pci
Modulus of rupture for concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Traffic Category, TC	A and C
Average daily truck traffic, ADTT	10 and 100

7.14.6 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.14.3.

TABLE 7.14.3
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Areas (TC=A-1)	6.0
Heavy Truck and Fire Lane Areas (TC=C)	7.5

7.14.7 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. The use of base materials below concrete surface improvements will not be required.

7.14.8 The rigid pavement should also be designed and constructed incorporating the parameters presented in Table 7.14.4.

TABLE 7.14.4
ADDITIONAL RIGID PAVEMENT RECOMMENDATIONS

Subject	Value
Thickened Edge	1.2 Times Slab Thickness
	Minimum Increase of 2 Inches
	4 Feet Wide
Crack Control Joint Spacing	30 Times Slab Thickness
	Max. Spacing of 12 feet for 5.5-Inch-Thick
	Max. Spacing of 15 Feet for Slabs 6 Inches and Thicker
Crack Control Joint Depth	Per ACI 330R-08
	1 Inch Using Early-Entry Saws on Slabs Less Than 9 Inches Thick
Crack Control Joint Width	¼-Inch for Sealed Joints
	⅜-Inch is Common for Sealed Joints
	$^1/_{10}$- to $^1/_8$-Inch is Common for Unsealed Joints

7.14.9 Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

7.14.10 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report.

7.14.11 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be installed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

7.14.12 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum

moisture content. Cross-gutters that receives vehicular should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

7.14.13 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

7.15 Slope Maintenance

7.15.1 Slopes that are steeper than 3:1 (horizontal to vertical) may, under conditions which are both difficult to prevent and predict, be susceptible to near surface (surficial) slope instability. The instability is typically limited to the outer three feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. It should be noted that although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.16 Site Drainage and Moisture Protection

7.16.1 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 2016 CBC 1804.4 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.

7.16.2 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.

7.16.3 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.

7.16.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

7.16.5 We should prepare a storm water infiltration feasibility report of storm water management devices are planned.

7.17 Grading and Foundation Plan Review

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

7.18 Testing and Observation Services During Construction

7.18.1 Geocon Incorporated should provide geotechnical testing and observation services during the grading operations, foundation construction, utility installation, retaining wall backfill

and pavement installation. Table 7.18 presents the typical geotechnical observations we would expect for the proposed improvements.

TABLE 7.18
EXPECTED GEOTECHNICAL TESTING AND OBSERVATION SERVICES

Construction Phase	Observations	Expected Time Frame
Grading	Base of Removal	Part Time During Removals
	Geologic Logging	Part Time to Full Time
	Fill Placement and Soil Compaction	Full Time
Soldier Piles	Solder Pile Drilling Depth	Part Time
Tieback Anchors	Tieback Drilling and Installation	Full Time
	Tieback Testing	Full Time
Soil Nail Walls	Soil Nail Drilling and Installation	Full Time
	Soil Nail Testing	Full Time
Foundations	Drilling Operations for Piles	Full Time
	Foundation Excavation Observations	Part Time
Utility Backfill	Fill Placement and Soil Compaction	Part Time to Full Time
Retaining Wall Backfill	Fill Placement and Soil Compaction	Part Time to Full Time
Subgrade for Sidewalks, Curb/Gutter and Pavement	Soil Compaction	Part Time
Pavement Construction	Base Placement and Compaction	Part Time
	Asphalt Concrete Placement and Compaction	Full Time

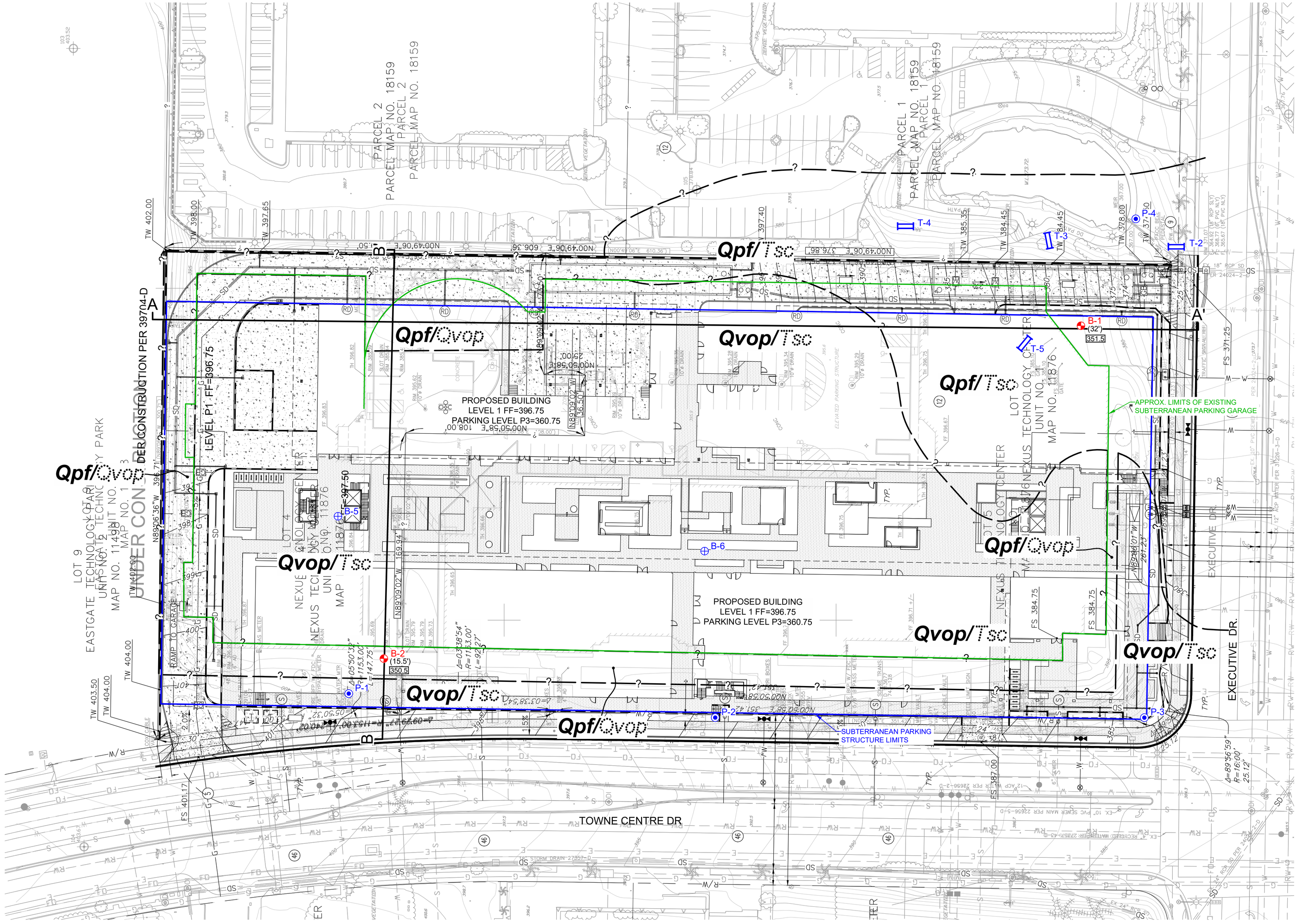
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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.



