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

One Alexandria North

[Insert Permit Application Number]

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

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

Engineer of Work:

Brendan Hastie, RCE #65809, Exp. 9/21

Provide Wet Signature and Stamp Above Line

Prepared For:

Alexandria Real Estate Equities, Inc.

10996 Torreyana Road, Suite 250

San Diego, California 92121

(858) 768-7985

Prepared By:

RICK
ENGINEERING COMPANY

Rick Engineering Company

5620 Friars Raod

San Diego, California 92110

(619) 291-0707

Date:

June 22, 2021

Revised: September 10, 2021

Revised: November 05, 2021

Approved by: City of San Diego Date

The City of SAN DIEGO

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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

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

DRAINAGE STUDY
FOR
ONE ALEXANDRIA NORTH
REVISION PAGE
November 5, 2021

This Drainage Study presents a revision to the September 10 study pursuant to first LDR-Engineering review comments from the City of San Diego. The following text is the City of San Diego's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's responses.

SWQMP – 1st Review (uncleared Comments)

34. *Please revise plans and DMA Exhibit to callout basin size and volume as stated in submitted SWQMP.*

    Basin bottom footprints and maximum storage volume has been provided for proposed biofiltration basins, BMP 1, BMP 2B. Dimensions and volume has been provided for the storm trap unit, BMP 2A. This information is shown on the DMA Exhibit as well as the Tentative Map.

37. *Please revise plans and DMA exhibit to show and call out proposed "Storm Trap" system. Please be sure to call out size and volume on plans and exhibit. Please also clarify if applicant is proposing this system for hydromodification purposes.*

    A callout on the DMA exhibit has been added to provide additional information about the "StormTrap" system. Notes have been added for size, storage volume, and HMP.

2nd Review – 10/07/2021 (New Issue Comments)

39. *All unchecked comments from the previous review are still standing and need to be addressed.*
    Comment noted. See responses above.

40. *SWQMP - Regarding cycle comments #34 and 37: Please be sure to call out size and volume of proposed basins and StormTrap vault on plans and TM exhibit. Please also be sure to call out StormTrap on plans and TM exhibit.*

    Comment Noted. See responses to comment 34 and 37.

41. *SWQMP - Please note, the submitted hydromodification calculations do not satisfactorily meet the requirements for sizing. Due to the type of vault proposed and the ability to upsize, LDR-Engineering conceptually approves design. The applicant will need to properly document the hydromodification sizing for project site prior to the issuance of any building permits.*

    Comment Noted. Detailed HMP Modeling will be done as part of Final Engineering.

The report has also been revised to reflect the latest site layout and all relevant calculations have been updated.

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)
FOR
ONE ALEXANDRIA NORTH
REVISION PAGE
September 10, 2021

This Priority Development Project Storm Water Quality Management Plan (PDP SWQMP) presents a revision to the June 22, 2021, plan pursuant to first LDR-Engineering review comments from the City of San Diego. The following text is the City of San Diego's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's responses.

2. *The San Diego Water Board adopted Order No. R9-2013-0001, NPDES No. CAS0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region. This project will be required to adhere to the new Storm Water Development Regulations. (New Issue)*

   Comment noted.

3. *Please refer to Appendix A of the Storm Water Manual. Additional comments will follow.*

   Comment noted.

4. *If The revised Storm Water Standards are available online at: https://www.sandiego.gov/development-services/industry/landdevcode/landdevmanual#stormwaterstandardsmanual2018 (New Issue)*

   Comment noted.

33. *Infiltration category: Please provide documentation in accordance with Appendix C and D of the City's Storm Water Standards Manual to support infiltration category. (New Issue)*

    Comment noted. Infiltration feasibility condition letter has been included in Attachment 1D of the revised report.

34. *Please revise plans and DMA Exhibit to callout basin size and volume as stated in submitted SWQMP. (New Issue)*

    Comment noted and addressed.

35. *DMA Exhibit: Provide structural details and cross sections of all proposed Treatment Control BMPs on the DMA Map. (New Issue)*

    The proposed proprietary pollutant control BMP details and cross-sections have been included separately in Attachment 1E. BMP cross-section detail of the proposed biofiltration BMP however has been included in the DMA exhibit as requested.

36. *Worksheet B.5-6: Please clarify why applicant has combined the retention calculations for DMA 1 and 2. Retention calculation should be separated per DMA/BMP to be size accordingly for each basin area. (New Issue)*

    Separate Worksheet B.5-6 has been provided.

37. *Please revise plans and DMA exhibit to show and call out proposed "StormTrap" system. Please be sure to call out size and volume on plans and exhibit. Please also clarify if applicant is proposing this system for hydromodification purposes. (New Issue)*

    Comment noted. Call out for the stormtrap system size and volume has been added to the DMA exhibit. Please note that the Notes provided in the DMA exhibit as well as Form I-6 in the report already discusses clearly that DMA-2 uses cistern to biofiltration for both HMP and pollutant control.

38. *Please Attachment 2 - Please include hydromodification calculations for the next submittal. (New Issue)*

    Comment noted. Hydromodification calculations have been included.

The report has also been revised to reflect the latest site layout and all relevant calculations have been updated.

Certification Page

Project Name:
Permit Application

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

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

Engineer of Work's Signature

PE#: 65809

Expiration Date: 09/23

Print Name: Brendan Hastie

Company: Rick Engineering Company

Date: 11/05/2021

Engineer's Stamp

Project Name: One Alexandria North

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	June 22, 2021	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	**Initial Submittal**
2	September 10, 2021	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Revisions based on City comments
3	November 05, 2021	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Revisions based on City comments
4		☐ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	

Project Vicinity Map

Project Name: One Alexandria North
Permit Application

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

Attach DS-560 form.

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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
November 2018

Project Address: 11255 N Torrey Pines Rd, La Jolla, CA 92037

Project Number:

SECTION 1. Construction Storm Water BMP Requirements:

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

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

PART A: Determine Construction Phase Storm Water Requirements.

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

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

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

☐ Yes; WPCP required, skip questions 3-4   ☐ No; next question

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

☐ Yes; WPCP required, skip question 4   ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include 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, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

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

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

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3,
a WPCP is REQUIRED. If the project 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 checked "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: www.sandiego.gov/stormwater/regulations/index.shtml

Clear Page 1

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 continued 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 not located in the ASBS watershed.

b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and 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 not located in an ASBS watershed.

c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos 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. Permanent Storm Water BMP Requirements.

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

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

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

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

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

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? ☐ Yes ☒ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? ☐ Yes ☒ No

3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). ☐ Yes ☒ No

Clear Page 2

PART D: PDP Exempt Requirements.

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

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

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

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

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard 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 drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☒ No

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

Clear Page 3

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☒ Yes ☐ No

8. **New development or redevelopment projects of a retail gasoline outlet (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 shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ☐

2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐

3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐

4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Name of Owner or Agent *(Please Print)* Title

Signature Date

Clear Page 4

Clear Form

Applicability of Permanent, Post-Construction Storm Water BMP Requirements

Form I-1

Project Identification

Project Name: One Alexandria North

Permit Application Number:

Date: November 5, 2021

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	Answer	Progression
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: One Alexandria North

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 (<u>not required if prior lawful approval does not apply</u>):		
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 <u>not</u> 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 <u>not</u> apply:		

Project Name: One Alexandria North

Project is not HMP exempt

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	One Alexandria North
Project Address	11255 N Torrey Pines Rd, La Jolla, CA 92037
Assessor's Parcel Number(s) (APN(s))	310-110-14 & 310-110-13
Permit Application Number	
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)	Miramar Reservoir 906.10
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	11.4 Acres (496,584 Square Feet)
Area to be disturbed by the project (Project Footprint)	10.1 Acres (438,799 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	7.0 Acres (306,085 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	3.1 Acres (132,714 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	37.3 %

Increase in Impervious
= (Proposed Impervious - Existing Impervious) / Existing Impervious * 100
= (7.0-5.1) / 5.1 *100
= 37.3%

Project Name: One Alexandria North

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

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

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

Description / Additional Information:

The site currently hosts National University Campus in La Jolla, CA

Existing Land Cover Includes (select all that apply):

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

Description / Additional Information:

The existing land cover includes office buildings, parking garage, parking lots, tennis courts, helipad, swimming pool and landscape areas.

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

☐NRCS Type A
☑NRCS Type B
☐NRCS Type C
☐NRCS Type D

Approximate Depth to Groundwater:

☐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
☑None

Description / Additional Information:

Project Name: One Alexandria North

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

Existing drainage conveyance is urban. No offsite conveyance through the site. The onsite area is approximately 11.4 acres. In the pre-project condition, the project has three (3) major drainage basins namely, Basin 100, 200 and 300. Basin 100 encompasses the northerly portion (approximately 2.5 acres) of the project site and generally flows east. Basin 1 has an existing on-site inlet and storm drain network that confluences at POI-1 (Node 110) by the eastern perimeter of the site and ultimately outfalls further downstream to an unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Basin 200 encompasses the southerly portion (approximately 8.4 acres) of the project site and generally flows east. Like Basin 100, Basin 200 has an existing on-site inlet and storm drain network that confluences at POI-2 (Node 220) by the eastern perimeter of the site and ultimately outfalls further downstream to a different unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Basin 300 encompasses approximately 0.5 acres and lies just north of Basin 200 in the southern parcel of the project. Runoff generally sheet flows along the slope and gets intercepted by a brow ditch that conveys to a Type F Catch Basin at POI-3 (Node 310) at the eastern perimeter of the site. The Type F Catch Basin outfalls further downstream to an unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Basin 100, Q100 = 7.3 CFS; Basin 200, Q100 = 20.7 CFS; Basin 300, Q100 = 1.2 CFS

For more detailed information regarding the site drainage, please refer to the included drainage study in Attachment 5 of this report.

Project Name: One Alexandria North

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 redevelop two currently developed parcels and construct two new 3-story research and development office buildings, one parking garage structure, parking lots, amenity building, and event spaces and decks.

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

The proposed impervious features include two new 3-story research and development office buildings, one parking garage structure, parking lots, amenity building, and even spaces and decks.

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

The proposed pervious feature include landscape areas and DG pathways.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The proposed grading will follow the overall existing drainage patterns but plans to grade the site to accommodate the proposed redevelopment.

Project Name: One Alexandria North

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:

In the post-project condition, the drainage characteristics will remain like the pre-project condition. However, the percentage imperviousness between pre- and post-project for Basin 100 is approximately 66% and 71%, respectively. The increase in percent imperviousness results in a 0.1 CFS increase in the post-project peak flow compared to pre-project peak flow and is considered negligible (<0.5 CFS).

The percentage imperviousness between pre- and post-project for Basin 200 is approximately 39% and 56%, respectively. The increase in percent imperviousness results in a 2.2 CFS increase in the post-project peak flow compared to pre-project peak flow. Hence, the project proposes detention for the 100-year 6-hour storm event via an underground detention vault in Basin 200 to attenuate the peak flow back to pre-project condition. Detailed detention sizing will be performed in Final Engineering.

Existing drainage patterns will be maintained in Basin 300. No changes in peak runoff are expected to occur in basin 300.

For more detailed information regarding the site drainage, please refer to the included drainage study in Attachment 5 of this report. For more information on storm water treatment facilities, please refer to Form I-6 in the following pages of this report.

Project Name: One Alexandria North

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:

1. All proposed storm drain inlets shall be marked with the words “No Dumping! Flows to Bay” or similar (i.e. Lagoon/Ocean) and maintained periodically to replace inlet markings.

2. Landscaping areas shall be maintained using minimum or no pesticides. Pesticides shall be used only after monitoring indicates they are needed according to established guidelines.

3. The proposed parking lots will drain to a structural BMP before entering the storm drain system.

Project Name: One Alexandria North

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)

Urban Drain System (POC-1) -> Unnamed Canyon -> Soledad Canyon -> Los Penasquitos Creek -> Los Penasquitos Lagoon -> Pacific Ocean

Urban Drain System (POC-2) -> Unnamed Canyon -> Soledad Canyon -> Los Penasquitos Creek -> Los Penasquitos Lagoon -> Pacific Ocean

Urban Drain System (POC-3) -> Unnamed Canyon -> Soledad Canyon -> Los Penasquitos Creek -> Los Penasquitos Lagoon -> Pacific Ocean

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Soledad Canyon - MUN, AGR, IND, REC1, REC2, WARM, COLD, WILD
Los Penasquitos Creek - MUN, AGR, IND, REC1, REC2, BIOL, WARM, WILD
Los Penasquitos Lagoon - REC1, REC2, BIOL, EST, WILD, RARE, MAR, MIGR, SPWN, SHELL
Pacific Ocean - IND, NAV, REC1, REC2, COMM, BIOL, WILD, RARE, MAR, AQUA, MIGR, SPWN, SHELL

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

There are no ASBS receiving waters downstream of the project location.

Provide distance from project outfall location to impaired or sensitive receiving waters

POC-1, POC-2 and POC-3 are approximately 2800 feet, 2200 feet, and 2150 feet from the nearest impaired or sensitive receiving water (Soledad Canyon), respectively.

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

POC-1, 2 and 3 discharge directly to an Environmentally Sensitive Area.

Project Name: One Alexandria North

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)
Los Penasquitos Creek	Enterococcus	Hydromodification
Los Penasquitos Lagoon	Fecal Coliform	Siltation/Sedimentation
	Selenium	Freshwater Discharges
	Total Dissolved Solids	Indicator Bacteria
	Total Nitrogen as N	
	Toxicity	
	Sedimentation/Siltation	
	Sediment Toxicity	

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	☐	☐	☐

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:

Please refer Attachment 2B for Management of Critical Coarse Sediment Yield Areas exhibit. There are no critical coarse sediment yield areas in the project site.

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.

For this project, two (2) POCs for HMP has been identified. POC-1 outflows to an unnamed canyon east of the northern parcel 310-110-14 and eventually confluences with Soledad Canyon. DMA-1 is tributary to POC-1.

POC-2 outflows to an unnamed canyon east of the southern parcel 310-110-13 and eventually confluences with Soledad Canyon. DMA-2 and 3 are tributary to POC-2.

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: One Alexandria North

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.

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:			
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:			
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:			

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: One Alexandria North

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: There are no known hydrologic features on-site. The project is a redevelopment of an existing pad. There are no natural drainage pathways. However, the proposed grading will follow the existing contours with minor changes to accommodate the redevelopment. TCV has not been estimated or used for the project.			
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: One Alexandria North

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: This site design has been implemented for the proposed landscape areas only.			
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: One Alexandria North

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 does not propose any rain barrels, green roofs or permeable pavements for runoff collection.			
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: Based on Form I-7 provided in Attachment 1C, harvesting and using precipitation is infeasible for the proposed land use.			
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: One Alexandria North

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:
Refer to DMA Exhibit in Attachment 1A

Project Name: One Alexandria North

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. Structural BMPs (BMP-1 for DMA-1 and BMP-2A & 2B for DMA-2) have been proposed for storm water pollutant control. Selection of the BMP type was performed using SWS Figures 5-1 and 5-2. All the DMAs contains impervious surfaces; therefore, the selection begins at Step 1B. After calculating the Design Capture Volume estimations, Step 2 was completed to determine Harvest and Use feasibility. Based on the proposed land use proposed for the site, it was determined that Harvest and Use is infeasible (refer to Form I-7 provided in Attachment 1C). In Step 3, the infiltration feasibility will be assessed for the project either based on Simple Feasibility Criteria or through approved infiltration testing methods in Appendix C and D of the SWS manual. "No infiltration" condition has been assumed for this submittal while the project Geotechnical Engineer conducts his/her investigation. Infiltration feasibility backup will be included in Attachment 1D. In Step 4, it was determined that biofiltration BMP (BMP-1) can be designed to treat the full DCV based on the maximum feasible footprint. (Continue on page 2 as necessary.)	

Form I-6 Page 2 of 8

(Continued from page 1)

BMP-1 will also be designed to comply with the hydromodification management (flow control) requirements using the standard hydromodification BMP sizing factors per Section G.2 of the Storm Water Standards Manual. Project proposes low flow restrictor on the perforated sub-drain at the bottom of the basin and a overflow catch basin set just above the HMP volume for 100-year peak flow conveyance.

Due to existing site constraints in the existing development's topography and available space, underground cistern to biofiltration BMP has been proposed for DMA-2. Underground cistern (BMP-2A) upstream of the proposed biofiltration facility (BMP-2B) will control the flows for water quality and hydromodification purposes. Low-flow restrictor set at the flowline of the vault allows the water quality flows to drain to the biofiltration BMP downstream. This allows for an optimized biofiltration facility with a smaller footprint but still meeting all the pollutant control requirements per the SWS manual. Hydromodification volume for flow control was estimated using the standard hydromodification BMP sizing factors per Section G.2 of SWS Manual. HMP volume will be provided within the cistern and will be released at a rate less than 0.1Q2 using the low-flow orifice. Low flow orifice is sized based on the minimum of 0.1Q2 or the average outflow from cistern per 12-hr drawdown corresponding to 0.85 times DCV. High-flow/overflow weir set above the HMP ponding depth will then convey the 100-year peak flow.

BMP cross-section schematic and detailed outlet work design for all proposed BMPs are included in Attachment 1E. Please refer to Attachment 2D for SWMM model inputs and outputs.

In order to meet the volume retention criteria in DMA-1 and 2 the project proposes impervious area dispersion (SD-B) throughout the site. Please refer to Worksheets B.5-2 and B.5-6 in Attachment 1E for the same.

The project does not propose any Structural BMPs for Self-Mitigating DMAs, DMA 3 and DMA 4. DMA 3 and 4 are self-mitigating DMAs pursuant to Section 5.2.1 of the SWS Manual. Please refer to Attachment 1E for the Self-Mitigating DMA Standards Checklist.

Project Name: One Alexandria North

Form I-6 Page 3 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1

Construction Plan Sheet No.

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	Project Engineer Rick Engineering Company Brendan Hastie: (619) 241-5827
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc.
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc.
What is the funding mechanism for maintenance?	Alexandria Real Estate Equities, Inc.

Form I-6 Page 4 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-1
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Biofiltration BMP for DMA-1. Combined pollutant control and hydromodification. Please refer to Attachment 1E for BMP sizing calculations.

Project Name: One Alexandria North

Form I-6 Page 5 of 8 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP-2A	
Construction Plan Sheet No.	
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	Project Engineer Rick Engineering Company Brendan Hastie: (619) 241-5827
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc.
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc.
What is the funding mechanism for maintenance?	Alexandria Real Estate Equities, Inc.

Form I-6 Page 6 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-2A
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Underground Storage Vault (BMP-2A) for DMA-2. Hydromodification control only.

Form I-6 Page 7 of 8 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-2B

Construction Plan Sheet No.

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	Project Engineer Rick Engineering Company Brendan Hastie: (619) 241-5827
Who will be the final owner of this BMP?	Alexandria Real Estate Equities, Inc.
Who will maintain this BMP into perpetuity?	Alexandria Real Estate Equities, Inc.
What is the funding mechanism for maintenance?	Alexandria Real Estate Equities, Inc.

Project Name: One Alexandria North

Form I-6 Page 8 of 8 (Copy as many as needed)
Structural BMP ID No. BMP-2B
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Biofiltration BMP for DMA-2. Pollutant control only. Please refer to Attachment 1E for BMP sizing calculations.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: One Alexandria North

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

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

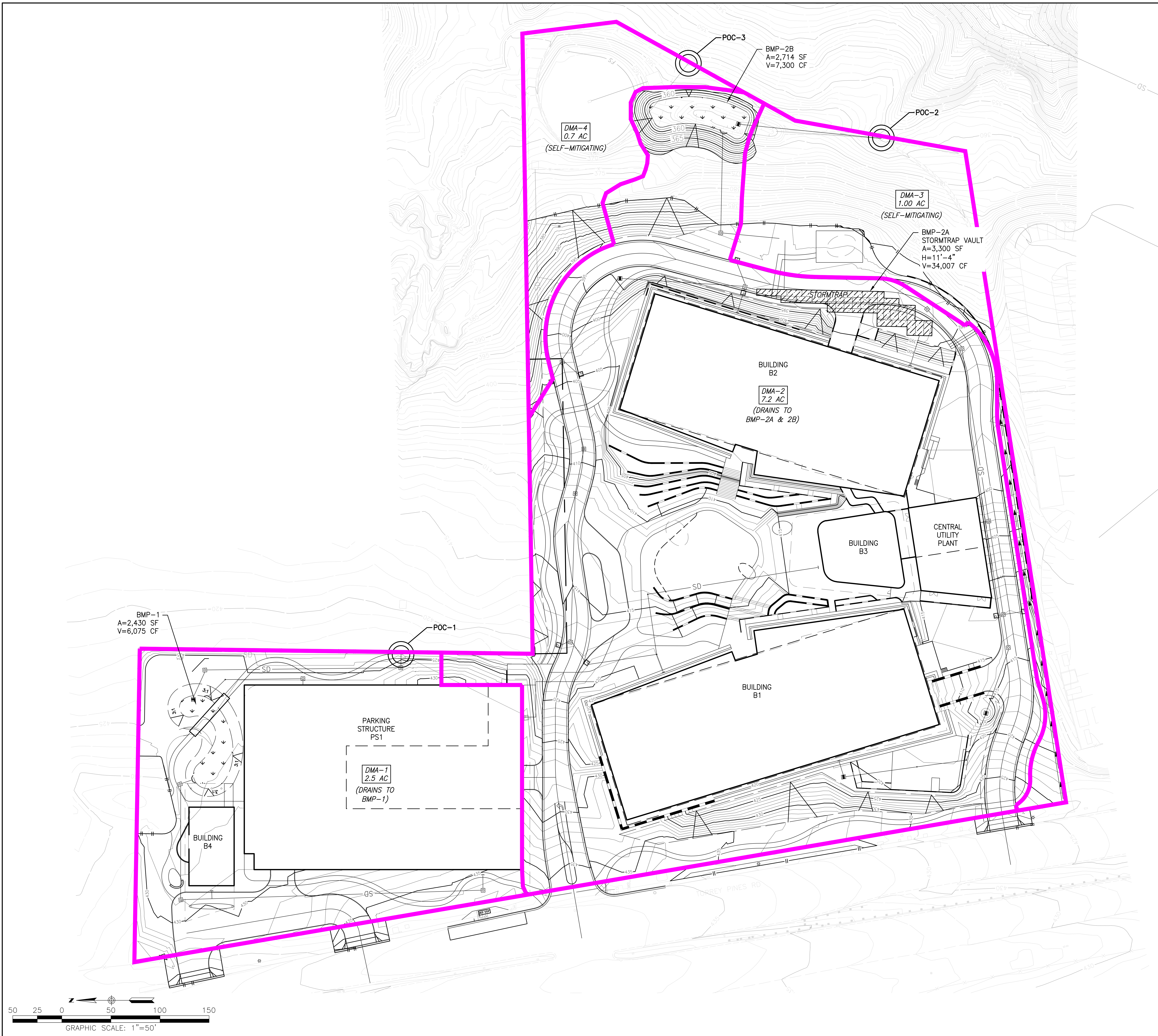
The DMA Exhibit must identify:

☑ Underlying hydrologic soil group
☑ Approximate depth to groundwater
N/A ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
N/A ☐ 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)

Project Name: **One Alexandria North**

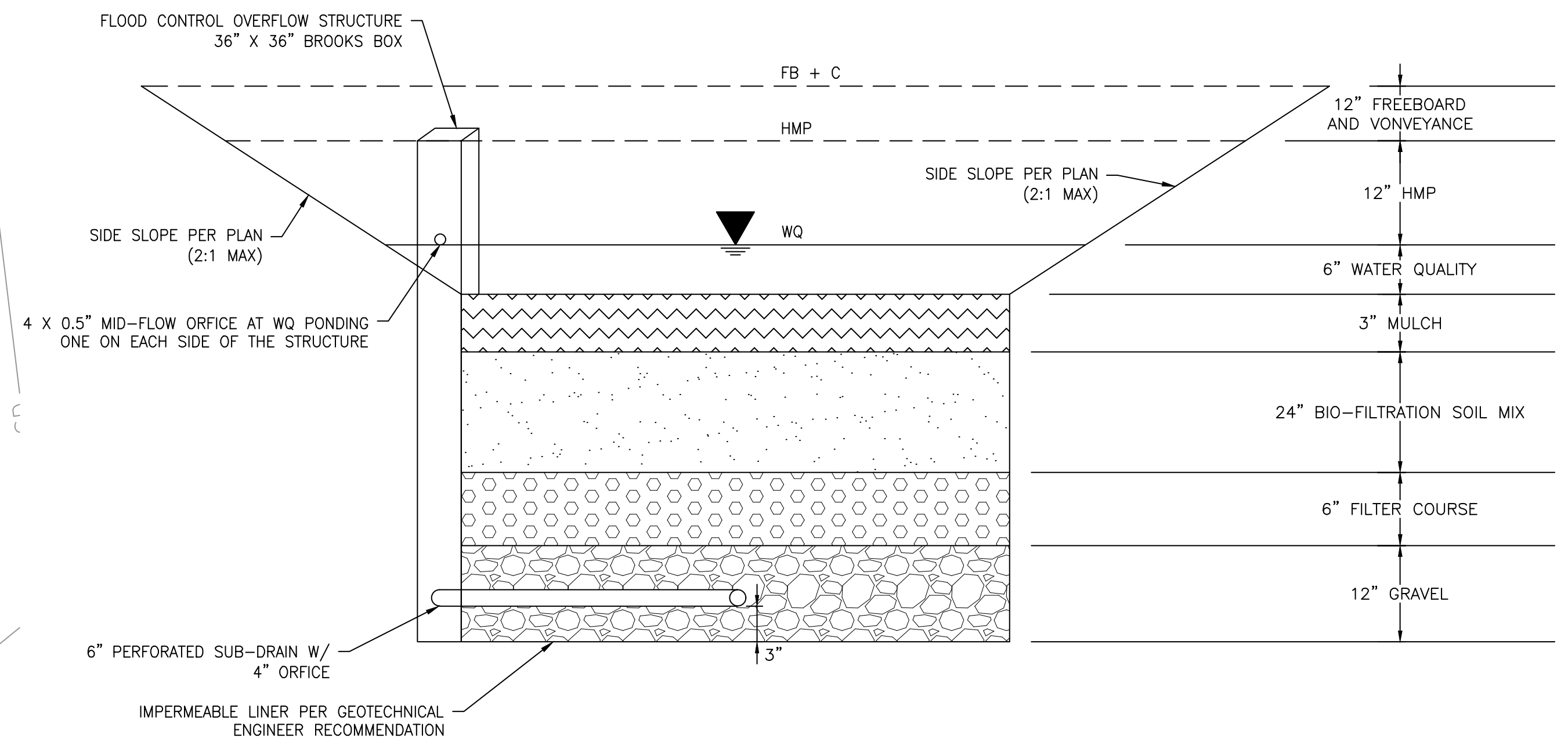
Attachment 1A

DMA Exhibit



NOTES:

1. UNDERLYING HYDROLOGIC SOIL GROUP = NRCS TYPE B.
2. APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20FT.
3. THE PROJECT SITE IS NOT LOCATED WITHIN ANY CRITICAL COARSE SEDIMENT YIELD AREAS (ATTACHMENT 2B).
4. BIOFILTRATION BMP (BF-1), HAS BEEN PROPOSED IN DMA-1 NAMELY, BMP-1. THE BIOFILTRATION FACILITY SERVES BOTH HMP FLOW CONTROL AND POLLUTANT CONTROL PURPOSES. THE FOOTPRINT OF BMP-1 IS 2430 SF. PLEASE REFER TO ATTACHMENT 1E FOR BMP CROSS-SECTION SCHEMATIC AND HMP ORIFICE DETAILS.
5. CISTERN (STORMTRAP) TO BIOFILTRATION BMP (BF-1), HAS BEEN PROPOSED IN DMA-2, FOR BOTH HMP FLOW CONTROL, POLLUTANT CONTROL, AND DETENTION. PLEASE REFER TO ATTACHMENT 1E FOR BMP CROSS-SECTION SCHEMATIC AND HMP ORIFICE DETAILS.
6. DMA-3 AND -4 ARE SELF-MITIGATING DMAs PURSUANT TO SECTION 5.2.1 OF THE STORM WATER STANDARDS (SWS) MANUAL (OCTOBER 2018).
7. IMPERVIOUS AREA DISPERSION (SD-B) HAS BEEN PROPOSED TO MEET VOLUME RETENTION REQUIREMENTS. IMPERVIOUS AREA (570 SF & 6,375 SF) OF ROOF & WALKWAY WILL DISPERSE TO ADJACENT LANDSCAPE AREAS (1,200 SF & 4,250 SF) IN DMAS 1 AND 2 RESPECTIVELY. DISPERSION AREAS WILL BE DESIGNED PURSUANT TO SD-B AND SD-F FACT SHEET.



BIOFILTRATION BASIN TYPICAL CROSS SECTION

NOT TO SCALE

SITE DESIGN BMPS:

4.3.2	CONSERVATION OF NATURAL AREAS, SOILS & VEGETATION
4.3.3	MINIMIZE IMPERVIOUS AREA
4.3.4	MINIMIZE SOIL COMPACTION
4.3.5	IMPERVIOUS AREA DISPERSION
4.3.7	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

LEGEND:

▬	DMA BOUNDARY
DMA-X	DMA ID
☐	BIOFILTRATION BMP (BF-1)
▨	UNDERGROUND CISTERN/VAULT
◎	POC

DRAINAGE MANAGEMENT EXHIBIT
FOR
ONE ALEXANDRIA NORTH

JN-19366

DATE: JUNE 23, 2021
REVISED: SEPTEMBER 10, 2021
REVISED: NOVEMBER 08, 2021

RICK
ENGINEERING COMPANY
San Diego

5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165

rickengineering.com

Riverside - Orange - San Luis Obispo - Denver - Sacramento - Phoenix - Tucson

NOT FOR CONSTRUCTION – EXHIBIT FOR PDPSWQMP ONLY

Project Name: **One Alexandria North**

Attachment 1B

DMA Summary Table

Project Name: One Alexandria North

Tabular Summary of DMAs							Worksheet B-1		
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA-1	2.5	2.0	80%	B	0.75	3312	BMP-1	BF-1	1
DMA-2	7.2	5.0	70%	B	0.67	8580	BMP-2A & 2B	Cistern to BF-1	2
DMA-3	1.0	0	0%	B	0.14	-			2
DMA-4	0.7	0	0%	B	0.14	-			3

Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
4	11.4	7	62%		0.61	11892	9.7		3

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

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Project Name: **One Alexandria North**

Attachment 1C

Form I-7

Harvest and Use Feasibility Screening Checklist

Harvest and Use Feasibility Checklist | Worksheet B.3-1 : Form I-7

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

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
[Provide a summary of calculations here]
Toilet Demand = 7 gal/person/day x 750 people = 5250 gal x 1.5 days = 5250 gal/36-hr
Irrigation Demand = Moderate plant water use, 1470 gal/acre x 3.1 acre = 4557 gal/36-hr
Total Demand = 9807 gallons = 1311 cu.ft
1311/11979 x 100% = 10.9% of DCV

3. Calculate the DCV using worksheet B-2.1.
DCV = 11979 (cubic feet)
[Provide a summary of calculations here]
Please refer to DMA Summary Table in Attachment 1B and Worksheet B.2-1 in Attachment 1E.

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

Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

Project Name: **One Alexandria North**

Attachment 1D

Categorization of Infiltration Feasibility Condition

INFILTRATION
FEASIBILITY CONDITION LETTER

ONE ALEXANDRIA NORTH
11255 AND 11355 NORTH TORREY PINES ROAD
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ALEXANDRIA®

AUGUST 24, 2021
PROJECT NO. G2566-52-02

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2566-52-02
August 24, 2021

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

Attention: Mr. Jason Moorhead

Subject: INFILTRATION FEASIBILITY CONDITION LETTER
ONE ALEXANDRIA NORTH
11255 AND 11355 NORTH TORREY PINES ROAD
SAN DIEGO, CALIFORNIA

References:

1. *Geotechnical Investigation, Alexandria National University, 11255 and 11355 North Torrey Pines Road, San Diego, California*, prepared by Geocon Incorporated, dated August 20, 2021 (Project No. G2566-52-02).

2. *One Alexandria North, 11255 & 11355 North Torrey Pines Road, San Diego, California*, prepared by Rick Engineering Company, dated June 15, 2021.

Dear Mr. Moorhead:

We prepared this letter in accordance with Section C.1.1 of the *Storm Water Standards* (SWS – City of San Diego, October 2018) proposing a “No Infiltration” condition for the subject project located in the Torrey Pines area of San Diego, California.

PROPERTY DESCRIPTION AND PROPOSED DEVELOPMENT

The subject property is located east of North Torrey Pines Road and the Torrey Pines Golf Course, north of existing commercial/science buildings and south and west of open space. The property is addressed 11255 and 11355 N. Torrey Pines Road and is currently developed with two, 2-story buildings connected by a pedestrian bridge. Both buildings possess a subterranean level below the existing building. The southeast side of the property includes a pool, pool/recreation building, walkways and a helipad. Asphalt concrete surface parking exists on the north, central and south. The property has 3 driveway access from N. Torrey Pines Road to the west. The site gently slopes to the east at elevations of about 430 to 370 feet above mean sea level (MSL). Descending slopes exists to the north and east that are about 300 feet high. The Existing Site Map shows the existing site conditions.

Existing Site Map

Historically, the northern portion of the site was previously occupied by a water reservoir in conjunction with the military facility known as Camp Callan. Our review of published aerial photography indicates that the reservoir facility consisted of embankment dikes on the north, east and south sides and an excavation into natural ground along the western boundary. The reservoir was constructed prior to 1932 and was dismantled between 1978 and 1980, prior to construction of the current development. In the absence of geotechnical engineering documentation and/or topographic maps and grading plans, it is difficult to evaluate the earthwork and grading related to the construction and deconstruction of the reservoir. Given our best estimates of the original topography of the site, we expect that the western portion of the reservoir footprint is likely composed of fill materials placed to achieve current grades at the site.

Based on our review of preliminary project plans we understand the proposed development will consist of 3 new buildings with subterreanean levels, one slab on grade building, a central utility plant, and a multi-story parking structure with accommodating utilities, landscaping and flatwork.

PREVIOUS GEOTECHNICAL STUDIES

We performed the referenced geotechnical investigation for the subject project, which including the drilling of 11 borings across the site to a maximum depth of about 41 feet. Based on the borings, the site is underlain by undocumented fill and overlying Very Old Paralic Deposits (Unit 10), Scripps Formation, and Ardath Shale. The fill materials ranged from 4 to 17 feet in thickness. We did not encounter groundwater to the maximum depth explored of 41 feet in our borings during the field investigation. We expect the groundwater table is at least 50 feet below existing grades and do not expect groundwater to be encountered during construction of the proposed development. The boring logs in Appendix A of the referenced report and the Geologic Map, Figure 1, show the occurrence, distribution, and description of each unit encountered during our field investigation.

STORM WATER MANAGEMENT DISCUSSION

We understand storm water management devices are being proposed in accordance with the 2018 City of San Diego Storm Water Standards Manual. If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Presented herein is a discussion for each item requested in Appendix C.1.1 of the 2018 City of San Diego Storm Water Standards.

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

The site was first analyzed for infiltration feasibility during the preliminary/planning phase and still applies to the design phase.

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

As indicated herein and in the referenced geotechnical investigation, the site is underlain by undocumented fill overlying Very Old Paralic Deposits, Scripps Formation, and Ardath Shale. We did not encounter groundwater in any of our borings during the field investigation. We expect the groundwater table is at least 50 feet below existing grades.

The development status of the site prior to the project application (i.e., new development with raw ungraded land, or redevelopment with existing graded conditions).

The subject project is currently developed with two, 2-story buildings connected by a pedestrian bridge. Both buildings possess a subterranean level below the existing buildings. The southeast side of the property includes a pool, pool/recreation building, walkways and a helipad. Asphalt concrete surface parking exists on the north, central and south. The site is gently slopes to the east at elevations of about 430 to 370 feet above mean sea level (MSL). Descending slopes exists to the north and east that are about 300 feet high.

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

We discussed the potential for infiltration with the project design team. However, the existing topography possesses slopes to the north and east with material that are prone to landslides. In accordance with the SWS, full or partial infiltration BMPs shall not be proposed within 50 feet of a natural slope or within a distance of 1.5H from fill slopes (where H is the height of the fill slope). Therefore, due to the presence of relatively large slopes that possess potential for landslides, 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 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.

Additionally, existing natural and fill slopes descends from the property along the eastern and northern boundaries. The slopes are inclined at about 2:1 (horizontal:vertical) and are about 300 feet high. In accordance with the SWS, full or partial infiltration BMPs shall not be proposed within 50 feet of a natural slope or within a distance of 1.5H from fill slopes (where H is the height of the fill slope). This requirement would result in setbacks on the order of about 450 feet from the top of slope boundaries. The site’s footprint does not permit for the required setbacks to allow for full or partial infiltration BMPs. Additionally, in the vicinity of the project site the underlying formational materials have shown to be prone to landslides. Therefore, due to this condition, infiltration would not be feasible on the site.

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

There are existing improvements (roadways and utilities) and structures located adjacent to the property margin. Infiltration within a lateral distance of at least 10 from these structures and improvements should not be allowed.

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

Due to the underlying formational material being prone to landslides and relatively large descending slopes that surround the property, there are no locations on the property which would support full or partial infiltration using near surface BMP basins.

A site design alternative to include full or partial infiltration would be limited to a deep dry well system situated below the fill materials. Dry well systems are typically only feasible for relatively high permeability soil (infiltration rate greater than 0.5 inches per hour) and relatively homogenous soils. Based on our experience with the underlying formational materials, full or partial infiltration within a dry well system will be infeasible. Therefore, infiltration below the proposed development would not be feasible on the site.

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

BMPs are being incorporated into the site design for storm water management. Based on discussions with the project civil engineer, the allowable proposed BMPs at the site include flow through planters, modular wetlands and a green roof. However, infiltration will not be incorporated into the design.

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

Due to the presence of existing slopes on the property, adjacent natural slopes with landslide conditions and the presence of fill materials greater than 5 feet thick over a majority of the property, we opine the site (all DMAs) is not feasible for partial or full infiltration and the property should be considered to possess a "No Infiltration" condition in accordance with Appendix C of the 2018 SWS. Infiltration would increase the risk of slope instability at the site that would not be feasibly mitigated.

Liners and subdrains are recommended in the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC). The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

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 1, 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 due to the geologic conditions of the site.

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

REGISTERED PROFESSIONAL ENGINEER
SHAWN WEEDON
No. 2714
GEOTECHNICAL
STATE OF CALIFORNIA

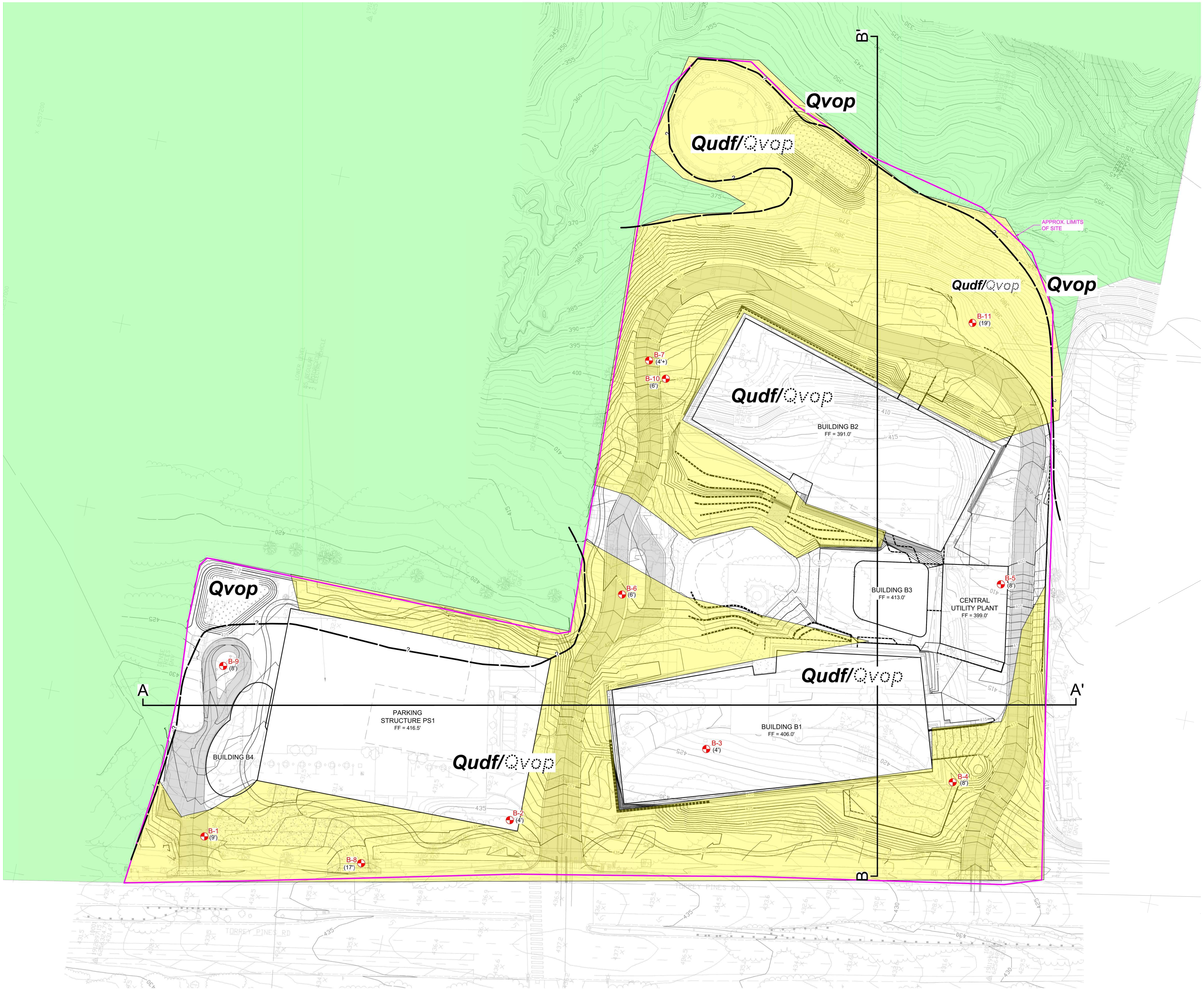
Matt Love
RCE 84154

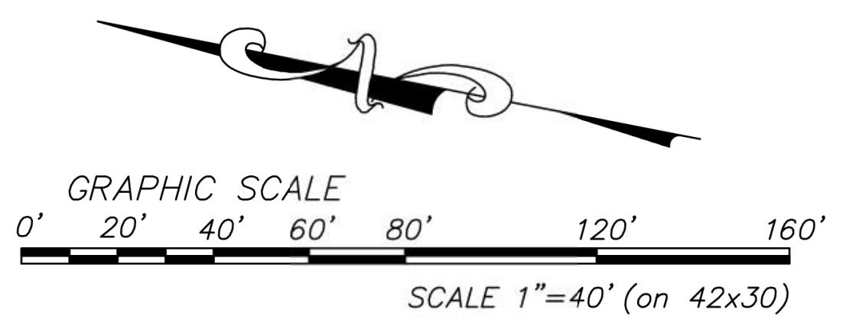
REGISTERED PROFESSIONAL ENGINEER
MATTHEW R. LOVE
C84154
CIVIL
STATE OF CALIFORNIA

MRL:SFW:arm

Attachments: Figure 1 – Geologic Map

(e-mail) Addressee





INFILTRATION EXHIBIT LEGEND

🟩	........APPROX. AREA OF NATURAL SLOPES
🟨	........APPROX. AREA OF FILL SLOPES

NOTE: We did not include infiltration-related setbacks on this figure since the entire site is considered to fall within the "No Infiltration" condition due to the site geologic conditions.

GEOCON LEGEND

Qudf	........UNDOCUMENTED FILL
Qvop	........OLD PARALIC DEPOSITS (Dotted Where Buried)
B-7 ⊕	........APPROX. LOCATION OF BORING
(1')	........APPROX. THICKNESS OF FILL (Feet)
B B'	........APPROX. LOCATION OF GEOLOGIC CROSS SECTION

INFILTRATION EXHIBIT MAP

11255 N. TORREY PINES ROAD
ONE ALEXANDRIA NORTH
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" = 40'
DATE 08 - 24 - 2021
PROJECT NO. G2655 - 52 - 01
FIGURE 1
SHEET 1 OF 1

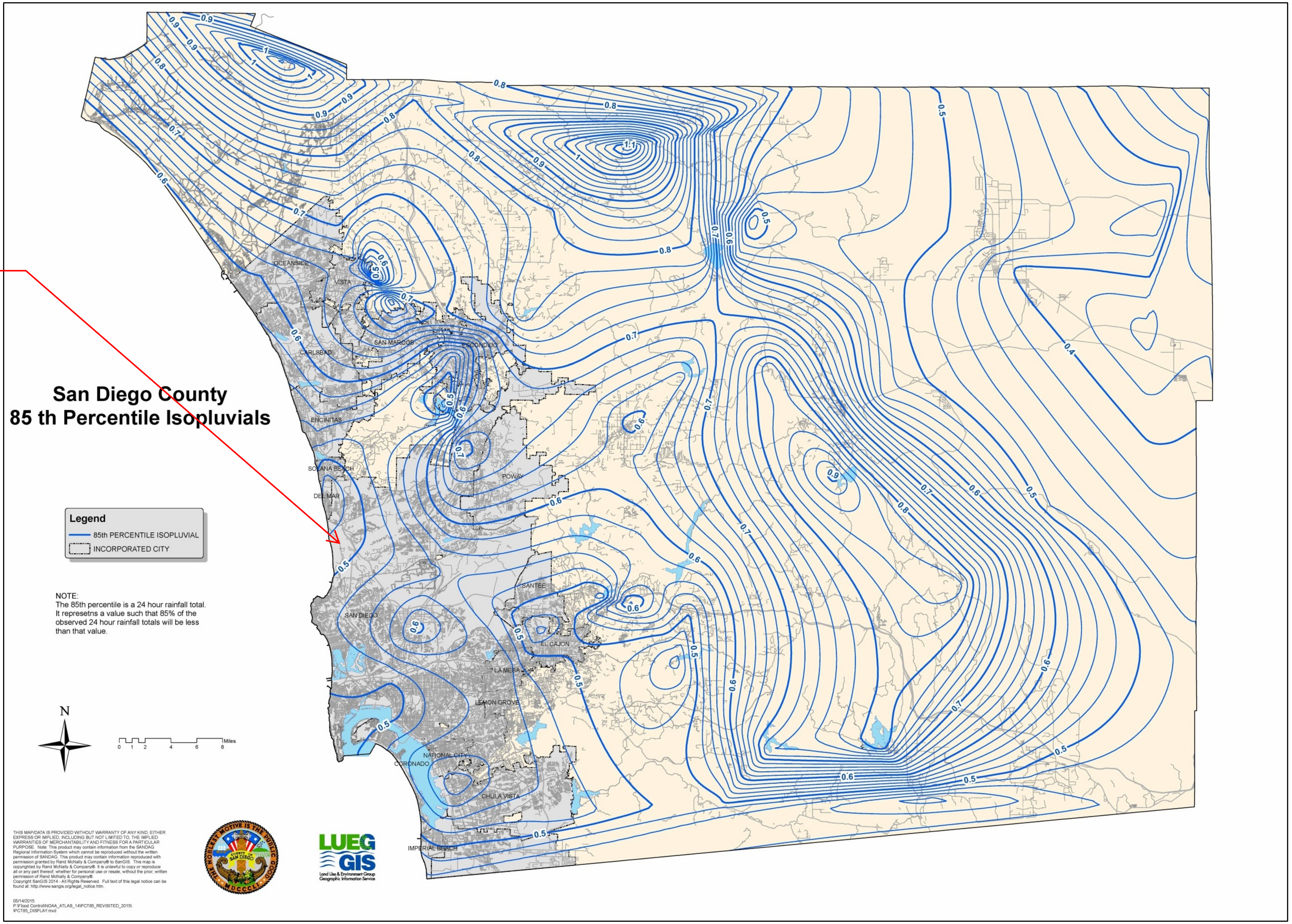
Plotted:08/24/2021 7:52AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2566-52-02 One Alexandria North\SHEETS\G2566-52-02 Infiltration Exhibit.dwg

Project Name: **One Alexandria North**

Attachment 1E

Pollutant Control BMP Design Worksheet/Calculations

BMP Cross-section Schematics and Details



85% Precip = 0.49 in

San Diego County
85 th Percentile Isopluvials

NOTE:
The 85th percentile is a 24 hour rainfall total. It represetns a value such that 85% of the observed 24 hour rainfall totals will be less than that value.

05/14/2015
P:\Flood Control\NOAA_ATLAS_14\PCT85_REVISITED_2015\
\PCT85_DISPLAY.mxd

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

Weighted Runoff Factor Calculation

DMA ID	Area (acres)	Area (ft^2)	% Impervious	Impervious Area (ft^2)	Pervious Area (ft^2)	Impervious Runoff Factor[1]	Pervious Runoff Factor[1]	Weighted Runoff Factor
DMA-1	2.5	108145.2	80%	86516	21629	0.90	0.14	**0.75**
DMA-2	7.2	313670.2	70%	219569	94101	0.90	0.14	**0.67**
DMA-3	1.0	43900.11	0%	0	43900	0.90	0.14	**0.14**
DMA-4	0.7	30847.54	0%	0	30848	0.90	0.14	**0.14**
Composite	11.4	496563	62%	306085	190478	0.90	0.14	**0.61**

Note:
1. Runoff factors are from, "Table B.1-1: Runoff factors for surfaces draining to BMPs - Pollutant Control BMPs". Pervious runoff factor corresponds to Natural Type B Soil.

DMA-1/BMP-1

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.49	inches
2	Area tributary to BMP (s)	A=	2.5	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.75	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	-	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	-	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3312	cubic-feet

The City of SAN DIEGO

Project Name	One Alexandria North
BMP ID	DMA-1/BMP-1

Sizing Method for Pollutant Removal Criteria — Worksheet B.5-1

1	Area draining to the BMP	108145	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	85th percentile 24-hour rainfall depth	0.49	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3312	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	30	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	18	inches
15	Total Depth Treated [Line 13 + Line 14]	48	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	4968	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	1242	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	2484	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1656	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.019	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	1541	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	1541	sq. ft.
23	Provided BMP Footprint	2430	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO

Project Name	One Alexandria North
BMP ID	DMA-1/BMP-1

Sizing Method for Volume Retention Criteria | **Worksheet B.5-2**

1	Area draining to the BMP	108145	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	85th percentile 24-hour rainfall depth	0.49	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3312	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 or enter 0.05	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]	76	cu. ft.

The City of SAN DIEGO

	Project Name	One Alexandria North
	BMP ID	DMA-1/BMP-1

Alternative Minimum Footprint Sizing Factor for Non-Standard Biofiltration

Worksheet B.5-4

1	Area draining to the BMP	108145	sq. ft.
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	Load to Clog (default value when using Appendix E fact sheets is 2.0)	2	lb/sq. ft.
4	Allowable Period to Accumulate Clogging Load (T_L) (default value is 10)	10	years

Volume Weighted EMC Calculation

Land Use	**Fraction of Total DCV**	**TSS EMC (mg/L)**	**Product**
Single Family Residential		123	0
Commercial		128	0
Industrial		125	0
Education (Municipal)		132	0
Transportation		78	0
Multi-family Residential		40	0
Roof Runoff	0.6	14	8.4
Low Traffic Areas	0.2	50	10
Open Space	0.2	216	43.2
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	61.6	mg/L

Sizing Factor for Clogging

6	Adjustment for pretreatment measures Where: Line 6 = 0 if no pretreatment; Line 6 = 0.25 when pretreatment is included; Line 6 = 0.5 if the pretreatment has an active Washington State TAPE approval rating for “pre-treatment.”	0	
7	Average Annual Precipitation [Provide documentation of the data source in the discussion box; SanGIS has a GIS layer for average annual precipitation]	12	inches
8	Calculate the Average Annual Runoff (Line 7/12) x Line 1 x Line2	81109	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 5 x (1 – Line 6))/10^6	312	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	1559	sq. ft.
11	Calculate the Minimum Footprint Sizing Factor for Clogging [Line 10/ (Line 1 x Line 2)]	0.019	

Discussion:

The City of SAN DIEGO

Project Name	One Alexandria North
BMP ID	DMA-1/BMP-1

Volume Retention for No Infiltration Condition	**Worksheet B.5-6**

1	Area draining to the biofiltration BMP	108145	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	81109	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	2433	sq. ft.
5	Biofiltration BMP Footprint	2430	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	**1**	**2**	**3**	**4**	**5**
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)	1200				
7	Impervious area draining to the landscape area (sq. ft.)	570				
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.48	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	380	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	380	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	2810	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.15	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	76	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-11.4	cu. ft.

Site Design BMP

	Identification	**Site Design Type**	**Credit**	
16	**1**			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

DMA-2/BMP-2

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.49	inches
2	Area tributary to BMP (s)	A=	7.2	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.67	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	-	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	-	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	8580	cubic-feet

The City of SAN DIEGO

Project Name: One Alexandria North

BMP ID: BMP-2/DMA-2

Sizing Method for Volume Retention Criteria — Worksheet B.5-2

1	Area draining to the BMP	313670	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
3	85th percentile 24-hour rainfall depth	0.49	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	8581	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 or enter 0.05	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]	197	cu. ft.

The City of SAN DIEGO

Project Name	One Alexandria North
BMP ID	BMP-2/DMA-2

	Optimized Biofiltration BMP Footprint when Downstream of a Storage Unit	**Worksheet B.5-5**	
1	Area draining to the storage unit and biofiltration BMP	313670	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
3	Effective impervious area draining to the storage unit and biofiltration BMP [Line 1 x Line 2]	210158.9	sq. ft.
4	Remaining DCV after implementing retention BMPs	8580	cu. ft.
5	Design infiltration rate (measured infiltration rate / 2)	0	ft./hr.
6	Media thickness [1.5 feet minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	2.5	ft.
7	Media filtration rate to be used for sizing (0.42 ft/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate)	0.4167	ft./hr.
8	Media retained pore space	0.05	in/in
Storage Unit Requirement			
9	Drawdown time of the storage unit, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)	12	hours
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)	0.85	fraction
11	Storage required in cubic feet (Line 4 x Line 10)	7293	cu. ft.
12	Storage provided in the design, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)	7300	cu. ft.
13	Is Line 12 ≥ Line 11?	Storage Requirement is Met	
Criteria 1: BMP Footprint Biofiltration Capacity			
14	Peak flow from the storage unit to the biofiltration BMP (using the elevation used to evaluate the percent capture)	0.3	cfs
15	Required biofiltration footprint [(3,600 x Line 14)/Line 7]	2592	sq. ft.
Criteria 2: Alternative Minimum Sizing Factor (Clogging)			
16	Alternative Minimum Footprint Sizing Factor [Line 11 of Worksheet B.5-4]		fraction
17	Required biofiltration footprint [Line 3 x Line 16]	0	sq. ft.
Criteria 3: Retention requirement [Not applicable for No Infiltration Condition]			
18	Retention Target (Line 10 in Worksheet B.5-2)		cu. ft.
19	Average discharge rate from the storage unit to the biofiltration BMP		cfs
20	Depth retained in the optimized biofiltration BMP {Line 6 x Line 8} + {[(Line 4)/(2400 x Line 19)] x Line 5}	0	ft
21	Required optimized biofiltration footprint (Line 18/Line 20)	0	sq. ft.
Optimized Biofiltration Footprint			
22	Optimized biofiltration footprint, maximum(Line 15, Line 17, Line 21)	2592	sq. ft.

The City of SAN DIEGO

Project Name	One Alexandria North	
BMP ID	BMP-2/DMA-2	

Volume Retention for No Infiltration Condition		**Worksheet B.5-6**	
1	Area draining to the biofiltration BMP	313670	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	210159	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	6305	sq. ft.
5	Biofiltration BMP Footprint	2714	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	**1**	**2**	**3**	**4**	**5**
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)	4250				
7	Impervious area draining to the landscape area (sq. ft.)	6375				
8	Impervious to Pervious Area ratio [Line 7/Line 6]	1.50	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	4250	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id’s 1 to 5]			4250		sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]			6964		sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.1	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	193	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-19.3	cu. ft.

Site Design BMP

	Identification	**Site Design Type**	**Credit**	
16	**1**			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id’s 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

Self-Mitigating DMA Standards Checklist

DMAs 3 and 4 meet the self-mitigating DMAs standards pursuant to Section 5.2.1 of the Storm Water Standards Manual, January 2018 edition. The incidental impervious percent is less than 5% for each DMA. The proposed/existing landscape areas do not require regular application of fertilizers and pesticides. The self-mitigating areas are hydraulically separate from other DMAs that contain storm water pollutant control BMPs. The impervious areas within each self-mitigating DMA are hydraulically disconnected to other impervious areas.

DMA ID	**Self-Mitigating DMA Standards Checklist (per Section 5.2.1)**	**Comments**
DMA 3	☒ Vegetation in the natural or landscaped area is native and/or non-native/non-invasive drought tolerant species that do not require regular application of fertilizers and pesticides. ☒ Soils are undisturbed native topsoil, or disturbed soils that have been amended and aerated to promote water retention characteristics equivalent to undisturbed native topsoil. ☒ The incidental impervious areas are less than 5 percent of the self-mitigating area. ☒ Impervious area within the self-mitigated area should not be hydraulically connected to other impervious areas unless it is a storm water conveyance system (such as brow ditches). ☒ The self-mitigating area is hydraulically separate from DMAs that contain permanent storm water pollutant control BMPs.	Pervious area – 1.0 acres Impervious Area – NA Impervious % - 0%
DMA 4	☒ Vegetation in the natural or landscaped area is native and/or non-native/non-invasive drought tolerant species that do not require regular application of fertilizers and pesticides. ☒ Soils are undisturbed native topsoil, or disturbed soils that have been amended and aerated to promote water retention characteristics equivalent to undisturbed native topsoil. ☒ The incidental impervious areas are less than 5 percent of the self-mitigating area. ☒ Impervious area within the self-mitigated area should not be hydraulically connected to other impervious areas unless it is a storm water conveyance system (such as brow ditches). ☒ The self-mitigating area is hydraulically separate from DMAs that contain permanent storm water pollutant control BMPs.	Pervious area – 0.7 acres Impervious Area – NA Impervious % - 0%

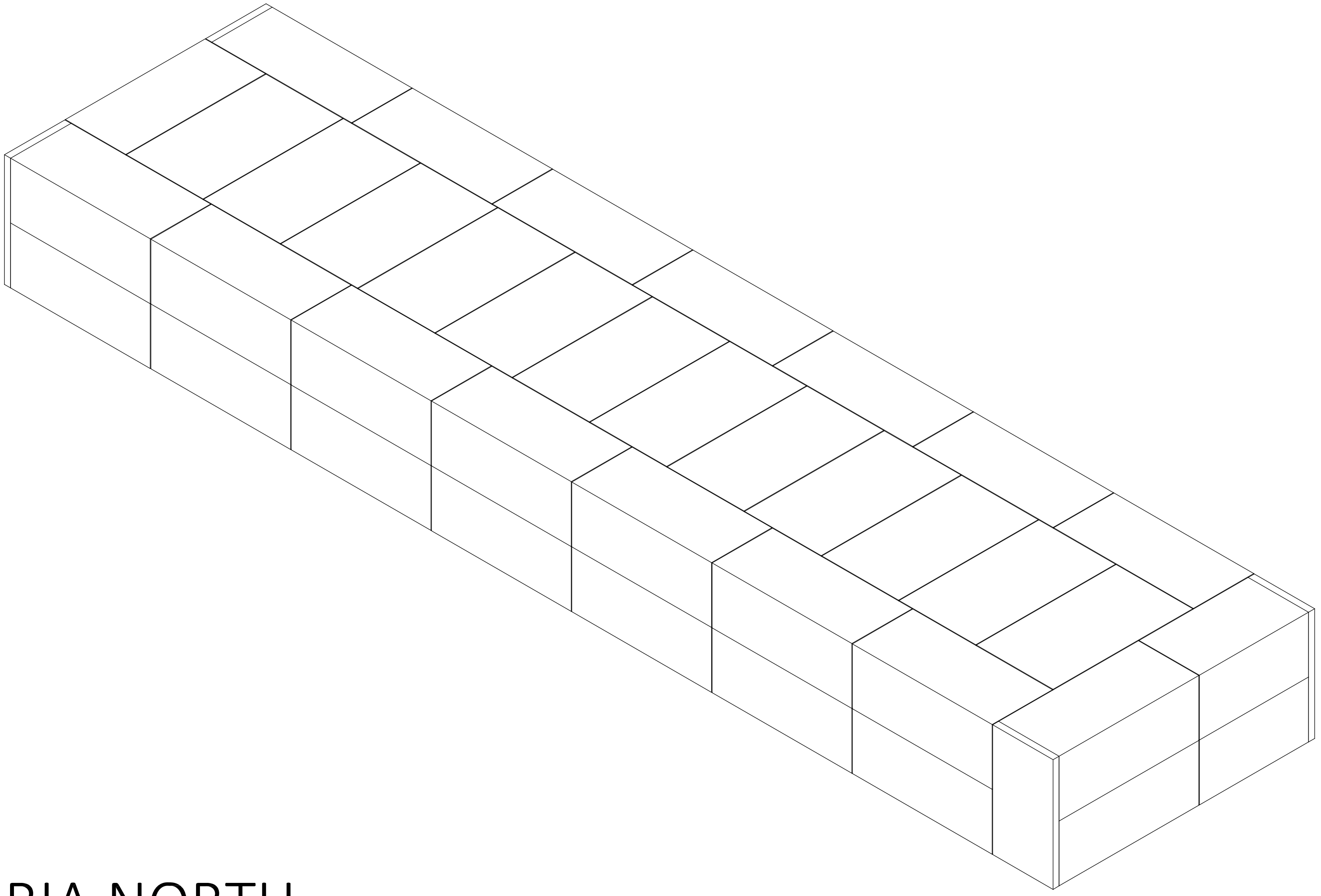
StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT

SHEET INDEX

STORMTRAP CONTACT INFORMATION

STORMTRAP SUPPLIER: STORMTRAP
CONTACT NAME: CHARLIE CARTER
CELL PHONE: 760-212-5628
SALES EMAIL: CCARTER@STORMTRAP.COM



19366 ONE ALEXANDRIA NORTH
LA JOLLA, CA

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PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

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ROMEOVILLE, IL 60446
P:815-941-4549 / F:331-318-5347

ENGINEER INFORMATION:

RICK ENGINEERING
COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA
619-291-0707

PROJECT INFORMATION:

19366 ONE ALEXANDRIA NORTH

LA JOLLA, CA

CURRENT ISSUE DATE:

6/11/2021

ISSUED FOR:

PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
△1	6/11/2021	PRELIMINARY	RJL

SCALE:

NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

LIVE LOADING: **AASHTO HS-20 HIGHWAY LOADING**

GROUND WATER TABLE: BELOW INVERT OF SYSTEM

SOIL BEARING PRESSURE: 3000 PSF

SOIL DENSITY: 120 PCF

EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE: 35 PSF / FT.

EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE: 80 PSF/FT. (IF WATER TABLE PRESENT)

APPLICABLE CODES: ASTM C857
ACI-318

BACKFILL TYPE: SEE SHEET 4.0 FOR BACKFILL OPTIONS

STORMTRAP SYSTEM INFORMATION

TOTAL WATER STORAGE PROV: 34,006.54 CUBIC FEET

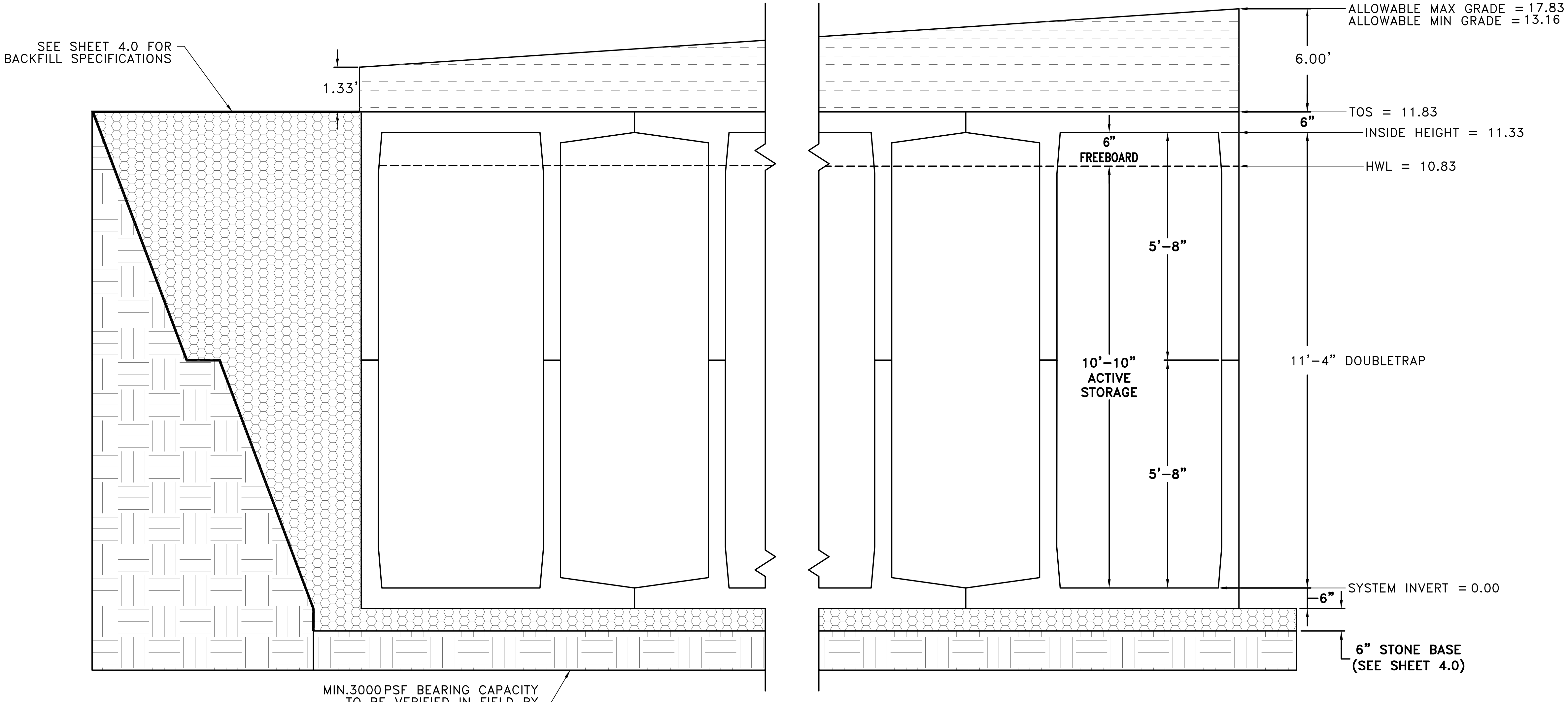
WATER STORAGE PROV: ELEV 0.00 - 10.83 32,505.81 CUBIC FEET

UNIT HEADROOM: 11'-4" DOUBLETRAP

UNIT QUANTITY: 58 TOTAL PIECES

SITE SPECIFIC DESIGN CRITERIA

1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.33' MAX. 6.00' CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL CALCULATIONS THE GROUND WATER TABLE IS ASSUMED TO BE BELOW INVERT OF SYSTEM IF WATER TABLE IS DIFFERENT THAN ASSUMED, CONTACT STORMTRAP.
5. **SYSTEM DESIGN MAY ALLOW FOR INCIDENTAL LEAKAGE AND WILL NOT BE SUBJECT TO LEAKAGE TESTING.**



11'-4" DOUBLETRAP

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SCALE:

NTS

SHEET TITLE:

DOUBLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
12	I	11'–4" DOUBLETRAP	15900	15698
0	II	11'–4" DOUBLETRAP	0	0
16	III	11'–4" DOUBLETRAP	16254	16153
0	IV	11'–4" DOUBLETRAP	0	0
0	VII	11'–4" DOUBLETRAP	0	0
1	SPIV	11'–4" DOUBLETRAP	VARIES	VARIES
0	T2 PANEL	8" THICK PANEL	0	
4	T4 PANEL	8" THICK PANEL	8171	
0	T7 PANEL	8" THICK PANEL	0	
7	JOINT WRAP	150' PER ROLL		
32	JOINT TAPE	14.5' PER ROLL		

LOADING DISCLAIMER:

STORMTRAP IS NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADINGS FROM NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY.

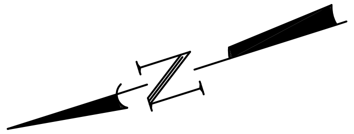
THE STORMTRAP SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT THE ADDITIONAL WEIGHT OF ANY TREES. FURTHERMORE, THE ROOTS OF THE TREES MUST BE CONTAINED TO PREVENT FUTURE DAMAGE TO THE STORMTRAP SYSTEM. STORMTRAP ACCEPTS NO LIABILITY FOR DAMAGES CAUSED BY TREES OR OTHER VEGETATION PLACE AROUND OR ON TOP OF THE SYSTEM.

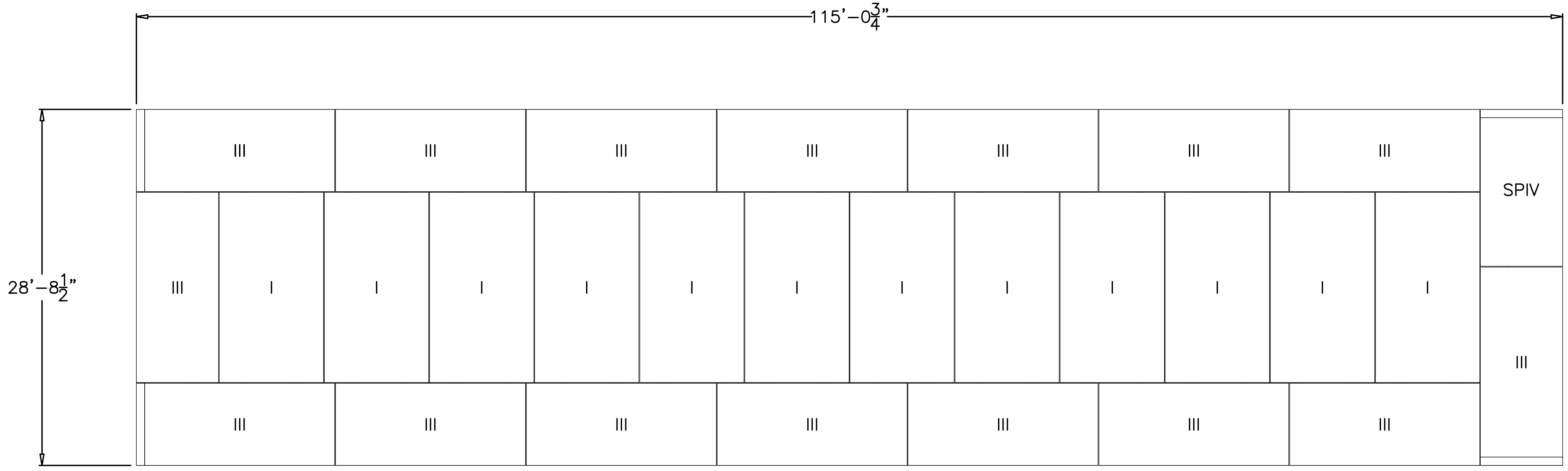
DESIGN CRITERIA

ALLOWABLE MAX GRADE = 17.83
ALLOWABLE MIN GRADE =13.16
INSIDE HEIGHT ELEVATION =11.33
SYSTEM INVERT = 0.00

NOTES:

1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP – INDICATES A MODULE WITH MODIFICATIONS.
5. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.





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SCALE:

NTS

SHEET TITLE:

DOUBLETRAP
SYSTEM LAYOUT

SHEET NUMBER:

2.0

STORMTRAP INSTALLATION SPECIFICATIONS

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891, STANDARD FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES, THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS SHALL APPLY:

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES CAN BE PLACED ON A LEVEL, 6" FOUNDATION OF ¾" AGGREGATE EXTENDING 2'-0" PAST THE OUTSIDE OF THE SYSTEM (SEE DETAIL 1) AND SHALL BE PLACED ON PROPERLY COMPACTED SOILS (SEE SHEET 1.0 FOR SOIL BEARING CAPACITY REQUIREMENTS), AND IN ACCORDANCE WITH ASTM C891 STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED ¾" (SEE DETAIL 2). IF THE SPACE EXCEEDS ¾", THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. STORMTRAP MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT STORMTRAP FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION IS TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER.

6. THE PERIMETER HORIZONTAL JOINT BETWEEN THE TOP AND BASE LEG CONNECTION OF THE STORMTRAP MODULES SHALL BE SEALED WITH PREFORMED MASTIC JOINT TAPE ACCORDING TO ASTM C891, 8.8 AND 8.12. (SEE DETAIL 3). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL.

7. ALL EXTERIOR JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 8" WIDE PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 4 & 5). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

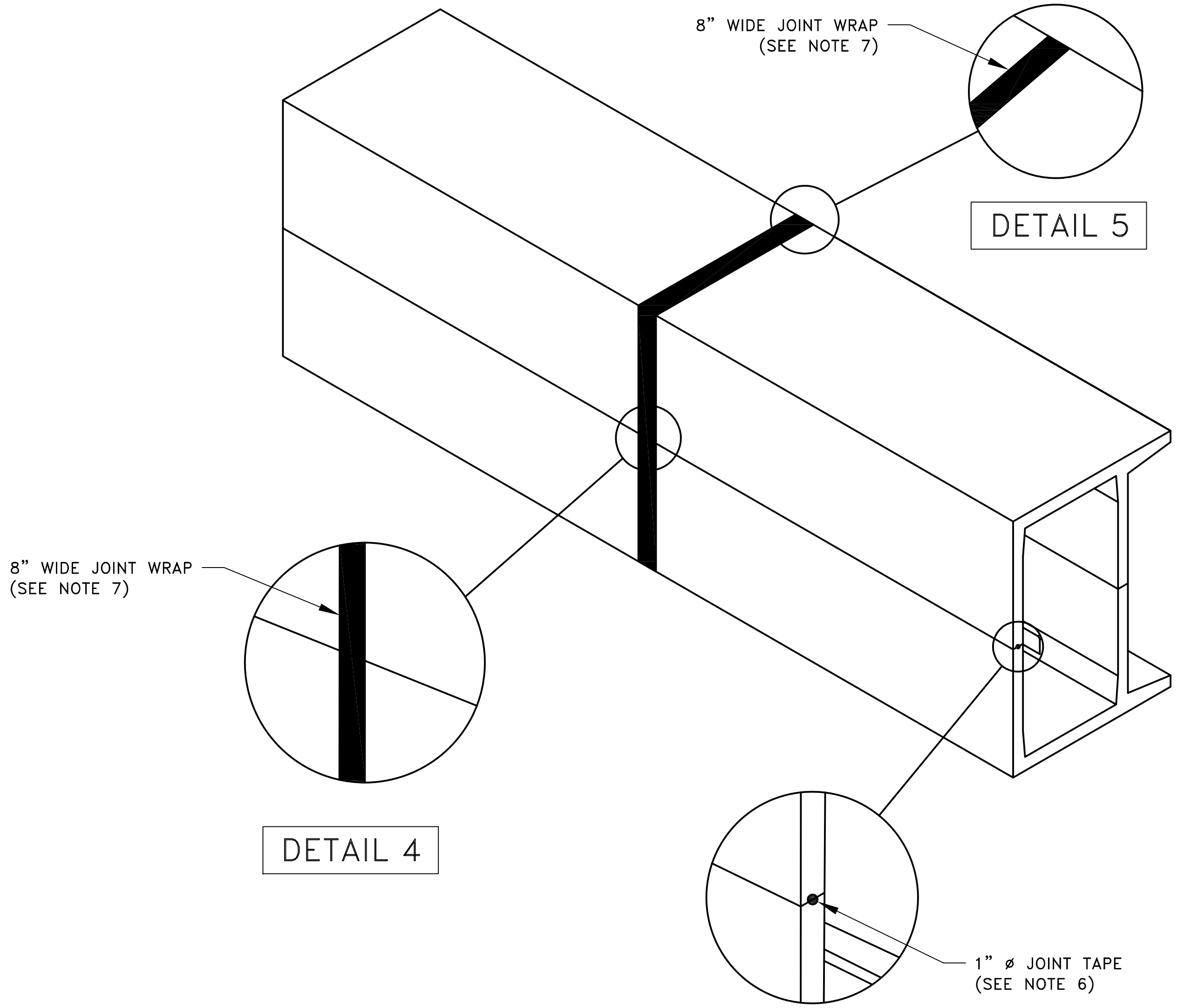
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

8. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

9. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND TO DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

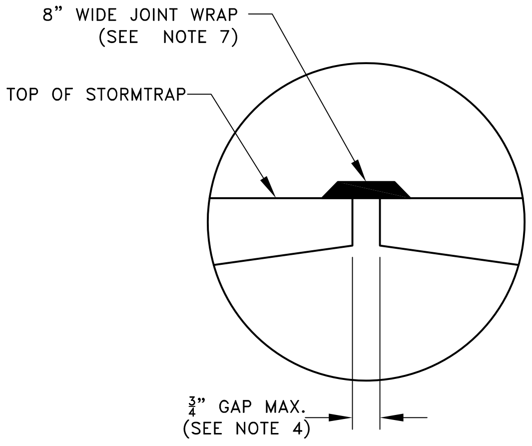
10. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



DETAIL 5

DETAIL 4

DETAIL 3



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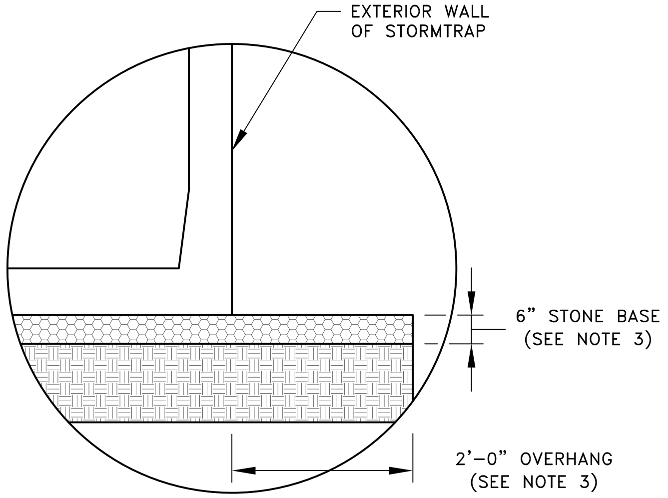

DETAIL 1

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ENGINEER INFORMATION:

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SAN DIEGO, CA
619-291-0707

PROJECT INFORMATION:

19366 ONE ALEXANDRIA NORTH

LA JOLLA, CA

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SCALE:

NTS

SHEET TITLE:

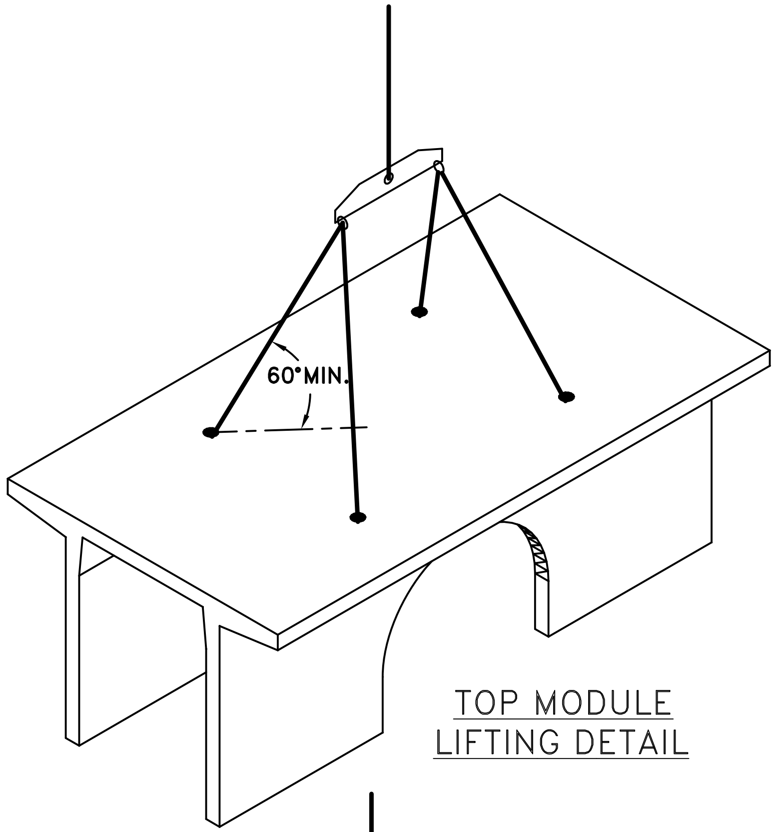
DOUBLETRAP
INSTALLATION
SPECIFICATIONS

SHEET NUMBER:

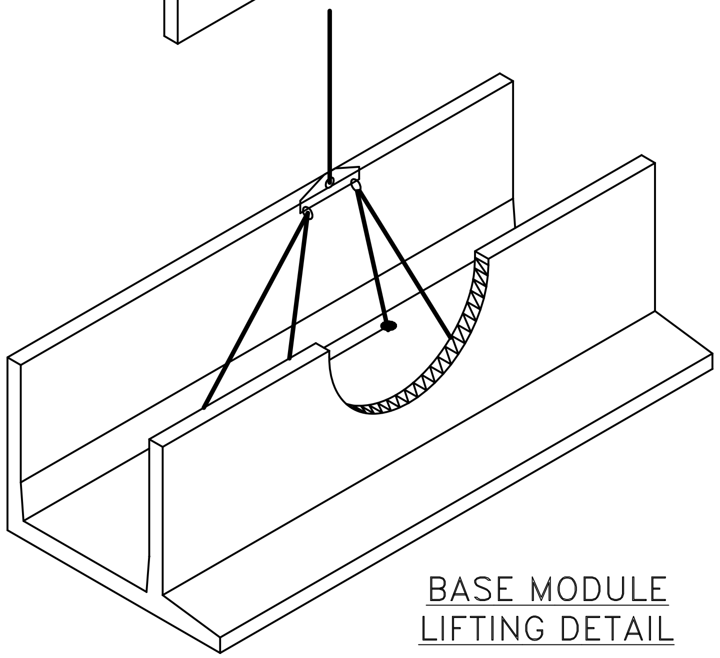
3.0

STORMTRAP MODULE LIFTING INSTALLATION NOTES

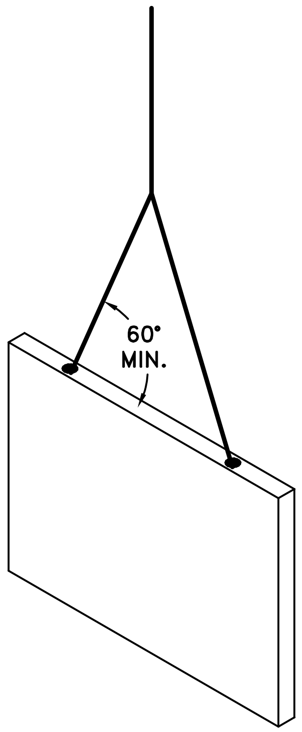
1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL (4) CHAINS/CABLES ARE SECURED PROPERLY TO THE LIFTING ANCHORS AND IN EQUAL TENSION WHEN LIFTING THE STORMTRAP MODULE (SEE RECOMMENDATIONS 2 & 3).
2. MINIMUM 7'-0" CHAIN/CABLE LENGTH TO BE USED TO LIFT STORMTRAP MODULES (SUPPLIED BY CONTRACTOR).
3. CONTRACTOR TO ENSURE MINIMUM LIFTING ANGLE IS 60° FROM TOP SURFACE OF STORMTRAP MODULE. SEE DETAIL.



TOP MODULE LIFTING DETAIL



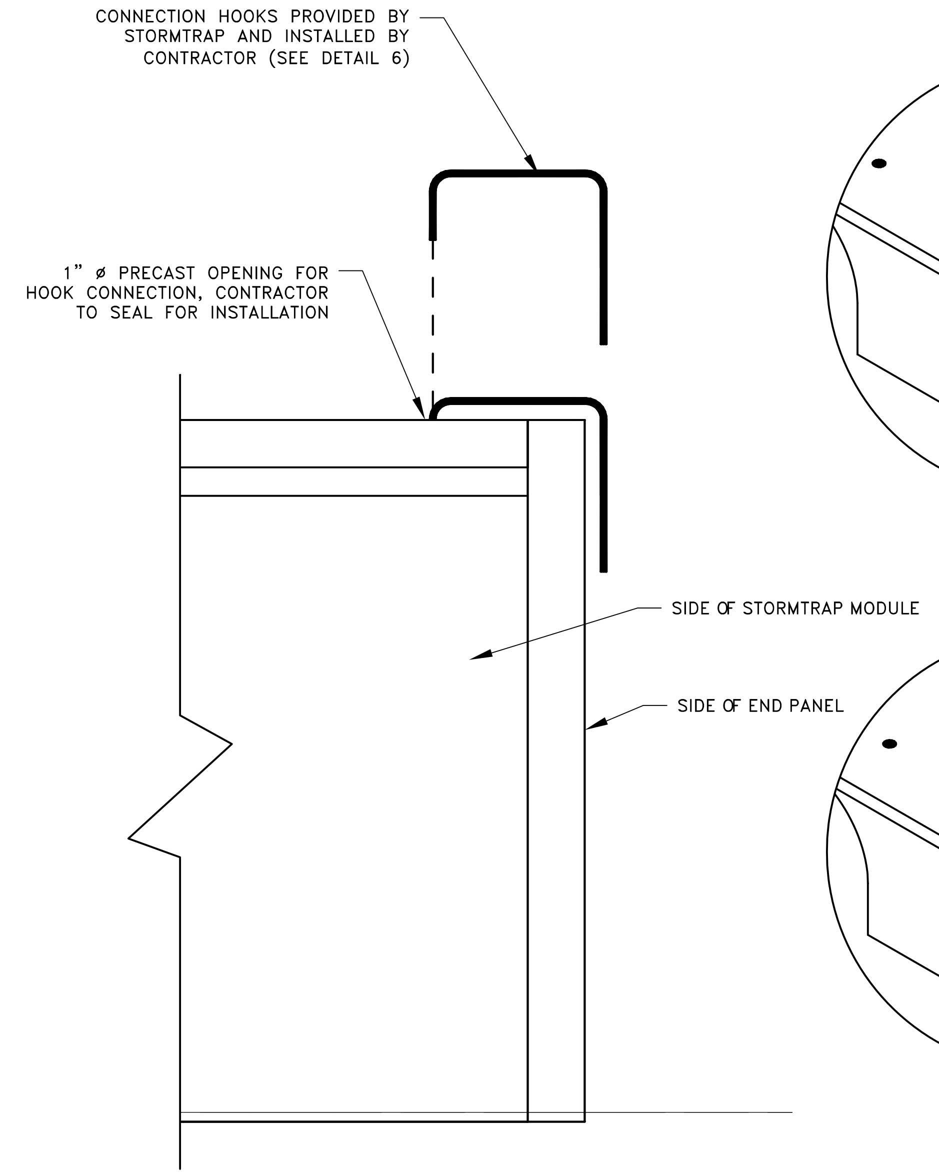
BASE MODULE LIFTING DETAIL



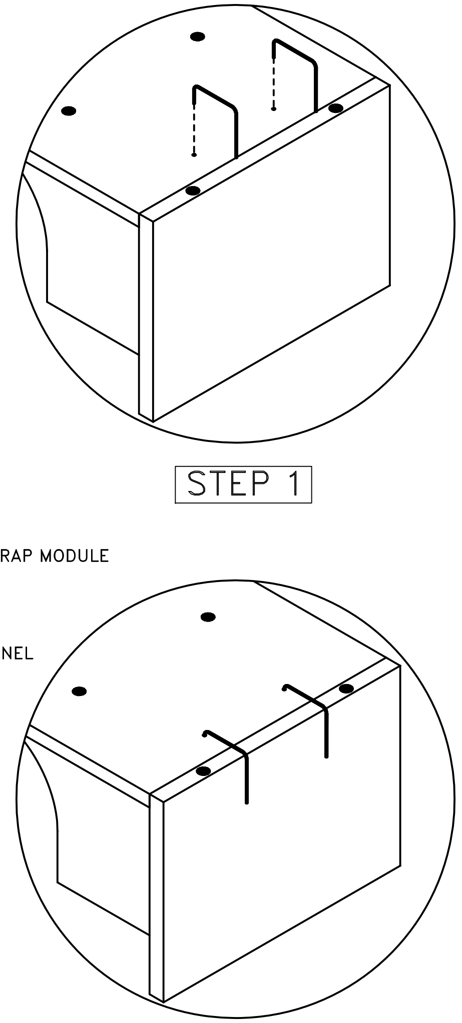
END PANEL LIFTING DETAIL

END PANEL ERECTION/INSTALLATION NOTES

1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOK IS ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



PANEL CONNECTION ELEVATION VIEW



STEP 1

STEP 2

DETAIL 6

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ZONE CHART		
ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 ($\frac{3}{4}$") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1690 psf
	18"	56.1	1219 psf
	24"	68.1	1111 psf
	30"	76.7	1000 psf
	36"	85.0	924 psf

NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

APPROVED ZONE 2 BACKFILL OPTIONS	
OPTION	REMARKS
$\frac{3}{4}$" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF CLEAN AND FREE DRAINING ANGULAR MATERIAL. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL (ASTM SIZE #57) AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
SAND	IMPORTED PURE SAND IS PERMITTED TO BE USED AS BACKFILL IF IT IS CLEAN AND FREE DRAINING. THE SAND USED FOR BACKFILLING SHALL HAVE LESS THAN 40% PASSING #40 SIEVE AND LESS THAN 5% PASSING #200 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE SAND BACKFILL.
CRUSHED CONCRETE AGGREGATE	CLEAN, FREE DRAINING CRUSHED CONCRETE AGGREGATE MATERIAL CAN BE USED AS BACKFILL FOR STORMTRAP'S MODULES. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL.
ROAD PACK	STONE AGGREGATE 100% PASSING THE 1-1/2" SIEVE WITH LESS THAN 12% PASSING THE #200 SIEVE (ASTM SIZE #467). GEOFABRIC AS PER GEOTECHNICAL ENGINEER RECOMMENDATION.

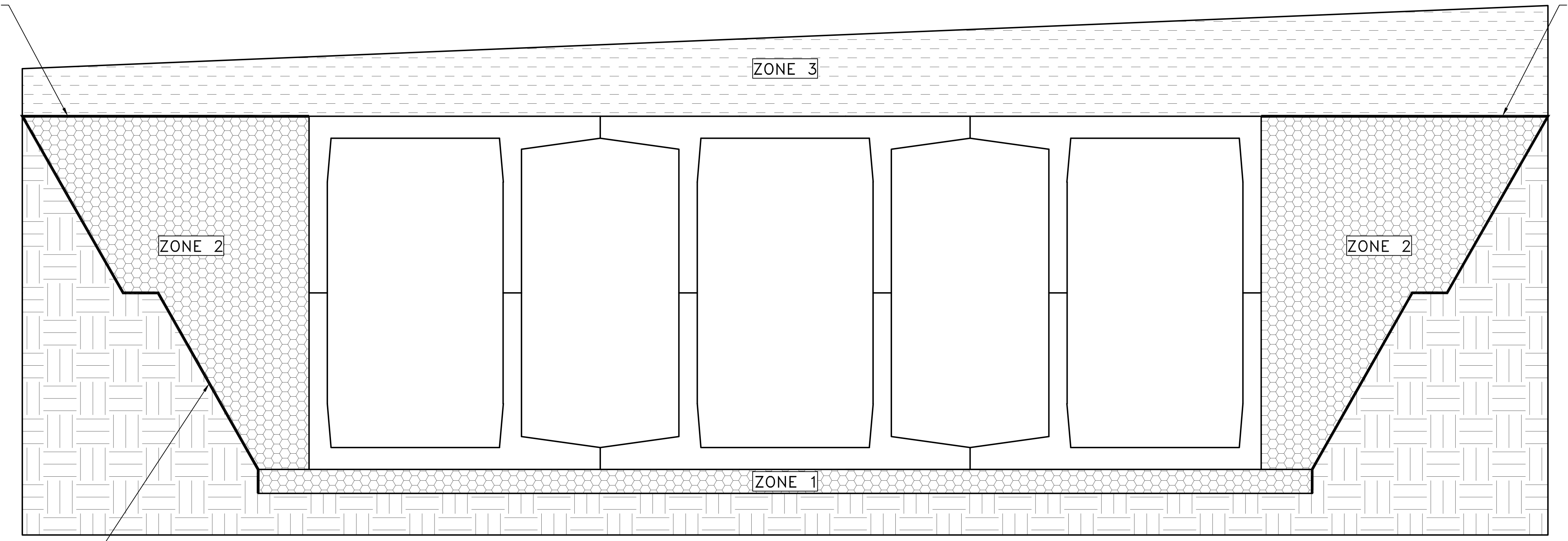
STORMTRAP ZONE INSTALLATION SPECIFICATIONS/PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MUST BE FREE-DRAINING MATERIAL. SEE ZONE 2 BACKFILL CHART ON THIS PAGE FOR APPROVED BACKFILL OPTIONS. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED (PROVIDED BY OTHERS).

2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.

3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING. SEE CHART FOR TRACKED VEHICLE WIDTH AND ALLOWABLE MAXIMUM PRESSURE PER TRACK.

4. STONE AGGREGATE FOUNDATION IN ZONE 1 IS RECOMMENDED FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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BACKFILL
SPECIFICATIONS

SHEET NUMBER:

4.0

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'-0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'-0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'-0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.
2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3-PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'-0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED AT A DISTANCE BETWEEN 10" MIN AND 14" MAX BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.
3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.
4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.
5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE SECTIONS. (PROVIDED BY OTHERS)

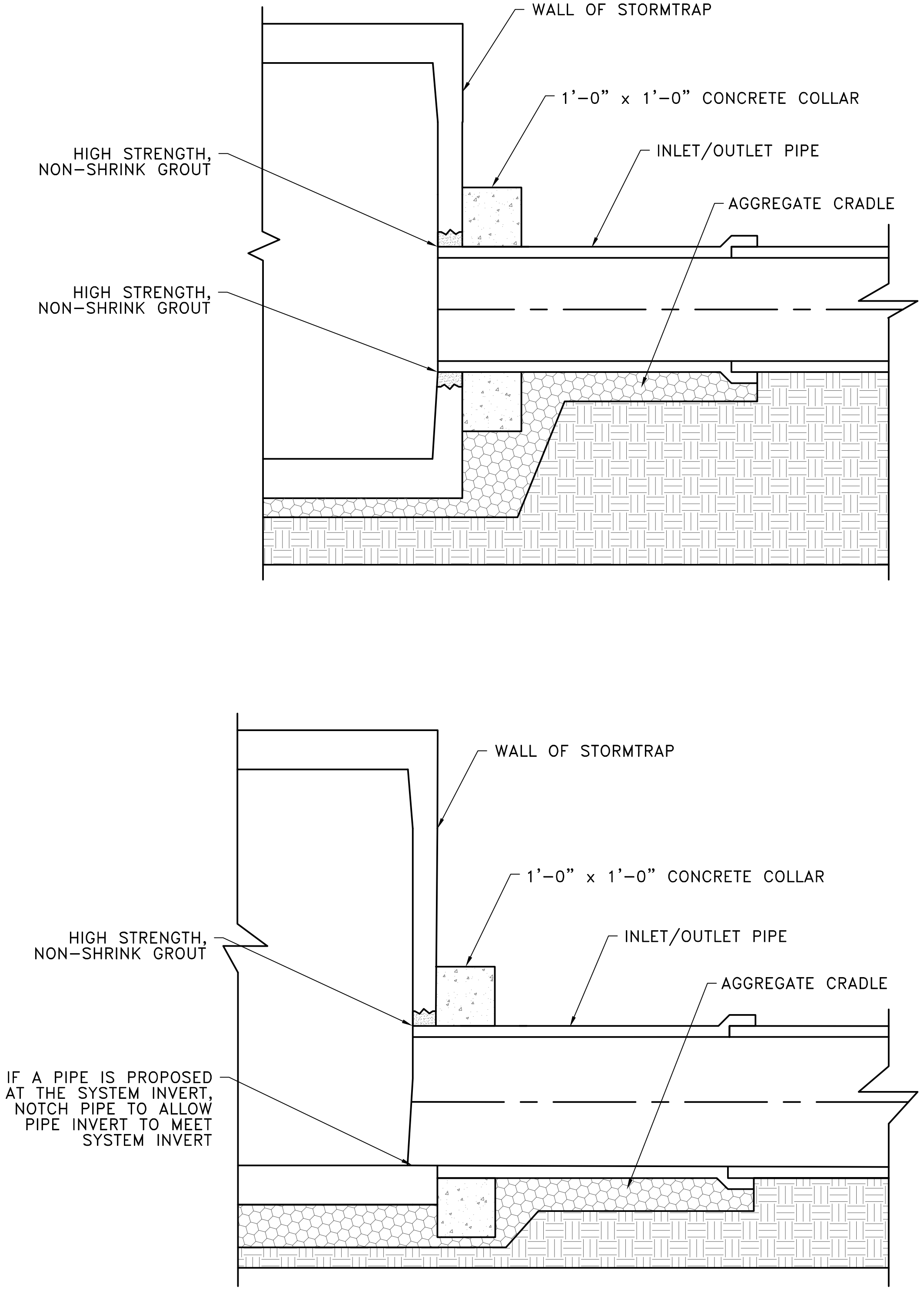
RECOMMENDED PIPE OPENING SPECIFICATION

1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'-0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON-SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.
4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON-SHRINK GROUT.

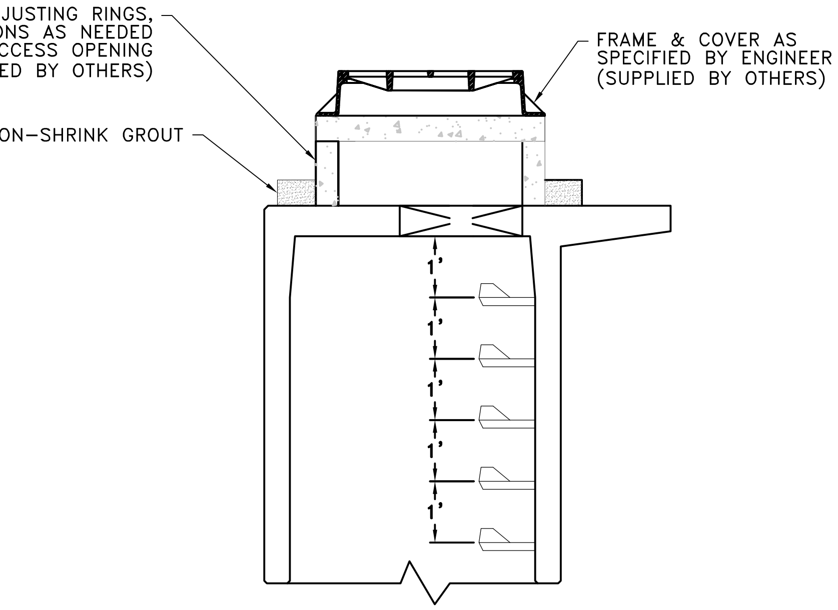
RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

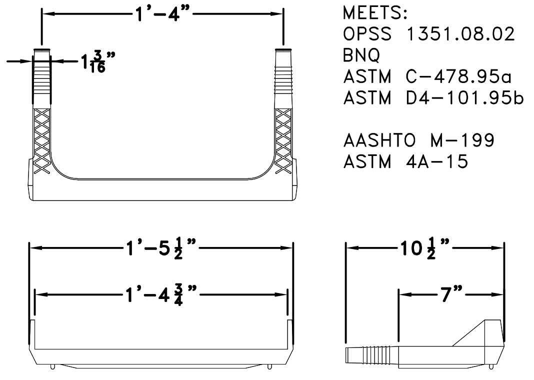
NOTE: ALL ANCILLARY PRODUCTS/SPECIFICATIONS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR AND/OR PER LOCAL MUNICIPAL CODE/REQUIREMENTS.



PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



MEETS:
OPSS 1351.08.02
BNQ
ASTM C-478.95a
ASTM D4-101.95b

AASHTO M-199
ASTM 4A-15

STEP DETAIL

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RECOMMENDED
PIPE / ACCESS
OPENING
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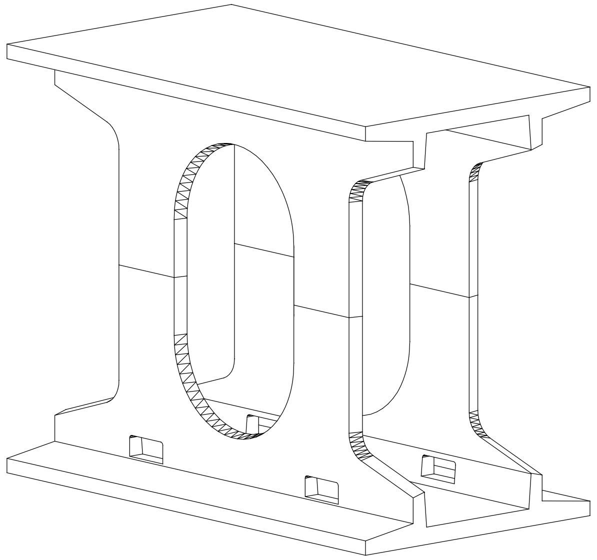
SHEET NUMBER:

5.0



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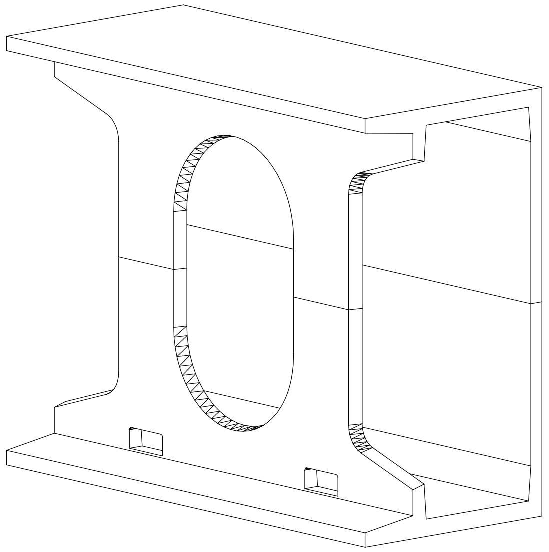

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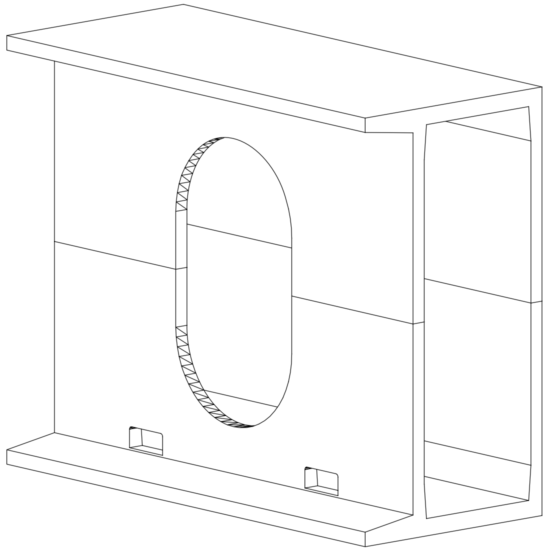
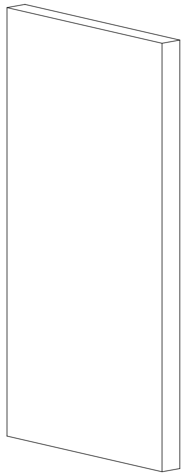


TYPE IV



TYPE IV
END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP – INDICATES A MODULE WITH MODIFICATIONS.
3. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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DOUBLETRAP
MODULE TYPES

SHEET NUMBER:

6.0

StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT

STORMWATER MANAGEMENT SOLUTIONS

StormTrap offers the industry's best solutions for managing runoff, protecting waterways and improving the use of your property. Whether you are concerned about detention, retention, water quality or water harvesting, StormTrap has a design that will reduce your footprint, accommodate any site constraints, lower overall costs and meet your specific project needs.

SingleTrap®

A durable stormwater management system customized to your site's exact requirements, ideal for working in an extremely limited space while preserving land above for parks, buildings or parking lots.

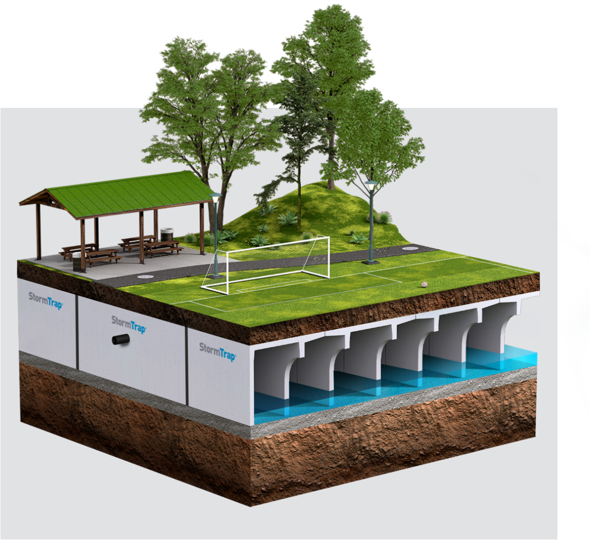
DoubleTrap®

The stormwater management solution you need to control runoff volume and discharge timing. Its modular design maximizes storage volume while minimizing footprint and installation cost.

STORMWATER APPLICATIONS

Detention

StormTrap underground stormwater detention systems temporarily store runoff in large underground chambers before releasing it at a controlled rate. This mitigates erosion, flooding and many of the other harmful effects of high volumes of stormwater runoff.



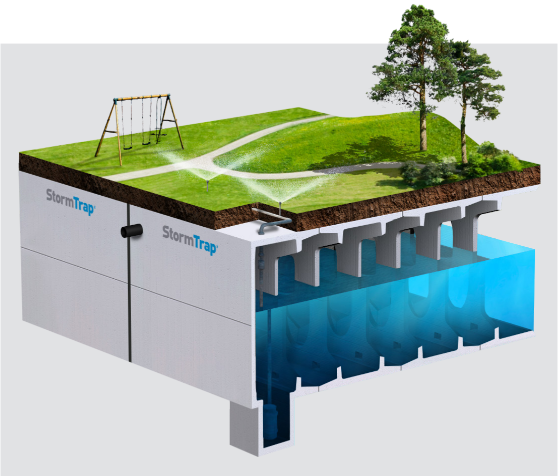
Infiltration

The StormTrap infiltration system provides a large infiltrative surface area that allows water to recharge into the native soil. The system can also help meet low impact development (LID) goals by reducing the volume of stormwater runoff discharged from a site.

Treatment

StormTrap is committed to improving stormwater quality by deploying our range of treatment products that target your pollutant issues with integrated or stand-alone solutions.

- **Filtration:** Sandfilters use various media to remove pollutants such as nutrients and heavy metals
- **Sedimentation:** Remove suspended solids with systems customized for your particle size and flow rate
- **Oil/Water Separation:** Baffle chambers eliminate hydrocarbons from runoff
- **Litter, Trash and Debris Removal:** Disposable mesh nets efficiently capture and remove trash and floatables from Stormwater and CSO discharges



Reuse and Harvesting

StormTrap offers rainwater harvesting applications that collect stormwater on site for use in irrigation or as greywater inside buildings.

These sustainable stormwater management practices adhere to low impact development (LID) principles for runoff reduction and also contribute to LEED (Leadership in Energy and Environmental Design) design credits for Sustainable Sites and Water Efficiency.

SIGNIFICANT ADVANTAGES

Increase Options

Sizes ranging from 1'1" to 15'0"

Designed to exceed HS-20 loading with minimum of 6" cover

Locally manufactured in a NPCA (National Precast Concrete Association) certified facility

Modular design maximizes storage volume while minimizes footprint and cost

Lower Costs

Installed savings compared to traditional systems

Innovative design allows quick and efficient installation

Reduced labor and excavation costs

Meets water quantity requirements without compromising land use

Minimize Maintenance

Total accessible void storage for easy maintenance

Reclaim 100% of original storage volume

High-strength precast concrete provides up to 100 years of service life

Streamline Design and Installation

Structural stamp on each project

Budget estimate for system and installation

Complete set of drawings

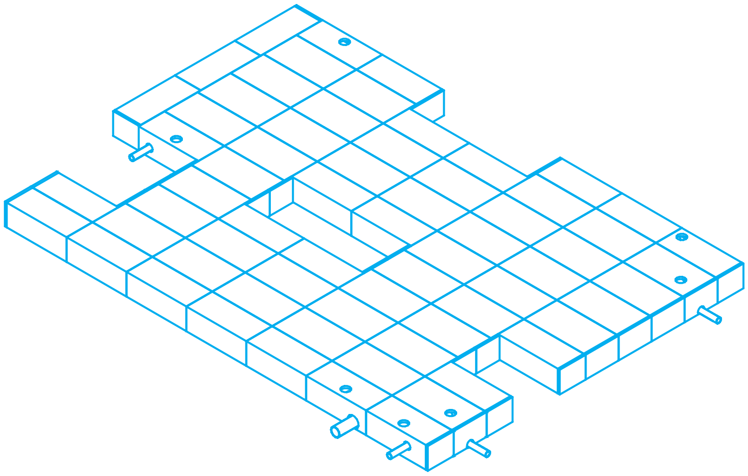
Pre-construction meeting

Representative on site during installation

FLEXIBLE AND ADAPTABLE DESIGNS

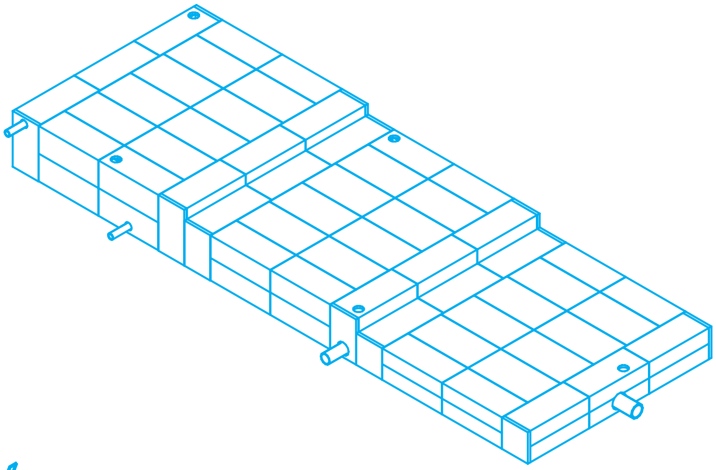
Unique Configurations

Flexible, modular design easily accommodates existing utilities, light pole foundations, trees and other job site constraints



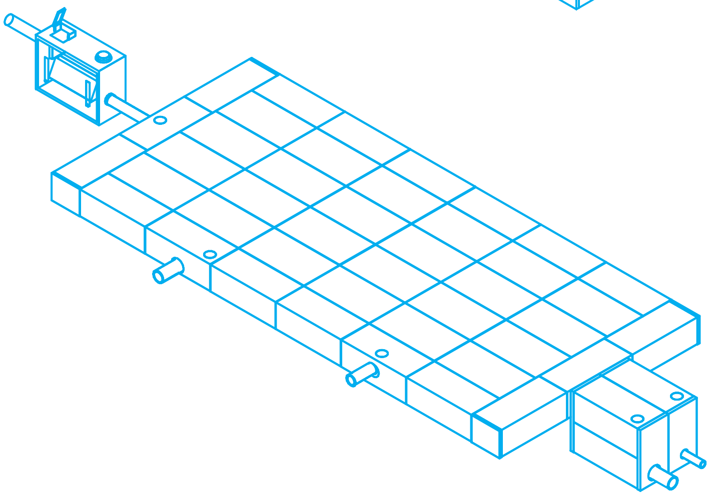
Varying Heights

Made of reinforced, high strength concrete available in sizes ranging from 1'1" to 15'0"



Integrated Applications

Integrated solutions, such as the SiteSaver water quality device or outlet control structures



PHONE 877 867 6872
WEB stormtrap.com

Schedule a lunch and learn, download product specifications, or request a free Design & Budget estimate to get your project started!

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: One Alexandria North

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	Drawdown calculations will be included in final engineering. ☐ Included ☐ Submitted as separate stand-alone document

Project Name: One Alexandria North

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
N/A ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
N/A ☐ 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).

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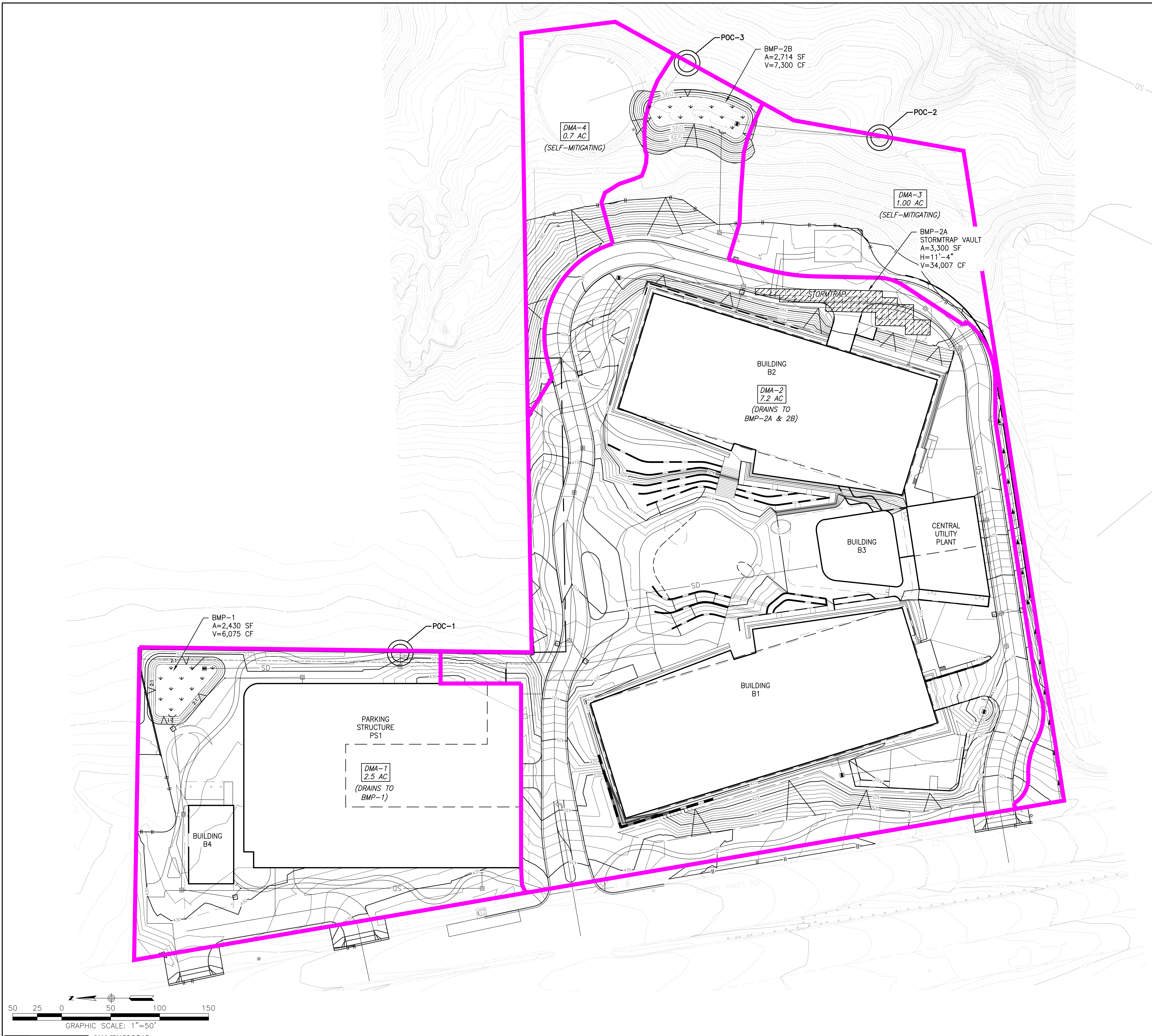
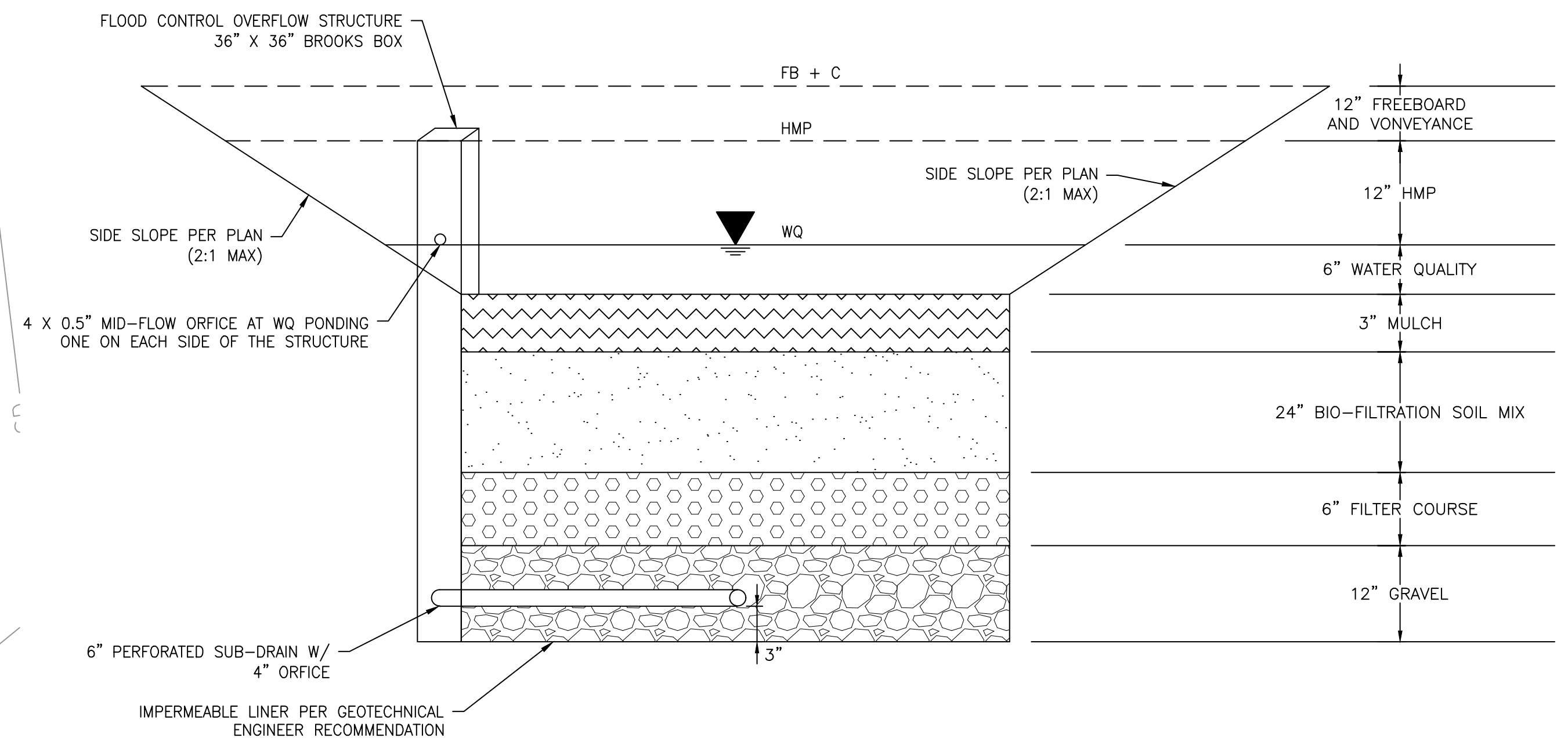
Attachment 2A

Hydromodification Management Exhibit



NOTES:

1. UNDERLYING HYDROLOGIC SOIL GROUP = NRCS TYPE B.
2. APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20FT.
3. THE PROJECT SITE IS NOT LOCATED WITHIN ANY CRITICAL COARSE SEDIMENT YIELD AREAS (ATTACHMENT 2B).
4. BIOFILTRATION BMP (BF-1), HAS BEEN PROPOSED IN DMA-1 NAMELY, BMP-1. THE BIOFILTRATION FACILITY SERVES BOTH HMP FLOW CONTROL AND POLLUTANT CONTROL PURPOSES. THE FOOTPRINT OF BMP-1 IS 2430 SF. PLEASE REFER TO ATTACHMENT 1E FOR BMP CROSS-SECTION SCHEMATIC AND HMP ORIFICE DETAILS.
5. CISTERN (STORMTRAP) TO BIOFILTRATION BMP (BF-1), HAS BEEN PROPOSED IN DMA-2, FOR BOTH HMP FLOW CONTROL, POLLUTANT CONTROL, AND DETENTION. PLEASE REFER TO ATTACHMENT 1E FOR BMP CROSS-SECTION SCHEMATIC AND HMP ORIFICE DETAILS.
6. DMA-3 AND -4 ARE SELF-MITIGATING DMAs PURSUANT TO SECTION 5.2.1 OF THE STORM WATER STANDARDS (SWS) MANUAL (OCTOBER 2018).
7. IMPERVIOUS AREA DISPERSION (SD-B) HAS BEEN PROPOSED TO MEET VOLUME RETENTION REQUIREMENTS. IMPERVIOUS AREA (570 SF & 6,375 SF) OF ROOF & WALKWAY WILL DISPERSE TO ADJACENT LANDSCAPE AREAS (1,200 SF & 4,250 SF) IN DMAS 1 AND 2 RESPECTIVELY. DISPERSION AREAS WILL BE DESIGNED PURSUANT TO SD-B AND SD-F FACT SHEET.



