Appendix F

Storm Water Quality Management Plan

P16-00004/D16-00016/CUP16-00014/RC16-00013/T18-00009

CITY OF OCEANSIDE
ENGINEERING DIVISION

PRIORITY DEVELOPMENT PROJECT

STORM WATER QUALITY MANAGEMENT PLAN

FOR

Breeze Luxury Townhomes

ENGINEER OF WORK

_____

Ronald Holloway – RCE 29271 – 3-31-19

PREPARED FOR:

OCEANSIDE-NEVADA, LP

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PREPARED BY:

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How to Use This Template

This template, assembled by GHD Inc. on behalf of the City of Oceanside, is for the development of Storm Water Quality Management Plans (SWQMPs) for Priority Development Projects (PDPs) proposed within Oceanside, CA. It is based on requirements set forth in the Regional Water Quality Control Board's National Pollutant Discharge Elimination System MS4 Permit that covers the San Diego Region (Order No. R9-2013-0001).

All references within the template refer to the City of Oceanside BMP Design Manual dated February 2016 (Manual). Use of this template in conjunction with the Manual is intended to help a project applicant develop a SWQMP compliant with City of Oceanside and MS4 Permit requirements.

Template Date: February 16, 2016

Assembled By:

Quick Reference Guide

Item	Project Information
Project Name	Breeze Luxury Townhomes
Application Number(s)	P16-00004
Project Address	East End of Nevada Street (1200 Block)
Total Parcel Area	115,847 sq. ft.
Project Description	The total parcel size of the project site is 2.66 acres. The existing site is undeveloped and located on the north and south sides of the cul-de-sac at the southeast end of Nevada Street. The project proposes the development of 34 two and three-story, multi-unit townhome buildings and associated improvements. The structures are to be constructed in level graded pads accessed at the intersection of Ditmar Street and Godfrey Street. Total disturbed area is 2.13 acres. Among the storm water improvements will be the installation of a curb inlets, a catch basins, storm drain conveyance systems. Developed onsite runoff will be drained to three (3) separate onsite underground storm water vaults for hydromodification and flow detention (the type of underground stormwater detention vault will be manufactured by StormTrap® or equivalent product), then drained to three (3) separate Modular Wetlands Systems (MWS) for pollutant control and a vegetated dispersion BMP for water quality purposes. Developed off-site runoff will be intercepted and conveyed in a storm drain through the project. Vegetated dispersion BMPs will be used to treat some of this off-site runoff where feasible. The 2.66 acre project site will be approximately 61% impervious post-development.
Proposed Disturbed Area	92,897 sq. ft.
Created or Replaced Impervious	74,878 sq. ft.
Project Hydrologic Unit Watershed	☐ Santa Maria ☐ San Luis Rey ☒ Carlsbad

Required to implement HMP	☒ Yes ☐ No

Table of Contents

CERTIFICATION PAGE

Project Name: Breeze Luxury Townhomes
Permit Application Number: P16-00004

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 City of Oceanside BMP Design Manual, which is based on the requirements of San Diego Regional Water Quality Control Board Order No. R9-2013-0001 (MS4 Permit).

I have read and understand that the City has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this 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 SWQMP by City staff 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.

As Engineer of Work, I agree to indemnify, defend, and hold harmless the City of Oceanside, its officers, agents, and employees from any and all liability, claims, damages, or injuries to any person or property which might arise from the negligent acts, errors, or omissions of the Engineer of Work, my employees, agents or consultants.

RCE 29271, EXP. 3-31-19

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

Ronald Holloway

Print Name

bHA, Inc

land planning, civil engineering, surveying

Company

January 9, 2018

Date

Engineer's Seal:

SUBMITTAL RECORD

Use this Table to keep a record of submittals of this SWQMP. Each time the 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 behind this page.

Submittal Number	Date	Project Status	Changes
1	09/09/16	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Initial Submittal
2	05/11/17	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Revision to Initial Submittal
3	10/09/18	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Revision to Initial Submittal
4	01/28/19	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Revisions to Plan Check Comments

bHA, Inc.
land planning, civil engineering, surveying

ROD BRADLEY, *Urban Planner*
RONALD L. HOLLOWAY, *Civil Engineer*

February 7, 2019
W.O. 1005-0989-100

Mr. Marty Eslambolchi
CITY OF OCEANSIDE
300 North Coast Highway
Oceanside, CA 92054

RE: BREEZE LUXURY TOWNHOMES, T18-00009 – STORM WATER QUALITY MANAGEMENT PLAN – 1ST REVIEW RESPONSE

Dear Mr. Eslambolchi:

The following are our responses to Tory R. Walker Engineering's comments pursuant to the correspondence dated December 11, 2018.

1. General Comments

A. INFORMATION ONLY - The SWQMP requires the Engineer of Work to submit a wet stamp, signature, and date prior to approval. At approval, please provide the following: (1) date and wet signature on the Cover Sheet; (2) date, wet stamp, and wet signature on the Certification Page; (3) date and wet stamp on the DMA Exhibit; (4) date and wet stamp on the Hydromodification Management Exhibit; and (5) date and wet signature on the SWQA Form in Attachment 7.

Response:

Acknowledged.

B. Please include the most recent Permit Application Number (T18-00009) in all designated locations.

Response:

Have included Permit Application Number on plans.

2. Submittal Record

A. FOR REVIEW PURPOSES ONLY - Please provide the complete record of plan check comments and corresponding responses as a separate attachment with the next submittal.

Response:

Acknowledged.

3. Form I-2

A. The Type D Hydrologic Soil Group (HSG) assumption does not appear to be warranted at the project site. Per the September 2018 site-specific geotechnical report, soil information retrieved at Boring Log location B-2 was taken within the HSG Type A footprint and appears to confirm the HSG Type A designation. Furthermore, the surface soils appear to remain homogeneous throughout the project site. Please revise the HSG designation in accordance with the geotechnical report and National Resource Conservation Service (NRCS) Web Soil Survey.

Response:

Based on the infiltration Feasibility Condition prepared by Geotechnical Exploration, Inc. "Infiltration Feasibility Condition, Proposed Breeze Luxury Townhome Project", the entire site is regarded as belonging to Type-D due to the low infiltration characteristics.

4. Form I-3B

A. The Description of Existing Site Condition and Drainage Patterns is incomplete. Please include a discussion about the potential for offsite run-on due to street flows from South Ditmar & Godfrey Street.

4. Form I-3B Continued

A. Continued

Response:

The potential for runoff from minor street widening of Godfrey Street and South Ditmar Street to run-on to the site will be mitigated by a concrete cross gutter constructed along Godfrey Street. Runoff from the minor widening of Godfrey Street will flow to a proposed vegetated dispersion area located on the south side of Godfrey Street at South Ditmar Street. The vegetated dispersion area has been designed as a site design BMP to slow runoff discharges and reduce volumes through infiltration. The dispersion area will also include soil amendments to improve vegetation support, infiltration capacity and enhance treatment of routed flows. The relatively flat slope of the dispersion area will facilitate sheet flows to mimic existing drainage conditions. Discussion of potential offsite run-on is included in SWQMP, SWMM Addendum and Hydrology Report.

B. The Description of Proposed Site Development and Drainage Patterns is incomplete. Please revise the following accordingly:

1. Note any rooftop planter boxes (per architectural plans) as proposed pervious features;

Response:

We acknowledge the movable proposed planter boxes on the roofs. Movable planter boxes do not function as impervious area dispersion areas. However, for simplicity in presenting the DMA exhibits we are not showing these movable planter boxes on the roof, nor are we including these areas as pervious areas in the DCV calculations. It is as noted that the roofs are not shown on the preliminary grading and drainage plans associated with this project.

4. Form I-3B Continued

B. Continued

2. Discuss the potential for offsite run-on due to street flows from South Ditmar & Godfrey Stret;

Response:

Discussion of potential offsite run-on has been included in the SWQMp and Hydrology Report.

3. Pollutant source area checklist needs to be consistent with Form 1-4, Page 3.

Response:

Have revised the pollutant source area check list to be consistent with Form I-4.

C. The Identification of Receiving Water Pollutants of Concern is not current. Please reference the Final 2014 and 2016 California Integrated Report to update the Pollutant(s)/Stressor(s) for Loma Alta Creek.

Response:

Have revised the receiving water pollutants of concern for Loma Alta Creek.

D. INFORMATION ONLY - The Identification of Project Site Pollutants only applies to projects that propose to implement flow-thru treatment BMPs and offsite alternative compliance. The provided information may be removed from the SWQMP (including the DMA Exhibit).

Response:

Acknowledged.

4. Form I-3B Continued

E. The proposed point of compliance (POC) configuration does not present an accurate pre-to-post development flow comparison for the project site. For hydromodification management purposes, the entire project site effectively discharges to POC-1. Please revise the hydromodification analysis to compare pre-to-post development conditions at POC-1 for the entire project site.

Response:

Have revised SWMM models to represent one POC for the project.

F. INFORMATION ONLY - The City of Oceanside has approved a "low susceptibility" rating for Loma Alta Creek per a February 2016 study prepared by TRWE titled, "Erosion Susceptibility Analysis of Loma Alta Creek for Morse Street Apartments.' The applicant may reference the 2016 TRWE study to utilize a low flow threshold of 0.5Q2.

Response:

Acknowledged. A lower flow threshold of 50% is being used in the SWMM models for this project.

G. Site-specific constraints prohibiting the implementation of larger footprint biofiltration BMPs have not been identified. Per the City of Oceanside BMP Design Manual (BMPDM) Appendix F.2.2, proprietary biofiltration is only acceptable if no infiltration is feasible and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible. Please address the following:

1. Discuss why larger footprint biofiltration basin(s) are not feasible anywhere throughout the project site;

Response:

Added discussion in Section 10 of SWQMP discussing reasons why biofiltration basins are not feasible.

4. Form I-3B Continued

G. Continued

2. If the site design cannot be altered as needed to accommodate larger footprint biofiltration BMPs, then discuss why compact biofiltration BMPs (sized with the alternative minimum sizing factors) are not feasible anywhere throughout the project site;

Response:

Added discussion in Section 10 of SWQMP reasons why compact biofiltration basins are not feasible.

3. Alternatively, should it be demonstrated that the project's site design elements and BMPs satisfy the January 2019 County of San Diego BMPDM annual retention requirements for each drainage management area (DMA), then the City can allow use of proprietary biofiltration BMPs without addressing Comments 4.G.1-2. If an equivalent retention analysis is to be provided to justify use of proprietary biofiltration, please use the County of San Diego Automated Stormwater Pollutant Control Worksheets, to demonstrate that site design BMPs satisfy the site-specific retention requirements. Please also include an accompanying narrative discussion explaining this approved deviation from the current City of Oceanside BMPDM.

Response:

We have chosen to demonstrate compliance with comments G1 and G2 in lieu of comments G3.

4. Form I-3B Continued

H. The proposed street improvements along Nevada Street and Godfrey Street are not completely addressed. Please address the following:

1. If the site design cannot be altered as needed to accommodate treatment of offsite added or replaced impervious areas, then the City will allow the applicant to exempt offsite street improvement areas from PDP requirements if the offsite improvements are designed and constructed in accordance with USEPA Green Streets guidance. If USEPA Green Streets guidance is to be provided to exempt the offsite improvement areas from PDP requirements, please use the County of San Diego Guidance on Green Infrastructure provided in the February 2016 County of San Diego BMPDM. Please also include an accompanying narrative discussion explaining this approved deviation from the current City of Oceanside BMPDM.

Response:

There is not sufficient area in the Nevada Street right-of-way for "Green Streets". There is no parkway. However we are proposing to treat estimated flow generated from new impervious areas in an onsite Modular Wetland System (MWS). See discussion in Section 6 of SWQMP.

5. Form I-4

A. The Source Control BMP Checklist appears to be incomplete. Refuse areas have been identified to be pollutant source present at the project site on Form I-3B, Page 5. Please revise the SC-6 checklist in accordance with BMPDM Section 4.2.

Response:

Have revised source control checklist to be consistent with Form I-3B.

6. Form I-5

A. The Site Design BMP Checklist appears to be incomplete. Please revise the checklist in accordance with BMPDM Section 4.3 and the following.

1. Per the July 2015 field reconnaissance noted on Form l-3B, Page 2, natural hydrologic features were not observed onsite; therefore, SD-1 does not apply to the project site.

Response:

Acknowledged. Form I-5 has been revised.

2. The noted ground-level landscape planter boxes are not minimizing impervious area, as provided in the discussion on Form l-3B, Page 4. If functioning as designed, said planter boxes would be considered SD-5.

Response:

Acknowledged. Movable planter boxes do not function as impervious area dispersion areas. See revised discussion.

3. Further justification is necessary to omit SD-6 at the project site. Runoff collection techniques are intended to be used on a small scale wherever feasible.

Response:

Retention practices (permeable pavers/concrete, etc.) for this site are not conducive to providing ponding free areas adjacent to buildings, street improvements with wet/dry utilities.

6. Form I-5 Continued

A. Continued

4. The Harvest and Use Feasibility Screening (Form 1-7) is not valid for assessment of rain barrels (SD-8) as a volume-reducing site design BMP.

Response:

No rain-water harvesting strategies proposed. Harvest and use is not considered to be infeasible per revised Form I-7.

7. Form I-6

A. The narrative description of the general strategy for structural BMP implementation is incomplete. The general strategy for structural BMP implementation must be presented for each DMA and must discuss how the proposed site design BMPs are implemented therein. Please update the general strategy for structural BMP implementation to document how the prescribed steps in BMPDM Figure 5-1were followed for each DMA. Please also include additional site design BMP details for all proposed self-retaining DMAs.

Response:

Have provided additional BMP details in the SWQMP. The only self-retaining area is proposed for the project is located offsite along Godfrey Street. Discussion on strategy has been revised in Section 10 of SWQMP.

B. The delineation technique for DMA 1 is not acceptable as presented. A single DMA may not drain to more than one BMP. Please re-delineate DMA 1 into two separate DMAs or provide junction box details and hydraulic calculations that demonstrate the pollutant control volume and hydromodification flow control requirements are satisfied through the proposed design.

Response:

See the junction box details and flow calculations in the Hydrology Report that support diverting DMA 1 DCV into two separate BMPs.

7. Form I-6 Continued

C. The proposed combined pollutant control and flow control detention system design appears to not function as designed. Please address the following:

1. Provide details to demonstrate how the proposed underground storage systems will be individually partitioned into two hydraulically separate, non-standard sized chambers.

Response:

Proposed underground storage system has been redesigned using one vault without it being partioned. See details on DMA Exhibit and in the SWQMP, Hydrology Report and SWMM Addendum.

2. Please account for the MWS internal bypass weir and the difference in elevation between the MWS inlet and outlet when calculating the detention vault stage discharge. Ponded volume within the storage vault will begin to spill over the MWS internal weir wall when the ponded depth exceeds the weir wall height (3.4 feet) less the drop across the MWS unit.

Response:

With the new proposed MWS and underground storage system, a flow control orifice feeds the MWS, the two are hydraulically disconnected.

D. Please provide Structural BMP Summary Information form(s) for both BMP-lA and BMP-lB and remove any blank forms from Section 9.

Response:

Have provided Structural BMP Forms for each BMP in Section 9.

8. Attachment 1(Backup for PDP Pollutant Control BMPs)

A. The DMA Exhibit is incomplete. Please address the following items and revise accordingly- using multiple sheets if necessary-and include a revised copy of the DMA Exhibit with the project grading plan sheets:

1. The BMP Exhibit does not show the following required elements:

A. Existing topography and impervious areas within the development footprint:

Response:

Have added topography and impervious areas within the development footprint.

B. The complete proposed site drainage network, including roof downspout locations;

Response:

See revised DMA Exhibit showing drainage network and roof down spout locations.

C. Proposed grading (i.e. pertinent elevation callouts) within each DMA;

Response:

See revised DMA Exhibit showing pertinent elevations.

D. DMA boundaries are not easily distinguishable;

Response:

See revised DMA Exhibit showing distinguishable DMA boundaries.

8. Attachment 1(Backup for PDP Pollutant Control BMPs) Continued

A. Continued

1. Continued

E. Proposed structural BMP details (i.e. size, model, etc.) are inconsistent with similar information provided elsewhere.

Response:

Structural BMP details shown in the SWQMP and exhibits are now consistent with each other.

2. Adequate details for effective implementation of all applicable source control BMPs have not been provided. Please reference BMPOM Section 4.2 and Appendix E.1 for guidance on including symbology and language for the DMA Exhibit to demonstrate source control BMP compliance.

Response:

Have provided acceptable symbology for source control BMPS on the DMA Exhibit per BMPDM Section 4.2 and Appendix E.I.

3. Adequate details for effective implementation of all applicable site design BMPs have not been provided. Please reference BMPOM Section 4.3 and Appendix E.1 for guidance on including details for the DMA Exhibit to demonstrate site design BMP compliance.

Response:

Have provided acceptable symbology for site design BMPs on the DMA Exhibit per BMPDM Section 4.3 and Appendix E.I.

8. Attachment 1(Backup for PDP Pollutant Control BMPs) Continued

B. The Tabular Summary of DMAs is inconsistent with the information provided on the DMA Exhibit. Please address the following:

1. Tabulated area values for DMAs 1and SM-2 are not equal to the exhibit callout values.

Response:

Tabulated area values are now identical to values labeled on the DMA Exhibit.

2. BMP 1-B is labeled as BMP 2-A.

Response:

Labels are corrected on DMA Exhibit.

3. Impervious area within DMA SR-1 does not appear to be effectively dispersed.

Response:

DMA SR-1 is now a self mitigating area.

4. The proposed landscape dispersion areas for DMAs SR-2 through 4 do not appear to meet all the requirements specified in BMPDM Section 5.2.3.

Response:

These areas are now self mitigating areas.

8. Attachment 1(Backup for PDP Pollutant Control BMPs) Continued

B. Continued

5. DMA SM-2 lists sidewalk as a land cover on the DMA Exhibit, but the adjacent sidewalk area is excluded from the DMA delineation.

Response:

The sidewalk has been removed from the self mitigating area.

6. DMA DMIN-1 is not consistent with the characteristics listed in BMPDM Section 5.2.2.

Response:

DMIN-1 is not feasible to drain to the MWS for pollutant control. The area includes 657 square feet significantly bigger than the suggested 250 square feet in the BMP Design Manual, but less than 2 percent of the total added or replaced impervious surface of the project. The De Minimis area is located at the northerly end of the proposed driveway along Oceanside Boulevard. The De Minimis Area is approximately 10 feet wide and 65 feet long and includes areas of the proposed driveway apron in Oceanside Boulevard. Intercepting upstream runoff from Oceanside Boulevard that comingles with the new impervious area driveway apron is not practicable. Alternatives to place street trees to treat the runoff are not practicable due to the sidewalk being contiguous to the street curb and based on recommendations by the Geotechnical Exploration, Inc. in the Form I-8 no infiltration is feasible for on-site. A discussion has been added in Section 10 of the SWQMP to discuss practicable options.

8. Attachment 1(Backup for PDP Pollutant Control BMPs) Continued

C. The DCV Worksheet section is incomplete. Please address the following:

1. INFORMATION ONLY - A 0.59-inch 85th percentile 24-hour storm depth may be used in accordance with the April 2018 County of San Diego ArcGIS Online 85th percentile precipitation layer.

Response:

Acknowledged. We will use 0.59-inch in the SWQMP calculations.

2. DCV calculations for DMA SR-5 and DMIN-1 are omitted.

Response:

All DCV calculations for DMAs have been included in the SWQMP.

3. The Total Project DMA Tabulation appears to be inconsistent with the Proposed Disturbed Area reported on the Quick Reference Guide. Please ensure all proposed disturbed areas are included in the tabulation and revise where necessar

Response:

Total project area are now consistent with Quick Reference Guide.

D. The Harvest and Use Feasibility Screening does not include harvested water demand from toilet and urinal flushing. Please account for all reliably present wet season harvested water demand use revise the calculations appropriately.

Response:

Harvest and Use Feasibility Screening now includes toilet and urinal flushing.

8. Attachment 1(Backup for PDP Pollutant Control BMPs) Continued

E. The Categorization of Infiltration Feasibility Condition conclusions require additional documentation for the "No Infiltration" designation. Please provide a reference to the language in the site-specific geotechnical report to support the "No" response to Criteria 2, 5 and 6.

Response:

Based on recommendations by the Geotechnical Exploration, Inc. in the Form I-8, infiltration is not feasible for on-site. Based on site geologic conditions and impermeable surface material, it has been determined that infiltration of any appreciable amount into onsite soils is not recommended. See letter prepared by the Geotechnical Exploration, Inc stating that infiltration BMPs are not considered feasible.

F. The Pollutant Control BMP Design Worksheets specifies MWS cut sheets and model numbers that differ from model numbers specified elsewhere in the submittal (e.g. DMA Exhibit, Drainage Report, HMP Study). Please revise accordingly.

Response:

Pollutant Control BMP Design Worksheets, MWS cut sheets, DMA Exhibits, Hydrology Report and SWMM Addendum now specify identical MWS model numbers.

9. Attachment 2 (Backup for PDP Hydromodification Control Measures)

A. The Hydromodification Management Exhibit is incomplete. Please address the following items and revise accordingly:

1. All items identified in Comment 8.A.1

Response:

Have added topography and impervious area within the development footprint.

9. Attachment 2 (Backup for PDP Hydromodification Control Measures) Continued

A. Continued

2. Existing site drainage network and connections to offsite drainage;

Response:

Have provided existing drainage network and connections to offsite drainage facilities.

3. Existing drainage boundary and drainage area to each POC.

Response:

Have provided an existing hydromodification exhibit showing existing drainage boundary and drainage areas to each POC.

10. Attachment 3 (Structural BMP Maintenance Information)

A. The required BMP Maintenance Information is omitted from Attachment 3. Please include the required information in Attachment 3.

Response:

BMP maintenance and operation information for MWS and Stormtrap Vaults have been added to Attachment 3.

11. Attachment 4 (Copy of Plan Sheets Showing Permanent Storm Water BMPs)

A. Please update for any revisions due to comments in this review letter.

Response:

Plan sheets have been updated based on comments in review letter.

12. Attachment 5 (Drainage Report)

A. Please update for any revisions due to comments in this review letter.

Response:

Drainage report has been updated based on comments in review letter.

13. Attachment 7 (Storm Water Quality Assessment Form)

A. The Total Parcel Area is inconsistent with parcel area values provided elsewhere. Please revise accordingly.

Response:

Total parcel area is consistent throughout the SWQMP.

14. Additional Supporting Documentation

A. HMP Study

1. Please revise the design of the proposed structural BMPs in accordance with Comments: 3.A; IV.E; 7.B, C, and F; and 9.A and update the HMP Study accordingly.

Response:

Have revised Hydromodification Report and Exhibits based on review comments.

2. Please submit a digital copy of the SWMM files with the all future submittals.

Response:

A CD with the SWMM files is included with the SWQMP.

14. Additional Supporting Documentation Continued

A. HMP Study Continued

3. The project site is in California Irrigation Management Information System (CIMIS) Zone 1. Please revise the monthly evapotranspiration values accordingly.

Response:

Monthly evapotranspiration values have been revised accordingly.

4. The proposed condition model for POC-1 does not include OMA 1-B. Please revise accordingly.

Response:

SWMM model has been revised accordingly.

5. The model excludes the total disturbed project area in the existing and proposed conditions models. Per BMPDM Section 5.2.3, self-retaining DMAs are considered only to meet pollutant control requirements and therefore must also be included in the HMP analysis. Please revise both the existing and proposed models to include all DMA areas.

Response:

SWMM models have been revised accordingly.

6. The LID cistern should only include the square footage attributed to the water quality volume rather than both water quality and hydromodification. Please revise the LID Usage Editor parameter accordingly.

Response:

SWMM model has been revised accordingly.

14. Additional Supporting Documentation Continued

A. Continued

7. The MWS orifice provides flow control for the upstream detention vaults when the WQ orifice is larger than the MWS orifice. Additionally, the maximum ponded depth within the detention vault occurs in accordance with Comment 7.C.3. Please revise the LID Control Editor accordingly.

Response:

The MWS orifice is hydraulically disconnected from the upstream Vault.

8. The BMP 2 elevation-area-discharge information has been omitted from Attachment 4. Please provide these tables for BMP 2.

Response:

Elevation-area-discharge information is provided in Attachment 4.

9. The page headers within Attachments 6 and 9 are incorrect. Please revise the headers to correctly state which input data is presented.

Response:

Headers have been corrected.

10. The subcatchment length value (taken as the subcatchment area divided by the width) should be similar to the overland flow length for the initial sub areas as determined in the drainage report. Please revise the subcatchment width parameter as appropriate to represent the overland flow length for each DMA.

Response:

Subcatchment length has been revised to reflect the overland flow length in the drainage report.

14. Additional Supporting Documentation Continued

A. Continued

11. The POC 2 input and output information provided in Attachments 6 and 9 are for the 100-year storm detention analysis rather than the HMP Study. Please provide the correct input and output summaries in their respective attachments.

Response:

SWMM model has been revised accordingly. Model summaries are attached to the HMP Addendum.

12. The SWMM screenshots are inconsistent with the values provided in the report body and associated attachments. Please revise accordingly and call to discuss alternative presentation of this information.

Response:

Screenshots have been eliminated from the SWMM Addendum.

13. The Soil Map has been omitted from Attachment 8. Please revise.

Response:

Soils Map has been added to Attachment 8.

14. The output summary files indicate that the proposed underground storage facilities are surcharged {flooded). Please revise the design to ensure that no surcharging occurs.

Response:

No surcharging occurs in the revised underground storage facilities.

14. Additional Supporting Documentation Continued

A. Continued

15. The drawdown time calculations ignore the orifice control provided by the MWS units. Please revise the drawdown calculations to demonstrate the drawdown time due to discharges through the smallest downstream orifice.

Response:

See revised drawdown time calculations based on orifice control from underground storage facilities.

If you have any questions or concerns please do not hesitate to contact me.

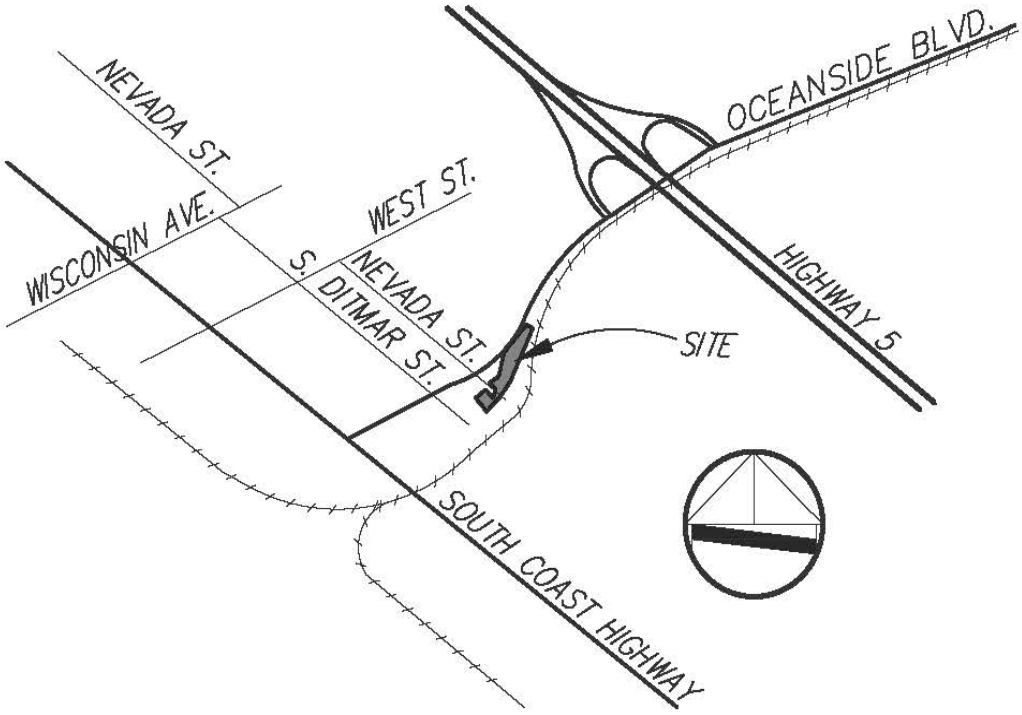
Sincerely,

bHA, Inc.

Bruce Rice
Project Engineer

BR:ss

swqmp 1st review response.ltr



VICINITY MAP

NO SCALE

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	Form I-1

Project Identification

Project Name: Breeze Luxury Townhomes	
Permit Application Number: P16-00004	Date: October 9, 2018

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 for guidance.	☒Yes	Go to Step 2.
	☐No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or exception to PDP definitions? To answer this item, see Section 1.4 of the manual *in its entirety* for guidance, AND complete Form I-2, Project Type Determination.	☐Standard Project	Stop. Standard Project requirements apply, including Standard Project SWQMP.
	☒PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐ Exception to PDP definitions	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

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 for guidance.	☐Yes	Consult the [City Engineer] to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual 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 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: No critical coarse sediment yield areas apply. See Attachment 2b.		

Project Type Determination Checklist			Form I-2
Project Information			
Project Name: Breeze Luxury Townhomes			
Permit Application Number: P16-00004			
Project Type Determination: Standard Project or PDP			
The project is (select one): ☒ New Development ☐ Redevelopment			
The total proposed newly created or replaced impervious area is: __74,878__ ft² (___1.72__) acres			
Is the project in any of the following categories, (a) through (f)?			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption SIC code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

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

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

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

☒ Yes – the project is a PDP.

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is: _____ ft² (A)
The total proposed newly created or replaced impervious area is: _____ ft² (B)
Percent impervious surface created or replaced (A/B)*100: _____%
The percent impervious surface created or replaced is (select one based on the above calculation):

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

OR

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

Site Information Checklist For PDPs	Form I-3B (PDPs)
Project Summary Information	
Project Name	Breeze Luxury Townhomes
Project Address	Nevada Street, Oceanside, CA 92054
Assessor's Parcel Number(s)	152-121-06, 152-123-05, 152-123-20 and 152-320-11
Permit Application Number	P16-00004
Project Watershed (Hydrologic Unit)	Select One: ☐Santa Margarita 902 ☐San Luis Rey 903 ☒Carlsbad 904
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	2.66 Acres (115,747 Square Feet)
Area to be disturbed by the project (Project Area)	2.13 Acres (92,897 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	1.72 Acres (74,878 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.41 Acres (18,019 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Hydrologic Unit	Hydrologic Area	Hydrologic Sub-Area
Santa Margarita 902.00	☐ Ysidora 902.10	☐ Lower Ysidora 902.11
San Luis Rey 903.00	☐ Lower San Luis 903.10	☐ Mission 903.11
		☐ Bonsall 903.12
Carlsbad 904.00	☒ Loma Alta 904.10	Not Applicable
	☐ Buena Vista Creek 904.20	☐ El Salto 904.21
		☐ Vista 904.22
	☐ Agua Hedionda 904.30	☐ Los Monos 904.31

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 existing site is undeveloped and is located on the north and south sides of the cul-de-sac at the southeast end of Nevada Street. The property consists of a gentle, southeast sloping vacant lot with steep bluff slopes along the east side of the property that descend to the track bed for the railroad right-of-way below.

Existing Land Cover Includes (select all that apply):

☐Vegetative Cover

☒Non-Vegetated Pervious Areas

☐Impervious Areas

Description / Additional Information:

Observations from a field reconnaissance on July 28, 2015 indicated that the project site has exposed bedrock materials (where not concealed by vegetation coverage) in the east perimeter slope. The remaining site is covered with sparse vegetation throughout. Observations also did not indicate the presence of natural hydrologic features.

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

☐NRCS Type A

☐NRCS Type B

☐NRCS Type C

☒NRCS Type D

The site soil quality is predominately "undefined" with regions of Type-A soil by NRCS Web Soil Survey. However, based on the Infiltration Feasibility Condition prepared by Geotechnical Exploration, Inc. "Infiltration Feasibility Condition, Proposed Breeze Luxury Townhome Project", the entire site is regarded as belonging to Type-D due to the low infiltration rate characteristics. No contaminated or hazardous soil was located within the project area, and no evidence of scouring or excessive erosion resulting from concentrated runoff was in evidence at the site.

Approximate Depth to Groundwater:

☐Groundwater Depth < 5 feet

☐5 feet < Groundwater Depth < 10 feet

☐10 feet < Groundwater Depth < 20 feet

☒Groundwater Depth > 20 feet

Per the geotechnical report by Geotechnical Exploration, Inc., groundwater was not encountered within depths of 20 feet.

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) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? If so, describe]:

The site is located on the north and south sides of the cul-de-sac at the southeast end of Nevada Street. The property consists of a gentle, southeast sloping vacant lot with steep bluff slopes along the east site of the property that descend to the track bed for the railroad right-of-way below. The property is bordered on the north by Oceanside Boulevard, on the south by existing residential properties, on the west by similar multi-family residential properties slightly higher in elevation, and on the east by south-easterly descending slopes that abut the railroad right-of-way at their base.

The project site drains to one (1) Points of Compliance, POC-1 located near the southeast corner of the project site. POC-1 collects runoff from two separate drainage basins, Basin A and Basin B.

Basin A
Existing site drainage is accompanied by sheet flow to the southeast. Runoff from the existing residential developments to the west of Nevada Street is directed to the curb and gutter on Nevada Street. Existing curb outlets at the south end of Nevada Street direct flow to the gentle sloping vacant lot, where runoff travels southeast and over the steep bluff slopes. There appears to be a potential for offsite run-on from street flows to sheet flow across the westerly portion of the property adjacent to South Ditmar Street and Godfrey Street. A concrete brow ditch along the railroad right-of-way collects runoff and directs flow south to an existing Type F catch basin where the flow is then conveyed easterly below the North County Transit District (NCTD) railroad tracks to an existing concrete lined channel where it confluences with runoff from Basin B at POC 1.

Basin B
Runoff from the existing residential developments located east of Nevada Street sheet flows east and into the vacant lot. Runoff then travels over the steep bluff slopes and into a brow ditch along the railroad right-of-way. The brow ditch directs flow north adjacent to the railroad tracks and into an existing Type F catch basin where the flow is then conveyed easterly below the NCTD railroad tracks to an existing concrete lined channel. Flow then is conveyed in the existing concrete lined channel approximately 850 feet southwesterly where it confluences with runoff from Basin A at POC 1.

Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The project proposes the development of 34 two and three-story, multi-unit townhome buildings and associated improvements accessed at the intersection of Ditmar Street and Godfrey Street. Among the storm water improvements will be the installation of an 18-inch HDPE storm drain system, concrete brow ditches, modular wetlands for pollutant control, and underground storm water vaults for hydromodificaiton and flow detention.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): The proposed impervious features of the project will include the development of 34 two and three-story, multi-unit townhome buildings and associated improvements. The structures are to be constructed in level graded pads accessed at the intersection of Ditmar Street and Godfrey Street. See the DMA Exhibit for the location of the proposed buildings.
List/describe proposed pervious features of the project (e.g., landscape areas): The proposed pervious features of the project will include the landscape areas surrounding the proposed buildings. The buildings will also include movable planter boxes on the ground level. Movable planter boxes do not function as impervious area dispersion areas.
Does the project include grading and changes to site topography? ☒Yes ☐No Description / Additional Information: Project grading will occur on approximately 2.13 acres of the project site. Proposed grading has been minimized as much as possible and avoids steep slope areas. This maintains existing slope and drainage patterns to the fullest extent possible. Post-development site flow will mimic existing conditions, and will discharge from the site at below historical flow rates (see Hydrology and Hydraulic Report for discussion and calculations). Impervious surfaces have been minimized where feasible. Due to minimized grading and steep slope areas, the eastern portion of the project site remains undisturbed.

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

☒Yes

☐No

Description / Additional Information:

The project proposes the development of 34 two and three-story, multi-unit townhome buildings and associated improvements. The structures are to be constructed in level graded pads accessed at the intersection of Ditmar Street and Godfrey Street. Among the storm water improvements will be the installation of a curb inlets, a catch basins, storm drain conveyance systems. Developed onsite runoff will be drained to three (3) separate onsite underground storm water vaults for hydromodification and flow detention (the type of underground stormwater detention vault will be manufactured by StormTrap® or equivalent product), then drained to three (3) separate Modular Wetlands Systems (MWS) for pollutant control. Developed off-site runoff will be intercepted and conveyed in a storm drain through the project. Vegetated dispersion BMPs will be used to treat some of this off-site runoff where feasible. The 2.66 acre project site will be approximately 61% impervious post-development.

Stormwater runoff from the proposed project site is routed to one (1) Points of Compliance, POC-1 located near the southeast corner of the project site. POC-1 collects runoff from two separate drainage basins, Basin A and Basin B. Both conveyances confluence in the concrete channel south of NCTD railroad right-of-way below the project. The proposed drainage pattern mimics the existing drainage pattern with regard to overall area and discharge points.

The project will be split into two (2) Drainage Management Areas (DMA) draining to the BMPs: DMA 1 and DMA 2. DMA 1 will be comprised primarily of the majority of the project, including Units 1 – 29 and will be directed into two (2) separate detention vaults. A modified Type A-4 Clean Out with two (2) orifices will distribute flows toward each detention vault (39% toward BMP 1A and 61% to BMP 1B). The size of the orifices are a function of the size of each basin divided by the area of the two basins combined. See the Hydrology Report for junction box details and flow calculations. Once flows are routed via the proposed orifices, the flows are then conveyed via storm drain pipes to the receiving detention vaults, BMP 1A and BMP 1B for treatment and detention. DMA 2 will encompass Units 30-34. Flows are conveyed via storm drain pipes to the receiving detention vault BMP 2 for treatment and detention. Storm water runoff from the impervious roof and road areas will intercepted by catch basins in the street, and conveyed via a storm drain system to the underground detention vaults. The detention vault will store runoff from the site and release it at a controlled rate for hydromodification, pollutant control, and detention to reduce the proposed 100-year flows to existing 100-year flow levels. A MWS will be located downstream of each underground vault to treat the pollutants from the site. Treated water from DMA-1A and DMA-1B will be conveyed via storm drain pipe and discharged at the existing Type F catch basin in the southeast corner of the project site at POC-1. Treated water from MWS-2 will be conveyed via 18"-dia HDPE storm drain pipe and discharged at the existing Type F catch basin in the northeast corner of the project site. Both conveyances from the Basin A and Basin B confluence in the concrete channel south of NCTD railroad right-of-way below the project.

Off-site run-on from four (4) separate upstream areas; OS-3 - the existing residential developments located east of Nevada Street, OS-1 - Nevada Street cul-de-sac (including new improvements), OS-2 - the existing residential developments west of Nevada Street, and OS-4 – the south east corner of South Ditmar Street and Godfrey Street will bypass the project site storm water treatment facilities and confluence with the proposed storm drain

facilities prior to discharging to POC-1. Runoff from Nevada Street cul-de-sac (OS-1) will be intercepted by a curb inlet. The curb inlet will have a low flow orifice to divert the estimated flow generated from new impervious to a Modular Wetland System (MWS) located onsite to treat the pollutants. The treated flows will then confluence with the off-site flows to bypass the project site storm water facilities downstream.

Runoff from the undisturbed bluff in the eastern portion of the project DMA 1B will sheet flow over the bluffs and into the existing and proposed brow ditches to POC-1. The undisturbed bluff areas will bypass the underground storage vaults and will not require storm water treatment.

The potential for runoff from minor street widening of Godfrey Street and South Ditmar Street to run-on to the site will be mitigated by a concrete cross gutter constructed along Godfrey Street. Runoff from the minor widening of Godfrey Street will flow to a proposed vegetated dispersion area located on the south side of Godfrey Street at South Ditmar Street. The vegetated dispersion area has been designed as a site design BMP to slow runoff discharges and reduce volumes through infiltration. The dispersion area will also include soil amendments to improve vegetation support, infiltration capacity and enhance treatment of routed flows. The relatively flat slope of the dispersion area will facilitate sheet flows to mimic existing drainage conditions.

The underground BMPs such as the detention vaults will require access for a vacuum truck to remove materials. The proprietary BMPs such as the MWS's may also require access for a vactor truck to remove of media cartridges or other internal components. Access requirements for the detention vault and Modular Wetlands must be verified with the manufacturers. Please refer to Attachment 3 for full maintenance approach for the structural BMPs.

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

Form I-3B Page 6 of 10		
Identification of Receiving Water Pollutants of Concern		
Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): All storm water runoff will be routed to the existing Type F catch basins located adjacent to the railroad track. The Type F catch basins will discharge into a tributary of Loma Alta Creek (904.10) within the Carlsbad Hydrologic Unit (904). Loma Alta Creek flows to the Loma Alta Slough and the Pacific Ocean.		
List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs for the impaired water bodies:		
303(d) Impaired Water Body	**Pollutant(s)/Stressor(s)**	**TMDLs**
Loma Alta Creek 904.10	Benthic Community Effects Bifenthrin Selenium Toxicity	N/A
Loma Alta Slough 904.10	Eutrophic Indicator Bacteria	N/A

Form I-3B Page 7 of 10			
Identification of Project Site Pollutants* ***Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)**			
Identify pollutants expected from the project site based on all proposed use(s) of the site (see manual Appendix B.6):			
Pollutant	**Not Applicable to the Project Site**	**Expected 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		✓	✓

Note: Indicator Bacteria shall be addressed as a Pollutant of Concern (POC) for projects located in the Lower San Luis Hydrologic Area and for projects that discharge to the Pacific Ocean Shoreline within the boundaries of the City of Oceanside.

Note: Nutrients shall be addressed as a Pollutant of Concern (POC) for projects located in the Loma Alta Hydrologic Area.

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the manual)?

☒Yes, hydromodification management flow control structural BMPs required.

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

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

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

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

Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

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

☐Yes

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

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

☐6.2.1 Verification of GLUs Onsite

☐6.2.2 Downstream Systems Sensitivity to Coarse Sediment

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

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

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

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

☐Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 8 of the SWQMP.

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

Discussion / Additional Information:

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.

Three (3) HMP control structures outlet to one Points of Compliance, POC 1. The HMP control structure BMP 1A and BMP 1B outlets via storm drain pipe that flows directly to he concrete brow ditch flowing south along the railroad tracks. The HMP control structure BMP 2 outlets via storm drain pipe that flows directly to the concrete brow ditch flowing north along the railroad tracks.

All project flows confluence at POC-1. Discharges flow to Loma Alta Creek and Loma Alta Slough within the Carlsbad Watershed. The proposed drainage pattern mimics the existing drainage pattern with regard to overall area and discharge points.

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

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

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

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

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

If a geomorphic assessment has been performed, provide title, date, and preparer:
Erosion Susceptibility Analysis of Loma Alta Creek for Morse Street Apartments, February 2016, TRWE

Discussion / Additional Information: (optional)

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

The proposed on-site grading creates enclosed areas where runoff will gather. Storm drain features will be located in these low areas to convey runoff safely to the proposed underground storm water vaults. The storm drain system must be laid to self-cleansing gradient and must be situated to avoid other underground utilities.

Rainwater from roofs must be collected in roof gutters and drained by vertical pipes discharging at the proposed toward the proposed storm drain system. Roof gutters and downpipes are considered essential because they prevent roof runoff from falling from a height in concentrated sheets or streams, which can cause erosion close to the foundations of the buildings. The size of the gutters and downpipes is dependant of the area of roof to be drained, the slope of the gutter, and the intensity of the rainfall expected.

The existing steeply sloping bluffs in the eastern portion of the project strictly limits the proposed project grading. The steep bluff requires retaining walls to be built near the building footprints.

The proposed building footprints also limit the area for grading biofiltration basins for DMA-1 and DMA-2. Since the entire site is regarded as belonging to Type-D due to the low infiltration rate characteristics and generally not feasible for infiltration, the project will utilize proprietary biofiltration BMPs (BF-3). This will be accomplished in the underground storage vaults and MWS units. The MWS unit will be located downstream of the underground storage vault. Since there will be upstream storage/detention, the MWS is sized based on the required treatment volume: 1.5 times the DCV (see Worksheet B.5-1 in Attachment 1e). The underground storage vault has been sized to meet current Hydromodification Management Plan (HMP) 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.

A feasibility analysis was conducted for conventional structural BMPs along Nevada Street and Godfrey Street for the proposed offsite improvements. Per the City of Oceanside BMP Design Manual, offsite improvements that generate pollutants and excess runoff should be addressed with storm water management features. However at this time, the City of Oceanside does not allow structural BMPs for private development in the public ROW.

A feasibility analysis was then conducted to route offsite flows to onsite BMPs for treatment and hydromodification. However, since the offsite improvements are located downstream of a much larger tributary area, the resultant size of the BMPs make treatment and hydromodification infeasible.

Based on existing topography and challenges for the development, it has been determined that there are justifications for not providing full hydromodification compliance for the off-site Nevada Street and Godfrey Street improvements. Additionally, this will allow the street sections to have a more conventional design behind the curb and gutter system for pedestrian friendly access.

A vegetated dispersion area was also selected for water quality purposes for the street improvement along Godfrey Street. In existing conditions, runoff along Godfrey Street is carried in the curb and gutter system before sheet flowing across pervious area south of the street. The vegetated dispersion area is proposed along the south side of Godfrey Street to mimic existing drainage conditions, preserve existing natural features (such as large trees), reduce runoff velocities, and improve water retention and pollutant-removal capabilities.

Source Control BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-4

Project Identification

Project Name: Breeze Luxury Townhomes

Permit Application Number: P16-00004

Source Control BMPs

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

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the 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	Implemented?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: No outdoor materials storage areas proposed.			

Form I-4 Page 2 of 3			
Source Control Requirement	**Implemented?**		
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: No materials stored outdoors proposed.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-5 not implemented: No trash storage areas are proposed for this project.			

Form I-4 Page 3 of 3			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	**Implemented?**		
Onsite 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 area	☐ Yes	☐ No	☒ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle and equipment cleaning	☐ 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

Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.

An Operation and Maintenance (O&M) Plan will be provided to future occupants that will acknowledge the potential pollutant sources and provide educational materials to prevent illicit discharges to the storm drain system. The following will discuss how source control requirements will be applied to the project:

• Storm drain inlets and catch basins will be labeled with "No Dumping Drains to Waterways". See DMA Exhibit for structural BMP label.

• Pest-resistant or well-adapted plant varieties such as drought tolerant and/or native plants will be planted in landscape areas. Integrated Pest Management (IPM) educational materials will be distributed to future occupants as a component of the O&M Plan that address physical pest elimination techniques such as relying on natural enemies to consume pests, weeding, pruning, and etc.

• Irrigation systems will be designed for the specific water requirements of each landscape area. Landscaping will be designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. Flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines will be used. Water conservation educational materials will also be provided for future occupants as a component of the O&M Plan.

• Provide a means to drain fire sprinkler test water to the sanitary sewer.

• Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.

• Plazas, sidewalks, and parking lots must be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing must be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser must be collected and discharged to the sanitary sewer and not discharged to a storm drain.

Site Design BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-5

Project Identification

Project Name: Breeze Luxury Townhomes

Permit Application Number: P16-00004

Site Design BMPs

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

Answer each category below pursuant to the following.

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

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-1 not implemented: Observations from a field reconnaissance on July 28, 2015 indicated that there are no natural hydrologic features onsite.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐ No	☒ N/A
Discussion / justification if SD-2 not implemented: Natural areas located in the eastern portion of the project will be preserved. See DMA Exhibit for location of undisturbed areas. Soil disturbance is minimized where feasible.			
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented: Project will incorporate multi-story buildings. The ground floor will include landscape planter boxes to disconnect impervious areas.			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented: Soil compaction will be minimized in natural landscape areas.			