GEOCON LEGEND

- **Qpf** .....PREVIOUSLY PLACED FILL
- **Qvop** .....VERY OLD PARALIC DEPOSITS (Dotted Where Buried)
- **Tsc** .....SCRIPPS FORMATION (Dotted Where Buried)
- ~2~ .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- B-2 .....APPROX. LOCATION OF BORING
- P-4 .....APPROX. LOCATION OF INFILTRATION TEST
- B-5 & B-6 .....APPROX. LOCATION OF PREVIOUS BORING (Geocon, 1985)
- T-2 - T-5 .....APPROX. LOCATION OF PREVIOUS TRENCH (Geocon, 1985)
- (32') .....APPROX. DEPTH TO FORMATION BELOW EXISTING GRADE (In Feet, MSL)
- 351.5 .....APPROX. ELEVATION OF FORMATION (In Feet, MSL)
- B B' .....APPROX. LOCATION OF GEOLOGIC CROSS-SECTION

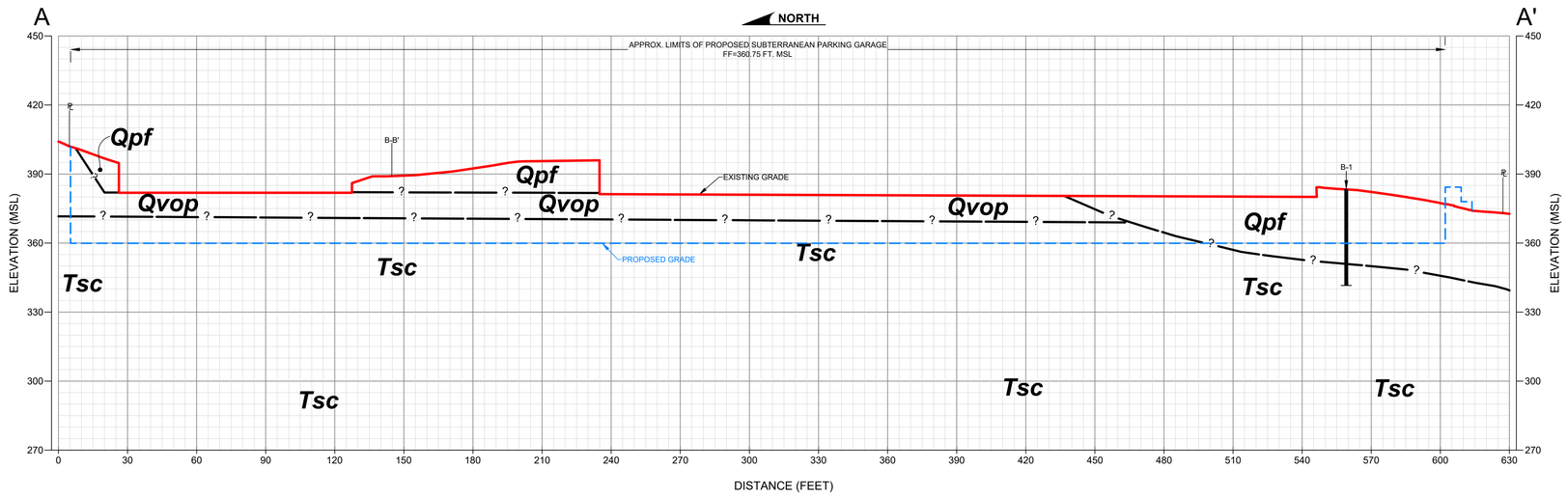
GEOLOGIC MAP

ALEXANDRIA SCIENCE VILLAGE
9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

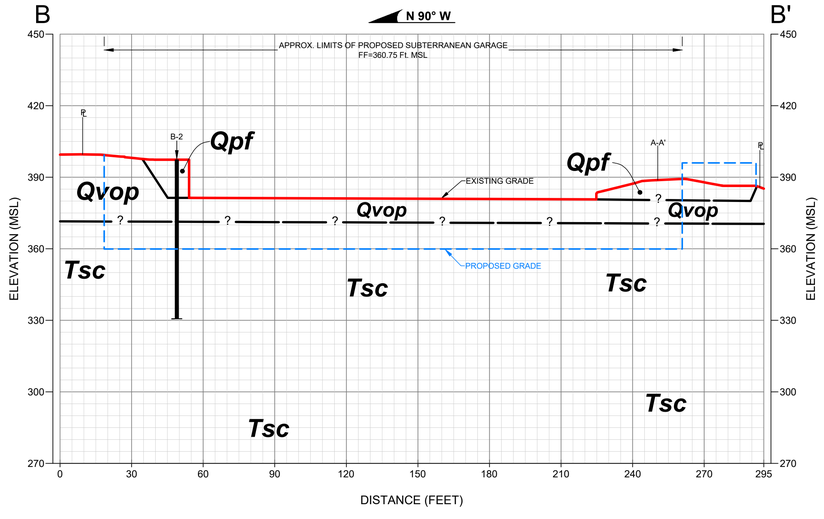
SCALE	1" = 30'	DATE	10 - 15 - 2021
PROJECT NO.	G2101 - 52 - 02	FIGURE	1
SHEET	1 OF 1		

Plotted: 10/15/2021 2:21PM | By: ALVIN LADRILLONO | File Location: Y:\PROJECTS\G2101-52-02 (Podium 93)\SHEETS\G2101-52-02 Geo Map.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 30' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 30' (Vert. = Horiz.)

GEOCON LEGEND

- *Qpf* .....PREVIOUSLY PLACED FILL
- *Qvop* .....VERY OLD PARALIC DEPOSITS
- *Tsc* .....SCRIPPS FORMATION
- B-2 .....APPROX. LOCATION OF GEOTECHNICAL BORING
- ? .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTIONS

ALEXANDRIA SCIENCE VILLAGE
9393 TOWN CENTER DRIVE
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858.558-6900 - FAX 858.558-6159

SCALE 1" = 30'	DATE 10 - 15 - 2021		
PROJECT NO. G2101 - 52 - 02		FIGURE 2	
SHEET 1 OF 1			

Plotted:10/15/2021 2:29PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2101-52-02 (Podium 93)\SHEETS\G2101-52-02 XSection.dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

We performed the field investigation during period of March 14, 2017. Our subsurface exploration consisted of drilling 2 small-diameter exploratory borings to a maximum depth of approximately 67 feet using a truck-mounted drill rig and an 8-inch hollow stem auger. The approximate locations of the exploratory borings are shown on the Geologic Map, Figure 2. Boring logs, and an explanation of the geologic units encountered are presented on Figures A-1 through A-2. We located the borings in the field using existing reference points; therefore, actual locations may deviate slightly.