BIOFILTRATION BASIN TYPICAL CROSS SECTION

NOT TO SCALE

SITE DESIGN BMPS:

4.3.2	CONSERVATION OF NATURAL AREAS, SOILS & VEGETATION
4.3.3	MINIMIZE IMPERVIOUS AREA
4.3.4	MINIMIZE SOIL COMPACTION
4.3.5	IMPERVIOUS AREA DISPERSION
4.3.7	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

LEGEND:

▬	DMA BOUNDARY
DMA-X	DMA ID
⩡	BIOFILTRATION BMP (BF-1)
▨	UNDERGROUND CISTERN/VAULT
◎	POC

DRAINAGE MANAGEMENT EXHIBIT
FOR
ONE ALEXANDRIA NORTH

DATE: JUNE 23, 2021
REVISED: SEPTEMBER 10, 2021
REVISED: NOVEMBER 05, 2021

JN-19366

RICK
ENGINEERING COMPANY
San Diego

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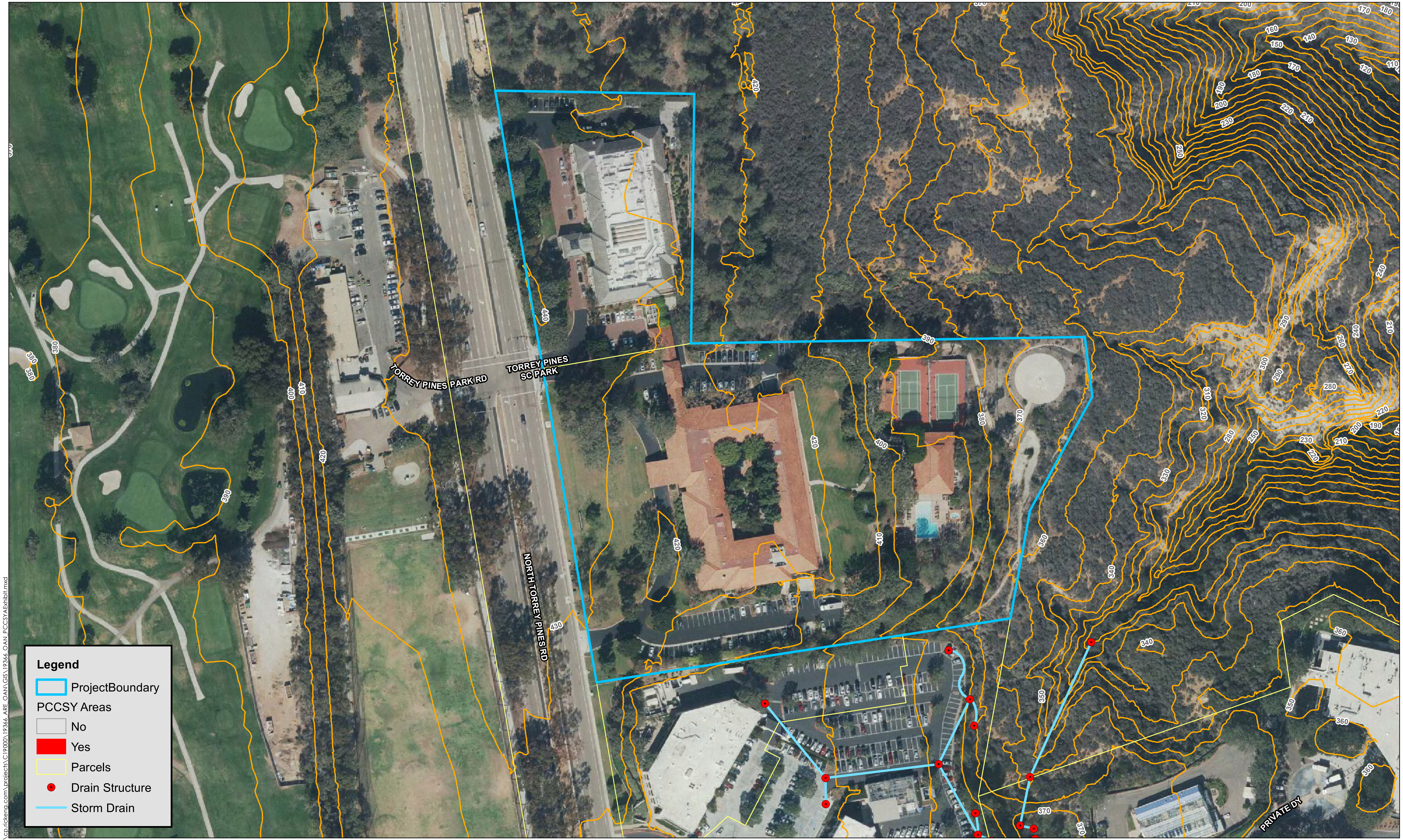
NOT FOR CONSTRUCTION – EXHIBIT FOR PDPSWQMP ONLY

Attachment 2B

Critical Coarse Sediment Yield Areas Exhibit



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RICK
ENGINEERING COMPANY

Scale in Feet
0 140 280

North

Date of Exhibit: 6/2/2021
SanGIS PCCSY: 03/2015
FEMA NFHL: 04/2016
SanGIS/USGS Aerial Imagery: 11/2014

ONE ALEXANDRIA NORTH

PCCSY Areas

JN: 19366

Project Name: **One Alexandria North**

Attachment 2C

Geomorphic Assessment of Receiving Channels

Not Performed

Project Name: **One Alexandria North**

HMP Design Backup

BMP Sizing Spreadsheet V3.1			
Project Name:	One Alexandira North	Hydrologic Unit:	Miramar Reservoir
Project Applicant:	Alexandria Real Estate Equities, Inc	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	496,584
Parcel (APN):	310-110-14 & 310-110-13	Low Flow Threshold:	0.1Q2
BMP Name:	BMP-1	BMP Type:	Biofiltration
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.1

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]	Surface Area	Surface Area (SF)
Imp Pavement	64,887	C	Moderate	Concrete	1.0	0.075	4867
Roof	21,629	C	Moderate	Roofs	1.0	0.075	1622
Pervious	21,629	C	Moderate	Landscape	0.1	0.075	162
						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	108,145					Minimum BMP Size	6651
						Proposed BMP Size*	2430

* Assumes standard configuration

Surface Ponding Depth	12.00	in
Bioretention Soil Media Depth	18.00	in
Filter Coarse	6.00	in
Gravel Storage Layer Depth	12	in
Underdrain Offset	3.0	in

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.

Detailed long term SMMM Modeling will be performed for the project during Final Engineering. Minimum footprint sizing has been met per Appendix B and pollutant control worksheets have been included in this report.

BMP Sizing Spreadsheet V3.1			
Project Name:	One Alexandira North	Hydrologic Unit:	Miramar Reservoir
Project Applicant:	Alexandria Real Estate Equities, In	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	496,584
Parcel (APN):	310-110-14 & 310-110-13	Low Flow Threshold:	0.1Q2
BMP Name	BMP-1	BMP Type:	Biofiltration

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 Pavement	Oceanside	C	Moderate	0.497	1.490	0.074	**1.06**
Roof	Oceanside	C	Moderate	0.497	0.497	0.025	**0.35**
Pervious	Oceanside	C	Moderate	0.497	0.497	0.025	**0.35**

3.75	**0.123**	**1.76**	**1.50**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.051	**0.055**	**0.79**	**1.000**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	13.2

BMP Sizing Spreadsheet V3.1			
Project Name:	One Alexandira North	Hydrologic Unit:	Miramar Reservoir
Project Applicant:	Alexandria Real Estate Equities, Inc	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	496,584
Parcel (APN):	310-110-14 & 310-110-13	Low Flow Threshold:	0.1Q2
BMP Name:	BMP-2A	BMP Type:	Cistern
BMP Native Soil Type:	C	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 Pavement	109,785	C	Moderate	Concrete	1.0	0.14	15370
Roof	109,785	C	Moderate	Roofs	1.0	0.14	15370
Pervious	94,100	C	Moderate	Landscape	0.1	0.14	1317
						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	313,670					Minimum BMP Size	32057
						Proposed BMP Size*	32500

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	11.3	ft
Minimum Required Cistern Footprint	2829	CF

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:	One Alexandria North	Hydrologic Unit:	Miramar Reservoir
Project Applicant:	lexandria Real Estate Equities, In	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	496,584
Parcel (APN):	310-110-14 & 310-110-13	Low Flow Threshold:	0.1Q2
BMP Name	BMP-2A	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 Pavement	Oceanside	C	Moderate	0.497	2.520	0.125	**1.03**
Roof	Oceanside	C	Moderate	0.497	2.520	0.125	**1.03**
Pervious	Oceanside	C	Moderate	0.497	2.160	0.107	**0.88**

11.33	**0.358**	**2.94**	**1.93**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

Provide Hand Calc.	**0.096**	**0.79**	**1.000**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation

Drawdown calculations will be included in final engineering.

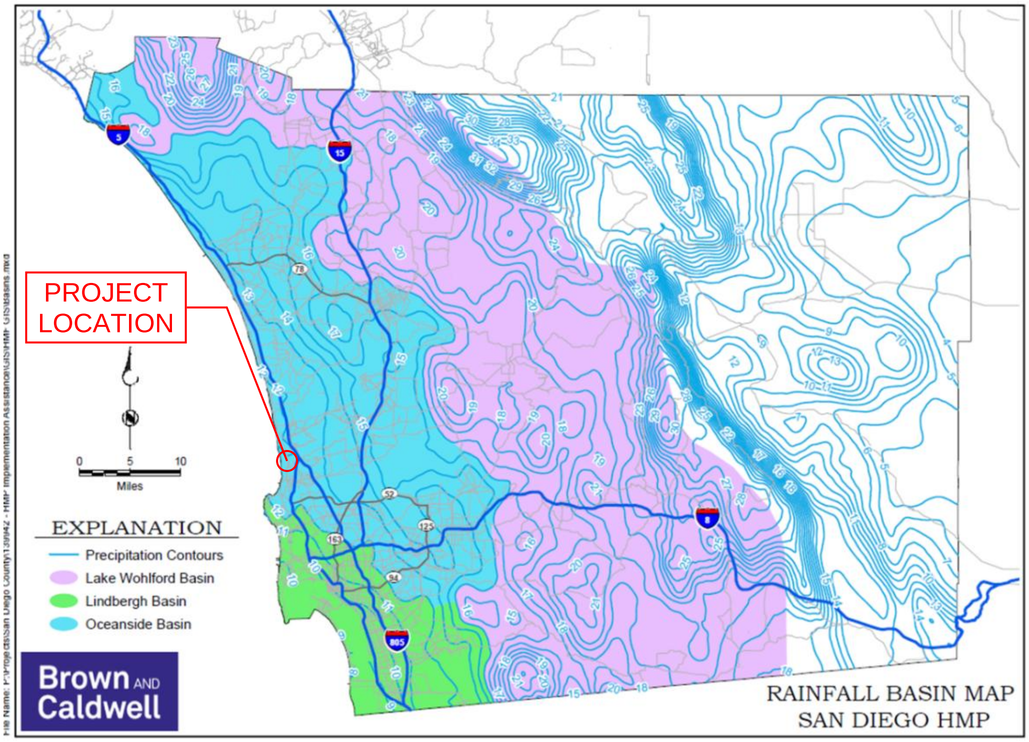

Figure G.2-2: Rainfall Basin Map

Table G.2-1: Runoff factors for surfaces draining to BMPs for Hydromodification Sizing Factor Method

Surface	Runoff Factor
Roofs	1.0
Concrete	1.0
Pervious Concrete	0.10
Porous Asphalt	0.10
Grouted Unit Pavers	1.0
Solid Unit Pavers on granular base, min. 3/16 inch joint space	0.20
Crushed Aggregate	0.10
Turf block	0.10
Amended, mulched soils	0.10
Landscape	0.10

Additional steps to use this BMP as a combined pollutant control and flow control BMP:

The BMP sized using the sizing factors in Table G.2-5 meets both pollutant control and flow control requirements except for surface drawdown requirements. Applicant must perform surface drawdown calculations and if needed develop a vector management plan (Refer to Section 6.3.7) or revise the BMP design to meet the drawdown requirements. If changes are made to the BMP design applicants must perform site specific continuous simulation modeling (Refer to Appendix G).

Table G.2-5: Sizing Factors for Hydromodification Flow Control Biofiltration BMPs Designed Using Sizing Factor Method

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A
$0.1Q_2$	A	Flat	Lindbergh	0.320
$0.1Q_2$	A	Moderate	Lindbergh	0.300
$0.1Q_2$	A	Steep	Lindbergh	0.285
$0.1Q_2$	B	Flat	Lindbergh	0.105
$0.1Q_2$	B	Moderate	Lindbergh	0.100
$0.1Q_2$	B	Steep	Lindbergh	0.095
$0.1Q_2$	C	Flat	Lindbergh	0.055
$0.1Q_2$	C	Moderate	Lindbergh	0.050
$0.1Q_2$	C	Steep	Lindbergh	0.050
$0.1Q_2$	D	Flat	Lindbergh	0.050
$0.1Q_2$	D	Moderate	Lindbergh	0.050
$0.1Q_2$	D	Steep	Lindbergh	0.050
$0.1Q_2$	A	Flat	Oceanside	0.150
$0.1Q_2$	A	Moderate	Oceanside	0.140
$0.1Q_2$	A	Steep	Oceanside	0.135
$0.1Q_2$	B	Flat	Oceanside	0.085
$0.1Q_2$	B	Moderate	Oceanside	0.085
$0.1Q_2$	B	Steep	Oceanside	0.085
$0.1Q_2$	C	Flat	Oceanside	0.075
$0.1Q_2$	C	Moderate	Oceanside	0.075
$0.1Q_2$	C	Steep	Oceanside	0.075
$0.1Q_2$	D	Flat	Oceanside	0.070
$0.1Q_2$	D	Moderate	Oceanside	0.070
$0.1Q_2$	D	Steep	Oceanside	0.070
$0.1Q_2$	A	Flat	L Wohlford	0.285
$0.1Q_2$	A	Moderate	L Wohlford	0.275

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A
$0.1Q_2$	A	Steep	L Wohlford	0.270
$0.1Q_2$	B	Flat	L Wohlford	0.150
$0.1Q_2$	B	Moderate	L Wohlford	0.145
$0.1Q_2$	B	Steep	L Wohlford	0.145
$0.1Q_2$	C	Flat	L Wohlford	0.070
$0.1Q_2$	C	Moderate	L Wohlford	0.070
$0.1Q_2$	C	Steep	L Wohlford	0.070
$0.1Q_2$	D	Flat	L Wohlford	0.060
$0.1Q_2$	D	Moderate	L Wohlford	0.060
$0.1Q_2$	D	Steep	L Wohlford	0.060

Q_2 = 2-year pre-project flow rate based upon partial duration analysis of long-term hourly rainfall records

A = Surface area (at surface of the BMP before any ponding occurs) sizing factor for flow control biofiltered, project-specific continuous simulation modeling is recommended. Refer to Sections 5.6 and 6.3.6.

Table G.2-6: Sizing Factors for Hydromodification Flow Control Cistern BMPs Designed Using Sizing Factor Method

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	V
$0.1Q_2$	A	Flat	Lindbergh	0.54
$0.1Q_2$	A	Moderate	Lindbergh	0.51
$0.1Q_2$	A	Steep	Lindbergh	0.49
$0.1Q_2$	B	Flat	Lindbergh	0.19
$0.1Q_2$	B	Moderate	Lindbergh	0.18
$0.1Q_2$	B	Steep	Lindbergh	0.18
$0.1Q_2$	C	Flat	Lindbergh	0.11
$0.1Q_2$	C	Moderate	Lindbergh	0.11
$0.1Q_2$	C	Steep	Lindbergh	0.11
$0.1Q_2$	D	Flat	Lindbergh	0.09
$0.1Q_2$	D	Moderate	Lindbergh	0.09
$0.1Q_2$	D	Steep	Lindbergh	0.09
$0.1Q_2$	A	Flat	Oceanside	0.26
$0.1Q_2$	A	Moderate	Oceanside	0.25
$0.1Q_2$	A	Steep	Oceanside	0.25
$0.1Q_2$	B	Flat	Oceanside	0.16
$0.1Q_2$	B	Moderate	Oceanside	0.16
$0.1Q_2$	B	Steep	Oceanside	0.16
$0.1Q_2$	C	Flat	Oceanside	0.14
$0.1Q_2$	C	Moderate	Oceanside	0.14
$0.1Q_2$	C	Steep	Oceanside	0.14
$0.1Q_2$	D	Flat	Oceanside	0.12
$0.1Q_2$	D	Moderate	Oceanside	0.12
$0.1Q_2$	D	Steep	Oceanside	0.12
$0.1Q_2$	A	Flat	L Wohlford	0.53
$0.1Q_2$	A	Moderate	L Wohlford	0.49
$0.1Q_2$	A	Steep	L Wohlford	0.49
$0.1Q_2$	B	Flat	L Wohlford	0.28
$0.1Q_2$	B	Moderate	L Wohlford	0.28
$0.1Q_2$	B	Steep	L Wohlford	0.28

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	V
$0.1Q_2$	C	Flat	L Wohlford	0.14
$0.1Q_2$	C	Moderate	L Wohlford	0.14
$0.1Q_2$	C	Steep	L Wohlford	0.14
$0.1Q_2$	D	Flat	L Wohlford	0.12
$0.1Q_2$	D	Moderate	L Wohlford	0.12
$0.1Q_2$	D	Steep	L Wohlford	0.12

Q_2 = 2-year pre-project flow rate based upon partial duration analysis of long-term hourly rainfall records

V = Cistern volume sizing factor

G.2.1 Unit Runoff Ratios

Table G.2-2 presents unit runoff ratios for calculating pre-development Q_2, to be used when applicable to determine the lower flow threshold for low flow orifice sizing for biofiltration with partial retention, biofiltration, or cistern BMPs. There is no low flow orifice in the infiltration BMP. The unit runoff ratios are updated from the previously reported BMP Sizing Calculator methodology ratios to account for changes in modeling methodologies. Unit runoff ratios for "urban" and "impervious" cover categories were not transferred to this manual due to the requirement to control runoff to pre-development condition (see Chapter 6.3.3).

How to use the unit runoff ratios:

Obtain unit runoff ratio from Table G.2-2 based on the project's rainfall basin, hydrologic soil group, and pre-development slope (for redevelopment projects, pre-development slope may be considered if historic topographic information is available, otherwise use pre-project slope). Multiply the area tributary to the structural BMP (A, acres) by the unit runoff ratio (Q_2, cfs/acre) to determine the pre-development Q_2 to determine the lower flow threshold, to use for low flow orifice sizing.

Table G.2-2: Unit Runoff Ratios for Sizing Factor Method

Rain Gauge	Soil	Slope	Q_2 (cfs/acre)	Q_{10} (cfs/ac)
Lake Wohlford	A	Low	0.256	0.518
Lake Wohlford	A	Moderate	0.275	0.528
Lake Wohlford	A	Steep	0.283	0.531
Lake Wohlford	B	Low	0.371	0.624
Lake Wohlford	B	Moderate	0.389	0.631
Lake Wohlford	B	Steep	0.393	0.633
Lake Wohlford	C	Low	0.490	0.729
Lake Wohlford	C	Moderate	0.495	0.733
Lake Wohlford	C	Steep	0.496	0.735
Lake Wohlford	D	Low	0.548	0.784
Lake Wohlford	D	Moderate	0.554	0.788
Lake Wohlford	D	Steep	0.556	0.788
Oceanside	A	Low	0.256	0.679
Oceanside	A	Moderate	0.277	0.694
Oceanside	A	Steep	0.285	0.700

Rain Gauge	Soil	Slope	Q_2 (cfs/acre)	Q_{10} (cfs/ac)
Oceanside	B	Low	0.377	0.875
Oceanside	B	Moderate	0.391	0.879
Oceanside	B	Steep	0.395	0.881
Oceanside	C	Low	0.488	0.981
Oceanside	C	Moderate	0.497	0.985
Oceanside	C	Steep	0.499	0.986
Oceanside	D	Low	0.571	0.998
Oceanside	D	Moderate	0.575	0.999
Oceanside	D	Steep	0.576	0.999
Lindbergh	A	Low	0.057	0.384
Lindbergh	A	Moderate	0.073	0.399
Lindbergh	A	Steep	0.082	0.403
Lindbergh	B	Low	0.199	0.496
Lindbergh	B	Moderate	0.220	0.509
Lindbergh	B	Steep	0.230	0.513
Lindbergh	C	Low	0.335	0.601
Lindbergh	C	Moderate	0.349	0.610
Lindbergh	C	Steep	0.354	0.613
Lindbergh	D	Low	0.429	0.751
Lindbergh	D	Moderate	0.437	0.753
Lindbergh	D	Steep	0.439	0.753

A dedicated SWMDCMA will be prepared during Final Engineering

Attachment 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: One Alexandria North

Indicate which Items are Included:

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

A dedicated SWMDCMA will be prepared during Final Engineering

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).

SITE DESIGN, SOURCE CONTROL, AND POLLUTANT CONTROL BMP
OPERATION & MAINTENANCE PROCEDURE[1]

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

O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER

BMP DESCRIPTION		INSPECTION FREQUENCY[2]	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	INCLUDED IN O&M MANUAL
SITE DESIGN	LANDSCAPED AREAS (VOLUME RETENTION)	MONTHLY (NOTE: INSPECTOR SHALL CHECK FOR THE FOLLOWING MAINTENANCE INDICATORS: EROSION IN THE FORM OF RILLS OR GULLIES, PONDING WATER, BARE AREAS, ANIMAL BURROWS, HOLES, MOUNDS, AND TRASH)	1. AS DETERMINED BY INSPECTION; AND 2. ON OR BEFORE SEPTEMBER 30TH.	1. FILL AND COMPACT AREAS OF RUTS, RILLS, OR GULLIES; 2. RE-SEED AND/OR PLANT SLOPES AND AREAS OF EXPOSED SOILS; AND 3. ROUTINE MOWING AND TRIMMING AND TRASH REMOVAL.	YES
	OUTLET PROTECTION	1. MONTHLY; 2. WITHIN 24 HOURS AFTER EACH "SIGNIFICANT RAIN EVENT" AND 3. WITHIN 24 HOURS FOLLOWING CONSTRUCTION IN IMMEDIATE AREA OF OUTLET PROTECTION	1. AS DETERMINED BY INSPECTION; 2. WHEN DISTURBED OR MISSING ROCKS (RIP RAP), OR SOIL EROSION BELOW AND/OR ADJACENT TO OUTLET PROTECTION ARE OBSERVED.	1. REMOVE TRASH, DEBRIS AND LEAVES. REPAIR ANY DAMAGE TO ROOF DRAINS; 2. IMMEDIATELY REPOSITION ALL DISPLACED ENERGY DISSIPATER; AND 3. IF SOIL EROSION IS FOUND, EXTEND ENERGY DISSIPATER (I.E. LANDSCAPE ROCKS AND/OR SPLASH PADS); REPOSITION OR INCREASE LIMITS OF ENERGY DISSIPATER TO COVER ERODED AREA.	YES
SOURCE CONTROL	INTEGRATED PEST MANAGEMENT	MONTHLY (NOTE: INSPECTOR SHALL CHECK FOR INDICATIONS OF THE PRESENCE OF PESTS ON-SITE)	WHEN THE PEST OR PESTS, OBSERVED IN GREATEST ABUNDANCE OR CAUSE THE MOST OBSERVED SYMPTOMS, ARE IDENTIFIED.	CHECK FREQUENTLY FOR PESTS, AND TREAT WITH A PESTICIDE ONLY WHEN A PEST IS PRESENT, ETC.	YES
	TRASH STORAGE AREAS	WEEKLY	1. AS DETERMINED BY INSPECTION; 2. STANDING WATER IN TRASH STORAGE AREA. 3. LOOSE TRASH OR DEBRIS. 4. LEAKED OR SPILLED MATERIALS. 5. COMPROMISED FENCE, SCREEN, GATE, WALL, BIN. LID OR ROOF AWNING (WHERE APPLICABLE). 6. CRACKED OR OTHERWISE COMPROMISED PAVING OR OTHER FLAWED FLOOR SURFACE (AS APPLICABLE).	1. IF STANDING WATER IS OBSERVED IN THE AREA, DETERMINE THE WATER SOURCE AND REMOVE THE SOURCE. ALLOW STANDING WATER TO EVAPORATE. IF WATER DOES NOT EVAPORATE IN 48 HOURS, REDISTRIBUTE THE WATER TO LANDSCAPED AREA(S). DO NOT DRAIN WATER TO STORM DRAIN SYSTEM. 2. REMOVE AND PROPERLY DISPOSE LOOSE TRASH, DEBRIS, AND LEAKED OR SPILLED MATERIALS. USE APPROPRIATE SPILL CLEANUP MATERIAL AS NECESSARY TO REMOVE ALL LEAKED AND SPILLED MATERIALS INCLUDING MATERIALS ADHERED TO PAVEMENT. IDENTIFY AND REMOVE OR REPAIR THE SOURCE OF ANY LEAKED OR SPILLED MATERIALS. 3. REPAIR THE FOLLOWING AS APPLICABLE: COMPROMISED FENCE, SCREEN, GATE, WALL, BIN, LID OR ROOF AWNING (WHERE APPLICABLE), CRACKED OR COMPROMISED PAVING OR OTHER FLOOR SURFACE (AS APPLICABLE).	YES
	PREVENTIVE STENCILING AND SIGNAGE	ANNUALLY	WHEN FULLY OR PARTIALLY ERASED SIGNS ARE OBSERVED; WHEN DUMPING OF TRASH ARE OBSERVED AT PUBLIC ACCESS POINTS, BUILDING ENTRANCES, PUBLIC PARKS, ETC.	1. REPLACE OR REPAINT THE STENCILS AND SIGNAGE SO THAT THEY ARE LEGIBLE; AND 2. MAKE SURE THAT THEY ARE PLACED AT ALL REQUIRED LOCATIONS (I.E. - ALL INLETS).	YES
	EFFECTIVE IRRIGATION SYSTEM	MONTHLY	WHEN BROKEN SPRINKLER HEADS, RAIN SHUTOFF DEVICES, AND FLOW REDUCERS ARE OBSERVED; OR RUNNING SPRINKLERS IN RAIN ARE	REPAIR OR REPLACE THE BROKEN AND/OR MALFUNCTIONING PARTS OF IRRIGATION SYSTEM.	YES

SITE DESIGN, SOURCE CONTROL, AND POLLUTANT CONTROL BMP
OPERATION & MAINTENANCE PROCEDURE[1]

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

O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER

BMP DESCRIPTION		INSPECTION FREQUENCY[2]	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	INCLUDED IN O&M MANUAL
STRUCTURAL BMP	UNDERGROUND CISTERN (STORMTRAP) BMP-2A (HMP ONLY)	1. TWICE A YEAR (ON OR BEFORE SEPTEMBER 30TH AND FOLLOWING THE RAINY SEASON AFTER MAY 1ST); AND 2. AFTER EACH "SIGNIFICANT RAIN EVENT"	1. AS DETERMINED BY INSPECTION; AND 2. ON OR BEFORE SEPTEMBER 30TH AND FOLLOWING THE RAINY SEASON AFTER MAY 1ST.	1. REMOVE ACCUMULATED MATERIALS SUCH AS TRASH AND DEBRIS AND SEDIMENTS; 2. MAINTAIN INLET AND OUTLET PIPES TO AVOID CLOGGING. (NOTE: FOR MORE DETAILS, REFER TO MANUFACTURER'S MAINTENANCE RECOMMENDATION)	YES
	BIOFILTRATION FACILITY BMP-1 (POLLUTANT CONTROL & HMP) BMP-2 (POLLUTANT CONTROL ONLY)	1. TWICE A YEAR (ON OR BEFORE SEPTEMBER 15TH AND FOLLOWING THE RAINY SEASON AFTER MAY 1ST); AND 2. AFTER EACH "SIGNIFICANT RAIN EVENT" (NOTE: INSPECTOR SHALL CHECK FOR THE FOLLOWING MAINTENANCE INIDICATORS: EROSION IN THE FORM OF RILLS OR GULLIES, PONDING WATER, BARE AREAS, DEAD VEGETATION, ANIMAL BURROWS, HOLES, MOUNDS, AND TRASH)	1. AS DETERMINED BY INSPECTION; AND 2. ON OR BEFORE SEPTEMBER 30TH AND FOLLOWING THE RAINY SEASON AFTER MAY 1ST; AND 3. AFTER EACH "SIGNIFICANT RAIN EVENT"2	1. REPLACE MULCH IN AREAS OF RUTS, RILLS, OR GULLIES; 2. RE-SEED AND/OR PLANT SLOPES AND AREAS OF EXPOSED SOILS; 3. ROUTINE MAINTENANCE TO REMOVE ACCUMULATED MATERIALS SUCH AS TRASH AND DEBRIS; 4. NON-ROUTINE MAINTENANCE WILL BE REQUIRED TO BACKWASH AND CLEAR UNDERDRAINS IF INSPECTION INDICATES UNDERDRAINS ARE CLOGGED; AND 5. DEPENDING ON POLLUTANT LOADS, SOILS MAY NEED TO BE REPLACED EVERY 5 TO 10 YEARS. 6. THE RISER STRUCTURE SHOULD BE MAINTAINED TO AVOID CLOGGING AND ANY LEAKAGE THROUGH BOLTHOLES.	YES

NOTE:

1. REFER TO THE "PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR ONE ALEXANDRIA NORTH", DATED JUNE 15, 2021 OR ANY REVISION THEREAFTER FOR MORE SPECIFIC INSPECTION AND MAINTENANCE INFORMATION.
2. DURING THE FIRST YEAR OF NORMAL OPERATION, ALL BMPS SHOULD BE INSPECTED ONCE BEFORE AUGUST 31 AND THEN MONTHLY FROM SEPTEMBER THROUGH MAY. THE MINIMUM INSPECTION AND MAINTENANCE FREQUENCY SHOULD BE DETERMINED BASED ON THE RESULTS OF THE FIRST YEAR INSPECTIONS.
3. A SIGNIFICANT RAIN EVENT IS CONSIDERED WHEN THE NATIONAL WEATHER SERVICE REPORTS 0.5 INCHES OF RAINFALL OVER A 48 HOUR PERIOD.

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

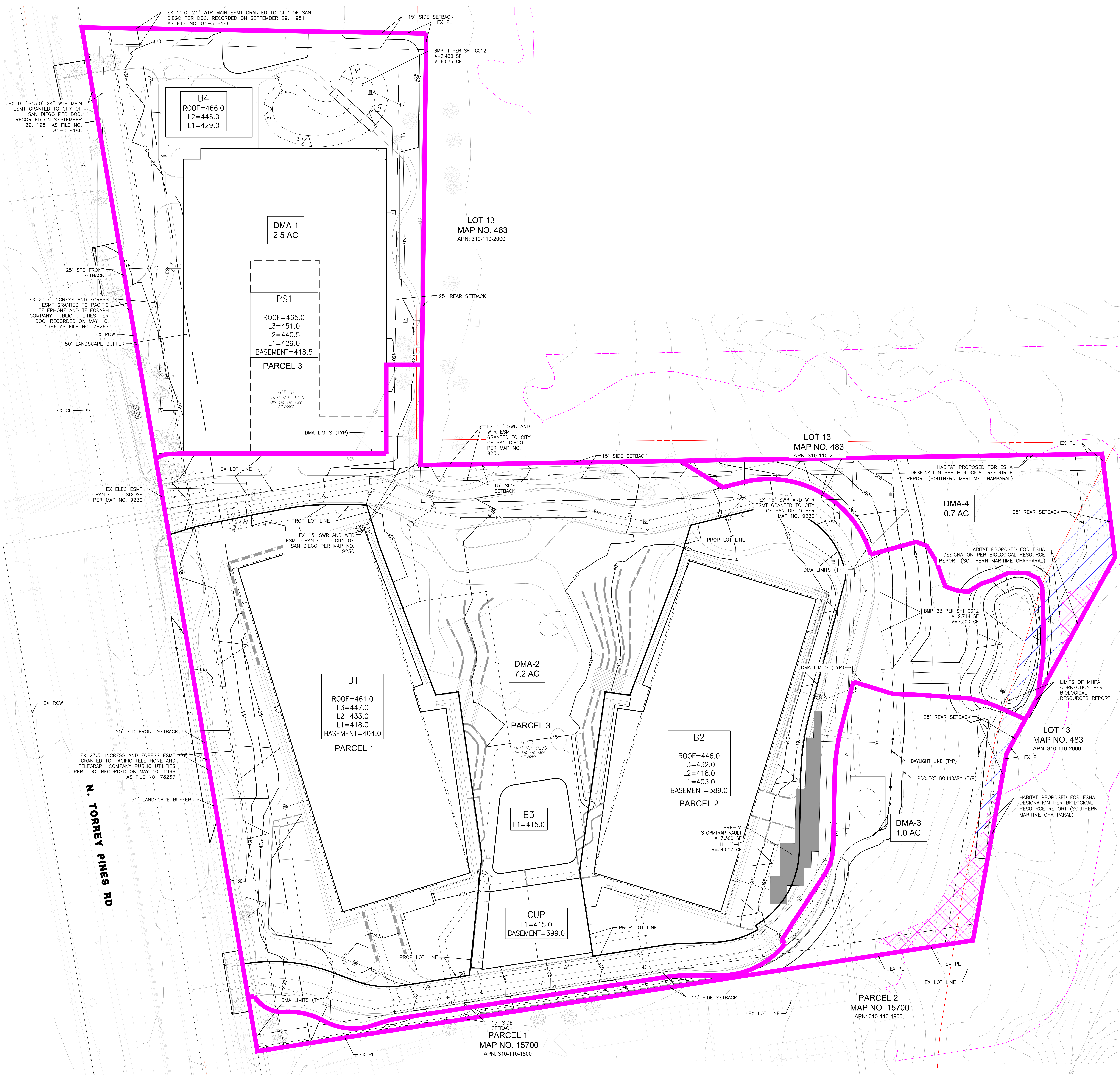
This is the cover sheet for Attachment 4.

Project Name: One Alexandria North

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

The plans must identify:

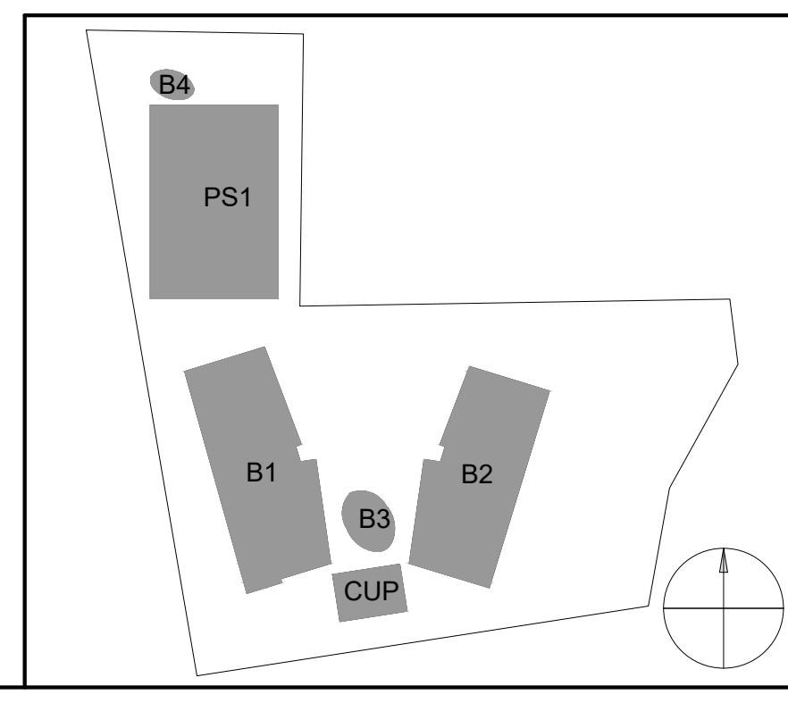
- ☑ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☑ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☑ Details and specifications for construction of structural BMP(s)
- ☑ Signage indicating 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.

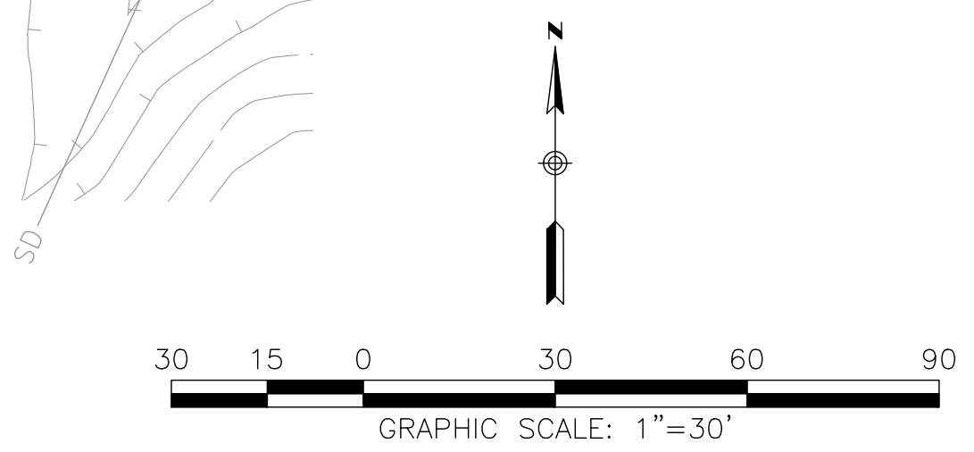


LEGEND:

EX ROW/PL	— — —
EX ESMT	— — —
EX RW MAIN	—RW—
EX WTR MAIN	—W—
EX SWR MAIN	—S—
EX SD	—SD—
EX SD CO/INLET	(SD)
EX VEGETATION COMMUNITIES/LAND COVER LIMITS	- - - -
EX ENVIRONMENTAL/CULTURAL SENSITIVE AREA SENSITIVE VEGETATION AREA	— · · —
EX FENCE	
EX TRANSIT STOP	
PROP DAYLIGHT LINE	
PROP 6" CURB & GUTTER	
PROP SWALE	→
PROP RETAINING WALL (WIDTH VARIES PER PLAN)	
PROP CONC PAVING	
VISIBILITY AREA TRIANGLE	▨
PROP UTILITY POC TO PUBLIC MAIN	POC
PROP CASE 1 BUS STOP PER MTS DESIGN MANUAL	BUS STOP

KEYPLAN





GRAPHIC SCALE: 1"=30'

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CARSON P. EDGINGTON
No.76519
CIVIL

ONE ALEXANDRIA NORTH

Issue Date
09/10/2021

REVISIONS

MARK	DATE	DESCRIPTION

PTS NO.	691942
I.O.	24008957
SHEET ISSUE DATE	09/10/2021

SHEET NAME

BMP PLAN

SHEET NUMBER

C011

53 TOTAL SHEETS

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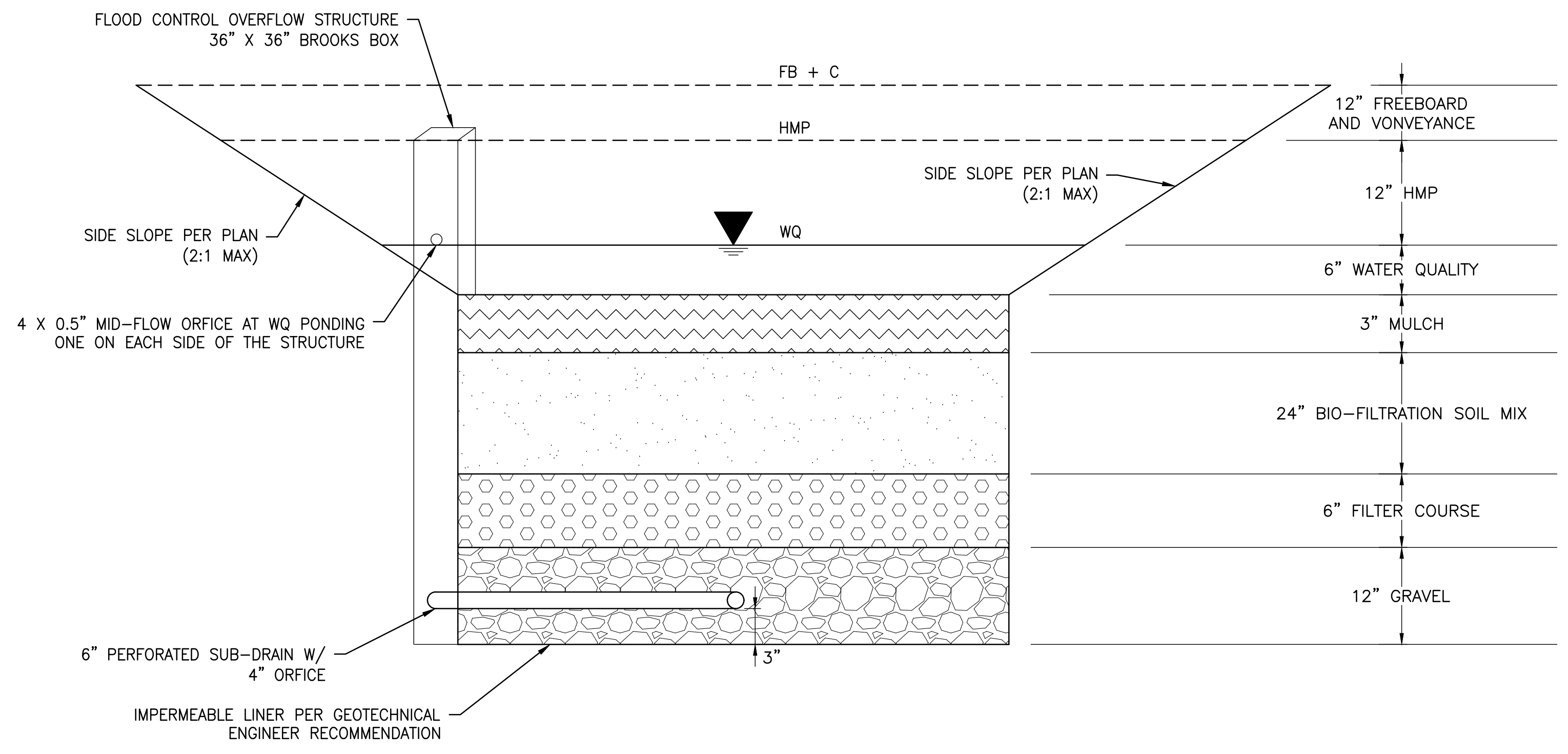

BIOFILTRATION BASIN TYPICAL CROSS SECTION

NOT TO SCALE

LEGEND:

- EX ROW/PL
- EX ESMT
- EX RW MAIN — RW
- EX WTR MAIN — W
- EX SWR MAIN — S
- EX SD — SD
- EX SD CO/INLET — SD
- EX VEGETATION COMMUNITIES/LAND COVER LIMITS
- EX ENVIRONMENTAL/CULTURAL SENSITIVE AREA SENSITIVE VEGETATION AREA
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- PROP DAYLIGHT LINE
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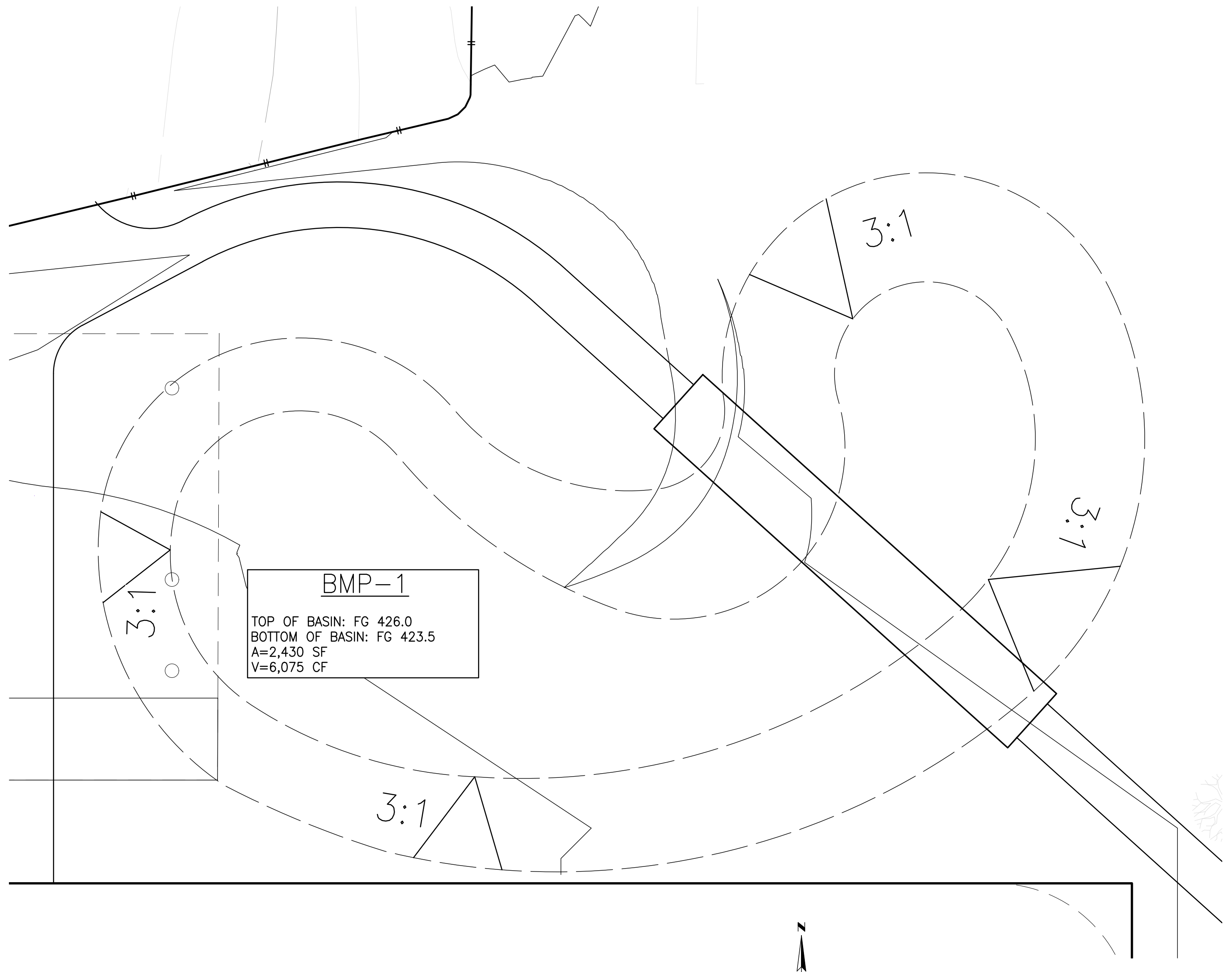
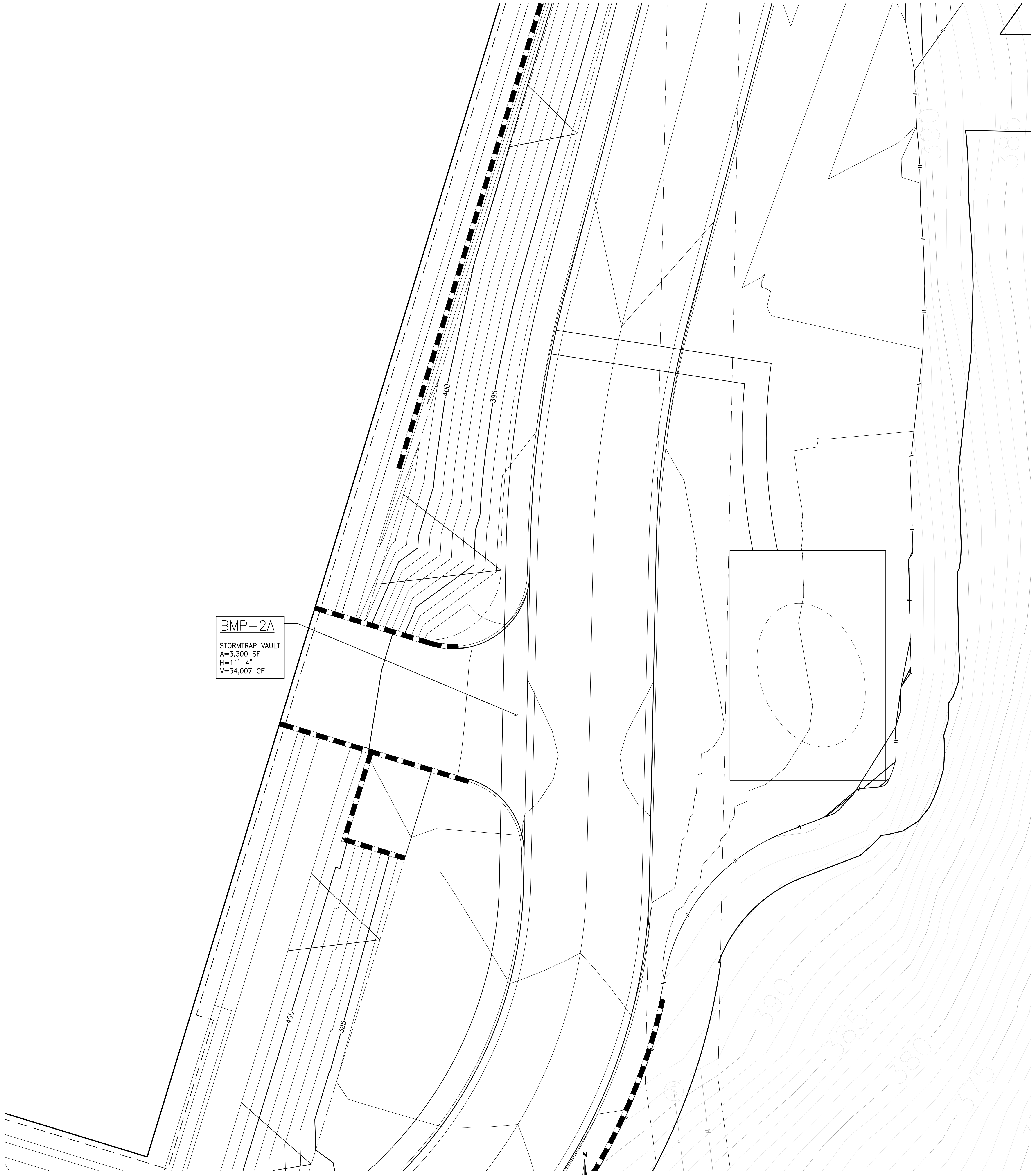
- PROP RETAINING WALL (WIDTH VARIES PER PLAN)
- PROP CONC PAVING
- VISIBILITY AREA TRIANGLE
- PROP UTILITY POC TO PUBLIC MAIN — POC
- PROP CASE 1 BUS STOP PER MTS DESIGN MANUAL — BUS STOP



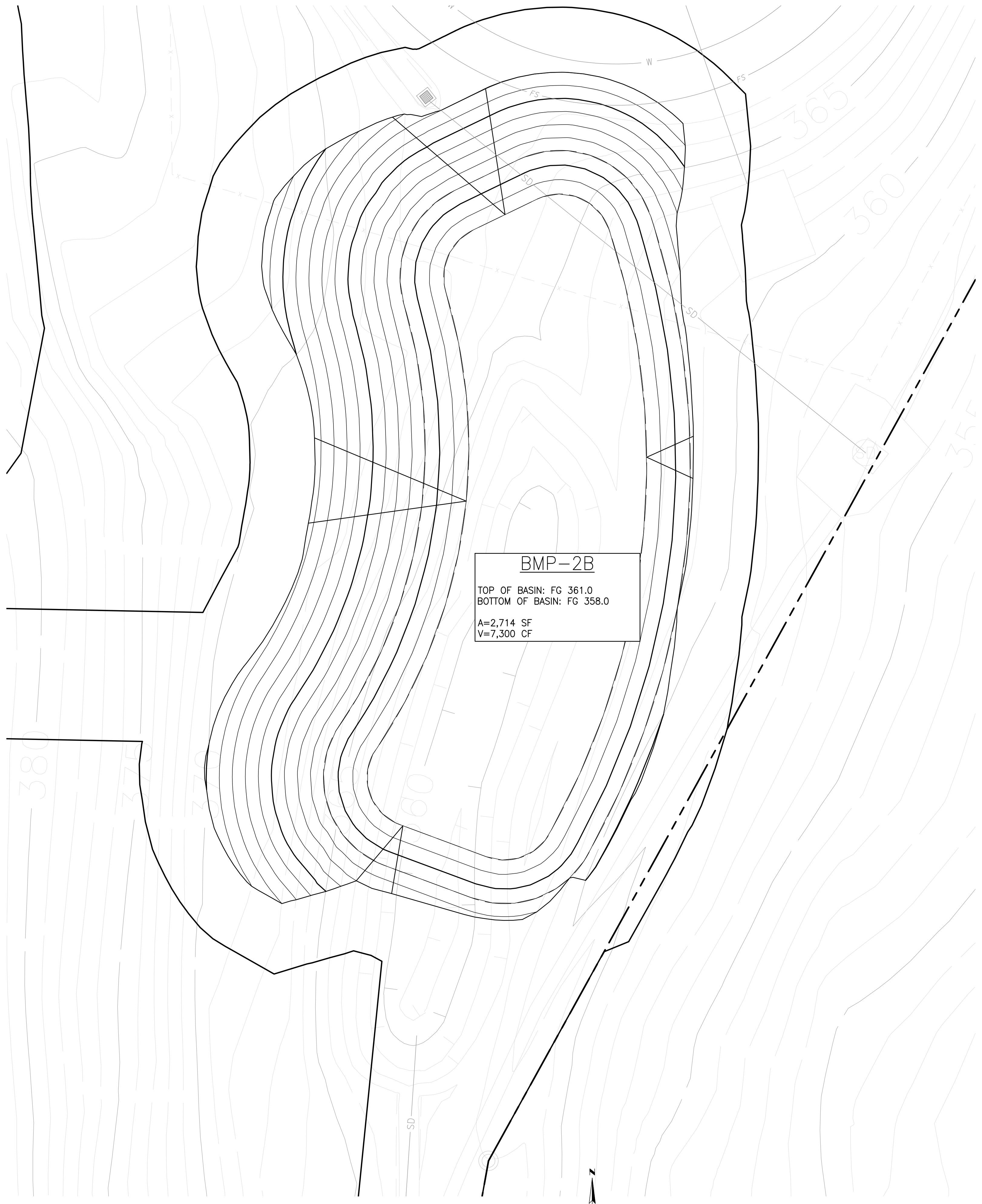
BMP-1
TOP OF BASIN: FG 426.0
BOTTOM OF BASIN: FG 423.5
A=2,430 SF
V=6,075 CF

BMP-1
SCALE: 1"=10'



BMP-2A
STORMTRAP VAULT
A=3,300 SF
H=11'-4"
V=34,007 CF

BMP-2A
SCALE: 1"=10'

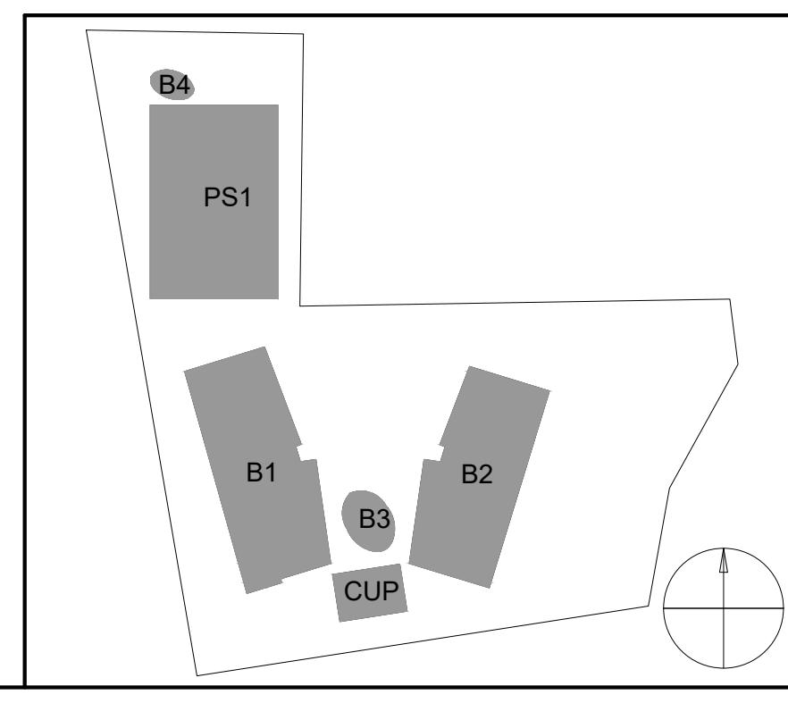


BMP-2B
TOP OF BASIN: FG 361.0
BOTTOM OF BASIN: FG 358.0

A=2,714 SF
V=7,300 CF

BIOINFILTRATION BASIN 2
SCALE: 1"=10'

KEYPLAN



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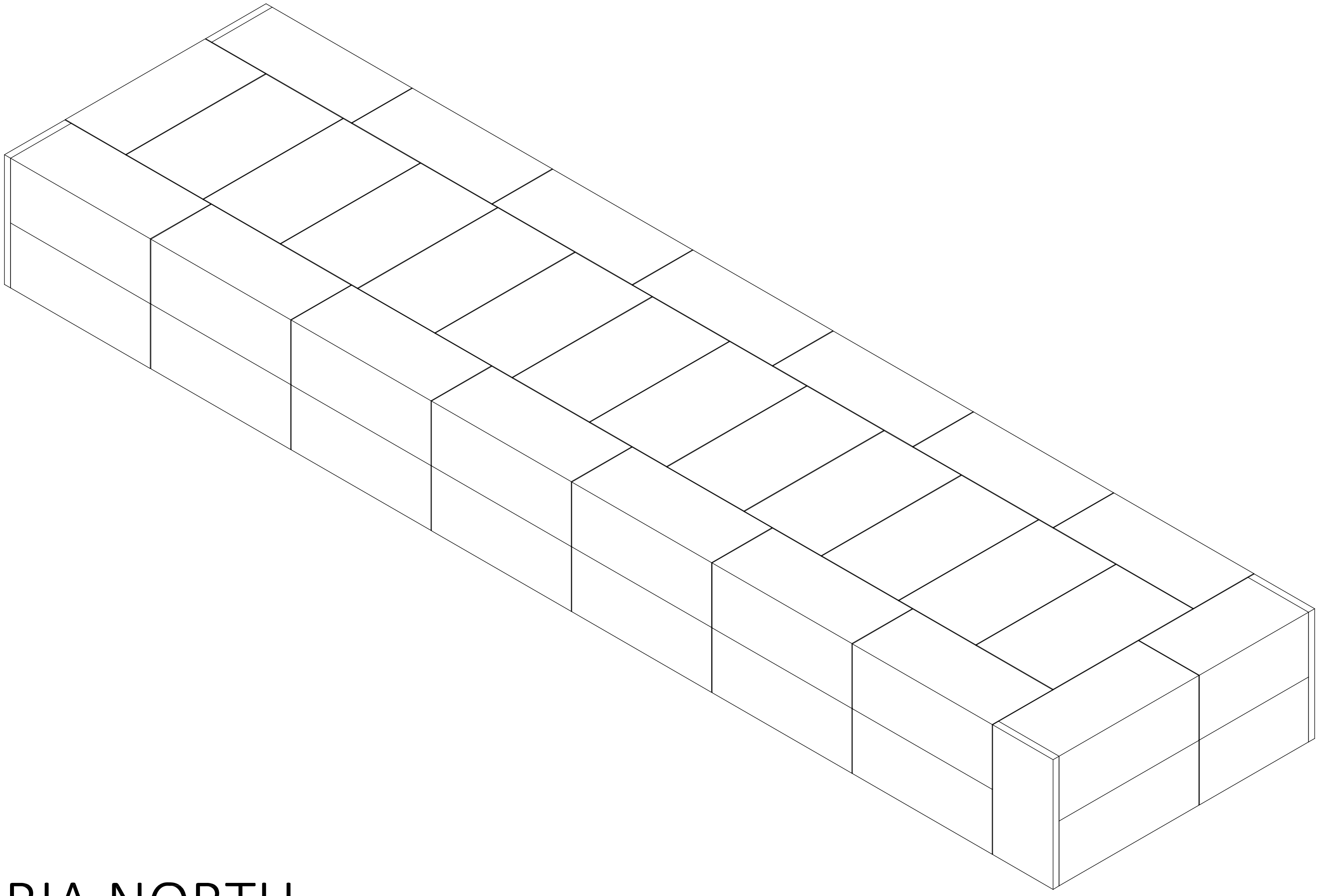
MODULAR CONCRETE
STORMWATER MANAGEMENT

SHEET INDEX	
PAGE	DESCRIPTION
0.0	COVER SHEET
1.0	DOUBLETRAP DESIGN CRITERIA
2.0	DOUBLETRAP SYSTEM LAYOUT
3.0	DOUBLETRAP INSTALLATION SPECIFICATIONS
3.1	DOUBLETRAP INSTALLATION SPECIFICATIONS
4.0	DOUBLETRAP BACKFILL SPECIFICATIONS
5.0	RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS
6.0	DOUBLETRAP MODULE TYPES

THESE DRAWINGS ARE FOR YOUR REFERENCE ONLY AND SHALL NOT BE USED FOR CONSTRUCTION PURPOSES. THE STORMTRAP DRAWINGS SHALL NOT BE ALTERED OR MANIPULATED IN WHOLE OR IN PART WITHOUT WRITTEN CONSENT OF STORMTRAP. USE OF THESE DRAWINGS IS STRICTLY GRANTED TO YOU, OUR CLIENT, FOR THE SPECIFIED AND NAMED PROJECT ONLY.