Form I-5 Page 2 of 2			
Site Design Requirement	**Applied?**		
SD-5 Impervious Area Dispersion	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-5 not implemented: Landscape areas are too small to effectively receive and infiltrate, and retain runoff from impervious onsite areas and movable planter boxes no not function as impervious area dispersion areas. A vegetated dispersion area is proposed for water quality purposes for the street improvement along Godfrey Street. The dispersion area is designed to mimic existing drainage conditions, preserve existing natural features (such as large trees), reduce runoff velocities, and improve water retention and pollutant-removal capabilities.			
SD-6 Runoff Collection	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-6 not implemented: Retention practices (permeable pavers/concrete) for this site are not conducive to providing ponding free areas adjacent to buildings, street improvements with wet/dry utilities.			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented: Native or drought tolerant species will be planted within landscaped areas such as planters within the project site.			
SD-8 Harvesting and Using Precipitation	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented: No rain-water harvesting strategies proposed. Harvest and use is not considered to be infeasible per Form I-7.			

Summary of PDP Structural BMPs	Form I-6 (PDPs)
Project Identification	
Project Name: Breeze Luxury Townhomes	
Permit Application Number: P16-00004	
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative to certify construction of the structural BMPs (see Section 1.12 of the manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the 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 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.

For the purpose of this SWQMP, the proposed site condition has been divided into (2) Drainage Management Areas: (2) DMAs Draining to Proprietary Biofiltration BMPs, (6) Self-Mitigating DMAs, (1) godfrey DMA, and (1) De Minimis DMA. The DMAs have been delineated based on onsite drainage patters and BMP locations. Proprietary Biofiltration BMPs (BF-3) were chosen as the structural BMP for DMAs draining to IMPs.

The types of structural BMPs chosen for the project was based on the flow chart presented in Figures 5-1 and 5-2 of the City of Oceanside BMP Design Manual (BMP DM) in the following order.

DMA 1

- DMA 1 was evaluated to exclude self-mitigating (SM), de minimis (DMIN) and self-retaining (SR) areas from the DCV calculations.

  Self-mitigating DMAs are natural or landscaping areas that drain directly off-site. SM-1 is identified as the portion of undeveloped bluffs below the project grading and landscaped slopes on the easterly edge of the proposed driveway. SM-2 is the landscaped yard behind Unit 1. SM-3 is the landscaped yard behind Unit 2.

  De Minimis DMAs are areas that are very small, and therefore are not considered to be significant contributors of pollutants, and are considered by the owner and the City Engineer not practicable to drain to a BMP. There are no de minimis areas associated with DMA 1.

  Self-retaining DMAs are areas that are designed with site design BMPs to retain runoff to a level equivalent to pervious land. There are no self-retaining areas proposed for DMA 1.

- Harvest and Use BMPS. Using Form I-7 to gauge the feasibility of capture and use techniques for the project site, it was determined that harvest and use BMPs are considered infeasible.

- Based on recommendations by the Geotechnical Exploration, Inc. in the Form I-8, infiltration is not feasible for on-site. Based on site geologic conditions and impermeable surface material, it has been determined that infiltration of any appreciable amount into onsite soils is not recommended.

- Biofiltration BMPS (BF-1) of any size including alternative compact sizing BF-1 BMPs are not considered feasible due site constraints that prevent locating such BMPs adjacent to very steep bluffs affecting the integrity of the slopes. For this reason proprietary biofiltration BMPs (BF-3) were selected for pollutant control and flow control. The MWS was selected for the BF-3 system for pollutant control and the StormTrap® vault system for flow control.

- Runoff from proposed offsite street improvements (added or replaced impervious areas) in the Nevada Street cul-de-sac will be treated with a BF-3 MWS for pollutant control. A proposed curb inlet will intercept the total runoff from the upstream drainage basin that includes existing single family residential development, multi-family dwelling buildings and street runoff. Since the offsite runoff is commingling with the added or replaced impervious, an internal bypass will be constructed within proposed curb inlet in Nevada Street. The bypass in the curb inlet will direct runoff from the added or replaced impervious areas to an onsite MWS to provide pollutant control treatment. The treated flows will then confluence with remaining flows from the curb inlet and will be conveyed by a storm drain system through the project and confluence with the storm drain system conveying onsite flows. Green street infrastructure (tree wells or impervious area dispersion) is not feasible due to the limited parkway width of 5 feet that is being used for a concrete sidewalk for pedestrian use. .

- The potential for runoff from minor street widening of Godfrey Street and South Ditmar Street to runon to the site will be mitigated by a concrete cross gutter constructed along Godfrey Street. Runoff from the minor widening of Godfrey Street will flow to a proposed vegetated dispersion area (self-retaining area that is designed with site design BMPs to retain runoff to a level equivalent to pervious land) located on the south side of Godfrey Street at South Ditmar Street. The vegetated dispersion area has been designed as a site design BMP (SR-1) to slow runoff discharges and reduce volumes through infiltration. The dispersion area will also include soil amendments to improve vegetation support, infiltration capacity and enhance treatment of routed flows. The relatively flat slope of the dispersion area will facilitate sheet flows to mimic existing drainage conditions.

DMA 2

- DMA 2 was evaluated to exclude self-mitigating (SM), de minimis (DMIN) and self-retaining (SR) areas from the DCV calculations.

  Self-mitigating DMAs are natural or landscaping areas that drain directly off-site. SM-4 is identified as the portion of undeveloped bluffs below the project grading and decomposed granite path below Unit 34.

  De Minimis DMAs are areas that are very small, and therefore are not considered to be significant contributors of pollutants, and are considered by the owner and the City Engineer not practicable to drain to a BMP. DMIN1 is not feasible to drain to the MWS for pollutant control. The area includes 657 square feet significantly bigger than the suggested 250 square feet in the BMP Design Manual, but less than 2 percent of the total added or replaced impervious surface of the project. The De Minimis area is located at the northerly end of the proposed driveway along Oceanside Boulevard. The De Minimis Area is approximately 10 feet wide and 65 feet long and includes areas of the proposed driveway apron in Oceanside Boulevard. Intercepting upstream runoff from Oceanside Boulevard that comingles with the new impervious area driveway apron is not practicable. Alternatives to place street trees to treat the runoff are not practicable due to the sidewalk being contiguous to the street curb and based on recommendations by the Geotechnical Exploration, Inc. in the Form I-8 no infiltration is feasible for on-site.

Self-retaining DMAs are areas that are designed with site design BMPs to retain runoff to a level equivalent to pervious land. There are no self-retaining areas proposed for DMA 2.

- Harvest and Use BMPS. Using Form I-7 to gauge the feasibility of capture and use techniques for the project site, it was determined that harvest and use BMPs are considered infeasible.

- Based on recommendations by the Geotechnical Exploration, Inc. in the Form I-8 no infiltration is feasible for on-site. Based on site geologic conditions and impermeable surface material, it has been determined that infiltration of any appreciable amount into onsite soils is not recommended.

- Biofiltration BMPS (BF-1) of any size including alternative compact sizing BF-1 BMPs are not considered feasible due site constraints that prevent locating such BMPs adjacent to very steep bluffs affecting the integrity of the slopes. For this reason proprietary biofiltration BMPs (BF-3) were selected for pollutant control and flow control. The Modular Wetlands Systems (MWS) was selected for the BF-3 system for pollutant control and the StormTrap® vault system for flow control.

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

The proposed building footprints and parking lot design limits the area for grading onsite biofiltration basins. Since the soil type is generally not feasible for infiltration, developed onsite runoff will be drained to proprietary biofiltration basins (BF-3) after flows are detained in underground detention facilities (Hydromodification BMPs). The type of proprietary biofiltration BMPs will be Modular Wetlands Systems (MWS) by Modular Wetlands.

Due to other site constraints identified in Form I-3B Page 10, a proprietary biofiltration basin (Modular Wetland Systems) was selected for stormwater pollutant control compliance for the street improvement along Nevada Street. A vegetated dispersion area was also incorporated as a site design BMP for the street improvement along Godfrey Street.

Runoff from the developed project site has been divided into (2) DMAs draining to three (3) BMPs. DMA-1 will be comprised primarily of the Westerly Townhome buildings draining to BMP-1A and BMP-1B. DMA-2 will be comprised primarily of the Easterly Townhome buildings draining to BMP-2. Both BMP-1A and BMP-1B consists of the underground stormwater detention vault and the downstream MWS-1A and MWS-1B. BMP-2 consists of the underground stormwater detention vault and the downstream MWS-2. For the purpose of this report, the designation BMP-1A and BMP 1B refers to the combined detention and treatment system for DMA-1.

Three (3) HMP-BMP underground detention facilities are located within the project site and are responsible for handling hydromodification requirements for POC-1 and POC-2. The underground vault for BMP-1A will have a total depth of 9.00 feet. The underground vault for BMP-1B will have a total depth of 8.50 feet. The underground vault for BMP-2 will have a total depth of 6.25 feet. The volume required to flow to the MWS for pollutant control treatment is called the water quality (WQ) volume, and is based on pollutant treatment performance standards described in the project's SWQMP. The remaining volume in the underground detention facility is for hydromodification (hydromod) storage. For the purpose of this report, each BMP will include the water quality volume, WQ, and the remaining hydromod portion, HMP. See the table blow.

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-1	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

The remaining hydromodification volume is proposed for hydromodification conformance and flood control for the project's POCs. The dimensions required for HMP conformance is based on the SWMM model that was undertaken for the project. HMP conformance is discussed within the Hydromodification Management Plan prepared by BHA for this project (see Attachment 8).

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

The underground detention vaults will be installed below proposed grades. The approximate volumes of the underground detention vaults is 3,411 cubic feet for BMP-1A, 5,228 cubic feet for BMP-1B and 1,169 cubic feet for BMP-2.

Storm water will enter the water quality portion of the vault through an inflow pipe. Flows will discharge from the water quality tank via a low flow orifice outlet to the downstream Modular Wetland System (MWS). The underground detention vaults (BMP-1A, BMP-1B and BMP-2) were modeled using the rain barrel LID module within SWMM. The rain barrel module can model the underdrain with orifice plate and vault storage pond up to the elevation of the required Design Capture Volume (DCV) for the Proprietary Biofiltration System in the vault structure. Ponding above the required DCV is modeled as a detention basin: elevation vs. area, and elevation vs. discharge tables, are needed by SWMM for Modified Puls routing purposes. Detailed outlet structure location and elevations should be shown on the construction plans based on the recommendations of this study.

The required drawdown time for the water quality volume and hydromodification volume is based on pollutant control and HMP requirements, and is detailed in Section B.5.2 and Section 6.3.7 of the City of Oceanside BMP Design Manual. The standard drawdown time for the water quality volume is 36 hours when treating 1.5 times the DCV. See table below for summary of dimensions for HMP-BMPS.

BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[3] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of undergound HMP vault; tied with maximum 36 hour drawdown time.

Three (3) Proprietary Biofiltration BMPs are located downstream of the underground detention facilities and are responsible for handling water quality requirements for POC-1. The type of Proprietary Biofiltration BMPs are Modular Wetland Systems (MWS).

Since there is upstream detention storage, the Modular Wetlands System can be sized based on the required pollutant control treatment volume. The required treatment volume is 1.5 times the DCV, per Appendix F.2.2 of the City of Oceanside BMP Design Manual. The required pollutant control treatment volume is approximately 1,536 cubic feet for DMA-1A, 2,403 cubic feet for DMA-1B and 608 for DMA-2. The type of

MWS selected for BMP-1A will be a MWS-L-4-6V-UG. The type of MWS selected for BMP-1B will be a MWS-L-4-8-V-UG. The type of MWS selected for BMP-2 be a MWS-L-4-4V-UG. See Attachment 2 for MWS design and drawdown calculations.

A fourth Proprietary Biofiltration BMP is located at the eastern end of Nevada Street and is responsible forhandling water quality requirements for the minor street widening and street improvement. The type of Proprietary Biofiltration BMP is also a Modular Wetland System (MWS). The proprietary biofiltration BMP will be designed as a flow-based BMP and the required treatment volume is 1.5 times the DCV, per Appendix F.2.2 of the City of Oceanside BMP Design Manual. The type of MWS selected for DMA-3 will be a MWS-L-4-6-V-UG. Peak flows that exceed the required treatment flows will be bypassed internally within the MWS and discharged directly to the storm drain system.

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

The benefit of the MWS is that one unit can be installed below grade of the proposed surface and downstream of the underground storage vault used for hydromodification and detention storage. The MWS units will also be configured as a vault, and will accept flows directly into the pre-treatment chamber. This end-of-the-line installation ensures that all drainage will be treated by the biofiltration system for maximum feasibility. The MWS is a pre-engineered biofiltration system composed of a pre-treatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofilter chamber containing a sorptive media mix, and a discharge chamber containing an orifice control structure. Treated water flows horizontally in series through the pre-treatment chamber cartridges, biofiltration chamber and orifice control structure. Discharges are conveyed via storm drain pipe to the existing storm water conveyance system.

See Attachment 2 for a cross section of the underground detention vaults and Modular Wetland System for BMP-1A, BMP-1B, BMP-2 and BMP-OS-1-T.

Form I-6 Page 5 of 8	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. BMP-1A	
Construction Plan Sheet No. 5	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☒Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Ronald Holloway RCE 29271 5115 Avenida Encinas, Suite "L" Carlsbad, CA 92008 (760) 931-8700
Who will be the final owner of this BMP?	Oceanside-Nevada, LP
Who will maintain this BMP into perpetuity?	Oceanside-Nevada, LP
What is the funding mechanism for maintenance?	Funding will be provided by Oceanside-Nevada, LP

Form I-6 Page 5 of 8	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. BMP 1B	
Construction Plan Sheet No. 5	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☒Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Ronald Holloway RCE 29271 5115 Avenida Encinas, Suite "L" Carlsbad, CA 92008 (760) 931-8700
Who will be the final owner of this BMP?	Oceanside-Nevada, LP
Who will maintain this BMP into perpetuity?	Oceanside-Nevada, LP
What is the funding mechanism for maintenance?	Funding will be provided by Oceanside-Nevada, LP

Form I-6 Page 6 of 8	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. BMP-2	
Construction Plan Sheet No. 6	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☒Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Ronald Holloway RCE 29271 5115 Avenida Encinas, Suite "L" Carlsbad, CA 92008 (760) 931-8700
Who will be the final owner of this BMP?	Oceanside-Nevada, LP
Who will maintain this BMP into perpetuity?	Oceanside-Nevada, LP
What is the funding mechanism for maintenance?	Funding will be provided by Oceanside-Nevada, LP

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. BMP-OS-1-T

Construction Plan Sheet No. 5

Type of structural BMP:

☐Retention by harvest and use (HU-1)

☐Retention by infiltration basin (INF-1)

☐Retention by bioretention (INF-2)

☐Retention by permeable pavement (INF-3)

☐Partial retention by biofiltration with partial retention (PR-1)

☐Biofiltration (BF-1)

☐Biofiltration with Nutrient Sensitive Media Design (BF-2)

☒Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F

☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)

☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)

☒Detention pond or vault for hydromodification management

☐Other (describe in discussion section below)

Purpose:

☐Pollutant control only

☐Hydromodification control only

☒Combined pollutant control and hydromodification control

☐Pre-treatment/forebay for another structural BMP

☐Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Ronald Holloway RCE 29271 5115 Avenida Encinas, Suite "L" Carlsbad, CA 92008 (760) 931-8700
Who will be the final owner of this BMP?	Oceanside-Nevada, LP
Who will maintain this BMP into perpetuity?	Oceanside-Nevada, LP
What is the funding mechanism for maintenance?	Funding will be provided by Oceanside-Nevada, LP

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Discussion (as needed):

The underground stormwater detention vault will be used for hydromodification management for the project stormwater runoff. The MWS will be used for pollutant control and designed as a proprietary biofiltration BMP (i.e. constant treatment capacity with negligible storage volume). The underground stormwater detention vault and MWS unit in BMP-1A, BMP-1B and BMP-2 are grouped together in this report as BMP-1 and BMP-2. The MWS will be used for pollutantcontrol only for BMP-OS-T.

	City of Oceanside 300 N Coast Highway Oceanside, CA 92054	**Permanent BMP Construction** **Self Certification Form**	February 2016

Date Prepared:	Project No.: P16-00004
Project Applicant: Oceanside-Nevada, LP	Phone: (941) 587-0210
Project Address: P.O. Box 531 Rancho Santa Fe, CA 92067	
Project Engineer: Ronald Holloway	Phone: (760) 931-8700

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

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

ENGINEER'S CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. P16-0004; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 of the San Diego Regional Water Quality Control Board.

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

Signature: _____

Date of Signature: _ _ __

Printed Name: _ **Ronald Holloway** _____

Title: _ **Project Engineer** _____

Phone No. _ **(760) 931-8700** _____

Engineer's Stamp

CONTRACTOR'S CERTIFICATION:

As the professional in responsible charge for construction of the above project, I certify that all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. P16-0004; have been constructed in compliance with the approved plans and all applicable specifications, permits, and ordinances.

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

Signature: _____

Date of Signature: _ ___ __

Printed Name: _ **Howard Jacobs** _____

Title: _ **Director of Development** _____

Phone No. _ **(941) 587-0210** _____

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

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	Design Capture Volume Worksheet	☒Included
Attachment 1d	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 1e	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒Included ☐Not included because the entire project will use harvest and use BMPs
Attachment 1f	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒Included

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

The DMA Exhibit must identify:

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

DMA Exhibit

LEGEND

DMA NAME AREA (SQUARE FEET)	DMA–1 64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

PROJECT CHARACTERISTICS	
PARCEL AREA	2.66 ACRES
DISTURBED AREA	2.13 ACRES
PROPOSED IMPERVIOUS AREA	1.72 ACRES
PROPOSED PERVIOUS AREA	0.41 ACRES
SOIL TYPE	D
DEPTH TO GROUNDWATER	> 20 FEET

HYDROLOGIC UNIT CONTRIBUTION (WATERSHED)			
WATERSHED	HYDROLOGIC AREA	HYDROLOGIC SUB-AREA	DOWNSTREAM WATERBODIES
CARLSBAD	904.1 (LOMA ALTA)	904.1 (LOMA ALTA)	LOMA ALTA CREEK, LOMA ALTA SLOUGH, PACIFIC OCEAN SHORELINE

IMPAIRED WATER BODIES	
IMPAIRED WATERBODY	CONSTITUENTS OF CONCERN
LOMA ALTA CREEK	BENTHIC COMMUNITY EFFECTS, BIFENTHRIN, SELENIUM, TOXICITY
LOMA ALTA SLOUGH	EUTROPHIC, INDICATOR BACTERIA
PACIFIC OCEAN SHORELIINE, LOMA ALTA HSA, AT LOMA ALTA CREEK MOUTH	INDICATOR BACTERIA

LID AND SITE DESIGN:

SD-2 CONSERVE NATURAL AREAS, SOILS, AND VEGETATION
- CONSERVE NATURAL AREAS WITHIN THE PROJECT FOOTPRINT, INCLUDING
- EXISTING TREES, OTHER VEGETATION, AND SOILS

SD-3 MINIMIZE IMPERVIOUS AREA
- CONSTRUCT STREETS, SIDEWALKS OR PARKING LOTS AISLES TO THE MINIMUM WIDTHS NECESSARY, PROVIDED PUBLIC SAFETY IS NOT COMPROMISED
- MINIMIZE THE IMPERVIOUS FOOTPRINT OF THE PROJECT

SD-4 MINIMIZE SOIL COMPACTION
- MINIMIZE SOIL COMPACTION IN LANDSCAPED AREAS (SHOWN AS LANDSCAPE PLANTER/LANDSCAPING IN LEGEND ABOVE)

SD-5 IMPERVIOUS AREA DISPERSION
- DISCONNECT IMPERVIOUS SURFACES THROUGH DISTURBED PERVIOUS AREAS
- DESIGN AND CONSTRUCT LANDSCAPED OR OTHER PERVIOUS AREAS TO EFFECTIVELY RECEIVE AND INFILTRATE, RETAIN AND/OR TREAT RUNOFF FROM IMPERVIOUS AREAS PRIOR TO DISCHARGING TO THE MS4.

SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES (SHOWN AS LANDSCAPE PLANTER/LANDSCAPING IN LEGEND ABOVE)

SOURCE CONTROL BMPS:

SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- PROJECT MUST EFFECTIVELY ELIMINATE DISCHARGES OF NON-STORM WATER TO THE MS4

SC-2 STORM DRAIN SIGNAGE
- PLACE SIGNAGE ADJACENT TO INLETS

SC-6 ADDITIONAL BMPS BASED ON POTENTIAL RUNOFF POLLUTANTS:

A ON-SITE/OFF-SITE STORM DRAIN INLETS
- PLACE SIGNAGE ADJACENT TO INLETS

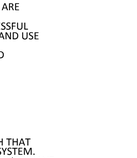
D1 NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL (NOT SHOWN)
- PROVIDE INTEGRATED PEST CONTROL MANAGEMENT INFORMATION TO OWNERS, RENTERS AND OPERATORS

D2 LANDSCAPE/OUTDOOR PESTICIDE USE (SHOWN AS LANDSCAPE PLANTER/LANDSCAPING IN LEGEND ABOVE)
- PRESERVE EXISTING DROUGHT TOLERANT TREES, SHRUBS, AND GROUND COVER TO THE MAXIMUM EXTENT POSSIBLE.
- DESIGN LANDSCAPING TO MINIMIZE IRRIGATION AND RUNOFF, TO PROMOTE SURFACE INFILTRATION WHERE APPROPRIATE, AND TO MINIMIZE THE USE OF FERTILIZERS AND PESTICIDES THAT CAN CONTRIBUTE TO STORM WATER POLLUTION.
- WHERE LANDSCAPED AREAS ARE USED TO RETAIN OR DETAIN STORM WATER, SPECIFY PLANTS THAT ARE
- TOLERANT OF PERIODIC SATURATED SOIL CONDITIONS.
- CONSIDER USING PEST-RESISTANT PLANTS, ESPECIALLY ADJACENT TO HARDSCAPE.TO ENSURE SUCCESSFUL ESTABLISHMENT, SELECT PLANTS APPROPRIATE TO SITE SOILS, SLOPES,CLIMATE, SUN, WIND, RAIN, LAND USE
- MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES.
- PROVIDE INTEGRATED PEST CONTROL MANAGEMENT INFORMATION TO NEW OWNERS, LESSEES AND OPERATORS.

N FIRE SPRINKLER TEST WATER (NOT SHOWN)
- PROVIDE A MEANS TO DRAIN FIRE SPRINKLER TEST WATER TO THE SANITARY SEWER.

O MISCELLANEOUS DRAIN OR WASH WATER (NOT SHOWN)
- CONDENSATE DRAIN LINES MAY DISCHARGE TO LANDSCAPED AREAS IF THE FLOW IS SMALL ENOUGH THAT RUNOFF WILL NOT OCCUR. CONDENSATE DRAIN LINES MAY NOT DISCHARGE TO THE STORM DRAIN SYSTEM.
- ROOFTOP MOUNTED EQUIPMENT WITH POTENTIAL TO PRODUCE POLLUTANTS MUST BE ROOFED AND/OR HAVE SECONDARY CONTAINMENT.
- ANY DRAINAGE SUMPS ONSITE MUST FEATURE A SEDIMENT SUMP TO REDUCE THE QUANTITY OF SEDIMENT IN PUMPED WATER.
- AVOID ROOFING, GUTTERS, AND TRIM MADE OF COPPER OR OTHER UNPROTECTED METALS THAT MAY LEACH INTO RUNOFF.

P PLAZAS, SIDEWALKS, AND PARKING LOTS (NOT SHOWN)
- PLAZAS, SIDEWALKS, AND PARKING LOTS MUST BE SWEPT REGULARLY TO PREVENT THE ACCUMULATION OF LITTER AND DEBRIS.



SIGNAGE DETAIL
NOT TO SCALE

SELF–MITIGATING DMAS:

VEGETATION IN THE NATURAL OR LANDSCAPE AREA IS NATIVE OR NON-NATIVE DROUGHT TOLERANT SPECIES.

SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.

INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.

IMPERVIOUS AREAS CALCULATED 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 POLLUTION CONTROL BMPS.

SELF–RETAINING DMAS:

SELF-RETAINING DMAS ARE AREAS DESIGNED WITH SITE DESIGN BMPS TO RETAIN RUNOFF TO A LEVEL EQUIVALENT TO PERVIOUS LAND.

SITE DESIGN BMPS SUCH AS IMPERVIOUS AREA DISPERSION AND PERMEABLE PAVEMENT MAY BE USED INDIVIDUALLY OR IN COMBINATION TO REDUCE OR ELIMINATE RUNOFF FROM A PORTION OF THE PDP.

IF A SITE DESIGN BMP IS USED TO CREATE A SELF-RETAINING DMA, THEN THE SITE DESIGN BMPS MUCH BE DESIGNED AND IMPLEMENTED PER THE CRITERIA IN THE APPLICABLE FACT SHEET. THE FACT SHEET CRITERIA FOR IMPERVIOUS ARE DISPERSION FOR MEETING POLLUTANT CONTROL REQUIREMENT DEVELOPED USING CONTINUOUS SIMULATION IS SUMMARIZED BELOW:

- SD-5 IMPERVIOUS AREA DISPERSION: A DMA IS CONSIDERED SELF-RETAINING IF THE IMPERVIOUS TO PERVIOUS RATIO IS 2:1 WHEN THE PERVIOUS AREA IS COMPOSED OF HYDROLOGIC SOIL GROUP A.

DE MINIMIS DMAS:

AREAS THAT ARE VERY SMALL, AND THEREFORE ARE NOT CONSIDERED TO BE SIGNIFICANT CONTRIBUTORS OF POLLUTANTS, AND ARE CONSIDERED NOT PRACTICAL TO DRAIN TO A BMP.

AREAS ABUT THE PERIMETER OF THE DEVELOPMENT SITE.

TOPOGRAPHY AND LAND OWNERSHIP CONSTRAINTS MAKE BMP CONSTRUCTION TO REASONABLY CAPTURE RUNOFF TECHNICALLY INFEASIBLE.

EACH DMA SHOULD BE LESS THAN 250 SQUARE FEET AND THE SUM OF ALL DE MINIMIS DMAS SHOULD REPRESENT LESS THAN 2 PERCENT OF THE TOTAL ADDED OR REPLACED IMPERVIOUS SURFACE OF THE PROJECT.

CRITICAL COARSE SEDIMENT YIELD AREAS:

PRIORITY DEVELOPMENT PROJECTS (PDPS) MUST SATISFY CRITICAL COURSE SEDIMENT YIELD AREA (CCSYA) REQUIREMENTS AS ADDRESSED IN APPENDIX H OF THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL.

REGIONAL-LEVEL MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS WAS PREPARED USING REGIONAL DATA SETS INCLUDED IN THE "SAN DIEGO COUNTY REGIONAL WMAA".

PDPS ARE REQUIRED TO CHECK THE MAP INCLUDED IN THE WMAA FOR THE WATERSHED IN WHICH THE PROJECT RESIDES TO DETERMINE IF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS EXIST WITHIN THE PROJECT DRAINAGE BOUNDARIES.

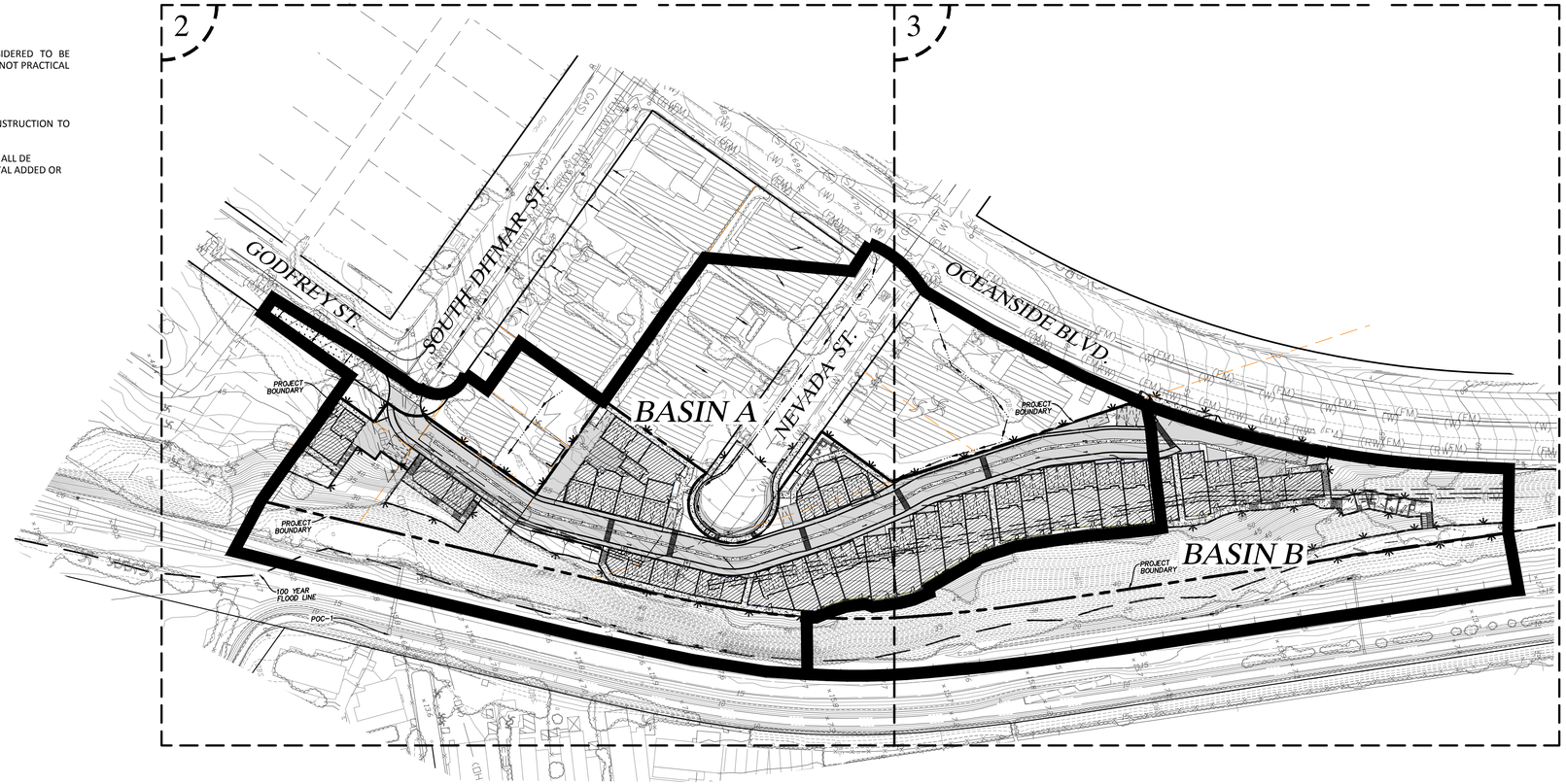
ACCORDING TO THE REGIONAL WMAA, NO PCCSYAS EXIST WITHIN THE PROJECT DRAINAGE BOUNDARIES. THEREFORE THE PROJECT IS (A) ENTIRELY EXEMPT/NOT SUBJECT TO RPO REQUIREMENTS WITHOUT UTILIZATION OF RPO EXEMPTIONS AND (B) AS THERE ARE NO AREAS UPSTREAM OF THE PROJECT TO PROTECT, THEN THE PROJECT IS NOT REQUIRED TO AVOID ONSITE CCSYAS AS NONE WERE IDENTIFIED (IN OTHER WORDS, NO AREAS IDENTIFIED ON THE DMA EXHIBIT ARE PCCSYAS THAT BECOME NON-CCSYAS.

REFER TO THE SWQMP FOR BREEZE LUXURY APARTMENTS BY BHA, INC. FOR CCSYA EXEMPTION METHODOLOGY.

SUMMARY OF DMAS:

DMA ID	DMA Surface Type	DMA Area (sq. ft.)	DMA Type	Proposed Structural BMP Type	Structural BMP ID	Total Detention Vault Volume (ft^3)	MWS Treatment Capacity / Volume (ft^3)/FLOW (cfs)
DMA-1A [1]	Roof, Dwy, Landscape	39,698	Drains to BMP	Detention Vault + MWS	BMP-1A	3,411	2,279
DMA-1B [2]	Roof, Dwy, Landscape	21,866	Drains to BMP	Detention Vault + MWS	BMP-1B	5,228	3,198
DMA-2	Street, Sidewalk, Ldsp	10,998	Drains to BMP	Detention Vault + MWS	BMP-2	1,169	1,139
SM-1	Street, Sidewalk, Ldsp	1,293	Self-Mitigating	-	-	-	-
SM-2	Street, Sidewalk, Ldsp	1,532	Self-Mitigating	-	-	-	-
SM-3	Street, Sidewalk, Ldsp	1,107	Self-Mitigating	-	-	-	-
SM-4	Street, Sidewalk, Ldsp	32,993	Self-Mitigating	-	-	-	-
SM-5	DG, Ldsp	12,256	Self-Mitigating	-	-	-	-
SM-6	Landscape	46,628	Self-Mitigating	-	-	-	-
OS-1-T	Street, Sidewalk, Ldsp	2,357	Drains to BMP	MWS	BMP-OS-T	-	0.076
DMIN-1	Street	657	De Minimis	-	-	-	-
SR-1	Street, Sidewalk, Ldsp	1,759	Self-Retaining	-	-	-	-

NOTES
1) 24,017 SF OF 39,698 SF OF DMA IS TREATED IN BMP 1A. 15,681 SF BYPASSES TO BMP 1B .
2) 15,681 SF BYPASSES TO BMP 1A. TOTAL TREATED BY BMP 1B IS 37,547 SF.



SHEET INDEX

60' 30' 0' 60' 120' 180'
SCALE: 1" = 60'

KEY MAP

REGISTERED PROFESSIONAL ENGINEER — RONALD L. HOLLOWAY NO. 29271 — CIVIL — STATE OF CALIFORNIA

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DRAINAGE MANAGEMENT AREA EXHIBIT BREEZE (LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA

SHEET 1 OF 4

LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	64,710 SF
SELF-MITIGATING DMA	SM-1
DE MINIMIS DMA	DMIN-1
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

20' 10' 0' 20' 40' 60'

SCALE: 1" = 20'

REGISTERED PROFESSIONAL ENGINEER
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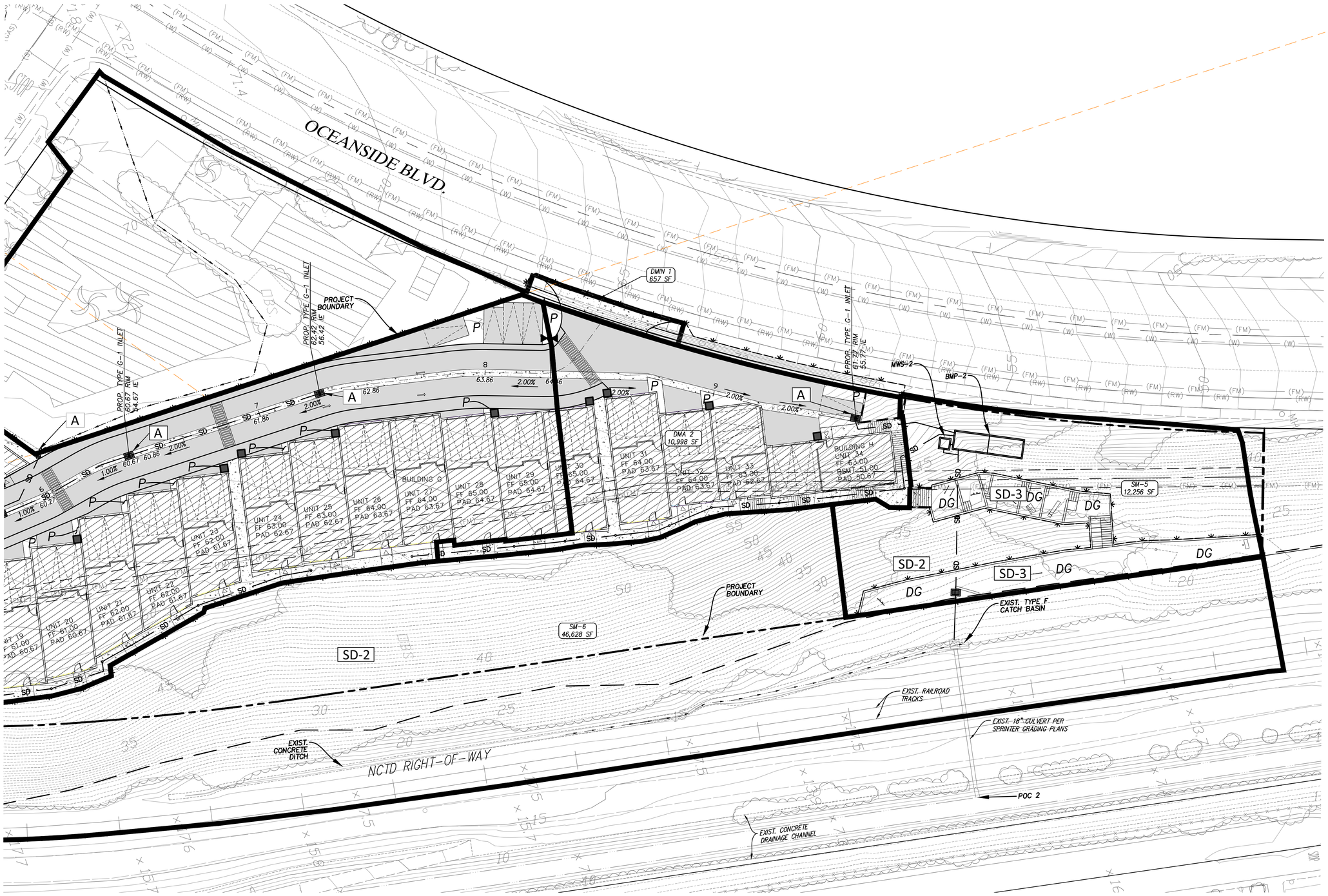
SEE SHEET 2



LEGEND

DMA NAME	DMA–1
AREA (SQUARE FEET)	64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

20' 10' 0' 20' 40' 60'

SCALE: 1" = 20'

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DRAINAGE MANAGEMENT AREA EXHIBIT BREEZE (LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA

HYDROMODIFICATION & TREATMENT CONTROL BMPS

DEVELOPED CONDITIONS

STORMWATER RUNOFF FROM THE PROPOSED PROJECT SITE IS ROUTED TO ONE (1) POINTS OF COMPLIANCE, POC-1 LOCATED NEAR THE SOUTHEAST CORNER OF THE PROJECT SITE. POC-1 COLLECTS RUNOFF FROM TWO SEPARATE DRAINAGE BASINS, BASIN A AND BASIN B. BOTH CONVEYANCES CONFLUENCE IN THE CONCRETE CHANNEL SOUTH OF NCTD RAILROAD RIGHT-OF-WAY BELOW THE PROJECT .

PRIOR TO DISCHARGING FROM THE PROJECT SITE, DEVELOPED ON-SITE RUNOFF (DMA-1 & DMA-2) IS DRAINED TO TWO (2) ONSITE RECEIVING UNDERGROUND DETENTION FACILITIES (HYDROMODIFICATION-BMPS OR HMP-BMPS) BEFORE FLOWS ARE TREATED IN MODULAR WETLAND SYSTEMS (PROPRIETARY BIOFILTRATION BMPS) FOR WATER QUALITY PURPOSES.

DEVELOPED OFF-SITE RUNOFF (OS-1) IS DRAINED TO ONE (1) MODULAR WETLAND SYSTEM (PROPRIETARY BIOFILTRATION BMP) FOR WATER QUALITY PURPOSES.

THE EXISTING SLOPES ALONG THE EASTERN PROJECT BOUNDARY (SM-1, SM-2, SM-3-, SM-4, SM-5 & SM-6) ARE UNABLE TO DRAIN TO THE RECEIVING UNDERGROUND DETENTION FACILITIES AND PROPRIETARY BIOFILTRATION BMPS AND BYPASS THESE FACILITIES, DRAINING DIRECTLY TO POC-1.

A PORTION OF THE OFFSITE PROPOSED STREET IMPROVEMENTS ALONG GODFREY STREET (SR-1) ARE UNABLE TO DRAIN TO POC-1. UPSTREAM OFF-SITE AREAS BYPASS THE UNDERGROUND DETENTION FACILITIES AND BIOFILTRATION BMP AND DRAIN DIRECTLY TO POC-1.

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
1	DMA-1A	0.55	95.9%
	DMA-1B	0.86	95.9%
	DMA-2	0.25	94.5%
	SM-1	0.04	10.1%
	SM-2	0.03	41.1%
	SM-3	0.04	10.1%
	SM-4	0.03	0.0%
	SM-5	0.76	0.0%
	SM-6	1.07	0.0%
	OS-1	0.89	61.3%
	OS-2	0.23	54.5%
	OS-3	0.47	56.4%
	OS-4	0.03	0.0%

RUNOFF FROM THE DEVELOPED PROJECT SITE HAS BEEN DIVIDED INTO (2) DMAS DRAINING TO THREE (3) BMPS. DMA-1 WILL BE COMPRISED PRIMARILY OF THE WESTERLY TOWNHOME BUILDINGS DRAINING TO BMP-1A AND BMP-1B. DMA-2 WILL BE COMPRISED PRIMARILY OF THE EASTERLY TOWNHOME BUILDINGS DRAINING TO BMP-2. BOTH BMP-1A AND BMP-1B CONSISTS OF THE UNDERGROUND STORMWATER DETENTION VAULT AND THE DOWNSTREAM MWS-1A AND MWS-1B. BMP-2 CONSISTS OF THE UNDERGROUND STORMWATER DETENTION VAULT AND THE DOWNSTREAM MWS-2. FOR THE PURPOSE OF THIS REPORT, THE DESIGNATION BMP-1A AND BMP 1B REFERS TO THE COMBINED DETENTION AND TREATMENT SYSTEM FOR DMA-1.

THREE (3) HMP-BMP UNDERGROUND DETENTION FACILITIES ARE LOCATED WITHIN THE PROJECT SITE AND ARE RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR POC-1. THE UNDERGROUND VAULT FOR BMP-1A WILL HAVE A TOTAL DEPTH OF 9.00 FEET. THE UNDERGROUND VAULT FOR BMP-1B WILL HAVE A TOTAL DEPTH OF 8.50 FEET. THE UNDERGROUND VAULT FOR BMP-2 WILL HAVE A TOTAL DEPTH OF 6.25 FEET. THE VOLUME REQUIRED TO FLOW TO THE MWS FOR POLLUTANT CONTROL TREATMENT IS CALLED THE WATER QUALITY (WQ) VOLUME, AND IS BASED ON POLLUTANT TREATMENT PERFORMANCE STANDARDS DESCRIBED IN THE PROJECT'S SWQMP. THE REMAINING VOLUME IN THE UNDERGROUND DETENTION FACILITY IS FOR HYDROMODIFICATION (HYDROMOD) STORAGE. FOR THE PURPOSE OF THIS REPORT, EACH BMP WILL INCLUDE THE WATER QUALITY VOLUME, WQ, AND THE REMAINING HYDROMOD PORTION, HMP.

THE REMAINING HYDROMODIFICATION VOLUME IS PROPOSED FOR HYDROMODIFICATION CONFORMANCE AND FLOOD CONTROL FOR THE PROJECT'S POCS. THE DIMENSIONS REQUIRED FOR HMP CONFORMANCE IS BASED ON THE SWMM MODEL THAT WAS UNDERTAKEN FOR THE PROJECT. HMP CONFORMANCE IS DISCUSSED WITHIN THE HYDROMODIFICATION MANAGEMENT PLAN PREPARED BY BHA FOR THIS PROJECT (SEE ATTACHMENT 8).

STORM WATER WILL ENTER THE WATER QUALITY PORTION OF THE VAULT THROUGH AN INFLOW PIPE. FLOWS WILL DISCHARGE FROM THE WATER QUALITY TANK VIA A LOW FLOW ORIFICE OUTLET TO THE DOWNSTREAM MODULAR WETLAND SYSTEM (MWS). THE UNDERGROUND DETENTION VAULTS (BMP-1A, BMP-1B AND BMP-2) WERE MODELED USING THE RAIN BARREL LID MODULE WITHIN SWMM. THE RAIN BARREL MODULE CAN MODEL THE UNDERDRAIN WITH ORIFICE PLATE AND VAULT STORAGE POND UP TO THE ELEVATION OF THE REQUIRED DESIGN CAPTURE VOLUME (DCV) FOR THE PROPRIETARY BIOFILTRATION SYSTEM IN THE VAULT STRUCTURE. PONDING ABOVE THE REQUIRED DCV IS MODELED AS A DETENTION BASIN: ELEVATION VS. AREA, AND ELEVATION VS. DISCHARGE TABLES, ARE NEEDED BY SWMM FOR MODIFIED PULS ROUTING PURPOSES. DETAILED OUTLET STRUCTURE LOCATION AND ELEVATIONS SHOULD BE SHOWN ON THE CONSTRUCTION PLANS BASED ON THE RECOMMENDATIONS OF THIS STUDY.

THREE (3) PROPRIETARY BIOFILTRATION BMPS ARE LOCATED DOWNSTREAM OF THE UNDERGROUND DETENTION FACILITIES AND ARE RESPONSIBLE FOR HANDLING WATER QUALITY REQUIREMENTS FOR POC-1. THE TYPE OF PROPRIETARY BIOFILTRATION BMPS ARE MODULAR WETLAND SYSTEMS (MWS).

SINCE THERE IS UPSTREAM DETENTION STORAGE, THE MODULAR WETLANDS SYSTEM CAN BE SIZED BASED ON THE REQUIRED POLLUTANT CONTROL TREATMENT VOLUME. THE REQUIRED TREATMENT VOLUME IS 1.5 TIMES THE DCV, PER APPENDIX F.2.2 OF THE CITY OF OCEANSIDE BMP DESIGN MANUAL. THE REQUIRED POLLUTANT CONTROL TREATMENT VOLUME IS APPROXIMATELY 1,536 CUBIC FEET FOR DMA-1A, 2,403 CUBIC FEET FOR DMA-1B AND 608 FOR DMA-2. THE TYPE OF MWS SELECTED FOR BMP-1A WILL BE A MWS-L-4-6V-UG. THE TYPE OF MWS SELECTED FOR BMP-1B WILL BE A MWS-L-4-8-V-UG. THE TYPE OF MWS SELECTED FOR BMP-2 BE A MWS-L-4-4V-UG. SEE ATTACHMENT 2 FOR MWS DESIGN AND DRAWDOWN CALCULATIONS.

A FOURTH PROPRIETARY BIOFILTRATION BMP IS LOCATED AT THE EASTERN END OF NEVADA STREET AND IS RESPONSIBLE FOR HANDLING WATER QUALITY REQUIREMENTS FOR THE MINOR STREET WIDENING AND STREET IMPROVEMENT. THE TYPE OF PROPRIETARY BIOFILTRATION BMP IS ALSO A MODULAR WETLAND SYSTEM (MWS). THE PROPRIETARY BIOFILTRATION BMP WILL BE DESIGNED AS A FLOW-BASED BMP AND THE REQUIRED TREATMENT VOLUME IS 1.5 TIMES THE DCV, PER APPENDIX F.2.2 OF THE CITY OF OCEANSIDE BMP DESIGN MANUAL. THE TYPE OF MWS SELECTED FOR DMA-3 WILL BE A MWS-L-4-6-V-UG. PEAK FLOWS THAT EXCEED THE REQUIRED TREATMENT FLOWS WILL BE BYPASSED INTERNALLY WITHIN THE MWS AND DISCHARGED DIRECTLY TO THE STORM DRAIN SYSTEM.