We obtained samples during our boring excavations using a California split-spoon sampler or a Standard Penetration Test (SPT) sampler. Both samplers are composed of steel and are driven to obtain the soil samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings that are 2.4 inches in diameter and 1 inch in height are placed inside the sampler. The SPT sampler has an inside diameter of 1.5 inches and an outside diameter of 2 inches. Ring samples at appropriate intervals were retained in moisture-tight containers and transported to the laboratory for testing. Bulk samples were also retained from the borings for laboratory testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 inches and 18 inches for California sampler and SPT sampler, respectively. The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler. If the sampler was not driven for 12 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values as adjustments have not been applied. We estimated elevations shown on the boring logs from a topographic map. Each excavation was backfilled as noted on the boring logs.

The soil encountered in the borings were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

PROJECT NO. G2101-52-02

BORING B 1

ELEV. (MSL.) **383.5'** DATE COMPLETED **03-14-2017**

EQUIPMENT **DIETRICH 120** BY: **K. JAMES**

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" **REINFORCED CONCRETE PAVEMENT** Over 3" **BASE**			
	B1-1			SC	**PREVIOUSLY PLACED FILL (Qpf)** Medium dense, damp, reddish brown, Silty, fine to coarse SAND			
2								
4								
	B1-2				-Rock in sampler tip	48	120.4	11.4
6								
8								
10	B1-3				-Becomes mottled reddish brown and light brown	26	104.3	14.6
12								
14								
	B1-4				-2" cobble on top of sampler; some concretion; few gravel; trace carbon; trace mica	34	111.5	11.3
16								
18					-Difficult drilling			
20	B1-5				-Becomes dense, two 2-inch cobbles stuck in sampler rings at top	66	123.7	12.1
22								
24					-Difficult drilling			
					-No recovery; very dense; gravel in drilling cuttings	81/11"		
26								
28					-Difficult drilling			
				SM	Medium dense, damp, reddish brown, Silty, fine to medium SAND; moderately cemented; trace gravel; trace carbon; trace clay			

G2101-52-01.GPJ

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

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.

PROJECT NO. G2101-52-02

BORING B 1

ELEV. (MSL.) **383.5'** DATE COMPLETED **03-14-2017**

EQUIPMENT **DIETRICH 120** BY: **K. JAMES**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1-6					27	116.7	9.7
					-Significant color change			
32	B1-7			ML	**SCRIPPS FORMATION (Tsc)** Medium dense, damp, yellowish brown, Sandy SILTSTONE; strongly indurated; trace clay			
34					-Very difficult drilling			
	B1-8					18	106.4	12.1
36								
					-Becomes very dense, light brown, carbonize			
38								
40	B1-9					88/8"	100.2	13.1
	B1-10				-Drilling terminated after 30 minutes and no increase in depth	50/5"		
					REFUSAL AT 41.35 FEET Groundwater not encountered Backfilled with 14.1 ft³ bentonite grout Patched with concrete			

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

G2101-52-01.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.

PROJECT NO. G2101-52-02

BORING B 2

ELEV. (MSL.) **396'** DATE COMPLETED **03-15-2017**

EQUIPMENT **DIETRICH 120** BY: **K. JAMES**

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" **REINFORCED CEMENT PAVEMENT** Over 6" **BASE**			
	B2-1			SM	**PREVIOUSLY PLACED FILL (Qpf)** Loose, moist, reddish brown, Silty, fine to coarse SAND; few gravel -Hand auger 5 feet			
2								
4								
	B2-2					12	116.1	12.5
6								
8					-Becomes brown to reddish brown			
10	B2-3					6	109.4	13.1
12								
14								
	B2-4					50/5"	100.0	13.1
16				SM	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, damp, reddish brown, Silty, fine to coarse SANDSTONE; moderately cemented -2" rock in sampler tip -difficult drilling			
18								
20	B2-5					74/11"		
	B2-6							
22								
24								
	92.2			ML	**SCRIPPS FORMATION (Tsc)** Very dense, damp, light yellowish brown, Clayey SILTSTONE with sand; moderately indurated	50/4"	92.2	13.0
26								
28								

Figure A-2,
Log of Boring B 2, Page 1 of 3

G2101-52-01.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.

PROJECT NO. G2101-52-02

BORING B 2

ELEV. (MSL.) **396'** DATE COMPLETED **03-15-2017**

EQUIPMENT **DIETRICH 120** BY: **K. JAMES**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-8				-Becomes light yellowish brown to light gray; strongly indurated	83/10"		
32					-Difficult drilling			
34				CL	Medium dense, dry, yellowish brown to olive brown,Silty CLAYSTONE; moderately cemented; some dark brown concretions			
36	B2-9				-Very difficult drilling	22	107.4	18.7
38								
40								
42				ML	Very dense, dry, yellowish brown, Clayey SILTSTONE; strong cemented -Very difficult drilling			
44								
46	B2-10					50/5"	104.1	18.3
48								
50								
52				CL	Very dense, dry, light yellowish brown, Silty CLAYSTONE; strongly cemented -Very difficult drilling			
54								
56	B2-11					50/5"	104.2	18.6
58					-Very difficult drilling; may be near refusal			

Figure A-2,
Log of Boring B 2, Page 2 of 3

G2101-52-01.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.

PROJECT NO. G2101-52-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B 2** ELEV. (MSL.) **396'** DATE COMPLETED **03-15-2017** EQUIPMENT **DIETRICH 120** BY: **K. JAMES**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B2-12							
62								
64					-Very difficult drilling			
66	B2-13					50/3"		
					-Little to no drilling progress after 1 hour of drilling REFUSAL AT 67 FEET Groundwater not encountered Backfilled with 22.9 ft³ bentonite grout Patched with concrete			

Figure A-2,
Log of Boring B 2, Page 3 of 3

G2101-52-01.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.