STORMTRAP CONTACT INFORMATION

STORMTRAP SUPPLIER: STORMTRAP
CONTACT NAME: CHARLIE CARTER
CELL PHONE: 760-212-5628
SALES EMAIL: CCARTER@STORMTRAP.COM



19366 ONE ALEXANDRIA NORTH
LA JOLLA, CA

PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

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LA JOLLA, CA

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SCALE:

NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

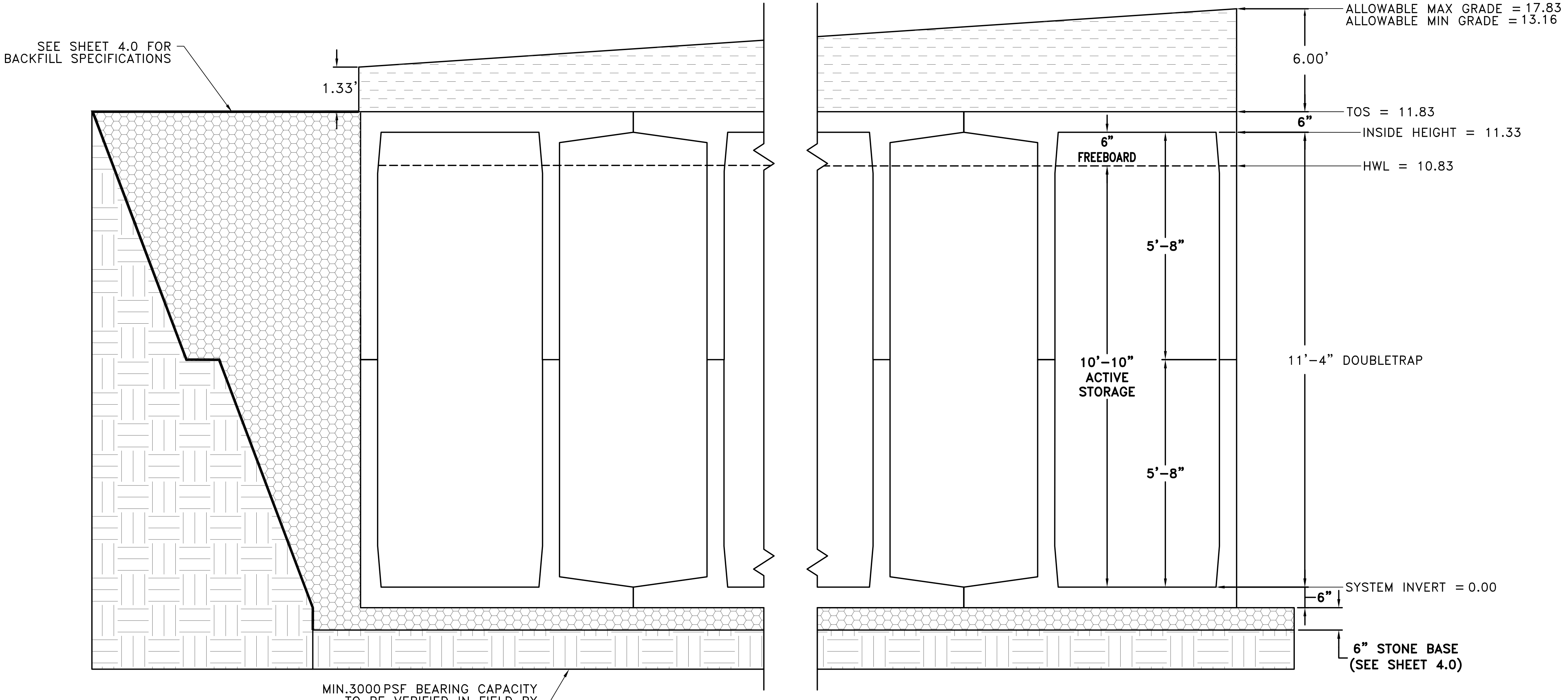
LIVE LOADING:	**AASHTO HS-20 HIGHWAY LOADING**
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	3000PSF
SOIL DENSITY:	120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE:	35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE:	80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE CODES:	ASTM C857 ACI-318
BACKFILL TYPE:	SEE SHEET 4.0 FOR BACKFILL OPTIONS

STORMTRAP SYSTEM INFORMATION

TOTAL WATER STORAGE PROV:	34,006.54 CUBIC FEET
WATER STORAGE PROV: ELEV 0.00 - 10.83	32,505.81 CUBIC FEET
UNIT HEADROOM:	11'-4" DOUBLETRAP
UNIT QUANTITY:	58 TOTAL PIECES

SITE SPECIFIC DESIGN CRITERIA

1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.33' MAX. 6.00' CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL CALCULATIONS THE GROUND WATER TABLE IS ASSUMED TO BE BELOW INVERT OF SYSTEM IF WATER TABLE IS DIFFERENT THAN ASSUMED, CONTACT STORMTRAP.
5. **SYSTEM DESIGN MAY ALLOW FOR INCIDENTAL LEAKAGE AND WILL NOT BE SUBJECT TO LEAKAGE TESTING.**



11'-4" DOUBLETRAP

StormTrap®

PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

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NTS

SHEET TITLE:

DOUBLETRAP
DESIGN
CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
12	I	11'–4" DOUBLETRAP	15900	15698
0	II	11'–4" DOUBLETRAP	0	0
16	III	11'–4" DOUBLETRAP	16254	16153
0	IV	11'–4" DOUBLETRAP	0	0
0	VII	11'–4" DOUBLETRAP	0	0
1	SPIV	11'–4" DOUBLETRAP	VARIES	VARIES
0	T2 PANEL	8" THICK PANEL	0	
4	T4 PANEL	8" THICK PANEL	8171	
0	T7 PANEL	8" THICK PANEL	0	
7	JOINT WRAP	150' PER ROLL		
32	JOINT TAPE	14.5' PER ROLL		

LOADING DISCLAIMER:

STORMTRAP IS NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADINGS FROM NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY.

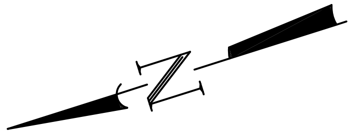
THE STORMTRAP SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT THE ADDITIONAL WEIGHT OF ANY TREES. FURTHERMORE, THE ROOTS OF THE TREES MUST BE CONTAINED TO PREVENT FUTURE DAMAGE TO THE STORMTRAP SYSTEM. STORMTRAP ACCEPTS NO LIABILITY FOR DAMAGES CAUSED BY TREES OR OTHER VEGETATION PLACE AROUND OR ON TOP OF THE SYSTEM.

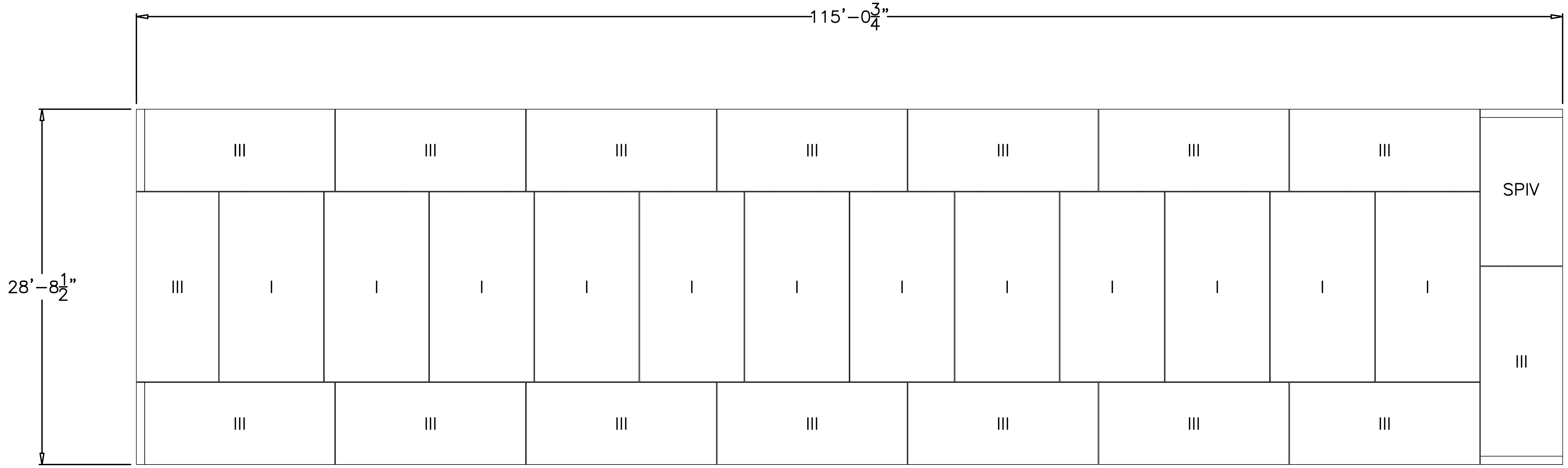
DESIGN CRITERIA

ALLOWABLE MAX GRADE = 17.83
ALLOWABLE MIN GRADE =13.16
INSIDE HEIGHT ELEVATION =11.33
SYSTEM INVERT = 0.00

NOTES:

1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP – INDICATES A MODULE WITH MODIFICATIONS.
5. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.





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SHEET TITLE:

DOUBLETRAP
SYSTEM LAYOUT

SHEET NUMBER:

2.0

STORMTRAP INSTALLATION SPECIFICATIONS

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891, STANDARD FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES, THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS SHALL APPLY:

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES CAN BE PLACED ON A LEVEL, 6" FOUNDATION OF ¾" AGGREGATE EXTENDING 2'-0" PAST THE OUTSIDE OF THE SYSTEM (SEE DETAIL 1) AND SHALL BE PLACED ON PROPERLY COMPACTED SOILS (SEE SHEET 1.0 FOR SOIL BEARING CAPACITY REQUIREMENTS), AND IN ACCORDANCE WITH ASTM C891 STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED ¾" (SEE DETAIL 2). IF THE SPACE EXCEEDS ¾", THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. STORMTRAP MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT STORMTRAP FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION IS TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER.

6. THE PERIMETER HORIZONTAL JOINT BETWEEN THE TOP AND BASE LEG CONNECTION OF THE STORMTRAP MODULES SHALL BE SEALED WITH PREFORMED MASTIC JOINT TAPE ACCORDING TO ASTM C891, 8.8 AND 8.12. (SEE DETAIL 3). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL.

7. ALL EXTERIOR JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 8" WIDE PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 4 & 5). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

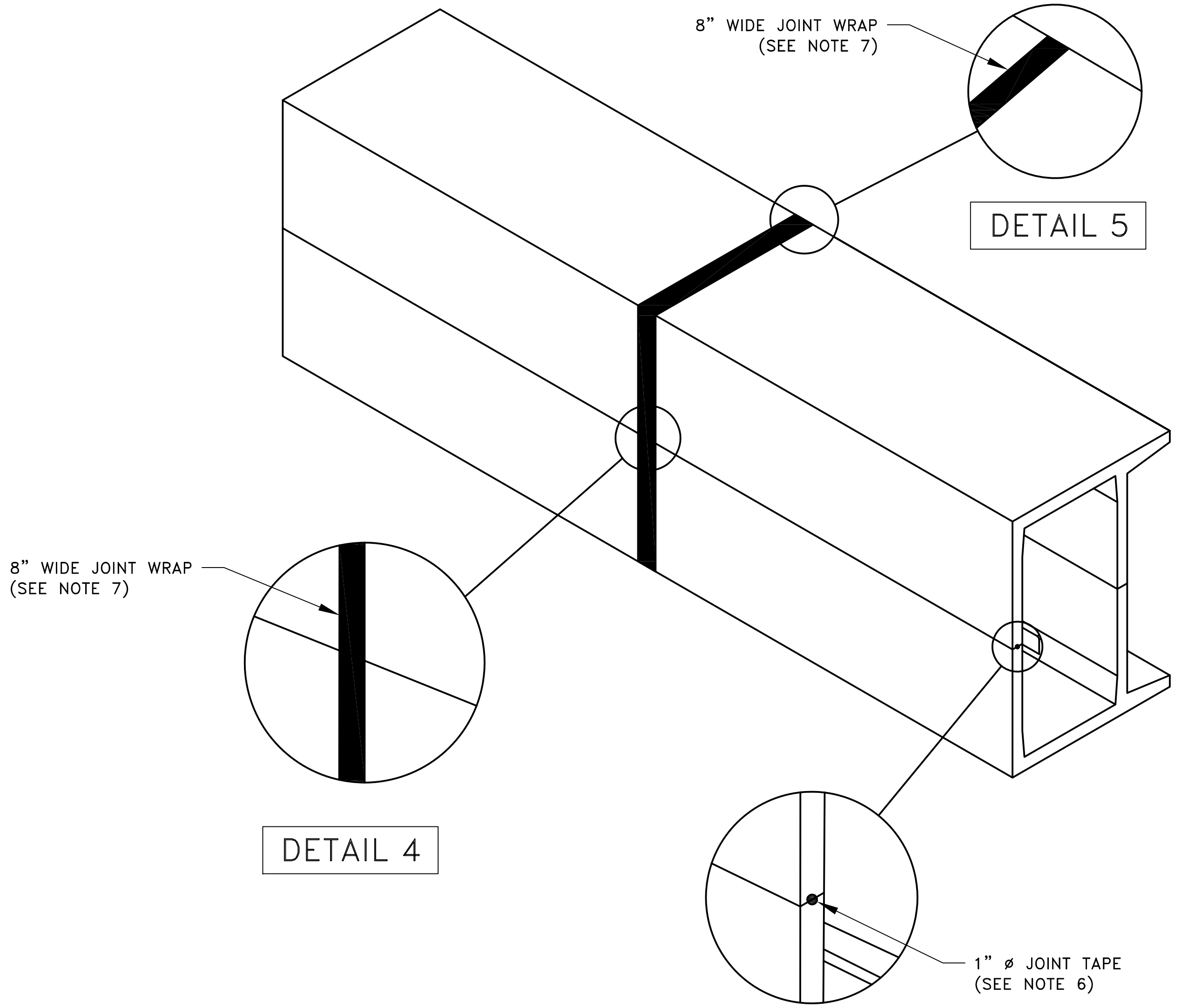
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

8. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

9. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND TO DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

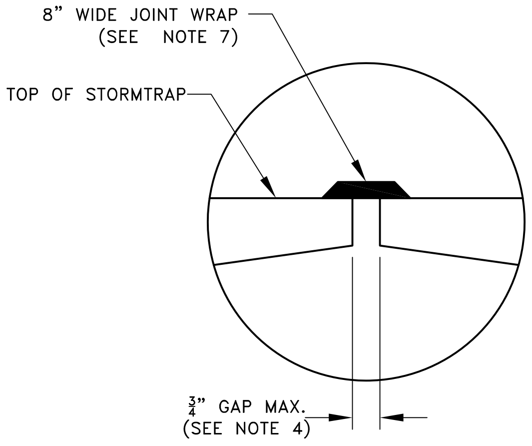
10. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



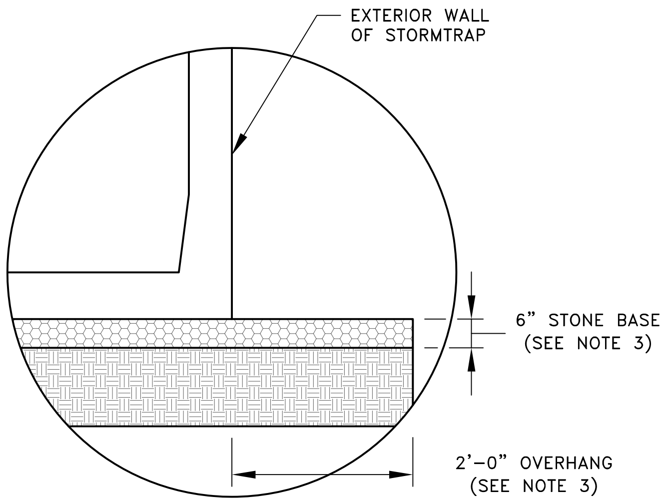
DETAIL 5

DETAIL 4

DETAIL 3



DETAIL 2



DETAIL 1

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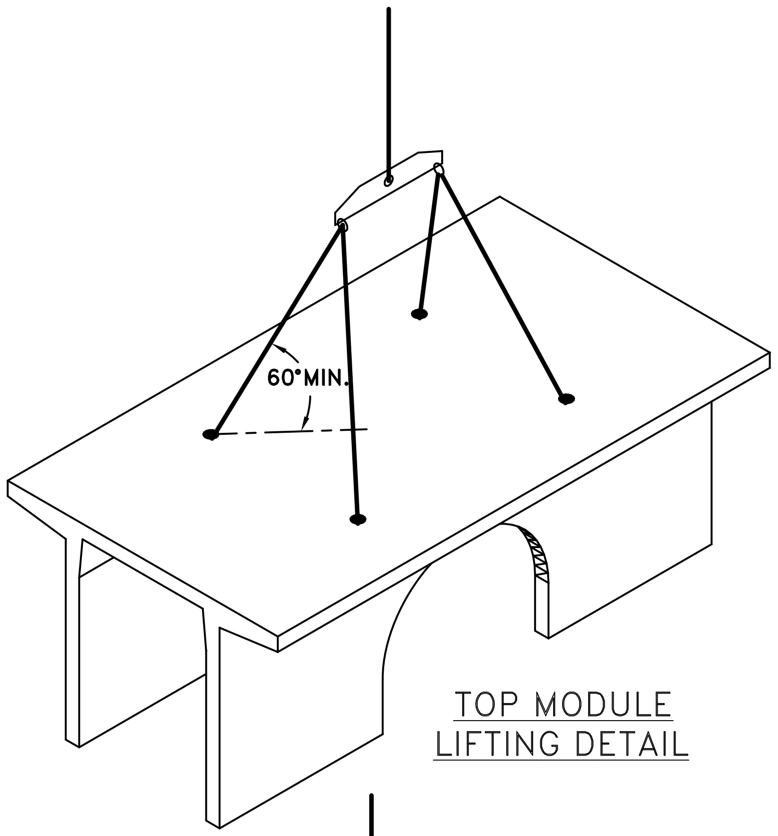
DOUBLETRAP
INSTALLATION
SPECIFICATIONS

SHEET NUMBER:

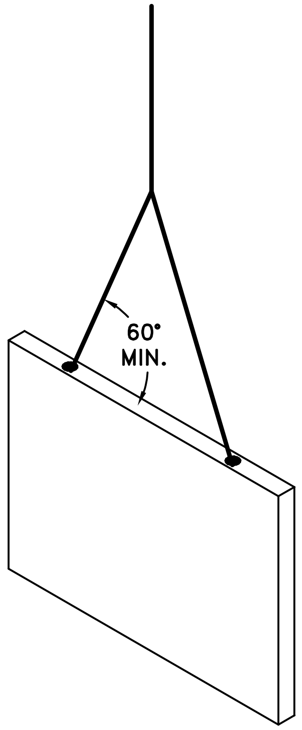
3.0

STORMTRAP MODULE LIFTING INSTALLATION NOTES

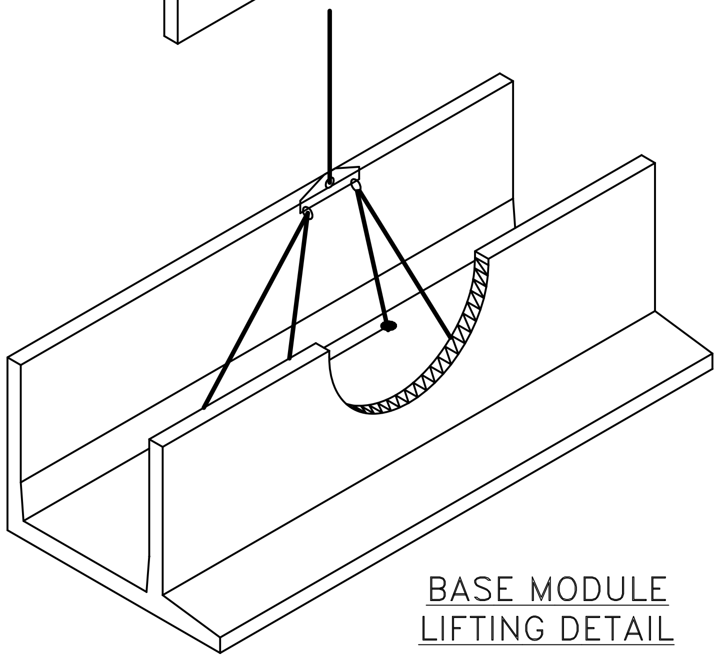
1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL (4) CHAINS/CABLES ARE SECURED PROPERLY TO THE LIFTING ANCHORS AND IN EQUAL TENSION WHEN LIFTING THE STORMTRAP MODULE (SEE RECOMMENDATIONS 2 & 3).
2. MINIMUM 7'-0" CHAIN/CABLE LENGTH TO BE USED TO LIFT STORMTRAP MODULES (SUPPLIED BY CONTRACTOR).
3. CONTRACTOR TO ENSURE MINIMUM LIFTING ANGLE IS 60° FROM TOP SURFACE OF STORMTRAP MODULE. SEE DETAIL.



TOP MODULE
LIFTING DETAIL



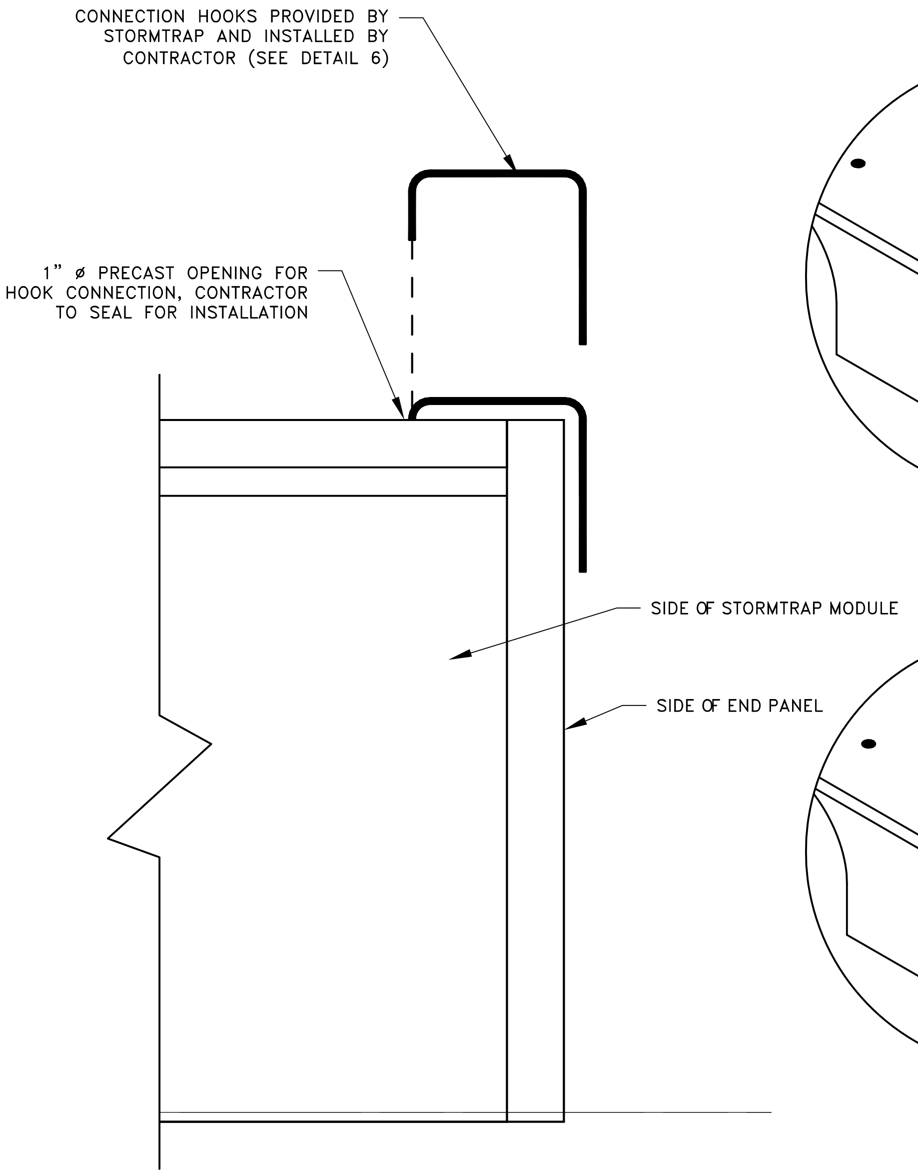
END PANEL
LIFTING DETAIL



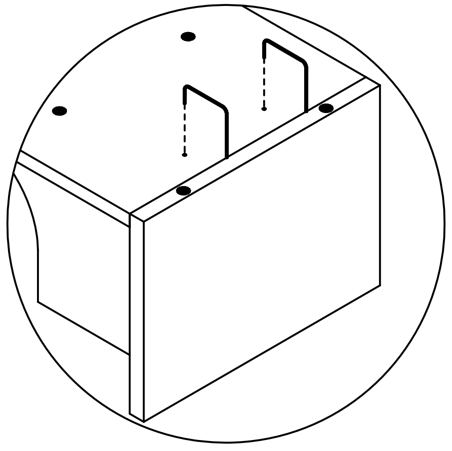
BASE MODULE
LIFTING DETAIL

END PANEL ERECTION/INSTALLATION NOTES

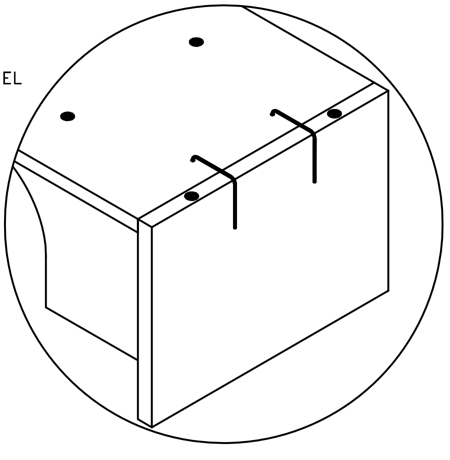
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOK IS ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



PANEL CONNECTION
ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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DOUBLETRAP
INSTALLATION
SPECIFICATIONS

SHEET NUMBER:

3.1

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 ($\frac{3}{4}$") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1690 psf
	18"	56.1	1219 psf
	24"	68.1	1111 psf
	30"	76.7	1000 psf
	36"	85.0	924 psf

NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
$\frac{3}{4}$" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF CLEAN AND FREE DRAINING ANGULAR MATERIAL. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL (ASTM SIZE #57) AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
SAND	IMPORTED PURE SAND IS PERMITTED TO BE USED AS BACKFILL IF IT IS CLEAN AND FREE DRAINING. THE SAND USED FOR BACKFILLING SHALL HAVE LESS THAN 40% PASSING #40 SIEVE AND LESS THAN 5% PASSING #200 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE SAND BACKFILL.
CRUSHED CONCRETE AGGREGATE	CLEAN, FREE DRAINING CRUSHED CONCRETE AGGREGATE MATERIAL CAN BE USED AS BACKFILL FOR STORMTRAP'S MODULES. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL.
ROAD PACK	STONE AGGREGATE 100% PASSING THE 1-1/2" SIEVE WITH LESS THAN 12% PASSING THE #200 SIEVE (ASTM SIZE #467). GEOFABRIC AS PER GEOTECHNICAL ENGINEER RECOMMENDATION.

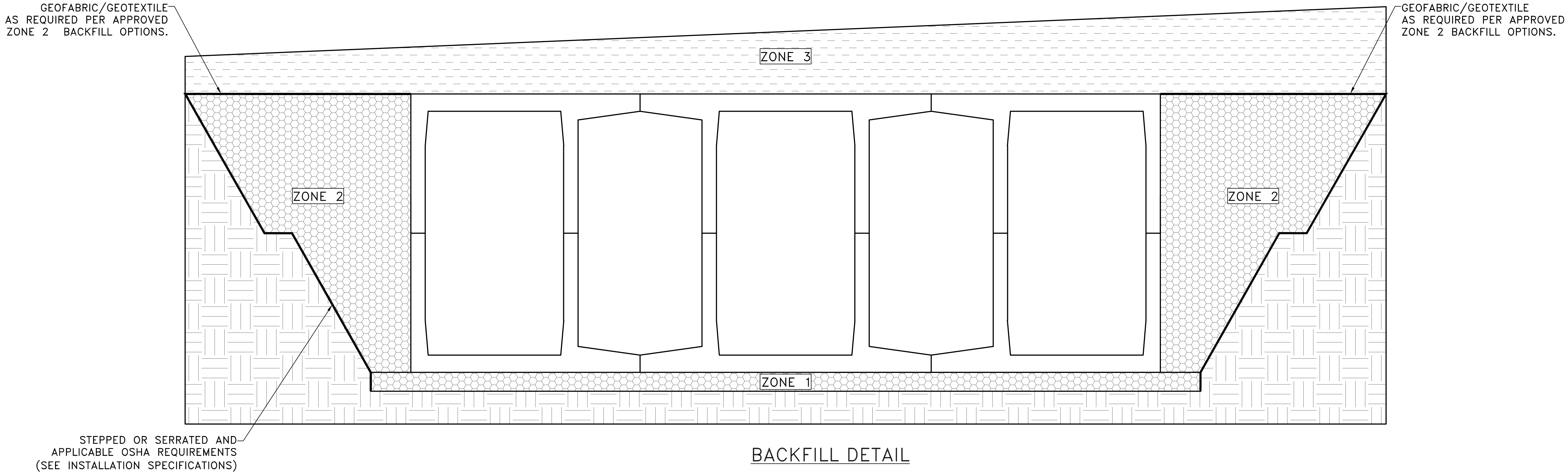
STORMTRAP ZONE INSTALLATION SPECIFICATIONS/PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MUST BE FREE-DRAINING MATERIAL. SEE ZONE 2 BACKFILL CHART ON THIS PAGE FOR APPROVED BACKFILL OPTIONS. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED (PROVIDED BY OTHERS).

2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.

3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING. SEE CHART FOR TRACKED VEHICLE WIDTH AND ALLOWABLE MAXIMUM PRESSURE PER TRACK.

4. STONE AGGREGATE FOUNDATION IN ZONE 1 IS RECOMMENDED FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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SHEET TITLE:

DOUBLETRAP
BACKFILL
SPECIFICATIONS

SHEET NUMBER:

4.0

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'-0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'-0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'-0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.
2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3-PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'-0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED AT A DISTANCE BETWEEN 10" MIN AND 14" MAX BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.
3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.
4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.
5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE SECTIONS. (PROVIDED BY OTHERS)

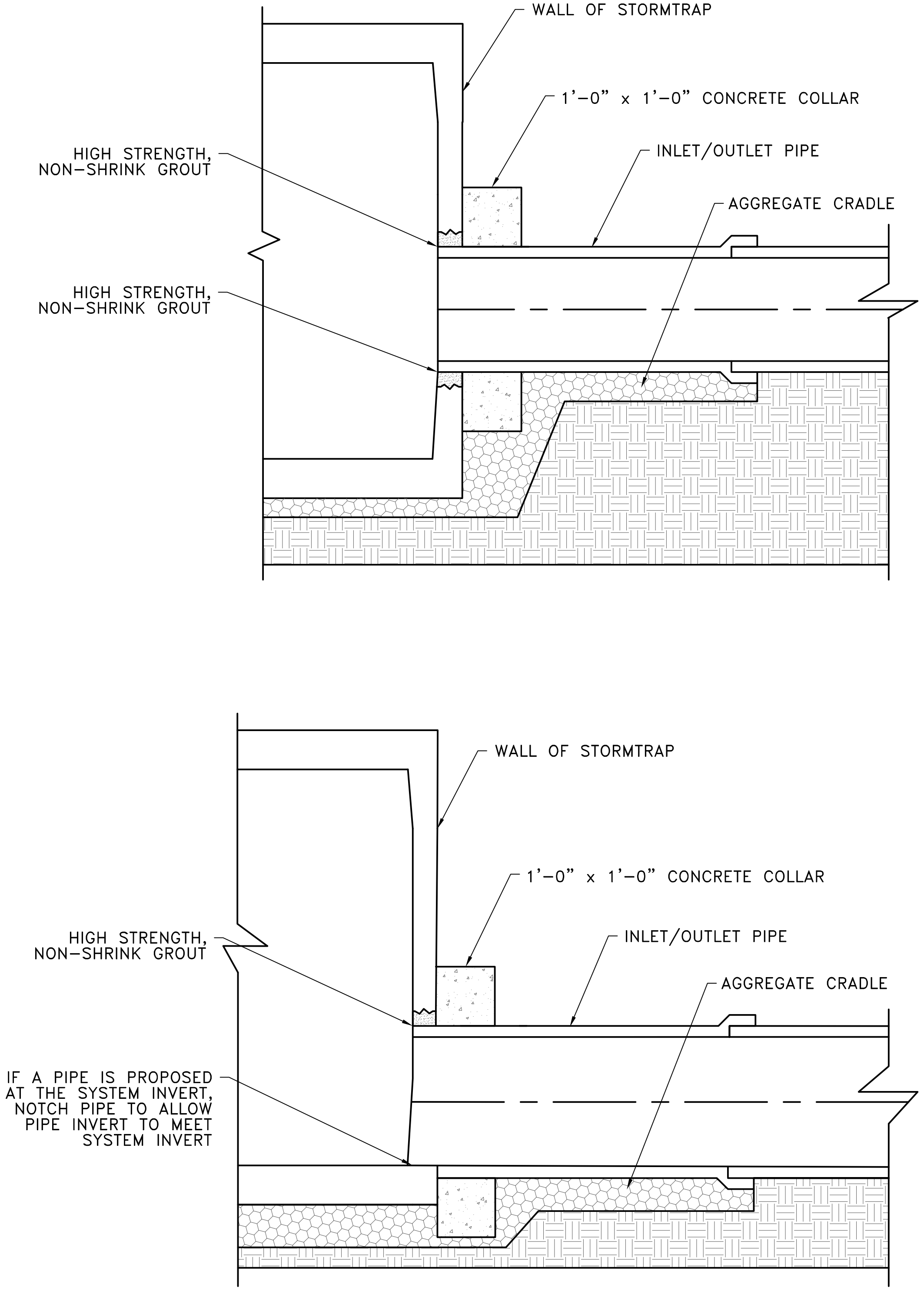
RECOMMENDED PIPE OPENING SPECIFICATION

1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'-0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON-SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.
4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON-SHRINK GROUT.

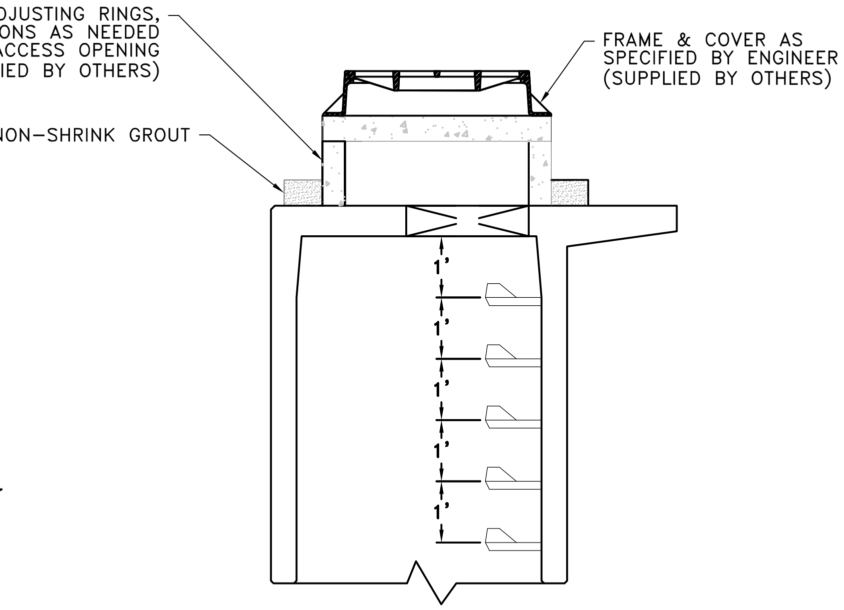
RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

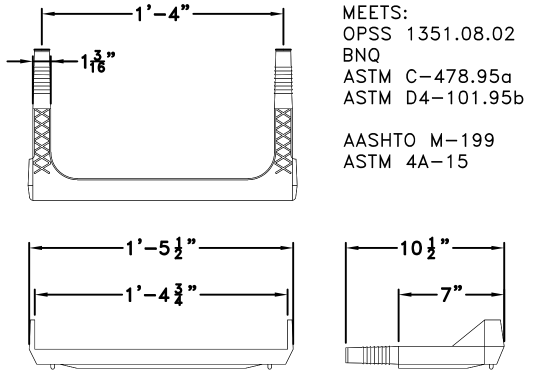
NOTE: ALL ANCILLARY PRODUCTS/SPECIFICATIONS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR AND/OR PER LOCAL MUNICIPAL CODE/REQUIREMENTS.



PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



MEETS:
OPSS 1351.08.02
BNQ
ASTM C-478.95a
ASTM D4-101.95b

AASHTO M-199
ASTM 4A-15

STEP DETAIL

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RECOMMENDED
PIPE / ACCESS
OPENING
SPECIFICATIONS

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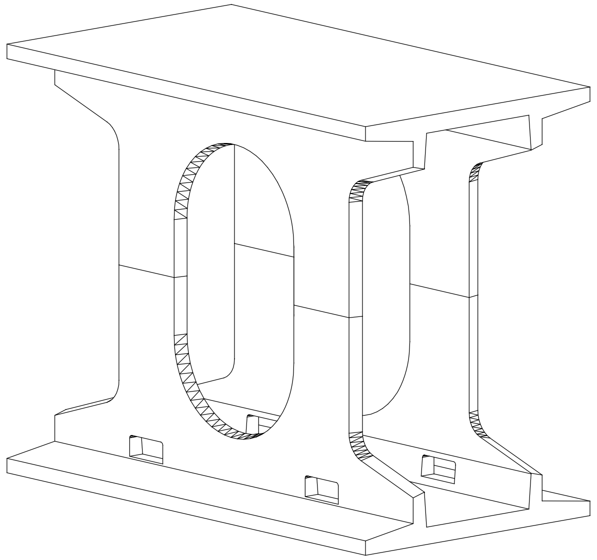
5.0



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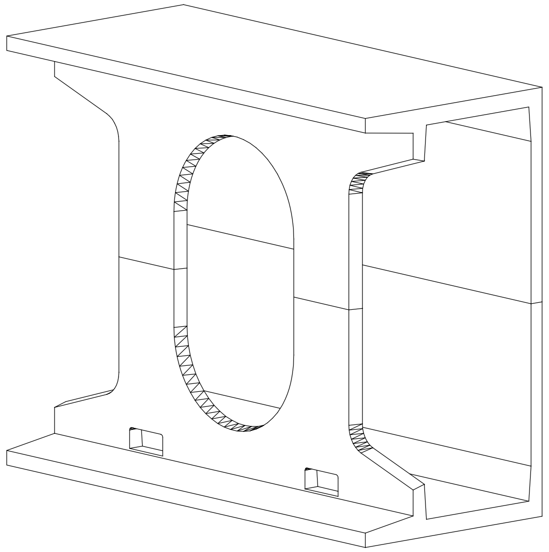

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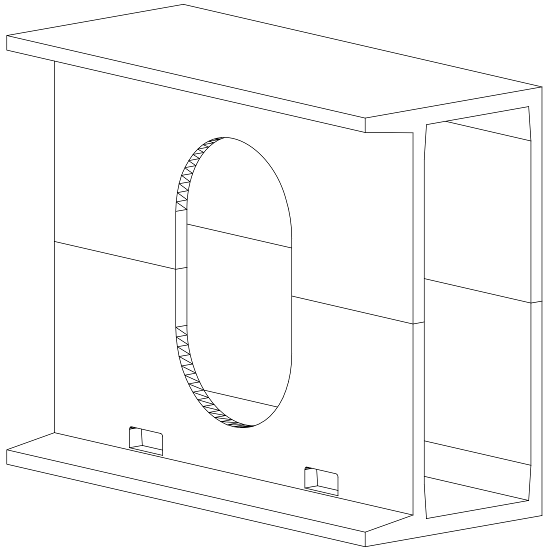

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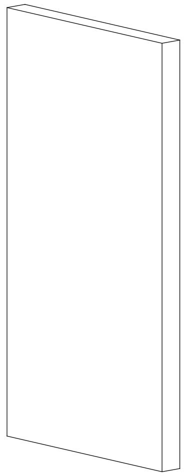

TYPE IV
END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP – INDICATES A MODULE WITH MODIFICATIONS.
3. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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DOUBLETRAP
MODULE TYPES

SHEET NUMBER:

6.0

Attachment 5
Drainage Report

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

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DRAINAGE STUDY
FOR
ONE ALEXANDRIA NORTH

(PRELIMINARY ENGINEERING)

Job Number 19366

June 22, 2021
Revised: September 10, 2021
Revised: November 5, 2021

RICK
ENGINEERING COMPANY

DRAINAGE STUDY

FOR

ONE ALEXANDRIA NORTH

(PRELIMINARY ENGINEERING)

Job Number 19366

Brendan Hastie, P.E.
R.C.E. #65809
Exp. 09/23

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June 22, 2021
Revised: September 10, 2021
Revised: November 5, 2021

Table of Contents

Figures

Tables

Appendices

Map Pockets

DRAINAGE STUDY
FOR
ONE ALEXANDRIA NORTH
REVISION PAGE
November 5, 2021

This Drainage Study presents a revision to the September 10 study pursuant to first LDR-Engineering review comments from the City of San Diego. The following text is the City of San Diego's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's responses.

1st Review – 08/20/2021 (uncleared comments)

10. *Please note, property to the east is owned by the State of California and no additional runoff can be proposed at these locations (POI 2 and 3, drainage study)*

    Detention will be provided upstream of POI 2 within BMP 2A to reduce peak runoff to at or below existing conditions. Grading has been adjusted in Basin 300 to match pre and post areas. Updated hydrology shows that runoff will not increase at POI 3. Refer to appendix E for Detention calculations and Appendix B for detained peak runoff rational method calculations. The updated peak flows are shown on the Post Project Drainage exhibits and listed in the narrative of the Drainage Report.

Drainage Report – 1st Review (uncleared Comments)

32. *Please refer to previous drainage related comments #10-12. Please revise design to reduce or maintain existing drainage discharge values on site for next submittal. Property cannot increase drainage discharge onto eastern property (State of California Property). Please redesign for next submittal.*

    Comment Noted. See response to comment 10. Detention will be provided within BMP2A and grading has been updated in Basin 300 to match pre and post area.

2nd Review – 10/07/2021 (New Issue Comments)

39. *All unchecked comments from the previous review are still standing and need to be addressed.*

    Comment noted. See responses above.

40. *Drainage - Please revise drainage exhibit and report narrative to show and call out proposed mitigated flows.*

    Proposed Mitigated flows have been added to the post project drainage map at POI 2. Detention is not required for POI 1 and 3.

The report has also been revised to reflect the latest site layout and all relevant calculations have been updated.

DRAINAGE STUDY
FOR
ONE ALEXANDRIA NORTH
REVISION PAGE
September 10, 2021

This Drainage Study presents a revision to the June 22, 2021, study pursuant to first LDR-Engineering review comments from the City of San Diego. The following text is the City of San Diego's plan check comments (in italicized lettering), immediately followed by Rick Engineering Company's responses.

11. *The Please note, property to the east is owned by the State of California and no additional runoff can be proposed at these locations (POI 2 and 3, drainage study). (New Issue)*

    Comment noted. A slight increase in area is observed from pre project to post project at POI-3, from 1.3 acres to 1.4 acres, respectively. This increase in acreage (0.1 acres) has resulted in a 0.2 CFS increase in the post-project peak flow compared to the pre-project peak flow and is considered negligible. Preliminary detention calculations have been included in Appendix D for the proposed StormTrap vault unit, which shows a reduction in peak flows at POI-2. Detailed stage-storage, stage-discharge and outlet work sizes will be provided during Final Engineering for all facilities.

32. *Please refer to previous drainage related comments #10-12. Please revise drainage design to reduce or maintain existing drainage discharge values on site for next submittal. Property cannot increase drainage discharge onto eastern property (State of California Property). Please redesign for next submittal. (New Issue)*

    Please see response to comment 10.

The report has also been revised to reflect the latest site layout and all relevant calculations have been updated.

1.0 INTRODUCTION

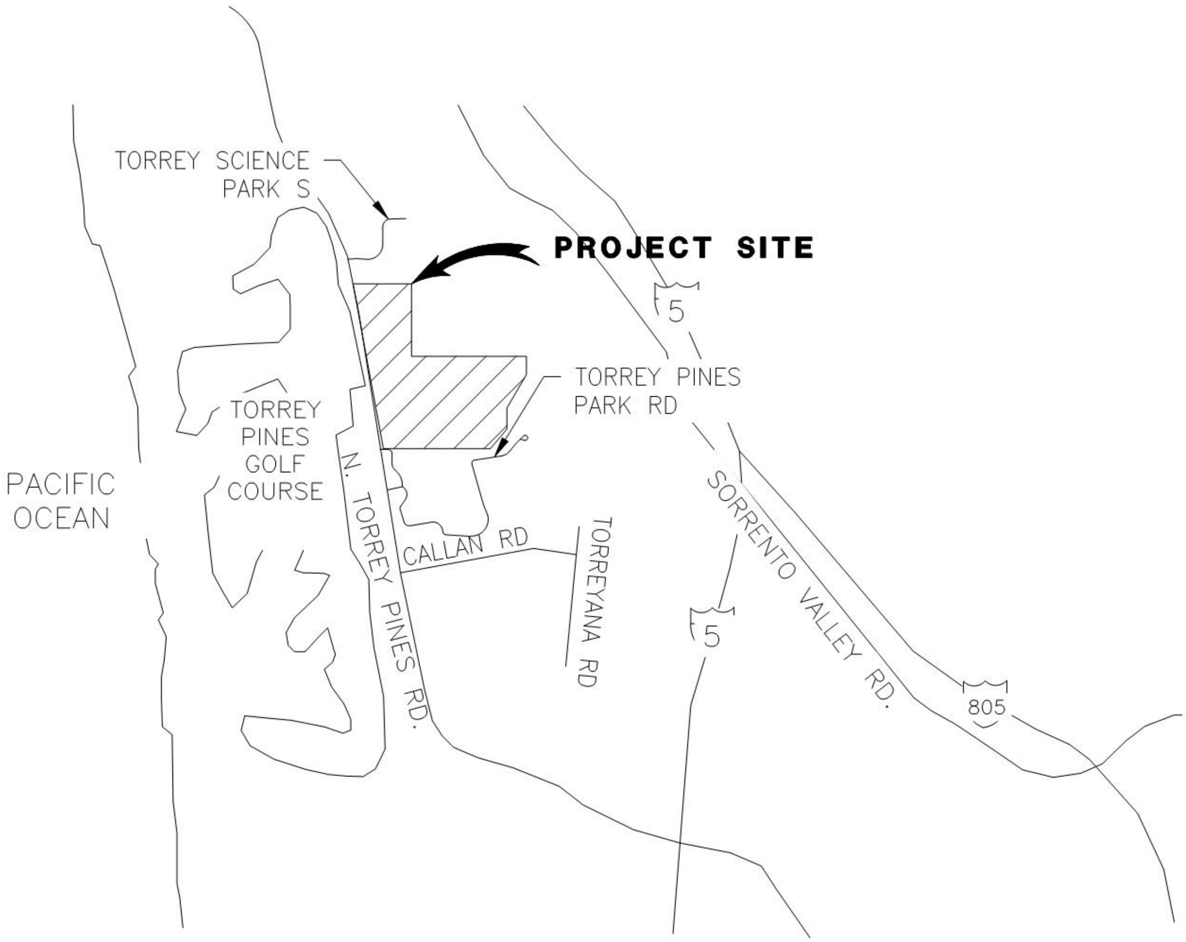
1.1 Project Description

This design report summarizes hydrologic and hydraulic analyses for the proposed One Alexandria North (OAN) Project (herein referred to as the "project"). The project is spread across two parcels within the City of San Diego. The northern parcel is located at 11355 North Torrey Pines Road, La Jolla, California 92037. The southern parcel is located at 11255 North Torrey Pines Road, La Jolla, California 92037. For the location of the project, please refer to the Vicinity Map in Figure 1, at the end of Section 1.0. The proposed redevelopment encompasses approximately 11.4 acres and consists of two (2) new 3-story research and development office buildings, one (1) parking garage structure, several parking lots, an amenity building, and event spaces and decks.

1.2 Water Quality

The project will include Low Impact Development (LID) Site Design, Source Control, Pollutant Control and Hydromodification Management Best Management Practices (BMPs), designed pursuant to the guidelines of the City of San Diego Storm Water Standards, dated October 1, 2018 (herein referred to as the "Storm Water Standards") to achieve water quality treatment and hydromodification management. Please refer to the report titled, "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP): One Alexandria North," dated November 05, 2021 (or any revisions thereafter), prepared by Rick Engineering Company (Job No. 19366), for more information on storm water quality requirements and post-construction BMPs.

Figure 1: Vicinity Map



2.0 HYDROLOGY

Hydrologic conditions for the project area have been analyzed for both pre-project and post-project conditions.

2.1 Methodology

The City of San Diego Drainage Design Manual dated January 2017 requires that the Rational Method be used for hydrologic analysis of a watershed up to but not exceeding 1.0 square-mile (640 acres). The Rational Method computer program developed by Advanced Engineering Software (AES 2003) was used for this study because it satisfies the City of San Diego's design criteria.

2.2 AES Rational Method Computer Model

The AES hydrologic model is developed by creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points. The AES program has the capability to perform calculations for 15 hydrologic processes. These processes are assigned code numbers that appear in the results. The code numbers and their significance are as follows:

Subarea Hydrologic Processes (Codes)

Code 1: Confluence analysis at node
Code 2: Initial subarea analysis
Code 3: Pipe flow travel time (computer-estimate pipe sizes)
Code 4: Pipe flow travel time (user-specified pipe size)
Code 5: Trapezoidal channel travel time
Code 6: Street flow analysis through a subarea
Code 7: User-specified information at a node
Code 8: Addition of the subarea runoff to mainline
Code 9: V-Gutter flow through subarea

Code 10:	Copy mainstream data onto memory bank
Code 11:	Confluence a memory bank with the mainstream memory
Code 12:	Clear a memory bank
Code 13:	Clear the mainstream memory
Code 14:	Copy a memory bank onto the mainstream memory
Code 15:	Hydrologic data bank storage functions

To perform the hydrologic analysis; base information for the study area is required. This information includes the existing drainage facility locations and sizes, existing land uses, flow patterns, drainage basin boundaries, and topographic elevations. Drainage basin boundaries, flow patterns, and topographic elevations are shown on the drainage exhibits located in the map pockets.

2.3 Design Criteria

The hydrologic conditions were analyzed in accordance with the City of San Diego's design criteria as follows:

Design Storm:	100-year
Runoff Coefficients (1):	
Asphalt/Concrete	C = 0.95
Undisturbed, Natural Terrain	C = 0.45
Soil Type:	D
Rainfall Intensity:	Based on time-intensity criteria per City of San Diego

(1) Weighted runoff coefficients were calculated as required in in Section A.1.2 - Runoff Coefficient of the City of San Diego Drainage Design Manual (January 2017)

2.4 Hydrologic Results

The results of the Modified Rational Method analysis for the pre- and post-project are provided in Appendix A and B of this report, respectively. Please refer to Appendix C for the weighted runoff coefficient backup calculations. Please refer to Map pocket 1 and Map Pocket 2 for the drainage area boundaries, nodes, and areas used in the Modified Rational Method analysis for pre-project and post-project conditions, respectively. A summary of the hydrologic results is provided below in Table 1.

Table 1: Summary of Hydrologic Results

Points of Interest (POI)/ Node Number	**Pre-Project**			**Post-Project Un-detained**			**Post-Project Detained**		
	Area (acres)	**Tc (minutes)**	**Peak Flow, Q_{100} (cfs)**	**Area (acres)**	**Tc (minutes)**	**Peak Flow, Q_{100} (cfs)**	**Area (acres)**	**Tc (minutes)**	**Peak Flow, Q_{100} (cfs)**
POI-1 (Node 110)	2.5	8.5	7.3	2.5	9.3	7.4	N/A		
POI-2 (Node 220)	8.4	8.2	20.7	8.4	8.5	22.9	8.4	14.5	10.3
POI-3 (Node 310)	0.5	6.0	1.2	0.5	5.9	1.2	N/A		

Pre-Project Condition

The onsite area is approximately 11.4 acres. In the pre-project condition, the project has three (3) major drainage basins namely, Basin 100, 200 and 300. Basin 100 encompasses the northerly portion (approximately 2.5 acres) of the project site and generally flows east. Basin 1 has an existing on-site inlet and storm drain network that confluences at POI-1 (Node 110) by the eastern perimeter of the site and ultimately outfalls further downstream to an unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Basin 200 encompasses the southerly portion (approximately 8.4 acres) of the project site and generally flows east. Like Basin 100, Basin 200 has an existing on-site inlet and storm drain network that confluences at POI-2 (Node 220) by the eastern perimeter of the site and ultimately outfalls further downstream to a different unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Basin 300 encompasses approximately 0.5 acres and lies just north of Basin 200 in the southern parcel of the project. Runoff generally sheet flows along the slope and gets intercepted by a brow ditch that conveys to a Type F Catch Basin at POI-3 (Node 310) at the eastern perimeter of the site. The Type F Catch Basin outfalls further downstream to an unnamed canyon east of the site. This canyon is tributary to Soledad Canyon and ultimately drains to the Pacific Ocean through Los Penasquitos Creek.

Post-Project Condition

In the post-project condition, the drainage characteristics will remain like the pre-project condition. However, the percentage imperviousness between pre- and post-project for Basin 100 is approximately 66% and 71%, respectively. The increase in percent imperviousness results in a 0.1 CFS increase in the post-project peak flow compared to pre-project peak flow and is considered negligible.

The percentage imperviousness between pre- and post-project for Basin 200 is approximately 39% and 56%, respectively. The increase in percent imperviousness results in a 2.2 CFS increase in the post-project peak flow compared to pre-project peak flow. Hence, the project proposes detention for the 100-year 6-hour storm event via an underground detention vault, BMP 2A, in Basin 200 to attenuate the peak flow back to pre-project condition. Preliminary detention sizing was done using Hec1.

Drainage boundaries in Basin 300 will be preserved and land use will remain unchanged. The area of the basin is 0.5 acres and impervious cover is approximately 25%. No increase in peak flow is expected as result of the project.

The project does not propose to impact any jurisdiction water, or wetlands. As such, it is anticipated that the project will not be subject to requirements under the Federal Clean Water Act (CWA) Section 401 or 404.

3.0 HYDRAULICS

3.1 Hydraulic Methodology and Criteria

The 100-year pre-project and post-project peak flow rates determined using the Modified Rational Method were used to evaluate the potential impacts to existing storm drain system due to the project improvements. The 100-year post-project peak flow rates were also used to size the onsite storm drain system.

3.2 Storm Drain Sizing

Pipe sizes were evaluated using Manning's equation:

$Q= (1.486/n)\ A\ R^{2/3}\ S^{1/2}$

Where:

Q = discharge (cfs)

n = Manning coefficient of roughness

A = Cross-sectional Area of flow (sq. ft.)

R = Hydraulic radius (ft.) = A/WP (WP = Wetted Perimeter)

S = Slope of pipe (ft./ft.)

The Manning's roughness coefficient "n" used for the hydraulic calculations for RCP and PVC pipes is 0.013.

3.3 Storm Drain Evaluation Results

Normal depth hydraulic calculations were performed to size the onsite storm drains. The pipe sizes were evaluated based on the AES rational method peak flow rates with a 30% bump up sizing factor and an assumed minimum pipe slope of 0.5%. A summary of the performed normal depth hydraulic analyses is provided in Appendix D in the form of a sizing matrix table.

4.0 DETENTION ANALYSES

Detention is provided within BMP 2A to bring the undetained 100-year peak discharge below or equal to pre-project conditions at POI 2. The detention analysis calculates the flow attenuation provided by the BMP. Results from the HEC-1 detention analysis was then used to create a new detained rational method AES run to demonstrate mitigation has been met at POI 2.

The sizing of a detention facility requires an inflow hydrograph. As the modified rational method only yields a peak discharge and time of concentration a hydrograph synthesizing procedure was used based on the 100-yr 6-hr storm precipitation, basin runoff coefficient, peak flow, and time of concentration. The hydrograph has 2/3 of the volume before the peak flow and 1/3 of the volume after the peak.

The 100-year hydrographs and preliminary elevation-storage-outflow rating curves were used in the HEC-1 to perform routing calculations for the storage vault, and to determine the preliminary 100-year detention volumes required for the vault to reduce the post-project peak discharge rate back to the pre-project peak discharge rate.

Based on the mitigated post-developed results, the proposed vault provides storage that reduces peak flows out of BMP 2A from 20.5 CFS to 8.3 CFS at Node 230 and 22.9 CFS to 10.3 CFS at POI 2. Refer to Appendix E for preliminary detention calculations and results.