THE BENEFIT OF THE MWS IS THAT ONE UNIT CAN BE INSTALLED BELOW GRADE OF THE PROPOSED SURFACE AND DOWNSTREAM OF THE UNDERGROUND STORAGE VAULT USED FOR HYDROMODIFICATION AND DETENTION STORAGE. THE MWS UNITS WILL ALSO BE CONFIGURED AS A VAULT, AND WILL ACCEPT FLOWS DIRECTLY INTO THE PRE-TREATMENT CHAMBER. THIS END-OF-THE-LINE INSTALLATION ENSURES THAT ALL DRAINAGE WILL BE TREATED BY THE BIOFILTRATION SYSTEM FOR MAXIMUM FEASIBILITY. THE MWS IS A PRE-ENGINEERED BIOFILTRATION SYSTEM COMPOSED OF A PRE-TREATMENT CHAMBER CONTAINING FILTRATION CARTRIDGES, A HORIZONTAL FLOW BIOFILTRATION CHAMBER WITH A PERIPHERAL VOID AREA AND A CENTRALIZED AND VERTICALLY EXTENDING UNDERDRAIN, THE BIOFILTER CHAMBER CONTAINING A SORPTIVE MEDIA MIX, AND A DISCHARGE CHAMBER CONTAINING AN ORIFICE CONTROL STRUCTURE. TREATED WATER FLOWS HORIZONTALLY IN SERIES THROUGH THE PRE-TREATMENT CHAMBER CARTRIDGES, BIOFILTRATION CHAMBER AND ORIFICE CONTROL STRUCTURE. DISCHARGES ARE CONVEYED VIA STORM DRAIN PIPE TO THE EXISTING STORM WATER CONVEYANCE SYSTEM.

BMP MODELING FOR WATER QUALITY PURPOSES

MODELING OF DUAL PURPOSE WATER QUALITY/HMP BMPS

TWO (2) BMPS ARE PROPOSED FOR INTEGRATED HYDROMODIFICATION AND WATER QUALITY TREATMENT FOR THE PROJECT SITE. TABLE 2 ILLUSTRATES THE DIMENSIONS REQUIRED FOR HMP COMPLIANCE FOR THE PROPOSED UNDERGROUND DETENTION BASINS, BMP-1A, BMP1B AND BMP-2. TABLE 3 ILLUSTRATES THE DIMENSIONS REQUIRED FOR POLLUTANT CONTROL COMPLIANCE FOR THE PROPOSED MODULAR WETLANDS.

TABLE 2 - SUMMARY OF UNDERGROUND DETENTION BASINS, HMP-BMPs:

BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[5] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of undergound HMP vault; tied with maximum 36 hour drawdown time.

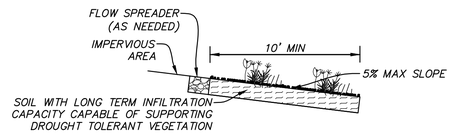
TABLE 3 - SUMMARY OF TREATMENT CONTROL BMPS:

BMP	Tributary Area[1] (Ac)	DIMENSIONS		
		Volume Provided[2] (ft^3)	Treatment Flow Provided[3] (cfs)	Model Number
MWS-1A	0.55	1,024	0.018	MWS-L-4-6-V-UG
MWS-1B	0.86	1,602	0.025	MWS-L-4-8-V-UG
MWS-2	0.86	703	0.005	MWS-L-4-4-V-UG
MWS-OS-1-T	0.05	-	0.013	MWS-L-4-6-V-UG

Notes: (1): IMP Areas are included in the overall DMA.

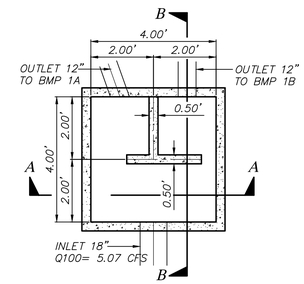
(2): For volume-based BMPs

(3): For flow-based BMPs

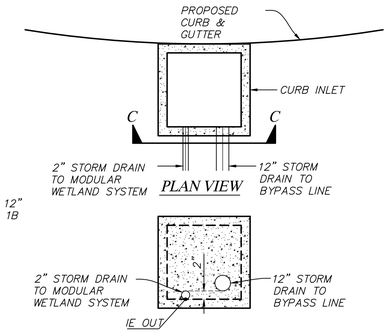


IMPERVIOUS AREA DISPERSION DETAIL

SITE DESIGN BMP SD-5, NOT TO SCALE



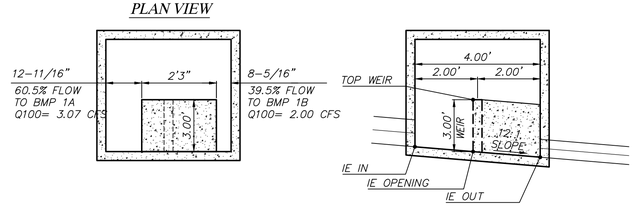
PLAN VIEW



SECTION C-C

PROPOSED CURB INLET

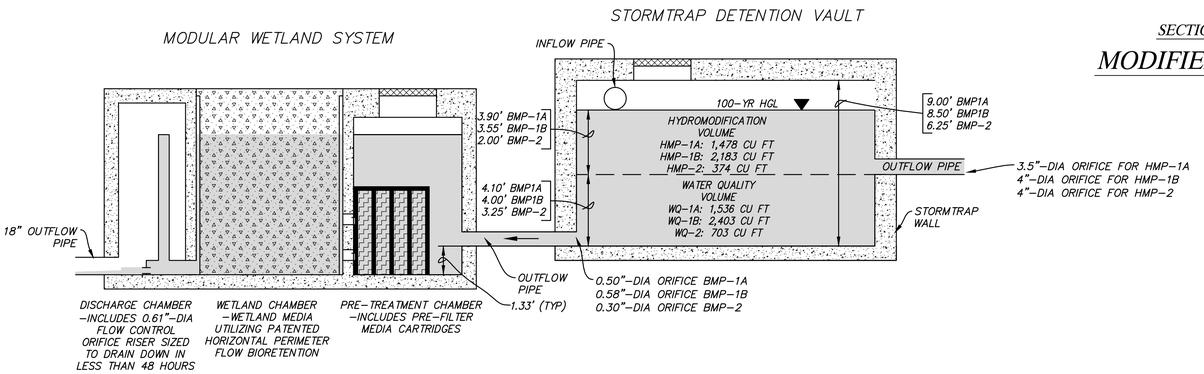
NEVADA STREET CUL-DE-SAC
NOT TO SCALE



SECTION A-A SECTION B-B

MODIFIED TYPE A-4 CLEAN OUT DETAIL

NOT TO SCALE



DETENTION VAULT & MWS DETAILS

NOT TO SCALE

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-2	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

REGISTERED PROFESSIONAL ENGINEER RONALD L HOLLOWAY NO. 29271 CIVIL STATE OF CALIFORNIA

bha, inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

DRAINAGE MANAGEMENT AREA EXHIBIT
BREEZE
(LUXURY TOWNHOMES)
CITY OF OCEANSIDE, CALIFORNIA

DMA Surface Tabulation to Determine DCV		DMA Name – DMA 1A
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
R1	Roof/Concrete/Asphalt	38,083
	Total Impervious Area (ft^2)	38,083
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L1	Landscape	1,615
	Total Pervious Area (ft^2)	1,615
	Total DMA (A)	39,698
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	95.9%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.87
	85th Percentile Rainfall (I)	0.59
	Design Capture Volume (DVC) = (C)(I)(A) / 12	1,693

OF THE 1,693 DCV, ONLY 1024 DCV (60.5%) IS ENTERING BMP 1A

DCV BYPASSING BMP 1A = 1693-1024 = 669 DCV (39.5%)

Sizing of Volume-Based Biofiltration BMP - MWS-1A		Per Appendix F.2.2 BMP DM		
1	DCV (60.5%) of Total DCV From DMA 1A	DCV	1,024	cubic-feet
2	Design Volume for Biofiltration System = DCV x 1.5	Volume =	1,536	cubic-feet
Provided Modular Wetland System (MWS)		MWS-L-4-4-V-UG		
3	Treatment Capacity	Volume =	5,036	cubic-feet
4	Drawdown Time	t =	36	hrs

DMA Surface Tabulation to Determine DCV		DMA Name – DMA 1B
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
R1	Roof/Concrete/Asphalt	20,997
	Total Impervious Area (ft^2)	20,997
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L1	Landscape	869
	Total Pervious Area (ft^2)	869
	Total DMA (A)	21,866
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	96.0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.87
	85th Percentile Rainfall (I)	0.59
	Design Capture Volume (DVC) = (C)(I)(A) / 12	933

ADD BYPASS FROM DMA 1A = 669 DCV (39.5%) THAT ENTERS BMP 1B
TOTAL DCV =993 + 669 = 1602 DCV

Sizing of Volume-Based Biofiltration BMP - MWS-1B		Per Appendix F.2.2 BMP DM		
1	DCV Including Bypass DCV From DMA 1A	DCV	1,602	cubic-feet
2	Design Volume for Biofiltration System = DCV x 1.5	Volume =	2,403	cubic-feet
Provided Modular Wetland System (MWS)		MWS-L-4-4-V-UG		
3	Treatment Capacity	Volume =	5,036	cubic-feet
4	Drawdown Time	t =	36	hrs

DMA Surface Tabulation to Determine DCV		DMA Name – DMA 2
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
R2	Roof/Concrete/Asphalt	10,395
	Total Impervious Area (ft^2)	10,395
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L2	Landscape	603
	Total Pervious Area (ft^2)	603
	Total DMA (A)	10,998
	Total Impervious Area (ft^2) /Total DMA (ft^2) = Percent Impervious	95%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.87
	85th Percentile Rainfall (I)	0.59
	Design Capture Volume (DVC) = (C)(I)(A) /12	469

DMA Surface Tabulation to Determine DCV		SM-1
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	532
	Total Impervious Area (ft^2)	532
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape	761
	Total Pervious Area (ft^2)	761
	Total DMA (A)	1,293
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	41%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.43
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		SM-2
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	154
	Total Impervious Area (ft^2)	154
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape	1,378
	Total Pervious Area (ft^2)	1,378
	Total DMA (A)	1,532
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	10%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.18
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		SM-3
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	0
	Total Impervious Area (ft^2)	0
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape	1,107
	Total Pervious Area (ft^2)	1,107
	Total DMA (A)	1,107
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.10
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		SM-4
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	0
	Total Impervious Area (ft^2)	0
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	32,993
	Total Pervious Area (ft^2)	32,993
	Total DMA (A)	32,993
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.10
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		SM-5
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	0
	Total Impervious Area (ft^2)	0
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	12,256
	Total Pervious Area (ft^2)	12,256
	Total DMA (A)	12,256
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.10
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		SM-6
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	0
	Total Impervious Area (ft^2)	0
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	46,628
	Total Pervious Area (ft^2)	46,628
	Total DMA (A)	46,628
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.10
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		OS-1
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	23,776
	Total Impervious Area (ft^2)	23,776
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	15,019
	Total Pervious Area (ft^2)	15,019
	Total DMA (A)	38,795
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	61%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.59
	85th Percentile Rainfall (I)	0.59

New Impervious Area Requiring Pollutant Treatment DMA Surface Tabulation to Determine DCV		OS-1-T
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	2,038
	Total Impervious Area (ft^2)	2,038
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	319
	Total Pervious Area (ft^2)	
	Total DMA (A)	2,357
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	86%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.78
	Percentile Rainfall (I)	0.2
	Design Capture Volume (DVC) = (C)(I)(A) / 12	31

DMA Surface Tabulation to Determine DCV		OS-2
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	5,516
	Total Impervious Area (ft^2)	5,516
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	4,605
	Total Pervious Area (ft^2)	4,605
	Total DMA (A)	10,121
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	55%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.54
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		OS-3
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	11,451
	Total Impervious Area (ft^2)	11,451
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	8,853
	Total Pervious Area (ft^2)	8,853
	Total DMA (A)	20,304
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	56%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.55
	85th Percentile Rainfall (I)	0.59

DMA Surface Tabulation to Determine DCV		OS-4
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
AC2	Roof/Concrete/Asphalt	0
	Total Impervious Area (ft^2)	0
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L4	Landscape/DG	1,381
	Total Pervious Area (ft^2)	1,381
	Total DMA (A)	1,381
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	0%
	Soil Type	D
	Area Weighted Runoff Factor (per Appendix B.1.1 and B.2.1)	0.10
	85th Percentile Rainfall (I)	0.59

Tabulation of De Minimis DMA - DMIN-1		
Surface Name	**Surface Type**	**Area (ft^2)**
DMIN-1	Asphalt	657
	Subtotal De Minimis Areas	657
Comment: Small portion of proposed pavement along Godfrey Street as part of the street improvement is unable to flow to the proposed vegetated swale, BMP-3, due to the crown of the street. Runoff from this area will mimic existing drainage patterns. This area is considered a De Minimis DMA per Chapter 5 Section 5.2.2 of the City of Oceanside BMP Design Manual.		

Total Project DMA Tabulation			
DMA Classification	**Quantity**	**Subtotal DMA (ft^2)**	**Subtotal DMA (acres)**
Self-Mitigating DMAs	6	95,809	2.20
Self-Retaining DMAs	1	1,759	0.04
Surfaces Draining to Self-Retaining DMAs	0	0	0
Bioretention IMPs	0	0	0
Flow Through Planter IMPs	0	0	0
Infiltration IMP	0	0	0
Conventional Vegetated Swale	0	0	0
Extended (Dry) Detention Basins	0	0	0
Media (Sand) Filter	0	0	0
Wet Pond	0	0	0
Constructed Wetland	0	0	0
DMAs Draining to Proprietary Vault/Tree Well	4	74,919	1.72
Proprietary Inlet Filter	0	0	0
Off-Site DMAs Bypassing Site	4	69,220	1.59
De Minimis DMAs	1	657	0.02
Total Project DMA	12	242,364	3.97
Total Parcel Area		115,747	2.66

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.59	inches
2	Area tributary to BMP (s)	A=	1.67	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3,112	cubic-feet

Harvest and Use Feasibility Checklist	Form I-7

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

☒ Toilet and urinal flushing

☒ Landscape irrigation

☐ Other:_____

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

Landscape Irrigation

Modified ETWU = ETo_{Wet} x [[∑(PF x HA)/IE] + SLA] x 0.015

Using the total landscape area within DMA-1A, DMA-1B, DMA-2, SM-1 for SM-1 for Hydrozone Area (HA) and Low Plant Water Use (per Table B.3-2);

PF = 0.5

HA = 5224,

Modified ETWU = 2.8 x [[(0.5 x 5,224] + 0] x 0.015

Modified ETWU= 110 cf

Toilet and Urinal Flushing

Assumptions:

Use residential land use type

Total number residential units = 34

Total use per resident = 9.3

Average residents per unit = 3.5

Toilet water usage = 34 x 9.3 x 3.5 = 1,107 gallons = 1,107 gallons x 0.133681 cf/gal = 148 cf

Total demand = 49 + 148 = 197 cf

3. Calculate the DCV using worksheet B-2.1.

DCV = 3,521 (cubic feet)

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

Categorization of Infiltration Feasibility Condition		Form I-8	
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: Based on review of our "Report of Geotechnical Investigation Update" for the subject site, our geologic reconnaissance and site observations, review of the geologic map for the area of the subject site, and review of the USDA Web Soil Survey, as well as our past experience with materials similar to those encountered at the site, it is our professional opinion that the colluvial soils and very dense formational materials do not allow for the design of full or partial storm water infiltration BMPs and infiltration is not considered feasible on the subject site. Our conclusions are based on the existing colluvial soils encountered on the site with a medium expansion potential, very dense bedrock materials encountered at a reletively shallow depth, proposed basement and site retaining walls proposed along the southeastern portion of the site in the direction of on-site drainage, and existing natural and cut slopes. In addition, the laboratory test results indicate that the on-site colluvial soils are clay, which prohibit the vertical migration of water through the soils, and exhibit medium expansive soil characteristics. Please refer to our "Report of Geotechnical Investigation Update" dated September 28, 2018 and our "Infiltration Feasibility Condition" letter dated January 15, 2019 for details of the comprehensive evaluation and investigation conducted and maps representative of the study. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

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

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

Form I-8 Page 3 of 4

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

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

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

Provide basis:

Based on review of our "Report of Geotechnical Investigation Update" for the subject site, our geologic reconnaissance and site observations, review of the geologic map for the area of the subject site, and review of the USDA Web Soil Survey, as well as our past experience with materials similar to those encountered at the site, it is our professional opinion that the colluvial soils and very dense formational materials do not allow for the design of full or partial storm water infiltration BMPs and infiltration is not considered feasible on the subject site. Our conclusions are based on the existing colluvial soils encountered on the site with a medium expansion potential, very dense bedrock materials encountered at a reletively shallow depth, proposed basement and site retaining walls proposed along the southeastern portion of the site in the direction of on-site drainage, and existing natural and cut slopes. In addition, the laboratory test results indicate that the on-site colluvial soils are clay, which prohibit the vertical migration of water through the soils, and exhibit medium expansive soil characteristics.
Please refer to our "Report of Geotechnical Investigation Update" dated September 28, 2018 and our "Infiltration Feasibility Condition" letter dated January 15, 2019 for details of the comprehensive evaluation and investigation conducted and maps representative of the study.

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

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

Provide basis:

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

Form I-8 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		

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

Factor of Safety and Design Infiltration Rate Worksheet				Form I-9	
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$					
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

Geotechnical Exploration, Inc.
SOIL AND FOUNDATION ENGINEERING ● GROUNDWATER ● ENGINEERING GEOLOGY

14 January 2019
(Revised 15 January 2019)

Oceanside-Nevada, LP
P.O. Box 531
Rancho Santa Fe, CA 92067
Attn: Mr. Howard Jacobs

Job No. 15-10805

Subject: **Infiltration Feasibility Condition**
Proposed Breeze Luxury Townhome Project
A.P.N. 152-121-06, 152-123-05 and 152-320-11
1200 Block of S. Nevada Street
Oceanside, California

Dear Mr. Jacobs:

In accordance with the request of your civil engineer, Mr. Bruce Rice with BHA Inc., we have prepared this letter regarding the infiltration feasibility conditions at the subject site. Our evaluation is based on review of our "*Report of Geotechnical Investigation Update*", dated September 28, 2018 for the subject site, our geologic reconnaissance and site observations, review of the geologic map for the area of the subject site, and review of the USDA Web Soil Survey, as well as our past experience with materials similar to those encountered at the site.

It is our understanding, based on review of the "Architectural Plans", prepared by Bob Abrams Architect, dated September 13, 2018, that the site will be developed with two-story and three-story over a basement residential townhomes and associated improvements. Based on review on the "*Preliminary Grading & Drainage Plan*", prepared by bha, Inc, the site is divided into two DMAs with three proprietary bio-filtration modular wetland systems proposed.

Since the time of our most recent geotechnical investigation conducted in 2016, the site remains relatively unchanged and no grading has occurred. The irregular, roughly arcuate-shaped site, consisting of approximately 2.24 acres, is located on the north and south sides of the cul-de-sac at the southeast end of Nevada Street. The property consists of a gentle, southeast sloping vacant lot with steep bluff slopes along the east side of the property that descend to the track bed for the NCTD railroad right-of-way below. The slope ranges in height from 35 to 52 feet at gradients ranging from 0.75:1.0 to 1.5:1.0 (horizontal to vertical). Near-vertical conditions

7420 TRADE STREET ● SAN DIEGO, CA. 92121 ● (858) 549-7222 ● FAX: (858) 549-1604 ● EMAIL: geotech@gei-sd.com

are locally present along some of the base-of-slope areas. The area of the proposed site development predominately covers the entire site.

We understand that grading for the new buildings will include cuts of approximately 14 feet or less with retaining walls up to 12 feet in height for the proposed basement levels of the townhomes along the south and southeast portions of the project. Based on our review of our previously noted report, the site is underlain by formational materials of the San Onofre Breccia (Tso). The encountered soil profile across the site consists of 2 to 4 feet of fill/topsoil/colluvium overlying the formational materials. In addition, the on-site colluvial soils are considered to possess a medium expansion potential.

Based on our review of available published information including the *"Geologic Map of the Oceanside 30' X 60' Quadrangle,"* by Michael P. Kennedy and Siang S. Tan (2008), the geologic materials underlying the site are referred to as *"San Onofre Breccia (Tso) (middle Miocence) – Marine sedimentary breccia, green, greenish gray, gray, brown, and white, massive-to well-bedded, well indurated breccia with interbedded conglomerate, sandstone, siltstone, and mudstone".* In our opinion, based on subsurface investigation, the very dense clayey gravel formational soils have poor infiltration rate characteristics.

Based on our review of the USDA Web Soil Survey and the USDA Soil Survey (1973) Map Sheet 22, the on-site soils on the southwestern portion of the site (approximately 30% of the proposed site development) are mapped as belonging to Hydrologic Group A, which indicates high infiltration rates. The on-site soils on the northern, eastern and southern portions of the site (approximately 70% of the proposed site development) are mapped as belonging to Hydrologic Group D, which indicates low infiltration rates. In our opinion, based on review of our geotechnical investigation report, we would regard the entire site as belonging to Hydrologic Soil Group D due to the low infiltration rate characteristics that are typical of colluvial and very dense bedrock materials that were encountered across the site. In addition, we did not encounter any soils on the site that exhibit high infiltration rate characteristics belonging to Hydrologic Soil Group A. (Refer to Appendix A for USDA Web Soil Survey Map).

Based on review of our *"Report of Geotechnical Investigation Update"* for the subject site, our geologic reconnaissance and site observations, review of the geologic map for the area of the subject site, and review of the USDA Web Soil Survey, as well as our past experience with materials similar to those encountered at the site, it is our professional opinion that the design of full or partial storm water infiltration BMPs are not considered feasible on the subject site. Our conclusions are based on the existing colluvial soils encountered on the site with a medium expansion potential, proposed

basement and site retaining walls proposed along the southeastern portion of the site in the direction of on-site drainage, and existing natural and cut slopes. In addition, the laboratory test results indicate that the on-site colluvial soils are clay, which prohibit the vertical migration of water through the soils, and exhibit medium expansive soil characteristics. As such, we recommend that all proposed proprietary bio-filtration modular wetland systems be completely enclosed and discharged to an approved drainage facility.

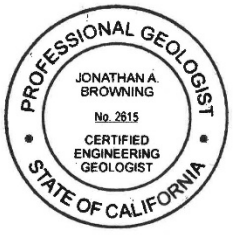
This opportunity to be of continued service is sincerely appreciated. If you have any questions concerning this matter, please contact our office. Reference to our **Job No. 15-10805** will help to expedite a response to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

Jaime A. Cerros, P.E.
R.C.E. 34422/G.E. 2007
Senior Geotechnical Engineer

Jonathan A. Browning
P.G. 9012/C.E.G. 2615
Senior Project Geologist



APPENDIX A

USDA WEB SOIL SURVEY


Hydrologic Soil Group—San Diego County Area, California
(Breeze Apartments)
117° 22' 2" W
117° 21' 52" W
33° 11' 10" N
33° 10' 59" N
465760
465800
465840
465880
465920
465960
466000
3671950
3671910
3671870
3671830
3671790
3671750
3671710
3671670
S Nevada St
Oceanside
Oceanside Blvd
S Ditmar St
Godfrey St
Beechwood Ln
Marwood Ln
TeF
Md
TuB
TuB
Soil Map may not be valid at this scale.
Map Scale: 1:1,630 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
1/10/2019
Page 1 of 4

Hydrologic Soil Group—San Diego County Area, California
(Breeze Apartments)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Md	Made land		0.9	42.6%
TeF	Terrace escarpments		0.6	28.4%
TuB	Tujunga sand, 0 to 5 percent slopes	A	0.6	29.0%
Totals for Area of Interest			**2.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA 1A	DMA 1B	DMA 2								unitless
	2	85th Percentile 24-hr Storm Depth	0.59	0.59	0.59								inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	23,040	36,040	10,395								sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)	0	0	0								sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	526	1,241	869								sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)	0	0	0								sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)	0	0	0								sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)	0	0	0								sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	0	0	0								sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	23,566	37,281	11,264	0	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.88	0.87	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.88	0.87	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	1,020	1,595	465	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.88	0.87	0.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	1,020	1,595	465	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.88	0.87	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	20,738	32,434	9,462	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	1,020	1,595	465	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

False

False

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	1	Drainage Basin ID or Name	DMA 1A	DMA 1B	DMA 2	-	-	-	-	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	0.000	-	-	-	-	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	1,020	1,595	465	-	-	-	-	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated								unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	Lined								unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain								unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard								unitless
	8	Provided Surface Area	379	615	187								sq-ft
	9	Provided Surface Ponding Depth	18	18	12								inches
	10	Provided Soil Media Thickness	18	18	18								inches
	11	Provided Gravel Thickness (Total Thickness)	12	12	12								inches
	12	Underdrain Offset	3	3	3								inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.50	0.58	0.30								inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.10	2.10	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.07	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	0	0	0	0	0	0	0	hours
	26	Efficacy of Retention Processes	0.08	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	86	135	39	0	0	0	0	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	934	1,460	426	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0127	0.0171	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	1.45	1.20	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	1.45	1.20	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	8.67	7.19	5.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	25.20	25.20	19.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	12	15	12	0	0	0	0	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	17	21	20	0	0	0	0	0	0	0	hours
	40	Total Depth Biofiltered	33.87	32.39	25.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	1,401	2,190	639	0	0	0	0	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	1,070	1,660	391	0	0	0	0	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	700	1,095	319	0	0	0	0	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	700	1,095	299	0	0	0	0	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	-	-	-	-	-	-	-	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Attention!

- BMPs sized at <3% of the effective tributary areas must be accompanied by Reduced Size BMP Maintenance calculations (see last tab).

False

False

Automated Worksheet B.4: Reduced Size BMP Maintenance Interval (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Drainage Basin Info	1	Drainage Basin ID or Name	DMA 1A	DMA 1B	DMA 2	-	-	-	-	-	-	-	unitless
	2	Final Effective Tributary Area	20,738	32,434	9,462	-	-	-	-	-	-	-	sq-ft
	3	Provided BMP Surface Area	379	615	187	-	-	-	-	-	-	-	sq-ft
Biofiltration Clogging Inputs	4	Average Annual Precipitation	11.0	11.0	11.0								inches
	5	Load to Clog (default =2.0)	2.0	2.0	2.0								lb/sq-ft
	6	TSS Pretreatment Efficacy	0.00	0.00	0.00								yes/no
	7	Percentage "Commercial"	0%	0%	0%								percentag
	8	Percentage "Education"	0%	0%	0%								percentag
	9	Percentage "Industrial"	0%	0%	0%								percentag
	10	Percentage "Low Traffic Areas"	0%	0%	0%								percentag
	11	Percentage "Multi-Family Residential"	100%	100%	100%								percentag
	12	Percentage "Roof Areas"	0%	0%	0%								percentag
	13	Percentage "Single Family Residential"	0%	0%	0%								percentag
	14	Percentage "Transportation"	0%	0%	0%								percentag
	15	Percentage "Vacant/Open Space"	0%	0%	0%								percentag
	16	Percentage "Steep Hillslopes"	0%	0%	0%								percentag
Result	17	Total Percentage of Above Land Uses	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%	percentag
	18	Average TSS Concentration for Tributary After Pretreatment	24	24	24	0	0	0	0	0	0	0	mg/L
	19	Average Annual Runoff Volume	19,010	29,731	8,674	0	0	0	0	0	0	0	cubic-feet
	20	Average Annual TSS Load	28	45	13	0	0	0	0	0	0	0	lb/yr
	21	Available Sediment Storage within BMP	758	1,230	374	0	0	0	0	0	0	0	lb
	22	Anticipated Major Maintenance Frequency	26.6	27.6	28.8	-	-	-	-	-	-	-	years

No Warning Messages

False

False

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	1. Hydromodification Management Exhibit (Required)	☒Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐6.2.1 Verification of Geomorphic Landscape Units Onsite ☐6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒Not performed ☐Included ☐Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☒Included ☐Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐Included ☒Not required because BMPs will drain in less than 96 hours

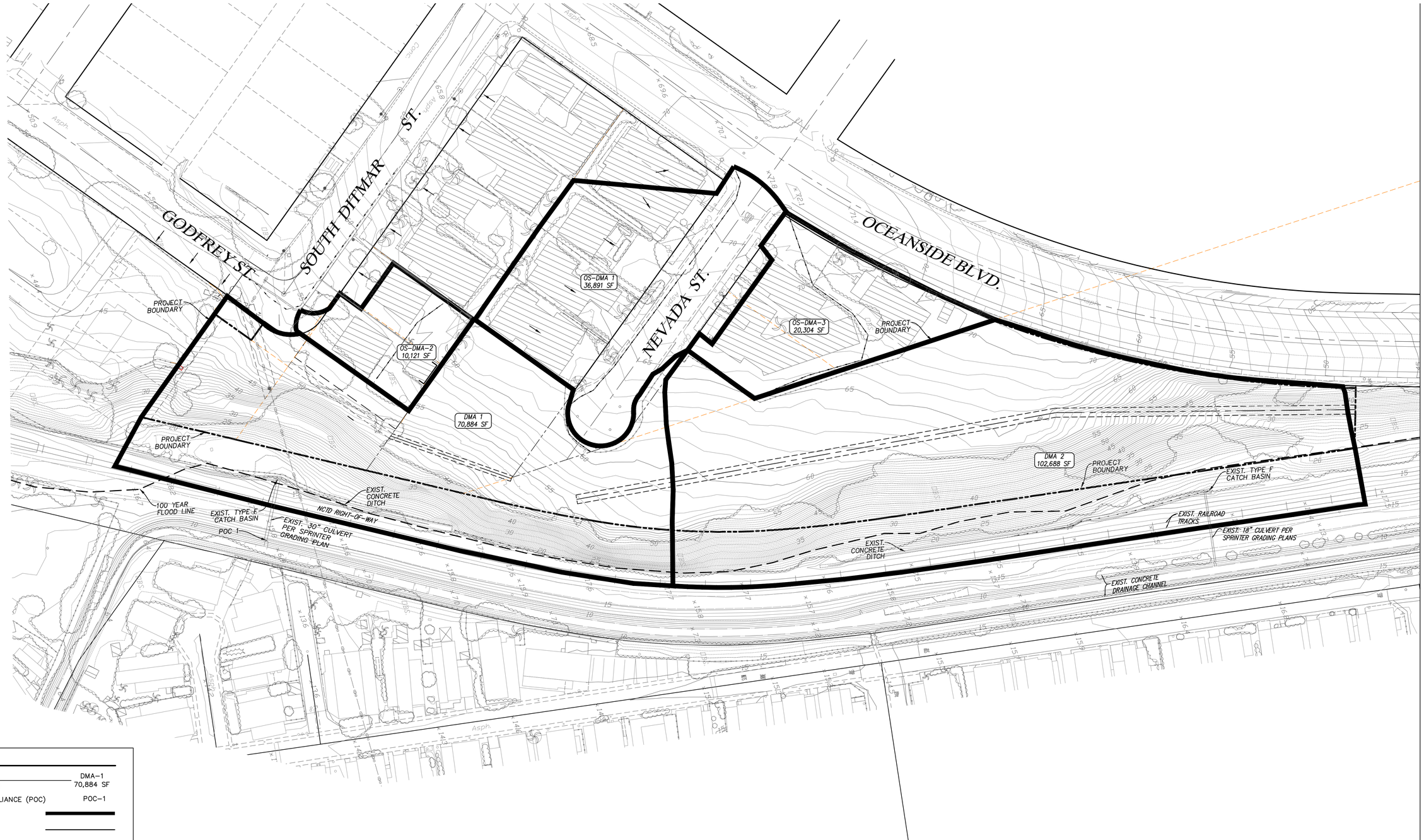
Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

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

Please provide the Exhibit in 24”x36” format with map pocket, wet date, and stamp.

Hydromodificaiton Management Exhibit



LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	70,884 SF
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
FLOW DIRECTION	

40' 20' 0' 40' 80' 120'

SCALE: 1" = 40'

REGISTERED PROFESSIONAL ENGINEER — RONALD L. HOLLOWAY — NO. 29271 — CIVIL — STATE OF CALIFORNIA

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EXISTING HYDROMODIFICATION MANAGEMENT AREA EXHIBIT

BREEZE

(LUXURY TOWNHOMES)

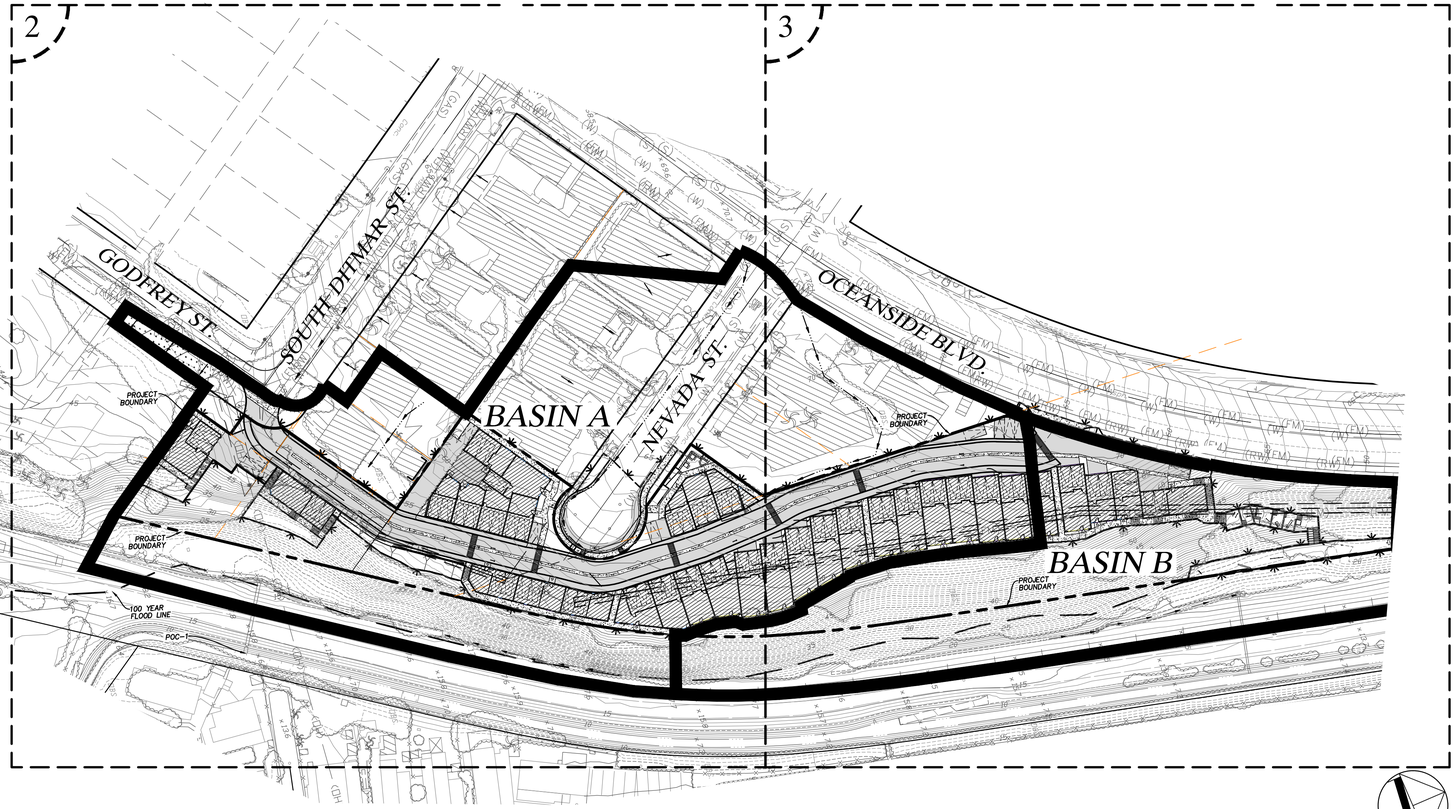
CITY OF OCEANSIDE, CALIFORNIA

SHEET 1 OF 1

LEGEND

DMA NAME AREA (SQUARE FEET)	DMA–1 64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

PROJECT CHARACTERISTICS	
PARCEL AREA	2.66 ACRES
DISTURBED AREA	2.13 ACRES
PROPOSED IMPERVIOUS AREA	1.72 ACRES
PROPOSED PERVIOUS AREA	0.41 ACRES
SOIL TYPE	D
DEPTH TO GROUNDWATER	> 20 FEET



SUMMARY OF DMAS:

DMA ID	DMA Surface Type	DMA Area (sq. ft.)	DMA Type	Proposed Structural BMP Type	Structural BMP ID	Total Detention Vault Volume (ft^3)	MWS Treatment Capacity / Volume (ft^3)/FLOW (cfs)
DMA-1A [1]	Roof, Dwy, Landscape	39,698	Drains to BMP	Detention Vault + MWS	BMP-1A	3,411	2,279
DMA-1B [2]	Roof, Dwy, Landscape	21,866	Drains to BMP	Detention Vault + MWS	BMP-1B	5,228	3,198
DMA-2	Street, Sidewalk, Ldsp	10,998	Drains to BMP	Detention Vault + MWS	BMP-2	1,169	1,139
SM-1	Street, Sidewalk, Ldsp	1,293	Self-Mitigating	-	-	-	-
SM-2	Street, Sidewalk, Ldsp	1,532	Self-Mitigating	-	-	-	-
SM-3	Street, Sidewalk, Ldsp	1,107	Self-Mitigating	-	-	-	-
SM-4	Street, Sidewalk, Ldsp	32,993	Self-Mitigating	-	-	-	-
SM-5	DG, Ldsp	12,256	Self-Mitigating	-	-	-	-
SM-6	Landscape	46,628	Self-Mitigating	-	-	-	-
OS-1-T	Street, Sidewalk, Ldsp	2,357	Drains to BMP	MWS	BMP-OS-T	-	0.076
DMIN-1	Street	657	De Minimis	-	-	-	-
SR-1	Street, Sidewalk, Ldsp	1,759	Self-Retaining	-	-	-	-

NOTES
1) 24,017 SF OF 39,698 SF OF DMA IS TREATED IN BMP 1A. 15,681 SF BYPASSES TO BMP 1B .
2) 15,681 SF BYPASSES TO BMP 1A. TOTAL TREATED BY BMP 1B IS 37,547 SF.

60' 30' 0' 60' 120' 180'
SCALE: 1" = 60'

KEY MAP

SHEET INDEX

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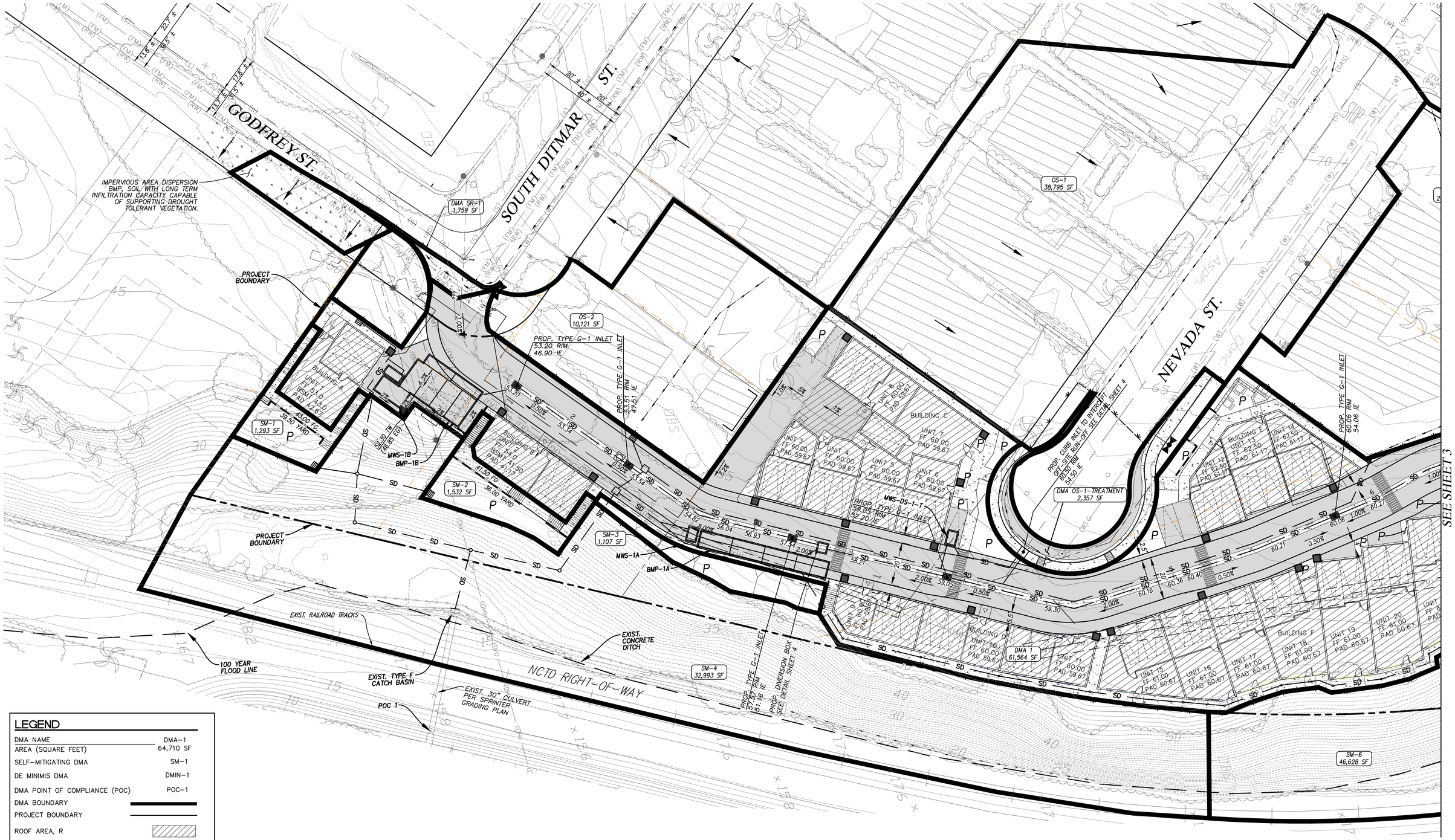
HYDROMODIFICATION MANAGEMENT AREA EXHIBIT BREEZE (LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA



LEGEND

DMA NAME	DMA–1
AREA (SQUARE FEET)	64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

20' 10' 0' 20' 40' 60'

SCALE: 1" = 20'

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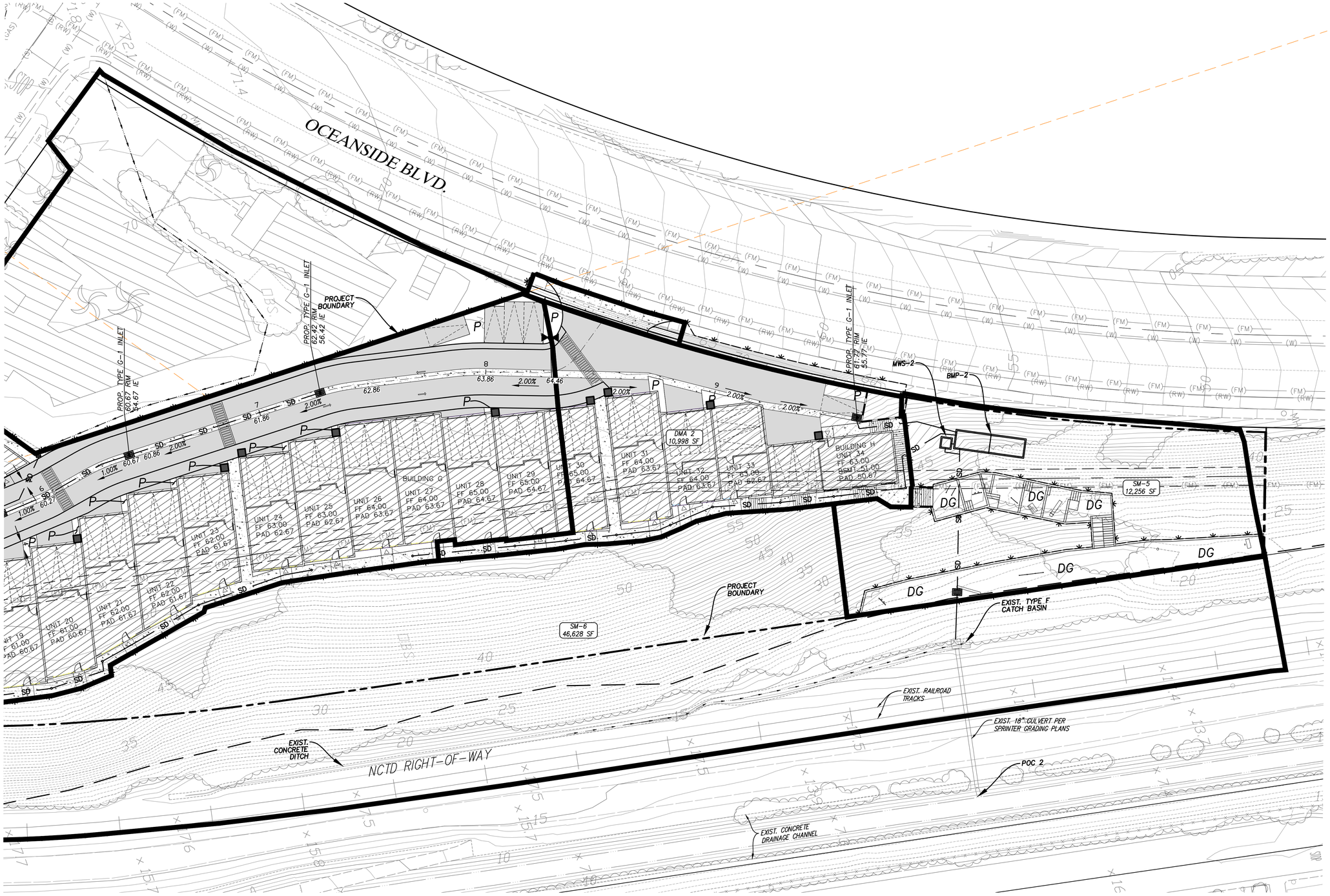

SEE SHEET 2

LEGEND

DMA NAME	DMA–1
AREA (SQUARE FEET)	64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

20' 10' 0' 20' 40' 60'

SCALE: 1" = 20'

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HYDROMODIFICATION MANAGEMENT AREA EXHIBIT BREEZE (LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA

HYDROMODIFICATION CALCULATIONS

ENVIRONMENTAL PROTECTION AGENCY (EPA) STORM WATER MANAGEMENT MODEL 5.0 (SWMM) CONTINUOUS SIMULATION MODELS WERE PREPARED FOR THE PRE AND POST-DEVELOPED CONDITIONS AT THE SITE IN ORDER TO DETERMINE IF THE PROPOSED DETENTION FACILITY HAS SUFFICIENT VOLUME TO MEET CURRENT HYDROMODIFICATION MANAGEMENT PLAN (HMP) REQUIREMENTS FROM THE SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD (SDRWQCB), AS ESTABLISHED AT THE HMP DOCUMENT DATED MARCH 2011, PREPARED BY BROWN AND CALDWELL. THE CONTINUOUS SIMULATION MODEL USES 58 YEARS OF RAINFALL DATA RECORDED BY THE OCEANSIDE RAIN GAUGE (RAINFALL DATA EXISTS FROM 8/28/1951 THROUGH 5/23/2008.

LOW FLOW THRESHOLD

EROSION SUSCEPTIBILITY ANALYSIS OF LOMA ALTA CREEK FOR MORSE STREET APARTMENTS, FEBRUARY 2016, BY TRWE EXIST FOR THE VICINITY. THEREFORE THE MOST CONSERVATIVE LOW FLOW THRESHOLD WAS USED- I.E. 50% OF THE PRE-DEVELOPMENT TWO-YEAR STORM EVENT (0.5Q2). THIS VALUE WAS USED TO DETERMINE THE DIAMETER OF THE LOW FLOW ORIFICES.

SWMM DEVELOPMENT

STORMWATER RUNOFF FROM THE PROPOSED PROJECT SITE IS ROUTED TO ONE (1) POINTS OF COMPLIANCE, POC-1 LOCATED NEAR THE SOUTHEAST CORNER OF THE PROJECT SITE. POC-1 COLLECTS RUNOFF FROM TWO SEPARATE DRAINAGE BASINS, BASIN A AND BASIN B. BOTH CONVEYANCES CONFLUENCE IN THE CONCRETE CHANNEL SOUTH OF NCTD RAILROAD RIGHT-OF-WAY BELOW THE PROJECT. THE PROPOSED DRAINAGE PATTERN MIMICS THE EXISTING DRAINAGE PATTERN WITH REGARD TO OVERALL AREA AND DISCHARGE POINTS.