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for in-place density and moisture content, maximum dry density and optimum moisture content, shear strength, expansion index, water-soluble sulfate characteristics, resistance value, gradation, consolidation characteristics, and unconfined compressive strength/undrained shear strength. The results of our laboratory tests are presented on the tables and figures, herein. In addition, the in-place dry density and moisture content results are presented on the boring logs in Appendix A.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557

Sample No.	Depth (feet)	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-1	0-5	Reddish brown, Clayey, fine to coarse SAND (Qudf)	128.4	9.5
B2-1	0-5	Reddish brown, Silty, fine to coarse SAND; few gravel (Qudf)	132.6	8.2
B2-12	60-67	Light yellowish brown, Silty Claystone (Tsc)	127.7	9.8

SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS ASTM D 3080

Sample No.	Depth (feet)	Geologic Unit	Dry Density (pcf)	Moisture Content (%)		Peak [Ultimate*] Cohesion [Ultimate*] (psf)	Peak [Ultimate*] Angle of Shear Resistance (degrees)
				Initial	Final		
B1-1**	0-5	Qudf	111.7	11.8	16.4	525 [425]	24 [24]
B1-6	30	Qvop	116.7	9.7	14.9	350 [350]	36 [36]
B2-9	35	Tsc	107.4	18.7	20.9	625 [475]	24 [24]
B2-11	55	Tsc	104.2	18.6	22.8	800 [725]	30 [28]

*Ultimate measured at 0.2-inch deflection.
**Sample Remolded

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2016 CBC Expansion Classification	ASTM Soil Expansion Classification
	Before Test	After Test				
B2-1	7.9	16.1	117.4	4	Non-Expansive	Very Low
B2-12	9.5	19.8	111.1	64	Expansive	Medium

SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	Sulfate Class
B2-1	0-5	Qudf	0.021	S0
B2-12	60-67	Tsc	0.011	S0

SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844

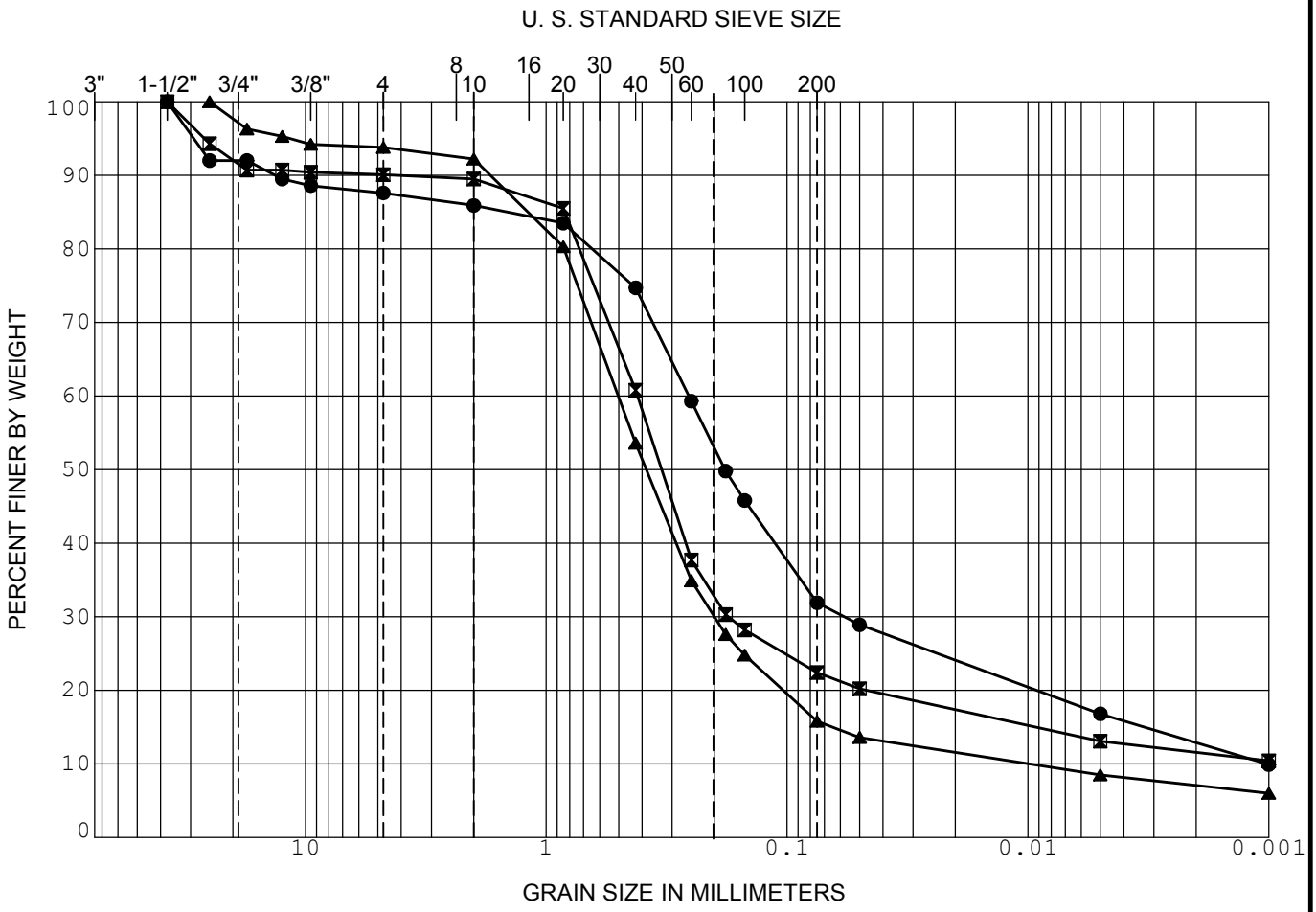
Sample No.	Depth (feet)	Description (Geologic Unit)	R-Value
B2-1	0-5	Reddish brown, Silty, fine to coarse SAND; few gravel (Qudf)	6

SUMMARY OF LABORATORY UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS
ASTM D 1558

Sample No.	Depth (feet)	Geologic Unit	Hand Penetrometer Reading, Unconfined Compression Strength (tsf)	Undrained Shear Strength (ksf)
B1-2	5	Qudf	4.5	4.5
B1-4	15	Qudf	3.0	3.0
B1-5	20	Qudf	4.5	4.5
B1-8	35	Tsc	3.0	3.0
B1-9	40	Tsc	3.0	3.0
B2-4	15	Qudf	1.5	1.5
B2-7	25	Tsc	3.5	3.5
B2-10	45	Tsc	4.5	4.5
B2-11	55	Tsc	2.5	2.5

PROJECT NO. G2101-52-02

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B1-3	10.0	(SC) Clayey SAND	14.6			
⊠	B2-2	5.0	(SM) Silty SAND	12.5			
▲	B2-5	20.0	(SM) Silty SAND				