5.0 CONCLUSION

This drainage report presents the hydrologic and hydraulic calculations in support of the One Alexandria North project. The 100-year pre- and post-project condition hydrologic analyses have been performed for the total tributary area to three (3) points of interests. The 100-year post-project peak flow rates were utilized to size the proposed drainage system. The peak discharge rates were determined using the Modified Rational Method based on the hydrologic methodology and criteria described in the City of San Diego, Drainage Design Manual January 2017 edition.

The project in general has been designed to improve the collection and conveyance of storm water runoff. The difference in the pre- and post-project 100-year peak flow is equal to 0.1 CFS for Basin 100 and this is considered negligible. The project proposes detention within BMP 2A for the 100-year, 6-hour storm event in Basin 200 so that the post-project peak flows are mitigated below pre-project conditions. Preliminary Detention calculations have been included for the TM submittal; detailed detention analysis will be included in final engineering. The project is not anticipated to result in any adverse impacts to downstream drainage facilities or adjacent properties. Normal Depth hydraulic calculations were performed to size the onsite storm drain system.

Post-project runoff will be treated via a network of storm water management features, designed pursuant to the guidelines of the City of San Diego Storm Water Standards, dated October 1, 2018. Please refer to the report titled, "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP): One Alexandria North," dated November 5, 2021 (or any revisions thereafter), prepared by Rick Engineering Company (Job No. 19366), for more information on storm water quality requirements and post-construction BMPs.

APPENDIX A

Modified Rational Method Analyses (100-year, 6-hour)
[Pre-Project]

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****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2012 Advanced Engineering Software (aes)
             Ver. 18.2 Release Date: 05/08/2012  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                               5620 Friars Rd
                            San Diego CA  92110
                       619-291-0707  Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY ***************************
* JN-19366    ONE ALEXANDRIA NORTH                                         *
* 100-YR 6-HR                                                              *
* BASIN 100     PRE-PROJECT                                                *
 ***************************************************************************

  FILE NAME: AN100E00.RAT
  TIME/DATE OF STUDY: 22:14 06/17/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  2   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
  3   13.0      8.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    437.50
  DOWNSTREAM ELEVATION(FEET) =    433.50
  ELEVATION DIFFERENCE(FEET) =      4.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.082
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.384
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  433.50  DOWNSTREAM ELEVATION(FEET) =  432.00
  STREET LENGTH(FEET) =   133.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 13.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.66
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.87
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.45
  STREET FLOW TRAVEL TIME(MIN.) =   1.19   Tc(MIN.) =    6.27
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.159
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    0.40      SUBAREA RUNOFF(CFS) =    1.25
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.59
  FLOW VELOCITY(FEET/SEC.) =  2.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.57
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   428.00  DOWNSTREAM(FEET) =   426.00
  FLOW LENGTH(FEET) =    87.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.43
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    6.54
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.108
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6871
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.56
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.98
  TC(MIN.) =    6.54

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   426.00  DOWNSTREAM(FEET) =   423.00
  FLOW LENGTH(FEET) =   308.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.98
  PIPE TRAVEL TIME(MIN.) =   1.18    Tc(MIN.) =    7.72
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     592.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.884
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7069
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.70
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       3.57
  TC(MIN.) =    7.72

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   423.00  DOWNSTREAM(FEET) =   421.00
  FLOW LENGTH(FEET) =   227.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.57
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =    8.48
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     819.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.738
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6727
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.34
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       3.77
  TC(MIN.) =    8.48

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.738
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7691
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    2.84
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       6.61
  TC(MIN.) =    8.48

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.738
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7764
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       7.26
  TC(MIN.) =    8.48
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      8.48
  PEAK FLOW RATE(CFS)   =       7.26
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2012 Advanced Engineering Software (aes)
             Ver. 18.2 Release Date: 05/08/2012  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                               5620 Friars Rd
                            San Diego CA  92110
                       619-291-0707  Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366      ONE ALEXANDRIA NORTH                                       *
* 100-YR 6-HR                                                              *
* BASIN 200       PRE-PROJECT                                              *
 **************************************************************************

  FILE NAME: AN200E00.RAT
  TIME/DATE OF STUDY: 22:38 06/17/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  2   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
  3   24.0     19.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  426.00  DOWNSTREAM ELEVATION(FEET) =  410.00
  STREET LENGTH(FEET) =   282.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    6.61
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.55
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   1.32   Tc(MIN.) =    6.32
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.149
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.735
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    3.03
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   8.60
  FLOW VELOCITY(FEET/SEC.) =  4.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     282.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   406.00  DOWNSTREAM(FEET) =   395.00
  FLOW LENGTH(FEET) =   194.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.50
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.35
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    6.66
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     476.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.084
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6433
  SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    1.43
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.73
  TC(MIN.) =    6.66

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    208.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   393.00
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.73
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    6.97
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     598.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.026
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7035
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    1.85
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       6.51
  TC(MIN.) =    6.97

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    209.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   393.00  DOWNSTREAM(FEET) =   360.00
  FLOW LENGTH(FEET) =   104.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.20
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.51
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    209.00 =     702.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    359.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    92.00   CHANNEL SLOPE =  0.0109
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  12.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.858
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.90
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   0.81
  Tc(MIN.) =    7.85
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    1.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.663
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       7.42

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.92
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     794.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    359.00  DOWNSTREAM(FEET) =    355.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    98.00   CHANNEL SLOPE =  0.0408
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.823
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.90
  AVERAGE FLOW DEPTH(FEET) =   0.65   TRAVEL TIME(MIN.) =   0.18
  Tc(MIN.) =    8.04
  SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.34
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.650
  TOTAL AREA(ACRES) =        3.1         PEAK FLOW RATE(CFS) =       7.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.66   FLOW VELOCITY(FEET/SEC.) =   8.86
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =     892.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.04
  RAINFALL INTENSITY(INCH/HR) =   3.82
  TOTAL STREAM AREA(ACRES) =     3.10
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.70

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    252.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    91.00
  UPSTREAM ELEVATION(FEET) =    436.00
  DOWNSTREAM ELEVATION(FEET) =    429.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.654
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.276
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    254.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  429.00  DOWNSTREAM ELEVATION(FEET) =  419.00
  STREET LENGTH(FEET) =   333.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.19
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.33
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   1.66   Tc(MIN.) =    7.32
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.959
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.601
```

```
  SUBAREA AREA(ACRES) =    1.60      SUBAREA RUNOFF(CFS) =    3.86
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       4.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.71
  FLOW VELOCITY(FEET/SEC.) =  3.81   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    254.00 =     424.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    254.00 TO NODE    256.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   415.00  DOWNSTREAM(FEET) =   401.00
  FLOW LENGTH(FEET) =   332.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.04
  PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =    7.93
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =     756.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.843
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6707
  SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    3.04
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =       6.96
  TC(MIN.) =    7.93

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.843
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6870
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.75
  TOTAL AREA(ACRES) =        3.3   TOTAL RUNOFF(CFS) =       8.71
```

```
  TC(MIN.) =    7.93

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.843
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7089
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       9.81
  TC(MIN.) =    7.93

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    258.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   401.00  DOWNSTREAM(FEET) =   383.00
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.15
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.81
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    8.15
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    258.00 =     956.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.801
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6840
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      10.40
  TC(MIN.) =    8.15

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.801
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6977
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.00
  TOTAL AREA(ACRES) =        4.3   TOTAL RUNOFF(CFS) =      11.40
  TC(MIN.) =    8.15

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   383.00  DOWNSTREAM(FEET) =   355.00
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.73
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.40
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    220.00 =    1046.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.789
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6509
  SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    1.71
  TOTAL AREA(ACRES) =        5.3   TOTAL RUNOFF(CFS) =      13.07
  TC(MIN.) =    8.21

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.21
  RAINFALL INTENSITY(INCH/HR) =   3.79
```

```
  TOTAL STREAM AREA(ACRES) =     5.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.70     8.04        3.823          3.10
      2       13.07     8.21        3.789          5.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       20.49     8.04       3.823
      2       20.71     8.21       3.789

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.71   Tc(MIN.) =    8.21
  TOTAL AREA(ACRES) =        8.4
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    220.00 =    1046.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.4  TC(MIN.) =      8.21
  PEAK FLOW RATE(CFS)   =      20.71
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************

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             Ver. 18.2 Release Date: 05/08/2012  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                               5620 Friars Rd
                            San Diego CA  92110
                       619-291-0707  Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366    ONE ALEXANDRIA NORTH                                         *
* 100-YR 6-HR                                                              *
* BASIN 300     PRE-PROJECT                                                *
 **************************************************************************

  FILE NAME: AN300E00.RAT
  TIME/DATE OF STUDY: 22:59 06/17/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  2   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
  3   13.0      8.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    305.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    310.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    368.00  DOWNSTREAM(FEET) =    357.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   277.00   CHANNEL SLOPE =  0.0397
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.218
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.83
  AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   0.96
  Tc(MIN.) =    5.96
  SUBAREA AREA(ACRES) =     0.40       SUBAREA RUNOFF(CFS) =    1.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.570
  TOTAL AREA(ACRES) =       0.5         PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOW VELOCITY(FEET/SEC.) =   5.49
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =     554.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =      5.96
  PEAK FLOW RATE(CFS)   =       1.20
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

APPENDIX B

Modified Rational Method Analyses (100-year, 6-hour)

[Post-Project]

```
*****************************************************************************

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                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                               5620 Friars Rd
                            San Diego CA  92110
                       619-291-0707  Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366     ONE ALEXANDRIA NORTH                                        *
* 100-YEAR 6-HR                                                            *
* BASIN 100       POST-PROJECT                                             *
 **************************************************************************

  FILE NAME: AN100P00.RAT
  TIME/DATE OF STUDY: 01:33 06/18/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    435.00
  DOWNSTREAM ELEVATION(FEET) =    434.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.020
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   430.00  DOWNSTREAM(FEET) =   426.00
  FLOW LENGTH(FEET) =   202.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.22
  PIPE TRAVEL TIME(MIN.) =   1.16    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     252.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.800
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8929
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.17
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       2.38
  TC(MIN.) =    8.16

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   426.00  DOWNSTREAM(FEET) =   419.00
  FLOW LENGTH(FEET) =   154.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.38
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    8.48
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     406.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.739
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8273
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    2.30
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.64
  TC(MIN.) =    8.48

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   419.00  DOWNSTREAM(FEET) =   417.00
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.64
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    8.65
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     486.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.706
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7563
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       5.33
  TC(MIN.) =    8.65

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.706
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8028
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.11
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       7.44
  TC(MIN.) =    8.65

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   417.00  DOWNSTREAM(FEET) =   416.00
  FLOW LENGTH(FEET) =   195.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.83
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.44
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =    9.32
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     681.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      9.32
  PEAK FLOW RATE(CFS)   =       7.44
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************

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                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                               5620 Friars Rd
                            San Diego CA  92110
                       619-291-0707  Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366      ONE ALEXANDRIA NORTH                                       *
* 100-YR 6-HR                                                              *
* BASIN 200      POST-PROJECT                                              *
 **************************************************************************

  FILE NAME: AN200P00.RAT
  TIME/DATE OF STUDY: 01:22 06/18/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  2   14.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  430.00  DOWNSTREAM ELEVATION(FEET) =  417.00
  STREET LENGTH(FEET) =   158.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.41
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =    5.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.308
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.658
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    1.42
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       1.70

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.18   HALFSTREET FLOOD WIDTH(FEET) =   2.57
  FLOW VELOCITY(FEET/SEC.) =  4.62   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     158.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   413.00  DOWNSTREAM(FEET) =   405.00
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.70
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    6.02
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     373.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.206
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7721
  SUBAREA AREA(ACRES) =    1.80   SUBAREA RUNOFF(CFS) =    6.13
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =       7.79
  TC(MIN.) =    6.02

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   405.00  DOWNSTREAM(FEET) =   400.00
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.04
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.79
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.14
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     461.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.183
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7497
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.66
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       9.41
  TC(MIN.) =    6.14

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    230.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   400.00  DOWNSTREAM(FEET) =   388.00
  FLOW LENGTH(FEET) =   233.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.41
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    6.46
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =     694.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.46
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     3.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.41
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
  UPSTREAM ELEVATION(FEET) =    436.00
  DOWNSTREAM ELEVATION(FEET) =    430.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.129
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.376
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    214.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   422.00  DOWNSTREAM(FEET) =   410.00
  FLOW LENGTH(FEET) =   420.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.45
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.24
  PIPE TRAVEL TIME(MIN.) =   2.03    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    214.00 =     513.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.990
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6567
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    2.14
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.36
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.990
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7614
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       4.25
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   395.00
  FLOW LENGTH(FEET) =   216.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.92
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.25
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    7.49
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     729.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    216.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.928
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7850
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.98
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       6.17
  TC(MIN.) =    7.49

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    230.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   388.00
  FLOW LENGTH(FEET) =   344.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

```
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.17
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    8.22
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    230.00 =    1073.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.22
  RAINFALL INTENSITY(INCH/HR) =   3.79
  TOTAL STREAM AREA(ACRES) =     2.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.17

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.41     6.46        4.123          3.00
      2        6.17     8.22        3.787          2.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.25     6.46       4.123
      2       14.81     8.22       3.787

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.81   Tc(MIN.) =    8.22
  TOTAL AREA(ACRES) =        5.0
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    230.00 =    1073.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    230.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.787
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7848
```

```
  SUBAREA AREA(ACRES) =    1.90   SUBAREA RUNOFF(CFS) =    6.04
  TOTAL AREA(ACRES) =        6.9   TOTAL RUNOFF(CFS) =      20.51
  TC(MIN.) =    8.22

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    232.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   388.00  DOWNSTREAM(FEET) =   360.00
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.06
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.51
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    8.33
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    232.00 =    1223.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.768
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7649
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.92
  TOTAL AREA(ACRES) =        7.4   TOTAL RUNOFF(CFS) =      21.33
  TC(MIN.) =    8.33

****************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   356.00  DOWNSTREAM(FEET) =   347.58
  FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.33
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    8.49
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    220.00 =    1368.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    233.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.738
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7503
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.72
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      21.87
  TC(MIN.) =    8.49

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.738
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7288
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        8.4   TOTAL RUNOFF(CFS) =      22.88
  TC(MIN.) =    8.49
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.4  TC(MIN.) =      8.49
  PEAK FLOW RATE(CFS)   =      22.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                         San Diego, California 92110
                       619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366      ONE ALEXANDRIA NORTH                                       *
* 100-YR 6-HR                                                              *
* BASIN 200        POST PROJECT DETAINED CONDITION                         *
 **************************************************************************

  FILE NAME: AN200D00.RAT
  TIME/DATE OF STUDY: 13:56 11/04/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   14.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  430.00  DOWNSTREAM ELEVATION(FEET) =  417.00
  STREET LENGTH(FEET) =   158.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.41
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =    5.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.308
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.658
  SUBAREA AREA(ACRES) =    0.50      SUBAREA RUNOFF(CFS) =    1.42
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       1.70

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.18   HALFSTREET FLOOD WIDTH(FEET) =   2.57
  FLOW VELOCITY(FEET/SEC.) =  4.62   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     158.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   413.00  DOWNSTREAM(FEET) =   405.00
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.70
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    6.02
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     373.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.206
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7721
  SUBAREA AREA(ACRES) =    1.80   SUBAREA RUNOFF(CFS) =    6.13
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =       7.79
  TC(MIN.) =    6.02

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   405.00  DOWNSTREAM(FEET) =   400.00
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.04
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.79
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.14
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     461.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.183
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7497
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.66
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =       9.41
  TC(MIN.) =    6.14

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    230.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   400.00  DOWNSTREAM(FEET) =   388.00
  FLOW LENGTH(FEET) =   233.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.41
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    6.46
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =     694.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.46
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     3.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.41

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.00
  UPSTREAM ELEVATION(FEET) =    436.00
  DOWNSTREAM ELEVATION(FEET) =    430.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.129
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.376
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    214.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   422.00  DOWNSTREAM(FEET) =   410.00
  FLOW LENGTH(FEET) =   420.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.45
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.24
  PIPE TRAVEL TIME(MIN.) =   2.03    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    214.00 =     513.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.990
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6567
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    2.14
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.36
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.990
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7614
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       4.25
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   395.00
  FLOW LENGTH(FEET) =   216.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.92
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.25
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    7.49
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    216.00 =     729.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    216.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.928
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7850
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    1.98
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       6.17
  TC(MIN.) =    7.49
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    230.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   388.00
  FLOW LENGTH(FEET) =   344.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.17
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    8.22
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    230.00 =    1073.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.22
  RAINFALL INTENSITY(INCH/HR) =   3.79
  TOTAL STREAM AREA(ACRES) =     2.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.17

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.41     6.46        4.123          3.00
      2        6.17     8.22        3.787          2.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.25     6.46       4.123
      2       14.81     8.22       3.787

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.81   Tc(MIN.) =    8.22
  TOTAL AREA(ACRES) =        5.0
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    230.00 =    1073.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    230.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.787
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7848
  SUBAREA AREA(ACRES) =    1.90   SUBAREA RUNOFF(CFS) =    6.04
  TOTAL AREA(ACRES) =        6.9   TOTAL RUNOFF(CFS) =      20.51
  TC(MIN.) =    8.22

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  14.22   RAIN INTENSITY(INCH/HOUR) =  2.99
  TOTAL AREA(ACRES) =     6.90   TOTAL RUNOFF(CFS) =      8.31

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    232.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   388.00  DOWNSTREAM(FEET) =   360.00
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.31
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   14.35
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    232.00 =    1223.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.971
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4092
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        7.4   TOTAL RUNOFF(CFS) =       9.00
  TC(MIN.) =   14.35

****************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   356.00  DOWNSTREAM(FEET) =   347.58
  FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.61
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.00
```

```
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   14.54
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    220.00 =    1368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    233.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4128
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    0.57
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =       9.50
  TC(MIN.) =   14.54

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.950
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4155
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        8.4   TOTAL RUNOFF(CFS) =      10.30
  TC(MIN.) =   14.54
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.4  TC(MIN.) =     14.54
  PEAK FLOW RATE(CFS)   =      10.30
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                        San Diego, California 92110
                      619-291-0707   Fax 619-291-4165

 ************************** DESCRIPTION OF STUDY **************************
* JN-19366    ONE ALEXANDRIA NORTH                                         *
* 100-YR 6-HR                                                              *
* BASIN 300    POST-PROJECT                                                *
 **************************************************************************

  FILE NAME: AN300P00.RAT
  TIME/DATE OF STUDY: 10:30 11/04/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  4.400
   2)  10.000;  3.450
   3)  15.000;  2.900
   4)  20.000;  2.500
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  40.000;  1.700
   8)  50.000;  1.500
   9)  60.000;  1.300
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   20.0     15.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
  3   13.0      8.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    305.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    310.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    378.50  DOWNSTREAM(FEET) =    357.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   320.00   CHANNEL SLOPE =  0.0672
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   4.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.224
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.77
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   0.92
  Tc(MIN.) =    5.92
  SUBAREA AREA(ACRES) =     0.40       SUBAREA RUNOFF(CFS) =    1.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.570
  TOTAL AREA(ACRES) =       0.5         PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   6.67
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    310.00 =     320.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =      5.92
  PEAK FLOW RATE(CFS)   =       1.20
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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APPENDIX C

Weighted Runoff Coefficient Backup Calculations

One Alexandria North
J-19366
6/18/2021

Pre-Project Weighted Runoff Coefficient Backup

	Undisturbed Natural Terrain	**Asphalt/ Concrete**
Runoff Coefficient for 'D' Soils[1]	0.45	0.95
% Imperviousness	0%	100%

Basin	Subbasin	Area (Acres)	Area (SF)	Impervious area (SF)	% Impervious	Runoff Coefficent
100	102	0.1	5,573	0	0%	0.45
	104	0.4	18,611	11,341	61%	0.75
	106	0.2	10,238	4,639	45%	0.68
	108	0.5	23,626	13,107	55%	0.73
	110	0.2	6,861	0	0%	0.45
	110A	0.8	36,336	36,272	100%	0.95
	110B	0.2	8,227	6,775	82%	0.86
	Total	2.5	109,472	72,134	66%	0.779
200	202	0.1	5,083	3,318	65%	0.78
	204	1.0	43,293	24,590	57%	0.73
	206	0.7	32,285	3,421	11%	0.50
	208	0.5	20,139	18,761	93%	0.92
	210	0.6	28,020	3,123	11%	0.51
	220A	0.2	8,489	0	0%	0.45
	252	0.1	5,258	0	0%	0.45
	254	1.6	69,603	22,450	32%	0.61
	256	1.0	42,702	29,194	68%	0.79
	256A	0.6	27,032	17,014	63%	0.76
	256B	0.3	12,171	12,151	100%	0.95
	258A	0.4	16,177	182	1%	0.46
	258B	0.3	11,140	9,501	85%	0.88
	220	1.0	42,495	0	0%	0.45
	Total	8.4	363,887	143,705	39%	0.65
300	305	0.1	4354	0	0%	0.45
	310	0.4	19193	5932	31%	0.60
	Total	0.5	23547	5932	25%	0.58

Notes:

1. The runoff coefficients for each land use are based on guidance provided in the City of San Diego Drainage Design Manual (January 2017) and are modeled based on type 'D' soils.

Post-Project Weighted Runoff Coefficient Back-up

	Undisturbed Natural Terrain	Asphalt/Concrete
Runoff Coefficient for 'D' Soils[1]	0.45	0.95
% Imperviousness	0%	100%

Basin	U/S Node	D/S Node	AES Code	Area by Land Use		Weighted Runoff Coefficient
				Undisturbed Natural Terrain	Asphalt/Concrete	
100	100	102	2	0.08	0.02	0.55
	103	104	8	0.00	0.60	0.95
	105	106	8	0.29	0.51	0.77
	107	109	8	0.37	0.03	0.49
	108	109	8	0.00	0.60	0.95
Total				0.74	1.76	0.81
200	200	201	2	0.06	0.04	0.65
	201	202	6	0.29	0.21	0.66
	203	204	8	0.51	1.29	0.81
	205	206	8	0.35	0.25	0.66
	210	211	2	0.08	0.02	0.55
	212	214	8	0.46	0.34	0.67
	213	214	8	0.00	0.50	0.95
	215	216	8	0.14	0.46	0.84
	218	230	8	0.43	1.47	0.84
	231	232	8	0.46	0.04	0.49
	233	220	8	0.38	0.02	0.48
	234	220	8	0.60	0.00	0.45
Total				3.76	4.64	0.73
300	301	305	2	0.09	0.00	0.45
	305	310	5	0.33	0.13	0.60
Total				0.42	0.13	0.57

Notes:

1. The runoff coefficients for each land use are based on guidance provided in the City of San Diego Drainage Design Manual (January 2017) and are modeled based on type 'D' soils.

APPENDIX D

Normal Depth Storm Drain Sizing Matrix
[Post-Project]

One Alexandria North Normal Depth Pipe Sizing
JN-19366
6/18/2021

Storm Drain Size

The purpose of this table is to provide an estimated pipe size to convey the 100-year flow rates with a sizing factor.

Manning's n: 0.013

Sizing Factor (%): 30

	Slope at:	0.5%		1.0%		2.0%		3.0%	
Q_{100} (cfs[1])	Q_{100} with Sizing Factor (cfs[1])	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size [2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)
2.0	2.6	1.01	12"	0.89	12"	0.78	10"	0.72	10"
5.0	6.5	1.43	18"	1.25	18"	1.10	18"	1.02	18"
7.5	9.8	1.66	24"	1.46	18"	1.28	18"	1.19	18"
10.0	13.0	1.85	24"	1.62	24"	1.43	18"	1.32	18"
15.0	19.5	2.15	30"	1.89	24"	1.66	24"	1.54	24"
20.0	26.0	2.40	30"	2.11	30"	1.85	24"	1.71	24"
25.0	32.5	2.61	36"	2.29	30"	2.01	24"	1.86	24"
30.0	39.0	2.79	36"	2.45	30"	2.15	30"	1.99	24"
35.0	45.5	2.96	36"	2.60	36"	2.28	30"	2.11	30"
40.0	52.0	3.11	42"	2.73	36"	2.40	30"	2.22	30"
50.0	65.0	3.38	42"	2.97	36"	2.61	36"	2.42	30"
60.0	78.0	3.62	48"	3.18	42"	2.79	36"	2.59	36"
70.0	91.0	3.83	48"	3.37	42"	2.96	36"	2.74	36"
80.0	104.0	4.03	54"	3.54	48"	3.11	42"	2.88	36"
90.0	117.0	4.21	54"	3.70	48"	3.25	42"	3.01	42"
110.0	143.0	4.54	60"	3.99	48"	3.50	42"	3.25	42"
145.0	188.5	5.04	72"	4.42	54"	3.89	48"	3.60	48"
170.0	221.0	5.35	72"	4.70	60"	4.12	54"	3.82	48"
240.0	312.0	6.09	84"	5.35	72"	4.69	60"	4.35	54"
350.0	455.0	7.01	96"	6.16	84"	5.41	72"	5.01	72"

Note:

1. "cfs" = cubic feet per second.
2. Minimum pipe sizes are calculated using the Manning's equation and are based on the flow rates with 30% factor.

APPENDIX E

Detention Calculations

Preliminary Detention Calculations Summary
BMP-2A - StormTrap Vault

Pre-Project

Pre-Project Q100 at POI 2	20.71	cfs

Post-Project

Inflow Hydrograph to BMP 2A	$Q100_{undetained}$	20.51	cfs
	Watershed Area	6.9	acres
	Tc	8.22	min

Storm Trap Water Storage Prov:	32,505.81	cubic feet
	0.75	ac-ft
Storm Trap Water Storage Prov:	10.83	ft

HEC 1 - Vault Capacity Results		
Peak Flow Out	8.31	cfs
Max Stage	4.34	ft

Post-Project Q100 at POI 2	10.30	cfs

HEC1 INPUT FILE FOR
BMP 2A

```
*DIAGRAM
*FREE
ID BMP2B VAULT HYDROMOD & 100-YR DETENTION
ID JN-19366 ONE ALEXANDRIA NORTH
IT 1 01JAN90 1200 600
IO 5 0
KK OAN_Vault_1104.hc1
KM RUN DATE   11/4/2021
KM RATIONAL METHOD HYDROGRAPH PROGRAM
KM COPYRIGHT 1992, 2014, RICK ENGINEERING COMPANY
KM 6HR RAINFALL IS 2.3 INCHES
KM RATIONAL METHOD RUNOFF COEFFICIENT IS 0.76
KM RATIONAL METHOD TIME OF CONCENTRATION IS 8 MIN.
KM FOR THIS DATA TO RUN PROPERLY THIS IT CARD MUST BE ADDED TO YOUR HEC-1
KM IT 2 01JAN90 1200 200
BA 0.0108
IN 8 01JAN90 1156
QI 0  0.7  0.7  0.8  0.8  0.8  0.8  0.8  0.8  0.9
QI 0.9  0.9  1  1  1  1.1  1.1  1.2  1.2  1.3
QI 1.4  1.5  1.6  1.7  1.8  2.1  2.3  2.8  3.2  4.6
QI 9.5  20.51  3.7  2.5  2  1.6  1.4  1.3  1.2  1.1
QI 1  0.9  0.9  0.8  0.8  0.7  0  0  0  0
QI 0  0  0  0  0  0  0
KK DETAIN
KO 2 2 0 0 21
RS 1 STOR -1
SV 0 0.75
SQ 0 20.7
SE 0 10.8
ZZ
```

```
1*****************************************                                                   ***************************************
 *                                       *                                                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998              *                                                   *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1                *                                                   *          609 SECOND STREET          *
 *                                       *                                                   *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   04NOV21  TIME  11:22:56   *                                                   *           (916) 756-1104            *
 *                                       *                                                   *                                     *
 *****************************************                                                   ***************************************
```

HEC1 OUTPUT FILE
FOR BMP 2A

```
                                                 X     X  XXXXXXX   XXXXX           X
                                                 X     X  X        X     X         XX
                                                 X     X  X        X                X
                                                 XXXXXXX  XXXX     X        XXXXX   X
                                                 X     X  X        X                X
                                                 X     X  X        X     X          X
                                                 X     X  XXXXXXX   XXXXX          XXX




            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                       HEC-1 INPUT                                                     PAGE  1

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                          *DIAGRAM
 *** FREE ***
              1           ID   BMP2B VAULT HYDROMOD & 100-YR DETENTION
              2           ID   JN-19366 ONE ALEXANDRIA NORTH
              3           IT       1 01JAN90    1200     600
              4           IO       5       0

              5           KKOAN_Vault_1104.hc1
              6           KM   RUN DATE   11/4/2021
              7           KM   RATIONAL METHOD HYDROGRAPH PROGRAM
              8           KM   COPYRIGHT 1992, 2014, RICK ENGINEERING COMPANY
              9           KM   6HR RAINFALL IS 2.3 INCHES
             10           KM   RATIONAL METHOD RUNOFF COEFFICIENT IS 0.76
             11           KM   RATIONAL METHOD TIME OF CONCENTRATION IS 8 MIN.
             12           KM   FOR THIS DATA TO RUN PROPERLY THIS IT CARD MUST BE ADDED TO YOUR HEC-1
             13           KM   IT 2 01JAN90 1200 200
             14           BA  0.0108
             15           IN       8 01JAN90    1156
             16           QI       0     0.7     0.7     0.8     0.8     0.8     0.8     0.8     0.8     0.9
             17           QI     0.9     0.9       1       1       1     1.1     1.1     1.2     1.2     1.3
             18           QI     1.4     1.5     1.6     1.7     1.8     2.1     2.3     2.8     3.2     4.6
             19           QI     9.5   20.51     3.7     2.5       2     1.6     1.4     1.3     1.2     1.1
             20           QI       1     0.9     0.9     0.8     0.8     0.7       0       0       0       0
             21           QI       0       0       0       0       0       0       0

             22           KK  DETAIN
             23           KO       2       2       0       0      21
             24           RS       1    STOR      -1
             25           SV       0    0.75
             26           SQ       0    20.7
             27           SE       0    10.8
             28           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR       (<---) RETURN OF DIVERTED OR PUMPED FLOW

     5    OAN_Vaul
                 V
                 V
    22      DETAIN

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                   ***************************************
```

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*                                       *                                                   *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998               *                                                   *    HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                 *                                                   *         609 SECOND STREET            *
*                                       *                                                   *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE   04NOV21  TIME  11:22:56   *                                                   *          (916) 756-1104              *
*                                       *                                                   *                                      *
*****************************************                                                   ****************************************




                          BMP2B VAULT HYDROMOD & 100-YR DETENTION
                          JN-19366 ONE ALEXANDRIA NORTH

   4 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     1JAN90  STARTING DATE
                       ITIME       1200  STARTING TIME
                          NQ        600  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     1JAN90  ENDING DATE
                      NDTIME       2159  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE    9.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  22 KK     *    DETAIN  *
            *            *
            **************

  23 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          2  PRINT CONTROL
                       IPLOT          2  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
                       IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                        IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        600  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       .017  TIME INTERVAL IN HOURS


               HYDROGRAPH ROUTING DATA

  24 RS          STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       STOR  TYPE OF INITIAL CONDITION
                      RSVRIC      -1.00  INITIAL CONDITION
                           X        .00 WORKING R AND D COEFFICIENT

  25 SV            STORAGE          .0        .8

  26 SQ          DISCHARGE          0.       21.

  27 SE          ELEVATION         .00     10.80
                                                                      ***

**********************************************************************************************************************************

                                                       HYDROGRAPH AT STATION   DETAIN
```

```
***********************************************************************************************************************************
                                           *                                           *
 DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                           *                                           *
  1 JAN 1200   1       0.       .0      .2 *  1 JAN 1520 201       2.       .1      .9 *  1 JAN 1840 401       0.       .0      .1
  1 JAN 1201   2       0.       .0      .2 *  1 JAN 1521 202       2.       .1      .9 *  1 JAN 1841 402       0.       .0      .1
  1 JAN 1202   3       0.       .0      .2 *  1 JAN 1522 203       2.       .1      .9 *  1 JAN 1842 403       0.       .0      .1
  1 JAN 1203   4       0.       .0      .2 *  1 JAN 1523 204       2.       .1      .9 *  1 JAN 1843 404       0.       .0      .1
  1 JAN 1204   5       0.       .0      .2 *  1 JAN 1524 205       2.       .1      .9 *  1 JAN 1844 405       0.       .0      .1
  1 JAN 1205   6       0.       .0      .2 *  1 JAN 1525 206       2.       .1      .9 *  1 JAN 1845 406       0.       .0      .1
  1 JAN 1206   7       0.       .0      .2 *  1 JAN 1526 207       2.       .1      .9 *  1 JAN 1846 407       0.       .0      .1
  1 JAN 1207   8       0.       .0      .2 *  1 JAN 1527 208       2.       .1     1.0 *  1 JAN 1847 408       0.       .0      .1
  1 JAN 1208   9       0.       .0      .2 *  1 JAN 1528 209       2.       .1     1.0 *  1 JAN 1848 409       0.       .0      .1
  1 JAN 1209  10       0.       .0      .2 *  1 JAN 1529 210       2.       .1     1.0 *  1 JAN 1849 410       0.       .0      .1
  1 JAN 1210  11       0.       .0      .2 *  1 JAN 1530 211       2.       .1     1.0 *  1 JAN 1850 411       0.       .0      .1
  1 JAN 1211  12       0.       .0      .2 *  1 JAN 1531 212       2.       .1     1.0 *  1 JAN 1851 412       0.       .0      .1
  1 JAN 1212  13       0.       .0      .2 *  1 JAN 1532 213       2.       .1     1.0 *  1 JAN 1852 413       0.       .0      .1
  1 JAN 1213  14       0.       .0      .2 *  1 JAN 1533 214       2.       .1     1.1 *  1 JAN 1853 414       0.       .0      .1
  1 JAN 1214  15       0.       .0      .2 *  1 JAN 1534 215       2.       .1     1.1 *  1 JAN 1854 415       0.       .0      .1
  1 JAN 1215  16       0.       .0      .3 *  1 JAN 1535 216       2.       .1     1.1 *  1 JAN 1855 416       0.       .0      .1
  1 JAN 1216  17       0.       .0      .3 *  1 JAN 1536 217       2.       .1     1.1 *  1 JAN 1856 417       0.       .0      .1
  1 JAN 1217  18       1.       .0      .3 *  1 JAN 1537 218       2.       .1     1.1 *  1 JAN 1857 418       0.       .0      .1
  1 JAN 1218  19       1.       .0      .3 *  1 JAN 1538 219       2.       .1     1.1 *  1 JAN 1858 419       0.       .0      .1
  1 JAN 1219  20       1.       .0      .3 *  1 JAN 1539 220       2.       .1     1.2 *  1 JAN 1859 420       0.       .0      .1
  1 JAN 1220  21       1.       .0      .3 *  1 JAN 1540 221       2.       .1     1.2 *  1 JAN 1900 421       0.       .0      .1
  1 JAN 1221  22       1.       .0      .3 *  1 JAN 1541 222       2.       .1     1.2 *  1 JAN 1901 422       0.       .0      .1
  1 JAN 1222  23       1.       .0      .3 *  1 JAN 1542 223       2.       .1     1.2 *  1 JAN 1902 423       0.       .0      .1
  1 JAN 1223  24       1.       .0      .3 *  1 JAN 1543 224       2.       .1     1.2 *  1 JAN 1903 424       0.       .0      .0
  1 JAN 1224  25       1.       .0      .3 *  1 JAN 1544 225       2.       .1     1.3 *  1 JAN 1904 425       0.       .0      .0
  1 JAN 1225  26       1.       .0      .3 *  1 JAN 1545 226       2.       .1     1.3 *  1 JAN 1905 426       0.       .0      .0
  1 JAN 1226  27       1.       .0      .3 *  1 JAN 1546 227       3.       .1     1.3 *  1 JAN 1906 427       0.       .0      .0
  1 JAN 1227  28       1.       .0      .3 *  1 JAN 1547 228       3.       .1     1.4 *  1 JAN 1907 428       0.       .0      .0
  1 JAN 1228  29       1.       .0      .3 *  1 JAN 1548 229       3.       .1     1.4 *  1 JAN 1908 429       0.       .0      .0
  1 JAN 1229  30       1.       .0      .3 *  1 JAN 1549 230       3.       .1     1.4 *  1 JAN 1909 430       0.       .0      .0
  1 JAN 1230  31       1.       .0      .3 *  1 JAN 1550 231       3.       .1     1.5 *  1 JAN 1910 431       0.       .0      .0
  1 JAN 1231  32       1.       .0      .3 *  1 JAN 1551 232       3.       .1     1.6 *  1 JAN 1911 432       0.       .0      .0
  1 JAN 1232  33       1.       .0      .3 *  1 JAN 1552 233       3.       .1     1.6 *  1 JAN 1912 433       0.       .0      .0
  1 JAN 1233  34       1.       .0      .3 *  1 JAN 1553 234       3.       .1     1.7 *  1 JAN 1913 434       0.       .0      .0
  1 JAN 1234  35       1.       .0      .3 *  1 JAN 1554 235       3.       .1     1.8 *  1 JAN 1914 435       0.       .0      .0
  1 JAN 1235  36       1.       .0      .3 *  1 JAN 1555 236       4.       .1     1.9 *  1 JAN 1915 436       0.       .0      .0
  1 JAN 1236  37       1.       .0      .3 *  1 JAN 1556 237       4.       .1     2.0 *  1 JAN 1916 437       0.       .0      .0
  1 JAN 1237  38       1.       .0      .3 *  1 JAN 1557 238       4.       .1     2.1 *  1 JAN 1917 438       0.       .0      .0
  1 JAN 1238  39       1.       .0      .3 *  1 JAN 1558 239       4.       .2     2.3 *  1 JAN 1918 439       0.       .0      .0
  1 JAN 1239  40       1.       .0      .4 *  1 JAN 1559 240       5.       .2     2.5 *  1 JAN 1919 440       0.       .0      .0
  1 JAN 1240  41       1.       .0      .4 *  1 JAN 1600 241       5.       .2     2.6 *  1 JAN 1920 441       0.       .0      .0
  1 JAN 1241  42       1.       .0      .4 *  1 JAN 1601 242       5.       .2     2.8 *  1 JAN 1921 442       0.       .0      .0
  1 JAN 1242  43       1.       .0      .4 *  1 JAN 1602 243       6.       .2     3.1 *  1 JAN 1922 443       0.       .0      .0
  1 JAN 1243  44       1.       .0      .4 *  1 JAN 1603 244       6.       .2     3.3 *  1 JAN 1923 444       0.       .0      .0
  1 JAN 1244  45       1.       .0      .4 *  1 JAN 1604 245       7.       .2     3.6 *  1 JAN 1924 445       0.       .0      .0
  1 JAN 1245  46       1.       .0      .4 *  1 JAN 1605 246       7.       .3     3.8 *  1 JAN 1925 446       0.       .0      .0
  1 JAN 1246  47       1.       .0      .4 *  1 JAN 1606 247       8.       .3     4.0 *  1 JAN 1926 447       0.       .0      .0
  1 JAN 1247  48       1.       .0      .4 *  1 JAN 1607 248       8.       .3     4.2 *  1 JAN 1927 448       0.       .0      .0
  1 JAN 1248  49       1.       .0      .4 *  1 JAN 1608 249       8.       .3     4.3 *  1 JAN 1928 449       0.       .0      .0
  1 JAN 1249  50       1.       .0      .4 *  1 JAN 1609 250       8.       .3     4.3 *  1 JAN 1929 450       0.       .0      .0
  1 JAN 1250  51       1.       .0      .4 *  1 JAN 1610 251       8.       .3     4.3 *  1 JAN 1930 451       0.       .0      .0
  1 JAN 1251  52       1.       .0      .4 *  1 JAN 1611 252       8.       .3     4.3 *  1 JAN 1931 452       0.       .0      .0
  1 JAN 1252  53       1.       .0      .4 *  1 JAN 1612 253       8.       .3     4.2 *  1 JAN 1932 453       0.       .0      .0
  1 JAN 1253  54       1.       .0      .4 *  1 JAN 1613 254       8.       .3     4.2 *  1 JAN 1933 454       0.       .0      .0
  1 JAN 1254  55       1.       .0      .4 *  1 JAN 1614 255       8.       .3     4.1 *  1 JAN 1934 455       0.       .0      .0
  1 JAN 1255  56       1.       .0      .4 *  1 JAN 1615 256       8.       .3     4.0 *  1 JAN 1935 456       0.       .0      .0
  1 JAN 1256  57       1.       .0      .4 *  1 JAN 1616 257       7.       .3     3.9 *  1 JAN 1936 457       0.       .0      .0
  1 JAN 1257  58       1.       .0      .4 *  1 JAN 1617 258       7.       .3     3.8 *  1 JAN 1937 458       0.       .0      .0
  1 JAN 1258  59       1.       .0      .4 *  1 JAN 1618 259       7.       .3     3.7 *  1 JAN 1938 459       0.       .0      .0
  1 JAN 1259  60       1.       .0      .4 *  1 JAN 1619 260       7.       .3     3.6 *  1 JAN 1939 460       0.       .0      .0
  1 JAN 1300  61       1.       .0      .4 *  1 JAN 1620 261       7.       .2     3.5 *  1 JAN 1940 461       0.       .0      .0
  1 JAN 1301  62       1.       .0      .4 *  1 JAN 1621 262       7.       .2     3.5 *  1 JAN 1941 462       0.       .0      .0
  1 JAN 1302  63       1.       .0      .4 *  1 JAN 1622 263       6.       .2     3.4 *  1 JAN 1942 463       0.       .0      .0
  1 JAN 1303  64       1.       .0      .4 *  1 JAN 1623 264       6.       .2     3.3 *  1 JAN 1943 464       0.       .0      .0
  1 JAN 1304  65       1.       .0      .4 *  1 JAN 1624 265       6.       .2     3.2 *  1 JAN 1944 465       0.       .0      .0
  1 JAN 1305  66       1.       .0      .4 *  1 JAN 1625 266       6.       .2     3.1 *  1 JAN 1945 466       0.       .0      .0
  1 JAN 1306  67       1.       .0      .4 *  1 JAN 1626 267       6.       .2     3.1 *  1 JAN 1946 467       0.       .0      .0
  1 JAN 1307  68       1.       .0      .4 *  1 JAN 1627 268       6.       .2     3.0 *  1 JAN 1947 468       0.       .0      .0
  1 JAN 1308  69       1.       .0      .4 *  1 JAN 1628 269       6.       .2     2.9 *  1 JAN 1948 469       0.       .0      .0
  1 JAN 1309  70       1.       .0      .4 *  1 JAN 1629 270       5.       .2     2.9 *  1 JAN 1949 470       0.       .0      .0
  1 JAN 1310  71       1.       .0      .4 *  1 JAN 1630 271       5.       .2     2.8 *  1 JAN 1950 471       0.       .0      .0
  1 JAN 1311  72       1.       .0      .4 *  1 JAN 1631 272       5.       .2     2.7 *  1 JAN 1951 472       0.       .0      .0
  1 JAN 1312  73       1.       .0      .4 *  1 JAN 1632 273       5.       .2     2.7 *  1 JAN 1952 473       0.       .0      .0
  1 JAN 1313  74       1.       .0      .4 *  1 JAN 1633 274       5.       .2     2.6 *  1 JAN 1953 474       0.       .0      .0
  1 JAN 1314  75       1.       .0      .4 *  1 JAN 1634 275       5.       .2     2.5 *  1 JAN 1954 475       0.       .0      .0
  1 JAN 1315  76       1.       .0      .4 *  1 JAN 1635 276       5.       .2     2.5 *  1 JAN 1955 476       0.       .0      .0
  1 JAN 1316  77       1.       .0      .4 *  1 JAN 1636 277       5.       .2     2.4 *  1 JAN 1956 477       0.       .0      .0
  1 JAN 1317  78       1.       .0      .4 *  1 JAN 1637 278       4.       .2     2.3 *  1 JAN 1957 478       0.       .0      .0
  1 JAN 1318  79       1.       .0      .4 *  1 JAN 1638 279       4.       .2     2.3 *  1 JAN 1958 479       0.       .0      .0
  1 JAN 1319  80       1.       .0      .4 *  1 JAN 1639 280       4.       .2     2.2 *  1 JAN 1959 480       0.       .0      .0
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1 JAN 1320  81       1.        .0       .4 *  1 JAN 1640 281       4.        .2      2.2 *  1 JAN 2000 481       0.        .0       .0
1 JAN 1321  82       1.        .0       .4 *  1 JAN 1641 282       4.        .1      2.1 *  1 JAN 2001 482       0.        .0       .0
1 JAN 1322  83       1.        .0       .4 *  1 JAN 1642 283       4.        .1      2.1 *  1 JAN 2002 483       0.        .0       .0
1 JAN 1323  84       1.        .0       .4 *  1 JAN 1643 284       4.        .1      2.0 *  1 JAN 2003 484       0.        .0       .0
1 JAN 1324  85       1.        .0       .4 *  1 JAN 1644 285       4.        .1      2.0 *  1 JAN 2004 485       0.        .0       .0
1 JAN 1325  86       1.        .0       .4 *  1 JAN 1645 286       4.        .1      1.9 *  1 JAN 2005 486       0.        .0       .0
1 JAN 1326  87       1.        .0       .4 *  1 JAN 1646 287       4.        .1      1.9 *  1 JAN 2006 487       0.        .0       .0
1 JAN 1327  88       1.        .0       .4 *  1 JAN 1647 288       4.        .1      1.8 *  1 JAN 2007 488       0.        .0       .0
1 JAN 1328  89       1.        .0       .4 *  1 JAN 1648 289       3.        .1      1.8 *  1 JAN 2008 489       0.        .0       .0
1 JAN 1329  90       1.        .0       .4 *  1 JAN 1649 290       3.        .1      1.8 *  1 JAN 2009 490       0.        .0       .0
1 JAN 1330  91       1.        .0       .4 *  1 JAN 1650 291       3.        .1      1.7 *  1 JAN 2010 491       0.        .0       .0
1 JAN 1331  92       1.        .0       .4 *  1 JAN 1651 292       3.        .1      1.7 *  1 JAN 2011 492       0.        .0       .0
1 JAN 1332  93       1.        .0       .4 *  1 JAN 1652 293       3.        .1      1.6 *  1 JAN 2012 493       0.        .0       .0
1 JAN 1333  94       1.        .0       .5 *  1 JAN 1653 294       3.        .1      1.6 *  1 JAN 2013 494       0.        .0       .0
1 JAN 1334  95       1.        .0       .5 *  1 JAN 1654 295       3.        .1      1.6 *  1 JAN 2014 495       0.        .0       .0
1 JAN 1335  96       1.        .0       .5 *  1 JAN 1655 296       3.        .1      1.5 *  1 JAN 2015 496       0.        .0       .0
1 JAN 1336  97       1.        .0       .5 *  1 JAN 1656 297       3.        .1      1.5 *  1 JAN 2016 497       0.        .0       .0
1 JAN 1337  98       1.        .0       .5 *  1 JAN 1657 298       3.        .1      1.5 *  1 JAN 2017 498       0.        .0       .0
1 JAN 1338  99       1.        .0       .5 *  1 JAN 1658 299       3.        .1      1.4 *  1 JAN 2018 499       0.        .0       .0
1 JAN 1339 100       1.        .0       .5 *  1 JAN 1659 300       3.        .1      1.4 *  1 JAN 2019 500       0.        .0       .0
1 JAN 1340 101       1.        .0       .5 *  1 JAN 1700 301       3.        .1      1.4 *  1 JAN 2020 501       0.        .0       .0
1 JAN 1341 102       1.        .0       .5 *  1 JAN 1701 302       3.        .1      1.4 *  1 JAN 2021 502       0.        .0       .0
1 JAN 1342 103       1.        .0       .5 *  1 JAN 1702 303       3.        .1      1.3 *  1 JAN 2022 503       0.        .0       .0
1 JAN 1343 104       1.        .0       .5 *  1 JAN 1703 304       2.        .1      1.3 *  1 JAN 2023 504       0.        .0       .0
1 JAN 1344 105       1.        .0       .5 *  1 JAN 1704 305       2.        .1      1.3 *  1 JAN 2024 505       0.        .0       .0
1 JAN 1345 106       1.        .0       .5 *  1 JAN 1705 306       2.        .1      1.2 *  1 JAN 2025 506       0.        .0       .0
1 JAN 1346 107       1.        .0       .5 *  1 JAN 1706 307       2.        .1      1.2 *  1 JAN 2026 507       0.        .0       .0
1 JAN 1347 108       1.        .0       .5 *  1 JAN 1707 308       2.        .1      1.2 *  1 JAN 2027 508       0.        .0       .0
1 JAN 1348 109       1.        .0       .5 *  1 JAN 1708 309       2.        .1      1.2 *  1 JAN 2028 509       0.        .0       .0
1 JAN 1349 110       1.        .0       .5 *  1 JAN 1709 310       2.        .1      1.2 *  1 JAN 2029 510       0.        .0       .0
1 JAN 1350 111       1.        .0       .5 *  1 JAN 1710 311       2.        .1      1.1 *  1 JAN 2030 511       0.        .0       .0
1 JAN 1351 112       1.        .0       .5 *  1 JAN 1711 312       2.        .1      1.1 *  1 JAN 2031 512       0.        .0       .0
1 JAN 1352 113       1.        .0       .5 *  1 JAN 1712 313       2.        .1      1.1 *  1 JAN 2032 513       0.        .0       .0
1 JAN 1353 114       1.        .0       .5 *  1 JAN 1713 314       2.        .1      1.1 *  1 JAN 2033 514       0.        .0       .0
1 JAN 1354 115       1.        .0       .5 *  1 JAN 1714 315       2.        .1      1.0 *  1 JAN 2034 515       0.        .0       .0
1 JAN 1355 116       1.        .0       .5 *  1 JAN 1715 316       2.        .1      1.0 *  1 JAN 2035 516       0.        .0       .0
1 JAN 1356 117       1.        .0       .5 *  1 JAN 1716 317       2.        .1      1.0 *  1 JAN 2036 517       0.        .0       .0
1 JAN 1357 118       1.        .0       .5 *  1 JAN 1717 318       2.        .1      1.0 *  1 JAN 2037 518       0.        .0       .0
1 JAN 1358 119       1.        .0       .5 *  1 JAN 1718 319       2.        .1      1.0 *  1 JAN 2038 519       0.        .0       .0
1 JAN 1359 120       1.        .0       .5 *  1 JAN 1719 320       2.        .1      1.0 *  1 JAN 2039 520       0.        .0       .0
1 JAN 1400 121       1.        .0       .5 *  1 JAN 1720 321       2.        .1       .9 *  1 JAN 2040 521       0.        .0       .0
1 JAN 1401 122       1.        .0       .5 *  1 JAN 1721 322       2.        .1       .9 *  1 JAN 2041 522       0.        .0       .0
1 JAN 1402 123       1.        .0       .5 *  1 JAN 1722 323       2.        .1       .9 *  1 JAN 2042 523       0.        .0       .0
1 JAN 1403 124       1.        .0       .5 *  1 JAN 1723 324       2.        .1       .9 *  1 JAN 2043 524       0.        .0       .0
1 JAN 1404 125       1.        .0       .5 *  1 JAN 1724 325       2.        .1       .9 *  1 JAN 2044 525       0.        .0       .0
1 JAN 1405 126       1.        .0       .5 *  1 JAN 1725 326       2.        .1       .9 *  1 JAN 2045 526       0.        .0       .0
1 JAN 1406 127       1.        .0       .5 *  1 JAN 1726 327       2.        .1       .8 *  1 JAN 2046 527       0.        .0       .0
1 JAN 1407 128       1.        .0       .5 *  1 JAN 1727 328       2.        .1       .8 *  1 JAN 2047 528       0.        .0       .0
1 JAN 1408 129       1.        .0       .5 *  1 JAN 1728 329       2.        .1       .8 *  1 JAN 2048 529       0.        .0       .0
1 JAN 1409 130       1.        .0       .5 *  1 JAN 1729 330       2.        .1       .8 *  1 JAN 2049 530       0.        .0       .0
1 JAN 1410 131       1.        .0       .5 *  1 JAN 1730 331       2.        .1       .8 *  1 JAN 2050 531       0.        .0       .0
1 JAN 1411 132       1.        .0       .5 *  1 JAN 1731 332       1.        .1       .8 *  1 JAN 2051 532       0.        .0       .0
1 JAN 1412 133       1.        .0       .5 *  1 JAN 1732 333       1.        .1       .8 *  1 JAN 2052 533       0.        .0       .0
1 JAN 1413 134       1.        .0       .5 *  1 JAN 1733 334       1.        .1       .8 *  1 JAN 2053 534       0.        .0       .0
1 JAN 1414 135       1.        .0       .5 *  1 JAN 1734 335       1.        .1       .7 *  1 JAN 2054 535       0.        .0       .0
1 JAN 1415 136       1.        .0       .6 *  1 JAN 1735 336       1.        .1       .7 *  1 JAN 2055 536       0.        .0       .0
1 JAN 1416 137       1.        .0       .6 *  1 JAN 1736 337       1.        .1       .7 *  1 JAN 2056 537       0.        .0       .0
1 JAN 1417 138       1.        .0       .6 *  1 JAN 1737 338       1.        .0       .7 *  1 JAN 2057 538       0.        .0       .0
1 JAN 1418 139       1.        .0       .6 *  1 JAN 1738 339       1.        .0       .7 *  1 JAN 2058 539       0.        .0       .0
1 JAN 1419 140       1.        .0       .6 *  1 JAN 1739 340       1.        .0       .7 *  1 JAN 2059 540       0.        .0       .0
1 JAN 1420 141       1.        .0       .6 *  1 JAN 1740 341       1.        .0       .7 *  1 JAN 2100 541       0.        .0       .0
1 JAN 1421 142       1.        .0       .6 *  1 JAN 1741 342       1.        .0       .7 *  1 JAN 2101 542       0.        .0       .0
1 JAN 1422 143       1.        .0       .6 *  1 JAN 1742 343       1.        .0       .7 *  1 JAN 2102 543       0.        .0       .0
1 JAN 1423 144       1.        .0       .6 *  1 JAN 1743 344       1.        .0       .7 *  1 JAN 2103 544       0.        .0       .0
1 JAN 1424 145       1.        .0       .6 *  1 JAN 1744 345       1.        .0       .6 *  1 JAN 2104 545       0.        .0       .0
1 JAN 1425 146       1.        .0       .6 *  1 JAN 1745 346       1.        .0       .6 *  1 JAN 2105 546       0.        .0       .0
1 JAN 1426 147       1.        .0       .6 *  1 JAN 1746 347       1.        .0       .6 *  1 JAN 2106 547       0.        .0       .0
1 JAN 1427 148       1.        .0       .6 *  1 JAN 1747 348       1.        .0       .6 *  1 JAN 2107 548       0.        .0       .0
1 JAN 1428 149       1.        .0       .6 *  1 JAN 1748 349       1.        .0       .6 *  1 JAN 2108 549       0.        .0       .0
1 JAN 1429 150       1.        .0       .6 *  1 JAN 1749 350       1.        .0       .6 *  1 JAN 2109 550       0.        .0       .0
1 JAN 1430 151       1.        .0       .6 *  1 JAN 1750 351       1.        .0       .6 *  1 JAN 2110 551       0.        .0       .0
1 JAN 1431 152       1.        .0       .6 *  1 JAN 1751 352       1.        .0       .6 *  1 JAN 2111 552       0.        .0       .0
1 JAN 1432 153       1.        .0       .6 *  1 JAN 1752 353       1.        .0       .6 *  1 JAN 2112 553       0.        .0       .0
1 JAN 1433 154       1.        .0       .6 *  1 JAN 1753 354       1.        .0       .6 *  1 JAN 2113 554       0.        .0       .0
1 JAN 1434 155       1.        .0       .6 *  1 JAN 1754 355       1.        .0       .6 *  1 JAN 2114 555       0.        .0       .0
1 JAN 1435 156       1.        .0       .6 *  1 JAN 1755 356       1.        .0       .6 *  1 JAN 2115 556       0.        .0       .0
1 JAN 1436 157       1.        .0       .6 *  1 JAN 1756 357       1.        .0       .6 *  1 JAN 2116 557       0.        .0       .0
1 JAN 1437 158       1.        .0       .6 *  1 JAN 1757 358       1.        .0       .5 *  1 JAN 2117 558       0.        .0       .0
1 JAN 1438 159       1.        .0       .6 *  1 JAN 1758 359       1.        .0       .5 *  1 JAN 2118 559       0.        .0       .0
1 JAN 1439 160       1.        .0       .6 *  1 JAN 1759 360       1.        .0       .5 *  1 JAN 2119 560       0.        .0       .0
1 JAN 1440 161       1.        .0       .6 *  1 JAN 1800 361       1.        .0       .5 *  1 JAN 2120 561       0.        .0       .0
1 JAN 1441 162       1.        .0       .6 *  1 JAN 1801 362       1.        .0       .5 *  1 JAN 2121 562       0.        .0       .0
1 JAN 1442 163       1.        .0       .6 *  1 JAN 1802 363       1.        .0       .5 *  1 JAN 2122 563       0.        .0       .0
1 JAN 1443 164       1.        .0       .6 *  1 JAN 1803 364       1.        .0       .5 *  1 JAN 2123 564       0.        .0       .0
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   1 JAN 1444 165       1.        .0      .7 *  1 JAN 1804 365       1.        .0      .5 *  1 JAN 2124 565       0.        .0      .0
   1 JAN 1445 166       1.        .0      .7 *  1 JAN 1805 366       1.        .0      .4 *  1 JAN 2125 566       0.        .0      .0
   1 JAN 1446 167       1.        .0      .7 *  1 JAN 1806 367       1.        .0      .4 *  1 JAN 2126 567       0.        .0      .0
   1 JAN 1447 168       1.        .0      .7 *  1 JAN 1807 368       1.        .0      .4 *  1 JAN 2127 568       0.        .0      .0
   1 JAN 1448 169       1.        .0      .7 *  1 JAN 1808 369       1.        .0      .4 *  1 JAN 2128 569       0.        .0      .0
   1 JAN 1449 170       1.        .0      .7 *  1 JAN 1809 370       1.        .0      .4 *  1 JAN 2129 570       0.        .0      .0
   1 JAN 1450 171       1.        .0      .7 *  1 JAN 1810 371       1.        .0      .4 *  1 JAN 2130 571       0.        .0      .0
   1 JAN 1451 172       1.        .0      .7 *  1 JAN 1811 372       1.        .0      .3 *  1 JAN 2131 572       0.        .0      .0
   1 JAN 1452 173       1.        .0      .7 *  1 JAN 1812 373       1.        .0      .3 *  1 JAN 2132 573       0.        .0      .0
   1 JAN 1453 174       1.        .0      .7 *  1 JAN 1813 374       1.        .0      .3 *  1 JAN 2133 574       0.        .0      .0
   1 JAN 1454 175       1.        .0      .7 *  1 JAN 1814 375       1.        .0      .3 *  1 JAN 2134 575       0.        .0      .0
   1 JAN 1455 176       1.        .0      .7 *  1 JAN 1815 376       1.        .0      .3 *  1 JAN 2135 576       0.        .0      .0
   1 JAN 1456 177       1.        .0      .7 *  1 JAN 1816 377       1.        .0      .3 *  1 JAN 2136 577       0.        .0      .0
   1 JAN 1457 178       1.        .1      .7 *  1 JAN 1817 378       1.        .0      .3 *  1 JAN 2137 578       0.        .0      .0
   1 JAN 1458 179       1.        .1      .7 *  1 JAN 1818 379       1.        .0      .3 *  1 JAN 2138 579       0.        .0      .0
   1 JAN 1459 180       1.        .1      .7 *  1 JAN 1819 380       0.        .0      .3 *  1 JAN 2139 580       0.        .0      .0
   1 JAN 1500 181       1.        .1      .7 *  1 JAN 1820 381       0.        .0      .2 *  1 JAN 2140 581       0.        .0      .0
   1 JAN 1501 182       1.        .1      .7 *  1 JAN 1821 382       0.        .0      .2 *  1 JAN 2141 582       0.        .0      .0
   1 JAN 1502 183       1.        .1      .8 *  1 JAN 1822 383       0.        .0      .2 *  1 JAN 2142 583       0.        .0      .0
   1 JAN 1503 184       1.        .1      .8 *  1 JAN 1823 384       0.        .0      .2 *  1 JAN 2143 584       0.        .0      .0
   1 JAN 1504 185       1.        .1      .8 *  1 JAN 1824 385       0.        .0      .2 *  1 JAN 2144 585       0.        .0      .0
   1 JAN 1505 186       1.        .1      .8 *  1 JAN 1825 386       0.        .0      .2 *  1 JAN 2145 586       0.        .0      .0
   1 JAN 1506 187       1.        .1      .8 *  1 JAN 1826 387       0.        .0      .2 *  1 JAN 2146 587       0.        .0      .0
   1 JAN 1507 188       1.        .1      .8 *  1 JAN 1827 388       0.        .0      .2 *  1 JAN 2147 588       0.        .0      .0
   1 JAN 1508 189       2.        .1      .8 *  1 JAN 1828 389       0.        .0      .2 *  1 JAN 2148 589       0.        .0      .0
   1 JAN 1509 190       2.        .1      .8 *  1 JAN 1829 390       0.        .0      .2 *  1 JAN 2149 590       0.        .0      .0
   1 JAN 1510 191       2.        .1      .8 *  1 JAN 1830 391       0.        .0      .2 *  1 JAN 2150 591       0.        .0      .0
   1 JAN 1511 192       2.        .1      .8 *  1 JAN 1831 392       0.        .0      .2 *  1 JAN 2151 592       0.        .0      .0
   1 JAN 1512 193       2.        .1      .8 *  1 JAN 1832 393       0.        .0      .2 *  1 JAN 2152 593       0.        .0      .0
   1 JAN 1513 194       2.        .1      .8 *  1 JAN 1833 394       0.        .0      .2 *  1 JAN 2153 594       0.        .0      .0
   1 JAN 1514 195       2.        .1      .8 *  1 JAN 1834 395       0.        .0      .1 *  1 JAN 2154 595       0.        .0      .0
   1 JAN 1515 196       2.        .1      .8 *  1 JAN 1835 396       0.        .0      .1 *  1 JAN 2155 596       0.        .0      .0
   1 JAN 1516 197       2.        .1      .8 *  1 JAN 1836 397       0.        .0      .1 *  1 JAN 2156 597       0.        .0      .0
   1 JAN 1517 198       2.        .1      .9 *  1 JAN 1837 398       0.        .0      .1 *  1 JAN 2157 598       0.        .0      .0
   1 JAN 1518 199       2.        .1      .9 *  1 JAN 1838 399       0.        .0      .1 *  1 JAN 2158 599       0.        .0      .0
   1 JAN 1519 200       2.        .1      .9 *  1 JAN 1839 400       0.        .0      .1 *  1 JAN 2159 600       0.        .0      .0
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  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR      9.98-HR
+   (CFS)       (HR)
                           (CFS)
+       8.      4.17                    2.          1.          1.           1.
                        (INCHES)     1.705       1.756       1.756        1.756
                         (AC-FT)        1.          1.          1.           1.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR      9.98-HR
+  (AC-FT)      (HR)
        0.      4.15                    0.          0.          0.           0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR      9.98-HR
+   (FEET)      (HR)
      4.34      4.17                  1.03         .64         .64          .64