DMA 1 WILL BE COMPRISED PRIMARILY OF THE MAJORITY OF THE PROJECT, INCLUDING UNITS 1 - 29 AND WILL BE DIRECTED INTO TWO (2) SEPARATE DETENTION VAULTS. A MODIFIED TYPE A-4 CLEAN OUT (PER SDRSD D-09) WITH TWO (2) ORIFICES WILL DISTRIBUTE FLOWS TOWARD EACH DETENTION VAULT (39% TOWARD BMP 1A AND 61% TO BMP 1B). THE SIZE OF THE ORIFICES ARE A FUNCTION OF THE SIZE OF EACH BASIN DIVIDED BY THE AREA OF THE TWO BASINS COMBINED. SEE THE HYDRAULIC CALCULATIONS SECTION FOR A DETAIL OF THE JUNCTION BOX AND ORIFICE CALCULATIONS. ONCE FLOWS ARE ROUTED VIA THE PROPOSED ORIFICES, THE FLOWS ARE THEN CONVEYED VIA STORM DRAIN PIPES TO THE RECEIVING DETENTION VAULTS, BMP 1A AND BMP 1B FOR TREATMENT AND DETENTION. DMA 2 WILL ENCOMPASS UNITS 30-34. FLOWS ARE CONVEYED VIA STORM DRAIN PIPES TO THE RECEIVING DETENTION VAULT BMP 2 FOR TREATMENT AND DETENTION.

THE INPUT DATA REQUIRED TO DEVELOP SWMM ANALYSES INCLUDE RAINFALL, WATERSHED CHARACTERISTICS, AND BMP CONFIGURATIONS. THE OCEANSIDE GAUGE FROM THE PROJECT CLEAN WATER WEBSITE WAS USE FOR THIS STUDY, SINCE IT IS THE MOST REPRESENTATIVE OF THE SITE PRECIPITATION DUE TO ELEVATION AND PROXIMITY TO THE PROJECT SITE. EVAPORATION FOR THE SITE WAS MODELED USING AVERAGE MONTHLY VALUES FROM THE COUNTY HOURLY DATASET. THE SITE WAS MODELED WITH TYPE D HYDROLOGIC SOILS, AS ASSUMED FOR THE UNKNOWN SOIL TYPE PER THE NATURAL RESOURCES CONSERVATION SERVICE (NRCS) WEB SOIL SURVEY. SOILS ARE MOSTLY ASSUMED TO BE UNCOMPACTED IN EXISTING CONDITIONS. IN DEVELOPED CONDITIONS, SOILS WITHIN THE DEVELOPED PORTION OF THE SITE ARE ASSUMED TO BE COMPACTED, WHILE SOILS IN UNDEVELOPED AREAS ARE ASSUMED TO REMAIN UNCOMPACTED. BASED ON THE HMP REVIEW AND AND ANALYSIS PREPARED FOR THE CITY OF SAN MARCOS, OCEANSIDE & VISTA, OTHER SWMM INPUTS FOR THE SUBAREAS ARE DISCUSSED IN THE APPENDICES OF THE SWMM STUDY, WHERE THE SELECTION OF PARAMETERS IS EXPLAINED IN DETAIL.

HMP MODELING

DEVELOPED CONDITIONS

THE EXISTING SITE WAS MODELED AS ENTIRELY PERVIOUS, AS REQUIRED BY RWQCB ORDER NO. R9-2013-0001. STORM WATER RUNOFF FROM THE IMPERVIOUS ROOF AND ROAD AREAS WILL INTERCEPTED BY CATCH BASINS IN THE STREET, AND CONVEYED VIA A STORM DRAIN SYSTEM TO THE UNDERGROUND DETENTION VAULTS. THE DETENTION VAULT WILL STORE RUNOFF FROM THE SITE AND RELEASE IT AT A CONTROLLED RATE FOR HYDROMODIFICATION, POLLUTANT CONTROL, AND DETENTION TO REDUCE THE PROPOSED 100-YEAR FLOWS TO EXISTING 100-YEAR FLOW LEVELS. THE TYPE OF UNDERGROUND DETENTION VAULT WILL BE MANUFACTURED BY STORMTRAP® OR EQUIVALENT PRODUCT (SEE ATTACHMENTS). A MODULAR WETLAND SYSTEM (MWS) WILL BE LOCATED DOWNSTREAM OF EACH UNDERGROUND VAULT TO TREAT THE POLLUTANTS FROM THE SITE. SEE THE "STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR BREEZE LUXURY TOWNHOMES" BY BHA FOR POLLUTANT AND HYDROMODIFICATION CONTROL COMPLIANCE. TREATED WATER FROM DMA-1A AND DMA-1B WILL BE CONVEYED VIA 18"-DIA. HDPE STORM DRAIN PIPE AND DISCHARGED AT THE EXISTING TYPE F CATCH BASIN IN THE SOUTHEAST CORNER OF THE PROJECT SITE AT POC-1. TREATED WATER FROM MWS-2 WILL BE CONVEYED VIA 18"-DIA HDPE STORM DRAIN PIPE AND DISCHARGED AT THE EXISTING TYPE F CATCH BASIN IN THE NORTHEAST CORNER OF THE PROJECT SITE. BOTH CONVEYANCES FROM THE DMA-1A, DMA1B AND DMA-2 CONFLUENCE IN THE CONCRETE CHANNEL SOUTH OF NCTD RAILROAD RIGHT-OF-WAY BELOW THE PROJECT.

OFF-SITE RUN-ON FROM THREE (3) SEPARATE UPSTREAM AREAS; THE EXISTING RESIDENTIAL DEVELOPMENTS LOCATED EAST OF NEVADA STREET, NEVADA STREET CUL-DE-SAC, THE EXISTING RESIDENTIAL DEVELOPMENTS WEST OF NEVADA STREET, AND THE SOUTH EAST CORNER OF SOUTH DITMAR STREET AND GODFREY STREET WILL BYPASS THE PROJECT SITE STORM WATER TREATMENT FACILITIES AND CONFLUENCE WITH THE PROPOSED STORM DRAIN FACILITIES PRIOR TO DISCHARGING TO POC-1.

RUNOFF FROM THE UNDISTURBED BLUFF AREAS (SELF MITIGATING AREAS - SM) IN THE EASTERN PORTION OF THE PROJECT SM-4, SM-5 AND SM-6 SHEET FLOW OVER THE BLUFF AND INTO THE EXISTING AND PROPOSED BROW DITCHES TO POC-1. THE UNDISTURBED BLUFF AREAS WILL BYPASS THE UNDERGROUND STORAGE VAULTS AND WILL NOT REQUIRE STORM WATER TREATMENT. THERE AREAS WILL UTILIZE OTHER LOW IMPACT DEVELOPMENT (LID) STRATEGIES. SEE THE SWQMP ASSOCIATED WITH THIS PROJECT.

THE POTENTIAL FOR RUNOFF FROM MINOR STREET WIDENING OF GODFREY STREET AND SOUTH DITMAR STREET TO RUNON TO THE SITE WILL BE MITIGATED BY A CONCRETE CROSS GUTTER CONSTRUCTED ALONG GODFREY STREET. RUNOFF FROM THE MINOR WIDENING OF GODFREY STREET WILL FLOW TO A PROPOSED VEGETATED DISPERSION AREA LOCATED ON THE SOUTH SIDE OF GODFREY STREET AT SOUTH DITMAR STREET. THE VEGETATED DISPERSION AREA HAS BEEN DESIGNED AS A SITE DESIGN BMP TO SLOW RUNOFF DISCHARGES AND REDUCE VOLUMES THROUGH INFILTRATION. THE DISPERSION AREA WILL ALSO INCLUDE SOIL AMENDMENTS TO IMPROVE VEGETATION SUPPORT, INFILTRATION CAPACITY AND ENHANCE TREATMENT OF ROUTED FLOWS. THE RELATIVELY FLAT SLOPE OF THE DISPERSION AREA WILL FACILITATE SHEET FLOWS TO MIMIC EXISTING DRAINAGE CONDITIONS.

THE UNDERGROUND BMPS SUCH AS THE DETENTION VAULTS WILL REQUIRE ACCESS FOR A VACUUM TRUCK TO REMOVE MATERIALS. THE PROPRIETARY BMPS SUCH AS THE MODULAR WETLANDS MAY ALSO REQUIRE ACCESS FOR A VACTOR TRUCK TO REMOVE OF MEDIA CARTRIDGES OR OTHER INTERNAL COMPONENTS. ACCESS REQUIREMENTS FOR THE DETENTION VAULT AND MODULAR WETLANDS MUST BE VERIFIED WITH THE MANUFACTURERS. PLEASE REFER TO ATTACHMENT 3 FOR FULL MAINTENANCE APPROACH FOR THE STRUCTURAL BMPS.

THE VACTOR TRUCKS CAN ACCESS THE UNDERGROUND BMPS USING THE ACCESS RAMPS TO THE UNDERGROUND PARKING FACILITIES. THE UNDERGROUND PARKING FACILITIES ARE DESIGNED ON LEVEL PADS FOR EASY ACCESS TO THE UNDERGROUND BMPS.

DMA 1 WILL BE COMPRISED PRIMARILY OF THE MAJORITY OF THE PROJECT, INCLUDING UNITS 1 - 29 AND WILL BE DIRECTED INTO TWO (2) SEPARATE DETENTION VAULTS. A MODIFIED TYPE A-4 CLEAN OUT (PER SDRSD D-09) WITH TWO (2) OUTLET ORIFICES WILL DISTRIBUTE FLOWS TOWARD EACH DETENTION VAULT (39% TOWARD BMP 1A AND 61% TO BMP 1B). THE SIZE OF THE ORIFICES ARE A FUNCTION OF THE SIZE OF EACH BASIN DIVIDED BY THE AREA OF THE TWO BASINS COMBINED. ONCE FLOWS ARE ROUTED VIA THE PROPOSED ORIFICES, THE FLOWS ARE THEN CONVEYED VIA STORM DRAIN PIPES TO THE RECEIVING DETENTION VAULTS, THEN TO POC-1.

DMA-2 WILL BE COMPRISED OF UNITS 29-34 AND PARCOURSE AND LANDSCAPING. THE DETENTION VAULT, BMP-2 IS RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR DMA-2. THE BMPS ARE COMPRISED OF A WATER QUALITY VOLUME AND REMAINING HYDROMODIFICATION VOLUME. THE REQUIRED WATER QUALITY VOLUMES ARE BASED ON TREATMENT CONTROL SIZING REQUIREMENTS AS DESCRIBED IN THE SWQMP FOR THIS PROJECT. ONCE FLOWS ARE ROUTED VIA THE PROPOSED ORIFICES, THE FLOWS ARE THEN CONVEYED VIA STORM DRAIN PIPES TO THE RECEIVING DETENTION VAULTS, THEN TO POC-1.

THE UNDERGROUND DETENTION FACILITIES WERE MODELED USING THE BASIN MODULE WITHIN SWMM. THE BASIN MODULE CAN MODEL THE COMPLEX OUTLET STRUCTURE PROPOSED, AS A DETAILED SPREAD SHEET IS PREPARED AND THE RESULT INCLUDED AS A TABLE WITHIN SWMM. IT SHOULD BE NOTED THAT THE DETAILED OUTLET STRUCTURE LOCATION AND ELEVATIONS WILL BE SHOWN ON THE CONSTRUCTION PLANS BASED ON THE RECOMMENDATIONS OF THIS STUDY.

BMP MODELING FOR HMP PURPOSES

MODELING OF DUAL PURPOSE WATER QUALITY/HMP BMPS

TWO (2) BMPS ARE PROPOSED FOR HYDROMODIFICATION CONFORMANCE AND FLOOD CONTROL FOR THE PROJECT SITE. TABLE 2 ILLUSTRATES THE DIMENSIONS REQUIRED FOR HMP COMPLIANCE ACCORDING TO THE SWMM MODEL THAT WAS UNDERTAKEN FOR THE PROJECT. FLOOD CONTROL IS DISCUSSED WITHIN THE HYDROLOGY AND HYDRAULIC REPORT PREPARED BY BHA FOR THIS PROJECT.

TABLE 2 - SUMMARY OF UNDERGROUND DETENTION BASINS, HMP-BMPs:

BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[3] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of underground HMP vault; tied with maximum 36 hour drawdown time.

FLOW DURATION CURVE COMPARISION

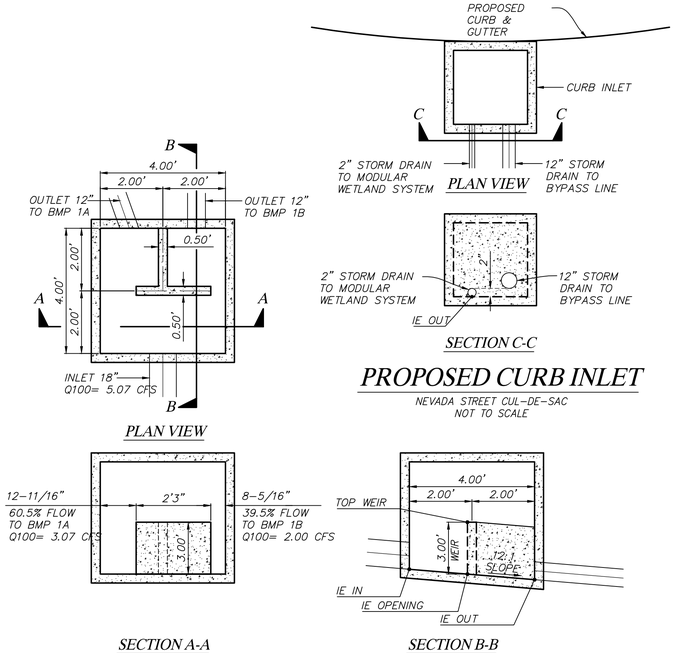
FLOW DURATION CURVES (FDC) WERE COMPARED AT THE PROJECT'S POCS BY EXPORTING THE HOURLY RUNOFF TIME SERIES RESULTS FROM SWMM TO A SPREADSHEET. THE FLOW DURATION CURVES (FDC) FOR POC-1 WERE COMPARED BETWEEN 50% OF THE EXISTING CONDITION Q2 UP TO THE EXISTING CONDITION Q10. THE Q2 AND Q10 WERE DETERMINED WITH A PARTIAL DURATION STATISTICAL ANALYSIS OF THE RUNOFF TIME SERIES IN AN EXCEL SPREADSHEET USING THE WEIBULL PLOTTING POSITION METHOD.

THE RANGE FROM 10% OF Q2 UP TO Q10 WAS DIVIDED INTO 100 EQUAL TIME INTERVALS; THE NUMBER OF HOURS THAT EACH FLOW RATE WAS EXCEEDED WAS COUNTED FROM THE HOURLY SERIES. ADDITIONALLY, THE INTERMEDIATE PEAKS WITH A RETURN PERIOD "I" WERE OBTAINED (QI WITH i-3 TO 9). FOR THE PURPOSE OF THE PLOT, THE VALUES ARE PRESENTED AS PERCENTAGE OF TIME EXCEEDED FOR EACH FLOW RATE. FDC COMPARISON FOR POC-1 AND POC-2 ARE ILLUSTRATED IN FIGURE 1 AND FIGURE 2 IN BOTH NORMAL AND LOGARITHMIC SCALE IN THE HMP STUDY.

AS CAN BE SEEN IN FIGURES 1 AND 2, THE FDC FOR THE PROPOSED CONDITION WITH THE HMP FACILITIES ARE WITHIN 110% OF THE CURVE FOR THE EXISTING CONDITION IN BOTH PEAK FLOW AND DURATION. THE ADDITIONAL RUNOFF VOLUME GENERATED FROM DEVELOPING THE SITE WILL BE RELEASED TO THE STORM DRAIN SYSTEM AT A FLOW RATE BELOW THE 10% Q2 LOWER THRESHOLD. ADDITIONALLY, THE PROJECT WILL NOT INCREASE PEAK FLOW RATES BETWEEN THE Q2 AND THE Q10, AS SHOWN IN THE FDC PLOTS AND ALSO IN THE PEAK FLOW TABLES.

TABLE 4 - Q2 TO Q10 COMPARISON TABLE - POC-1

Return Period (years)	Pre-Dev. Peak Flows (cfs)	Post-Dev. Peak Flows (cfs)	Reduction (cfs)
LF = 0.1xQ2	1.360	1.098	0.263
2-year	2.720	2.195	0.525
3-year	3.035	2.647	0.388
4-year	3.511	2.759	0.752
5-year	3.601	3.136	0.465
6-year	3.780	3.376	0.404
7-year	3.983	3.561	0.423
8-year	4.106	3.595	0.511
9-year	4.323	3.754	0.569
10-year	4.587	3.936	0.651

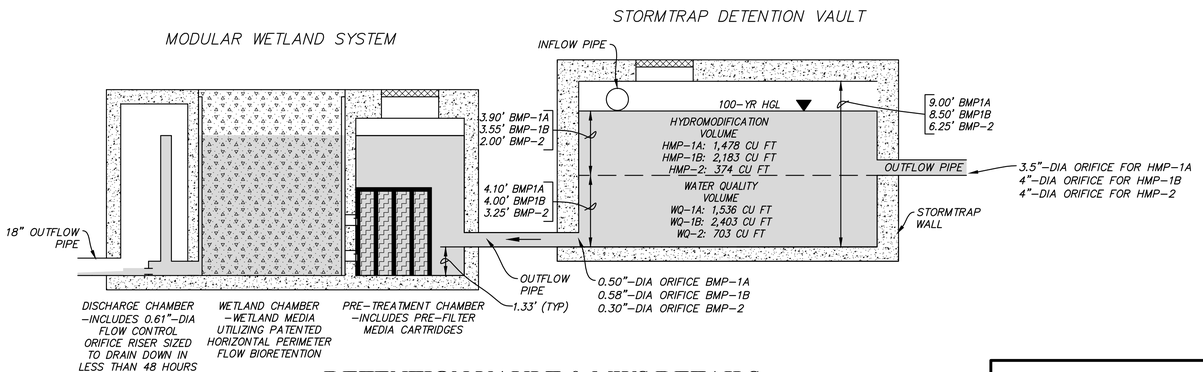


PROPOSED CURB INLET

NEVADA STREET CUL-DE-SAC
NOT TO SCALE

MODIFIED TYPE A-4 CLEAN OUT DETAIL

NOT TO SCALE



DETENTION VAULT & MWS DETAILS

NOT TO SCALE

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-2	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

REGISTERED PROFESSIONAL ENGINEER — RONALD L HOLLOWAY NO. 29271 — CIVIL — STATE OF CALIFORNIA

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HYDROMODIFICATION MANAGEMENT AREA EXHIBIT
BREEZE
(LUXURY TOWNHOMES)
CITY OF OCEANSIDE, CALIFORNIA

WMAA Exhibit


WMAA Critical Coarse Sediment Yield Area Map
Breeze Luxury Apartments
S Nevada St
Project Site
Legend
Project Site
Yes
Google earth
© 2016 Google
1000 ft
N

6.2.1 **Verification of GLUs Onsite** (if applicable)

☒Not Applicable

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

Not Applicable

6.3.4 Geomorphic Assessment of Receiving Channels (Optional)

Not Applicable

Flow Control Facility Design and Structural BMP Drawdown Calculations

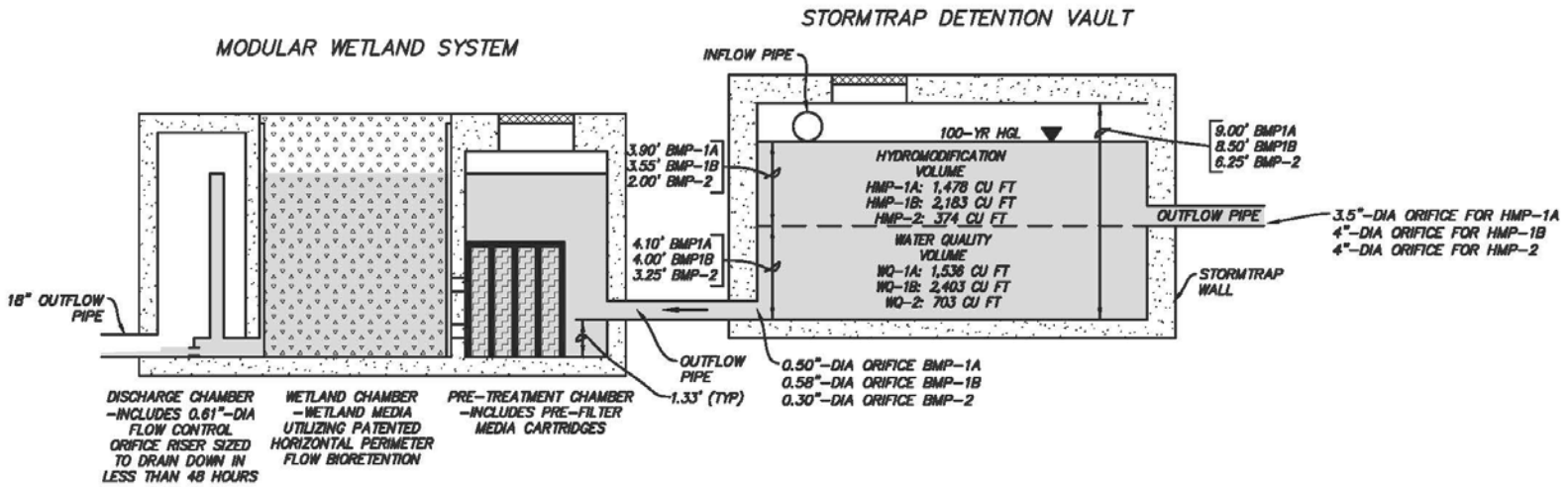
SWMM simulations were prepared for the pre and post-developed conditions at the site in order to determine if the proposed HMP-BMP detention facilities have sufficient volume to meet current Hydromodification Management Plan (HMP) requirements. The SWMM models were prepared under separate cover *Hydromodification Management Plan: SWMM Modeling for Hydromodification Compliance of: Breeze Luxury Townhomes* by BHA dated January 2018. See the HMP Study in Attachment 8.

Sizing of Volume-Based Biofiltration BMP - MWS-1A		Per Appendix F.2.2 BMP DM		
1	DCV (60.5%) of Total DCV From DMA 1A	DCV	1,024	cubic-feet
2	Design Volume for Biofiltration System = DCV x 1.5	Volume =	1,536	cubic-feet
Provided Modular Wetland System (MWS)		MWS-L-4-6-V-UG		
3	Treatment Capacity	Volume =	3,199	cubic-feet
4	Drawdown Time	t =	36	hrs

Sizing of Volume-Based Biofiltration BMP - MWS-1B		Per Appendix F.2.2 BMP DM		
1	DCV Including Bypass DCV From DMA 1A	DCV	1,602	cubic-feet
2	Design Volume for Biofiltration System = DCV x 1.5	Volume =	2,403	cubic-feet
Provided Modular Wetland System (MWS)		MWS-L-4-8-V-UG		
3	Treatment Capacity	Volume =	5,036	cubic-feet
4	Drawdown Time	t =	36	hrs

Sizing of Volume-Based Biofiltration BMP - MWS-2		Per Appendix F.2.2 BMP DM		
1	DCV	DCV	469	cubic-feet
2	Design Volume for Biofiltration System = DCV x 1.5	Volume =	703	cubic-feet
Provided Modular Wetland System (MWS)		MWS-L-4-4-V-UG		
3	Treatment Capacity	Volume =	2,279	cubic-feet
4	Drawdown Time	t =	36	hrs

Sizing of Flow Based Biofiltration BMP-MWS-OS1		Per Appendix F.1.2.2 BMP DM		
1	Flow Rate = CIA*1.5 = (0.90 * 0.2 * 2357/43560) * 1.5	Q =	0.013	cubic-feet-second
Provided Modular Wetland System (MWS)		MWS-L-4-6-V-UG		
3	Treatment Capacity	Q=	0.036	cubic-feet-second


MODULAR WETLAND SYSTEM
STORMTRAP DETENTION VAULT
INFLOW PIPE
100-YR HGL
9.00' BMP1A
8.50' BMP1B
6.25' BMP-2
3.90' BMP-1A
3.55' BMP-1B
2.00' BMP-2
HYDROMODIFICATION VOLUME
HMP-1A: 1,478 CU FT
HMP-1B: 2,183 CU FT
HMP-2: 374 CU FT
OUTFLOW PIPE
3.5"-DIA ORIFICE FOR HMP-1A
4"-DIA ORIFICE FOR HMP-1B
4"-DIA ORIFICE FOR HMP-2
4.10' BMP1A
4.00' BMP1B
3.25' BMP-2
WATER QUALITY VOLUME
WQ-1A: 1,536 CU FT
WQ-1B: 2,403 CU FT
WQ-2: 703 CU FT
STORMTRAP WALL
18" OUTFLOW PIPE
OUTFLOW PIPE
1.33' (TYP)
0.50"-DIA ORIFICE BMP-1A
0.58"-DIA ORIFICE BMP-1B
0.30"-DIA ORIFICE BMP-2
DISCHARGE CHAMBER -INCLUDES 0.61"-DIA FLOW CONTROL ORIFICE RISER SIZED TO DRAIN DOWN IN LESS THAN 48 HOURS
WETLAND CHAMBER -WETLAND MEDIA UTILIZING PATENTED HORIZONTAL PERIMETER FLOW BIORETENTION
PRE-TREATMENT CHAMBER -INCLUDES PRE-FILTER MEDIA CARTRIDGES

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-2	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

TABLE 2 – SUMMARY OF UNDERGROUND DETENTION BASINS, HMP-BMPs:

BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[3] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of undergound HMP vault; tied with maximum 36 hour drawdown time.

TABLE 3 – SUMMARY OF TREATMENT CONTROL BMPs:

BMP	Tributary Area[1] (Ac)	DIMENSIONS		
		Volume Provided[2] (ft^3)	Treatment Flow Provided[3] (cfs)	Model Number
MWS-1A	0.55	1,024	0.018	MWS-L-4-6-V-UG
MWS-1B	0.86	1,602	0.025	MWS-L-4-8-V-UG
MWS-2	0.86	703	0.005	MWS-L-4-4-V-UG
MWS-OS-1-T	0.05	-	0.013	MWS-L-4-6-V-UG

Notes: (1): IMP Areas are included in the overall DMA.

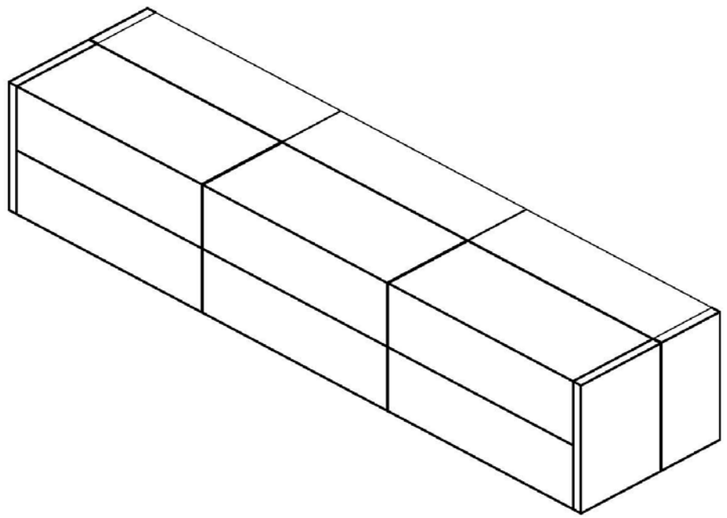
(2): For volume-based BMPs

(3): For flow-based BMPs

StormTrap® Details

StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT



BREEZE LUXURY APTS - BASIN 1A
OCEANSIDE, CA

SHEET INDEX

STORMTRAP CONTACT INFORMATION

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

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NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

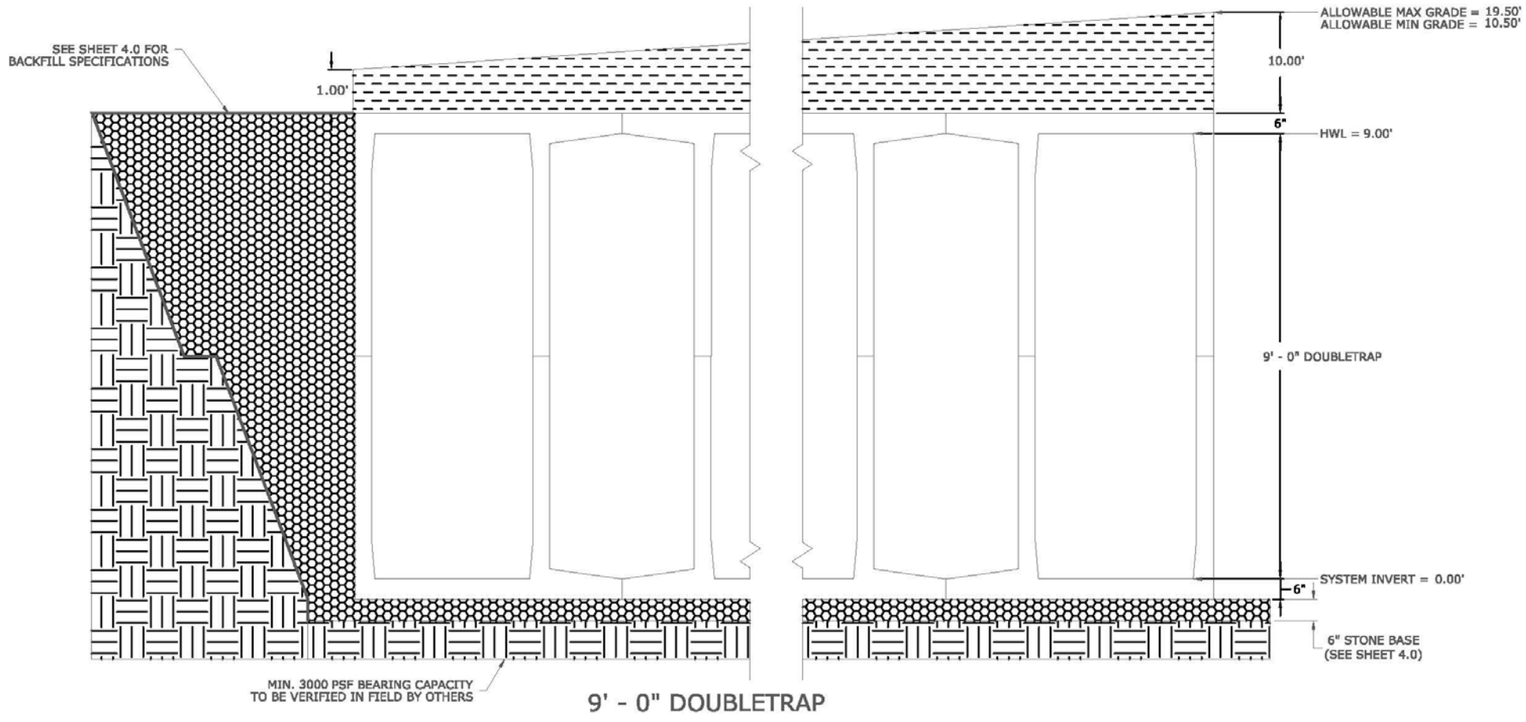
LIVE LOADING:	AASHTO HS-20 HIGHWAY LOADING
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	3000 PSF
SOIL DENSITY:	120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE:	35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE:	80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE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

STORMTRAP SYSTEM INFORMATION

WATER STORAGE PROV:	4,124.99 CUBIC FEET
UNIT HEADROOM:	9' - 0" DOUBLETRAP
UNIT QUANTITY:	12 TOTAL UNITS

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. 1.00' MAX. 10.00CONSULT 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.



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DOUBLETRAP DESIGN CRITERIA

SHEET NUMBER:
1.0

BILL OF MATERIALS

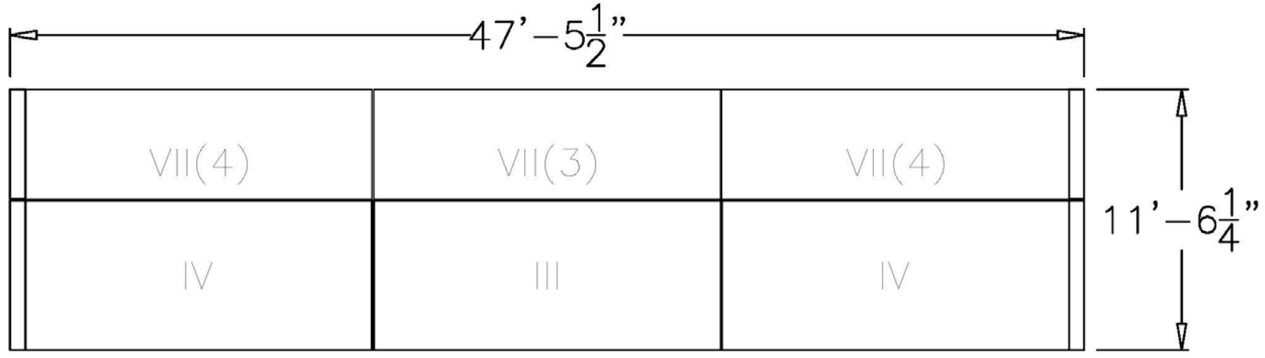
QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
1	VII(3)	9' - 0" DOUBLETRAP	12547	12446
2	VII(4)	9' - 0" DOUBLETRAP	13585	13484
1	III	9' - 0" DOUBLETRAP	14779	14678
2	IV	9' - 0" DOUBLETRAP	15817	15716
0	VII	9' - 0" DOUBLETRAP	14365	14365
0	SPIV	9' - 0" DOUBLETRAP	VARIES	VARIES
4	PANEL	8" THICK PANELS	VARIES	
2	JOINT WRAP	150' PER ROLL		
16	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.

DESIGN CRITERIA
ALLOWABLE MAX GRADE = 19.50'
ALLOWABLE MIN GRADE = 10.50'
INSIDE HEIGHT ELEVATION = 9.00'
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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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. THE SOLE PURPOSE OF THE JOINT TAPE IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM.

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 3 & 4). 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:

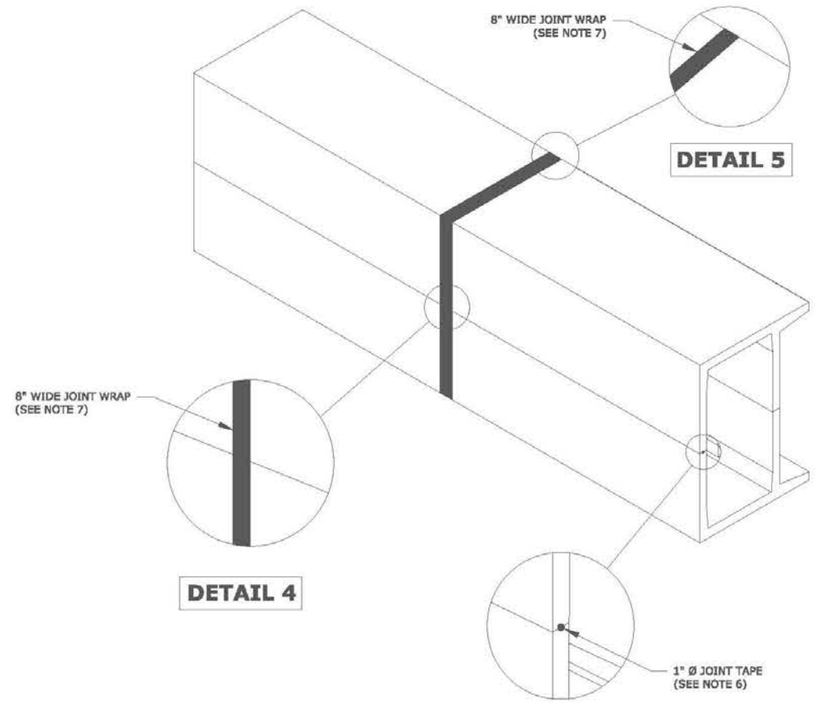
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

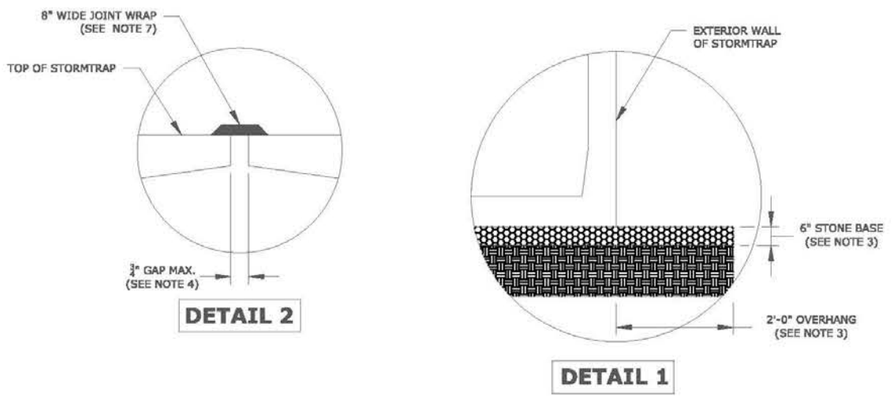
   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

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.





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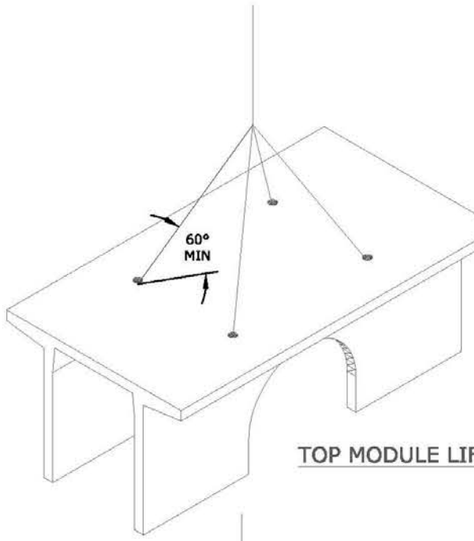
SHEET NUMBER:

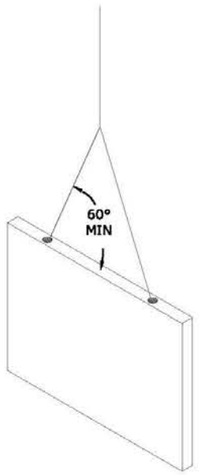
3.0

END PANEL ERECTION/INSTALLATION NOTES

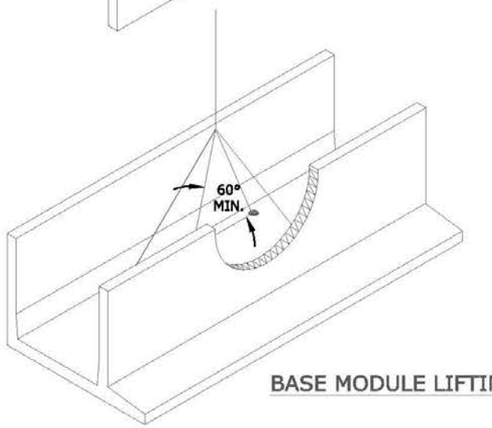
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (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).



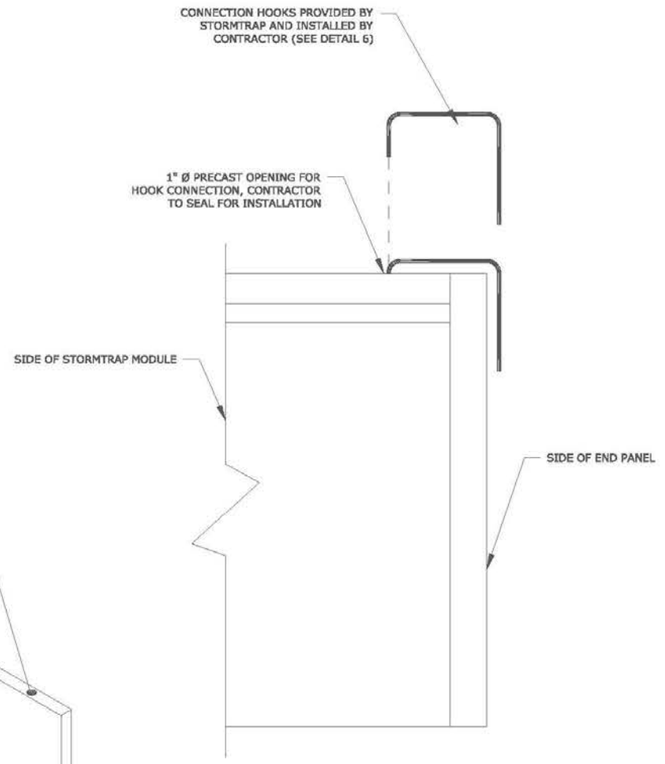
TOP MODULE LIFTING DETAIL



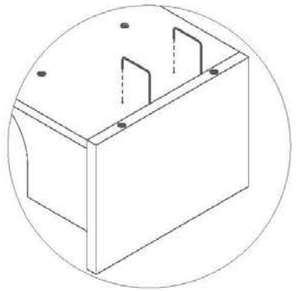
END PANEL LIFTING DETAIL



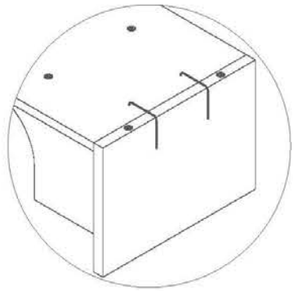
BASE MODULE LIFTING DETAIL



PANEL CONNECTION ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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SHEET NUMBER:

3.1

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 (¾") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) - SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
¾" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF WASHED, 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.

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

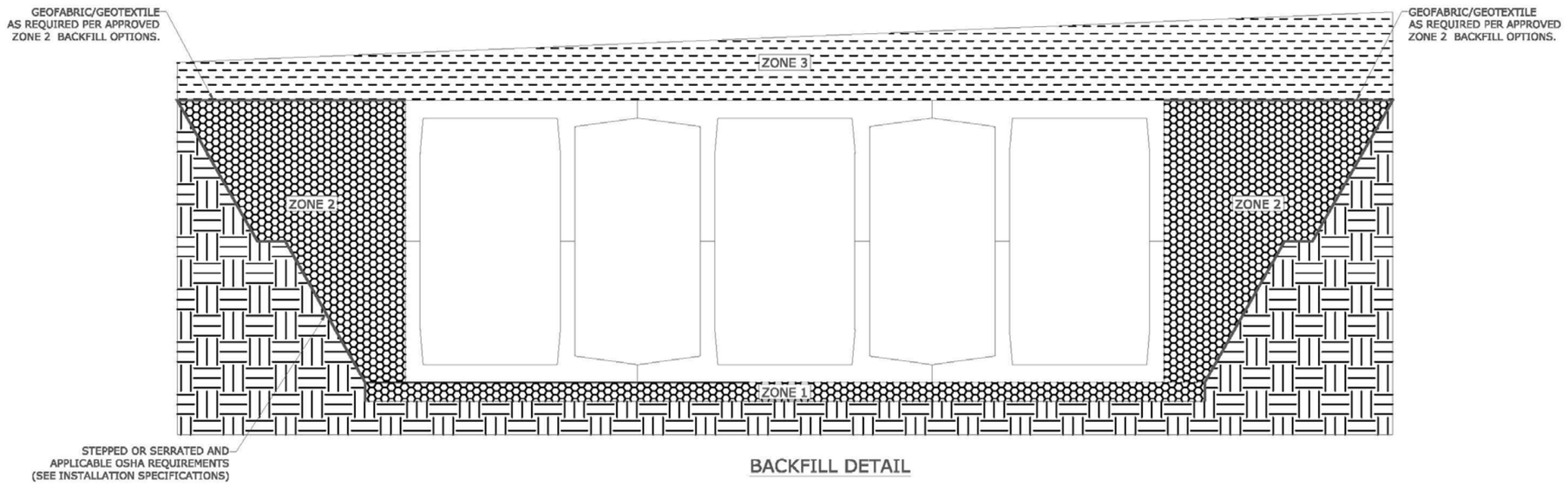
NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

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 MAY BE REQUIRED FOR THE FOLLOWING:

   A.) INFILTRATION - IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON ½" SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN ½" AND 1", AND ONLY 5% OF MATERIAL PASSING #3/8" SIEVE.

   B.) LEVELING - STORMTRAP RECOMMENDS STONE SUBBASE FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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PROJECT INFORMATION:

BREEZE LUXURY APTS

BASIN 1A

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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 INSPECTIONS. (PROVIDED BY OTHERS)

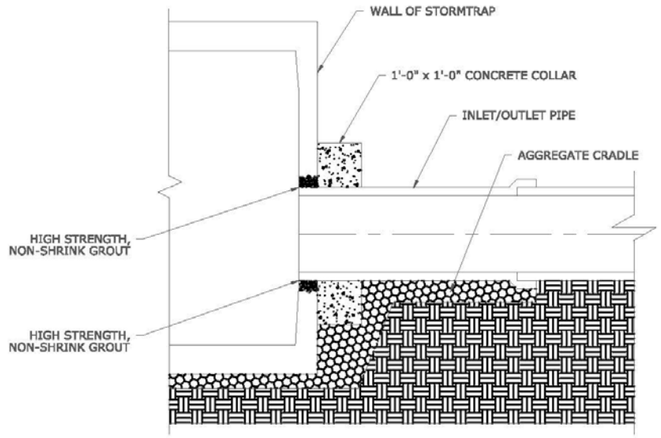
RECOMMENDED PIPE OPENING SPECIFICATION

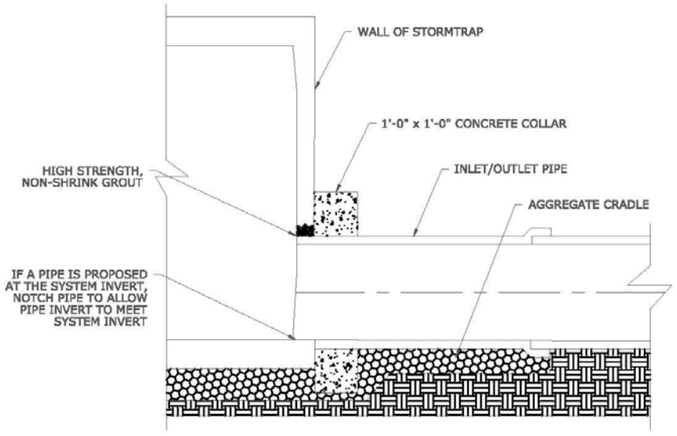
1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE Ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. 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

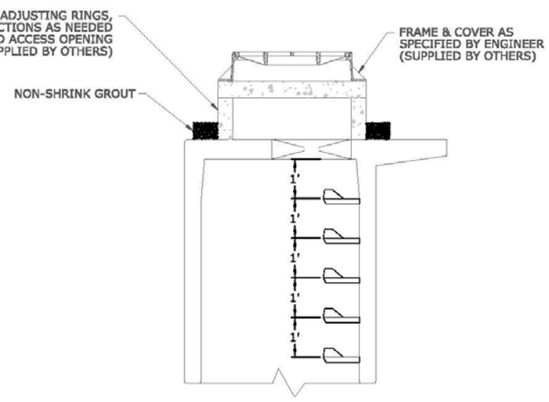
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

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.