GRADATION CURVE

ALEXANDRIA SCIENCE VILLAGE
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

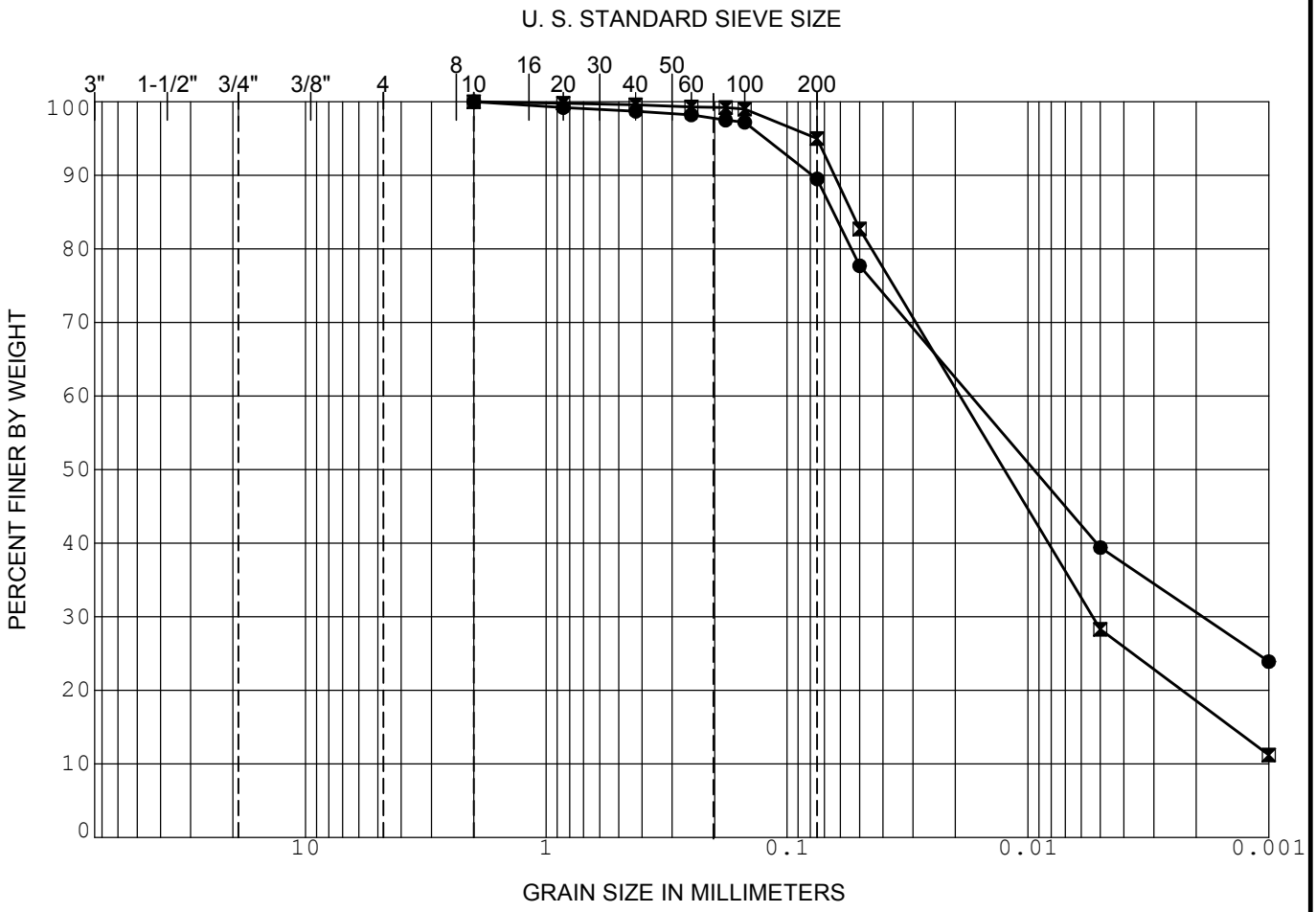
G2101-52-01.GPJ

Figure B-1

GEOCON

PROJECT NO. G2101-52-02

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B2-9	35.0	(CL) Lean CLAY	18.7			
⊠	B2-11	55.0	(CL) Lean CLAY	18.6			
▲							

GRADATION CURVE

ALEXANDRIA SCIENCE VILLAGE
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

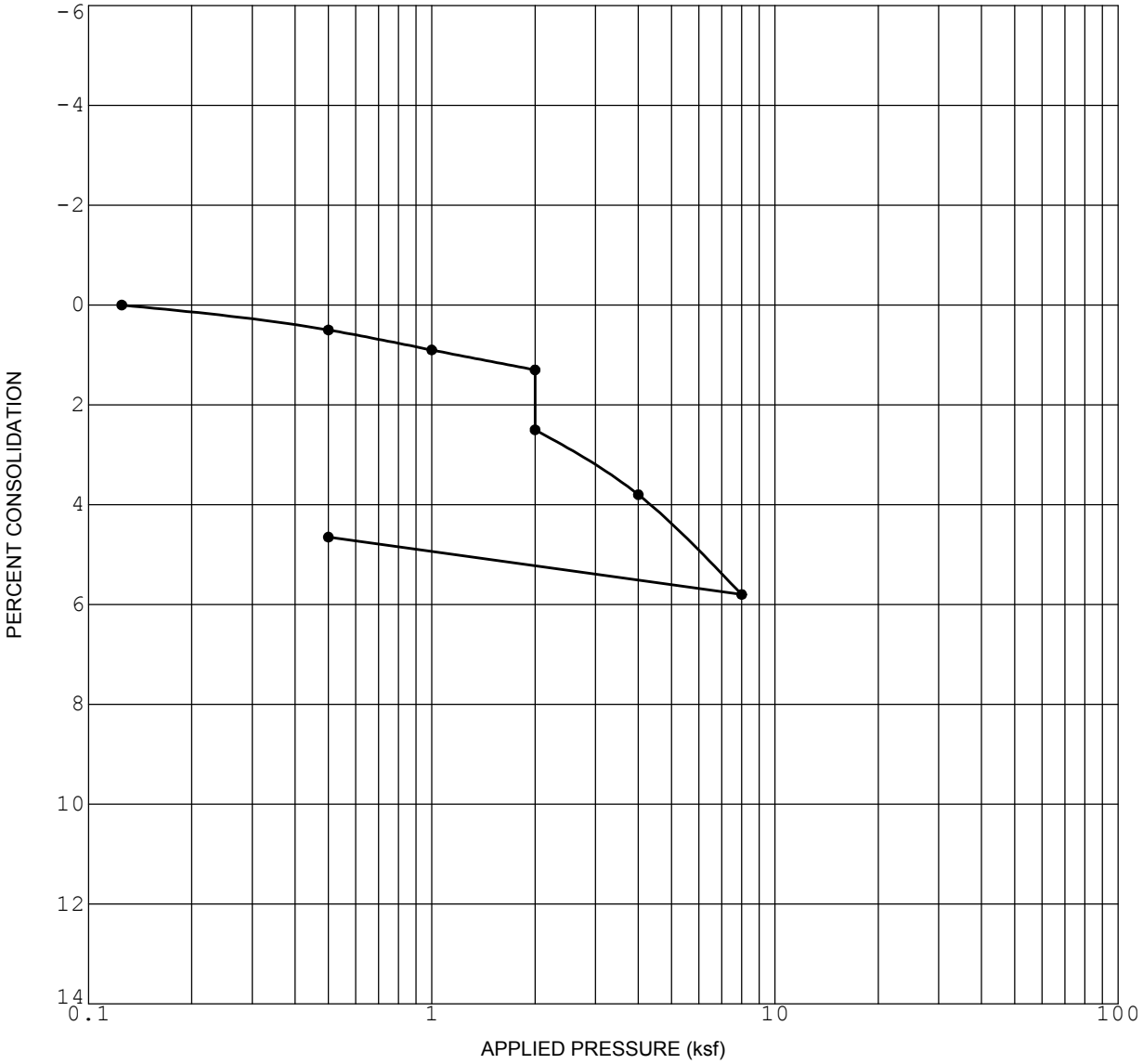
G2101-52-01.GPJ

Figure B-2

GEOCON

PROJECT NO. G2101-52-02

SAMPLE NO. B1-3



Initial Dry Density (pcf)	104.3	**Initial Saturation (%)**	65.8
Initial Water Content (%)	14.6	**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