                         CUMULATIVE AREA =     .01 SQ MI

1                                                          STATION   DETAIN

                          (I) INFLOW,   (O) OUTFLOW
          0.        4.        8.       12.       16.       20.       24.        0.        0.        0.        0.        0.        0.
                                                                                 (S) STORAGE
          .0        .0        .0        .0        .0        .0        .0        .1        .2        .3        .4        .0        .0
 DAHRMN PER
  11200   1.I--------.---------.---------.---------.---------.---------.S--------.---------.---------.---------.---------.---------.
  11201   2.I        .         .         .         .         .         .S        .         .         .         .         .         .
  11202   3.I        .         .         .         .         .         .S        .         .         .         .         .         .
  11203   4.OI       .         .         .         .         .         .S        .         .         .         .         .         .
  11204   5.OI       .         .         .         .         .         .S        .         .         .         .         .         .
  11205   6.OI       .         .         .         .         .         .S        .         .         .         .         .         .
  11206   7.OI       .         .         .         .         .         .S        .         .         .         .         .         .
  11207   8.OI       .         .         .         .         .         .S        .         .         .         .         .         .
  11208   9.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11209  10.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11210  11.OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  11211  12.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11212  13.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11213  14.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11214  15.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11215  16.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11216  17.OI       .         .         .         .         .         . S       .         .         .         .         .         .
  11217  18.OI       .         .         .         .         .         . S       .         .         .         .         .         .
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11218  19.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11219  20.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11220  21.OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11221  22.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11222  23.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11223  24.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11224  25.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11225  26.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11226  27.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11227  28.OI       .         .         .         .         .         . S       .         .         .         .         .         .
11228  29. I       .         .         .         .         .         . S       .         .         .         .         .         .
11229  30. I       .         .         .         .         .         . S       .         .         .         .         .         .
11230  31. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11231  32. I       .         .         .         .         .         . S       .         .         .         .         .         .
11232  33. I       .         .         .         .         .         . S       .         .         .         .         .         .
11233  34. I       .         .         .         .         .         . S       .         .         .         .         .         .
11234  35. I       .         .         .         .         .         . S       .         .         .         .         .         .
11235  36. I       .         .         .         .         .         . S       .         .         .         .         .         .
11236  37. I       .         .         .         .         .         . S       .         .         .         .         .         .
11237  38. I       .         .         .         .         .         . S       .         .         .         .         .         .
11238  39. I       .         .         .         .         .         . S       .         .         .         .         .         .
11239  40. I       .         .         .         .         .         . S       .         .         .         .         .         .
11240  41. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11241  42. I       .         .         .         .         .         . S       .         .         .         .         .         .
11242  43. I       .         .         .         .         .         . S       .         .         .         .         .         .
11243  44. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11244  45. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11245  46. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11246  47. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11247  48. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11248  49. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11249  50. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11250  51. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11251  52. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11252  53. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11253  54. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11254  55. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11255  56. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11256  57. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11257  58. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11258  59. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11259  60. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11300  61. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11301  62. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11302  63. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11303  64. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11304  65. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11305  66. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11306  67. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11307  68. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11308  69. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11309  70. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11310  71. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11311  72. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11312  73. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11313  74. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11314  75. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11315  76. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11316  77. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11317  78. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11318  79. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11319  80. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11320  81. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11321  82. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11322  83. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11323  84. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11324  85. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11325  86. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11326  87. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11327  88. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11328  89. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11329  90. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11330  91. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11331  92. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11332  93. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11333  94. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11334  95. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11335  96. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11336  97. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11337  98. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11338  99. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11339 100. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11340 101. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11341 102. I       .         .         .         .         .         .  S      .         .         .         .         .         .
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11342 103. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11343 104. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11344 105. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11345 106. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11346 107. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11347 108. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11348 109. I       .         .         .         .         .         .  S      .         .         .         .         .         .
11349 110. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11350 111. OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11351 112. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11352 113. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11353 114. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11354 115. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11355 116. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11356 117. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11357 118. OI      .         .         .         .         .         .  S      .         .         .         .         .         .
11358 119. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11359 120. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11400 121. OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11401 122. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11402 123. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11403 124. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11404 125. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11405 126. OI      .         .         .         .         .         .   S     .         .         .         .         .         .
11406 127.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11407 128.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11408 129.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11409 130.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11410 131. .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11411 132.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11412 133.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11413 134.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11414 135.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11415 136.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11416 137.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11417 138.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11418 139.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11419 140.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11420 141. .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11421 142.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11422 143.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11423 144.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11424 145.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11425 146.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11426 147.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11427 148.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11428 149.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11429 150.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11430 151. .I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11431 152.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11432 153.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11433 154.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11434 155.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11435 156.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11436 157.  I      .         .         .         .         .         .   S     .         .         .         .         .         .
11437 158.  OI     .         .         .         .         .         .   S     .         .         .         .         .         .
11438 159.  OI     .         .         .         .         .         .   S     .         .         .         .         .         .
11439 160.  OI     .         .         .         .         .         .   S     .         .         .         .         .         .
11440 161. .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11441 162.  OI     .         .         .         .         .         .   S     .         .         .         .         .         .
11442 163.  OI     .         .         .         .         .         .   S     .         .         .         .         .         .
11443 164.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11444 165.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11445 166.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11446 167.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11447 168.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11448 169.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11449 170.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11450 171. .OI . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . .
11451 172.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11452 173.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11453 174.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11454 175.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11455 176.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11456 177.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11457 178.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11458 179.  OI     .         .         .         .         .         .    S    .         .         .         .         .         .
11459 180.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11500 181. . I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . .
11501 182.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11502 183.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11503 184.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11504 185.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11505 186.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
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11506 187.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11507 188.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11508 189.   I     .         .         .         .         .         .    S    .         .         .         .         .         .
11509 190.   OI    .         .         .         .         .         .    S    .         .         .         .         .         .
11510 191. . OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11511 192.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11512 193.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11513 194.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11514 195.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11515 196.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11516 197.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11517 198.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11518 199.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11519 200.   OI    .         .         .         .         .         .     S   .         .         .         .         .         .
11520 201. . OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11521 202.   O I   .         .         .         .         .         .     S   .         .         .         .         .         .
11522 203.   O I   .         .         .         .         .         .     S   .         .         .         .         .         .
11523 204.   O I   .         .         .         .         .         .     S   .         .         .         .         .         .
11524 205.   O I   .         .         .         .         .         .     S   .         .         .         .         .         .
11525 206.   O I   .         .         .         .         .         .      S  .         .         .         .         .         .
11526 207.    OI   .         .         .         .         .         .      S  .         .         .         .         .         .
11527 208.    OI   .         .         .         .         .         .      S  .         .         .         .         .         .
11528 209.    OI   .         .         .         .         .         .      S  .         .         .         .         .         .
11529 210.    O I  .         .         .         .         .         .      S  .         .         .         .         .         .
11530 211. . .O.I. . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11531 212.    O I  .         .         .         .         .         .      S  .         .         .         .         .         .
11532 213.    O I  .         .         .         .         .         .      S  .         .         .         .         .         .
11533 214.    O I  .         .         .         .         .         .      S  .         .         .         .         .         .
11534 215.    O I  .         .         .         .         .         .      S  .         .         .         .         .         .
11535 216.    O I  .         .         .         .         .         .       S .         .         .         .         .         .
11536 217.    O I  .         .         .         .         .         .       S .         .         .         .         .         .
11537 218.    O  I .         .         .         .         .         .       S .         .         .         .         .         .
11538 219.    O  I .         .         .         .         .         .       S .         .         .         .         .         .
11539 220.     O I .         .         .         .         .         .       S .         .         .         .         .         .
11540 221. . . O I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11541 222.     O I .         .         .         .         .         .       S .         .         .         .         .         .
11542 223.     O  I.         .         .         .         .         .       S .         .         .         .         .         .
11543 224.     O  I.         .         .         .         .         .        S.         .         .         .         .         .
11544 225.     O   I         .         .         .         .         .        S.         .         .         .         .         .
11545 226.     O   I         .         .         .         .         .        S.         .         .         .         .         .
11546 227.     O   .I        .         .         .         .         .        S.         .         .         .         .         .
11547 228.      O  .I        .         .         .         .         .         S         .         .         .         .         .
11548 229.      O  .I        .         .         .         .         .         S         .         .         .         .         .
11549 230.      O  .  I      .         .         .         .         .         S         .         .         .         .         .
11550 231. . . .O. . . .I. . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . .
11551 232.      O  .     I   .         .         .         .         .         .S        .         .         .         .         .
11552 233.       O .       I .         .         .         .         .         .S        .         .         .         .         .
11553 234.       O .        I.         .         .         .         .         . S       .         .         .         .         .
11554 235.        O.         .I        .         .         .         .         .  S      .         .         .         .         .
11555 236.        O.         . I       .         .         .         .         .  S      .         .         .         .         .
11556 237.         O         .   I     .         .         .         .         .   S     .         .         .         .         .
11557 238.         O         .      I  .         .         .         .         .    S    .         .         .         .         .
11558 239.         .O        .         .I        .         .         .         .     S   .         .         .         .         .
11559 240.         . O       .         .   I     .         .         .         .      S  .         .         .         .         .
11600 241. . . . . . .O. . . . . . . . . . . . I . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . .
11601 242.         .   O     .         .         .I        .         .         .         S         .         .         .         .
11602 243.         .    O    .         .         .   I     .         .         .         .S        .         .         .         .
11603 244.         .     O   .         .         .       I .         .         .         .  S      .         .         .         .
11604 245.         .      O  .         .         .         .I        .         .         .    S    .         .         .         .
11605 246.         .       O .         .         .     I   .         .         .         .      S  .         .         .         .
11606 247.         .        O.         .         .I        .         .         .         .       S .         .         .         .
11607 248.         .         O         .     I   .         .         .         .         .        S.         .         .         .
11608 249.         .         O         I         .         .         .         .         .         S         .         .         .
11609 250.         .         .O   I    .         .         .         .         .         .         S         .         .         .
11610 251. . . . . . . . . . IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . .
11611 252.         .    I    .O        .         .         .         .         .         .         S         .         .         .
11612 253.        I.         O         .         .         .         .         .         .        S.         .         .         .
11613 254.        I.         O         .         .         .         .         .         .        S.         .         .         .
11614 255.        I.        O.         .         .         .         .         .         .       S .         .         .         .
11615 256.       I .        O.         .         .         .         .         .         .       S .         .         .         .
11616 257.       I .        O.         .         .         .         .         .         .      S  .         .         .         .
11617 258.      I  .       O .         .         .         .         .         .         .     S   .         .         .         .
11618 259.      I  .       O .         .         .         .         .         .         .     S   .         .         .         .
11619 260.      I  .      O  .         .         .         .         .         .         .    S    .         .         .         .
11620 261. . . I . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . .
11621 262.     I   .      O  .         .         .         .         .         .         .   S     .         .         .         .
11622 263.     I   .     O   .         .         .         .         .         .         .  S      .         .         .         .
11623 264.     I   .     O   .         .         .         .         .         .         .  S      .         .         .         .
11624 265.     I   .    O    .         .         .         .         .         .         . S       .         .         .         .
11625 266.    I    .    O    .         .         .         .         .         .         . S       .         .         .         .
11626 267.    I    .    O    .         .         .         .         .         .         .S        .         .         .         .
11627 268.    I    .   O     .         .         .         .         .         .         .S        .         .         .         .
11628 269.    I    .   O     .         .         .         .         .         .         S         .         .         .         .
11629 270.    I    .   O     .         .         .         .         .         .         S         .         .         .         .
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11630 271. . .I. . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . .
11631 272.    I    .  O      .         .         .         .         .         .        S.         .         .         .         .
11632 273.   I     .  O      .         .         .         .         .         .       S .         .         .         .         .
11633 274.   I     . O       .         .         .         .         .         .       S .         .         .         .         .
11634 275.   I     . O       .         .         .         .         .         .       S .         .         .         .         .
11635 276.   I     . O       .         .         .         .         .         .      S  .         .         .         .         .
11636 277.   I     . O       .         .         .         .         .         .      S  .         .         .         .         .
11637 278.   I     .O        .         .         .         .         .         .     S   .         .         .         .         .
11638 279.   I     .O        .         .         .         .         .         .     S   .         .         .         .         .
11639 280.   I     .O        .         .         .         .         .         .     S   .         .         .         .         .
11640 281. . I . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
11641 282.   I     O         .         .         .         .         .         .    S    .         .         .         .         .
11642 283.   I     O         .         .         .         .         .         .   S     .         .         .         .         .
11643 284.   I     O         .         .         .         .         .         .   S     .         .         .         .         .
11644 285.  I     O.         .         .         .         .         .         .   S     .         .         .         .         .
11645 286.  I     O.         .         .         .         .         .         .  S      .         .         .         .         .
11646 287.  I     O.         .         .         .         .         .         .  S      .         .         .         .         .
11647 288.  I     O.         .         .         .         .         .         .  S      .         .         .         .         .
11648 289.  I     O.         .         .         .         .         .         . S       .         .         .         .         .
11649 290.  I    O .         .         .         .         .         .         . S       .         .         .         .         .
11650 291. .I. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . .
11651 292.  I    O .         .         .         .         .         .         . S       .         .         .         .         .
11652 293.  I    O .         .         .         .         .         .         .S        .         .         .         .         .
11653 294.  I    O .         .         .         .         .         .         .S        .         .         .         .         .
11654 295.  I    O .         .         .         .         .         .         .S        .         .         .         .         .
11655 296.  I   O  .         .         .         .         .         .         .S        .         .         .         .         .
11656 297.  I   O  .         .         .         .         .         .         S         .         .         .         .         .
11657 298.  I   O  .         .         .         .         .         .         S         .         .         .         .         .
11658 299.  I   O  .         .         .         .         .         .         S         .         .         .         .         .
11659 300.  I   O  .         .         .         .         .         .         S         .         .         .         .         .
11700 301. .I. .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . .
11701 302.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11702 303.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11703 304.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11704 305.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11705 306.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11706 307.  I  O   .         .         .         .         .         .        S.         .         .         .         .         .
11707 308.  I  O   .         .         .         .         .         .       S .         .         .         .         .         .
11708 309.  I  O   .         .         .         .         .         .       S .         .         .         .         .         .
11709 310.  I  O   .         .         .         .         .         .       S .         .         .         .         .         .
11710 311. .I.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . .
11711 312.  I O    .         .         .         .         .         .       S .         .         .         .         .         .
11712 313.  I O    .         .         .         .         .         .       S .         .         .         .         .         .
11713 314.  I O    .         .         .         .         .         .      S  .         .         .         .         .         .
11714 315.  I O    .         .         .         .         .         .      S  .         .         .         .         .         .
11715 316.  I O    .         .         .         .         .         .      S  .         .         .         .         .         .
11716 317. I  O    .         .         .         .         .         .      S  .         .         .         .         .         .
11717 318. I  O    .         .         .         .         .         .      S  .         .         .         .         .         .
11718 319. I  O    .         .         .         .         .         .      S  .         .         .         .         .         .
11719 320. I  O    .         .         .         .         .         .      S  .         .         .         .         .         .
11720 321. I .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . .
11721 322. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11722 323. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11723 324. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11724 325. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11725 326. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11726 327. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11727 328. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11728 329. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11729 330. I O     .         .         .         .         .         .     S   .         .         .         .         .         .
11730 331. I O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . .
11731 332. I O     .         .         .         .         .         .    S    .         .         .         .         .         .
11732 333. I O     .         .         .         .         .         .    S    .         .         .         .         .         .
11733 334. I O     .         .         .         .         .         .    S    .         .         .         .         .         .
11734 335. I O     .         .         .         .         .         .    S    .         .         .         .         .         .
11735 336. I O     .         .         .         .         .         .    S    .         .         .         .         .         .
11736 337. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11737 338. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11738 339. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11739 340. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11740 341. IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . .
11741 342. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11742 343. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11743 344. IO      .         .         .         .         .         .    S    .         .         .         .         .         .
11744 345. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11745 346. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11746 347. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11747 348. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11748 349. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11749 350. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11750 351. IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11751 352. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11752 353. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11753 354. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
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11754 355. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11755 356. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11756 357. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11757 358. IO      .         .         .         .         .         .   S     .         .         .         .         .         .
11758 359.I O      .         .         .         .         .         .   S     .         .         .         .         .         .
11759 360.I O      .         .         .         .         .         .   S     .         .         .         .         .         .
11800 361.IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11801 362.IO       .         .         .         .         .         .  S      .         .         .         .         .         .
11802 363I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11803 364I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11804 365I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11805 366I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11806 367I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11807 368I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11808 369I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11809 370I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11810 371I O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . .
11811 372I O       .         .         .         .         .         . S       .         .         .         .         .         .
11812 373I O       .         .         .         .         .         . S       .         .         .         .         .         .
11813 374I O       .         .         .         .         .         . S       .         .         .         .         .         .
11814 375IO        .         .         .         .         .         . S       .         .         .         .         .         .
11815 376IO        .         .         .         .         .         . S       .         .         .         .         .         .
11816 377IO        .         .         .         .         .         . S       .         .         .         .         .         .
11817 378IO        .         .         .         .         .         . S       .         .         .         .         .         .
11818 379IO        .         .         .         .         .         . S       .         .         .         .         .         .
11819 380IO        .         .         .         .         .         . S       .         .         .         .         .         .
11820 381IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11821 382IO        .         .         .         .         .         . S       .         .         .         .         .         .
11822 383IO        .         .         .         .         .         . S       .         .         .         .         .         .
11823 384IO        .         .         .         .         .         . S       .         .         .         .         .         .
11824 385IO        .         .         .         .         .         .S        .         .         .         .         .         .
11825 386IO        .         .         .         .         .         .S        .         .         .         .         .         .
11826 387IO        .         .         .         .         .         .S        .         .         .         .         .         .
11827 388IO        .         .         .         .         .         .S        .         .         .         .         .         .
11828 389IO        .         .         .         .         .         .S        .         .         .         .         .         .
11829 390IO        .         .         .         .         .         .S        .         .         .         .         .         .
11830 391IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11831 392IO        .         .         .         .         .         .S        .         .         .         .         .         .
11832 393IO        .         .         .         .         .         .S        .         .         .         .         .         .
11833 394IO        .         .         .         .         .         .S        .         .         .         .         .         .
11834 395IO        .         .         .         .         .         .S        .         .         .         .         .         .
11835 396IO        .         .         .         .         .         .S        .         .         .         .         .         .
11836 397IO        .         .         .         .         .         .S        .         .         .         .         .         .
11837 398IO        .         .         .         .         .         .S        .         .         .         .         .         .
11838 399IO        .         .         .         .         .         .S        .         .         .         .         .         .
11839 400IO        .         .         .         .         .         .S        .         .         .         .         .         .
11840 401IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11841 402IO        .         .         .         .         .         .S        .         .         .         .         .         .
11842 403IO        .         .         .         .         .         .S        .         .         .         .         .         .
11843 404I         .         .         .         .         .         .S        .         .         .         .         .         .
11844 405I         .         .         .         .         .         .S        .         .         .         .         .         .
11845 406I         .         .         .         .         .         .S        .         .         .         .         .         .
11846 407I         .         .         .         .         .         .S        .         .         .         .         .         .
11847 408I         .         .         .         .         .         .S        .         .         .         .         .         .
11848 409I         .         .         .         .         .         .S        .         .         .         .         .         .
11849 410I         .         .         .         .         .         .S        .         .         .         .         .         .
11850 411I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11851 412I         .         .         .         .         .         .S        .         .         .         .         .         .
11852 413I         .         .         .         .         .         .S        .         .         .         .         .         .
11853 414I         .         .         .         .         .         S         .         .         .         .         .         .
11854 415I         .         .         .         .         .         S         .         .         .         .         .         .
11855 416I         .         .         .         .         .         S         .         .         .         .         .         .
11856 417I         .         .         .         .         .         S         .         .         .         .         .         .
11857 418I         .         .         .         .         .         S         .         .         .         .         .         .
11858 419I         .         .         .         .         .         S         .         .         .         .         .         .
11859 420I         .         .         .         .         .         S         .         .         .         .         .         .
11900 421I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11901 422I         .         .         .         .         .         S         .         .         .         .         .         .
11902 423I         .         .         .         .         .         S         .         .         .         .         .         .
11903 424I         .         .         .         .         .         S         .         .         .         .         .         .
11904 425I         .         .         .         .         .         S         .         .         .         .         .         .
11905 426I         .         .         .         .         .         S         .         .         .         .         .         .
11906 427I         .         .         .         .         .         S         .         .         .         .         .         .
11907 428I         .         .         .         .         .         S         .         .         .         .         .         .
11908 429I         .         .         .         .         .         S         .         .         .         .         .         .
11909 430I         .         .         .         .         .         S         .         .         .         .         .         .
11910 431I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11911 432I         .         .         .         .         .         S         .         .         .         .         .         .
11912 433I         .         .         .         .         .         S         .         .         .         .         .         .
11913 434I         .         .         .         .         .         S         .         .         .         .         .         .
11914 435I         .         .         .         .         .         S         .         .         .         .         .         .
11915 436I         .         .         .         .         .         S         .         .         .         .         .         .
11916 437I         .         .         .         .         .         S         .         .         .         .         .         .
11917 438I         .         .         .         .         .         S         .         .         .         .         .         .
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11918 439I         .         .         .         .         .         S         .         .         .         .         .         .
11919 440I         .         .         .         .         .         S         .         .         .         .         .         .
11920 441I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11921 442I         .         .         .         .         .         S         .         .         .         .         .         .
11922 443I         .         .         .         .         .         S         .         .         .         .         .         .
11923 444I         .         .         .         .         .         S         .         .         .         .         .         .
11924 445I         .         .         .         .         .         S         .         .         .         .         .         .
11925 446I         .         .         .         .         .         S         .         .         .         .         .         .
11926 447I         .         .         .         .         .         S         .         .         .         .         .         .
11927 448I         .         .         .         .         .         S         .         .         .         .         .         .
11928 449I         .         .         .         .         .         S         .         .         .         .         .         .
11929 450I         .         .         .         .         .         S         .         .         .         .         .         .
11930 451I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11931 452I         .         .         .         .         .         S         .         .         .         .         .         .
11932 453I         .         .         .         .         .         S         .         .         .         .         .         .
11933 454I         .         .         .         .         .         S         .         .         .         .         .         .
11934 455I         .         .         .         .         .         S         .         .         .         .         .         .
11935 456I         .         .         .         .         .         S         .         .         .         .         .         .
11936 457I         .         .         .         .         .         S         .         .         .         .         .         .
11937 458I         .         .         .         .         .         S         .         .         .         .         .         .
11938 459I         .         .         .         .         .         S         .         .         .         .         .         .
11939 460I         .         .         .         .         .         S         .         .         .         .         .         .
11940 461I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11941 462I         .         .         .         .         .         S         .         .         .         .         .         .
11942 463I         .         .         .         .         .         S         .         .         .         .         .         .
11943 464I         .         .         .         .         .         S         .         .         .         .         .         .
11944 465I         .         .         .         .         .         S         .         .         .         .         .         .
11945 466I         .         .         .         .         .         S         .         .         .         .         .         .
11946 467I         .         .         .         .         .         S         .         .         .         .         .         .
11947 468I         .         .         .         .         .         S         .         .         .         .         .         .
11948 469I         .         .         .         .         .         S         .         .         .         .         .         .
11949 470I         .         .         .         .         .         S         .         .         .         .         .         .
11950 471I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11951 472I         .         .         .         .         .         S         .         .         .         .         .         .
11952 473I         .         .         .         .         .         S         .         .         .         .         .         .
11953 474I         .         .         .         .         .         S         .         .         .         .         .         .
11954 475I         .         .         .         .         .         S         .         .         .         .         .         .
11955 476I         .         .         .         .         .         S         .         .         .         .         .         .
11956 477I         .         .         .         .         .         S         .         .         .         .         .         .
11957 478I         .         .         .         .         .         S         .         .         .         .         .         .
11958 479I         .         .         .         .         .         S         .         .         .         .         .         .
11959 480I         .         .         .         .         .         S         .         .         .         .         .         .
12000 481I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12001 482I         .         .         .         .         .         S         .         .         .         .         .         .
12002 483I         .         .         .         .         .         S         .         .         .         .         .         .
12003 484I         .         .         .         .         .         S         .         .         .         .         .         .
12004 485I         .         .         .         .         .         S         .         .         .         .         .         .
12005 486I         .         .         .         .         .         S         .         .         .         .         .         .
12006 487I         .         .         .         .         .         S         .         .         .         .         .         .
12007 488I         .         .         .         .         .         S         .         .         .         .         .         .
12008 489I         .         .         .         .         .         S         .         .         .         .         .         .
12009 490I         .         .         .         .         .         S         .         .         .         .         .         .
12010 491I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12011 492I         .         .         .         .         .         S         .         .         .         .         .         .
12012 493I         .         .         .         .         .         S         .         .         .         .         .         .
12013 494I         .         .         .         .         .         S         .         .         .         .         .         .
12014 495I         .         .         .         .         .         S         .         .         .         .         .         .
12015 496I         .         .         .         .         .         S         .         .         .         .         .         .
12016 497I         .         .         .         .         .         S         .         .         .         .         .         .
12017 498I         .         .         .         .         .         S         .         .         .         .         .         .
12018 499I         .         .         .         .         .         S         .         .         .         .         .         .
12019 500I         .         .         .         .         .         S         .         .         .         .         .         .
12020 501I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12021 502I         .         .         .         .         .         S         .         .         .         .         .         .
12022 503I         .         .         .         .         .         S         .         .         .         .         .         .
12023 504I         .         .         .         .         .         S         .         .         .         .         .         .
12024 505I         .         .         .         .         .         S         .         .         .         .         .         .
12025 506I         .         .         .         .         .         S         .         .         .         .         .         .
12026 507I         .         .         .         .         .         S         .         .         .         .         .         .
12027 508I         .         .         .         .         .         S         .         .         .         .         .         .
12028 509I         .         .         .         .         .         S         .         .         .         .         .         .
12029 510I         .         .         .         .         .         S         .         .         .         .         .         .
12030 511I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12031 512I         .         .         .         .         .         S         .         .         .         .         .         .
12032 513I         .         .         .         .         .         S         .         .         .         .         .         .
12033 514I         .         .         .         .         .         S         .         .         .         .         .         .
12034 515I         .         .         .         .         .         S         .         .         .         .         .         .
12035 516I         .         .         .         .         .         S         .         .         .         .         .         .
12036 517I         .         .         .         .         .         S         .         .         .         .         .         .
12037 518I         .         .         .         .         .         S         .         .         .         .         .         .
12038 519I         .         .         .         .         .         S         .         .         .         .         .         .
12039 520I         .         .         .         .         .         S         .         .         .         .         .         .
12040 521I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12041 522I         .         .         .         .         .         S         .         .         .         .         .         .
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  12042 523I         .         .         .         .         .         S         .         .         .         .         .         .
  12043 524I         .         .         .         .         .         S         .         .         .         .         .         .
  12044 525I         .         .         .         .         .         S         .         .         .         .         .         .
  12045 526I         .         .         .         .         .         S         .         .         .         .         .         .
  12046 527I         .         .         .         .         .         S         .         .         .         .         .         .
  12047 528I         .         .         .         .         .         S         .         .         .         .         .         .
  12048 529I         .         .         .         .         .         S         .         .         .         .         .         .
  12049 530I         .         .         .         .         .         S         .         .         .         .         .         .
  12050 531I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12051 532I         .         .         .         .         .         S         .         .         .         .         .         .
  12052 533I         .         .         .         .         .         S         .         .         .         .         .         .
  12053 534I         .         .         .         .         .         S         .         .         .         .         .         .
  12054 535I         .         .         .         .         .         S         .         .         .         .         .         .
  12055 536I         .         .         .         .         .         S         .         .         .         .         .         .
  12056 537I         .         .         .         .         .         S         .         .         .         .         .         .
  12057 538I         .         .         .         .         .         S         .         .         .         .         .         .
  12058 539I         .         .         .         .         .         S         .         .         .         .         .         .
  12059 540I         .         .         .         .         .         S         .         .         .         .         .         .
  12100 541I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12101 542I         .         .         .         .         .         S         .         .         .         .         .         .
  12102 543I         .         .         .         .         .         S         .         .         .         .         .         .
  12103 544I         .         .         .         .         .         S         .         .         .         .         .         .
  12104 545I         .         .         .         .         .         S         .         .         .         .         .         .
  12105 546I         .         .         .         .         .         S         .         .         .         .         .         .
  12106 547I         .         .         .         .         .         S         .         .         .         .         .         .
  12107 548I         .         .         .         .         .         S         .         .         .         .         .         .
  12108 549I         .         .         .         .         .         S         .         .         .         .         .         .
  12109 550I         .         .         .         .         .         S         .         .         .         .         .         .
  12110 551I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12111 552I         .         .         .         .         .         S         .         .         .         .         .         .
  12112 553I         .         .         .         .         .         S         .         .         .         .         .         .
  12113 554I         .         .         .         .         .         S         .         .         .         .         .         .
  12114 555I         .         .         .         .         .         S         .         .         .         .         .         .
  12115 556I         .         .         .         .         .         S         .         .         .         .         .         .
  12116 557I         .         .         .         .         .         S         .         .         .         .         .         .
  12117 558I         .         .         .         .         .         S         .         .         .         .         .         .
  12118 559I         .         .         .         .         .         S         .         .         .         .         .         .
  12119 560I         .         .         .         .         .         S         .         .         .         .         .         .
  12120 561I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12121 562I         .         .         .         .         .         S         .         .         .         .         .         .
  12122 563I         .         .         .         .         .         S         .         .         .         .         .         .
  12123 564I         .         .         .         .         .         S         .         .         .         .         .         .
  12124 565I         .         .         .         .         .         S         .         .         .         .         .         .
  12125 566I         .         .         .         .         .         S         .         .         .         .         .         .
  12126 567I         .         .         .         .         .         S         .         .         .         .         .         .
  12127 568I         .         .         .         .         .         S         .         .         .         .         .         .
  12128 569I         .         .         .         .         .         S         .         .         .         .         .         .
  12129 570I         .         .         .         .         .         S         .         .         .         .         .         .
  12130 571I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12131 572I         .         .         .         .         .         S         .         .         .         .         .         .
  12132 573I         .         .         .         .         .         S         .         .         .         .         .         .
  12133 574I         .         .         .         .         .         S         .         .         .         .         .         .
  12134 575I         .         .         .         .         .         S         .         .         .         .         .         .
  12135 576I         .         .         .         .         .         S         .         .         .         .         .         .
  12136 577I         .         .         .         .         .         S         .         .         .         .         .         .
  12137 578I         .         .         .         .         .         S         .         .         .         .         .         .
  12138 579I         .         .         .         .         .         S         .         .         .         .         .         .
  12139 580I         .         .         .         .         .         S         .         .         .         .         .         .
  12140 581I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12141 582I         .         .         .         .         .         S         .         .         .         .         .         .
  12142 583I         .         .         .         .         .         S         .         .         .         .         .         .
  12143 584I         .         .         .         .         .         S         .         .         .         .         .         .
  12144 585I         .         .         .         .         .         S         .         .         .         .         .         .
  12145 586I         .         .         .         .         .         S         .         .         .         .         .         .
  12146 587I         .         .         .         .         .         S         .         .         .         .         .         .
  12147 588I         .         .         .         .         .         S         .         .         .         .         .         .
  12148 589I         .         .         .         .         .         S         .         .         .         .         .         .
  12149 590I         .         .         .         .         .         S         .         .         .         .         .         .
  12150 591I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  12151 592I         .         .         .         .         .         S         .         .         .         .         .         .
  12152 593I         .         .         .         .         .         S         .         .         .         .         .         .
  12153 594I         .         .         .         .         .         S         .         .         .         .         .         .
  12154 595I         .         .         .         .         .         S         .         .         .         .         .         .
  12155 596I         .         .         .         .         .         S         .         .         .         .         .         .
  12156 597I         .         .         .         .         .         S         .         .         .         .         .         .
  12157 598I         .         .         .         .         .         S         .         .         .         .         .         .
  12158 599I         .         .         .         .         .         S         .         .         .         .         .         .
  12159 600I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
1
1
                                                           RUNOFF SUMMARY
                                                   FLOW IN CUBIC FEET PER SECOND
                                                TIME IN HOURS,  AREA IN SQUARE MILES
```

```
                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                        OAN_Vaul        21.    4.07           2.          1.          1.        .01

          ROUTED TO
+                          DETAIN         8.    4.17           2.          1.          1.        .01
+                                                                                                           4.34        4.17


 *** NORMAL END OF HEC-1 ***
```

lag time = 4.17 - 4.07 =
0.1hr = 6min

```
DETAIN    11200  1JAN90 0 1 1 600      .011
       .350         .352         .356         .364         .375         .387         .399         .410         .421         .431
       .442         .451         .460         .470         .479         .488         .498         .507         .517         .527
       .537         .547         .556         .565         .574         .583         .591         .598         .606         .613
       .620         .627         .633         .640         .646         .651         .657         .662         .667         .672
       .677         .682         .686         .690         .694         .698         .702         .706         .709         .713
       .716         .719         .722         .725         .728         .731         .733         .736         .738         .740
       .743         .745         .748         .751         .754         .758         .762         .767         .771         .776
       .781         .785         .790         .794         .798         .801         .805         .809         .812         .815
       .818         .822         .824         .827         .830         .833         .836         .840         .843         .848
       .852         .857         .862         .867         .872         .877         .882         .886         .890         .894
       .898         .902         .906         .909         .913         .916         .919         .922         .925         .928
       .931         .935         .939         .944         .948         .953         .958         .964         .969         .974
       .978         .983         .987         .991         .996        1.000        1.004        1.009        1.014        1.019
      1.025        1.031        1.037        1.043        1.049        1.054        1.060        1.065        1.070        1.075
      1.080        1.084        1.089        1.095        1.100        1.106        1.112        1.118        1.125        1.132
      1.139        1.146        1.153        1.161        1.169        1.176        1.185        1.193        1.201        1.210
      1.219        1.227        1.236        1.246        1.255        1.264        1.274        1.283        1.293        1.303
      1.313        1.323        1.333        1.343        1.353        1.364        1.374        1.385        1.395        1.406
      1.417        1.428        1.438        1.449        1.460        1.471        1.482        1.494        1.505        1.516
      1.529        1.543        1.557        1.573        1.589        1.606        1.624        1.642        1.660        1.679
      1.698        1.717        1.737        1.756        1.776        1.797        1.819        1.843        1.868        1.895
      1.923        1.952        1.982        2.014        2.046        2.079        2.112        2.146        2.181        2.216
      2.252        2.290        2.334        2.383        2.436        2.494        2.556        2.623        2.693        2.776
      2.878        2.999        3.139        3.296        3.471        3.661        3.868        4.104        4.382        4.701
      5.060        5.457        5.890        6.358        6.861        7.331        7.705        7.987        8.179        8.287
      8.311        8.257        8.126        7.958        7.791        7.624        7.458        7.293        7.128        6.964
      6.800        6.639        6.481        6.326        6.175        6.028        5.883        5.742        5.604        5.468
      5.336        5.207        5.081        4.957        4.837        4.719        4.603        4.491        4.382        4.276
      4.172        4.072        3.975        3.880        3.788        3.699        3.612        3.529        3.448        3.369
      3.293        3.219        3.148        3.079        3.012        2.947        2.884        2.823        2.763        2.706
      2.650        2.595        2.543        2.491        2.442        2.393        2.346        2.300        2.256        2.212
      2.170        2.129        2.089        2.050        2.012        1.975        1.939        1.904        1.869        1.836
      1.803        1.771        1.739        1.709        1.679        1.650        1.622        1.595        1.569        1.544
      1.520        1.497        1.475        1.453        1.432        1.411        1.390        1.370        1.349        1.330
      1.310        1.291        1.273        1.255        1.238        1.222        1.206        1.191        1.176        1.162
      1.148        1.134        1.120        1.106        1.092        1.078        1.064        1.049        1.031        1.010
       .987         .962         .934         .904         .872         .840         .808         .778         .749         .721
       .694         .668         .643         .619         .596         .574         .553         .532         .512         .493
       .475         .457         .440         .423         .408         .392         .378         .364         .350         .337
       .325         .312         .301         .290         .279         .268         .258         .249         .239         .230
       .222         .214         .206         .198         .191         .183         .177         .170         .164         .158
       .152         .146         .141         .135         .130         .125         .121         .116         .112         .108
       .104         .100         .096         .093         .089         .086         .083         .079         .077         .074
       .071         .068         .066         .063         .061         .059         .056         .054         .052         .050
       .048         .047         .045         .043         .042         .040         .039         .037         .036         .034
       .033         .032         .031         .030         .028         .027         .026         .025         .024         .024
       .023         .022         .021         .020         .019         .019         .018         .017         .017         .016
       .015         .015         .014         .014         .013         .013         .012         .012         .011         .011
       .011         .010         .010         .009         .009         .009         .008         .008         .008         .008
       .007         .007         .007         .006         .006         .006         .006         .006         .005         .005
       .005         .005         .005         .004         .004         .004         .004         .004         .004         .004
       .003         .003         .003         .003         .003         .003         .003         .003         .002         .002
       .002         .002         .002         .002         .002         .002         .002         .002         .002         .002
       .002         .002         .001         .001         .001         .001         .001         .001         .001         .001
       .001         .001         .001         .001         .001         .001         .001         .001         .001         .001
       .001         .001         .001         .001         .001         .001         .001         .001         .001         .001
```

Peak Detained Q = 8.31 CFS

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               .001         .000         .000         .000         .000         .000         .000         .000         .000         .000
               .000         .000         .000         .000         .000         .000         .000         .000         .000         .000
               .000         .000         .000         .000         .000         .000         .000         .000         .000         .000
               .000         .000         .000         .000         .000         .000         .000         .000         .000         .000
```
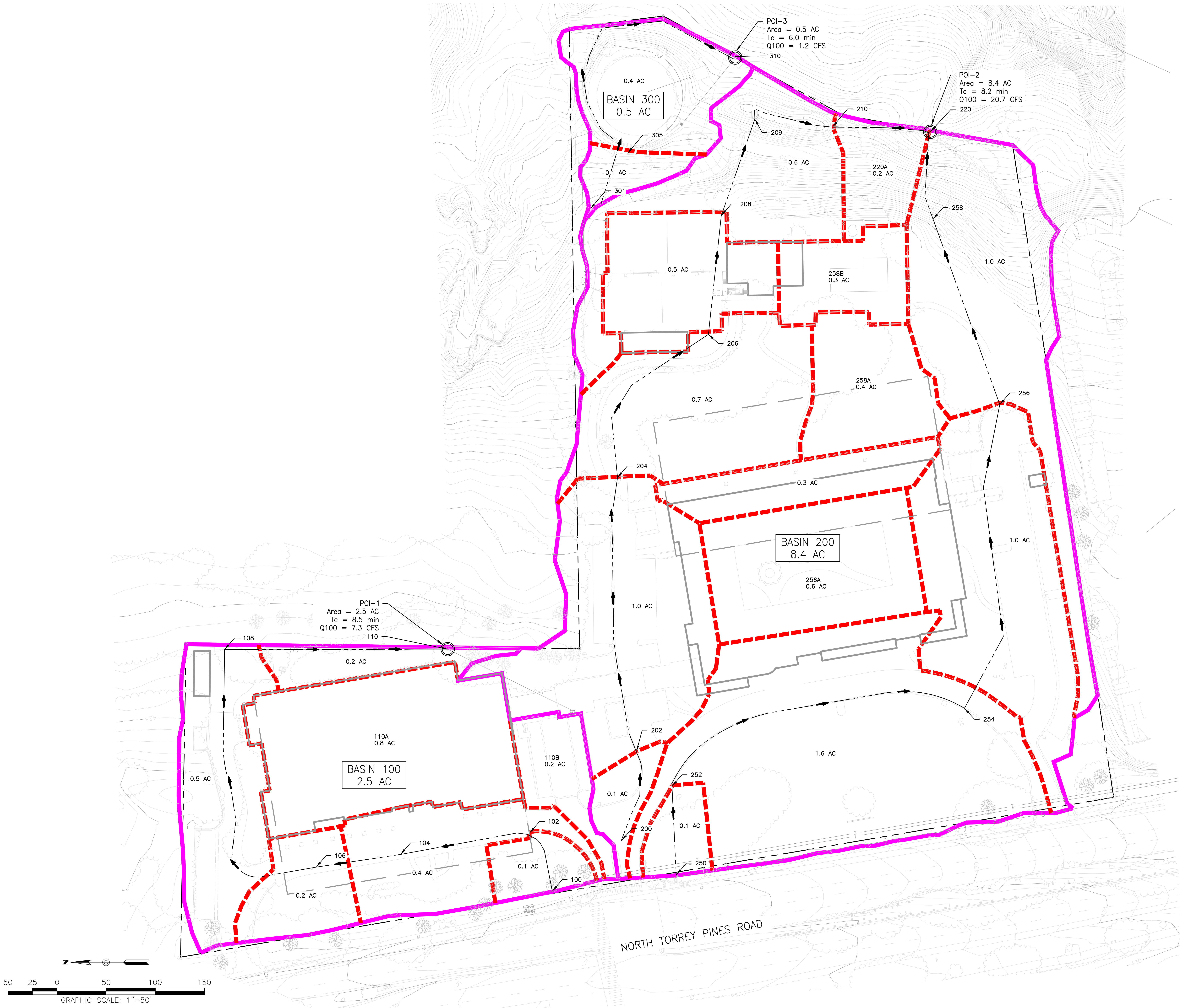

MAP POCKET 1

Pre-Project Drainage Map
for
One Alexandria North



LEGEND

BASIN XXX X.X AC	MAJOR BASIN ID
▬	MAJOR BASIN BOUNDARY
▬ ▬ ▬ ▬	SUB-BASIN BOUNDARY
◎	POINT OF INTEREST (POI)
↙ POI-X	POI ID
↙ XXX	NODE ID
XXXX X.X AC	SUB-BASIN ID & ACREAGE
----—→—	FLOW PATH

DRAINAGE STUDY MAP
FOR
ONE ALEXANDRIA NORTH
(PRE-PROJECT)

DATE: JUNE 23, 2021
REVISED: NOVEMBER 5, 2021

JN-19366

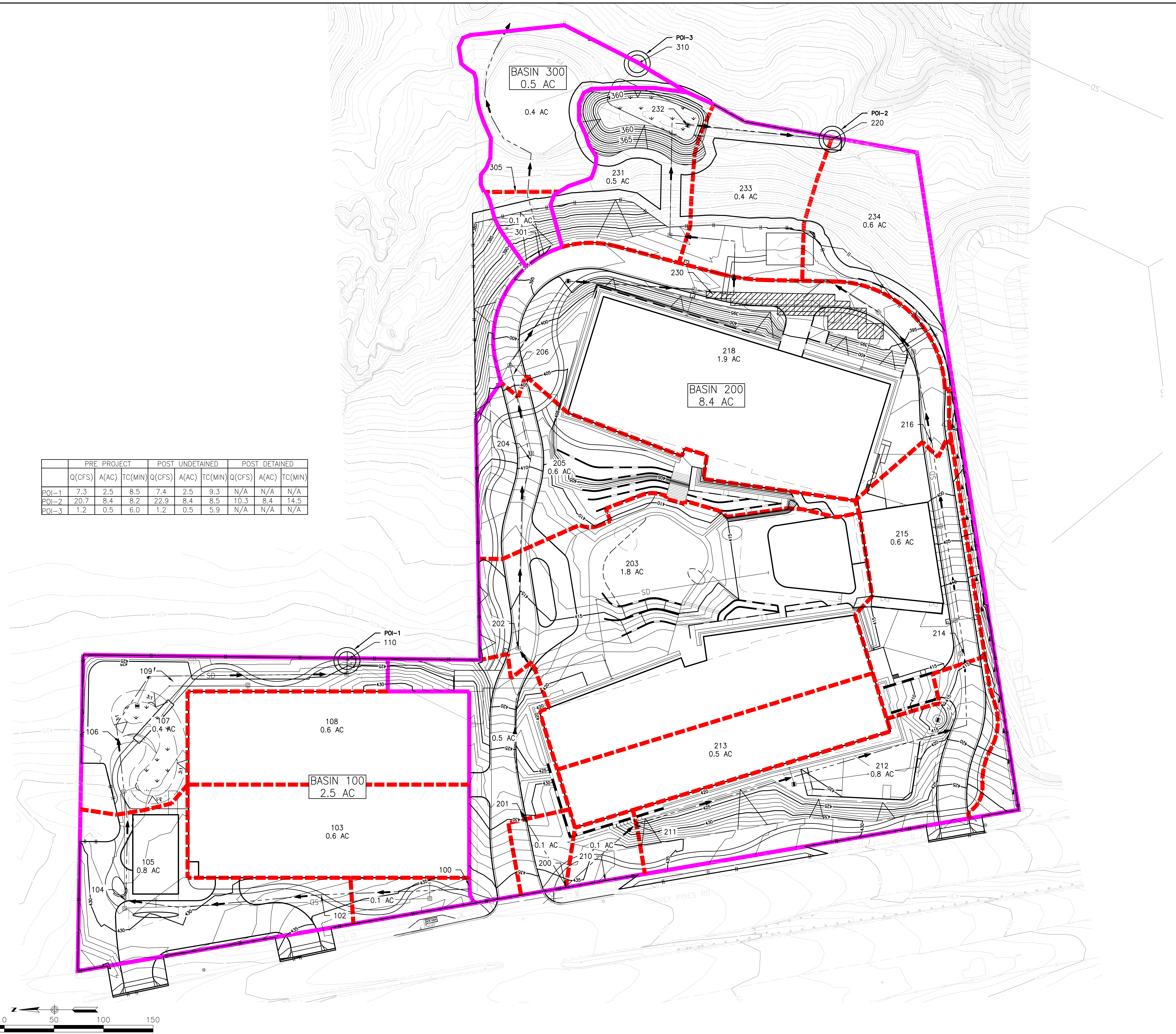
RICK™
ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Riverside - Orange - San Luis Obispo - Denver - Sacramento - Phoenix - Tucson

2021-11-05 - 1:59PM - ejappelli

NOT FOR CONSTRUCTION — EXHIBIT FOR DRAINAGE REPORT ONLY

MAP POCKET 2

Post-Project Drainage Map
for
One Alexandria North



	PRE PROJECT			POST UNDETAINED			POST DETAINED		
	Q(CFS)	A(AC)	TC(MIN)	Q(CFS)	A(AC)	TC(MIN)	Q(CFS)	A(AC)	TC(MIN)
POI-1	7.3	2.5	8.5	7.4	2.5	9.3	N/A	N/A	N/A
POI-2	20.7	8.4	8.2	22.9	8.4	8.5	10.3	8.4	14.5
POI-3	1.2	0.5	6.0	1.2	0.5	5.9	N/A	N/A	N/A

LEGEND:

🟪	MAJOR BASIN BOUNDARY
🟥	SUB-BASIN BOUNDARY
→	FLOW PATH
◎	POINT OF INTEREST (POI)
POI-X	POI ID
310	NODE ID
BASIN XXX X.X AC	MAJOR BASIN ID & ACREAGE
XXX X.X AC	SUB-BASIN ID & ACREAGE
☐	BIOFILTRATION BMP (BF-1)
▨	UNDERGROUND DETENTION VAULT

RICK
ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Riverside - Orange - San Luis Obispo - Denver - Sacramento - Phoenix - Tucson

DRAINAGE STUDY MAP
FOR
ONE ALEXANDRIA NORTH
(POST-PROJECT)

JN-19366

DATE: JUNE 23, 2021
REVISED: NOVEMBER 08, 2021

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE REPORT ONLY

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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GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

ONE ALEXANDRIA NORTH
11255 AND 11355 NORTH TORREY PINES ROAD
SAN DIEGO, CALIFORNIA

PREPARED FOR

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AUGUST 24, 2021
PROJECT NO. G2566-52-02

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2566-52-02
August 24, 2021

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

Attention: Mr. Jason Moorhead

Subject: GEOTECHNICAL INVESTIGATION
ONE ALEXANDRIA NORTH
11255 AND 11355 NORTH TORREY PINES ROAD
SAN DIEGO, CALIFORNIA

Dear Mr. Moorhead:

In accordance with your request and authorization of our Proposal No. LG-21254 dated May 17, 2021, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards, and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

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

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TABLE OF CONTENTS

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed commercial development in the Torrey Pines area of San Diego, California (see Vicinity Map). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property including faulting, liquefaction and seismic shaking based on the 2019 CBC seismic design criteria. In addition, we provided preliminary recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, pavement, and retaining walls.

Vicinity Map

The scope of this investigation included reviewing readily available published and unpublished geologic literature (see List of References); performing engineering analyses; and preparing this report. We also advanced 11 exploratory borings to a maximum depth of about 41 feet, sampled soil and performed laboratory testing. Appendix A presents the exploratory boring logs and details of the field investigation. The details of the laboratory tests and a summary of the test results are shown in Appendix B and on the boring logs in Appendix A.

2. SITE AND PROJECT DESCRIPTION

The subject property is located east of North Torrey Pines Road and the Torrey Pines Golf Course, north of existing commercial/science buildings and south and west of open space. The property is addressed 11255 and 11355 N. Torrey Pines Road and is currently developed with two, 2-story buildings connected by a pedestrian bridge. Both buildings possess a subterranean level below the existing building. The southeast side of the property includes a pool, pool/recreation building, walkways and a helipad. Asphalt concrete surface parking exists on the north, central and south. The property has 3 driveway access from N. Torrey Pines Road to the west. The site is gently slopes to the east at elevations of about 430 to 370 feet above mean sea level (MSL). A natural descending slope exists to the east that is about 300 feet high. The Existing Site Map shows the existing site conditions.

Existing Site Map

Historically, the northern portion of the site was previously occupied by a water reservoir in conjunction with the military facility known as Camp Callan. Our review of published aerial photography indicates that the reservoir facility consisted of embankment dikes on the north, east and south sides and an excavation into natural ground along the western boundary. The reservoir was constructed prior to 1932 and was dismantled between 1978 and 1980, prior to construction of the current development. In the absence of geotechnical engineering documentation and/or topographic maps and grading plans, it is difficult to evaluate the earthwork and grading related to the construction and deconstruction of the reservoir. Given our best estimates of the original topography of the site, we expect that the western portion of the reservoir footprint is likely composed of fill materials placed to achieve current grades at the site.

Based on our review of the preliminary grading plan prepared by Rick Engineering Company (see *List of References*), we understand the proposed development will consist of constructing 4 new buildings, a multi-story parking structure, a central utility plant with accommodating utilities, landscaping and flatwork. We understand that two of the buildings (B1 and B2), the parking garage and the central utility plant will possess one subterranean level each.

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with project personnel. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

Regionally, the site is located in the Peninsular Ranges geomorphic province. The province is bounded by the Transverse Ranges to the north, the San Jacinto Fault Zone on the east, the Pacific Ocean coastline on the west, and the Baja California on the south. The province is characterized by elongated northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest trend is further reflected in the direction of the dominant geologic structural features of the province that are northwest to west-northwest trending folds and faults, such as the nearby Rose Canyon fault zone.

Locally, the site is within the coastal plain of San Diego County. The coastal plain is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary bedrock units that thicken to the west and range in age from Upper Cretaceous age through the Pleistocene age which have been deposited on Cretaceous to Jurassic age igneous and volcanic bedrock. Geomorphically, the coastal plain is characterized by a series of twenty-one, stair-stepped marine terraces (younger to the west) that have been dissected by west flowing rivers. 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 site is located on the western portion of the coastal plain. Marine sedimentary units make up the geologic sequence encountered on the site and consist of Pleistocene-age Very Old Paralic Deposits (formerly known as the Lindavista Formation) and the Tertiary-aged Scripps Formation and Ardath Shale. The Old Paralic Deposits are shallow marine deposits generally consisting of sand and silty sand units interfingered with layers of silt and clay. The Regional Geologic Map, Figure 2, shows the geologic units in the area of the site.

4. SOIL AND GEOLOGIC CONDITIONS

We encountered one surficial soil unit (consisting of undocumented fill) and two formational units (consisting of Very Old Paralic Deposits and the Scripps Formation). The occurrence, distribution, and description of each unit encountered is shown on the Geologic Map, Figure 1 and on the boring logs in Appendix A. The geologic units are described herein in order of increasing age.

4.1 Undocumented Fill (Qudf)

We encountered undocumented fill in each of our borings to depths ranging from about 4 to 17 feet below grade. In general, the fill consists of loose to medium dense, dry to wet, silty and clayey sand. The undocumented fill is not considered suitable in its current condition for the support of foundations or structural fill and remedial grading will required. The undocumented fill can be reused for new compacted fill during grading operations provided it is generally free of roots and debris.

4.2 Very Old Paralic Deposits, Unit 10 (Qvop)

The Quaternary-age Very Old Paralic Deposits exist below the undocumented fill or at-grade across the site. These deposits generally consist of medium dense to dense, light to dark reddish brown and olive brown, silty to clayey, fine to medium sand and stiff, olive brown, sandy clay. The Very Old Paralic Deposits typically possess a “very low” to “medium” expansion potential (expansion index of 90 or less) and a “S0” sulfate class. The Very Old Paralic Deposits are considered acceptable to support the planned fill and foundation loads for the development.

4.3 Scripps Formation (Tsc)

Tertiary-age Scripps Formation is mapped to underly the Very Old Paralic Deposits. We did not encountered the Scripps Formation during our field investigation to the maximum depth explored of 40 feet. The Scripps Formation is generally brown, yellowish brown to light gray, silty to clayey sandstone and sandy siltstone/claystone with layers of strongly cemented material. Based on our experience, the Scripps Formation typically possesses a “very low” to “medium” expansion potential (expansion index of 90 or less) and can contain an “S0” to “S2” water-soluble sulfate classification. The Scripps Formation is generally considered suitable for support of properly compacted structural fill and improvements.

4.4 Ardath Shale (Ta)

Tertiary-age Ardath Shale is mapped to underly the Scrips Formation. We did not encountered the Ardath Shale during our field investigation to the maximum depth explored of 40 feet. The Ardath Shale is generally consists of hard, gray, clayey siltstone and sandy siltstone. The upper portion may contain thin beds of medium-grained sandstone similar to the overlying Scripps Formation (Kennedy and Tan, 2008). The Ardath Shale may contain localized areas of highly cemented concretionary beds. Soil generated from this unit typically possess a “very low” to “medium” expansion potential (expansion index of 90 or less) and an “S0” to “S2” water-soluble sulfate exposure. The Ardath Shale is generally considered suitable for support of properly compacted structural fill and improvements.

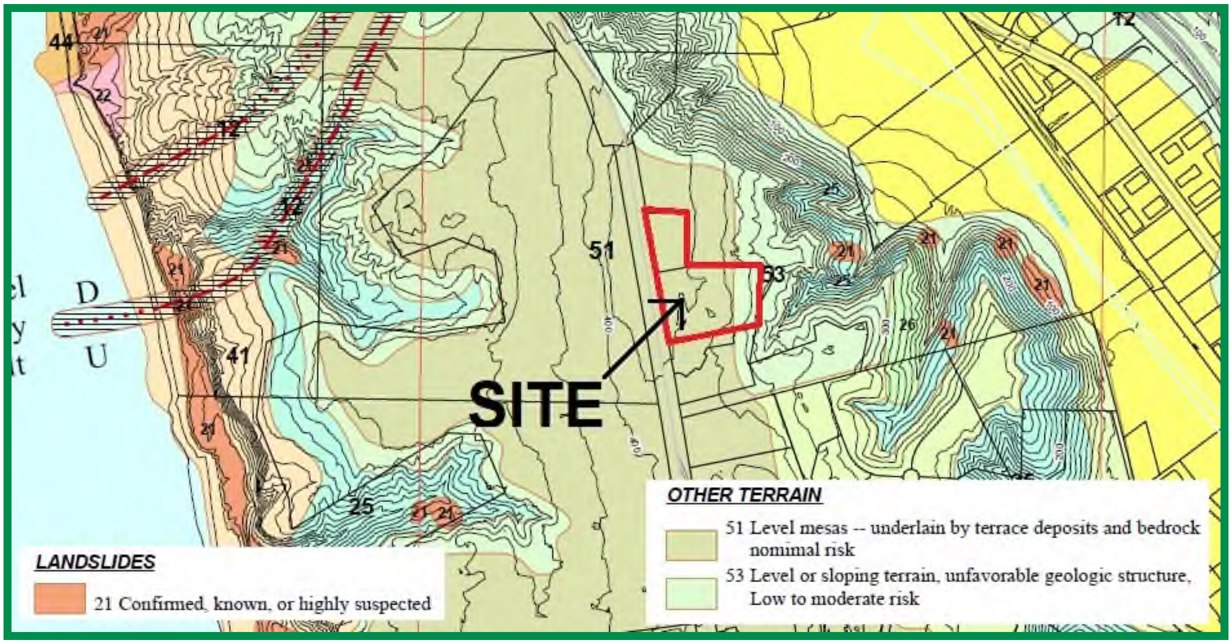
5. GROUNDWATER

We did not encounter groundwater or seepage during our site investigation. However, it is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project. We expect groundwater is deeper than about 50 feet below existing grade. We do not expect groundwater to be encountered during construction of the proposed development.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34 defines the site with *Hazard Category 51: Level Mesas – Underlain by Terrace Deposits and Bedrock, Nominal Risk* and *Hazard Category 53: Level or Sloping Terrain, Unfavorable Geologic Structures, Low to Moderate Risk* (as shown on the Hazard Category Map). Based on a review of the map, a fault does not traverse the planned development area.