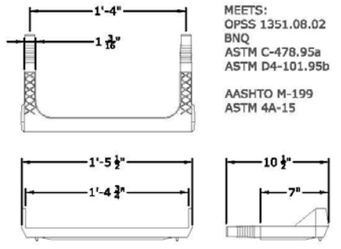




PIPE CONNECTION DETAIL



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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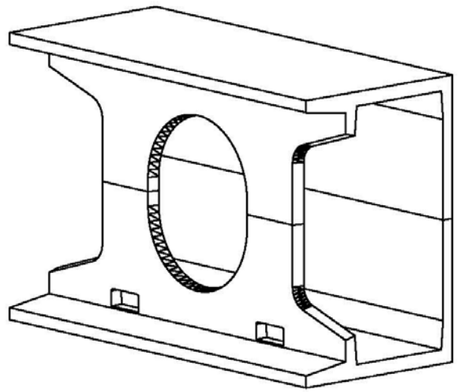
RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS

SHEET NUMBER:

5.0



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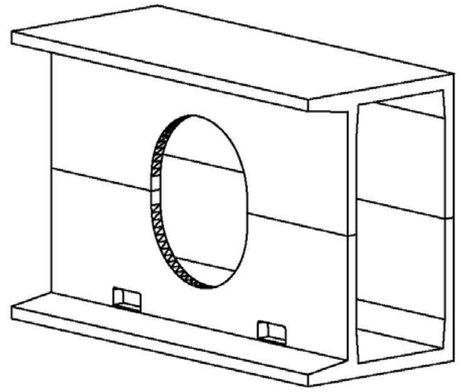

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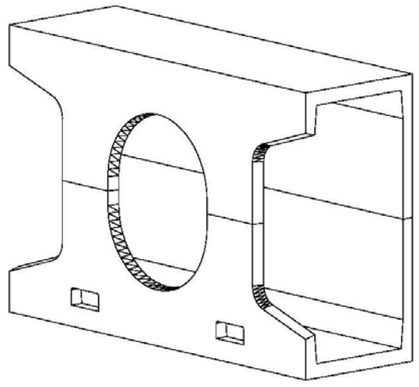
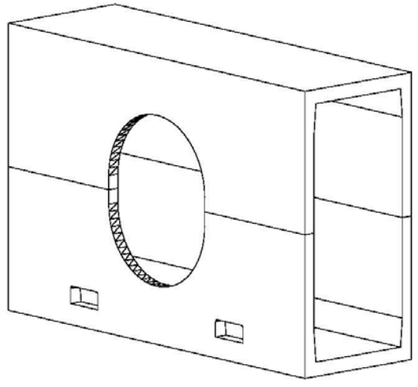
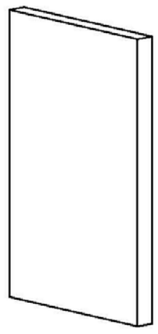


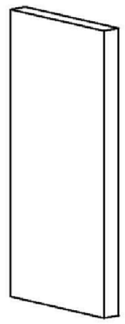
TYPE VII(3)



TYPE VII(4)



TYPE IV
END PANEL



TYPE VII
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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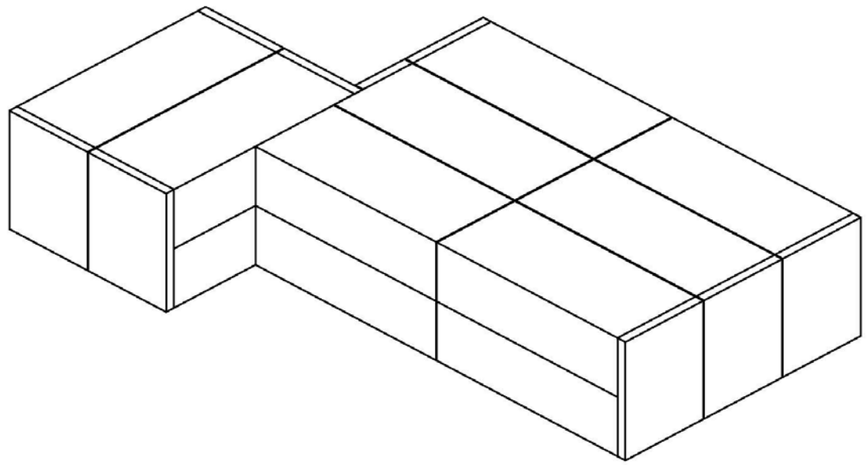
SHEET TITLE:
DOUBLETRAP
MODULE TYPES

SHEET NUMBER:
6.0

StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT



BREEZE LUXURY APTS BASIN 1B
OCEANSIDE, CA

SHEET INDEX

STORMTRAP CONTACT INFORMATION

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

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COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

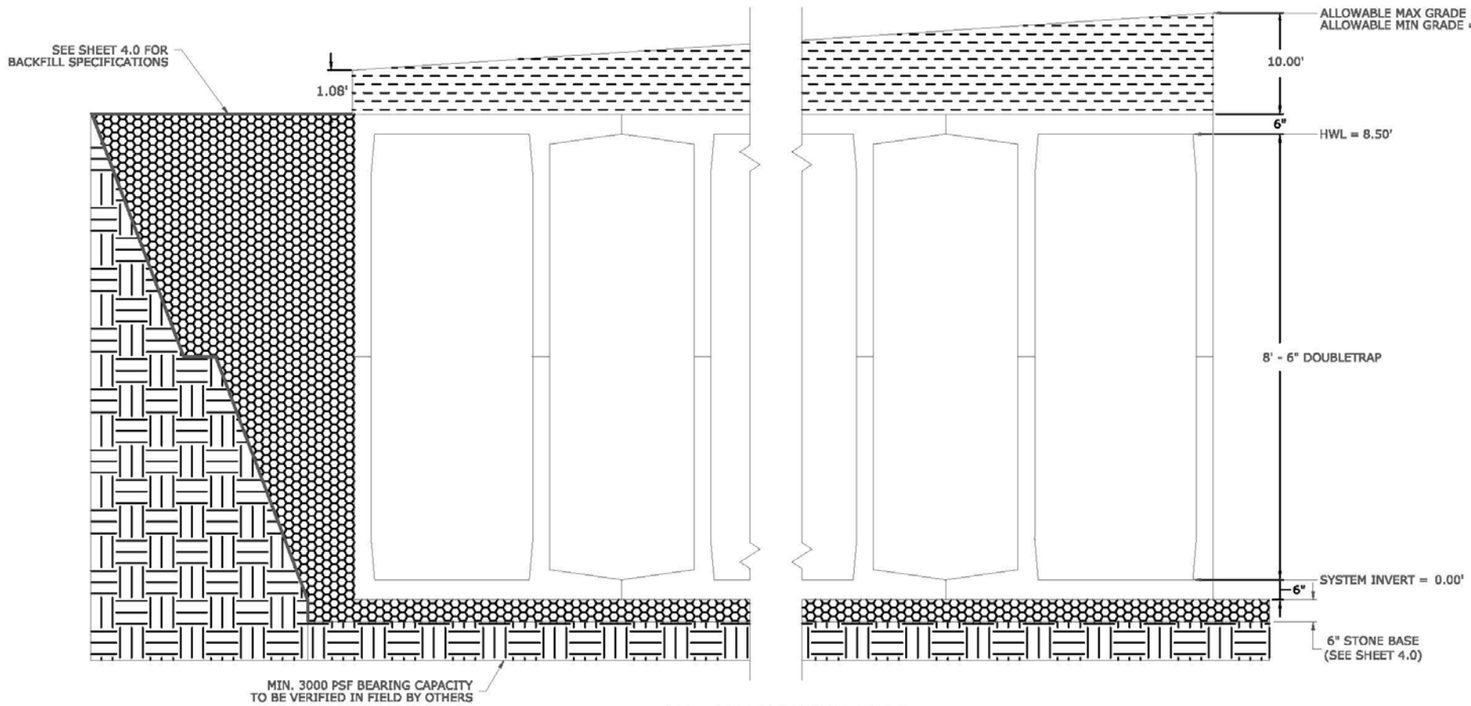
LIVE LOADING:	AASHTO HS-20 HIGHWAY LOADING
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	3000 PSF
SOIL DENSITY:	120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE:	35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE:	80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE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

STORMTRAP SYSTEM INFORMATION

WATER STORAGE PROV:	6,079.41 CUBIC FEET
UNIT HEADROOM:	8' - 6" DOUBLETRAP
UNIT QUANTITY:	16 TOTAL UNITS

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. 1.08' MAX. 10.00CONSULT 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.



8' - 6" DOUBLETRAP

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SHEET TITLE:

DOUBLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

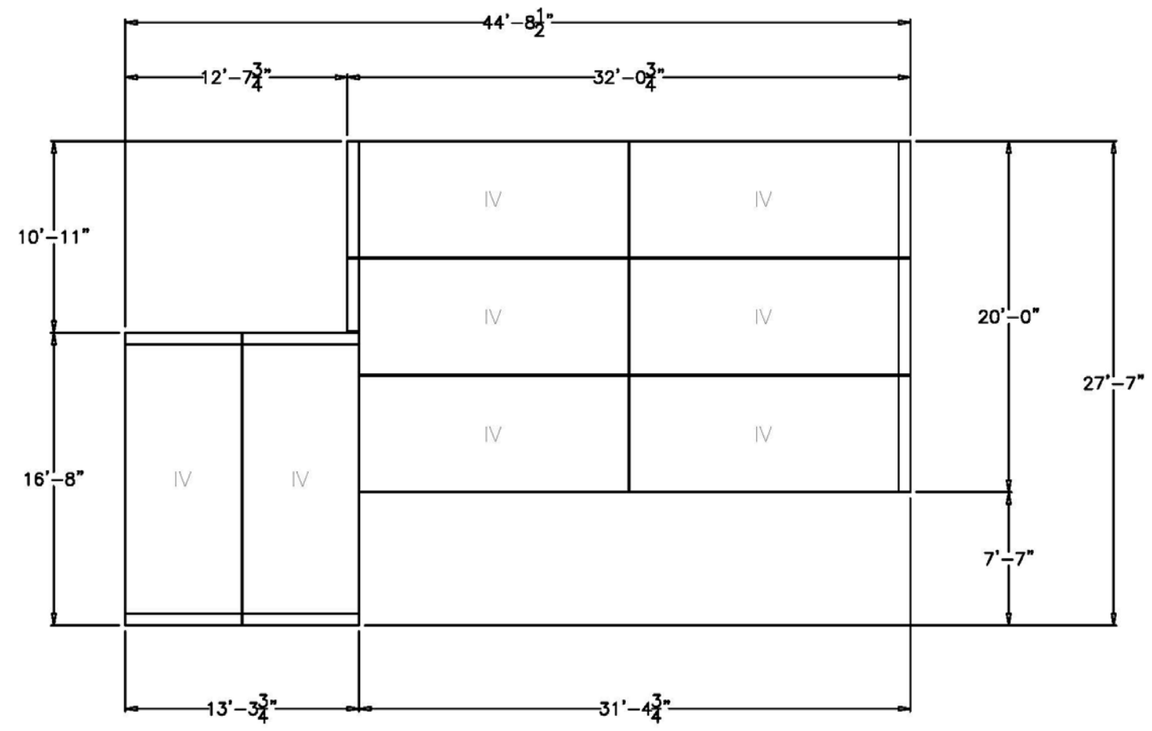
QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
0	I	8' - 6" DOUBLETRAP	15035	14833
0	II	8' - 6" DOUBLETRAP	16942	16740
0	III	8' - 6" DOUBLETRAP	14463	14362
8	IV	8' - 6" DOUBLETRAP	15417	15316
0	VII	8' - 6" DOUBLETRAP	13886	13886
0	SPIV	8' - 6" DOUBLETRAP	VARIES	VARIES
9	PANEL	8" THICK PANELS	6294	
3	JOINT WRAP	150' PER ROLL		
16	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.

DESIGN CRITERIA
ALLOWABLE MAX GRADE = 19.00'
ALLOWABLE MIN GRADE = 10.08'
INSIDE HEIGHT ELEVATION = 8.50'
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. THE SOLE PURPOSE OF THE JOINT TAPE IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM.

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 3 & 4). 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:

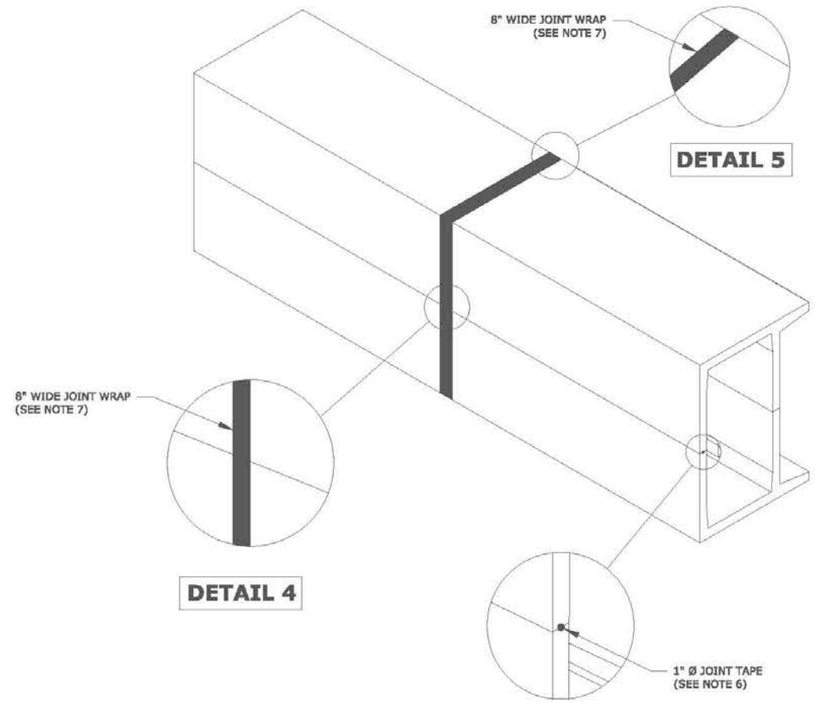
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

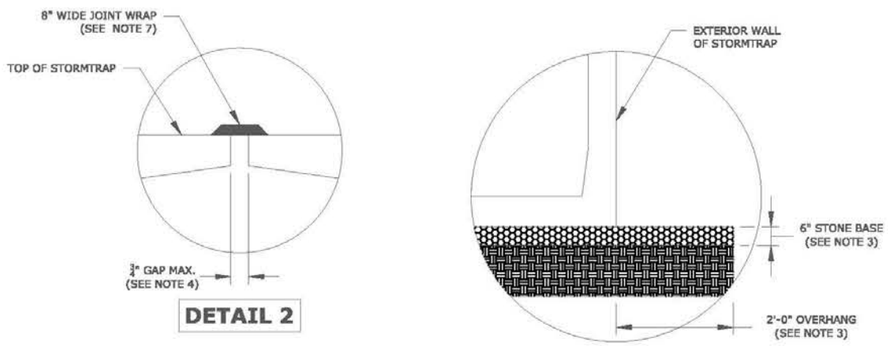
   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

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.





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ENGINEER INFORMATION:

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BREEZE LUXURY APTS

BASIN 1B

OCEANSIDE, CA

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SHEET TITLE:

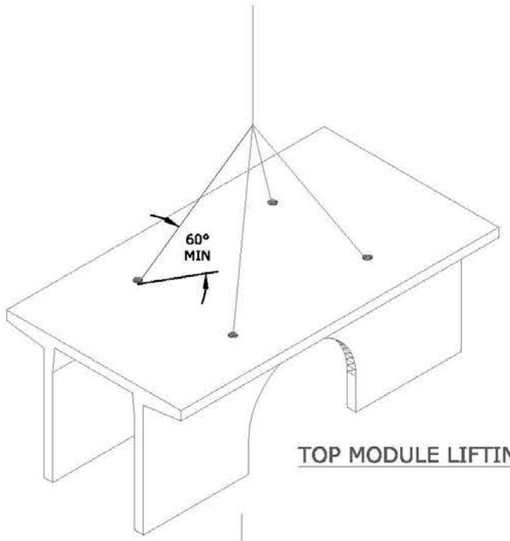
DOUBLETRAP INSTALLATION SPECIFICATIONS

SHEET NUMBER:

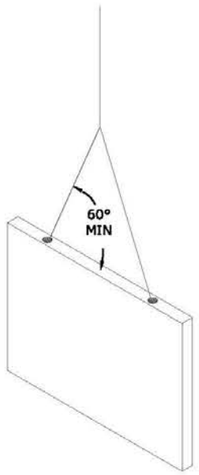
3.0

END PANEL ERECTION/INSTALLATION NOTES

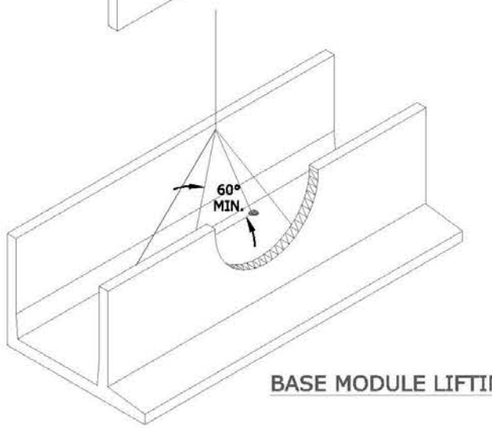
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (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).



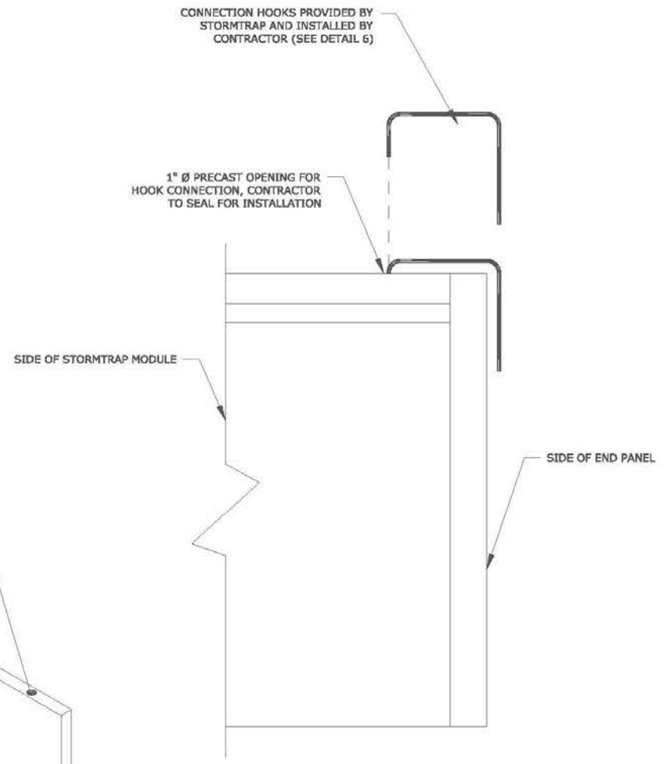
TOP MODULE LIFTING DETAIL



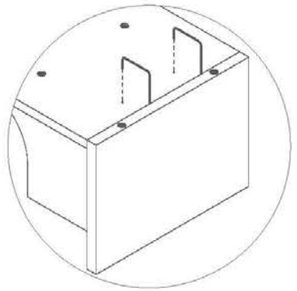
END PANEL LIFTING DETAIL



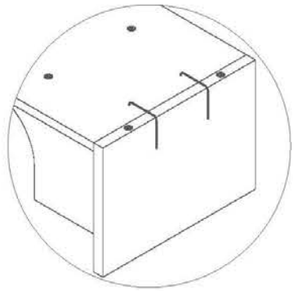
BASE MODULE LIFTING DETAIL



PANEL CONNECTION ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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3.1

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 (¾") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) - SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
¾" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF WASHED, 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.

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

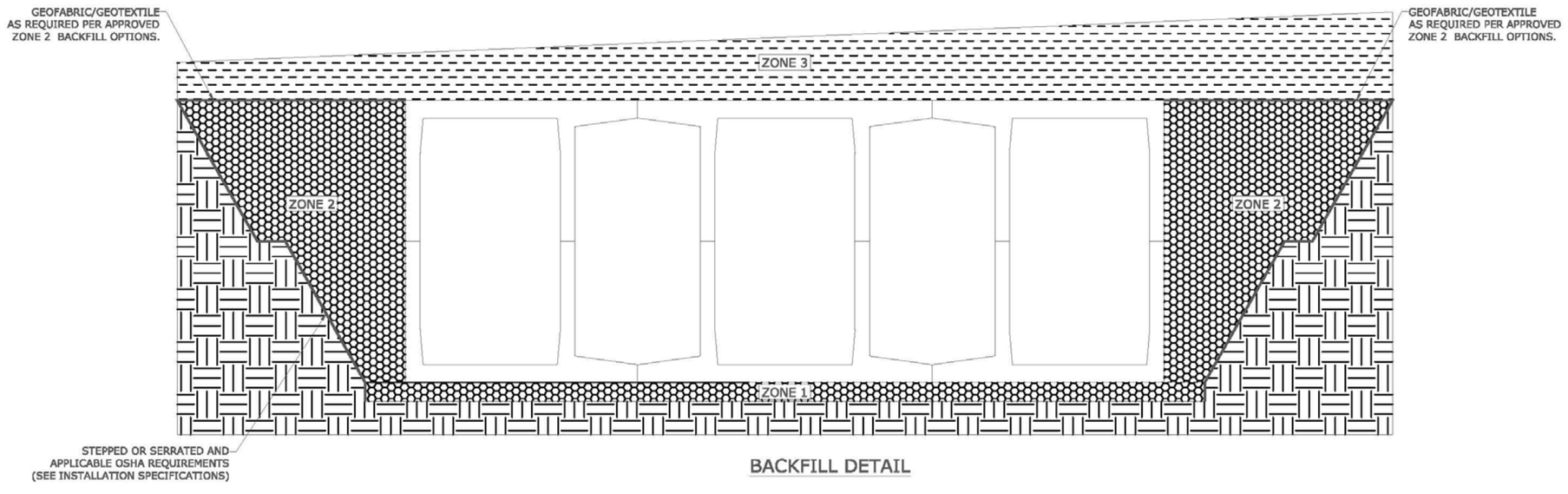
NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

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 MAY BE REQUIRED FOR THE FOLLOWING:

   A.) INFILTRATION - IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON ½" SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN ½" AND 1", AND ONLY 5% OF MATERIAL PASSING #3/8" SIEVE.

   B.) LEVELING - STORMTRAP RECOMMENDS STONE SUBBASE FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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DOUBLETRAP BACKFILL SPECIFICATIONS

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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 INSPECTIONS. (PROVIDED BY OTHERS)

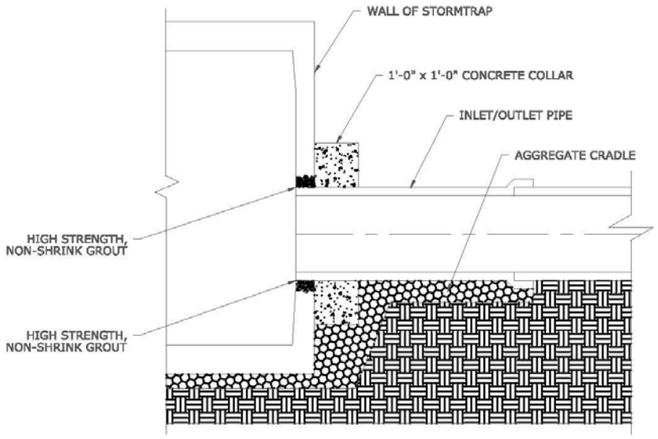
RECOMMENDED PIPE OPENING SPECIFICATION

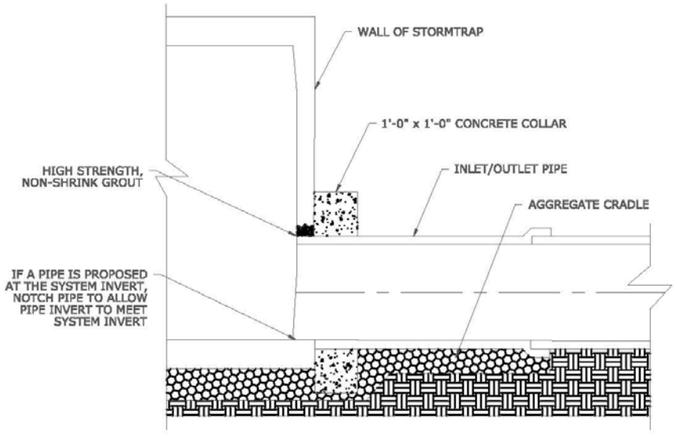
1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE Ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. 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

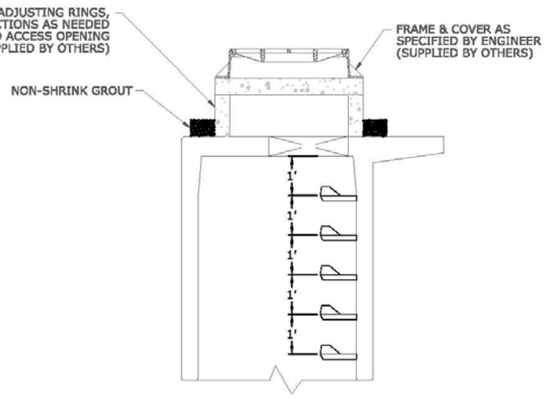
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

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.

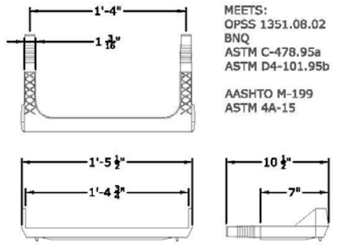




PIPE CONNECTION DETAIL



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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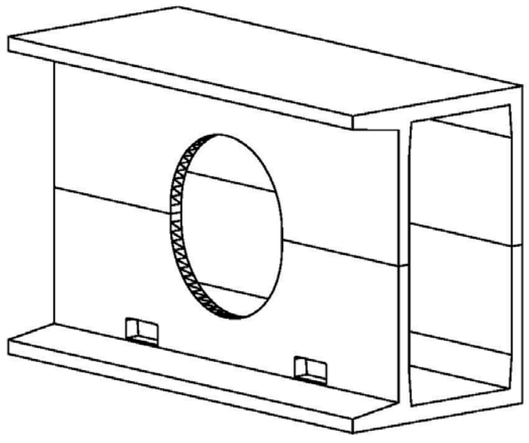
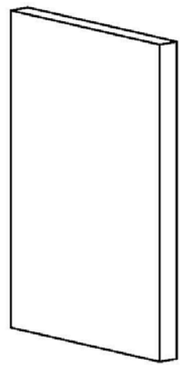
5.0



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

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6.0

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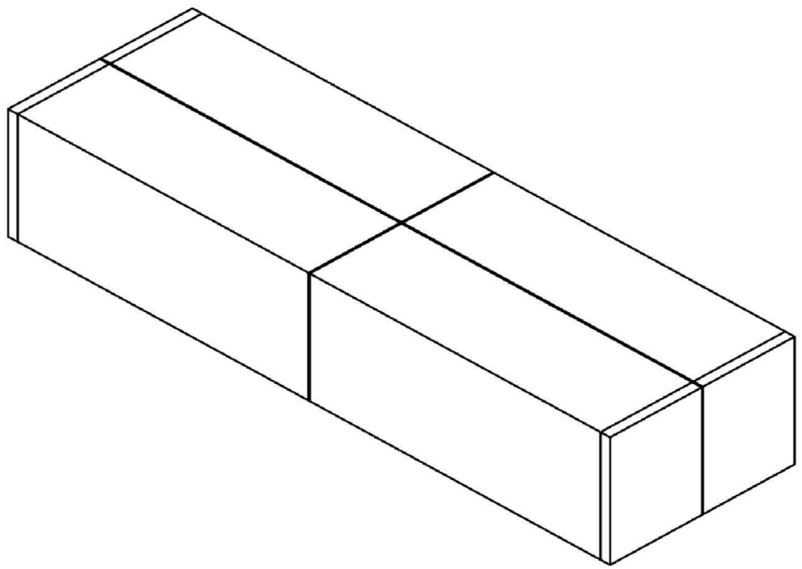
MODULAR CONCRETE
STORMWATER MANAGEMENT



BREEZE LUXURY APTS - BASIN 2
OCEANSIDE, CA

SHEET INDEX

STORMTRAP CONTACT INFORMATION

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CONTACT NAME: CHARLIE CARTER
CELL PHONE: 760-212-5628
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NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

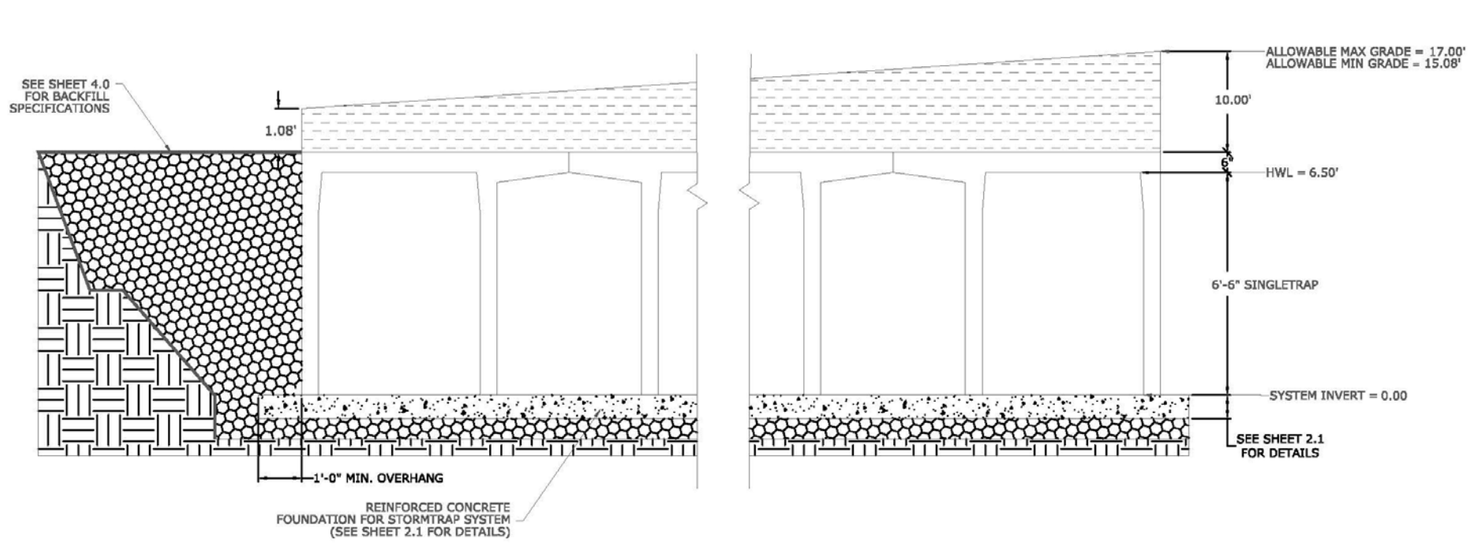
LIVE LOADING:	AASHTO HS-20 HIGHWAY LOADING
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	3000 PSF
SOIL DENSITY:	120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE:	35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE:	80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE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

STORMTRAP SYSTEM INFORMATION

WATER STORAGE PROV:	1,520.76 CUBIC FEET
UNIT HEADROOM:	6'-6" SINGLETRAP
UNIT QUANTITY:	4 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. 1.08' MAX. 10.00'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.



6'-6" SINGLETRAP

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SINGLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

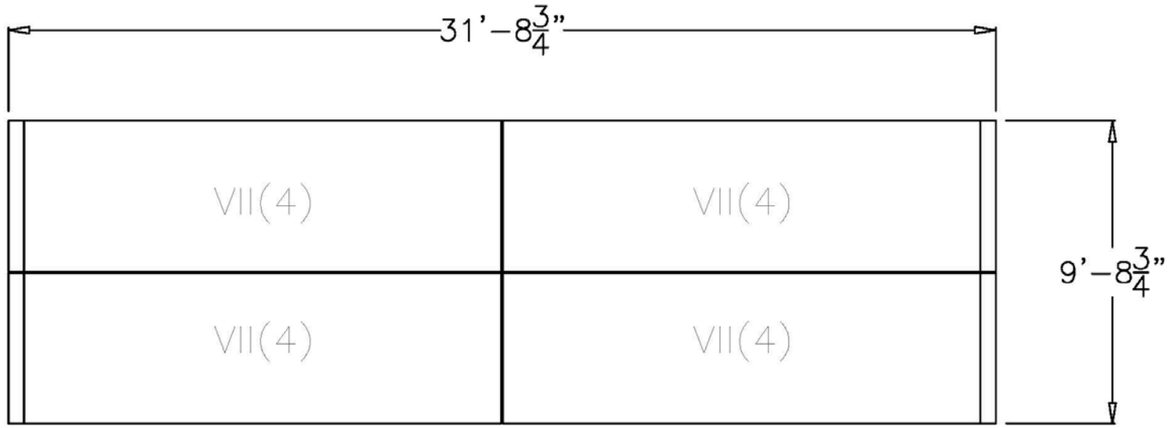
QTY.	UNIT TYPE	DESCRIPTION	WEIGHT
0	I	6'-6" SINGLETRAP	15900
0	II	6'-6" SINGLETRAP	18762
0	III	6'-6" SINGLETRAP	16254
0	IV	6'-6" SINGLETRAP	17685
4	VII(4)	6'-6" SINGLETRAP	20786
0	SPIV	6'-6" SINGLETRAP	VARIES
4	PANEL	6" THICK PANELS	VARIES
2	JOINT WRAP	150' PER ROLL	
16	JOINT TAPE	14.5' PER ROLL	

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.

DESIGN CRITERIA
ALLOWABLE MAX GRADE = 17.00'
ALLOWABLE MIN GRADE = 15.08'
INSIDE HEIGHT ELEVATION = 6.50'
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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PROJECT INFORMATION:

BREEZE LUXURY APTS

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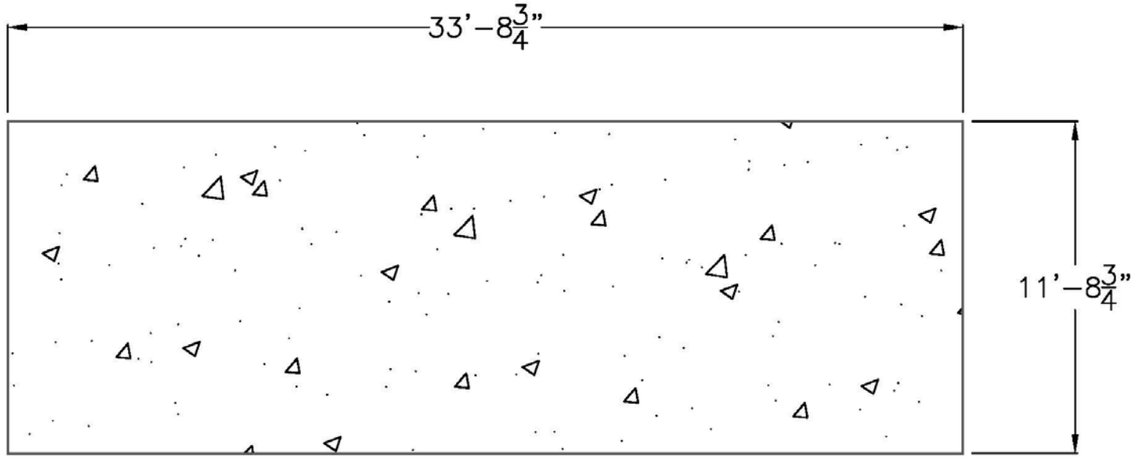
SINGLETRAP SYSTEM LAYOUT

SHEET NUMBER:

2.0



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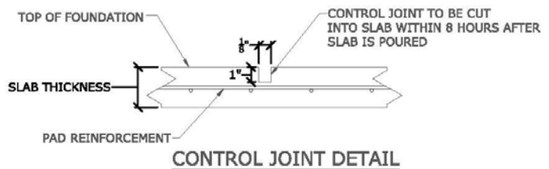
SINGLETRAP FOUNDATION LAYOUT

SHEET NUMBER:

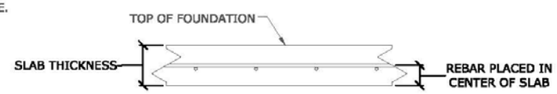
2.1

NOTES:

1. CONCRETE STRENGTH @ 28 DAYS, 5%-8% ENTRAINED AIR, 4" MAX. SLUMP.
2. NET ALLOWABLE SOIL PRESSURE AS INDICATED ON SHEET 1.0.
3. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
4. REBAR: ASTM A-615 GRADE 60. BLACK BAR.
5. DIMENSION OF FOUNDATION MUST HAVE 1'-0" OVERHANG BEYOND EXTERNAL FACE OF MODULE.
6. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
7. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
8. THE CONTROL JOINTS SHALL BE BETWEEN (IF REQUIRED BY ENGINEER OF RECORD) 16'-0" TO 24'-0" MAX APART.
9. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.



CONTROL JOINT DETAIL

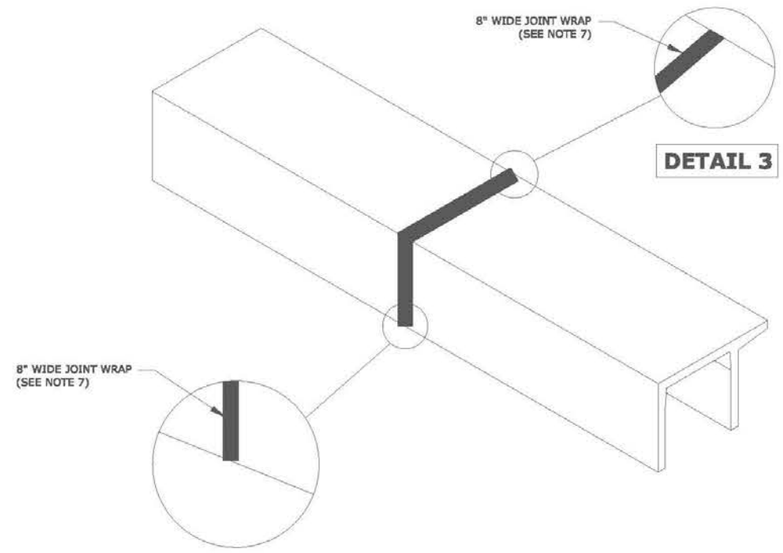


STORMTRAP FOUNDATION DETAIL

MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	REINFORCEMENT (BOTH DIRECTIONS)
6" - 12"	0'-8"	4000 PSI	#4 @ 18" O.C.
>1'-0" - 2'-0"	0'-8"	4000 PSI	#4 @ 16" O.C.
>2'-0" - 3'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
>3'-0" - 4'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
>4'-0" - 5'-0"	0'-8"	4000 PSI	#5 @ 18" O.C.
>5'-0" - 6'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
>6'-0" - 7'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
>7'-0" - 8'-0"	0'-9"	4000 PSI	#5 @ 12" O.C.
>8'-0" - 9'-0"	0'-10"	4000 PSI	#5 @ 12" O.C.
>9'-0" - 10'-0"	0'-10"	4500 PSI	#5 @ 12" O.C.

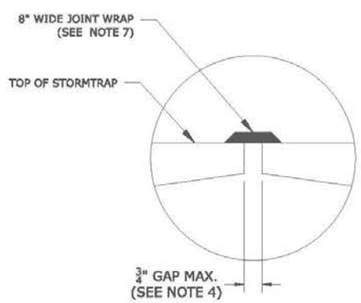
STORMTRAP INSTALLATION SPECIFICATIONS

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 SHALL BE PLACED ON A LEVEL CONCRETE FOUNDATION (SEE SHEET 2.1) WITH A 1'-0" OVERHANG ON ALL SIDES THAT SHALL BE POURED IN PLACE BY INSTALLING CONTRACTOR. A QUALIFIED GEOTECHNICAL ENGINEER WILL BE EMPLOYED, BY OWNER, TO PROVIDE ASSISTANCE IN EVALUATING THE EXISTING SOIL CONDITIONS TO ENSURE THAT THE SOIL BEARING PRESSURE MEETS OR EXCEEDS THE STRUCTURAL DESIGN LOADING CRITERIA AS SPECIFIED ON SHEET 1.0.
4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED $\frac{3}{4}$" (SEE DETAIL 2). IF THE SPACE EXCEEDS $\frac{3}{4}$", 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 STORMTRAP MODULES AND THE CONCRETE FOUNDATION SHALL BE SEALED TO THE FOUNDATION WITH PRE-FORMED MASTIC JOINT SEALER ACCORDING TO ASTM C891, 8.8 AND 8.12 (SEE DETAIL 1). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT TAPE IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM.
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 3 & 4). 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 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.

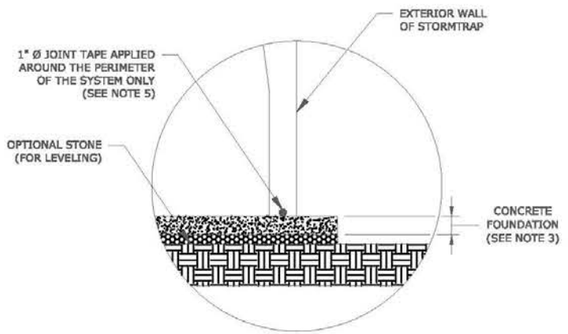


DETAIL 3

DETAIL 4



DETAIL 2



DETAIL 1

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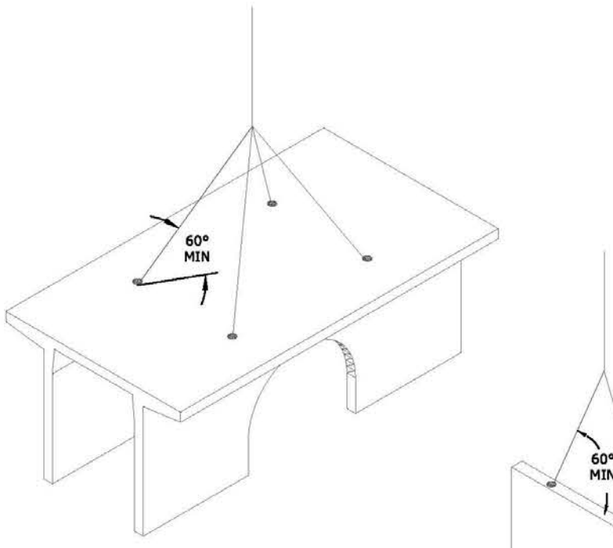
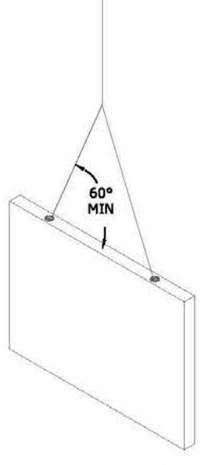
END PANEL ERECTION/INSTALLATION NOTES

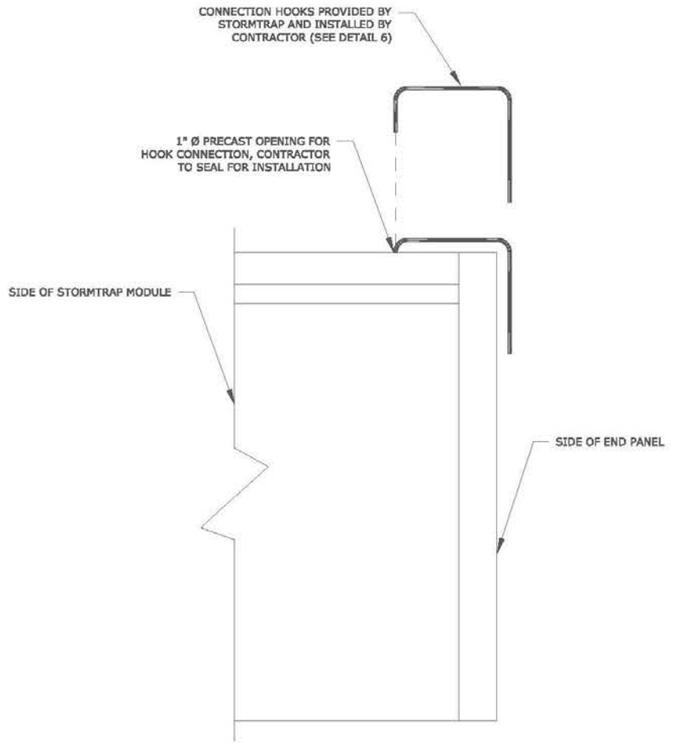
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE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



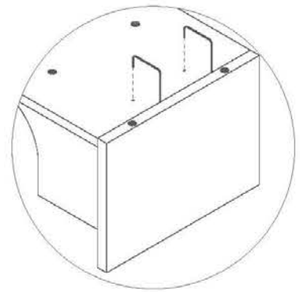
MODULE LIFTING DETAIL



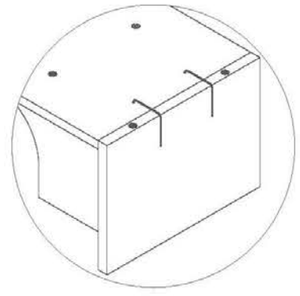
END PANEL LIFTING DETAIL



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 (¾") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) - SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
¾" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF WASHED, 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.

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

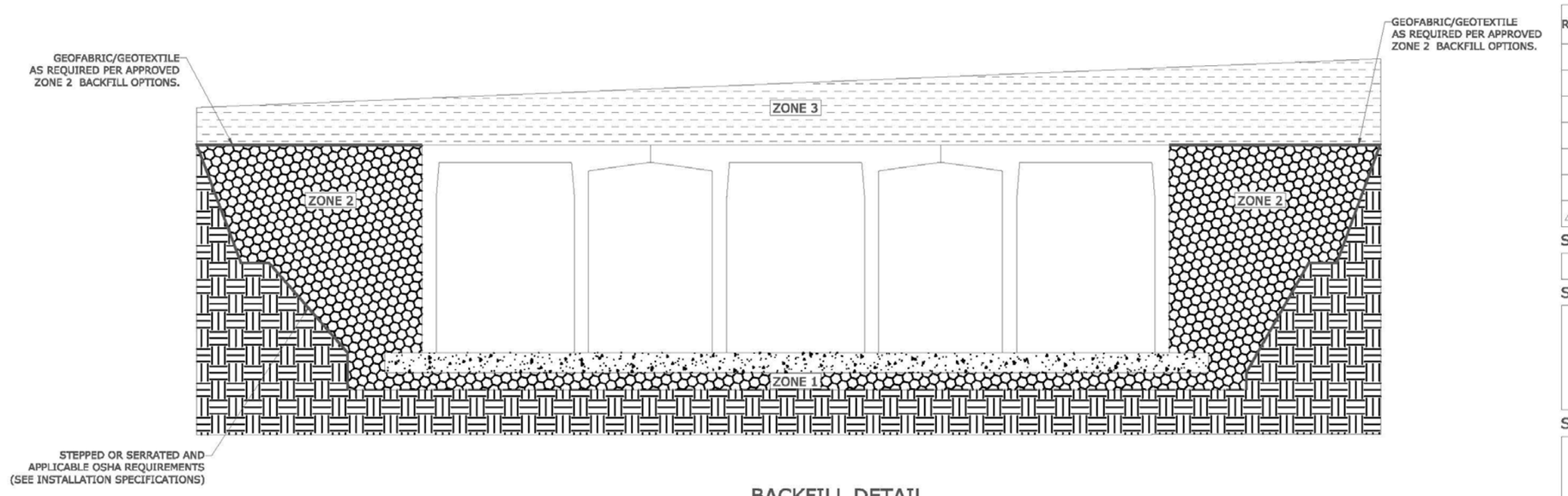
NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

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 MAY BE REQUIRED FOR THE FOLLOWING:

   A.) INFILTRATION - IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON ½" SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN ½" AND 1", AND ONLY 5% OF MATERIAL PASSING #3/8" SIEVE.