ALEXANDRIA SCIENCE VILLAGE
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

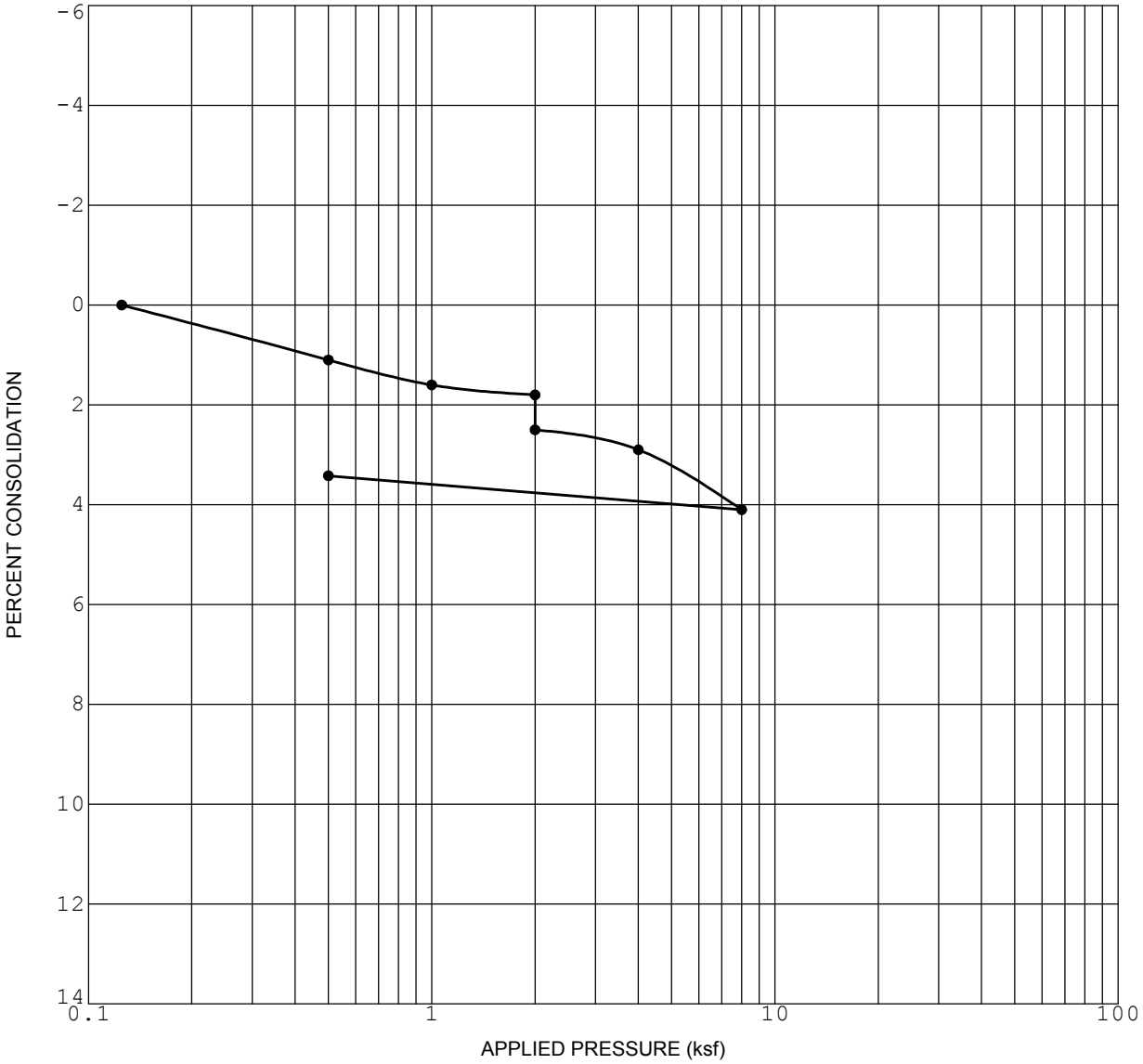
G2101-52-01.GPJ

Figure B-3

GEOCON

PROJECT NO. G2101-52-02

SAMPLE NO. B2-2



Initial Dry Density (pcf)	116.1	**Initial Saturation (%)**	77.8
Initial Water Content (%)	12.5	**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

ALEXANDRIA SCIENCE VILLAGE
9363, 9373 AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

G2101-52-01.GPJ

Figure B-4

GEOCON

APPENDIX C

APPENDIX C

LOG OF PREVIOUS EXPLORATORY BORINGS AND TRENCHES PERFORMED BY GEOCON INCORPORATED, 1985

FOR

ALEXANDRIA SCIENCE VILLAGE
9363, 9373, AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2101-52-02

File No. D-3592-M01
January 20, 1986

BORING NO. 5

ELEVATION 395MSL DATE DRILLED 11/15/85

EQUIPMENT Mobile B-50 Drill Rig

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0								
					TOPSOIL Loose, wet, brown, silty SAND			
2								
					LINDAVISTA FORMATION			
4								
	5-1				Dense, damp, red brown, silty SAND	50/3"	133.8	6.8
6								
8								
10	5-2						111.6	7.6
12								
14					gravels			
16								
					BORING TERMINATED AT 17 FEET ON GRAVELS			

Figure A-4, Log of Boring No. 5

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.

File No. D-3592-M01
January 20, 1986

BORING NO. 6

ELEVATION 402MSL DATE DRILLED 11/15/85

EQUIPMENT Mobile B-50 Drill Rig

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0					TOPSOIL Loose, wet, brown, silty SAND			
2					LINDAVISTA FORMATION Dense, damp, orange red, silty fine SAND			
4								
6								
8								
10	6-1					50/3.5"		
12					Dense to very dense, damp, orange brown, fine to medium SAND			
14								
16	6-2					50/2.5"	122.0	7.5
18					gravels Dense, damp, red brown silty SAND with gravels			
20								
					BORING TERMINATED AT 20 FEET			

Figure A-5, Log of Boring No. 6

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.

File No. D-3592-M01
January 20, 1986

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					TRENCH NO. 1 ELEVATION _____ DATE DRILLED 12/5/85 EQUIPMENT Trackhoe			
0					TOPSOIL Very loose, wet brown medium gray silty SAND			
2								
4	T1-1				SCRIPPS FORMATION Very dense, moist light brown massive medium gray SAND			
6								
8								
10								
12					TRENCH TERMINATED AT 12 FEET			
					TRENCH NO. 2			
0					ALLUVIUM Very loose, wet black clayey SAND			
2								
4					ALLUVIUM/SLOPEWASH Loose, medium dense moist/wet brown clayey SAND			
6								
8								
10								
					SCRIPPS FORMATION Very dense, damp light brown cemented SAND			

Figure A-10, Log of Test Trenches 1 and 2

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.