Hazard Category Map

6.2 Faulting and Seismicity

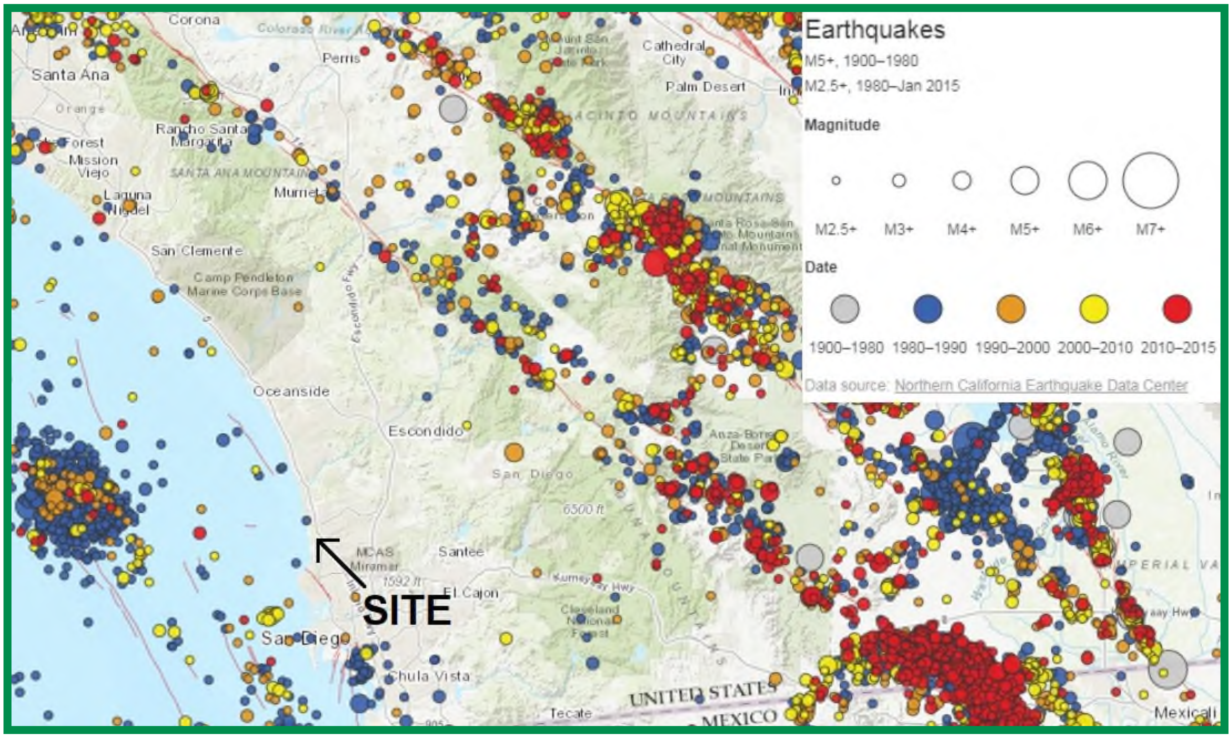
A review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faults. An active fault is defined by the

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.

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 fault 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 very 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 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the ground surface. The potential for ground rupture is considered to be very low due to the absence of active faults at the subject site.

6.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the very dense nature of the underlying Very Old Paralic Deposits and Scripps Formation, liquefaction potential for the site is considered very low.

6.5 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 ¾ miles from the Pacific Ocean and is at an elevation of about 370 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 at a minimum elevation of 370 above feet MSL and is about ¾ miles from the Pacific Ocean. Therefore, the potential for the site to be affected by a tsunami is negligible.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is not located in the vicinity of or downstream from such bodies of water. Therefore, the risk of seiches affecting the site is negligible.

6.6 Landslides

We did not observe evidence of previous or incipient slope instability on the eastern slopes during our reconnaissance. The *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, Map Sheet 34 have mapped a landslide area to the east of the property defined as Hazard Category 21: *Landslides, confirmed, known, or highly suspected*. The mapped landslides are at least 300 feet away from the proposed development. Therefore, we do not expect landsliding is an issue for this property. The Landslide Map shown the site location and the possible landslides in the area.

Landslide Map

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.

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 The undocumented fill is potentially compressible and unsuitable in its present condition for the support of compacted fill or settlement-sensitive improvements. Remedial grading of these materials should be performed as discussed herein. The Very Old Paralic Deposits and Scripps Formation are considered suitable for the support of proposed fill and structural loads.

7.1.4 We did not encounter groundwater during our subsurface exploration and we do not expect it to be a constraint to project development. However, seepage within surficial soil and formational materials may be encountered during the grading operations, especially during the rainy seasons.

7.1.5 Excavation of the fill and Very Old Paralic Deposits 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 the underlying formational materials (if encountered during grading).

7.1.6 Proper drainage should be maintained in order to preserve the engineering properties of the fill in both the building pads and slope areas. Recommendations for site drainage are provided herein.

7.1.7 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 if properly constructed.

7.1.8 Surface settlement monuments and canyon subdrains will not be required on this project.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the formational materials will require very heavy effort and 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 the formational units that can be incorporated into landscape use or deep compacted fill areas, if available.

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 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a “very low” to “low” expansion potential (EI of 50 or less).

TABLE 7.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2019 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. 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.

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 Preliminary Grading Recommendations

7.3.1 Grading should be performed in accordance with the recommendations provided in this report, the Recommended Grading Specifications contained in Appendix C and the City of San Diego’s Grading Ordinance. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during the fill placement.

7.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the county inspector, developer, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.3.3 Site preparation should begin with the removal of deleterious material, debris, and vegetation. The depth of vegetation removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site. Asphalt and concrete should not be mixed with the fill soil unless approved by the Geotechnical Engineer.

7.3.4 Abandoned foundations and buried utilities (if encountered) should be removed and the resultant depressions and/or trenches should be backfilled with properly compacted material as part of the remedial grading.

7.3.5 We expect Very Old Paralic Deposits will be exposed at the base of the excavation for Buildings B1, B2, the parking structure and the central utility plant. Remedial grading will not be required where the Old Paralic Deposits are exposed at finish grade elevation within the entire footprint of the building. Where undocumented fill materials are present below proposed pad grade (i.e. Building B3 and B4), the undocumented fill should be excavated to expose the underlying formational materials followed by the placement of compacted fill. Removals should be extend 10 feet outside the structural footprint, where possible. To reduce the potential for differential settlement of the compacted fill, the building pads with cut-fill transitions (if present) should be undercut at least 3 feet and replaced with properly compacted fill. Undercutting into the formational materials would not be necessary where piles or deepened foundations that extend into the formational materials are used (i.e. northeast corner of Building B2).

7.3.6 In areas of proposed improvements outside of the building areas, the upper 1 to 2 feet of existing soil should be processed, moisture conditioned as necessary and recompacted. 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 improvement area, where possible. Table 7.3.1 provides a summary of the grading recommendations.

TABLE 7.3.1
SUMMARY OF GRADING RECOMMENDATIONS

Area	Removal Requirements
Building Pads – Formational Materials	Removal to Pad Grade
Building Pads – Fill or Cut-Fill Pads	Removal of Undocumented Fill to Expose Underlying Formational Materials;
	Undercut at Least 3 Feet in Cut Portion of Cut-Fill Pad*
Site Development	Process Upper 1 to 2 Feet of Existing Materials
Grading Limits	10 Feet Outside of Buildings/2 Feet Outside of Improvement Areas, Where Possible
Exposed Bottoms of Remedial Grading	Scarify Upper 12 Inches

*Undercutting not necessary where deepened foundation that extend into formational materials are used.

7.3.7 The bottom of the excavations should be sloped 1 percent to the adjacent street or deepest fill. Prior to fill soil being placed, the existing ground surface should be scarified, moisture conditioned as necessary, and compacted to a depth of at least 12 inches. Deeper removals may be required if saturated or loose fill soil is encountered. A representative of Geocon should be on-site during removals to evaluate the limits of the remedial grading.

7.3.8 Some areas of overly wet and saturated soil could be encountered due to the existing landscape and pavement areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacement with drier soil, use of stabilization fabric (e.g. Tensar TX7 or other approved fabric), or chemical treating (i.e. cement or lime treatment).

7.3.9 The site should then be brought to final subgrade elevations with fill compacted in layers. In general, soil native to the site is suitable for use from a geotechnical engineering standpoint as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, 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 Test Procedure D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement 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 shortly before paving operations.

7.3.10 Import fill (if necessary) should consist of the characteristics presented in Table 7.3.2. 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 7.3.2
SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values
Expansion Potential	“Very Low” to “Low” (Expansion Index of 50 or less)
Particle Size	Maximum Dimension Less Than 3 Inches
	Generally Free of Debris

7.4 Subdrains

7.4.1 With the exception of retaining wall drains, we do not expect the installation of other subdrains.

7.5 Excavation Slopes, Shoring and Tiebacks

7.5.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

7.5.2 Temporary excavations should be made in conformance with OSHA requirements and as directed by the assigned competent person in the field (contractor). In general, special shoring requirements may not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. 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.

7.5.3 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 or sheet piles. Excavations exceeding 15 feet may require soil nails, tieback anchors or internal bracing to provide additional wall restraint.

7.5.4 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavations 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.

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

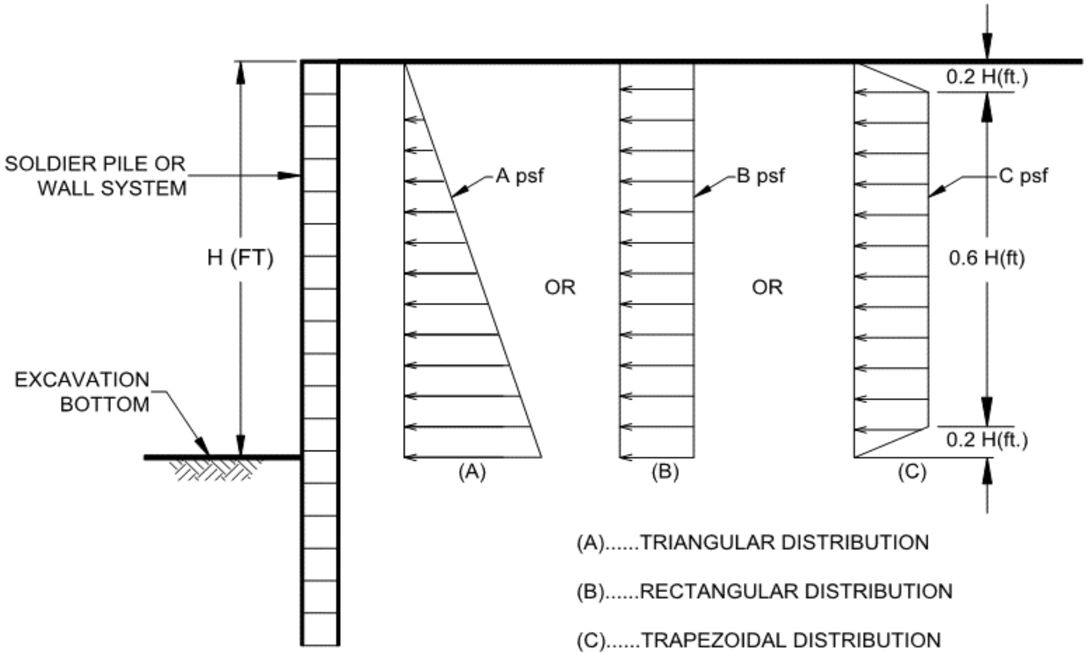
7.5.6 Temporary shoring with a level backfill should be designed using a lateral pressure envelope acting on the back of the shoring as presented in Table 7.5.1 assuming a level backfill. The distributions are shown on the Active Pressures for Temporary Shoring.

TABLE 7.5.1
SUMMARY OF TEMPORARY SHORING WALL RECOMMENDATIONS

Parameter	Value
Triangular Distribution, A	26H psf
Rectangular Distribution, B	17H psf
Trapezoidal Distribution, C	21H psf
Passive Pressure, P	400D + 500 psf
Effective Zone Angle, E	31 degrees
Maximum Design Lateral Movement	1 Inch
Maximum Design Vertical Movement	½ Inch
Maximum Design Retained Height, H	30 Feet

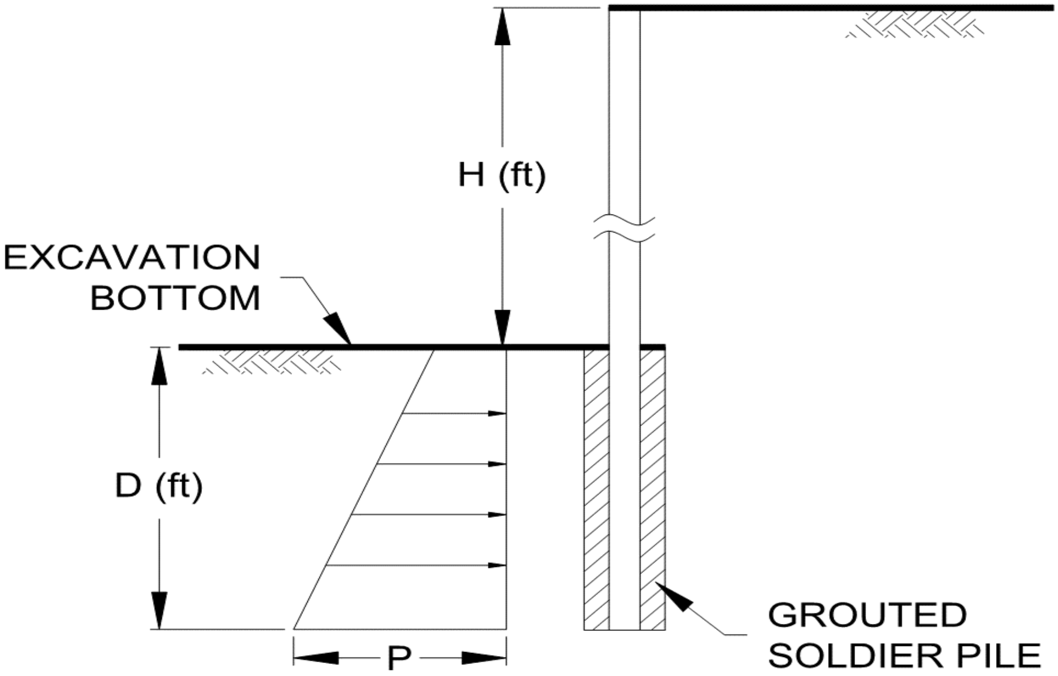
H equals the height of the retaining portion of the wall in feet
D equals the embedment depth of the retaining wall in feet

7.5.7 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.



Active Pressures on Temporary Shoring

7.5.8 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

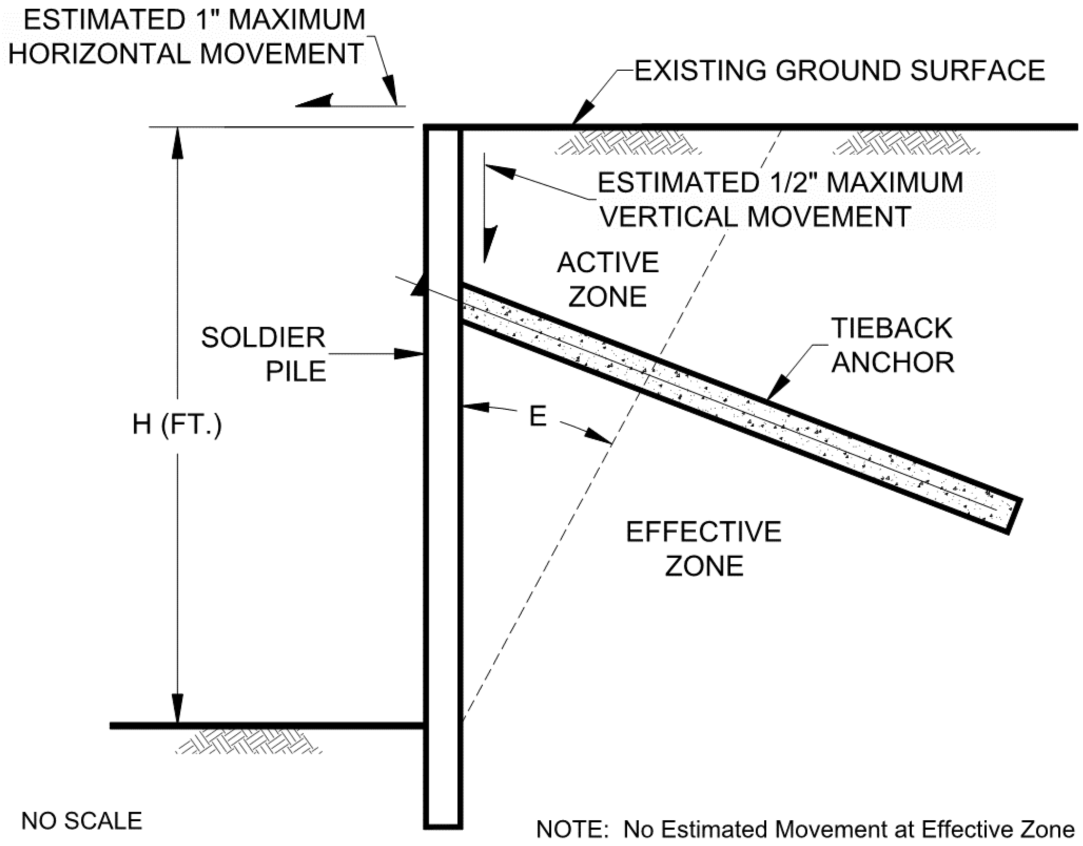
7.5.9 We should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil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

7.5.10 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.

7.5.11 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.

7.5.12 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.

7.5.13 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

7.5.14 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.

7.5.15 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 7.5.2.

TABLE 7.5.2
SOIL STRENGTH PARAMETERS FOR TEMPORARY SHORING

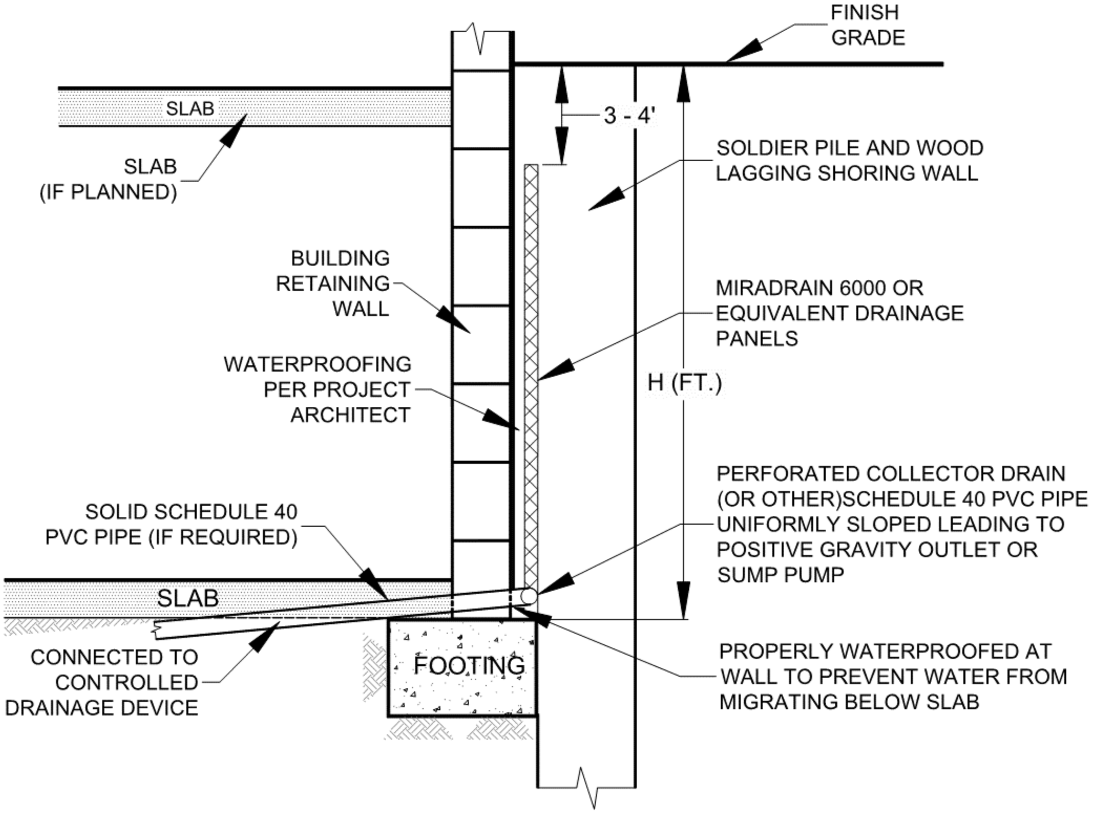
Description	Cohesion (psf)	Friction Angle (Degrees)
Compacted Fill	250	30
Very Old Paralic Deposits	400	32

7.5.16 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.

7.5.17 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.

7.5.18 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.

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



Shoring Retaining Wall Drainage Detail

7.6 Seismic Design Criteria – 2019 California Building Code

7.6.1 Table 7.6.1 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. 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 7.6.1
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	1.237g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.436g	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}	1.484g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.654g	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.99g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.436g	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.

7.6.2 Table 7.6.2 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 7.6.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.559g	Figure 22-7
Site Coefficient, F_{PGA}	1.200	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.671g	Section 11.8.3 (Eqn 11.8-1)

7.6.3 Conformance to the criteria in Tables 7.6.1 and 7.6.2 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.

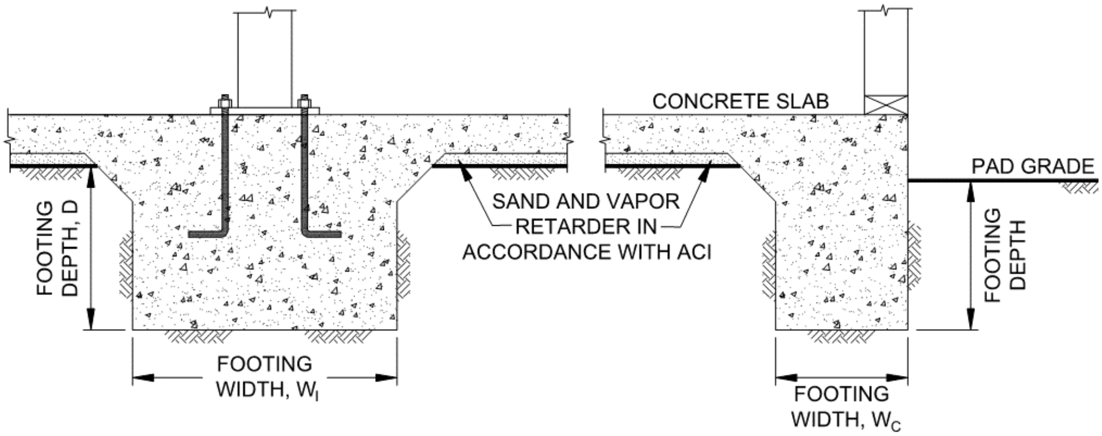
7.7 Shallow Foundations

7.7.1 The proposed structure can be supported on a shallow foundation system founded in either compacted fill or formational materials. Foundations for the structure 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 7.7 provides a summary of the foundation design recommendations.

TABLE 7.7
SUMMARY OF FOUNDATION RECOMMENDATIONS

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 – Formation	4,000 psf (at existing grade) / 5,500 psf (at 10 feet of cut) / 7,000 (at 20 feet of cut)
Allowable Bearing Capacity – Compacted Fill	2,500 psf
Bearing Capacity Increase	500 psf per Foot of Depth or Width
Maximum Allowable Bearing Capacity – Formation*	6,000 psf (at grade) / 7,500 psf (at 10 Feet of Cut) / 9,000 (at 20 Feet of Cut)
Maximum Allowable Bearing Capacity – Compacted Fill	4,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	8-Foot Square
Design Expansion Index	50 or less

7.7.2 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

7.7.3 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.

7.7.4 For building pads that primarily expose formational materials, overexcavation of the footings and replacement with slurry can be performed in areas where formational materials are not encountered at the bottom of the footing (i.e. northeast corner of Building B-2). Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation. Additional remedial grading should be considered where overexcavation depths exceed 10 feet or more than 25% of the pad exposes fill materials.

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

- For fill slopes less than 20 feet high, 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.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- 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.

7.7.6 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.

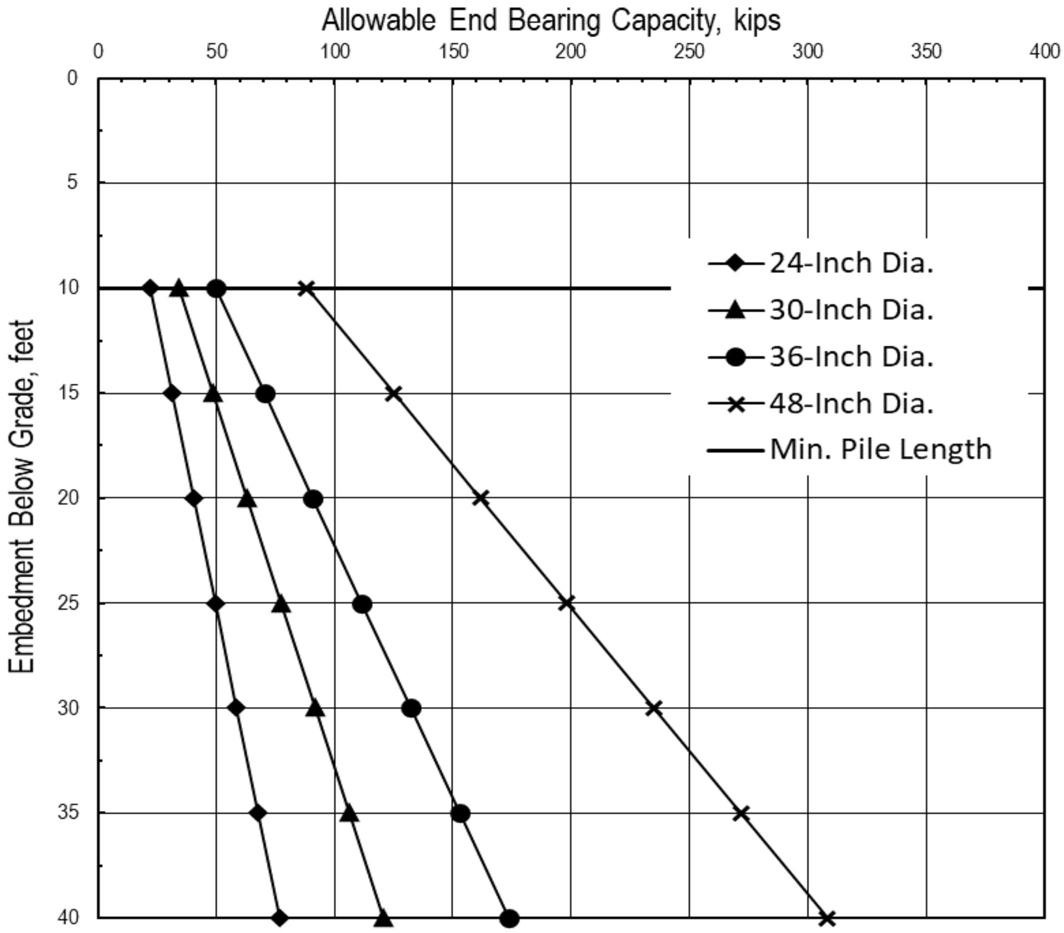
7.7.7 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.8 Drilled Pier Recommendations

7.8.1 We understand that drilled piers might be used for foundation support for the northeastern corner of Building B2 due to the anticipated deep fill materials (on the order of 10 to 15 feet) that will be necessary in that area. The foundation recommendations herein assume that the piers will extend through fill into the formational materials. The piers should be at least 10 feet long and be embedded at least 5 feet within the formational materials.

7.8.2 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. An allowable skin friction resistance of 400 psf can be used for that portion of the drilled pier embedded in fill soil and formational materials. 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.

7.8.3 The diameter of the piers should be a minimum of 24 inches. 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.



End Bearing Capacity Chart

7.8.4 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.

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

7.8.6 The formational 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. 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.

7.8.7 Pile settlement of production piers is expected to be on the order of ½ to 1 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.

7.8.8 We can provide a lateral pile capacity analysis using the *LPILE* computer program once the pile type, size, and approximate length has been provided. The total capacity of pile groups should be considered less than the sum of the induvial pile capacities for pile spacing of less than 8D (where D is pile diameter) for lateral loads parallel to the pile group and 3D for loads perpendicular to the pile group. The reduction in capacity is based on pile spacing and positioning and can result in group efficiency on the order of 50 percent of the sum of single-pile capacities. We can evaluate the lateral capacity of pile groups using the *GROUP* computer program, if requested

7.9 Concrete Slabs-On-Grade

7.9.1 Concrete slabs-on-grade for the structures should be constructed in accordance with Table 7.9.

TABLE 7.9
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	50 or less

7.9.2 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.

7.9.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand for 5-inch and 4-inch thick slabs, respectively, in the southern California region. 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.

7.9.4 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.

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

7.9.6 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 Exterior Concrete Flatwork

7.10.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in Table 7.10. The recommended steel reinforcement would help reduce the potential for cracking.

TABLE 7.10
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.

7.10.2 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.

7.10.3 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. 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.

7.10.4 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.

7.10.5 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.

7.10.6 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.

7.11 Retaining Walls

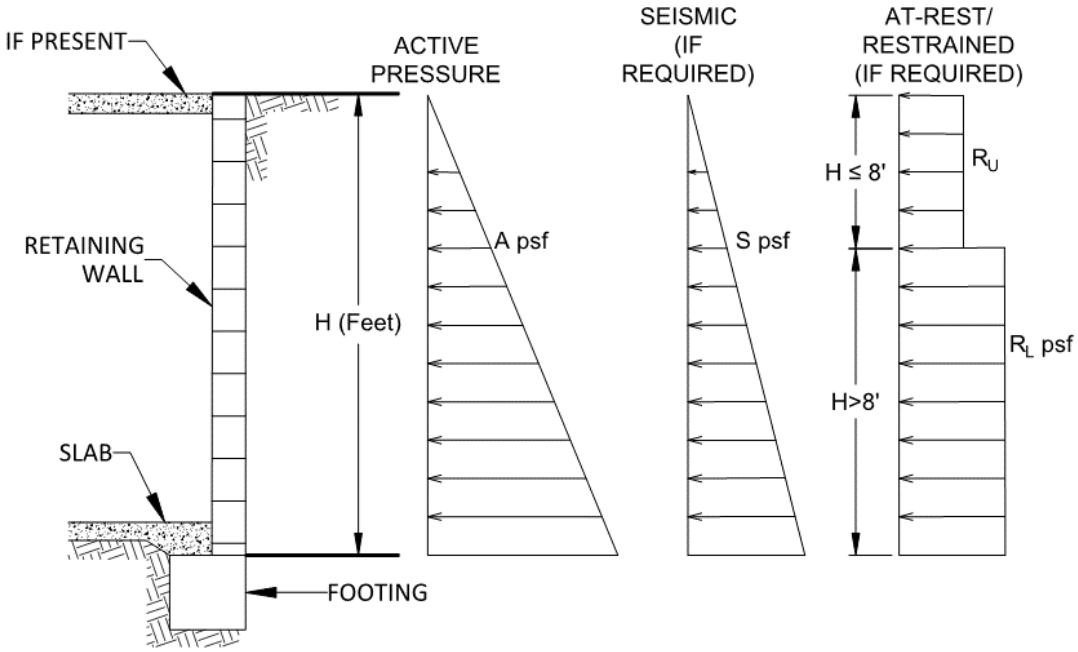
7.11.1 Retaining walls should be designed using the values presented in Table 7.11.1 Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

TABLE 7.11.1
RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	35 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	50 pcf
Seismic Pressure, S	10H 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 $\leq$ 50

H equals the height of the retaining portion of the wall

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



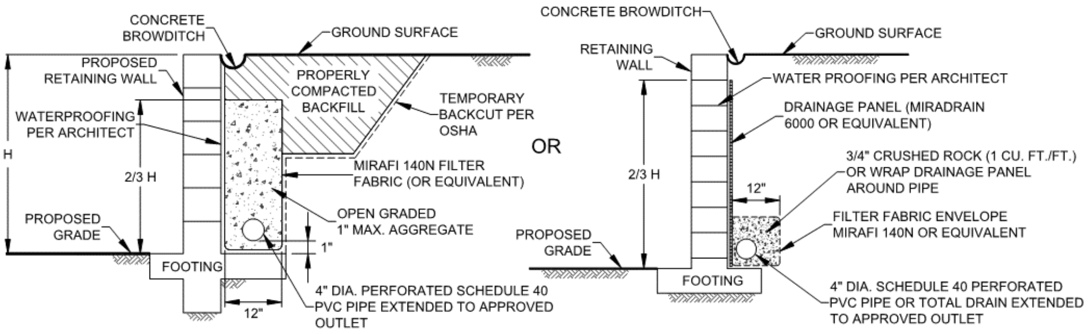
Retaining Wall Loading Diagram

7.11.3 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.

7.11.4 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.

7.11.5 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.

7.11.6 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

7.11.7 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.

7.11.8 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 7.11.2
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	2,500 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet

7.11.9 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.

7.11.10 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.

7.11.11 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.

7.12 Lateral Loading

7.12.1 Table 7.12 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 7.12
SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	400 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

7.12.2 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.

7.13 Preliminary Pavement Recommendations

7.13.1 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 for the parking lot should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 20 (based on laboratory testing) and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. Table 7.13.1 presents the preliminary flexible pavement sections.

TABLE 7.13.1
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	20	3	7
Driveways for automobiles and light-duty vehicles	5.5	20	3	9
Medium truck traffic areas	6.0	20	3½	10
Driveways for heavy truck traffic	7.0	20	4	12

7.13.2 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 material 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.

7.13.3 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. 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 7.13.2.

TABLE 7.13.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	100 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

7.13.4 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.13.3.

TABLE 7.13.3
RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=A)	5.5
Driveways (TC=C)	7.0

7.13.5 The PCC vehicular 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.

7.13.6 The rigid pavement should also be designed and constructed incorporating the parameters presented in Table 7.13.4.

TABLE 7.13.4
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

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

7.13.8 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.

7.13.9 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. 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 as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

7.13.10 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 Site Drainage and Moisture Protection

7.14.1 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 2019 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.

7.14.2 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.

7.14.3 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.

7.14.4 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.

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

7.15 Grading and Foundation Plan Review

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

7.16 Testing and Observation Services During Construction

7.16.1 Geocon Incorporated should provide geotechnical testing and observation services during the grading operations, foundation construction, utility installation, retaining wall backfill and pavement installation. Table 7.16 presents the typical geotechnical observations we would expect for the proposed improvements.

TABLE 7.16
EXPECTED GEOTECHNICAL TESTING AND OBSERVATION SERVICES

Construction Phase	Observations	Expected Time Frame
Grading	Base of Removal	Part Time During Removals
	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	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

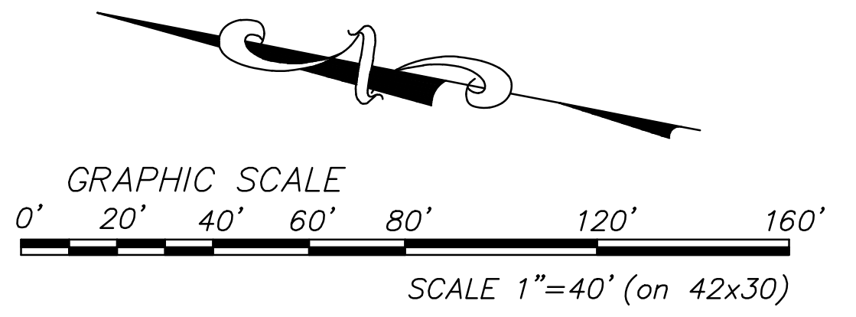
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

Qudf ........UNDOCUMENTED FILL

Qvop ....OLD PARALIC DEPOSITS (Dotted Where Buried)

B-7 ⊕ ....APPROX. LOCATION OF BORING

(1') ....APPROX. THICKNESS OF FILL (Feet)

B ⌊⌋ B' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

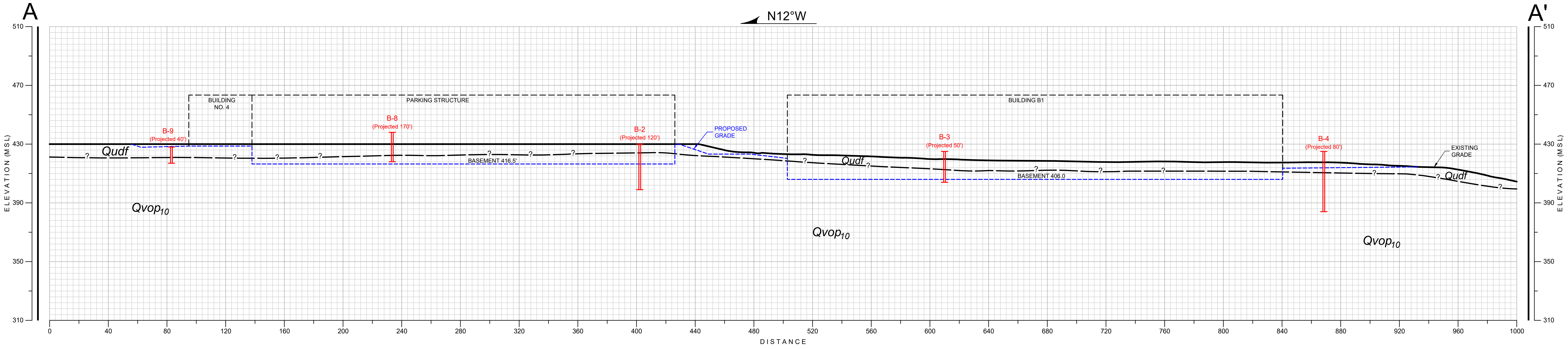
GEOLOGIC MAP

11255 N. TORREY PINES ROAD
ONE ALEXANDRIA NORTH
SAN DIEGO, CALIFORNIA

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

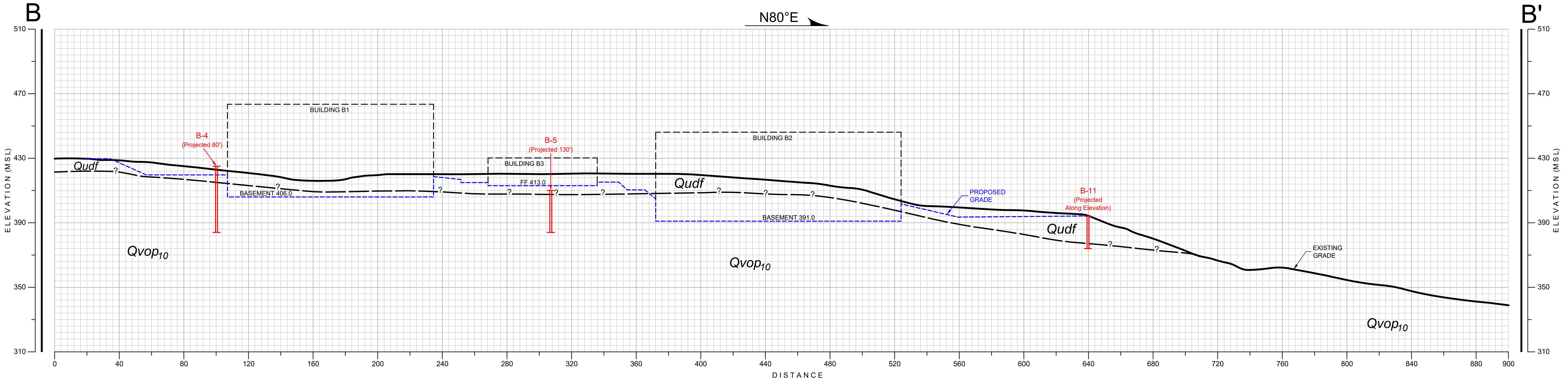
SCALE 1" = 40'
DATE 08 - 24 - 2021
PROJECT NO. G2655 - 52 - 01
FIGURE 1
SHEET 1 OF 1

Plotted:08/23/2021 3:36PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2566-52-02 One Alexandria North\SHEETS\G2566-52-02 GeoMap.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

Qudf........UNDOCUMENTED FILL

Qvop$_{10}$........VERY OLD PARALIC DEPOSITS - Unit 10

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

B-11........APPROX. LOCATION OF BORING

GEOLOGIC CROSS SECTION

11255 N. TORREY PINES ROAD
ONE ALEXANDRIA NORTH
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" = 40'
DATE 08 - 24 - 2021
PROJECT NO. G2566 - 52 - 02
FIGURE 2
SHEET 1 OF 1

Plotted:08/23/2021 3:50PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2566-52-02 One Alexandria North\SHEETS\G2566-52-02 XSectiion.dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

We performed the drilling operations on July 6 and 7, 2020 and June 28, 2021. Borings extended to maximum depth of approximately 41 feet below grade. The locations of the exploratory borings are shown on the Geologic Map, Figure 1. The boring logs are presented in this Appendix. We located the borings in the field using a measuring tape and existing reference points; therefore, actual boring locations may deviate slightly. The geotechnical borings were drilled to depths ranging from approximately 4 to 41 feet below existing grade using a CME 75 hollow-stem auger drill rig and Fraste PL-G solid-flight auger drill rig.

We obtained samples during our subsurface exploration in the borings using a California sampler. The sampler is composed of steel and are driven to obtain ring samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 3 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. We obtained ring samples at appropriate intervals, placed them in moisture-tight containers, and transported them to the laboratory for testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 inches. 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 either from a topographic map or by using a benchmark. Each excavation was backfilled as noted on the boring logs.

We visually examined, classified, and logged the soil encountered in the borings 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. G2566-52-02

BORING B 1

ELEV. (MSL.) **430'** DATE COMPLETED **07-06-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**4.5 INCHES AC OVER 2.5 INCHES BASE**			
	B1-1			SC	**UNDOCUMENTED FILL (Qudf)** Dense, damp, dark yellowish brown, Clayey, fine to medium SAND			
2								
4								
	B1-2				-Becomes very dense, dry	50/4"		6.5
6								
8								
					-Difficult drilling			
10	B1-3			SC	**VERY OLD PARALIC DEPOSITS (Qvop)** Very dense, dry, reddish brown, Clayey, fine to coarse SAND	79/11"	110.5	7
12								
14								
	B1-4					50/6"	108.4	5.6
16								
18								
20	B1-5					87/11"	112	6.6
22					-Becomes reddish brown with mottled white			
24								

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

G2566-52-02.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. G2566-52-02

BORING B 1

ELEV. (MSL.) **430'** DATE COMPLETED **07-06-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B1-6					89/10"	124.1	8.6
26								
28								
30	B1-7					91/11"	115.2	7.5
32								
				SP	Dense, moist, yellowish white with mottled black, fine to coarse SAND; trace silt; weak (easily breakable)			
34								
	B1-8					59	111	5
36								
38								
40	B1-9					61	113.6	4.8
					BORING TERMINATED AT 41 FEET No groundwater encountered			

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

G2566-52-02.GPJ

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

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

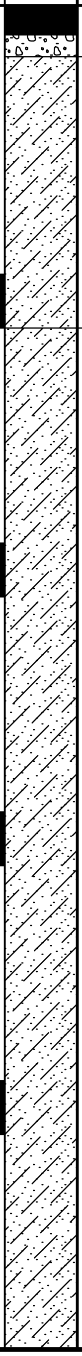
GEOCON

PROJECT NO. G2566-52-02

BORING B 2

ELEV. (MSL.) 430' DATE COMPLETED 07-06-2020

EQUIPMENT CME 75 BY: M. LOVE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**5.5 INCH AC OVER 4 INCH BASE**			
				SC	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, dark reddish brown, Clayey, fine to coarse SAND			
2								
4								
	B2-1						118	12.2
6				SC	**VERY OLD PARALIC DEPOSITS (Qvop10)** Very dense, dry, reddish brown, Clayey, fine to medium SAND	70/11"		
8								
10	B2-2					66/11"	119	8.6
12								
14					-Turns reddish brown with mottled black			
	B2-3					50/6"	127.1	11.8
16								
					-Becomes weak (easily breakable)			
18								
20	B2-4					79	113.5	8.6
22								
24								

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

G2566-52-02.GPJ

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 2

ELEV. (MSL.) 430' DATE COMPLETED 07-06-2020

EQUIPMENT CME 75 BY: M. LOVE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B2-5					82/11"	112.2	12.1
26								
					-Trace clay			
28								
30	B2-6					78	118.8	14
					BORING TERMINATED AT 31 FEET No groundwater encountered			

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

G2566-52-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 3

ELEV. (MSL.) 425' DATE COMPLETED 07-06-2020

EQUIPMENT CME 75 BY: M. LOVE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**4INCH AC OVER 6 INCH BASE**			
	B3-1			SC	**UNDOCUMENTED FILL (Qudf)** Medium dense, dry, reddish brown, Clayey, fine to medium SAND; trace gravel		115.9	8.7
4				SC	**VERY OLD PARALIC DEPOSITS (Qvop10)** Medium dense, dry, reddish brown, Clayey, fine to medium SAND			
	B3-2					29	114.8	14.5
					-Becomes dense, fine to coarse SAND			
10	B3-3					59	124	11
					-Becomes moist, reddish brown, mottled black and white			
	B3-4					73	112.8	9.4
18					-Becomes very dense			
20	B3-5					96/11"	115.9	9.3
					BORING TERMINATED AT 21 FEET No groundwater encountered			

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

G2566-52-02.GPJ

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

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

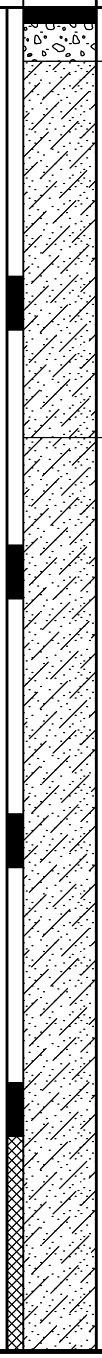
GEOCON

PROJECT NO. G2566-52-02

BORING B 4

ELEV. (MSL.) **425'** DATE COMPLETED **07-07-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**



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 INCH AC OVER 12 INCH BASE**			
				SC	**UNDOCUMENTED FILL (Qudf)** Loose, moist, yellowish gray, Clayey, fine to coarse SAND; little gravel			
2								
4					-Becomes medium dense, light reddish brown; trace gravel			
	B4-1					26	125.3	12.3
6								
8				SC	**VERY OLD PARALIC DEPOSITS (Qvop10)** Dense to very dense, damp, reddish brown, mottled black, Clayey, fine to coarse SAND			
10	B4-2					49	118	11.8
12								
14								
	B4-3					80	124.3	12.1
16								
18								
20	B4-4					65	123	12.3
	B4-5						115.3	8.6
22								
24								

Figure A-4,
Log of Boring B 4, Page 1 of 2

G2566-52-02.GPJ

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

PROJECT NO. G2566-52-02

BORING B 4

ELEV. (MSL.) **425'** DATE COMPLETED **07-07-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B4-6					96/10"	125.8	11.7
26								
28								
30	B4-7					95/11"	122.6	11.6
32								
34					-Becomes moist			
	B4-8					90/11"	121.9	10.1
36								
38								
40	B4-9					87	109.2	6.9
					BORING TERMINATED AT 41 FEET No groundwater encountered			

Figure A-4,
Log of Boring B 4, Page 2 of 2

G2566-52-02.GPJ

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 5

ELEV. (MSL.) 405' DATE COMPLETED 07-07-2020

EQUIPMENT CME 75 BY: M. LOVE

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 INCH AC OVER 12 INCH BASE**			
	B5-1			SC/CL	**UNDOCUMENTED FILL (Qudf)** Loose, moist, gray, Clayey, fine to coarse SAND; little gravel			
2								
4								
	B5-2				-Becomes medium dense	17	113.7	15.7
6								
8					-Turns brown			
				SC	**VERY OLD PARALIC DEPOSITS (Qvop10)** Very dense, dry, reddish brown with mottled black and white, Clayey, fine to coarse SAND			
10	B5-3					50/6"	109.8	8.3
12								
14								
	B5-4					72	129.3	11
16								
18					-Becomes dark reddish brown			
20	B5-5					76/11"	124.6	9.9
					BORING TERMINATED AT 21 FEET No groundwater encountered			

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

G2566-52-02.GPJ

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 6

ELEV. (MSL.) **410'** DATE COMPLETED **07-07-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**

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 INCH AC OVER 12 INCH BASE**			
				SC	**UNDOCUMENTED FILL (Qudf)** Medium dense, damp, moist, yellowish/grayish brown, Clayey, fine to coarse SAND; little gravel			
2								
4								
	B6-1					35	123.5	8.6
6				SC	**VERY OLD PARALIC DEPOSITS (Qvop10)** Medium dense, damp, reddish brown, mottled black, Clayey, fine to medium SAND			
8								
10	B6-2					41	125.1	11.5
					-Becomes dense, fine to coarse SAND			
12								
14								
	B6-3					77	126.5	12.2
16					-Becomes weak (easily breakable)			
18								
20	B6-4					54	117.2	10
22								
24								

Figure A-6,
Log of Boring B 6, Page 1 of 2

G2566-52-02.GPJ

SAMPLE SYMBOLS

▢ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR ▽ ... SEEPAGE

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

GEOCON

BORING B 6

ELEV. (MSL.) 410' DATE COMPLETED 07-07-2020

EQUIPMENT CME 75 BY: M. LOVE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B6-5 ■	▨				67	119.9	9.8
26		▨						
28		▨			-Becomes very dense			
30	B6-6 ■	▨				87	116.5	4.1
					BORING TERMINATED AT 31 FEET No groundwater encountered			

Figure A-6,
Log of Boring B 6, Page 2 of 2

G2566-52-02.GPJ

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 7

ELEV. (MSL.) **395'** DATE COMPLETED **07-07-2020**

EQUIPMENT **CME 75** BY: **M. LOVE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Loose, wet, brownish black, Silty, fine to medium SAND; some organics			
2	B7-1 ☒			SC	**UNDOCUMENTED FILL (Qudf)** Loose, wet, yellowish/grayish brown, Clayey, fine to coarse SAND; little gravel			
4					BORING TERMINATED AT 4 FEET DUE TO CONFLICT WITH UTILITIES No groundwater encountered			

Figure A-7,
Log of Boring B 7, Page 1 of 1

G2566-52-02.GPJ

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 8

ELEV. (MSL.) **438'** DATE COMPLETED **06-28-2021**

EQUIPMENT **FRASTE PLG YX3T37** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					Approx. 3-6" **TOPSOIL/GRASS/SAND**			
				SM	**UNDOCUMENTED FILL (Qudf)** Medium dense, damp to moist, reddish brown, Silty, fine to coarse SAND			
2								
	B8-1					34	112.1	6.2
4								
	B8-2					62	120.3	6.9
6					-Becomes dense, black/gray brown			
8	B8-3				-Becomes damp, black/dark gray	47		
	B8-4				-Red iron balls			
10	B8-5					33	116.2	8.3
12								
14								
	B8-6					38	111.9	13.1
16								
				SM	**VERY OLD PARALIC DEPOSITS ($Qvop_{10}$)** Dense, moist, reddish brown with black particles, Silty, fine to coarse SAND			
18								
	B8-7				-Becomes very dense	79	123.9	11.0
20					BORING TERMINATED AT 20 FEET No groundwater encountered Backfilled with spoils			

Figure A-8,
Log of Boring B 8, Page 1 of 1

G2566-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR ▽ ... SEEPAGE

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 9

ELEV. (MSL.) **428'** DATE COMPLETED **06-28-2021**

EQUIPMENT **FRASTE PLG YX3T37** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					2" **ASPHALT CONCRETE** over 12" **BASE**			
				SM	**UNDOCUMENTED FILL (Qudf)** Dense, damp, reddish brown, Silty, fine to coarse SAND			
2								
	B9-1					39	118.4	9.5
4	B9-4							
	B9-2					36	119.9	9.1
6					-Roots			
	B9-3					31		
8				SC	**VERY OLD PARALIC DEPOSITS (Qvop$_{10}$)** Dense, damp, reddish brown with mottled black, Clayey, fine to coarse SAND			
10	B9-5					51		
					-Roots			

PRACTICAL REFUSAL AT 11 FEET
Backfilled with spoils
Aquaphalt top

Figure A-9,
Log of Boring B 9, Page 1 of 1

G2566-52-02.GPJ

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

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

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PROJECT NO. G2566-52-02

BORING B 10

ELEV. (MSL.) **396'** DATE COMPLETED **06-28-2021**

EQUIPMENT **FRASTE PLG YX3T37** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					Approx. 3-6" **TOPSOIL/GRASS**			
				SM/SC	**UNDOCUMENTED FILL (Qudf)** Loose, moist, tan to reddish brown, Silty/Clayey, fine to coarse SAND with little gravel			
2	B10-1					11	117.9	13.7
4								
	B10-2					12	109.6	16.2
6				SM	**VERY OLD PARALIC DEPOSITS ($Qvop_{10}$)** Very dense, damp, reddish brown, Silty, fine to coarse SAND			
	B10-4							
8	B10-3					50/16"	105.3	9.3

BORING TERMINATED AT 9 FEET
No groundwater encountered
Backfilled with spoils

Figure A-10,
Log of Boring B 10, Page 1 of 1

G2566-52-02.GPJ

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

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

GEOCON

PROJECT NO. G2566-52-02

BORING B 11

ELEV. (MSL.) **394'** DATE COMPLETED **06-28-2021**

EQUIPMENT **FRASTE PLG YX3T37** BY: **D. GITHENS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC	**UNDOCUMENTED FILL (Qudf)** Dense, dry, pale brown, Silty/Clayey, fine to coarse SAND with little gravel			
2	B11-1 ■					31		
4								
	B11-2 ■					32		
6								
8	B11-3 ■					28		
	B11-4 ▨							
10	B11-5 ■					26		
12								
14								
	B11-6 ■					18		
16					-Becomes damp			
18								
	B11-7 ■			SM	**VERY OLD PARALIC DEPOSITS ($Qvop_{10}$)** Very dense, moist, reddish brown, Silty SAND	50/6"		
20					BORING TERMINATED AT 20 FEET No groundwater encountered Backfilled with spoils			

Figure A-11,
Log of Boring B 11, Page 1 of 1

G2566-52-02.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. Selected soil samples were tested for in-place dry density and moisture content, maximum density and optimum moisture content, direct shear strength, expansion index, water soluble sulfate, R-Value, consolidation, and gradation characteristics. The results of our current laboratory tests are presented herein. The in-place dry density and moisture content of the samples tested 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.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-1	Yellowish Brown, Clayey, fine to medium SAND (Qudf)	138.1	7.6
B4-5	Reddish Brown, Clayey, fine to coarse SAND (Qvop)	130.0	9.7
B8-4	Reddish Brown, Silty, fine to medium SAND, trace of clay (Qudf)	135.4	7.3

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	2019 CBC Expansion Classification	ASTM Soil Expansion Classification
	Before Test	After Test				
B3-1	8.7	14.8	115.9	4	Non-Expansive	Very Low
B4-5	8.6	16.5	115.3	20	Non-Expansive	Very Low
B8-4	7.6	13.1	120.3	2	Non-Expansive	Very Low

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

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
B4-5	21-25	Qvop	0.021	S0

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

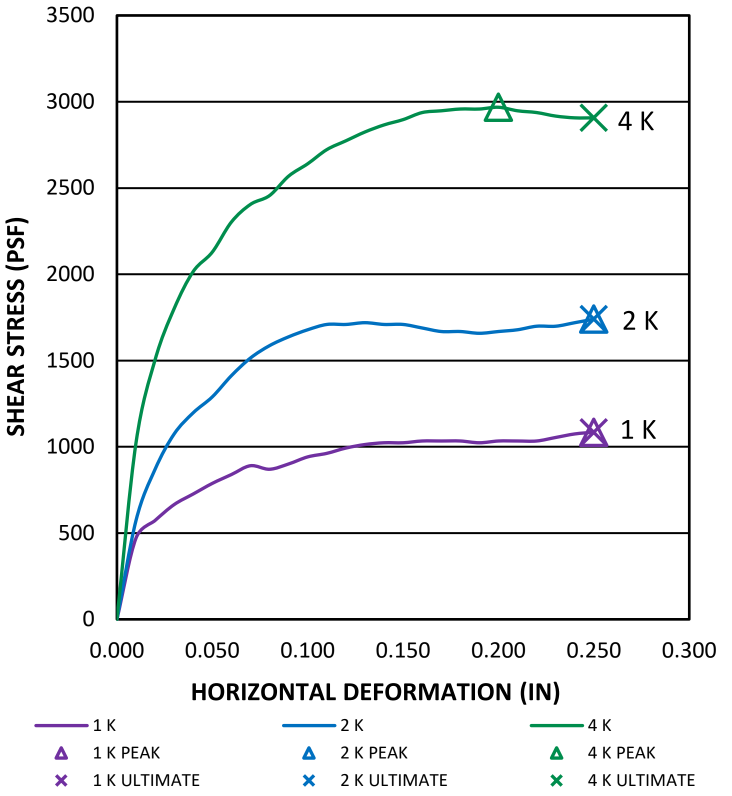
Sample No.	Depth (Feet)	Description (Geologic Unit)	R-Value
B1-1	1 - 5	Yellowish Brown, Clayey, Fine to Medium SAND (Qudf)	29

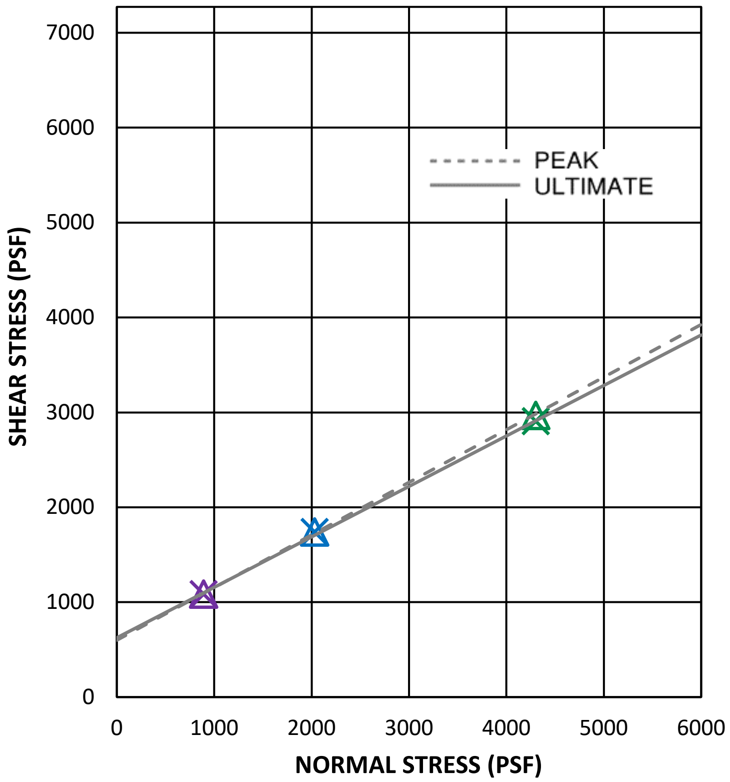
SAMPLE NO.: **B1-5**
SAMPLE DEPTH (FT): **20'**
GEOLOGIC UNIT: **Qvop**
NATURAL/REMOLDED: **N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**1 K**	**2 K**	**4 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	6.9	6.2	6.8	6.6
DRY DENSITY (PCF):	111.8	111.4	113.0	112.0

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**1 K**	**2 K**	**4 K**	**AVERAGE**
WATER CONTENT (%):	16.5	16.8	16.4	16.6
PEAK SHEAR STRESS (PSF):	1085	1740	2968	--
ULT.-E.O.T. SHEAR STRESS (PSF):	1085	1740	2907	--

RESULTS		
PEAK	COHESION, C (PSF)	600
	FRICTION ANGLE (DEGREES)	29
ULTIMATE	COHESION, C (PSF)	625
	FRICTION ANGLE (DEGREES)	28