   B.) LEVELING - STORMTRAP RECOMMENDS STONE SUBBASE FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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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 INSPECTIONS. (PROVIDED BY OTHERS)

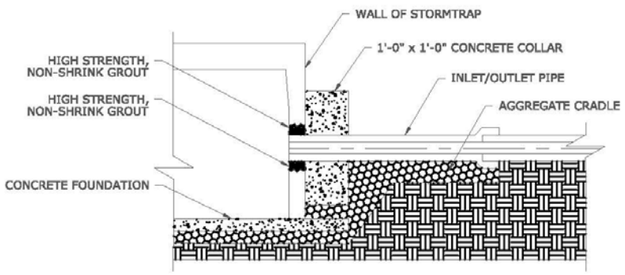
RECOMMENDED PIPE OPENING SPECIFICATION

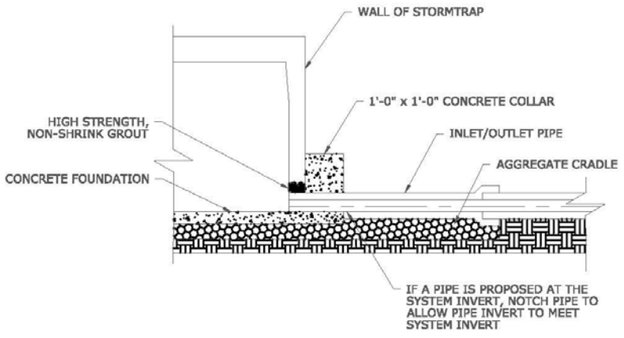
1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE Ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. 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

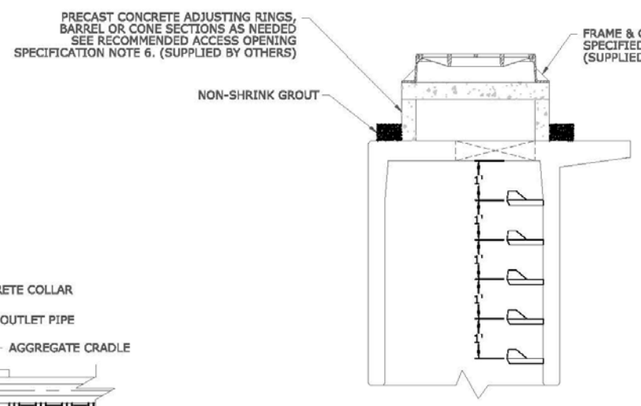
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

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.

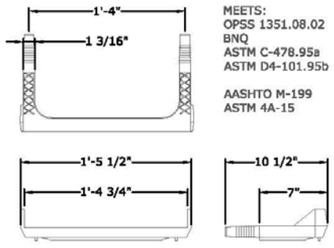




PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



STEP DETAIL

StormTrap

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

1287 WINDHAM PARKWAY
ROMEOVILLE, IL 60446
P:815-941-4549 / F:331-318-5347

ENGINEER INFORMATION:

BHA ENGINEERS
5115 AVENIDA ENCINAS
CARLSBAD, CA 92008
760-931-8700

PROJECT INFORMATION:

BREEZE LUXURY APTS

BASIN 2

OCEANSIDE, CA

CURRENT ISSUE DATE:

1/24/2019

ISSUED FOR:

PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
1	1/24/2019	PRELIMINARY	GS

SCALE:

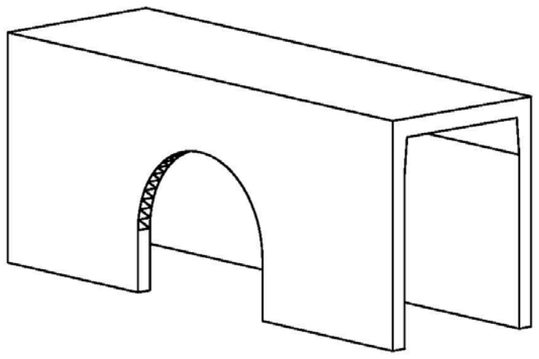
NTS

SHEET TITLE:

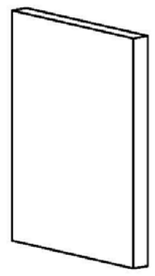
RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS

SHEET NUMBER:

5.0



TYPE VII



TYPE VII
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.

StormTrap
PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]
1287 WINDHAM PARKWAY
ROMEOVILLE, IL 60446
P:815-941-4549 / F:331-318-5347

ENGINEER INFORMATION:

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PROJECT INFORMATION:

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ISSUED FOR:

PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
1	1/24/2019	PRELIMINARY	GS

SCALE:

NTS

SHEET TITLE:

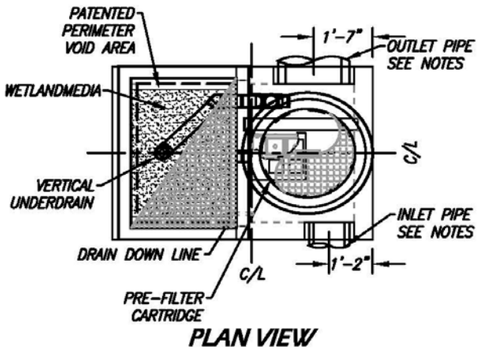
SINGLETRAP
MODULE TYPES

SHEET NUMBER:

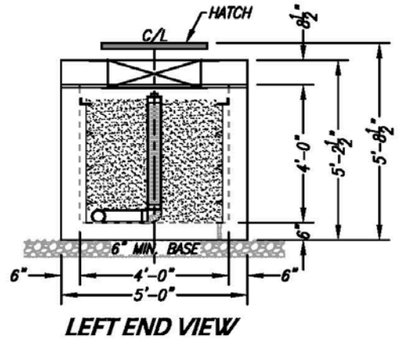
6.0

Modular Wetland System (MWS) Details

SITE SPECIFIC DATA			
PROJECT ID#		4085	
PROJECT NAME		BREEZE LUXURY APARTMENTS	
PROJECT LOCATION		OCEANSIDE, CA	
STRUCTURE ID		UNIT 1A	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
2279.00			
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	52.02	PVC	10"
INLET PIPE 2			
OUTLET PIPE	50.69	PVC	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	55.80	55.80	55.80
SURFACE LOAD	PARKWAY	PARKWAY	PARKWAY
FRAME & COVER	ø30"	30"X48"	N/A
WETLANDMEDIA VOLUME (CY)			1.30
WETLANDMEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			ø0.62"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. EOR TO PROVIDE AN ORIFICE AND DISCHARGE AT 0.01825CFS INTO MWS.			



PLAN VIEW



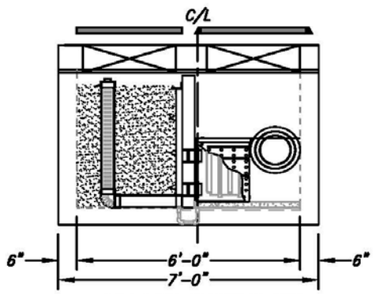
LEFT END VIEW

INSTALLATION NOTES

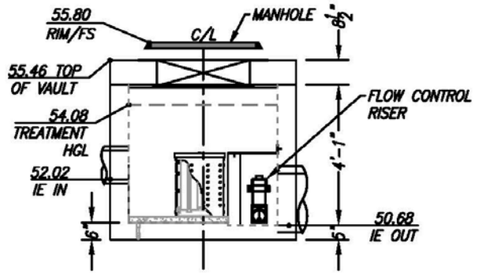
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER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

GENERAL NOTES

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



ELEVATION VIEW



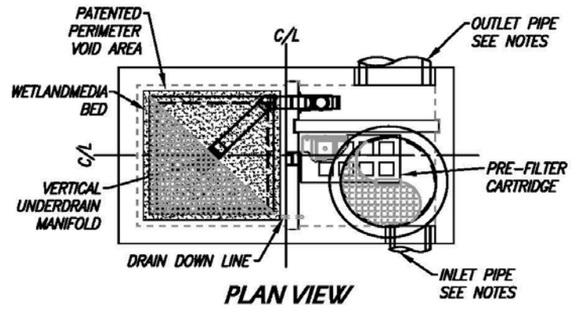
RIGHT END VIEW

REQUIRED TREATMENT VOLUME (CF)	2279
DRAINDOWN DURATION (HOURS)	34
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)	8.31
OPERATING HEAD (FT)	3.4
WETLANDMEDIA INFILTRATION RATE (IN/HR) OR	26
WETLANDMEDIA LOADING RATE (GPM/SF) OR	0.26

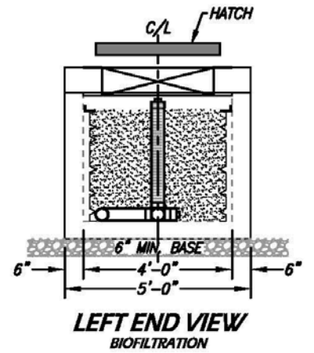
Bio Clean
A Forterra Company

MWS-L-4-6-4-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

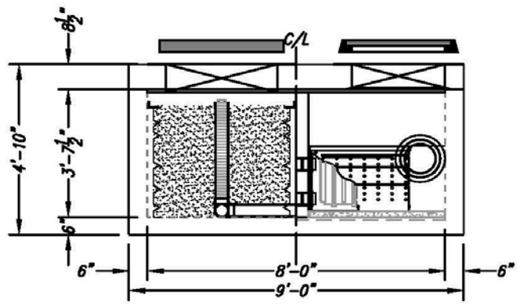
SITE SPECIFIC DATA			
PROJECT ID		4085.00	
PROJECT NAME		BREZZE LUXURY APARTMENTS	
PROJECT LOCATION		OCEANSIDE, CA	
STRUCTURE ID		UNIT 1B	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
3198.00			
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	49.52	PVC	10"
INLET PIPE 2			
OUTLET PIPE	48.19	PVC	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	53.30	53.30	53.30
SURFACE LOAD	H20 DIRECT	H20 DIRECT	H20 DIRECT
FRAME & COVER	ø30"	36"X36"	N/A
WETLANDMEDIA VOLUME (CY)			1.55
WETLANDMEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			ø0.75"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. EOR TO PROVIDE AN ORIFICE AND DISCHARGE AT 0.02456CFS INTO MWS.			



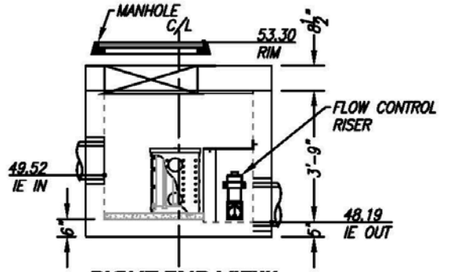
PLAN VIEW



LEFT END VIEW
BIOFILTRATION



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
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GENERAL NOTES

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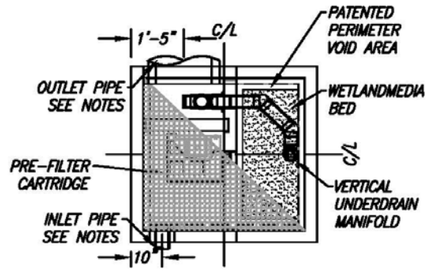
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

REQUIRED TREATMENT VOLUME (CF)	3198
DRAINDOWN DURATION (HOURS)	32
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)	12.31
OPERATING HEAD (FT)	3.2
WETLANDMEDIA INFILTRATION RATE (IN/HR)	26
OR	
WETLANDMEDIA LOADING RATE (GPM/SF)	0.26

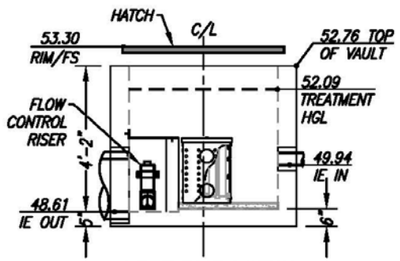
Bio Clean
A Forterra Company

MWS-L-4-8-3'-8"-UG-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

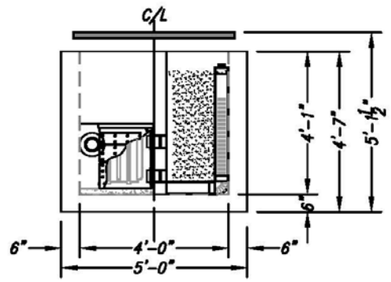
SITE SPECIFIC DATA			
PROJECT NUMBER		4085	
PROJECT NAME		BREEZE LUXURY APARTMENTS	
PROJECT LOCATION		OCEANSIDE, CA	
STRUCTURE ID		UNIT 2	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
1139			
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPES	49.94	N/K	4"
OUTLET PIPE	48.61	N/K	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	53.30	53.30	53.30
SURFACE LOAD	PEDESTRIAN	N/A	N/A
FRAME & COVER	48"X48"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			0.72
WETLANDMEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			ø0.52"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			



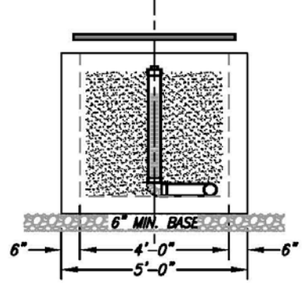
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

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GENERAL NOTES

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REQUIRED TREATMENT VOLUME (CF)	1139
DRAINDOWN DURATION (HOURS)	24
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)	5.92
OPERATING HEAD (FT)	3.4
WETLANDMEDIA INFILTRATION RATE (IN/HR)	26
OR	
WETLANDMEDIA LOADING RATE (GPM/SF)	0.26

Bio Clean
A Forterra Company

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

SITE SPECIFIC DATA*	
PROJECT NAME	
PROJECT LOCATION	
STRUCTURE ID	

PERFORMANCE DATA	
TREATMENT FLOW (CFS)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	DEPENDANT ON PIPE SIZE

PROJECT PARAMETERS			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1		PVC	8"
OUTLET PIPE	-4.13	PVC	8"
RIM ELEVATION	0.0		
SURFACE LOADING REQUIREMENT		PARKWAY	

FRAME & COVER	PRETREATMENT	BIOFILTRATION	DISCHARGE
	24"X36"	OPEN PLANTER	12"

WETLANDMEDIA VOLUME (CY)	1.7
MEDIA DELIVERED	TBD
ORIFICE SIZE (DIA)	
MAX PICK WEIGHT (LBS)	TBD

NOTES:
*PER ENGINEER OF RECORD

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
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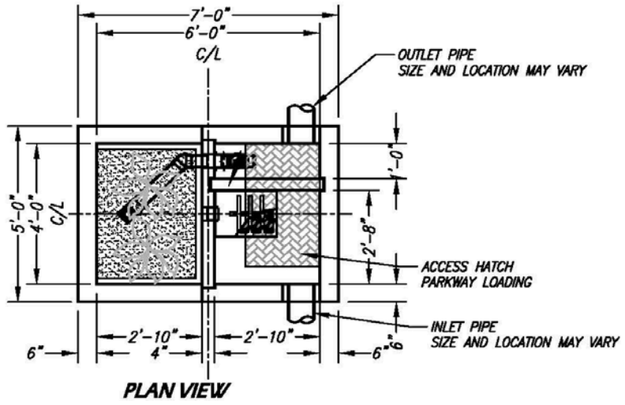
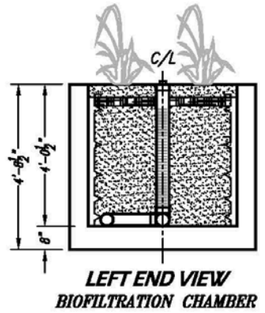
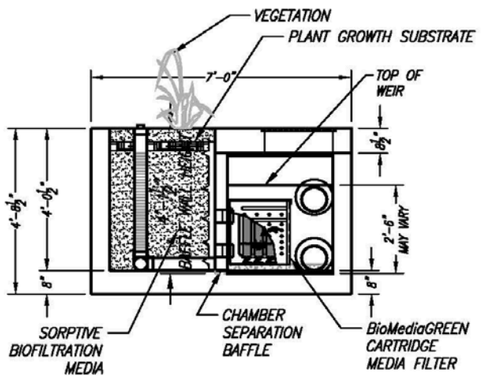


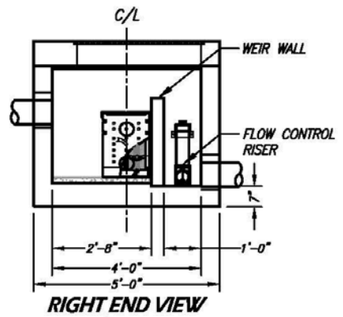
PLAN VIEW



LEFT END VIEW
BIOFILTRATION CHAMBER



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE CHAMBER

MWS UNIT DESIGN DATA	
TREATMENT CAPACITY (CFS)	0.071
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.5
WETLAND LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

MWS-L-4-6-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Vector Control Plan (required when structural BMPs will drain in 96 hours)

Not Applicable

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

Indicate which Items are Included:

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

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

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:

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

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

Final Design level submittal:

Attachment 3a must identify:

☐Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐How to access the structural BMP(s) to inspect and perform maintenance
☐Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐Recommended equipment to perform maintenance
☐When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

Structural BMP Maintenance Information

MAINTENANCE INDICATORS AND ACTIONS FOR DETENTION BMPS	
TYPICAL MAINTENANCE INDICATORS	**TYPICAL MAINTENANCE ACTIONS**
ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS	REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS WITHOUT DAMAGE TO THE VAULT. CONFIRM
STANDING WATER (BMP NOT DRAINING). IF MOSQUITO LARVAE ARE PRESENT AND PERSISTENT, CONTACT THE SAN DIEGO VECTOR CONTROL PROGRAM AT (858) 694-2888. MOSQUITO LARVICIDES SHOULD BE APPLIED ONLY WHEN ABSOLUTELY NECESSARY AND THEN ONLY BY A LICENSED INDIVIDUAL CONTRACTOR.	WHERE THERE IS AN UNDERDRAIN, SUCH AS IN PLANTER BOXES AND MANUFACTURED BIOFILTERS, CHECK THE UNDERDRAIN PIPING TO MAKE SURE IT IS INTACT AND UNOBSTRUCTED. ABATE ANY POTENTIAL VECTORS BY FILLING HOLES IN THE GROUND IN AND AROUND THE BIOFILTER FACILITY AND BY INSURING THAT THERE ARE NO AREAS WHERE WATER STANDS LONGER THAN 96 HOURS FOLLOWING A STORM.
OBSTRUCTED OUTLET INLET OR OUTLET STRUCTU	CLEAR OBSTRUCTIONS.
DAMAGE TO STRUCTURAL COMPONENTS SUCH AS WEIRS, INLET, OR OUTLET STRUCTURES	REPAIR OR REPLACE AS APPLICABLE.
BEFORE THE WET SEASON AND AFTER RAIN EVENTS: REMOVE SEDIMENT AND DEBRIS FROM SCREENS AND OVERFLOW DRAINS AND DOWNSPOUTS: ENSURE PUMPS ARE FUNCTIONING, WHERE APPLICABLE; CHECK INTEGRITY OF MOSQUITO SCREENS; AND; CHECK THAT COVERS ARE PROPERLY SEALED AND LOCKED.	WHERE CISTERNS ARE PART OF THE SYSTEM

MODULAR WETLAND SYSTEMS OPERATION AND MAINTENANCE
EVERY INSTALLED MWS-LINEAR UNIT IS TO BE MAINTAINED BY THE SUPPLIER, OR A SUPPLIER APPROVED CONTRACTOR FOR AT LEAST THE FIRST YEAR. THE COST OF THIS SERVICE VARIES AMONG OUTSIDE SERVICE PROVIDERS. THE MWS-LINEAR IS A MULTI-STAGE SELF-CONTAINED TREATMENT TRAIN FOR STORMWATER TREATMENT. EACH STAGE IS DESIGNED AND INTENDED TO PROTECT SUBSEQUENT STAGES FROM CLOGGINGS. STAGES INCLUDE SCREENING, SEPARATION, CARTRIDGE MEDIA FILTRATION, AND BIOFILTRATION. THE BIOFILTRATION STAGE CAN CONTAIN VARIOUS TYPES OF VEGETATION OR PLANTINGS. ANNUAL INSPECTION IS REQUIRED TO EVALUATE PLANT HEALTH AND TRIM EXCESS VEGETATION. THE MAINTENANCE PROCEDURES ARE DESCRIBED BELOW.
CLEAN CATCH BASIN FILTER - SCREENING IS PROVIDED BY A CATCH BASIN FILTER. THE FILTER WILL CONTAIN COARSE SEDIMENT, TRASH, AND OTHER FLOATABLES. SEDIMENT CAPACITY IS REACHED AT 2 CUBIC FEET FOR THE CURB STYLE INLET AND 4 CUBIC FEET FOR THE DROP OR GRATED INLET CONFIGURATION (VARIES WITH SMALLER AND LARGER MODELS). THE FILTER REMOVES GROSS SOLIDS, INCLUDING LITTER, AND SEDIMENT GREATER THAN 200 MICRONS. THE CLEANING PROCEDURE IS EASILY DONE BY HAND OR WITH A SMALL INDUSTRIAL VACUUM DEVICE. THIS FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE COVER OR CRATE FOR EASY ACCESS.
1. CLEAN PRE-TREATMENT CHAMBER - SEPARATION OCCURS IN THE PRE-TREATMENT CHAMBER'S SETTLING AREA LOCATED DIRECTLY UNDER THE CURB OR GRATED INLET. THIS CHAMBER HAS A CAPACITY OF APPROXIMATELY 21 CUBIC FEET FOR TRASH, DEBRIS, AND SEDIMENTS FOR MOST MODEL SIZES (VARIES WITH SMALLER AND LARGER MODELS). THE CHAMBER TARGET TOTAL SUSPENDED SOLIDS AND PARTICULATE METALS AND NUTRIENTS. CLEANING THE SETTLING AREA CAN BE PERFORMED WITH A STANDARD VACUUM TRUCK OR HAND HELD INDUSTRIAL SHOP VACUUM. THIS CHAMBER IS LOCATED DIRECTLY UNDER THE MANHOLE OR GRATE ACCESS COVER FOR EASY ACCESS INTO THE CHAMBER.
2. REPLACE PRE-FILTER CARTRIDGE MEDIA (BIOMEDIAGREEN™) - INITIAL FILTRATION IS PROVIDED BY A HORIZONTAL FLOW CARTRIDGE FILTER UTILIZING BIOMEDIAGREEN MEDIA. MEDIA LIFE DEPENDS ON LOCAL SEDIMENT LOADING CONDITIONS AND CAN EASILY BE REPLACED AND DISPOSED OF WITHOUT ANY EQUIPMENT. THE BIOMEDIAGREEN MEDIA IS HELD WITHIN THE MEDIA CARTRIDGE PRE-FILTERS THAT ARE HOUSED IN THE PRE-TREATMENT CHAMBER. ENTRY INTO THE PRE-TREATMENT CHAMBER IS REQUIRED TO REPLACE THE BIOMEDIAGREEN MEDIA. THE LID OF THE MEDIA CARTRIDGE PRE-FILTER IS REMOVED BY LOOSENING TWO BOLTS. ONCE REMOVED MAINTENANCE PERSONNEL HAVE UNIMPEDED ACCESS TO EACH MEDIA CAGE HOUSING THE BIOMEDIAGREEN WHICH CAN BE QUICKLY REMOVED BY HAND OR WITH A VACUUM TRUCK. ONCE OLD BIOMEDIAGREEN IS REMOVED NEW MATERIAL, PROVIDED IS PRE-WEIGHED BAGS, IS DROPPED INTO THE MEDIA CAGE HOUSINGS. ONCE COMPLETED, THE CARTRIDGE LID IS REPLACED AND BOLTS TIGHTENED ON THE LID OF THE MEDIA CARTRIDGE PRE-FILTER.

CONTINUE MODULAR WETLANDS SYSTEM MAINTENANCE AND OPERATION

3. REPLACE DRAIN DOWN FILTER MEDIA (BIOMEDIAGREEN™) - AN OPTIONAL DRAIN DOWN FILTER, SIMILAR IN FUNCTION TO THE MEDIA CARTRIDGE PRE-FILTER IS LOCATED IN THE DISCHARGE CHAMBER. THIS FILTER ALLOWS ANY STANDING WATER FROM THE PRE-TREATMENT CHAMBER TO DRAIN FROM UNDER THE PERVIOUS PAVERS THROUGH THE SMALL FILTRATION CARTRIDGE LOCATED IN THE DISCHARGE CHAMBER. THE DRAIN DOWN DEVICE ADDRESSES ANY VECTOR ISSUES, BY ELIMINATING ALL STANDING WATER WITHIN THE MWS-LINEAR. REPLACEMENT OF MEDIA CAN BE PERFORMED BY HAND.
4. TRIM VEGETATION - THE MWS-LINEAR UTILIZES MULTIPLE PLANTS IN THE WETLAND CHAMBER TO ENHANCE POLLUTANT REMOVAL. THE VEGETATION WILL NEED TO BE MAINTAINED (TRIMMED) AS NEEDED AND IS DONE AS PART OF REGULAR SITE LANDSCAPING OR SYSTEM MAINTENANCE. MODULAR WETLAND SYSTEMS, INC. RECOMMENDS THAT THE PLANTINGS ARE NEVER GIVEN ANY FERTILIZER TO PROMOTE PLANT GROWTH OR HEALTH.
5. EVALUATE FLOW HYDRAULIC CONDUCTIVITY - THE SYSTEM'S FLOW CHARACTERISTICS CAN BE ASSESSED FROM THE DISCHARGE CHAMBER. THIS INSPECTION FOR ADEQUATE FLOW CAPACITY SHOULD BE DONE DURING A RAIN EVENT. BY INSPECTION AND VIEWING THE DISCHARGE CHAMBER, THE FLOW OUT OF THE SYSTEM CAN BE EASILY OBSERVED OR MEASURE. IF FLOW OUT OF THE ORIFICE IS TOO LOW, IT COULD INDICATE MEDIA CARTRIDGE PRE-FILTER FOULING AND MAINTENANCE MAY NEED TO BE PROVIDED TO THE BIOMEDIAGREEN AS DESCRIBED ABOVE.
6. WETLANDMEDIA MAINTENANCE - BIOFILTRATION IS PROVIDED BY AN ADVANCED HORIZONTAL FLOW VEGETATED WETLAND CHAMBER. THIS BIOFILTRATION CONTAINS A MIX OF SORPTIVE MEDIA, KNOWN AS WETLANDMEDIA, WHICH IS DESIGNED TO SUPPORTS ABUNDANT PLANT AND BIOLOGICAL LIFE. THE LIFE OF THIS MEDIA CAN BE UP TO 20 YEARS WHEN PROPERLY MAINTAINED. THE PERIPHERAL VOID AREA SURROUNDING THE PERIMETER OF THE WETLANDMEDIA CAN BE ACCESSED TO REMOVE ANY SURFACE CLOGGING. THE VERTICAL RISERS IN THE MIDDLE OF THE WETLANDMEDIA CAN ALSO BE ACCESSED AND WATER INJECTED TO BACKWASH THE WETLANDMEDIA. THESE FEATURES ALLOW FULL FLOW CAPACITY CANNOT BE RESTORED BY THESE STEPS, THE WETLANDMEDIA CAN BE REPLACED.
7. WETLANDMEDIA REPLACEMENT - REMOVAL OF SPENT WETLANDMEDIA CAN BE DONE WITH A SHOVEL NOSE OF ANY VACUUM TRUCK. REPLACEMENT OF THE WETLANDMEDIA, ALTHOUGH NOT ANTICIPATED FOR 20 YEARS, IS DONE BY ADDING NEW WETLANDMEDIA FROM A NUMBER OF VENDOR SUPPLIED SUPERSACS AND ADDED TO FILL THE WETLAND CHAMBER TO RECOMMENDED LEVELS.

ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

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 propritery BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

Stormwater BMP Plan Sheet(s)

LEGEND

DMA NAME AREA (SQUARE FEET)	DMA–1 64,710 SF
SELF–MITIGATING DMA	SM–1
SELF–RETAINING DMA	SR–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

PROJECT CHARACTERISTICS	
PARCEL AREA	2.66 ACRES
DISTURBED AREA	2.13 ACRES
PROPOSED IMPERVIOUS AREA	1.72 ACRES
PROPOSED PERVIOUS AREA	0.41 ACRES
SOIL TYPE	D
DEPTH TO GROUNDWATER	> 20 FEET

GENERAL MAINTENANCE NOTES

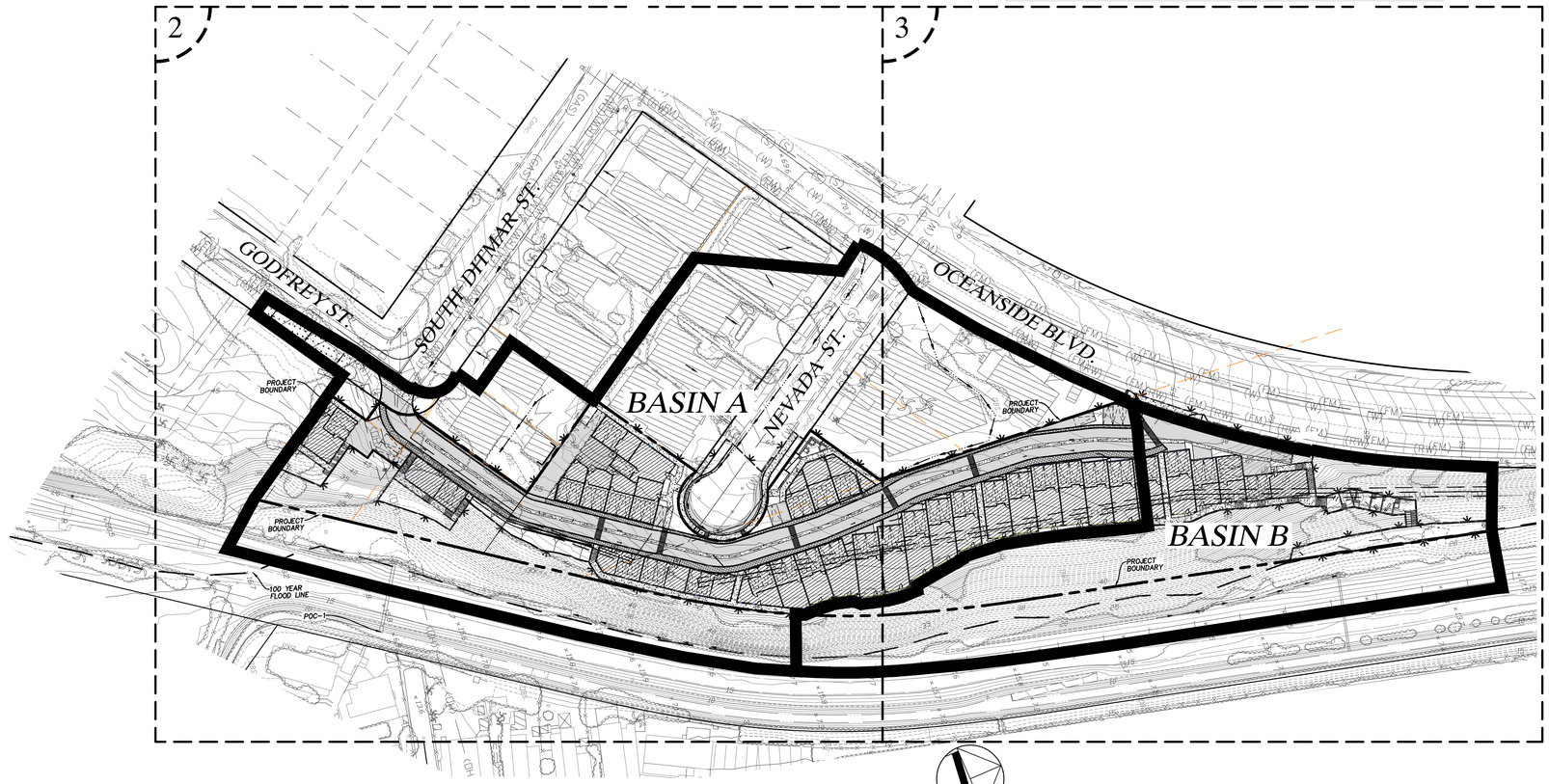
1. SEE STORMTRAP DETAILS FOR SITE SPECIFIC MAINTENANCE INDICATORS AND ACTIONS.
2. STORMTRAP VAULTS WILL INCLUDE TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
3. MODULAR WETLAND SYSTEM WILL INCLUDE A MANHOLE AND HATCH FOR INSPECTION AND MAINTENANCE.
4. HATCH ON MANHOLES CAN BE REMOVED FOR INSPECTING ALL UNDERGROUND COMPONENTS THAT REQUIRE INSPECTION AND MAINTENANCE.

MAINTENANCE INDICATORS AND ACTIONS FOR DETENTION BMPS	
TYPICAL MAINTENANCE INDICATORS	TYPICAL MAINTENANCE ACTIONS
ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS	REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS WITHOUT DAMAGE TO THE VAULT. CONFIRM THAT SOIL IS NOT CLOGGING AND THAT THE AREA DRAINS AFTER STORM EVENT.
STANDING WATER (BMP NOT DRAINING). IF MOSQUITO LARVAE ARE PRESENT AND PERSISTENT, CONTACT THE SAN DIEGO VECTOR CONTROL PROGRAM AT (858) 694-2888. MOSQUITO LARVICIDES SHOULD BE APPLIED ONLY WHEN ABSOLUTELY NECESSARY AND THEN ONLY BY A LICENSED INDIVIDUAL CONTRACTOR.	WHERE THERE IS AN UNDERDRAIN, SUCH AS IN PLANTER BOXES AND MANUFACTURED BIOFILTERS, CHECK THE UNDERDRAIN PIPING TO MAKE SURE IT IS INTACT AND UNOBSTRUCTED. ABATE ANY POTENTIAL VECTORS BY FILLING HOLES IN THE GROUND IN AND AROUND THE BIOFILTER FACILITY AND BY INSURING THAT THERE ARE NO AREAS WHERE WATER STANDS LONGER THAN 96 HOURS FOLLOWING A STORM.
OBSTRUCTED OUTLET INLET OR OUTLET STRUCTURE	CLEAR OBSTRUCTIONS.
DAMAGE TO STRUCTURAL COMPONENTS SUCH AS WEIRS, INLET, OR OUTLET STRUCTURES	REPAIR OR REPLACE AS APPLICABLE.
BEFORE THE WET SEASON AND AFTER RAIN EVENTS: REMOVE SEDIMENT AND DEBRIS FROM SCREENS AND OVERFLOW DRAINS AND DOWNSPOUTS: ENSURE PUMPS ARE FUNCTIONING, WHERE APPLICABLE; CHECK INTEGRITY OF MOSQUITO SCREENS; AND; CHECK THAT COVERS ARE PROPERLY SEALED AND LOCKED.	WHERE CISTERNS ARE PART OF THE SYSTEM

SUMMARY OF DMAS:

DMA ID	DMA Surface Type	DMA Area (sq. ft.)	DMA Type	Proposed Structural BMP Type	Structural BMP ID	Total Detention Vault Volume (ft^3)	MWS Treatment Capacity / Volume (ft^3)/FLOW (cfs)
DMA-1A [1]	Roof, Dwy, Landscape	39,698	Drains to BMP	Detention Vault + MWS	BMP-1A	3,411	2,279
DMA-1B [2]	Roof, Dwy, Landscape	21,866	Drains to BMP	Detention Vault + MWS	BMP-1B	5,228	3,198
DMA-2	Street, Sidewalk, Ldsp	10,998	Drains to BMP	Detention Vault + MWS	BMP-2	1,169	1,139
SM-1	Street, Sidewalk, Ldsp	1,293	Self-Mitigating	-	-	-	-
SM-2	Street, Sidewalk, Ldsp	1,532	Self-Mitigating	-	-	-	-
SM-3	Street, Sidewalk, Ldsp	1,107	Self-Mitigating	-	-	-	-
SM-4	Street, Sidewalk, Ldsp	32,993	Self-Mitigating	-	-	-	-
SM-5	DG, Ldsp	12,256	Self-Mitigating	-	-	-	-
SM-6	Landscape	46,628	Self-Mitigating	-	-	-	-
OS-1-T	Street, Sidewalk, Ldsp	2,357	Drains to BMP	MWS	BMP-OS-T	-	0.076
DMIN-1	Street	657	De Minimis	-	-	-	-
SR-1	Street, Sidewalk, Ldsp	1,759	Self-Retaining	-	-	-	-

NOTES
1) 24,017 SF OF 39,698 SF OF DMA IS TREATED IN BMP 1A. 15,681 SF BYPASSES TO BMP 1B .
2) 15,681 SF BYPASSES TO BMP 1A. TOTAL TREATED BY BMP 1B IS 37,547 SF.



60' 30' 0' 60' 120' 180'
SCALE: 1" = 60'

KEY MAP

SHEET INDEX

REGISTERED PROFESSIONAL ENGINEER
RONALD L HOLLOWAY
NO. 29271
CIVIL
STATE OF CALIFORNIA

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land planning, civil engineering, surveying
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(760) 931–8700

BMP EXHIBIT
BREEZE
(LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA

SHEET 1 OF 4

GODFREY ST.

SOUTH DITMAR ST.

NEVADA ST.

NCTD RIGHT-OF-WAY

IMPERVIOUS AREA DISPERSION BMP, SOIL WITH LONG TERM INFILTRATION CAPACITY CAPABLE OF SUPPORTING DROUGHT TOLERANT VEGETATION, SEE DETAIL SHEET 4

PROJECT BOUNDARY

DMA SR-1
1,759 SF

OS-1
38,795 SF

OS-2
10,121 SF

PROP. TYPE G-1 INLET
53.20 RIM
46.90 IE

PROP. TYPE G-1 INLET
53.51 RIM
47.51 IE

SM-1
1,293 SF

SM-2
1,532 SF

SM-3
1,107 SF

SM-4
32,993 SF

SM-6
46,628 SF

DMA 1
61,564 SF

DMA OS-1-TREATMENT
2,357 SF

MWS-1B

BMP-1B

MWS-1A

BMP-1A

MWS-DS-1-1

PROP. TYPE G-1 INLET
59.05 RIM
52.20 IE

PROP. CURB INLET TO INTERCEPT RUN-OFF, SEE DETAIL SHEET 4
60.55 RIM
54.50 IE

PROP. TYPE G-1 INLET
60.06 RIM
54.06 IE

PROP. TYPE G-1 INLET
57.57 RIM
51.16 IE

PROP. DIVERSION BOX, SEE DETAIL SHEET 4

EXIST. RAILROAD TRACKS

EXIST. CONCRETE DITCH

EXIST. TYPE F CATCH BASIN

EXIST. 30" CULVERT PER SPRINTER GRADING PLAN

POC 1

100 YEAR FLOOD LINE

BUILDING A
BUILDING B
BUILDING C
BUILDING E
BUILDING F
BUILDING G

SEE SHEET 3

LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	64,710 SF
SELF-MITIGATING DMA	SM-1
DE MINIMIS DMA	DMIN-1
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
CONCRETE AREA, PCC	
ASPHALT, AC	
FLOW DIRECTION	
LANDSCAPE PLANTER/LANDSCAPING	P
DECOMPOSED GRANITE	DG
ROOF DOWNSPOUT	

20' 10' 0' 20' 40' 60'

SCALE: 1" = 20'

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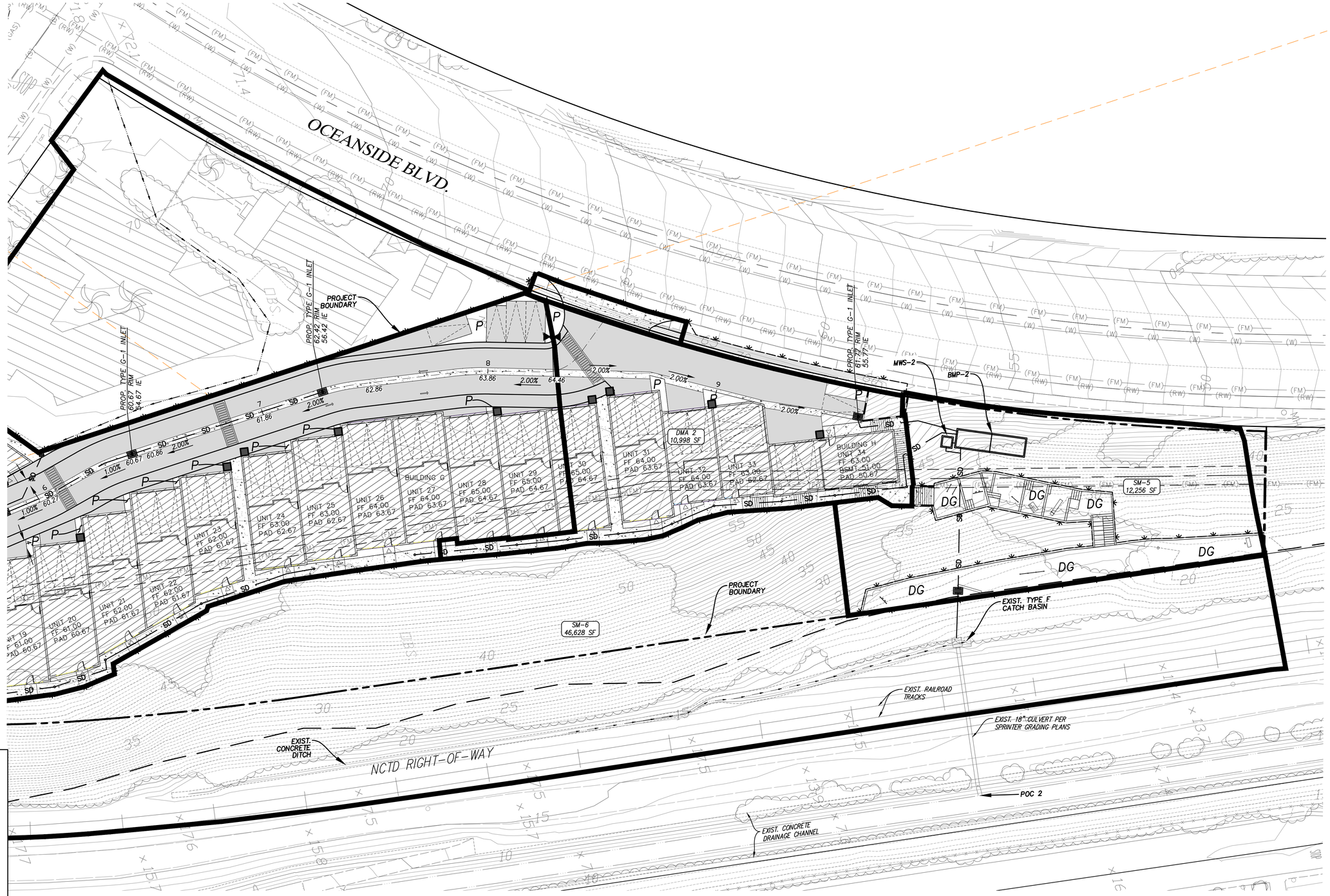
SEE SHEET 2



LEGEND

DMA NAME	DMA–1
AREA (SQUARE FEET)	64,710 SF
SELF–MITIGATING DMA	SM–1
DE MINIMIS DMA	DMIN–1
DMA POINT OF COMPLIANCE (POC)	POC–1
DMA BOUNDARY	
PROJECT BOUNDARY	
ROOF AREA, R	
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HYDROMODIFICATION & TREATMENT CONTROL BMPS

DEVELOPED CONDITIONS

STORMWATER RUNOFF FROM THE PROPOSED PROJECT SITE IS ROUTED TO ONE (1) POINTS OF COMPLIANCE, POC-1 LOCATED NEAR THE SOUTHEAST CORNER OF THE PROJECT SITE. POC-1 COLLECTS RUNOFF FROM TWO SEPARATE DRAINAGE BASINS, BASIN A AND BASIN B. BOTH CONVEYANCES CONFLUENCE IN THE CONCRETE CHANNEL SOUTH OF NCTD RAILROAD RIGHT-OF-WAY BELOW THE PROJECT .

PRIOR TO DISCHARGING FROM THE PROJECT SITE, DEVELOPED ON-SITE RUNOFF (DMA-1 & DMA-2) IS DRAINED TO TWO (2) ONSITE RECEIVING UNDERGROUND DETENTION FACILITIES (HYDROMODIFICATION-BMPS OR HMP-BMPS) BEFORE FLOWS ARE TREATED IN MODULAR WETLAND SYSTEMS (PROPRIETARY BIOFILTRATION BMPS) FOR WATER QUALITY PURPOSES.

DEVELOPED OFF-SITE RUNOFF (DMA-3) IS DRAINED TO ONE (1) MODULAR WETLAND SYSTEM (PROPRIETARY BIOFILTRATION BMP) FOR WATER QUALITY PURPOSES.

THE EXISTING SLOPES ALONG THE EASTERN PROJECT BOUNDARY (SM-1, SM-2, SM-3-, SM-4, SM-5 & SM-6) ARE UNABLE TO DRAIN TO THE RECEIVING UNDERGROUND DETENTION FACILITIES AND PROPRIETARY BIOFILTRATION BMPS AND BYPASS THESE FACILITIES, DRAINING DIRECTLY TO POC-1.

A PORTION OF THE OFFSITE PROPOSED STREET IMPROVEMENTS ALONG GODFREY STREET (SR-1) ARE UNABLE TO DRAIN TO POC-1. UPSTREAM OFF-SITE AREAS BYPASS THE UNDERGROUND DETENTION FACILITIES AND BIOFILTRATION BMP AND DRAIN DIRECTLY TO POC-1.

DESCRIPTION OF SYSTEM

THE MODULAR WETLAND SYSTEMS - LINEAR (MWS-LINEAR) IS A STRUCTURAL STORMWATER TREATMENT SYSTEM DEVELOPED BY MODULAR WETLAND SYSTEMS, INC. THE MWS-LINEAR UTILIZES A MULTI-STAGE TREATMENT PROCESSES, INCLUDING A PRE-TREATMENT CHAMBER THAT HOUSES A SETTLING BASIN AND A MEDIA CARTRIDGE PRE-FILTERS THAT ARE DESIGNED TO REMOVE COARSE TO FINE SEDIMENT AND HYDROCARBONS FROM ENTERING THE SUBSEQUENT WETLAND CHAMBER. THE WETLAND CHAMBER MEDIA PROVIDES CHEMICAL AND BIOLOGICAL FILTRATION AND SECONDARY PHYSICAL FILTRATION. THIS SYSTEM IS HOUSED IN A MODULAR PRECAST CONCRETE STRUCTURE THAT CAN BE DESIGNED IN MANY INLET CONFIGURATIONS. THE MWS-LINEAR PROVIDES WATER QUALITY TREATMENT OF CAPTURED FLOWS THROUGH THE PROCESSES OF SEPARATION, SEDIMENTATION, FILTRATION, ADSORPTION, SEQUESTRATION, VOLATILZATION, ION EXCHANGE, BIOLOGICAL REMEDIATION, AND UPTAKE.

THE MWS-LINEAR STORMWATER FILTRATION SYSTEM PROVIDES WATER QUALITY TREATMENT OF CAPTURED FLOWS THROUGH SEVERAL PHYSICAL, BIOLOGICAL, AND CHEMICAL UNIT PROCESSES. THIS SECTION DESCRIBED THE SYSTEM'S PHYSICAL COMPONENTS, TREATMENT PROCESSES AND REMOVAL MECHANISMS, SIZING METHODS, EXPECTED TREATMENT CAPABILITIES, EXPECTED DESIGN LIFE, AND REQUIRES MAINTENANCE PROCEDURES.

SYSTEM OVERVIEW

THE MWS-LINEAR CAN BE USED IN A VARIETY OF CONFIGURATIONS, INCLUDING CURB, GRATE, AND VAULT-TYPE (PIPED), OFFLINE-DVERT DOWNSPOUT AND VOLUME BASED DESIGNS. NEW CONSTRUCTION AND STORMWATER RETROFIT PROJECTS CAN UTILIZE THE MODULAR DESIGN OF THE MWS-LINEAR IN PLACE OF STANDARD CATCH BASIN STRUCTURES, RAIN GARDENS, BIORETENTION CELLS, MEDIA FILTERS, OR OTHER TREATMENT DEVICES. A VARIETY OF INLET, BYPASS, AND WETLAND CHAMBER DESIGNS ARE AVAILABLE FOR THE MWS-LINEAR AND CAN BE EASILY BE ADAPTED FOR DIFFERENT STORMWATER DRAINAGE SYSTEM DESIGNS AND NEEDS. HOWEVER, THE HYDRAULICS WITHIN THE SYSTEM ITSELF AND THE TREATMENT PROCESSES ARE THE SAME FOR EACH OF THESE CONFIGURATIONS.