File No. D-3592-M01
January 20, 1986

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	TRENCH NO. 3 ELEVATION _____ DATE DRILLED 12/5/85 EQUIPMENT Trackhoe MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0	3-1				ALLUVIUM Very loose, wet dark brown silty SAND			
4					ALLUVIUM/SLOPEWASH Loose, medium dense, moist brown clayey SAND			
8					SCRIPPS FORMATION			
10					TRENCH TERMINATED AT 10 FEET			
					TRENCH NO. 4			
0					ALLUVIUM Very loose, wet, blackish brown silty SAND			
4					heavy seepage, caving			
6					ALLUVIUM/COLLUVIUM Loose to medium dense, yellowish brown clayey SAND			
10					SCRIPPS FORMATION Very dense, moist, massive yellowish tan, weakley cemented SANDSTONE			
12					TRENCH TERMINATED AT 12 FEET			
14								

Figure A-11, Log of Test Trenches 3 and 4

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.

File No. D-3592-M01
January 20, 1986

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	TRENCH NO. 5 ELEVATION _____ DATE DRILLED 12/5/85 EQUIPMENT Trackhoe	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					MATERIAL DESCRIPTION			
0					ALLUVIUM Very loose, wet, blackish brown silty SAND			
2								
4					ALLUVIUM/COLLUVIUM Loose to medium dense, wet, yellowish brown clayey SAND with cobbles			
6								
8					SCRIPPS FORMATION Very dense, moist, yellowish gray interbedded SANDSTONE/SILTSTONE			
10								
12					TRENCH TERMINATED AT 7 FEET			
					TRENCH NO. 6			
0					ALLUVIUM Very loose, wet, dark gray Silty SAND			
2								
4					----seepage, caving			
6					SCRIPPS FORMATION Very dense, wet, yellow-gray, interbedded fine SANDSTONE/SILTSTONE			
8								
10					TRENCH TERMINATED AT 7 FEET			

Figure A-12, Log of Test Trenches 5 and 6

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.

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

ALEXANDRIA SCIENCE VILLAGE
9363, 9373, AND 9393 TOWNE CENTRE DRIVE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2101-52-02

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. 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, and/or 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

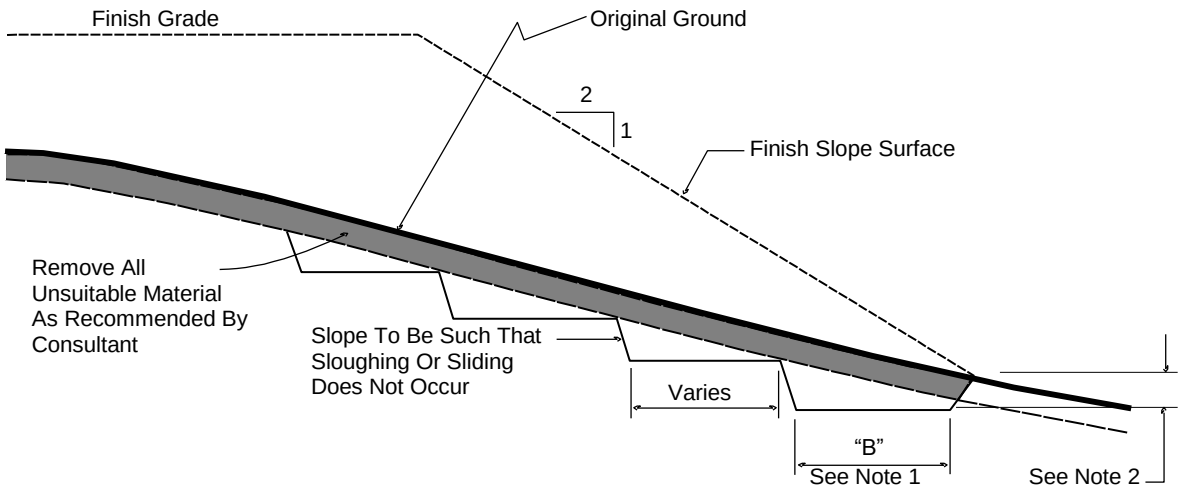
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. 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



No Scale

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.

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. 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, 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.

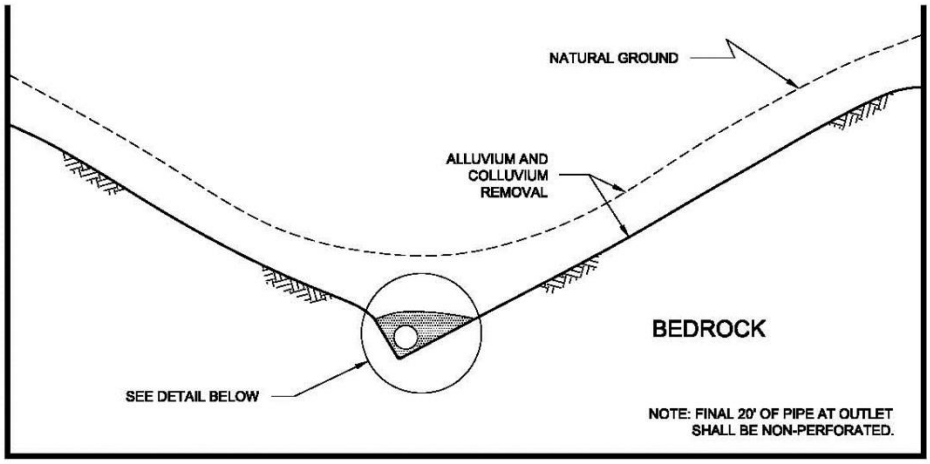
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant 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.