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DIRECT SHEAR - ASTM D 3080

ONE ALEXANDRIA NORTH

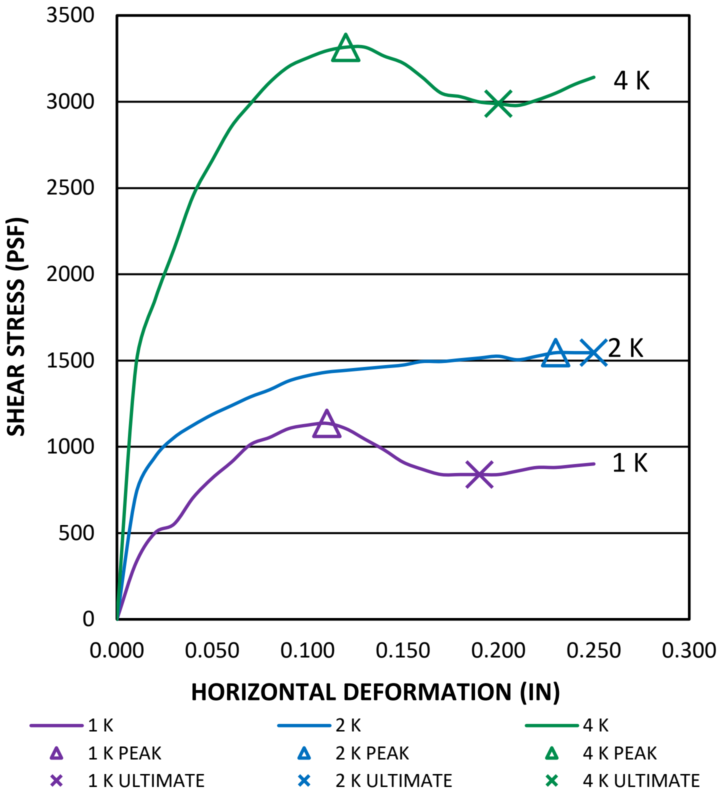
PROJECT NO.: G2566-52-02

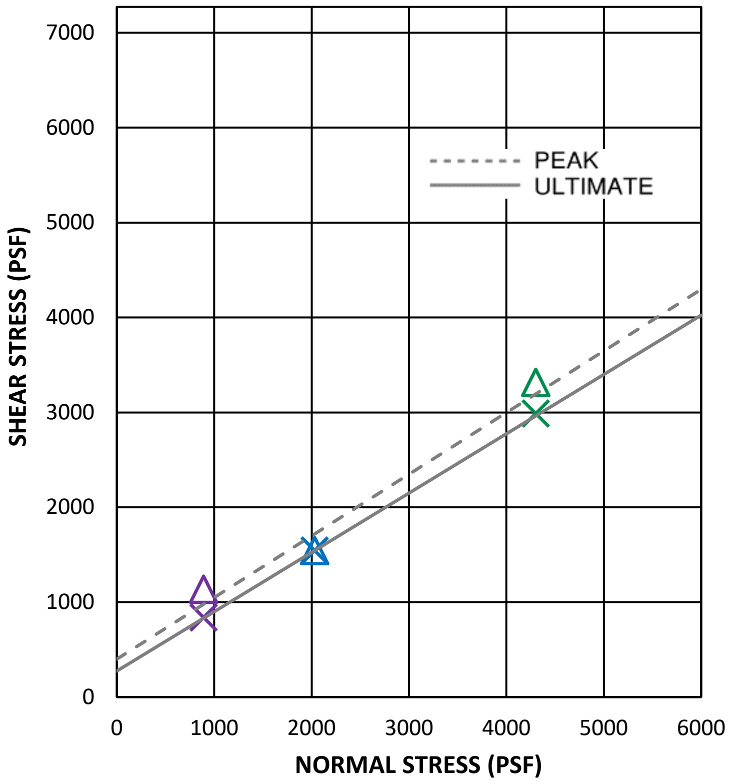
SAMPLE NO.:	**B1-8**	GEOLOGIC UNIT:	**Qvop**
SAMPLE DEPTH (FT):	**35'**	NATURAL/REMOLDED:	**N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	**1 K**	**2 K**	**4 K**	**AVERAGE**
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	4.7	5.5	4.7	5.0
DRY DENSITY (PCF):	114.2	104.4	114.3	111.0

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	**1 K**	**2 K**	**4 K**	**AVERAGE**
WATER CONTENT (%):	16.0	21.3	16.8	18.0
PEAK SHEAR STRESS (PSF):	1136	1545	3316	--
ULT.-E.O.T. SHEAR STRESS (PSF):	839	1545	2988	--

RESULTS		
PEAK	COHESION, C (PSF)	400
	FRICTION ANGLE (DEGREES)	33
ULTIMATE	COHESION, C (PSF)	275
	FRICTION ANGLE (DEGREES)	32





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DIRECT SHEAR - ASTM D 3080

ONE ALEXANDRIA NORTH

PROJECT NO.: G2566-52-02

SAMPLE NO.: **B4-2**
SAMPLE DEPTH (FT): **10'**
GEOLOGIC UNIT: **Qvop**
NATURAL/REMOLDED: **N**

INITIAL CONDITIONS

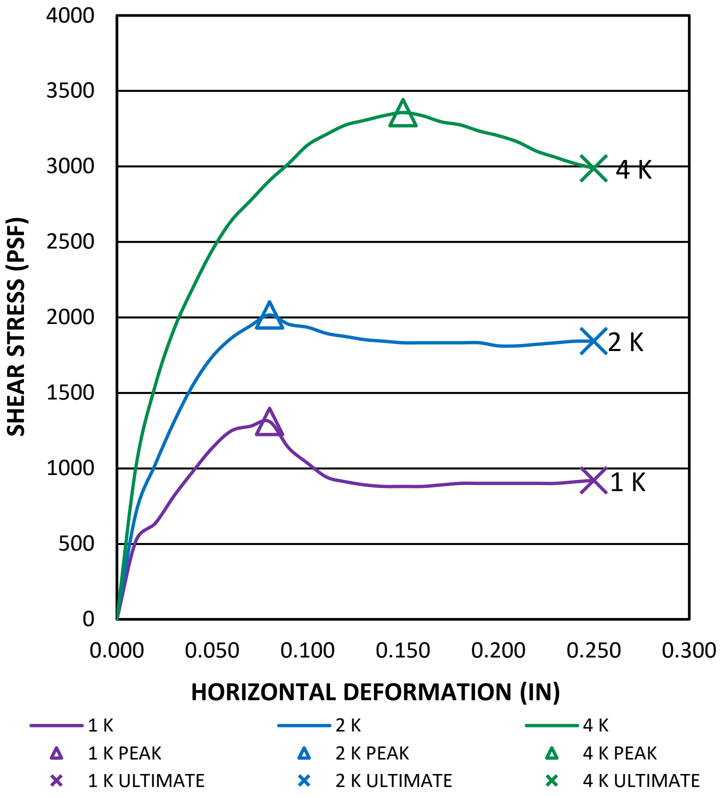
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	11.8	11.6	12.2	11.8
DRY DENSITY (PCF):	118.5	116.1	119.5	118.0

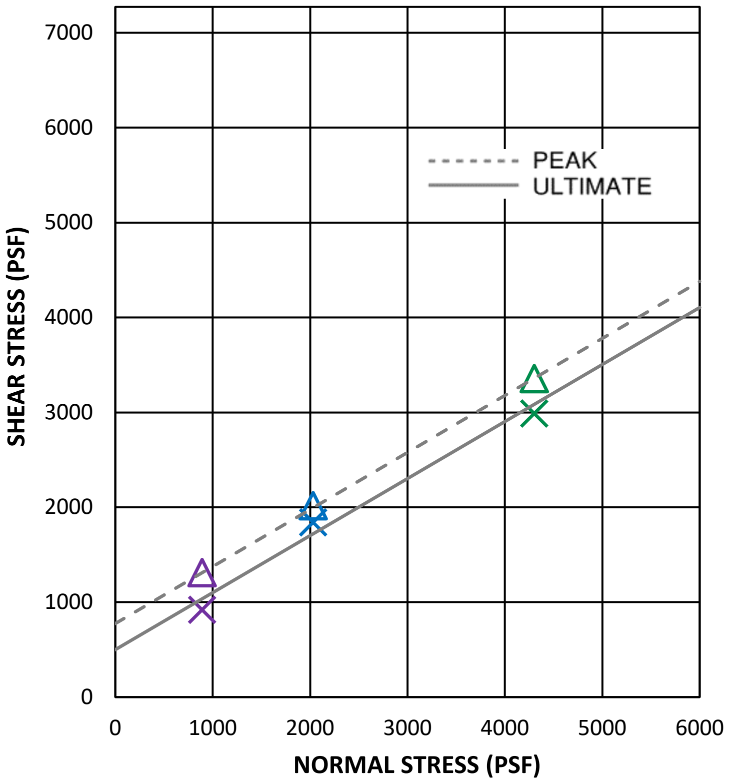
AFTER TEST CONDITIONS

NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	14.0	14.8	14.8	14.5
PEAK SHEAR STRESS (PSF):	1310	2016	3357	--
ULT.-E.O.T. SHEAR STRESS (PSF):	921	1842	2988	--

RESULTS

PEAK	COHESION, C (PSF)	775
	FRICTION ANGLE (DEGREES)	31
ULTIMATE	COHESION, C (PSF)	500
	FRICTION ANGLE (DEGREES)	31





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DIRECT SHEAR - ASTM D 3080

ONE ALEXANDRIA NORTH

PROJECT NO.: G2566-52-02

SAMPLE NO.: **B6-4**
SAMPLE DEPTH (FT): **20'**
GEOLOGIC UNIT: **Qvop**
NATURAL/REMOLDED: **N**

INITIAL CONDITIONS

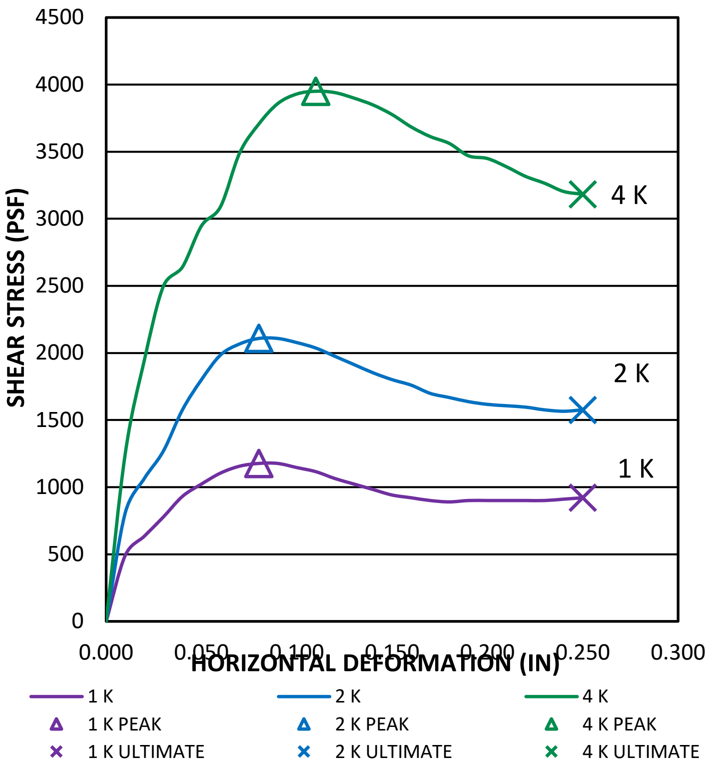
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	--
WATER CONTENT (%):	10.3	10.3	9.3	10.0
DRY DENSITY (PCF):	114.8	121.3	115.5	117.2

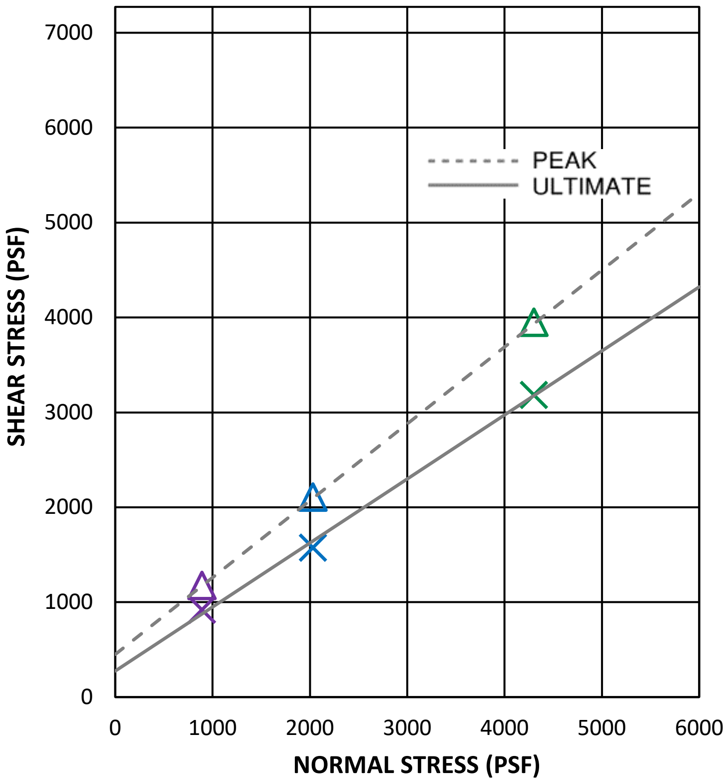
AFTER TEST CONDITIONS

NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	14.5	12.5	13.7	13.6
PEAK SHEAR STRESS (PSF):	1177	2108	3951	--
ULT.-E.O.T. SHEAR STRESS (PSF):	921	1576	3183	--

RESULTS

PEAK	COHESION, C (PSF)	450
	FRICTION ANGLE (DEGREES)	39
ULTIMATE	COHESION, C (PSF)	275
	FRICTION ANGLE (DEGREES)	34





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ONE ALEXANDRIA NORTH

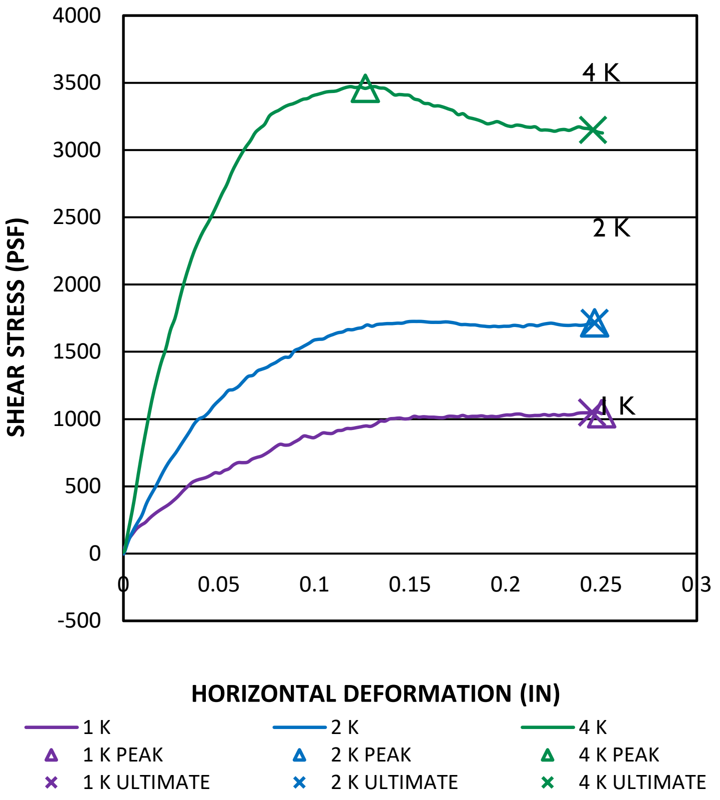
PROJECT NO.: G2566-52-02

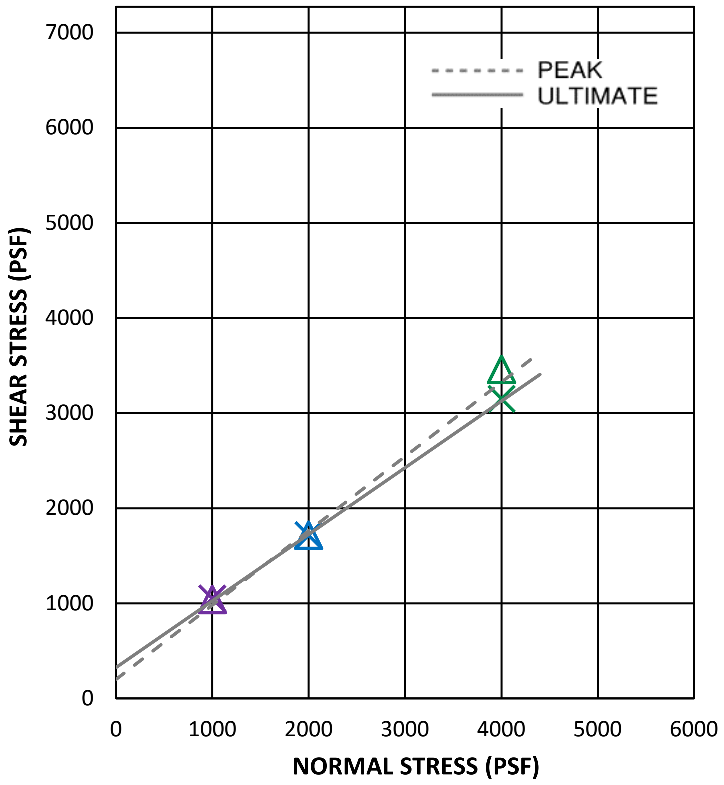
SAMPLE NO.: **B9-4** GEOLOGIC UNIT: **Qvop**
SAMPLE DEPTH (FT): **7.5** NATURAL/REMOLDED: **N**

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
ACTUAL NORMAL STRESS (PSF):	1000	2000	4000	--
WATER CONTENT (%):	6.2	6.3	5.2	5.9
DRY DENSITY (PCF):	102.5	105.5	105.9	104.7

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	1 K	2 K	4 K	AVERAGE
WATER CONTENT (%):	22.5	19.7	19.4	20.5
PEAK SHEAR STRESS (PSF):	1040	1716	3458	--
ULT.-E.O.T. SHEAR STRESS (PSF):	1050	1716	3150	--

RESULTS		
PEAK	COHESION, C (PSF)	200
	FRICTION ANGLE (DEGREES)	38
ULTIMATE	COHESION, C (PSF)	325
	FRICTION ANGLE (DEGREES)	35





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ONE ALEXANDRIA NORTH

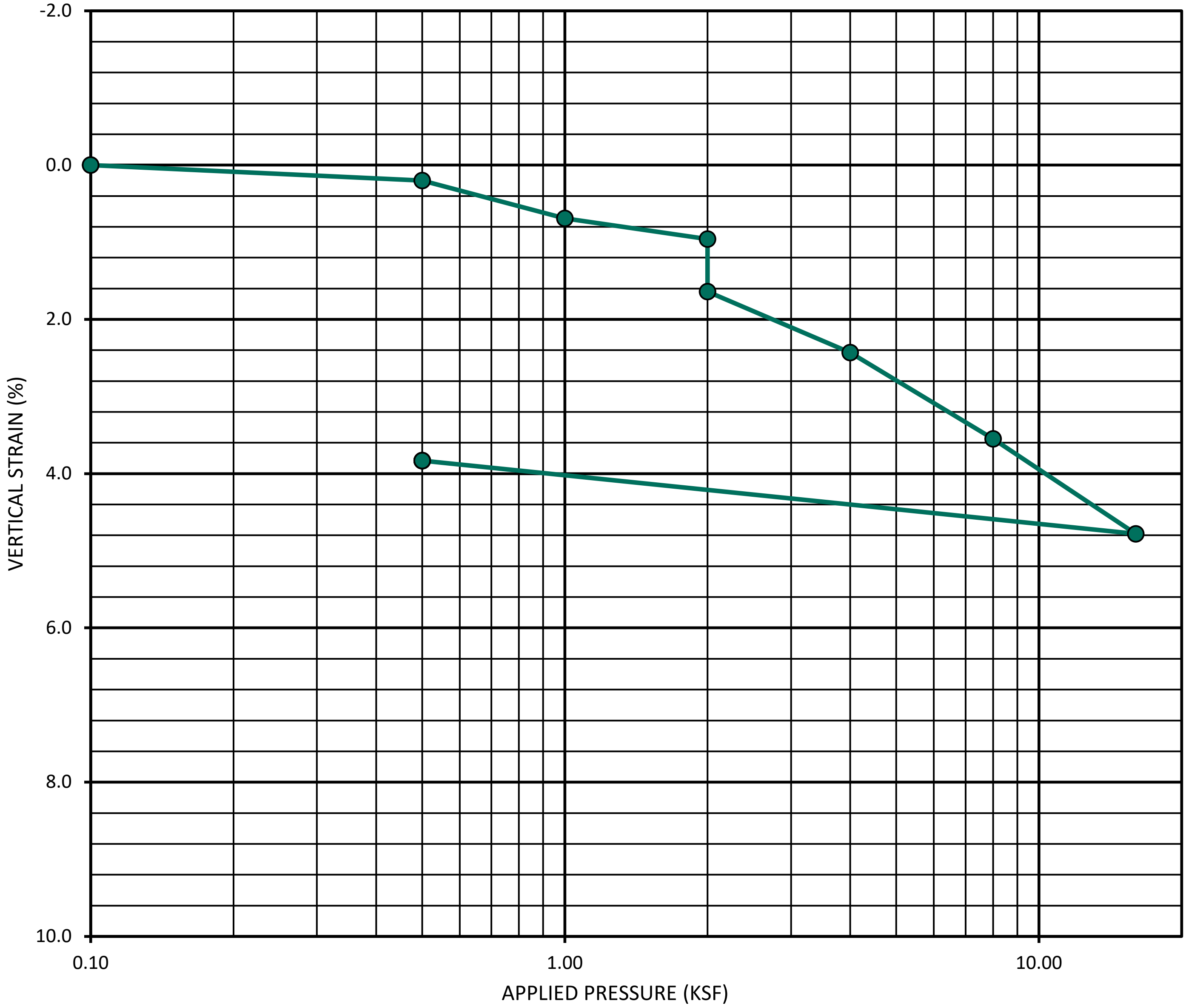
PROJECT NO.: G2566-52-02

SAMPLE NO.: **B1-6**

SAMPLE DEPTH (FT): **25'**

GEOLOGIC UNIT: **Qvop**

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	124.1
INITIAL WATER CONTENT (%):	8.6%
SAMPLE SATURATED AT (KSF):	2.0
INITIAL SATURATION (%):	68.0%



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CONSOLIDATION CURVE - ASTM D 2435

ONE ALEXANDRIA NORTH

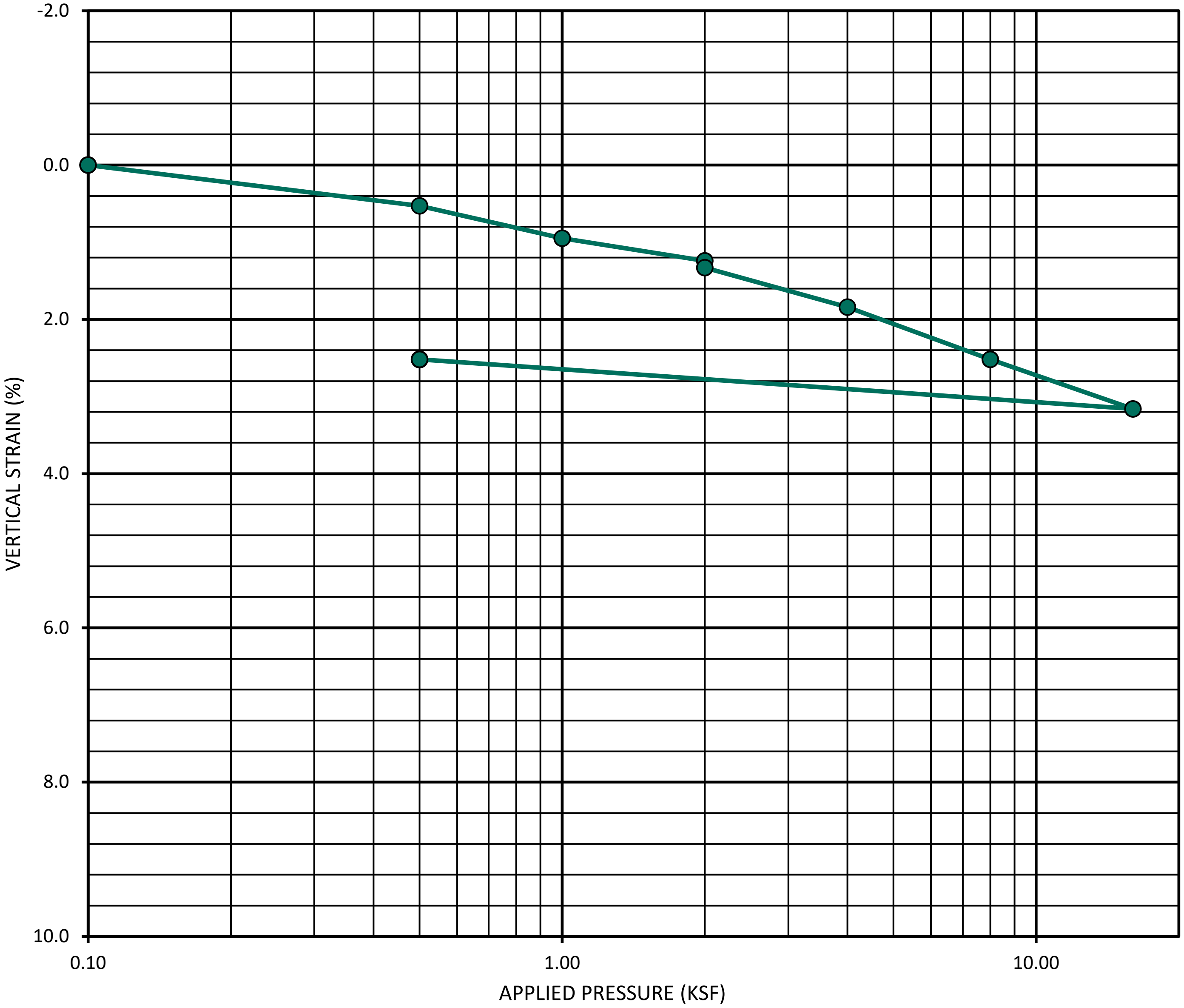
PROJECT NO.: G2566-52-02

SAMPLE NO.: **B4-6**

SAMPLE DEPTH (FT): **25'**

GEOLOGIC UNIT: **Qvop**

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	125.8
INITIAL WATER CONTENT (%):	11.7%
SAMPLE SATURATED AT (KSF):	2.0
INITIAL SATURATION (%):	97.1%



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CONSOLIDATION CURVE - ASTM D 2435

ONE ALEXANDRIA NORTH

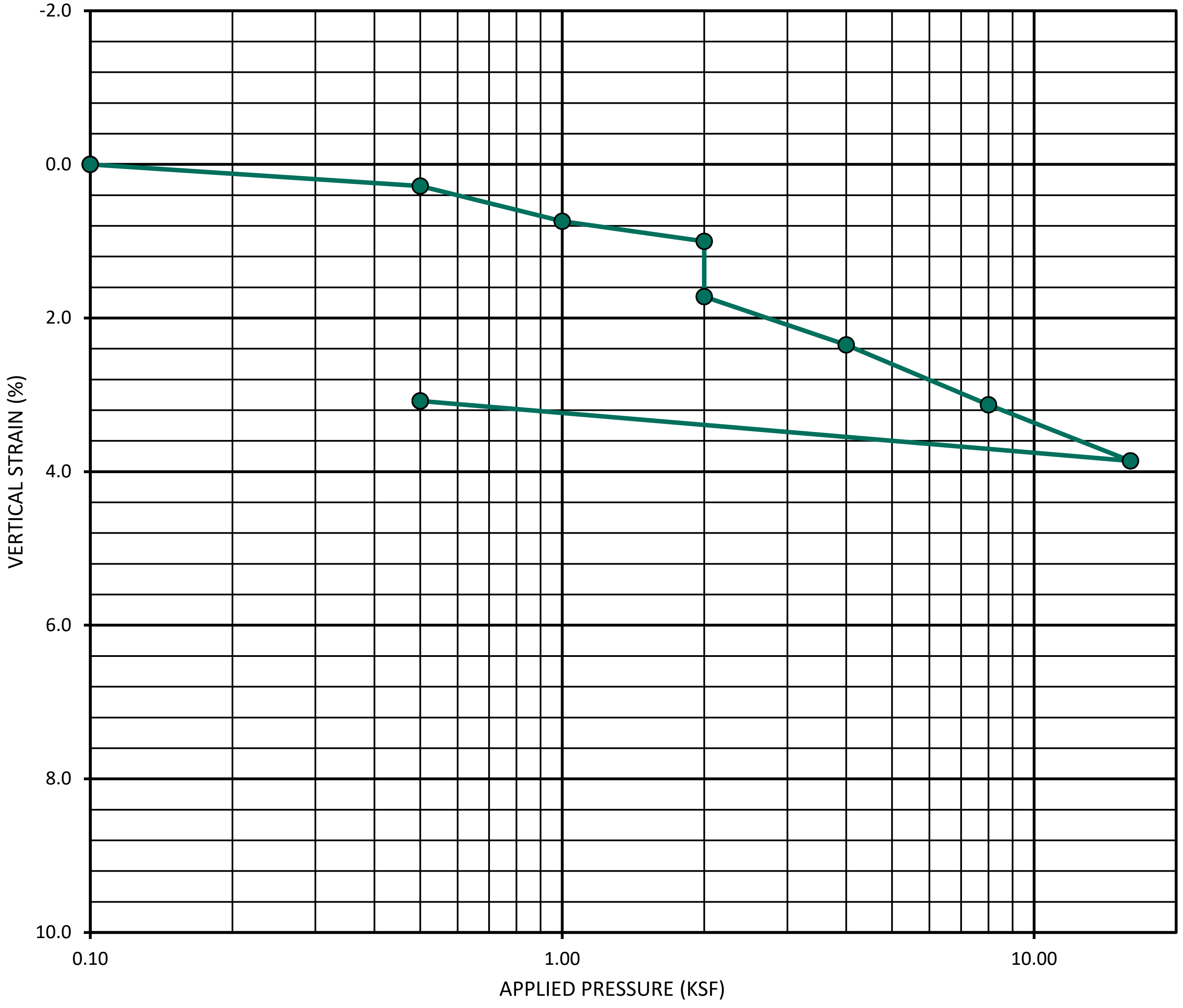
PROJECT NO.: G2566-52-02

SAMPLE NO.: **B6-5**

SAMPLE DEPTH (FT): **25'**

GEOLOGIC UNIT: **Qvop**

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	119.9
INITIAL WATER CONTENT (%):	9.8%
SAMPLE SATURATED AT (KSF):	2.0
INITIAL SATURATION (%):	68.2%



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CONSOLIDATION CURVE - ASTM D 2435

ONE ALEXANDRIA NORTH

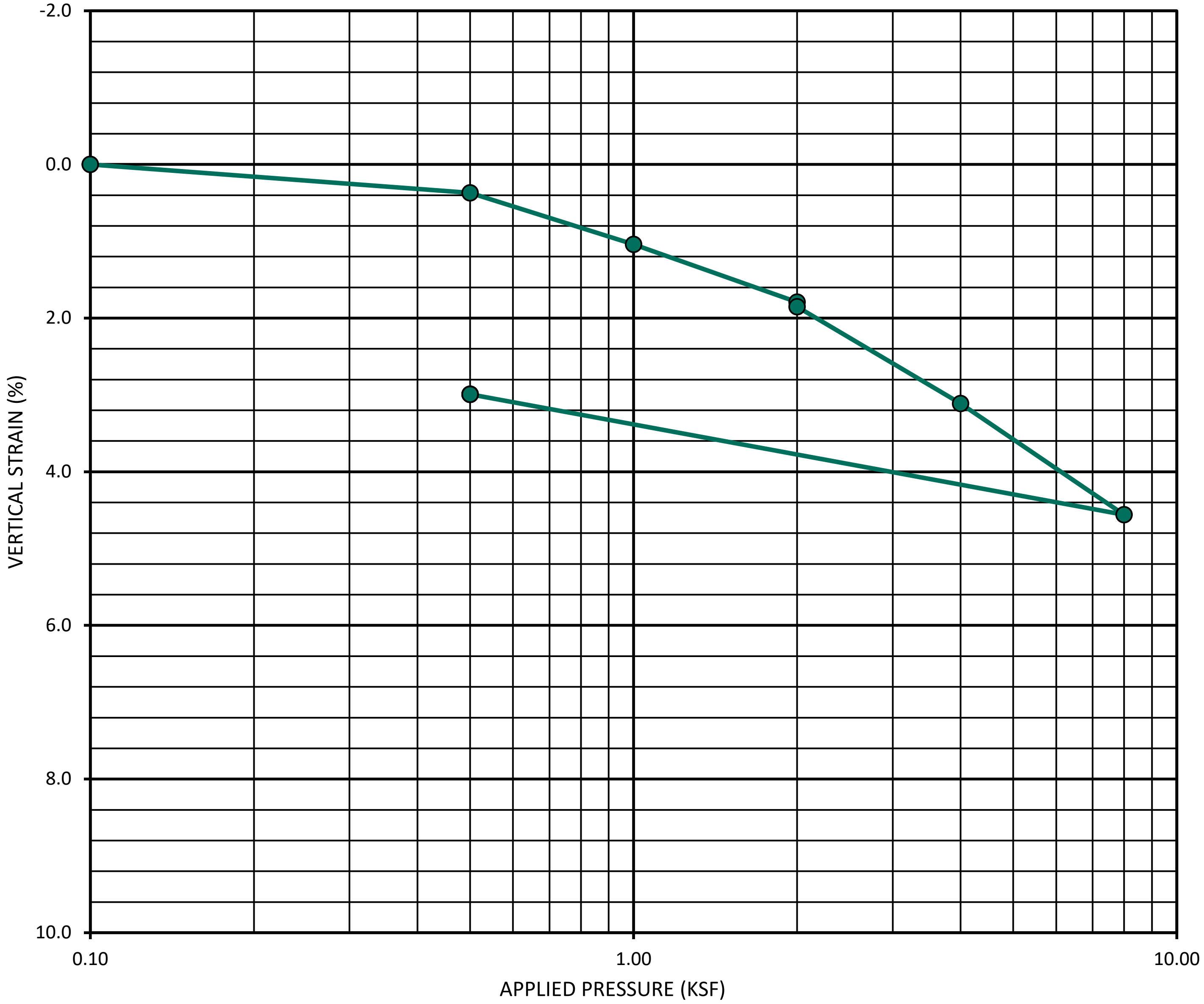
PROJECT NO.: G2566-52-02

SAMPLE NO.: **B11-5**

SAMPLE DEPTH (FT): **10'**

GEOLOGIC UNIT: **Qudf**

TEST INFORMATION	
INITIAL DRY DENSITY (PCF):	115.2
INITIAL WATER CONTENT (%):	10.0%
SAMPLE SATURATED AT (KSF):	2.0
INITIAL SATURATION (%):	60.0%



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CONSOLIDATION CURVE - ASTM D 2435

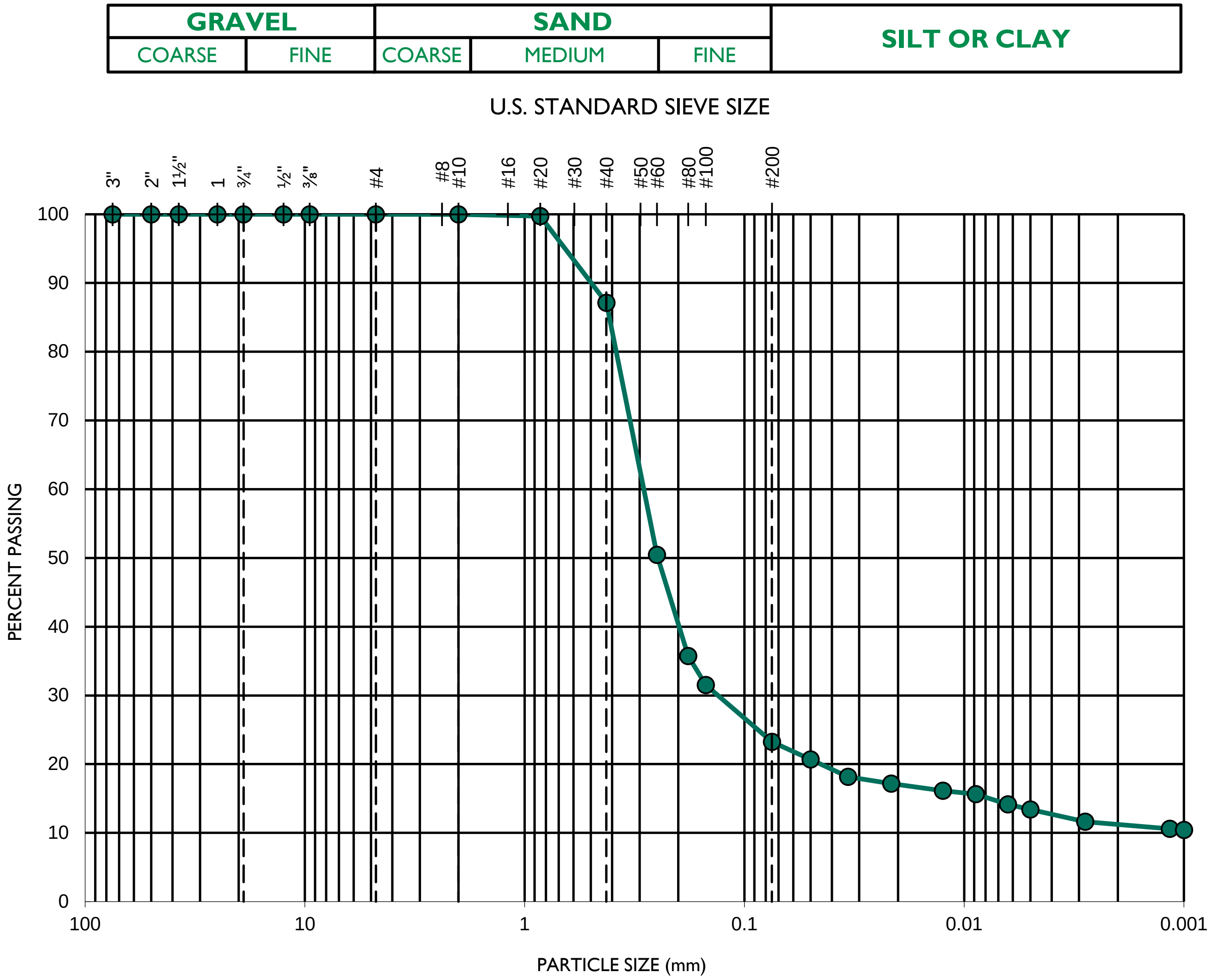
ONE ALEXANDRIA NORTH

PROJECT NO.: G2566-52-02

SAMPLE NO.: **B3-5**

SAMPLE DEPTH (FT.): **20'**

GEOLOGIC UNIT: **Qvop**



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00060	0.13631	0.29556	105.6	496.7	Silty Clayey SAND

GEOCON INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SIEVE ANALYSES - ASTM D 135 & D 422

ONE ALEXANDRIA NORTH

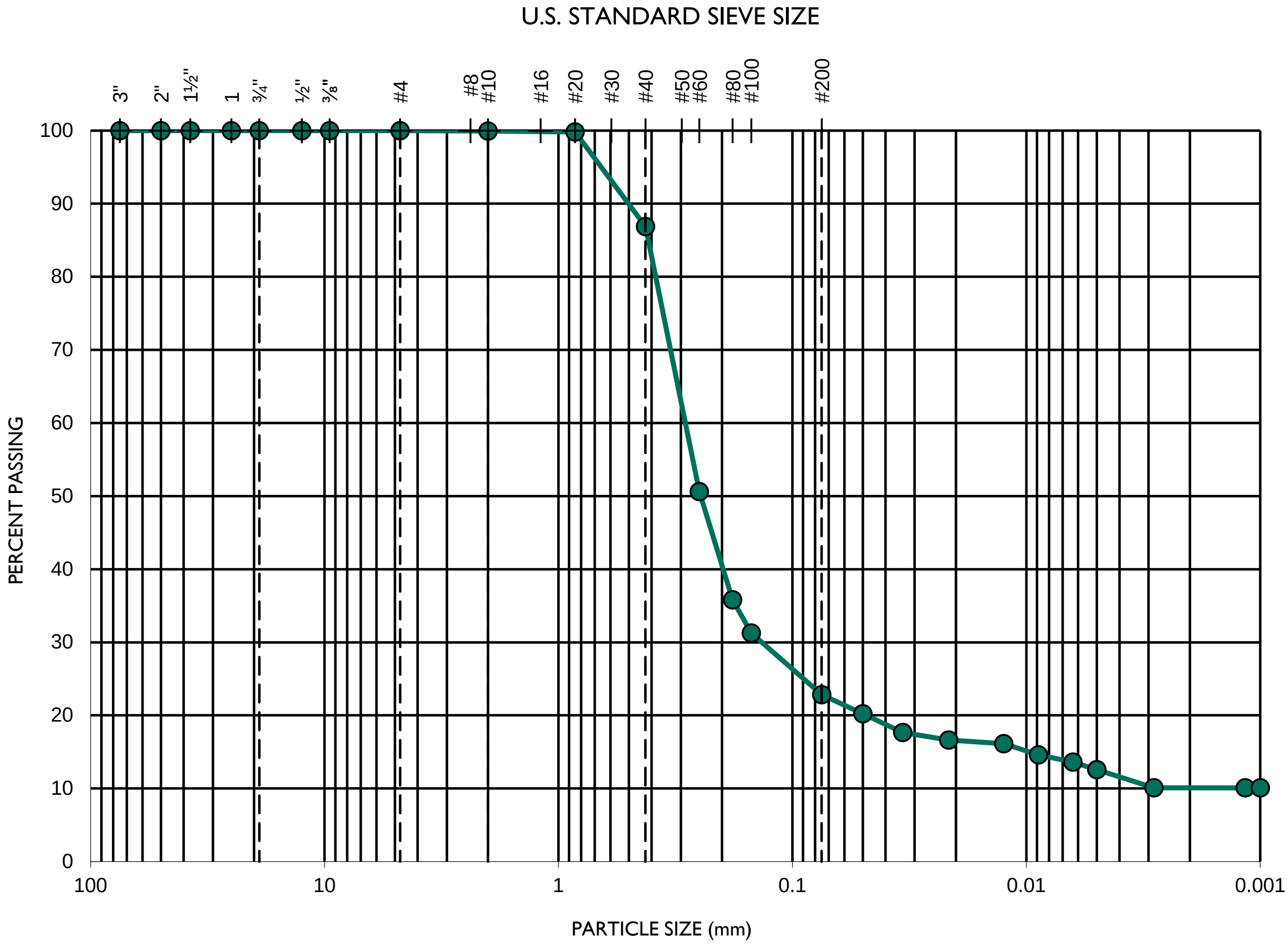
PROJECT NO.: G2566-52-02

SAMPLE NO.: **B4-3**

SAMPLE DEPTH (FT.): **15'**

GEOLOGIC UNIT: **Qvop**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.13860	0.29530	--	--	Silty Clayey SAND

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SIEVE ANALYSES - ASTM D 135 & D 422

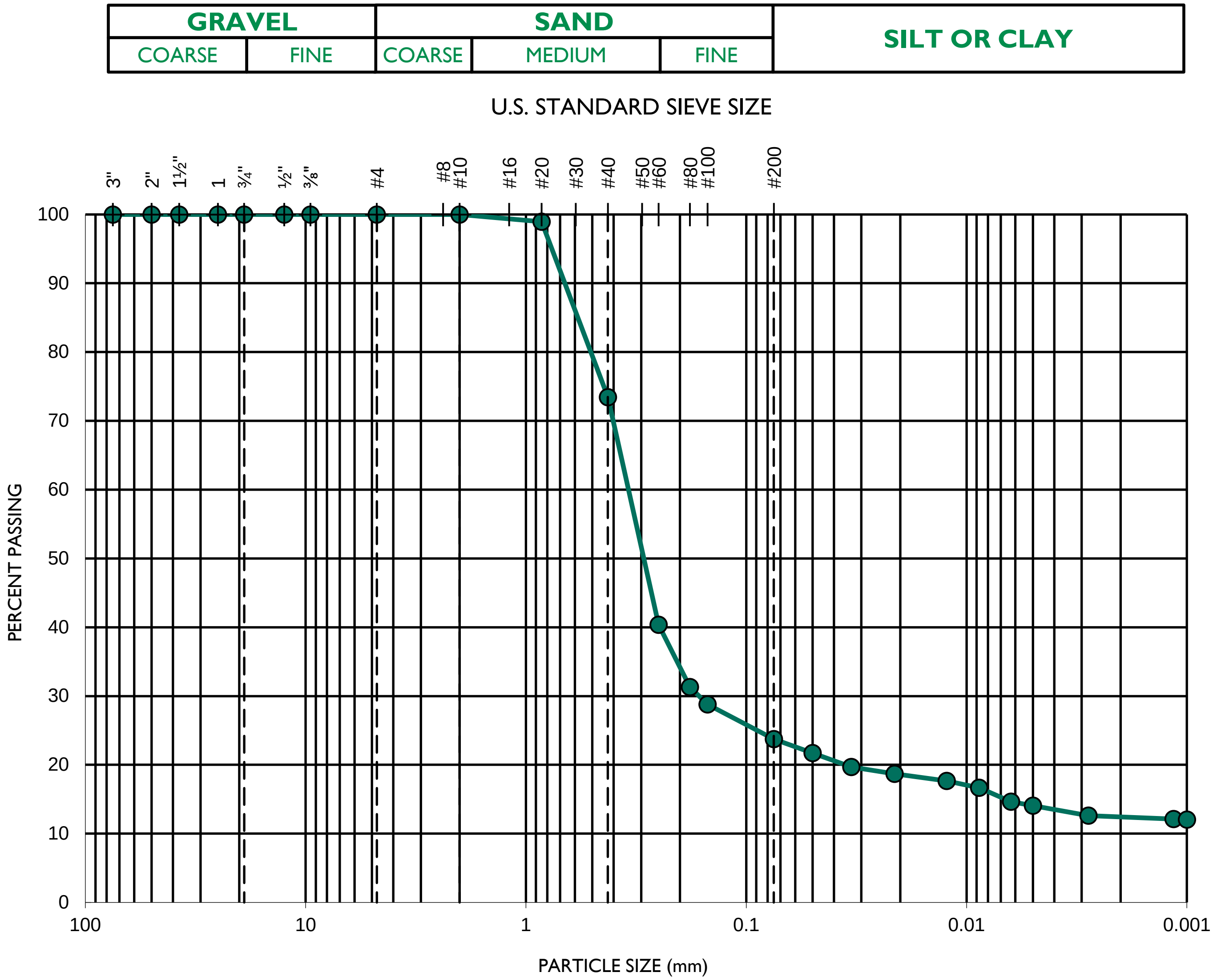
ONE ALEXANDRIA NORTH

PROJECT NO.: G2566-52-02

SAMPLE NO.: **B6-3**

GEOLOGIC UNIT: **Qvop**

SAMPLE DEPTH (FT.): **15'**



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
--	0.16436	0.35394	--	--	Silty Clayey SAND

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SIEVE ANALYSES - ASTM D 135 & D 422

ONE ALEXANDRIA NORTH

PROJECT NO.: G2566-52-02

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

ALEXANDRIA NATIONAL UNIVERSITY
SAN DIEGO, CALIFORNIA

PROJECT NO. G2566-52-02

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

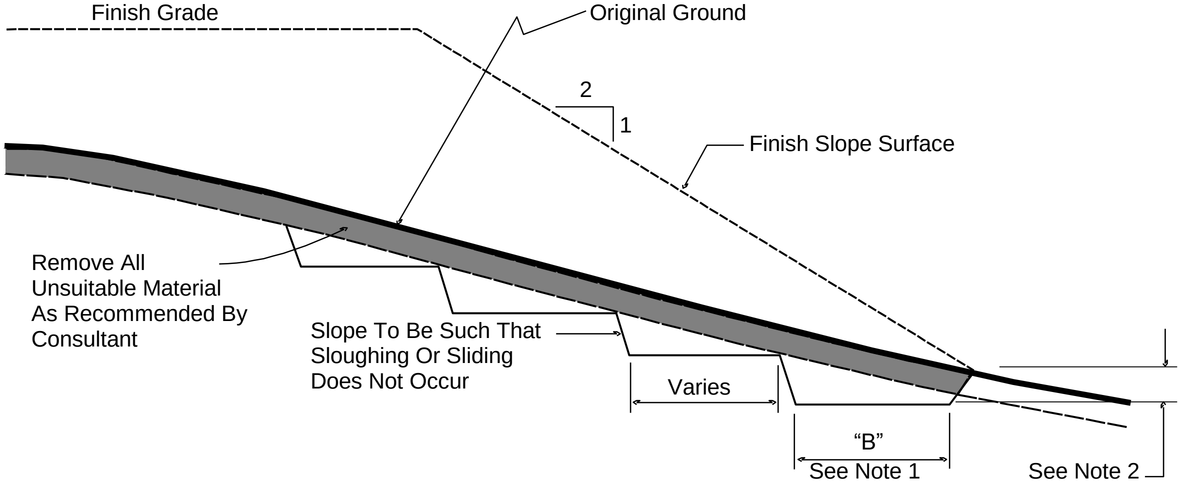
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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.

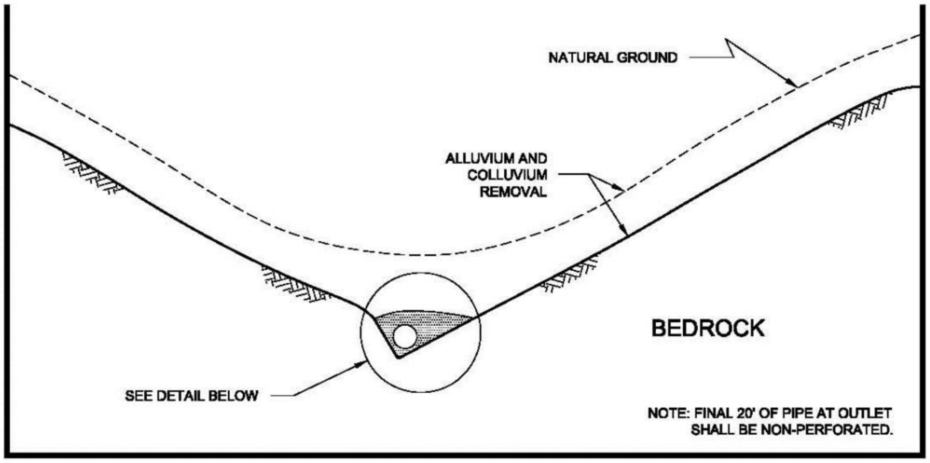
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant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

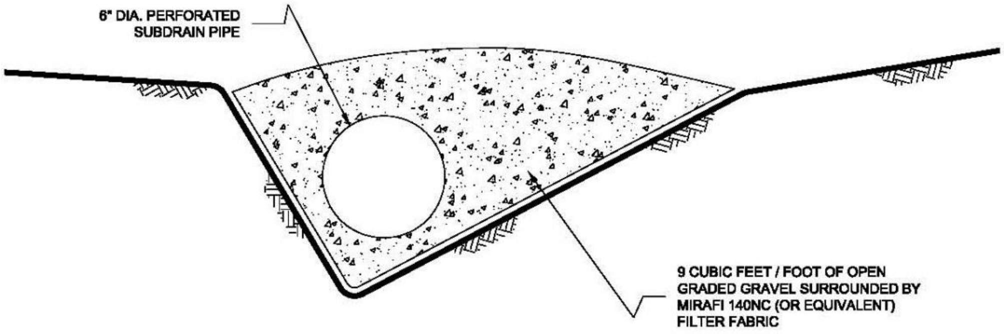
7. SUBDRAINS

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



NOTE: FINAL 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED.



NOTES:

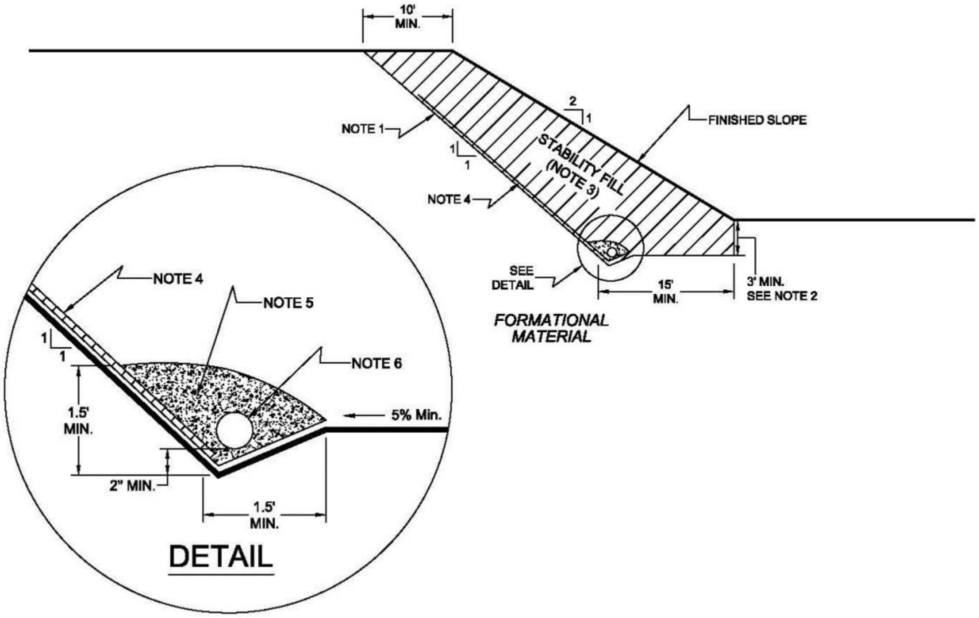
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

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

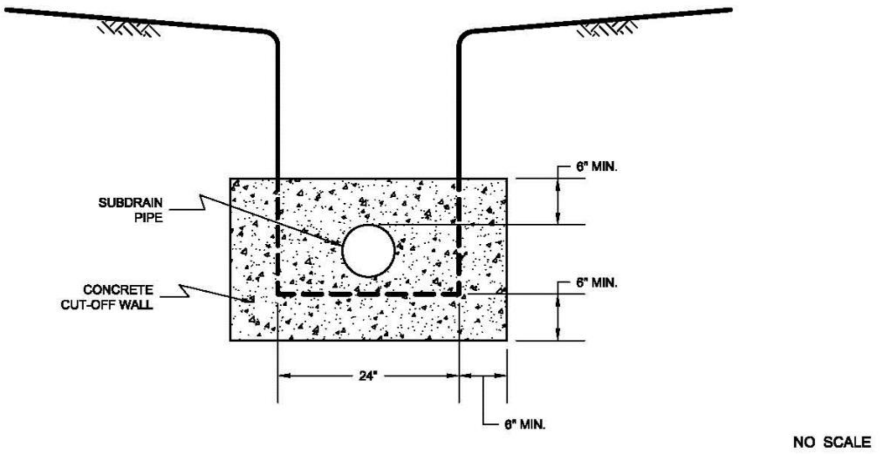
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing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

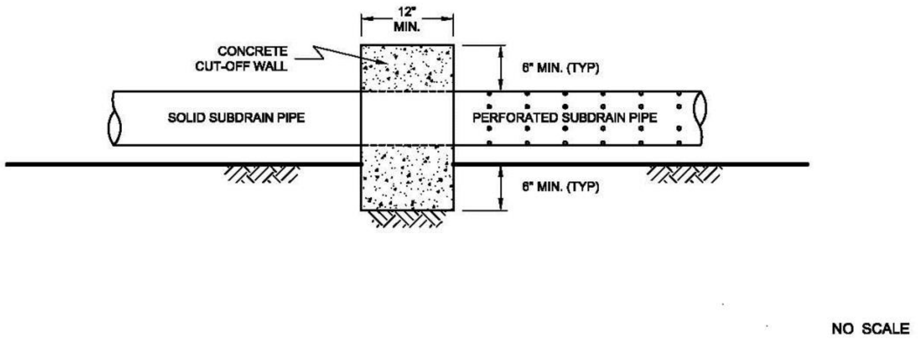
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

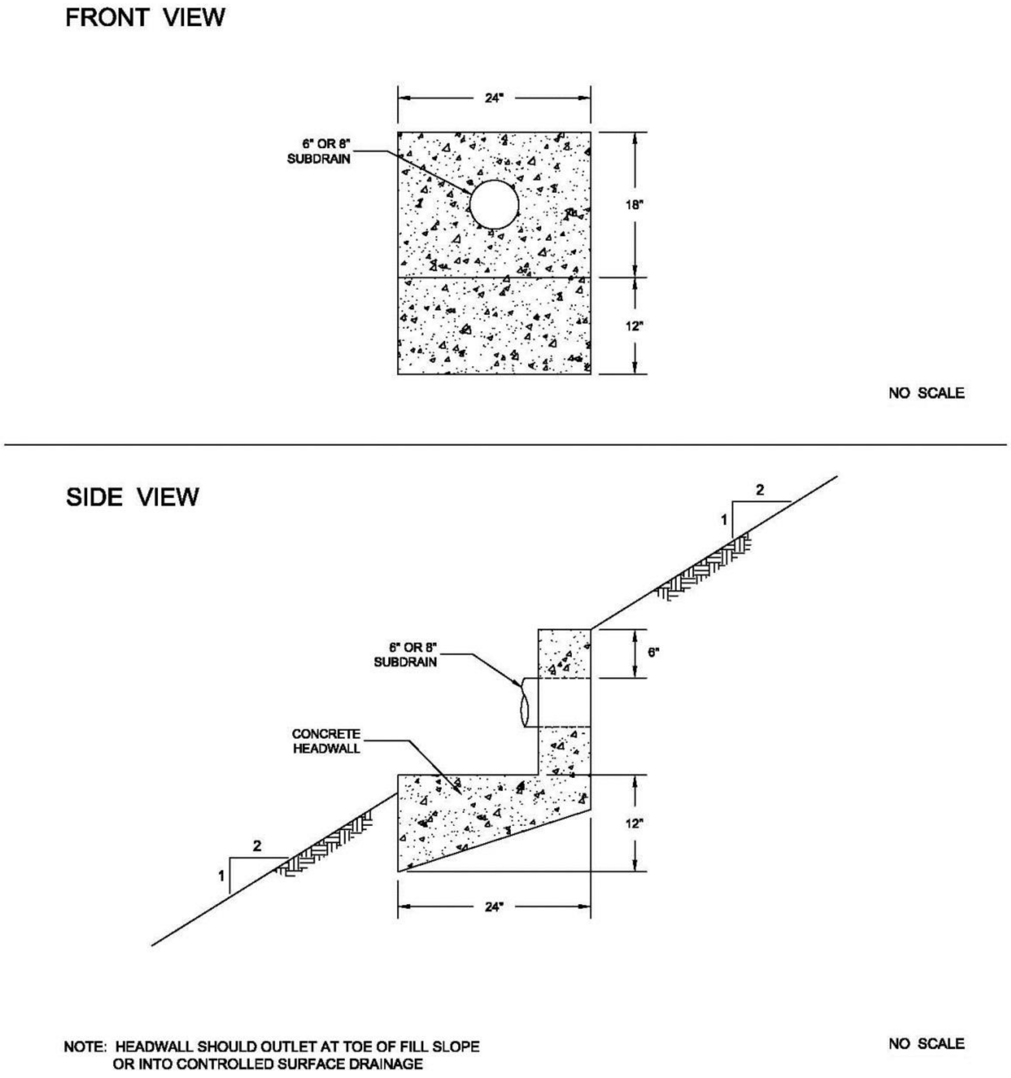


SIDE VIEW



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



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.

LIST OF REFERENCES

1. *2019 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2018 International Building Code*, prepared by California Building Standards Commission, dated July 2019.

2. American Concrete Institute, *ACI 318-11, Building Code Requirements for Structural Concrete and Commentary*, dated August, 2011.

3. American Concrete Institute, *ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots*, dated June, 2008.

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

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

6. California Geological 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*

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

8. Historical Aerial Photos. *http://www.historicaerials.com*

9. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas*, California Geologic Data Map Series Map No. 6.

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