STORMWATER RUNOFF ENTERS THE MWS-LINEAR VIA PIPE, CURB, OR GRATE OPENING. FOR THE MWS-LINEAR WITH A GRATE OR CURB-TYPE OPENING, A CATCH BASIN FILTER INSERT FACILITATES THE REMOVAL OF GRASS SOILS AND FLOATABLE TRASH PRIOR TO THE STORMWATER ENTERING THE PRE-TREATMENT CHAMBER. FOR THE MWS-LINEAR WITH PIPE OPENINGS, STORMWATER ENTERS THE PRE-TREATMENT CHAMBER DIRECTLY. THE PRE-TREATMENT CHAMBER IS SPECIFICALLY DESIGNED TO SETTLE OUT TRASH AND LITTER, GROSS SOLIDS, AND SUSPENDED SEDIMENT. STORMWATER IS THEN TREATED BY THE MEDIA CARTRIDGE PRE-FILTERS, WHICH REMOVES SEVERAL POLLUTANTS, FINE TSS, AND HYDROCARBONS TO PROTECT THE WETLAND CHAMBER FROM CLOGGING. AFTER THE STORMWATER MOVES THROUGH THE MEDIA CARTRIDGE PRE-FILTER, IT ENTERS THE WETLAND CHAMBER, WHICH ACTS AS A BIOFILTER AND IS THE MAIN TREATMENT COMPONENT OF THE SYSTEM. THE MWS-LINEAR PROCESSES STORMWATER HORIZONTALLY THROUGH THE BIOFILTRATION MEDIA CONTAINED WITHIN THE WETLAND CHAMBER. WITHIN THE WETLAND CHAMBER, A COMBINATION OF PHYSICAL, CHEMICAL, AND BIOLOGICAL MECHANISMS REMOVE ADDITIONAL PARTICULATE AND SOLUBLE POLLUTANTS. TREATED RUNOFF LEAVING THE WETLAND CHAMBER IS CONTROLLED BY A DOWNSTREAM ORIFICE OR FLOW CONTROL STRUCTURE IN THE DISCHARGE CHAMBER AND LEAVES THE SYSTEM VIA THE DISCHARGE CHAMBER PIPING. THE HYDRAULIC CONDUCTIVITY OF THE BIOFILTRATION MEDIA CONTAINED WITHIN THE WETLAND CHAMBER IS HIGHER THAN THE SET ORIFICE RATE. IN THE MANNER THE BIOFILTRATION MEDIA HAS BUILT-IN HYDRAULIC SAFETY FACTOR TO ENSURE SUSTAINED TREATMENT FLOW RATES.

OPERATION AND MAINTENACE

EVERY INSTALLED MWS-LINEAR UNIT IS TO BE MAINTAINED BY THE SUPPLIER, OR A SUPPLIER APPROVED CONTRACTOR FOR AT LEAST THE FIRST YEAR. THE COST OF THIS SERVICE VARIES AMONG OUTSIDE SERVICE PROVIDERS. THE MWS-LINEAR IS A MULTI-STAGE SELF-CONTAINED TREATMENT TRAIN FOR STORMWATER TREATMENT. EACH STAGE IS DESIGNED AND INTENDED TO PROTECT SUBSEQUENT STAGES FROM CLOGGINGS. STAGES INCLUDE SCREENING, SEPARATION, CARTRIDGE MEDIA FILTRATION, AND BIOFILTRATION. THE BIOFILTRATION STAGE CAN CONTAIN VARIOUS TYPES OF VEGETATION OR PLANTINGS. ANNUAL INSPECTION IS REQUIRED TO EVALUATE PLANT HEALTH AND TRIM EXCESS VEGETATION. THE MAINTENANCE PROCEDURES ARE DESCRIBED BELOW.

CLEAN CATCH BASIN FILTER - SCREENING IS PROVIDED BY A CATCH BASIN FILTER. THE FILTER WILL CONTAIN COARSE SEDIMENT, TRASH, AND OTHER FLOATABLES. SEDIMENT CAPACITY IS REACHED AT 2 CUBIC FEET FOR THE CURB STYLE INLET AND 4 CUBIC FEET FOR THE DROP OR GRATED INLET CONFIGURATION (VALUES WITH SMALLER AND LARGER MODELS). THE FILTER REMOVES GROSS SOLIDS, INCLUDING LITTER, AND SEDIMENT GREATER THAN 200 MICRONS. THE CLEANING PROCEDURE IS EASILY DONE BY HAND OR WITH A SMALL INDUSTRIAL VACUUM DEVICE. THIS FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE COVER OR CRATE FOR EASY ACCESS.

1. CLEAN PRE-TREATMENT CHAMBER - SEPARATION OCCURS IN THE PRE-TREATMENT CHAMBER'S SETTLING AREA LOCATED DIRECTLY UNDER THE CURB OR GRATED INLET. THIS CHAMBER HAS A CAPACITY OF APPROXIMATELY 21 CUBIC FEET FOR TRASH, DEBRIS, AND SEDIMENTS FOR MOST MODEL SIZES (VARIES WITH SMALLER AND LARGER MODELS). THE CHAMBER TARGET TOTAL SUSPENDED SOLIDS AND PARTICULATE METALS AND NUTRIENTS. CLEANING THE SETTLING AREA CAN BE PERFORMED WITH A STANDARD VACUUM TRUCK OR HAND HELD INDUSTRIAL SHOP VACUUM. THIS CHAMBER IS LOCATED DIRECTLY UNDER THE MANHOLE OR GRATE ACCESS COVER FOR EASY ACCESS INTO THE CHAMBER.

2. REPLACE PRE-FILTER CARTRIDGE MEDIA (BIOMEDIAGREEN™) - INITIAL FILTRATION IS PROVIDED BY A HORIZONTAL FLOW CARTRIDGE FILTER UTILIZING BIOMEDIAGREEN MEDIA. MEDIA LIFE DEPENDS ON LOCAL SEDIMENT LOADING CONDITIONS AND CAN EASILY BE REPLACED AND DISPOSED OF WITHOUT ANY EQUIPMENT. THE BIOMEDIAGREEN MEDIA IS HELD WITHIN THE MEDIA CARTRIDGE PRE-FILTERS THAT ARE HOUSED IN THE PRE-TREATMENT CHAMBER. ENTRY INTO THE PRE-TREATMENT CHAMBER IS REQUIRED TO REPLACE THE BIOMEDIAGREEN MEDIA. THE LID OF THE MEDIA CARTRIDGE PRE-FILTER IS REMOVED BY LOOSENING TWO BOLTS. ONCE REMOVED MAINTENANCE PERSONNEL HAVE UNIMPEDED ACCESS TO EACH MEDIA CAGE HOUSING THE BIOMEDIAGREEN WHICH CAN BE QUICKLY REMOVED BY HAND OR WITH A VACUUM TRUCK. ONCE OLD BIOMEDIAGREEN IS REMOVED NEW MATERIAL, PROVIDED IS PRE-WEIGHED BAGS, IS DROPPED INTO THE MEDIA CAGE HOUSINGS. ONCE COMPLETED, THE CARTRIDGE LID IS REPLACED AND BOLTS TIGHTENED ON THE LID OF THE MEDIA CARTRIDGE PRE-FILTER.

3. REPLACE DRAIN DOWN FILTER MEDIA (BIOMEDIAGREEN™) - AN OPTIONAL DRAIN DOWN FILTER, SIMILAR IN FUNCTION TO THE MEDIA CARTRIDGE PRE-FILTER IS LOCATED IN THE DISCHARGE CHAMBER. THIS FILTER ALLOWS ANY STANDING WATER FROM THE PRE-TREATMENT CHAMBER TO DRAIN FROM UNDER THE PERVIOUS PAVERS THROUGH THE SMALL FILTRATION CARTRIDGE LOCATED IN THE DISCHARGE CHAMBER. THE DRAIN DOWN DEVICE ADDRESSES ANY VECTOR ISSUES, BY ELIMINATING ALL STANDING WATER WITHIN THE MWS-LINEAR. REPLACEMENT OF MEDIA CAN BE PERFORMED BY HAND.

4. TRIM VEGETATION - THE MWS-LINEAR UTILIZES MULTIPLE PLANTS IN THE WETLAND CHAMBER TO ENHANCE POLLUTANT REMOVAL. THE VEGETATION WILL NEED TO BE MAINTAINED (TRIMMED) AS NEEDED AND IS DONE AS PART OF REGULAR SITE LANDSCAPING OR SYSTEM MAINTENANCE. MODULAR WETLAND SYSTEMS, INC. RECOMMENDS THAT THE PLANTINGS ARE NEVER GIVEN ANY FERTILIZER TO PROMOTE PLANT GROWTH OR HEALTH.
5. EVALUATE FLOW HYDRAULIC CONDUCTIVITY - THE SYSTEM'S FLOW CHARACTERISTICS CAN BE ASSESSED FROM THE DISCHARGE CHAMBER. THIS INSPECTION FOR ADEQUATE FLOW CAPACITY SHOULD BE DONE DURING A RAIN EVENT. BY INSPECTION AND VIEWING THE DISCHARGE CHAMBER, THE FLOW OUT OF THE SYSTEM CAN BE EASILY OBSERVED OR MEASURE. IF FLOW OUT OF THE ORIFICE IS TOO LOW, IT COULD INDICATE MEDIA CARTRIDGE PRE-FILTER FOULING AND MAINTENANCE MAY NEED TO BE PROVIDED TO THE BIOMEDIAGREEN AS DESCRIBED ABOVE.

6. WETLANDMEDIA MAINTENANCE - BIOFILTRATION IS PROVIDED BY AN ADVANCED HORIZONTAL FLOW VEGETATED WETLAND CHAMBER. THIS BIOFILTRATION CONTAINS A MIX OF SORPTIVE MEDIA, KNOWN AS WETLANDMEDIA, WHICH IS DESIGNED TO SUPPORTS ABUNDANT PLANT AND BIOLOGICAL LIFE. THE LIFE OF THIS MEDIA CAN BE UP TO 20 YEARS WHEN PROPERLY MAINTAINED. THE PERIPHERAL VOID AREA SURROUNDING THE PERIMETER OF THE WETLANDMEDIA CAN BE ACCESSED TO REMOVE ANY SURFACE CLOGGING. THE VERTICAL RISERS IN THE MIDDLE OF THE WETLANDMEDIA CAN ALSO BE ACCESSED AND WATER INJECTED TO BACKWASH THE WETLANDMEDIA. THESE FEATURES ALLOW FULL FLOW CAPACITY CANNOT BE RESTORED BY THESE STEPS, THE WETLANDMEDIA CAN BE REPLACED.

7. WETLANDMEDIA REPLACEMENT - REMOVAL OF SPENT WETLANDMEDIA CAN BE DONE WITH A SHOVEL NOSE OF ANY VACUUM TRUCK. REPLACEMENT OF THE WETLANDMEDIA, ALTHOUGH NOT ANTICIPATED FOR 20 YEARS, IS DONE BY ADDING NEW WETLANDMEDIA FROM A NUMBER OF VENDOR SUPPLIED SUPERSACS AND ADDED TO FILL THE WETLAND CHAMBER TO RECOMMENDED LEVELS.

TABLE 2 - SUMMARY OF UNDERGROUND DETENTION BASINS, HMP-BMPs:

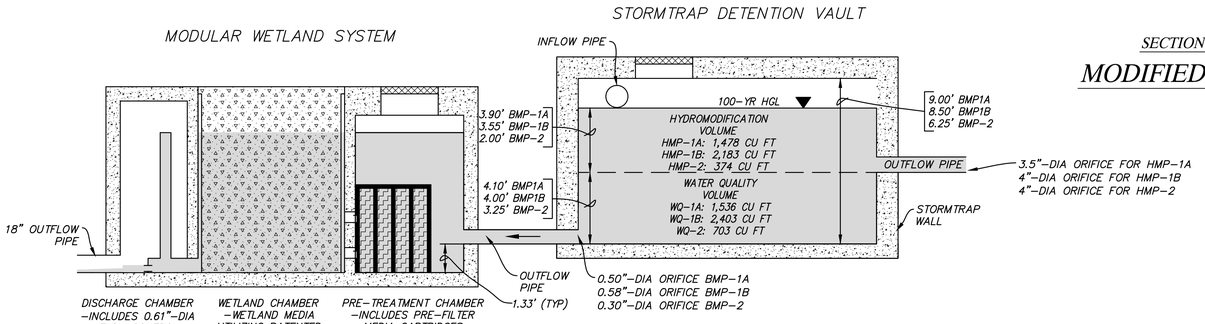
BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[3] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of undergound HMP vault; tied with maximum 36 hour drawdown time.



DETENTION VAULT & MWS DETAILS

NOT TO SCALE

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-2	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.

2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.

3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.

4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.

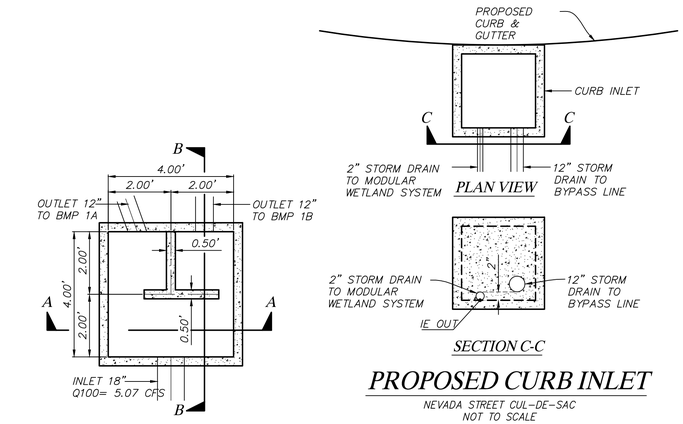
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHED. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.

2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

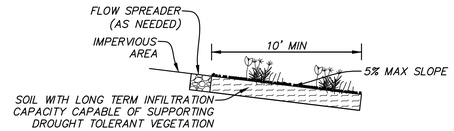


PROPOSED CURB INLET

NEVADA STREET CUL-DE-SAC
NOT TO SCALE

MODIFIED TYPE A-4 CLEAN OUT DETAIL

NOT TO SCALE



IMPERVIOUS AREA DISPERSION DETAIL

SITE DESIGN BMP SD-5, NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
RONALD I HOLLOWAY
NO. 29271
CIVIL
STATE OF CALIFORNIA

bHA, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

BMP EXHIBIT
BREEZE
(LUXURY TOWNHOMES)

CITY OF OCEANSIDE, CALIFORNIA

ATTACHMENT 5
Drainage Report

Drainage Report

ATTACHMENT 6
Geotechnical and Groundwater Investigation Report

Geotechnical and Groundwater Investigation Report

ATTACHMENT 7
Storm Water Quality Assessment Form

Storm Water Quality Assessment Form

City of Oceanside – Engineering Division – Clean Water Program

STORM WATER QUALITY ASSESSMENT FOR PLANNING, ENGINEERING, AND BUILDING PERMIT APPLICATIONS

All applications for Planning, Engineering, or Building Division permits are required to complete this assessment form and include it as part of the initial permit application submittal. Staff will review the permit application content to determine the applicability of State and City storm water requirements. Please note a storm water assessment cannot be provided without a complete permit application package.

Section 1 – Project Information	
Applicant Name: Oceanside-Nevada, LP	Phone Number: (941) 587-0210
Project Name: Breeze Luxury Apartments	Email Address (Optional):
Project Site Address: Nevada Street, Oceanside, CA 92056	Street Intersection: East End of Nevada Street (1200 Block)
Assessor Parcel Number(s): 152-123-05 & 20, 152-121-06, 152-320-11	Total Parcel Area (acres or square feet): 113,439 sf
Project Description: Development of three multiple-unit apartment buildings and storm water improvements	Proposed Project Impervious Area (acres or square feet): 90,652 sf

Section 2 – Identify Project Type	
☒	New Development Project – go to Section 3
☐	Redevelopment Project go to Section 3
☐	None of the above – Skip Section 3 and go to Section 4

Section 3 – Identify Applicable Priority Development Project Categories	
☒	**New Development Project** – A project that creates 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
☐	**Redevelopment Project** – A project that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
☐	**Restaurants** – Category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812); where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☒	**Hillside Development** – Category includes development on any natural slope that is twenty-five percent or greater; where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☒	**Parking Lots** – Category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce; where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☒	**Streets, Roads, Highways, Freeways, and Driveways** – Category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles; where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Water Quality Environmentally Sensitive Area** – New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to a Water Quality Environmentally Sensitive Area (WQESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the WQESA, 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).
☐	**Automotive Repair Shop** – Category is defined as a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539, where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Retail Gasoline Outlet (RGOs)** – Category includes RGOs that meet the following criteria (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day; where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☒	**Development Projects greater than one acre** – New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.
☐	**None of the Above**

City of Oceanside – Engineering Division – Clean Water Program

STORM WATER QUALITY ASSESSMENT FOR PLANNING, ENGINEERING, AND BUILDING PERMIT APPLICATIONS

Section 4 – Identify Permit Application Type	
☒	**Discretionary Permit Application**: Specific Plan (S), General Plan Amendment (GPA), Zone Amendment (ZA), Tentative Map (T), Tentative Parcel Map (P), Development Plan (D), Conditional Use Permit (CUP), Variance (V), Regular Coastal Permit (RC), Historic Permit (H), Reclamation Plan, Planned Development Permit, Planned Unit Development Permit, Planning Commission Approval of Plans, Site Plan Review, Tentative Map Amendments to Conditions of Approval or Time Extension, Variance.
☐	**Administrative Permit Application**: Administrative Clearing Permit, Lot Line Adjustment, Final Map Modification, Grading Plan (including modification or renewal), Improvement Plan (including modification), Landscape Plan, Building Permit, Construction Right-of-Way Permit, Encroachment Permit, Excavation Permit, On-site Wastewater System Permit, Underground Tank Permit, Well Permit, or etc.

Section 5 – Applicant Certification	
Name of Responsible Party: Oceanside-Nevada, LP	Phone Number: (941) 587-0210
Email Address (optional): HOWARD@JACOBSTRUST.COM	FAX Number (optional):
I understand and acknowledge the City of Oceanside has adopted minimum requirements, as mandated by the San Diego Regional Water Quality Control Board – Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100 (NPDES NO. CAS0109266) for mitigating impacts associated with urban runoff, including storm water from construction and land development activities. I certify this assessment has been accurately completed to the best of my knowledge and is consistent with the proposed project. I acknowledge that non-compliance with the City Best Management Practice (BMP) Design Manual, Grading Ordinance, and Erosion Control Ordinance may result in enforcement action by the City, the California State Water Resources Control Board, and/or the San Diego Regional Water Quality Control Board. Enforcement action may include stop work orders, notice of violation, fines, or other actions.	
Applicant Signature: AS PRESIDENT of GENERAL PARTNER	Date: 10-20-16

ATTACHMENT 8
HMP Study

HYDROMODIFICATION MANAGEMENT PLAN (HMP)
SWMM Modeling for Hydromodification Compliance of:

Breeze Luxury Townhomes
P16-00004

East End of Nevada Street (1200 Block)
Oceanside, CA 92054
152-121-06, 152-123-05, 152-123-20 and 152-320-11

Prepared For:

Oceanside-Nevada, LP
P.O. Box 531
Rancho Santa Fe, CA 92067

January 29, 2019

Prepared By:

Ron Holloway, R.C.E. 29271

bHA, Inc
land planning, civil engineering, surveying
5115 Avenida Encinas, Suite L
Carlsbad, CA 92008-4387
(760) 931-8700

W.O. 1005-0989-100

HYDROMODIFICATION MANAGEMENT PLAN (HMP)

SWMM Modeling for Hydromodification Compliance of: Breeze Luxury Townhomes, City of Oceanside, CA

INTRODUCTION

This document summarizes the approach used to model the proposed Breeze Luxury Townhomes project site in the City of Oceanside using the Environmental Protection Agency (EPA) Storm Water Management Model 5.1 (SWMM). SWMM simulations were prepared for the pre and post-development conditions at the site in order to determine if the proposed HMP detention vaults have sufficient volume to meet the current Hydromodification Management Plan (HMP) requirements from the San Diego Regional Water Quality Control Board (SDRWQCB), as established in the Model BMP Design Manual San Diego Region (BMPDM) for the County of San Diego Copermittees, which includes the City of Oceanside.

SWMM MODEL DEVELOPMENT

The Breeze Luxury Townhomes project proposes to develop an existing site, which is currently undeveloped, located on the north and south sides of the cul-de-sac at the southeast end of Nevada Street in the City of Oceanside. Two (2) SWMM simulation were prepared for the study: the first for pre-development and the second for the post-developed conditions. Stormwater runoff from the proposed project site is routed to one(1) Point of Concentration (POC); POC-1 located near the southeast corner of the project site. Conveyances from the POC-1 confluence in the concrete channel south of NCTD railroad right-of-way below the project. The proposed drainage pattern mimics the existing drainage pattern with regard to overall area and discharge points.

The SWMM was used since we have found it to be more comparable to San Diego area watersheds that the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM simulations, flow duration curves were prepared for POC-1 to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

The inputs required to develop SWMM simulations include rainfall, watershed characteristics, and BMP configuration. The Oceanside Gage from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System “Reference Evaporation Zones” (CIMIS ETo Zone Map), the project site is located within the Zone 1 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 1 monthly values from Table G.1-1 from the City of Oceanside BMP Design Manual. The site soil quality is predominately “undefined” with regions of Type-A soil by NRCS Web Soil Survey. However, based on the Infiltration Feasibility Condition prepared by Geotechnical Exploration, Inc. “Infiltration Feasibility Condition, Proposed Breeze Luxury Townhome Project”, the entire site is regarded as belonging to Type-D due to the low infiltration rate characteristics. No contaminated

or hazardous soil was located within the project area, and no evidence of scouring or excessive erosion resulting from concentrated runoff was in evidence at the site.

Onsite soil areas have been assumed to be compacted in the existing condition to represent the current condtion of the site and fully compacted in the post development conditions. Other SWMM inputs for subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

Stormwater runoff from the proposed project site is routed to one (1) Points of Compliance, POC-1 located near the southeast corner of the project site. POC-1 collects runoff from two separate drainage basins, Basin A and Basin B. Both conveyances confluence in the concrete channel south of NCTD railroad right-of-way below the project. The proposed drainage pattern mimics the existing drainage pattern with regard to overall area and discharge points.

DMA 1 will be comprised primarily of the majority of the project, including Units 1 – 29 and will be directed into two (2) separate detention vaults. A modified Type A-4 Clean Out with two (2) orifices will distribute flows toward each detention vault (39% toward BMP 1A and 61% to BMP 1B). The size of the orifices are a function of the size of each basin divided by the area of the two basins combined. See the Hydrology Report for junction box details and flow calculations. Once flows are routed via the proposed orifices, the flows are then conveyed via storm drain pipes to the receiving detention vaults, BMP 1A and BMP 1B for treatment and detention. DMA 2 will encompass Units 30-34. Flows are conveyed via storm drain pipes to the receiving detention vault BMP 2 for treatment and detention.

The existing site was modeled as entirely pervious, as required by RWQCB Order No. R9-2013-0001. Storm water runoff from the impervious roof and road areas will intercepted by catch basins in the street, and conveyed via a storm drain system to the underground detention vaults. The detention vault will store runoff from the site and release it at a controlled rate for hydromodification, pollutant control, and detention to reduce the proposed 100-year flows to existing 100-year flow levels. The type of underground detention vault will be manufactured by StormTrap® or equivalent product (see Attachments). A Modular Wetland System (MWS) will be located downstream of each underground vault to treat the pollutants from the site. See the "Storm Water Quality Management Plan (SWQMP) for Breeze Luxury Townhomes" by BHA for pollutant and hydromodification control compliance. Treated water from DMA-1A and DMA-1B will be conveyed via a storm drain pipe and discharged at the existing Type F catch basin in the southeast corner of the project site at POC-1. Treated water from MWS-2 will be conveyed via a storm drain pipe and discharged at the existing Type F catch basin in the northeast corner of the project site. Conveyances from the DMA-1A, DMA1B and DMA-2 confluence in the concrete channel south of NCTD railroad right-of-way below the project.

Off-site run-on from four (4) separate upstream areas; OS-3 - the existing residential developments located east of Nevada Street, OS-1 - Nevada Street cul-de-sac (including new improvements), OS-2 - the

existing residential developments west of Nevada Street, and OS-4 – the south east corner of South Ditmar Street and Godfrey Street will bypass the project site storm water treatment facilities and confluence with the proposed storm drain facilities prior to discharging to POC-1. Runoff from Nevada Street cul-de-sac (OS-1) will be intercepted by a curb inlet. The curb inlet will have a low flow orifice to divert the estimated flow generated from new impervious to a Modular Wetland System (MWS) located onsite to treat the pollutants. The treated flows will then confluence with the off-site flows to bypass the project site storm water facilities downstream.

Runoff from the undisturbed bluff areas (Self Mitigating Areas - SM) in the eastern portion of the project SM-4, SM-5 and SM-6 sheet flow over the bluff and into the existing and proposed brow ditches to POC-1. The undisturbed bluff areas will bypass the underground storage vaults and will not require storm water treatment. There areas will utilize other Low Impact Development (LID) strategies. See the SWQMP associated with this project.

The potential for runoff from minor street widening of Godfrey Street and South Ditmar Street to runon to the site will be mitigated by a concrete cross gutter constructed along Godfrey Street. Runoff from the minor widening of Godfrey Street will flow to a proposed vegetated dispersion area located on the south side of Godfrey Street at South Ditmar Street. The vegetated dispersion area has been designed as a site design BMP to slow runoff discharges and reduce volumes through infiltration. The dispersion area will also include soil amendments to improve vegetation support, infiltration capacity and enhance treatment of routed flows. The relatively flat slope of the dispersion area will facilitate sheet flows to mimic existing drainage conditions.

The underground BMPs such as the detention vaults will require access for a vacuum truck to remove materials. The proprietary BMPs such as the Modular Wetlands may also require access for a vactor truck to remove of media cartridges or other internal components. Access requirements for the detention vault and Modular Wetlands must be verified with the manufacturers. Please refer to Attachment 3 for full maintenance approach for the structural BMPs.

The vactor trucks can access the underground BMPs using the access ramps to the underground parking facilities. The underground parking facilities are designed on level pads for easy access to the underground BMPs.

DMA 1 will be comprised primarily of the majority of the project, including Units 1 – 29 and will be directed into two (2) separate detention vaults. A modified Type A-4 Clean Out with two (2) outlet orifices will distribute flows toward each detention vault (39% toward BMP 1A and 61% to BMP 1B). The size of the orifices are a function of the size of each basin divided by the area of the two basins combined. Once flows are routed via the proposed orifices, the flows are then conveyed via storm drain pipes to the receiving detention vaults, then to POC-1.

DMA-2 will be comprised of Units 29-34 and Parcourse and landscaping. The detention vault, BMP-2 is responsible for handling hydromodification requirements for DMA-2. The BMPs are comprised of a water

quality volume and remaining hydromodification volume. The required water quality volumes are based on treatment control sizing requirements as described in the SWQMP for this project. Once flows are routed via the proposed orifices, the flows are then conveyed via storm drain pipes to the receiving detention vaults, then to POC-1.

Tables 1.1 and 1.2 summarize data for the POC-1 DMAs.

TABLE 1.1 – SUMMARY OF EXISTING CONDITIONS FOR POC-1

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	1.62727	0.0%
OS-1	0.84690	59.0%
OS-2	0.23235	54.5%
DMA-2	2.35693	0.0%
OS-3	0.46612	56.4%
Total	5.53	

TABLE 1.2 – SUMMARY OF DEVELOPED CONDITIONS FOR POC-1

POC	**DMA**	**Tributary Area, A (Ac)**	**Impervious Percentage, Ip**
1	DMA-1A	0.55	95.9%
	DMA-1B	0.86	95.9%
	DMA-2	0.25	94.5%
	SM-1	0.04	10.1%
	SM-2	0.03	41.1%
	SM-3	0.04	10.1%
	SM-4	0.03	0.0%
	SM-5	0.76	0.0%
	SM-6	1.07	0.0%
	OS-1	0.89	61.3%
	OS-2	0.23	54.5%
	OS-3	0.47	56.4%
	OS-4	0.03	0.0%

(1) HMP Areas are separate from the overall DMA to ensure areas are not double counted.

General Considerations

The underground detention vaults (BMP-1A, BMP-1B and BMP-2) were modeled using the rain barrel LID module within SWMM. The rain barrel module can model the underdrain with orifice plate and vault storage pond up to the elevation of the required Design Capture Volume (DCV) for the Proprietary

Biofiltration System in the vault structure. Ponding above the required DCV is modeled as a detention basin: elevation vs. area, and elevation vs. discharge tables, are needed by SWMM for Modified Puls routing purposes. Detailed outlet structure location and elevations should be shown on the construction plans based on the recommendations of this study. Once flows are routed via the proposed orifices, the flows are then conveyed via storm drain pipes to the receiving detention vaults, then to POC-1. Detailed outlet structure location and elevations should be shown on the construction plans based on the recommendations of this study.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project site will be met by the Modular Wetland Systems. However, detailed water quality requirements are not discussed within this technical memo.

The detention vaults have been designed in accordance with County of San Diego sizing criteria (which includes maximum draw down requirements). For further information in regards to water quality requirements for the project (including sizing and drawdown) please refer to Attachment 1 of the SWQMP.

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP IMP

Two HMP-BMP detention vaults are proposed for hydromodification conformance and flood control for the project site. Tables 2 illustrates the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project. Flood control is discussed within the Drainage Report prepared by BHA for this project.

TABLE 2 – SUMMARY OF DETENTION VAULT DIMENSIONS

BMP	Tributary Area[1] (Ac)	DIMENSIONS						
		Water Quality Vault				Hydromod Vault		
		Annotation	BMP Area (ft^2)	LID orifice[3] (in)	Depth (ft)	Annotation	BMP Area[2] (ft^2)	Outlet orifice[4] (in)
BMP-1A	0.55	WQ-1A	379	0.5	4.10	HMP-1A	379	3.5
BMP-1B	0.86	WQ-1B	615	0.58	4.00	HMP-1B	615	4
BMP-2	0.25	WQ-2	187	0.3	3.25	HMP-2	187	4

Notes: (1): IMP Areas are included in the overall DMA.

(2): As the underground system has vertical walls, the area is constant at any depth. Total depth of detention vaults for BMP-1A is 3.90', BMP-1B is 3.55' and BMP-2 is 2.00'ft. Total depth of for BMP-1A IS 9.0', BMP-1B IS 8.50' AND BMP-2 IS 6.25'.

(3): Diameter of LID orifice with invert at bottom of undergound WQ vault; tied with hydromod min threshold (50%Q2) and a maximum 36 hour drawdown time.

(5): Diameter of orifice with invert at bottom of undergound HMP vault; tied with maximum 36 hour drawdown time.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at POC-1 by exporting the hourly runoff time series results from SWMM to a spreadsheet. At both POCs, the FDC was compared between 10% of the existing condition Q_2 up to the existing condition Q_{10}. The Q_2 and Q_{10} were determined using a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Weibull plotting position method.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "I" were obtained (Qi with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at POC-1 is illustrated in Figure 1 and Figure 2, respectively, in both normal and logarithmic scale.

As can be seen in Figure 1 and Figure 2, the FDCs for the proposed condition with the HMP facilities is within 110% of the curve for the existing condition in both peak and duration. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 50% Q_2 lower threshold. Additionally, the project will also not increase peak flow rates between the pre-development Q_2 and the Q_{10}, as shown in the graphic and also in the peak flow tables listed in Attachment 1.

DRAWDOWN TIME

To ensure compliance with the 24 hour and 96 hour drawdown requirements (per Section 6.3.7 of the BMP Design Manual); drawdown calculations are provided in Attachment 10 of this report.

SUMMARY

This study has demonstrated that the proposed detention vaults provided for the Breeze Luxury Townhomes project site is sufficient to meet current HMP criteria if the cross-section areas and volumes recommended within this document, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soil is representative of the "undefined" existing condition site soil.
2. The detention vaults and proprietary biofiltration BMPs are designed with no infiltration.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge & Stage- Storage Curves to be used in SWMM
5. Detention Vault Structure Details
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model
10. Drawdown calculations

REFERENCES

[1] – "*City of Oceanside BMP Design Manual*", February 2016, City of Oceanside.

[2] – "*Final Hydromodification Management Plan (HMP) prepared for the County of San Diego*", March 2011, Brown and Caldwell.

[3] – Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista*", May 2012, Tory R. Walker Engineering.

[5] – "*San Diego County Hydraulic Design Manual*", September 2014, County of San Diego Department of Public Works Flood Control Section.

ATTACHMENT 1

Q_2 to Q_{10} Comparison Tables

ATTACHMENT 2

FDC Plots (log and natural “x” scale) and Flow Duration Table

Flow Duration Curve Analysis

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

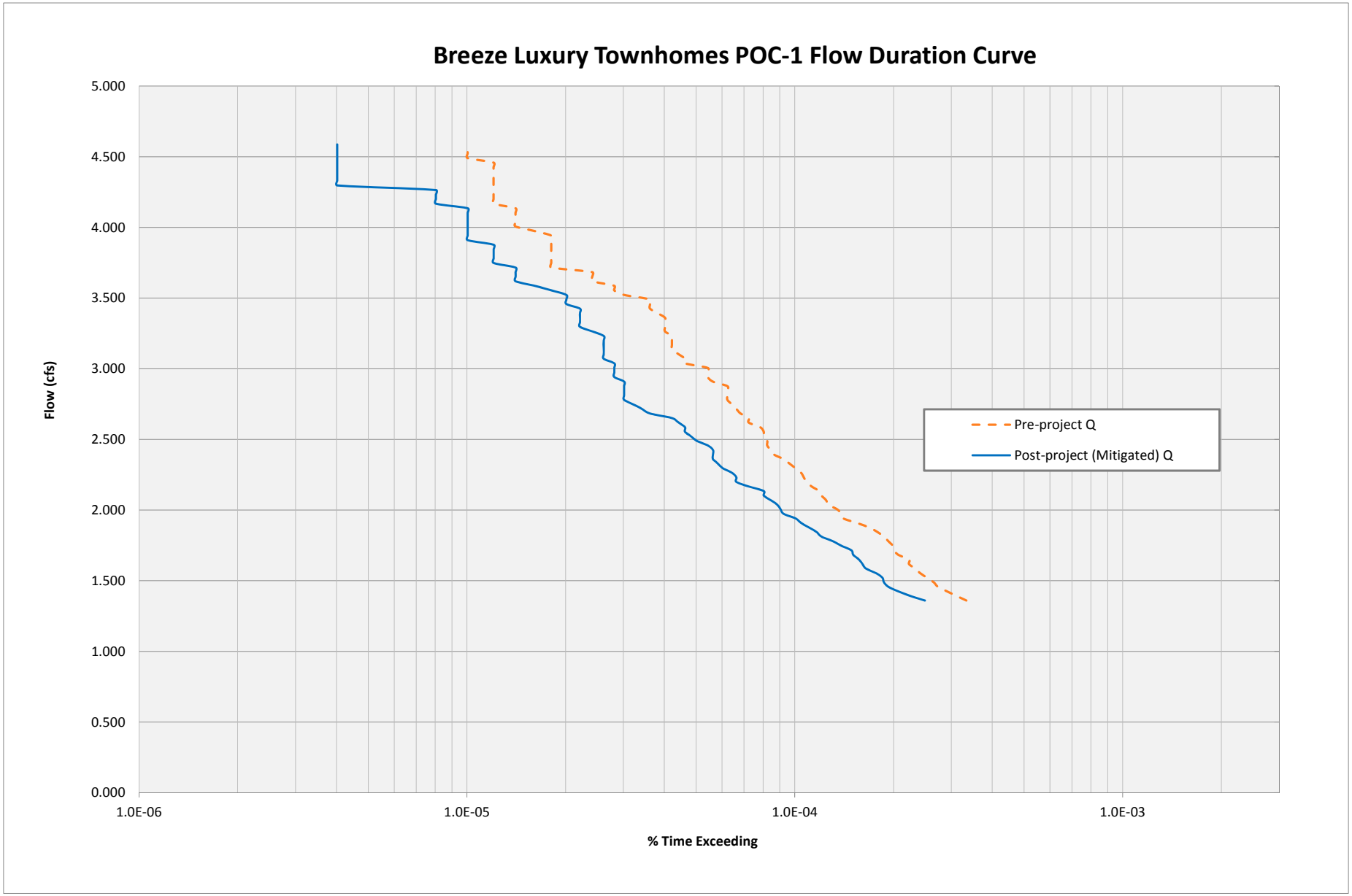
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.1Q_2 – Q_{10}$ is divided into 100 sub intervals, the post development divided by pre-development durations is never larger than 110% (the permit allows up to 110%)

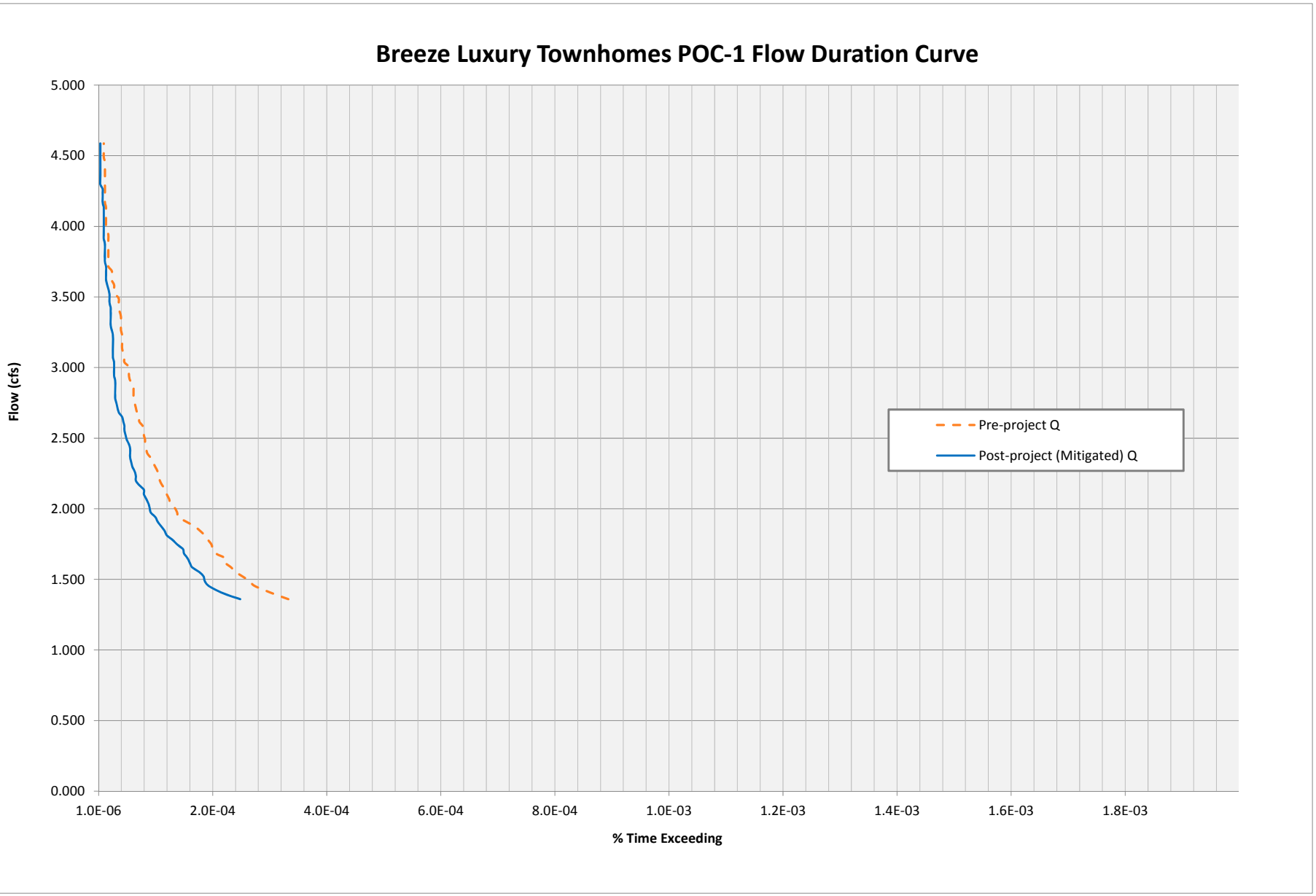
Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the County of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by BHA, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8, and Q_9) in order to demonstrate compliance at any range $Q_x – Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). BHA performed the analysis using the Weibull Plotting positon Method from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i = 2 to 10. The Q_i values are also added into the flow-duration plot.


Breeze Luxury Townhomes POC-1 Flow Duration Curve
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q


Breeze Luxury Townhomes POC-1 Flow Duration Curve
Flow (cfs)
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
1.0E-06
2.0E-04
4.0E-04
6.0E-04
8.0E-04
1.0E-03
1.2E-03
1.4E-03
1.6E-03
1.8E-03
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

Flow Duration Curve Data for Breeze Luxury Townhomes, Oceanside, CA

Low Flow Threshold:	50%	
0.1xQ2 (Pre):	1.360	cfs
Q10 (Pre):	4.587	cfs
# of Ordinates:	100	
Incremental Q (Pre):	0.03227	cfs
Total Hourly Data:	497370	hours

The proposed BMP: **PASSED**

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	1.360	166	3.34E-04	122	2.45E-04	73%	Pass
1	1.392	155	3.12E-04	109	2.19E-04	70%	Pass
2	1.425	145	2.92E-04	104	2.09E-04	72%	Pass
3	1.457	136	2.73E-04	97	1.95E-04	71%	Pass
4	1.489	132	2.65E-04	92	1.85E-04	70%	Pass
5	1.521	126	2.53E-04	90	1.81E-04	71%	Pass
6	1.554	120	2.41E-04	88	1.77E-04	73%	Pass
7	1.586	116	2.33E-04	85	1.71E-04	73%	Pass
8	1.618	111	2.23E-04	79	1.59E-04	71%	Pass
9	1.650	111	2.23E-04	77	1.55E-04	69%	Pass
10	1.683	103	2.07E-04	73	1.47E-04	71%	Pass
11	1.715	100	2.01E-04	71	1.43E-04	71%	Pass
12	1.747	99	1.99E-04	67	1.35E-04	68%	Pass
13	1.780	96	1.93E-04	59	1.19E-04	61%	Pass
14	1.812	93	1.87E-04	58	1.17E-04	62%	Pass
15	1.844	89	1.79E-04	57	1.15E-04	64%	Pass
16	1.876	84	1.69E-04	52	1.05E-04	62%	Pass
17	1.909	77	1.55E-04	51	1.03E-04	66%	Pass
18	1.941	70	1.41E-04	49	9.85E-05	70%	Pass
19	1.973	69	1.39E-04	47	9.45E-05	68%	Pass
20	2.005	67	1.35E-04	45	9.05E-05	67%	Pass
21	2.038	63	1.27E-04	43	8.65E-05	68%	Pass
22	2.070	62	1.25E-04	42	8.44E-05	68%	Pass
23	2.102	60	1.21E-04	41	8.24E-05	68%	Pass
24	2.135	59	1.19E-04	40	8.04E-05	68%	Pass
25	2.167	56	1.13E-04	38	7.64E-05	68%	Pass
26	2.199	54	1.09E-04	35	7.04E-05	65%	Pass
27	2.231	53	1.07E-04	33	6.63E-05	62%	Pass

28	2.264	52	1.05E-04	32	6.43E-05	62%	Pass
29	2.296	50	1.01E-04	30	6.03E-05	60%	Pass
30	2.328	48	9.65E-05	30	6.03E-05	63%	Pass
31	2.361	46	9.25E-05	28	5.63E-05	61%	Pass
32	2.393	43	8.65E-05	27	5.43E-05	63%	Pass
33	2.425	42	8.44E-05	26	5.23E-05	62%	Pass
34	2.457	41	8.24E-05	26	5.23E-05	63%	Pass
35	2.490	41	8.24E-05	25	5.03E-05	61%	Pass
36	2.522	40	8.04E-05	25	5.03E-05	63%	Pass
37	2.554	40	8.04E-05	23	4.62E-05	58%	Pass
38	2.586	39	7.84E-05	23	4.62E-05	59%	Pass
39	2.619	36	7.24E-05	20	4.02E-05	56%	Pass
40	2.651	36	7.24E-05	20	4.02E-05	56%	Pass
41	2.683	34	6.84E-05	19	3.82E-05	56%	Pass
42	2.716	33	6.63E-05	17	3.42E-05	52%	Pass
43	2.748	32	6.43E-05	16	3.22E-05	50%	Pass
44	2.780	31	6.23E-05	16	3.22E-05	52%	Pass
45	2.812	31	6.23E-05	15	3.02E-05	48%	Pass
46	2.845	31	6.23E-05	14	2.81E-05	45%	Pass
47	2.877	31	6.23E-05	14	2.81E-05	45%	Pass
48	2.909	28	5.63E-05	14	2.81E-05	50%	Pass
49	2.941	27	5.43E-05	14	2.81E-05	52%	Pass
50	2.974	27	5.43E-05	14	2.81E-05	52%	Pass
51	3.006	27	5.43E-05	14	2.81E-05	52%	Pass
52	3.038	23	4.62E-05	13	2.61E-05	57%	Pass
53	3.071	23	4.62E-05	13	2.61E-05	57%	Pass
54	3.103	22	4.42E-05	13	2.61E-05	59%	Pass
55	3.135	21	4.22E-05	13	2.61E-05	62%	Pass
56	3.167	21	4.22E-05	12	2.41E-05	57%	Pass
57	3.200	21	4.22E-05	12	2.41E-05	57%	Pass
58	3.232	21	4.22E-05	12	2.41E-05	57%	Pass
59	3.264	20	4.02E-05	11	2.21E-05	55%	Pass
60	3.296	20	4.02E-05	11	2.21E-05	55%	Pass
61	3.329	20	4.02E-05	10	2.01E-05	50%	Pass
62	3.361	20	4.02E-05	10	2.01E-05	50%	Pass
63	3.393	19	3.82E-05	10	2.01E-05	53%	Pass
64	3.426	18	3.62E-05	10	2.01E-05	56%	Pass
65	3.458	18	3.62E-05	10	2.01E-05	56%	Pass
66	3.490	18	3.62E-05	9	1.81E-05	50%	Pass
67	3.522	15	3.02E-05	9	1.81E-05	60%	Pass
68	3.555	14	2.81E-05	8	1.61E-05	57%	Pass

69	3.587	14	2.81E-05	8	1.61E-05	57%	Pass
70	3.619	12	2.41E-05	8	1.61E-05	67%	Pass
71	3.652	12	2.41E-05	7	1.41E-05	58%	Pass
72	3.684	12	2.41E-05	7	1.41E-05	58%	Pass
73	3.716	9	1.81E-05	7	1.41E-05	78%	Pass
74	3.748	9	1.81E-05	6	1.21E-05	67%	Pass
75	3.781	9	1.81E-05	6	1.21E-05	67%	Pass
76	3.813	9	1.81E-05	6	1.21E-05	67%	Pass
77	3.845	9	1.81E-05	6	1.21E-05	67%	Pass
78	3.877	9	1.81E-05	6	1.21E-05	67%	Pass
79	3.910	9	1.81E-05	5	1.01E-05	56%	Pass
80	3.942	9	1.81E-05	5	1.01E-05	56%	Pass
81	3.974	8	1.61E-05	5	1.01E-05	63%	Pass
82	4.007	7	1.41E-05	5	1.01E-05	71%	Pass
83	4.039	7	1.41E-05	5	1.01E-05	71%	Pass
84	4.071	7	1.41E-05	5	1.01E-05	71%	Pass
85	4.103	7	1.41E-05	5	1.01E-05	71%	Pass
86	4.136	7	1.41E-05	5	1.01E-05	71%	Pass
87	4.168	6	1.21E-05	5	1.01E-05	83%	Pass
88	4.200	6	1.21E-05	3	6.03E-06	50%	Pass
89	4.232	6	1.21E-05	2	4.02E-06	33%	Pass
90	4.265	6	1.21E-05	2	4.02E-06	33%	Pass
91	4.297	6	1.21E-05	2	4.02E-06	33%	Pass
92	4.329	6	1.21E-05	2	4.02E-06	33%	Pass
93	4.362	6	1.21E-05	2	4.02E-06	33%	Pass
94	4.394	6	1.21E-05	2	4.02E-06	33%	Pass
95	4.426	6	1.21E-05	2	4.02E-06	33%	Pass
96	4.458	6	1.21E-05	2	4.02E-06	33%	Pass
97	4.491	5	1.01E-05	2	4.02E-06	40%	Pass
98	4.523	5	1.01E-05	2	4.02E-06	40%	Pass
99	4.555	5	1.01E-05	2	4.02E-06	40%	Pass
100	4.587	5	1.01E-05	2	4.02E-06	40%	Pass

Peak flows calculated with the Weibull Plotting Position

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
LF = $0.1xQ_2$	1.360	1.106	0.254
2-year	2.720	2.212	0.508
3-year	3.035	2.608	0.427
4-year	3.511	2.759	0.753
5-year	3.601	3.077	0.524
6-year	3.780	3.309	0.471
7-year	3.983	3.518	0.465
8-year	4.106	3.609	0.497
9-year	4.323	3.770	0.553
10-year	4.587	3.945	0.642

ATTACHMENT 3

List of the “n” largest Peaks: Pre-Development and Post-Development Conditions

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

- Basic Probabilistic Equation: $R = \frac{1}{P}$

  where,

  R = Return period in years; and

  P = Probability of a flow to be equaled or exceeded any given year (dimensionless).