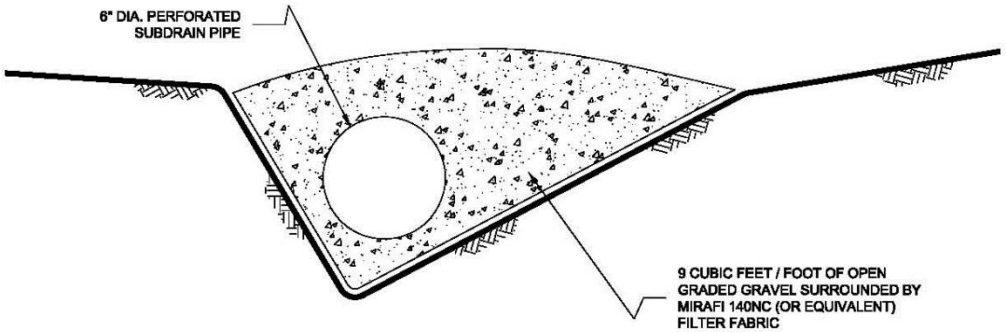
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

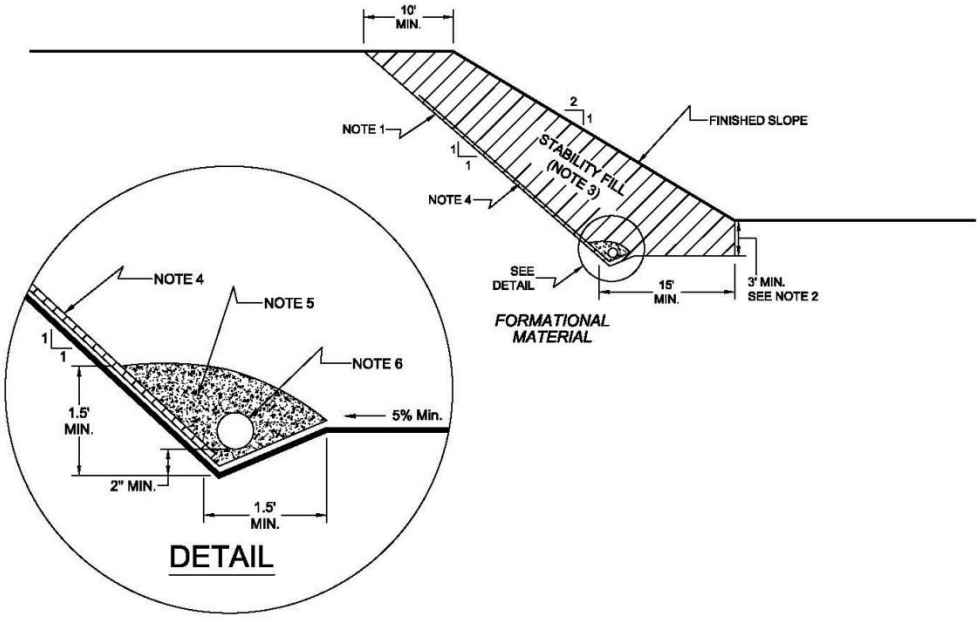
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

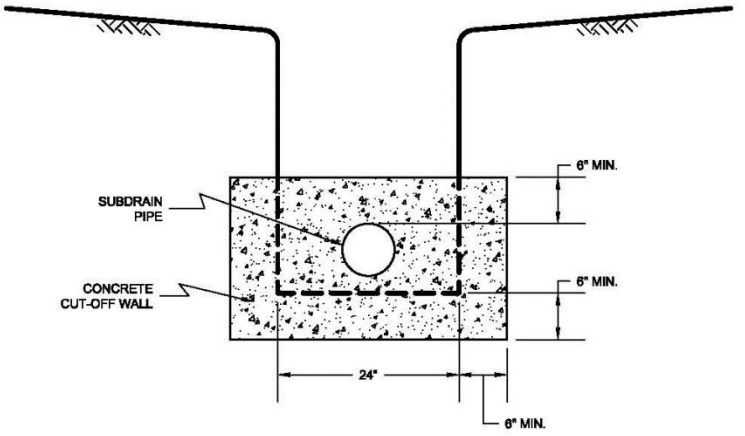
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

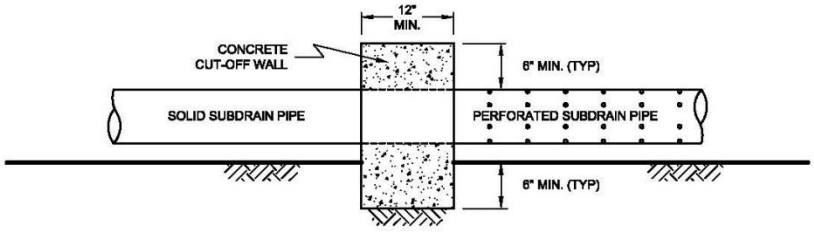
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

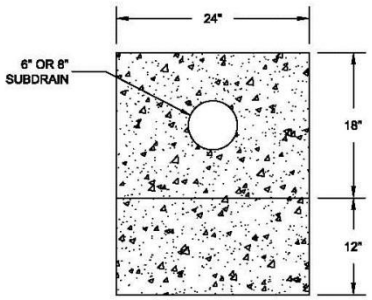


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

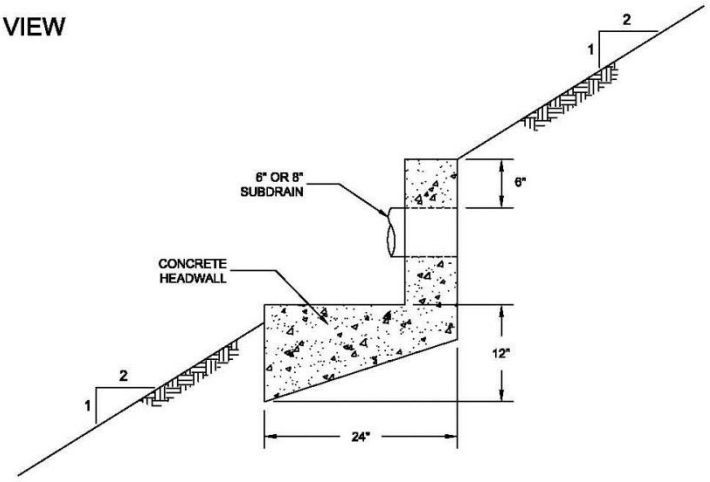
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 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.

8.2 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.

8.3 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.

8.4 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.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 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.

9.2 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.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 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.

10.2 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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4. American Society of Civil Engineers (ASCE), *ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, 2017.

5. California Geologic Survey, *Seismic Shaking Hazards in California, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model,* 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

6. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

7. *City of San Diego Seismic Safety Study, Geologic Hazards and Faults,* 2008 edition, Map Sheet 34.

8. County of San Diego, *San Diego County Multi Jurisdiction Hazard Mitigation Plan, San Diego, California – Final Draft,* dated 2017.

9. Geocon, 1985. Preliminary Soil and Geologic Investigation for Nexus Technology Center, San Diego, California, December 9 (Project No. D-3592-MO1).

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14. Legg, M. R., J. C. Borrero, and C. E. Synolakis (2002), *Evaluation of Tsunami Risk to Southern California Coastal Cities,* 2002 NEHRP Professional Fellowship Report, dated January.

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16. SEAOC Web Application, OSHPD Seismic Design Maps, https://seismicmaps.org/

17. Special Publication 117A, Guidelines For Evaluating and Mitigating Seismic Hazards in *California 2008*, California Geological Survey, Revised and Re-adopted September 11, 2008.

18. United States Geological Survey, *7.5 Minute Quadrangle Series,* La Jolla, 1996.

19. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

20. USGS computer program, Seismic Hazard Curves and Uniform Hazard Response Spectra, http://earthquake.usgs.gov/research/hazmaps/design/.