- Weibull Equation: $P = \frac{i}{n+1}$

  where,

  i = Position of the peak whose probability is desired (sorted from large to small); and

  n = number of years analyzed.

Explanation of Variables for the Tables in this Attachment

- Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.
- Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.
- Date: Date of the occurrence of the peak at the outlet form the continuous simulation.
- Note: All peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt=0, and the peak is the largest value in 25 hours (12 hours before the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

Pre-Project Flow Frequency POC-1 – Long-term Simulation

Breeze Luxury Apartments, Pre-Developed Runoff Condition
Statistics - Node POC-1 Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1	4/14/2003	9	6.19	0.19	58
2	1/4/1978	3	5.587	0.37	29
3	10/1/1983	3	5.569	0.56	19.33
4	1/15/1979	4	5.238	0.74	14.5
5	1/4/1995	9	5.065	0.93	11.6
6	9/23/1986	2	4.489	1.11	9.67
7	2/25/2003	7	4.147	1.3	8.29
8	2/3/1958	31	4	1.48	7.25
9	2/24/1969	45	3.946	1.67	6.44
10	10/27/2004	7	3.705	1.85	5.8
11	2/18/2005	20	3.601	2.04	5.27
12	2/17/1980	82	3.601	2.22	4.83
13	1/16/1952	9	3.526	2.41	4.46
14	10/29/2000	2	3.518	2.59	4.14
15	2/27/1978	35	3.505	2.78	3.87
16	1/13/1993	10	3.497	2.96	3.63
17	3/17/1982	25	3.422	3.15	3.41
18	4/1/1958	9	3.369	3.33	3.22
19	3/2/1980	15	3.111	3.52	3.05
20	2/10/1978	4	3.093	3.7	2.9
21	12/29/1991	13	3.03	3.89	2.76
22	2/3/1998	6	3.022	4.07	2.64
23	11/22/1965	25	3.014	4.26	2.52
24	12/19/1970	18	2.941	4.44	2.42
25	1/29/1983	4	2.905	4.63	2.32
26	2/27/1983	4	2.89	4.81	2.23
27	2/22/1998	31	2.878	5	2.15
28	1/27/2008	21	2.775	5.19	2.07
29	2/16/1980	3	2.72	5.37	2
30	2/16/1998	28	2.705	5.56	1.93
31	11/11/1985	10	2.675	5.74	1.87
32	11/14/1952	31	2.665	5.93	1.81
33	10/20/2004	6	2.618	6.11	1.76
34	2/18/1993	1	2.604	6.3	1.71

35	12/1/1961	20	2.594	6.48	1.66
36	1/16/1978	9	2.571	6.67	1.61
37	1/28/1980	29	2.506	6.85	1.57
38	2/3/1994	12	2.449	7.04	1.53
39	1/5/2008	47	2.378	7.22	1.49
40	1/15/1993	76	2.376	7.41	1.45
41	2/14/1986	11	2.356	7.59	1.41
42	2/14/1998	6	2.353	7.78	1.38
43	3/16/1963	4	2.315	7.96	1.35
44	2/22/2008	8	2.309	8.15	1.32
45	1/16/1972	4	2.293	8.33	1.29
46	3/11/1995	24	2.288	8.52	1.26
47	3/15/1986	23	2.244	8.7	1.23
48	4/27/1960	5	2.216	8.89	1.21
49	8/17/1977	3	2.181	9.07	1.18
50	3/19/1981	3	2.146	9.26	1.16
51	2/12/1992	15	2.141	9.44	1.14
52	12/22/1982	1	2.129	9.63	1.12
53	2/27/1991	41	2.094	9.81	1.09
54	2/7/1993	14	2.079	10	1.07
55	2/11/2003	27	2.048	10.19	1.05
56	1/11/2005	9	2.018	10.37	1.04
57	4/28/2005	1	1.988	10.56	1.02
58	3/1/1983	69	1.974	10.74	1

Pre-project

10-year Q:	4.587	cfs
5-year Q:	3.601	cfs
2-year Q:	2.720	cfs

Lower Flow Threshold: 50%

$0.1xQ_2$ (Pre): 1.360 cfs

Post-Project (Mitigated) Flow Frequency POC-1 – Long-term Simulation

Breeze Luxury Apartments, Post-Developed Mitigated Runoff Condition
Statistics - Node POC-1 Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1	4/14/2003	100	5.753	0.11	58
2	1/3/1995	340	4.98	0.22	29
3	1/14/1979	134	4.282	0.33	19.33
4	9/29/1983	121	4.268	0.44	14.5
5	1/3/1978	420	4.15	0.55	11.6
6	2/18/1969	260	3.892	0.65	9.67
7	9/23/1986	106	3.607	0.76	8.29
8	2/13/1980	263	3.564	0.87	7.25
9	2/27/1978	188	3.553	0.98	6.44
10	2/25/2003	120	3.296	1.09	5.8
11	2/3/1958	111	3.25	1.2	5.27
12	3/14/1982	169	3.064	1.31	4.83
13	11/22/1965	110	2.935	1.42	4.46
14	10/27/2004	98	2.779	1.53	4.14
15	2/14/1998	324	2.741	1.64	3.87
16	10/29/2000	67	2.698	1.74	3.63
17	1/6/1993	380	2.682	1.85	3.41
18	2/17/2005	210	2.669	1.96	3.22
19	1/13/1952	203	2.657	2.07	3.05
20	1/27/1980	133	2.626	2.18	2.9
21	4/1/1958	224	2.527	2.29	2.76
22	3/2/1980	145	2.462	2.4	2.64
23	12/28/1991	125	2.332	2.51	2.52
24	2/5/1978	268	2.319	2.62	2.42
25	2/27/1991	116	2.292	2.73	2.32
26	12/16/1970	166	2.264	2.84	2.23
27	2/3/1998	196	2.237	2.94	2.15
28	11/11/1985	101	2.196	3.05	2.07
29	2/23/1983	291	2.195	3.16	2
30	1/26/2008	91	2.178	3.27	1.93
31	1/27/1983	116	2.162	3.38	1.87
32	2/18/1993	161	2.148	3.49	1.81
33	11/14/1952	108	2.146	3.6	1.76
34	10/17/2004	159	2.088	3.71	1.71

35	1/5/1979	128	2.036	3.82	1.66
36	3/7/1968	92	1.982	3.93	1.61
37	2/3/1994	140	1.968	4.03	1.57
38	12/1/1961	90	1.966	4.14	1.53
39	2/13/1986	129	1.958	4.25	1.49
40	3/11/1995	99	1.952	4.36	1.45
41	12/28/2004	415	1.915	4.47	1.41
42	1/5/2008	129	1.88	4.58	1.38
43	3/16/1963	73	1.85	4.69	1.35
44	12/22/1982	67	1.809	4.8	1.32
45	1/9/1980	163	1.799	4.91	1.29
46	2/20/2008	146	1.793	5.02	1.26
47	4/28/2005	52	1.756	5.13	1.23
48	3/8/1986	244	1.753	5.23	1.21
49	1/12/1997	142	1.747	5.34	1.18
50	1/16/1972	117	1.738	5.45	1.16
51	2/12/1992	139	1.729	5.56	1.14
52	8/16/1977	107	1.716	5.67	1.12
53	3/19/1981	55	1.701	5.78	1.09
54	4/27/1960	73	1.662	5.89	1.07
55	2/7/1993	93	1.656	6	1.05
56	1/30/2007	60	1.622	6.11	1.04
57	2/11/2003	127	1.591	6.22	1.02
58	2/5/1969	102	1.583	6.32	1

Post-project (Mitigated)

10-year Q:	3.961	cfs
5-year Q:	3.156	cfs
2-year Q:	2.212	cfs

Lower Flow Threshold: 50%

$0.1xQ_2$ (Pre): 1.106 cfs

ATTACHMENT 4

Elevation vs. Area Curves and Elevation vs. Discharge Curves to be used in SWMM

Elevation vs. Area

The elevation vs. area curves in the model are calculated in Excel and imported into the model. The summary of elevation vs. area for each BMP has been provided on the following pages.

The LID surface storage depth beneath the lowest surface discharge structure is accounted for in the LID module as illustrated in Attachment 7.

Elevation vs. Discharge

The total elevation vs. discharge curve is imported from an Excel spreadsheet that calculates the elevation vs. discharge of the outlet system. Elevation vs. discharge relationships are provided in the surface discharge of the biofiltration basin as this is where a Modified Puls routing procedure will be applied in the continuous simulation model.

The low-flow orifice size has been selected to maximum its size while still restricting flows to conform with the required 50% of the Q_2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While BHA acknowledges that this orifice is small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conforming with HMP requirements.

In order to further reduce the risk of blockage of the orifice, regular maintenance of the riser and orifice must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structures are provided in Attachment 5 of this memorandum.

Discharge Equations

The following equations are based on the *San Diego County Hydraulic Design Manual* (September 2014):

- Weir:
  $Q_W = C_W * L * H^{3/2}$ (1)

- Slot:

  As an orifice: $Q_S = B_S * h_S * c_g * \sqrt{2g(H - \frac{h_S}{2})}$ (2.a)

  As a weir: $Q_S = C_W * B_S * H^{3/2}$ (2.b)

  For $H > h_S$ slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

- Vertical Orifices:

  As an orifice: $Q_O = 0.25 * \pi D^2 * c_g * \sqrt{2g(H - \frac{D}{2})}$ (3.a)

  As a weir: Critical depth and geometric family of circular sector must be solved to determine Q as a function of H:

  $$\frac{Q_o^2}{g} = \frac{A_{cr}^3}{T_{cr}}; H = y_{cr} + \frac{A_{cr}}{2*T_{cr}}; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}; A_{cr} = \frac{D^2}{8}[a_{cr} - \sin(a_{cr})];$$
  $$y_{cr} = \frac{D}{2}[1 - \sin(0.5 * a_{cr})]$$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

  There is a value of H (approximately H=110%D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type of discharge.

The following are the variables used above:

Q_W, Q_s, Q_o : Discharge of weir, slot or orifice (cfs)

C_W, c_g: Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s: Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

$A_{cr}, T_{cr}, y_{cr}, a_{cr}$: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Stage-Area for WQ-1A

Elevation vs. Area Tables

SURFACE STORAGE WQ-1A

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.00	379	0
0.25	379	95
0.50	379	190
0.75	379	284
1.00	379	379
1.25	379	474
1.50	379	569
1.75	379	663
2.00	379	758
2.25	379	853
2.50	379	948
2.75	379	1042
3.00	379	1137
3.25	379	1232
3.50	379	1327
3.75	379	1421
4.00	379	1516
4.10	379	1554
4.25	379	1611
4.50	379	1706
4.75	379	1800
5.00	379	1895
5.25	379	1990
5.50	379	2085
5.75	379	2179
6.00	379	2274
6.25	379	2369
6.50	379	2464
6.75	379	2558
7.00	379	2653
8.00	379	3032
9.00	379	3411
	BMP TOTAL =	**3411**

Effective Depth:	93.00 in

Outlet Structure for Discharge of WQ-1A

Elevation vs. Discharge Table

Orifice 1

No. of orif:	1	
Dia:	3.5	"
Invert:	4.1	ft
Cg-low:	0.62	

Low Flow Orifice

No. of orif:	1	
Dia:	0.5	"
Invert:	0	ft
Cg-low:	0.620	

***Note: h = head above the invert of the lowest surface discharge opening.**

SWMM

H (ft)	h* (ft)	$Q_{orifice\ 1}$ (cfs)	
0.00	0.000	0.000	
0.25	0.000	0.000	
0.50	0.000	0.000	
0.75	0.000	0.000	
1.00	0.000	0.000	
1.25	0.000	0.000	
1.50	0.000	0.000	
1.75	0.000	0.000	
2.00	0.000	0.000	
2.25	0.000	0.000	
2.50	0.000	0.000	
2.75	0.000	0.000	
3.00	0.000	0.000	
3.25	0.000	0.000	
3.50	0.000	0.000	
3.75	0.000	0.000	
4.00	0.000	0.000	
4.10	0.000	0.000	TOP DCV STORAGE
5.10	1.000	0.332	
6.00	1.900	0.440	
7.00	2.900	0.552	
8.00	3.900	0.644	

Stage-Area for HMP-1B

Elevation vs. Area Tables

SURFACE STORAGE WQ-1B

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.00	615	0
0.25	615	154
0.50	615	308
0.75	615	461
1.00	615	615
1.25	615	769
1.50	615	923
1.75	615	1076
2.00	615	1230
2.25	615	1384
2.50	615	1538
2.75	615	1691
3.00	615	1845
3.25	615	1999
3.50	615	2153
3.75	615	2306
4.00	615	2460
4.25	615	2614
4.50	615	2768
4.75	615	2921
5.00	615	3075
5.25	615	3229
5.50	615	3383
5.75	615	3536
6.00	615	3690
6.25	615	3844
6.50	615	3998
6.75	615	4151
7.00	615	4305
8.00	615	4920
	BMP TOTAL =	**4920**

Effective Depth:	93.00 in

Outlet Structure for Discharge of HMP-1A

Elevation vs. Discharge Table

Orifice 1

No. of orif:	1	
Dia:	4	"
Invert:	4	ft
Cg-low:	0.62	

Low Flow Orifice

No. of orif:	1	
Dia:	0.58	"
Invert:	0	ft
Cg-low:	0.620	

***Note: h = head above the invert of the lowest surface discharge opening.**

SWMM

H (ft)	h* (ft)	$Q_{orifice1}$ (cfs)	
0.00	0.000	0.000	
0.25	0.000	0.000	
0.50	0.000	0.000	
0.75	0.000	0.000	
1.00	0.000	0.000	
1.25	0.000	0.000	
1.50	0.000	0.000	
1.75	0.000	0.000	
2.00	0.000	0.000	
2.25	0.000	0.000	
2.50	0.000	0.000	
2.75	0.000	0.000	
3.00	0.000	0.000	
3.25	0.000	0.000	
3.50	0.000	0.000	
3.75	0.000	0.000	
4.00	0.000	0.000	TOP DCV STORAGE
5.00	1.000	0.434	
6.00	2.000	0.588	
7.00	3.000	0.731	
8.00	4.000	0.850	

Stage-Area for WQ-2

Elevation vs. Area Tables

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.00	187	0
0.25	187	47
0.50	187	94
0.75	187	140
1.00	187	187
1.25	187	234
1.50	187	281
1.75	187	327
2.00	187	374
2.25	187	421
2.50	187	468
2.75	187	514
3.00	187	561
3.25	187	4
3.50	187	655
3.75	187	701
4.00	187	748
4.25	187	795
4.50	187	842
4.75	187	888
5.00	187	935
5.25	187	982
5.50	187	1029
5.80	187	1085
6.00	187	1122
	BMP TOTAL =	**1122**

Effective Depth:	63.00 in

Outlet Structure for Discharge of WQ-2

Elevation vs. Discharge Table

Orifice 1

No. of orif:	1	
Dia:	4	"
Invert:	3.25	ft
Cg-low:	0.62	

Orifice 2

No. of orif:	1	
Dia:	0.3	"
Invert:	0	ft
Cg-low:	0.620	

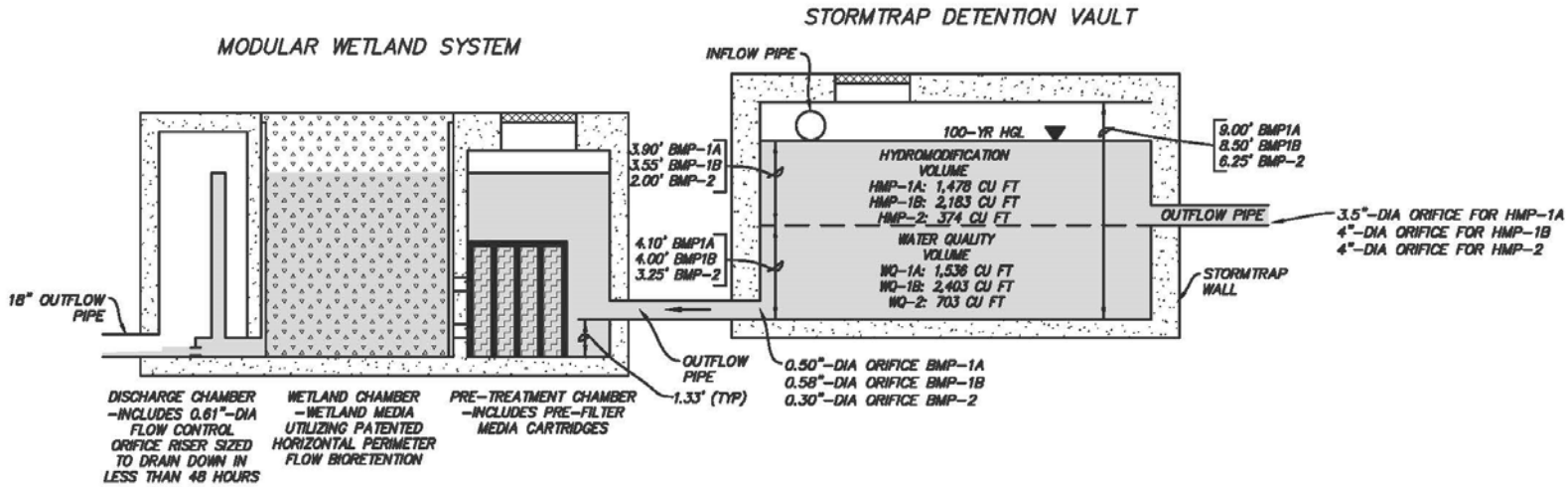
***Note: h = head above the invert of the lowest surface discharge opening.**

SWMM

H (ft)	h* (ft)	$Q_{orifice1}$ (cfs)	
0.00	0.000	0.000	
0.25	0.000	0.000	
0.50	0.000	0.000	
0.75	0.000	0.000	
1.00	0.000	0.000	
1.25	0.000	0.000	
1.50	0.000	0.000	
1.75	0.000	0.000	
2.00	0.000	0.000	
2.25	0.000	0.000	
2.50	0.000	0.000	
2.75	0.000	0.000	
3.00	0.000	0.000	
3.80	0.000	0.000	TOP DCV STORAGE
4.80	1.000	0.434	
5.80	2.000	0.670	

ATTACHMENT 5

Detention Vault Structure Details


MODULAR WETLAND SYSTEM
STORMTRAP DETENTION VAULT
INFLOW PIPE
100-YR HGL
9.00' BMP1A
8.50' BMP1B
6.25' BMP-2
3.90' BMP-1A
3.55' BMP-1B
2.00' BMP-2
HYDROMODIFICATION VOLUME
HMP-1A: 1,478 CU FT
HMP-1B: 2,183 CU FT
HMP-2: 374 CU FT
OUTFLOW PIPE
3.5"-DIA ORIFICE FOR HMP-1A
4"-DIA ORIFICE FOR HMP-1B
4"-DIA ORIFICE FOR HMP-2
4.10' BMP1A
4.00' BMP1B
3.25' BMP-2
WATER QUALITY VOLUME
WQ-1A: 1,536 CU FT
WQ-1B: 2,403 CU FT
WQ-2: 703 CU FT
STORMTRAP WALL
18" OUTFLOW PIPE
OUTFLOW PIPE
1.33' (TYP)
0.50"-DIA ORIFICE BMP-1A
0.58"-DIA ORIFICE BMP-1B
0.30"-DIA ORIFICE BMP-2
DISCHARGE CHAMBER -INCLUDES 0.61"-DIA FLOW CONTROL ORIFICE RISER SIZED TO DRAIN DOWN IN LESS THAN 48 HOURS
WETLAND CHAMBER -WETLAND MEDIA UTILIZING PATENTED HORIZONTAL PERIMETER FLOW BIORETENTION
PRE-TREATMENT CHAMBER -INCLUDES PRE-FILTER MEDIA CARTRIDGES

Area Contributing to:	DMA	BMP	Water Quality Volume	Hydro-modification Volume	MWS
POC-1	DMA-1A	BMP-1A	WQ-1A	HMP-1A	MWS-1A
POC-1	DMA-1B	BMP-1B	WQ-1B	HMP-1B	MWS-1B
POC-2	DMA-2	BMP-2	WQ-2	HMP-2	MWS-2

ATTACHMENT 6

SWMM Input Data in Input Format
(Existing and Proposed Models)

PRE POC-1

```
[TITLE]
;;Project Title/Notes
Breeze Luxury Townhomes, Pre-Developed Runoff Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
```

```
;;-------------- ----------------
MONTHLY          0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00     1.0      TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            OCEANSIDE        POC-1            1.62727  0        215      14.7     0
DMA-2            OCEANSIDE        POC-1            2.35693  0        130      6.6      0
OS-1             OCEANSIDE        POC-1            0.84690  59.0     128      3.6      0
OS-2             OCEANSIDE        POC-1            0.23235  54.5     103      6.4      0
OS-3             OCEANSIDE        POC-1            0.46612  56.4     203      6.0      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.10       0.05       0.1        25         OUTLET
DMA-2            0.012      0.10       0.05       .1         25         OUTLET
OS-1             0.012      0.10       0.05       .1         25         OUTLET
OS-2             0.012      0.10       0.05       .1         25         OUTLET
OS-3             0.012      0.10       0.05       .1         25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-1            9          .025       0.30
DMA-2            9          0.025      0.30
OS-1             9          0.01875    0.3
OS-2             9          0.01875    0.3
OS-3             9          0.01875    0.3

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUT_1            Rating     0.000      0.000
```

```
OUT_1                     0.083      0.018
OUT_1                     0.167      0.025
OUT_1                     0.250      0.031
OUT_1                     0.333      0.035
OUT_1                     0.417      0.040
OUT_1                     0.500      0.043
OUT_1                     0.583      0.047
OUT_1                     0.667      0.050
OUT_1                     0.750      0.053
OUT_1                     0.833      0.056
OUT_1                     0.917      0.059
OUT_1                     1.000      0.061
OUT_1                     1.083      0.064
OUT_1                     1.167      0.241
OUT_1                     1.250      0.316
OUT_1                     1.333      0.374
OUT_1                     1.417      0.460
OUT_1                     1.500      0.584
OUT_1                     1.583      0.672
OUT_1                     1.667      0.746
OUT_1                     1.750      0.812
OUT_1                     1.833      0.871
OUT_1                     1.917      0.927
OUT_1                     2.000      0.979
OUT_1                     2.083      1.084
OUT_1                     2.167      1.262
OUT_1                     2.250      1.444
OUT_1                     2.333      1.581
OUT_1                     2.417      1.699
OUT_1                     2.500      1.805
OUT_1                     2.583      1.903
OUT_1                     2.667      1.995
OUT_1                     2.750      2.081
OUT_1                     2.833      2.313
OUT_1                     2.917      2.664
OUT_1                     3.000      3.093
;
BASIN            Storage  0.00       1260
BASIN                     3          1260

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Oceanside Rain Data.dat"
```

```
[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 191.920 4920.830 1021.827 5718.627
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            757.069            4959.747

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            609.478            5129.177
DMA-1            609.478            5129.177
DMA-2            939.361            5127.441
OS-1             656.356            5196.022
OS-2             770.079            5270.680
OS-3             978.426            5252.450

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        757.548            5779.526
```

POST POC-1

```
[TITLE]
;;Project Title/Notes
Breeze Luxury Townhomes, Post-Developed Mitigated Runoff Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
```

```
;;-------------- ----------------
MONTHLY          0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00     1.0      TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
BMP-1A           OCEANSIDE        DIV-1A           0.0087   100      7        0        0
DMA-1A           OCEANSIDE        BMP-1A           0.55119  95.9     48       1.2      0
DMA-1B           OCEANSIDE        BMP-1B           0.86212  95.9     172      2.2      0
BMP-1B           OCEANSIDE        DIV-1B           0.01412  100      19       0        0
SM-1             OCEANSIDE        POC-1            0.02968  41.1     21       1.0      0
SM-2             OCEANSIDE        POC-1            0.03540  10       17       1        0
DMA-2            OCEANSIDE        BMP-2            0.2523   94.5     70       1.9      0
BMP-2            OCEANSIDE        DIV-2            0.00429  100      7        0        0
SM-3             OCEANSIDE        POC-1            0.02541  0        111      40       0
SM-4             OCEANSIDE        POC-1            0.75742  0        84       10.8     0
OS-1             OCEANSIDE        POC-1            0.89061  61.3     132      3.6      0
OS-2             OCEANSIDE        POC-1            0.23235  54.5     103      6.4      0
OS-3             OCEANSIDE        POC-1            0.46612  56.4     203      6.0      0
SM-5             OCEANSIDE        POC-1            0.32645  0        180      56.8     0
SM-6             OCEANSIDE        POC-1            1.07043  0        117      13.1     0
OS-4             OCEANSIDE        POC-1            0.0317   0        35       10       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
BMP-1A           0.012      .10        0.05       0.1        25         OUTLET
DMA-1A           0.012      .10        0.05       0.1        25         OUTLET
DMA-1B           0.012      0.10       0.05       .1         25         OUTLET
BMP-1B           0.012      0.10       0.05       .1         25         OUTLET
SM-1             0.012      0.10       0.05       .1         25         OUTLET
SM-2             0.012      0.10       0.05       .1         25         OUTLET
DMA-2            0.012      0.10       0.05       .1         25         OUTLET
BMP-2            0.012      0.10       0.05       .1         25         OUTLET
SM-3             0.012      0.10       0.05       .1         25         OUTLET
SM-4             0.012      0.10       0.05       .1         25         OUTLET
OS-1             0.012      0.10       0.05       .1         25         OUTLET
OS-2             0.012      0.10       0.05       .1         25         OUTLET
OS-3             0.012      0.10       0.05       .1         25         OUTLET
```

```
SM-5             0.012      0.10       0.05       .1         25         OUTLET
SM-6             0.012      0.10       0.05       .1         25         OUTLET
OS-4             0.012      0.10       0.05       .1         25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
BMP-1A           9          0.01875    0.3
DMA-1A           9          0.01875    0.30
DMA-1B           9          0.01875    0.3
BMP-1B           9          0.01875    0.3
SM-1             9          0.01875    0.3
SM-2             9          0.01875    0.3
DMA-2            9          0.01875    0.3
BMP-2            9          0.01875    0.3
SM-3             9          0.025      0.3
SM-4             9          0.025      0.3
OS-1             9          0.01875    0.3
OS-2             9          0.01875    0.3
OS-3             9          0.01875    0.3
SM-5             9          0.01875    0.3
SM-6             9          0.025      0.3
OS-4             9          0.01875    0.3

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-1A           RB
BMP-1A           STORAGE    93         0.99       0          0
BMP-1A           DRAIN      0.2178     0.5        0          0

BMP-1B           RB
BMP-1B           STORAGE    93         0.75       0.5        0
BMP-1B           DRAIN      0.1806     0.5        0          0

BMP-5            RB
BMP-5            STORAGE    63         0.75       0.5        0
BMP-5            DRAIN      0.1923     0.5        0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
DrainTo
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ----------------------
-- ----------------
BMP-1A           BMP-1A           1       378.97     0          0          100        0
```

```
BMP-1B           BMP-1B           1       615.07     0          0          0          0
BMP-2            BMP-5            1       186.87     0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-1A           0          BYPASS-1A        CUTOFF     0.01825    0          0          0          0
DIV-1B           0          BYPASS-1B        CUTOFF     0.02456    0          0          0          0
DIV-2            0          BYPASS-2         CUTOFF     0.00654    0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat
IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          ---
----- --------
STOR-1A          0        3.9        0          TABULAR    STORAGE-1A                   0        1
STOR-1B          0        4.0        0          TABULAR    STORAGE-1B                   0        0
STOR-2           0        2.0        0          TABULAR    STORAGE-5                    0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
BYPASS-1A        DIV-1A           STOR-1A          10         0.01       0          0          0          0
DUM_1A           DIV-1A           POC-1            10         0.01       0          0          0          0
DUM_1B           DIV-1B           POC-1            10         0.01       0          0          0          0
BYPASS-1B        DIV-1B           STOR-1B          10         0.01       0          0          0          0
DUM_2            DIV-2            POC-1            10         0.01       0          0          0          0
BYPASS-2         DIV-2            STOR-2           10         0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
STOR-1A-ORIFICE  STOR-1A          POC-1            0          TABULAR/DEPTH   STOR-1AORIFICE              NO
STOR-1B-ORIFICE  STOR-1B          POC-1            0          TABULAR/DEPTH   STOR-1BORIFICE              NO
STOR-2-ORIFICE   STOR-2           POC-1            0          TABULAR/DEPTH   STOR-2-ORIFICE              NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
BYPASS-1A        DUMMY        0                0          0          0          1
```

```
DUM_1A           DUMMY        0               0          0          0          1
DUM_1B           DUMMY        0               0          0          0          1
BYPASS-1B        DUMMY        0               0          0          0          1
DUM_2            CIRCULAR     1               0          0          0          1
BYPASS-2         DUMMY        0               0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
STOR-1AORIFICE   Rating     0.000      0.014
STOR-1AORIFICE              1.000      0.348
STOR-1AORIFICE              1.900      0.457
STOR-1AORIFICE              2.900      0.570
STOR-1AORIFICE              3.90       0.663
;
STOR-1BORIFICE   Rating     0.000      0.000
STOR-1BORIFICE              1.000      0.434
STOR-1BORIFICE              2.000      0.588
STOR-1BORIFICE              3.000      0.731
STOR-1BORIFICE              4.0        0.850
;
STOR-5-ORIFICE   Rating     0.000      0.000
STOR-5-ORIFICE              1.000      0.434
STOR-5-ORIFICE              2.000      0.588
;
1                Rating     0.000      0.000
1                           1.550      0.434
1                           2.550      0.670
;
STOR-2-ORIFICE   Rating     0.000      0.000
STOR-2-ORIFICE              1.550      0.434
STOR-2-ORIFICE              2.550      0.670
;
STORAGE-1A       Storage    0          379
STORAGE-1A                  0.15       379
STORAGE-1A                  0.40       379
STORAGE-1A                  0.65       379
STORAGE-1A                  0.90       379
STORAGE-1A                  1.15       379
STORAGE-1A                  1.40       379
STORAGE-1A                  1.65       379
STORAGE-1A                  1.90       379
STORAGE-1A                  2.15       379
STORAGE-1A                  2.40       379
STORAGE-1A                  2.65       379
```

```
STORAGE-1A                 2.90       379
STORAGE-1A                 3.90       379
;
STORAGE-1B       Storage   0          615
STORAGE-1B                 0.25       615
STORAGE-1B                 0.50       615
STORAGE-1B                 0.75       615
STORAGE-1B                 1.00       615
STORAGE-1B                 1.25       615
STORAGE-1B                 1.50       615
STORAGE-1B                 1.75       615
STORAGE-1B                 2.00       615
STORAGE-1B                 2.25       615
STORAGE-1B                 2.50       615
STORAGE-1B                 2.75       615
STORAGE-1B                 3.00       615
STORAGE-1B                 4.0        615
;
STORAGE-5        Storage   0          187
STORAGE-5                  0.25       187
STORAGE-5                  0.50       187
STORAGE-5                  0.75       187
STORAGE-5                  1.00       187
STORAGE-5                  1.25       187
STORAGE-5                  1.50       187
STORAGE-5                  1.75       187
STORAGE-5                  2.00       187
STORAGE-5                  2.25       187
STORAGE-5                  2.55       187

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Oceanside Rain Data.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
```

```
[MAP]
DIMENSIONS 191.920 4920.830 1021.827 5718.627
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            757.925            5297.592
DIV-1A           599.929            5442.567
DIV-1B           923.735            5448.643
DIV-2            911.730            5138.330
STOR-1A          361.197            5440.830
STOR-1B          1157.258           5453.852
STOR-2           1114.720           5141.331

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BMP-1A           598.192            5489.445
DMA-1A           597.324            5542.400
DMA-1A           597.324            5542.400
DMA-1B           921.565            5569.745
DMA-1B           920.697            5570.614
BMP-1B           919.395            5507.675
BMP-1B           919.395            5507.675
SM-1             619.895            5235.955
SM-1             619.895            5235.955
SM-2             648.977            5201.665
SM-2             648.109            5202.533
DMA-2            915.488            5027.174
DMA-2            914.620            5028.042
BMP-2            913.318            5087.508
SM-3             665.905            5163.034
SM-4             700.630            5130.046
OS-1             704.102            5556.290
OS-2             756.189            5518.093
OS-3             794.386            5467.742
OS-3             794.386            5467.742
SM-5             734.486            5069.278
SM-6             788.309            5106.606
OS-4             849.332            5455.666
```

```
[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        757.548            5779.526
```

ATTACHMENT 7

SWMM Screens and Explanation of Significant Variables

EPA SWMM Figures and Explanations

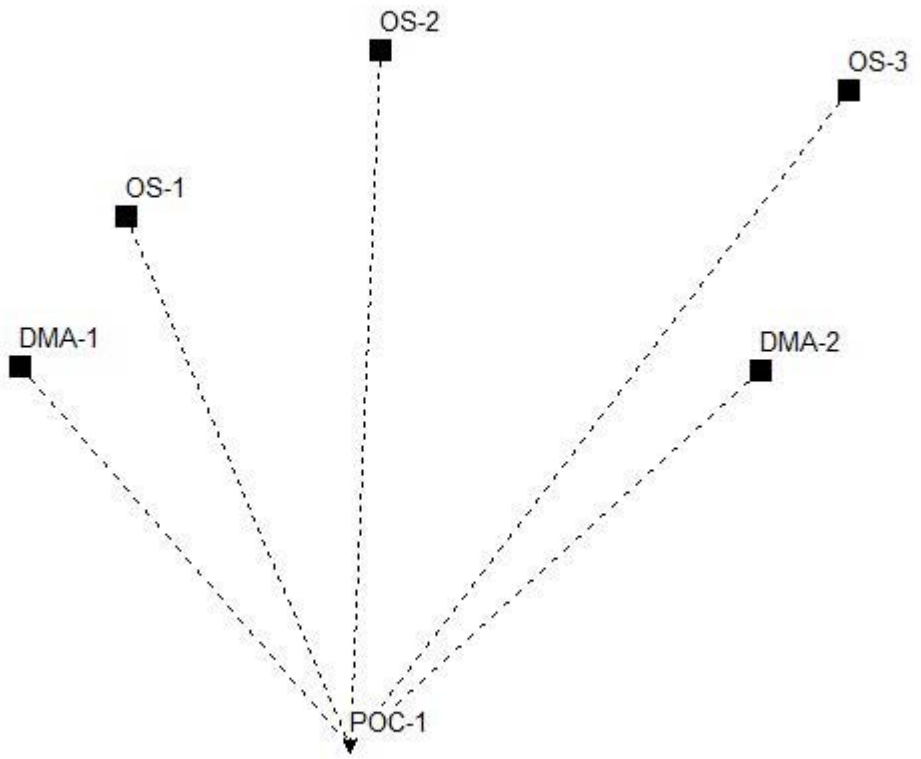
Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, storage units, weirs and orifices as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model and the Model BMP Design Manual San Diego Region.

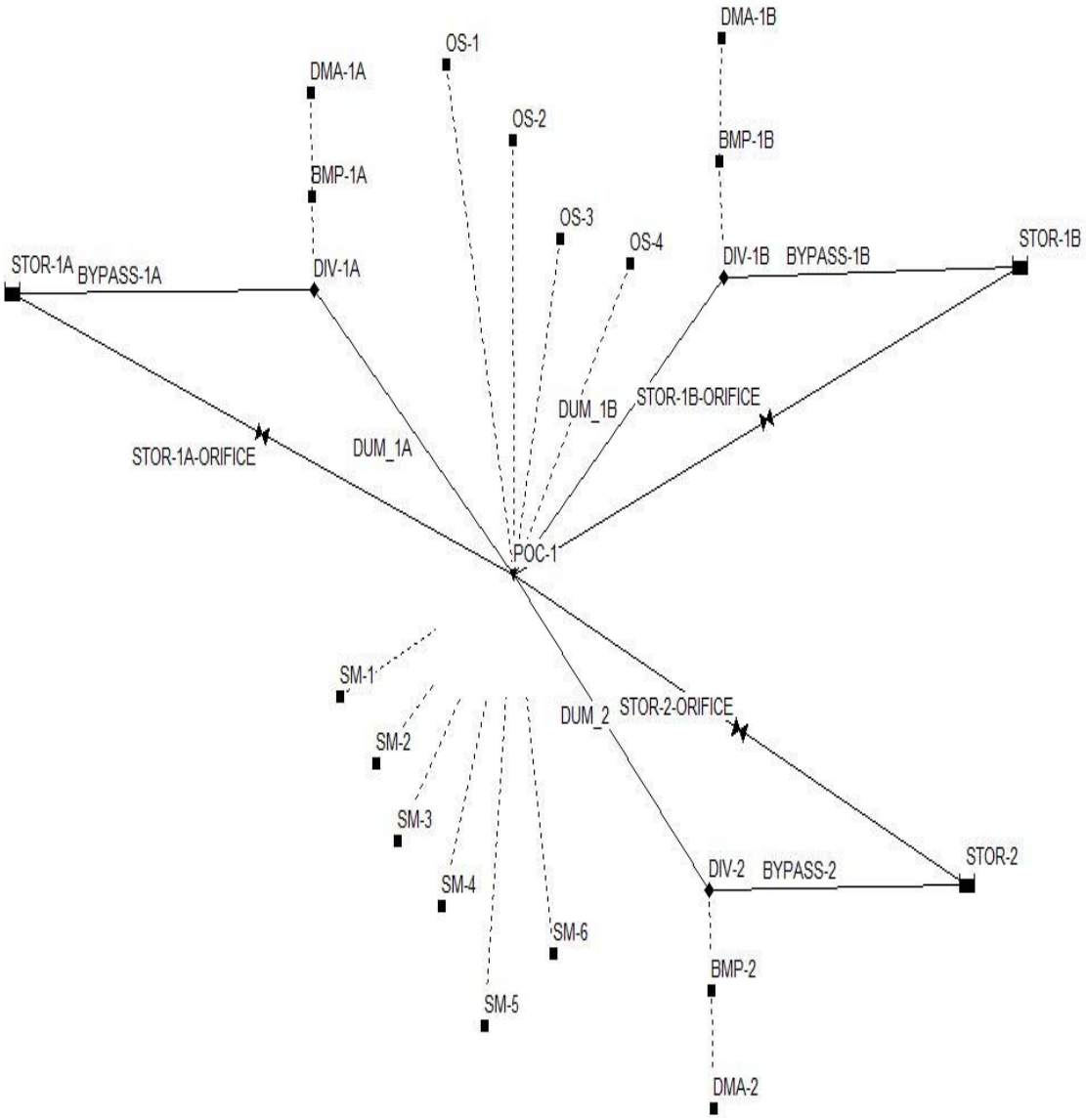
Soil characteristics of the existing soils were determined from the site specific NRCS Web Soil Survey.

Some values incorporated within the SWMM model have been determined from the professional experience of BHA using conservative assumptions that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

PRE-DEVELOPED CONDITION (POC-1)



POST-DEVELOPED CONDITION (POC-1)



Explanation of Selected Variables

- Sub Catchment Areas: Please refer to the attached diagram that indicates the DMA and dentention vault BMP sub-areas modeled within the project site at both the pre and post developed conditions draining to the POCs.

  Parameters for the pre-developed model include soils Type D as assumed for "unknown" soils from the NRCS Web Soils Survey (see Attachment 8). Suction head, conductivity and initial deficit correspond to average values expected for this soil type, according to the BMP Design Manual (BMPDM). Type D soil has been assumed in post-developed conditions to account for the anticipated fill soils onsite, as required by the BMPDM.

  The BMPDM default value for the pervious overland flow roughness (N-perv was used for this project).

- Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant that the precious routing in a system where the time of concentration is much smaller than 1 hour.

- Sub Catchment BMP: The subcatchment BMP is assigned the area of detention vault, which is equal to the area of the vault. At least five (5) decimal places were given regarding the area of the detention vault to insure that the area used by the program for the LID subroutine corresponds exactly with the actual detention vault area.

LID Control Editor: Explanation of Significant Variables

- Storage Depth: The storage depth (barrel height) variable within the SWMM model is representative of the storage volume provided beneath the lowest surface outlet within the detention vault. This is the volume that can only discharge from the facility via the LID portion of the vault.

- Drain (Flow) coefficient: The flow coefficient in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form:

$$q = C(H - H_D)^n \qquad (2)$$

where,

q is the peak flow in in/hr;

n is exponent (typically 0.5 for orifice equation);

H_D is the elevation of the centroid of the orifice in inches (assumed equal to the invert of the orifice for small orifices and in our design equal to 0); and

H is the depth of the water in inches.

The general orifice equation can be expressed as:

$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \quad (3)$$

where,

Q is the peak flow in cfs;

D is the underdrain orifice diameter in inches;

c_g is the typical discharge coefficient for orifices (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);

g is the gravitational constant (32.2 ft/s^2); and

H and H_D are defined above are also used in inches in Equation (3).

It is clear that:

$$q = \left(\frac{in}{hr}\right) \frac{A_{BMP}}{12*3600} = Q(cfs) \quad (4)$$

The flow coefficient used in the SWMM Model characterizes the rate of discharge to the outlet as a function of the height of water stored in the detention vault. The flow coefficient, as presented in the BMPDM, can be determined by the following equation:

$$C = c_g \left(\frac{605}{A_{lid}}\right) \left(\frac{\pi D^2}{8}\right) \sqrt{\frac{g}{6}} \quad (5)$$

where,

c_g is the orifice discharge coefficient (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);

A_{lid} is the cumulative footprint area (ft2) of all LID controls;

D is the underdrain orifice diameter in inches; and

g is the gravitational constant (32.2 ft/s^2);

- Cut-Off Flow: The cut-off flow represents the maximum flow rate leaving the “low flow” outlet. Therefore, the orifice equation is used to calculate the cutoff flow when H is maximum.

ATTACHMENT 8

Soil Map


Hydrologic Soil Group—San Diego County Area, California
(OCEANSIDE GATEWAY APTS)
117° 22' 1" W
117° 21' 50" W
33° 11' 13" N
33° 11' 1" N
465770
465810
465850
465890
465930
465970
466010
466050
3672080
3672040
3672000
3671960
3671920
3671880
3671840
3671800
3671760
3671720
Reese St
Oceanside
Oceanside Blvd
Md
ToF
TuB
TuB
Beechwood Ln
Loma Alta Creek
Map Scale: 1:1,840 if printed on A portrait (8.5" x 11") sheet.
Meters
0 25 50 100 150
Feet
0 50 100 200 300
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

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

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Md	Made land		2.0	67.1%
TeF	Terrace escarpments		0.7	22.5%
TuB	Tujunga sand, 0 to 5 percent slopes	A	0.3	10.3%
Totals for Area of Interest			**2.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

SUMMARY PRE POC-1

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

Breeze Luxury Townhomes, Post-Developed Mitigated Runoff Condition

WARNING 04: minimum elevation drop used for Conduit BYPASS-1A
WARNING 04: minimum elevation drop used for Conduit DUM_1A
WARNING 04: minimum elevation drop used for Conduit DUM_1B
WARNING 04: minimum elevation drop used for Conduit BYPASS-1B
WARNING 04: minimum elevation drop used for Conduit DUM_2
WARNING 04: minimum elevation drop used for Conduit BYPASS-2

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
```

```
**************************     ---------       -------
Total Precipitation ......       312.705       675.110
Evaporation Loss .........        20.833        44.977
Infiltration Loss ........       124.727       269.277
Surface Runoff ...........        92.716       200.167
LID Drainage .............        77.365       167.026
Final Storage ............         0.012         0.026
Continuity Error (%) .....        -0.942

**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       170.080        55.423
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........       170.078        55.422
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.001

*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


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

Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BMP-1A	675.11	36560.42	0.00	0.00	37233.18	8.80	0.67	1.000
DMA-1A	675.11	0.00	84.03	19.51	577.08	8.64	0.66	0.855
DMA-1B	675.11	0.00	79.92	19.37	584.70	13.69	1.04	0.866
BMP-1B	675.11	35699.45	0.00	0.00	36372.20	13.95	1.05	1.000
SM-1	675.11	0.00	41.43	281.72	359.58	0.29	0.03	0.533
SM-2	675.11	0.00	21.53	433.52	224.50	0.22	0.04	0.333
DMA-2	675.11	0.00	78.29	26.00	580.32	3.98	0.30	0.860
BMP-2	675.11	34129.17	0.00	0.00	34801.43	4.05	0.31	1.000
SM-3	675.11	0.00	11.41	503.98	171.36	0.12	0.03	0.254
SM-4	675.11	0.00	12.20	517.06	148.65	3.06	0.85	0.220
OS-1	675.11	0.00	55.93	185.59	441.18	10.67	1.05	0.653
OS-2	675.11	0.00	49.91	216.04	418.34	2.64	0.27	0.620
OS-3	675.11	0.00	51.20	206.90	426.25	5.39	0.55	0.631
SM-5	675.11	0.00	14.55	474.10	195.08	1.73	0.37	0.289
SM-6	675.11	0.00	12.14	516.55	149.34	4.34	1.20	0.221
OS-4	675.11	0.00	14.91	471.15	197.08	0.17	0.04	0.292

****
LID Performance Summary
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Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-1A	BMP-1A	37235.53	0.00	0.00	1740.80	35493.94	0.00	0.61	0.00
BMP-1B	BMP-1B	36374.56	0.00	0.00	1927.15	34446.22	0.00	0.93	0.00
BMP-2	BMP-5	34804.28	0.00	0.00	3746.09	31057.06	0.00	0.86	0.00

****
Node Depth Summary
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	Average	Maximum	Maximum	Time of Max	Reported

Node	Type	Depth Feet	Depth Feet	HGL Feet	Occurrence days hr:min	Max Depth Feet
POC-1	OUTFALL	0.01	0.08	0.08	11721 20:33	0.08
DIV-1A	DIVIDER	0.00	0.00	0.00	0 00:00	0.00
DIV-1B	DIVIDER	0.00	0.00	0.00	0 00:00	0.00
DIV-2	DIVIDER	0.01	0.08	0.08	141 06:52	0.08
STOR-1A	STORAGE	0.00	2.06	2.06	18857 12:22	1.78
STOR-1B	STORAGE	0.00	2.67	2.67	15835 16:19	2.42
STOR-2	STORAGE	0.00	1.07	1.07	18857 12:14	1.05

****
Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-1	OUTFALL	4.44	5.74	18857 12:01	28.6	55.4	0.000
DIV-1A	DIVIDER	0.67	0.67	18857 12:01	8.8	8.8	0.000
DIV-1B	DIVIDER	1.05	1.05	18857 11:46	13.9	13.9	0.000
DIV-2	DIVIDER	0.31	0.31	18857 11:46	4.05	4.05	0.000
STOR-1A	STORAGE	0.00	0.65	18857 12:01	0	0.412	-0.063
STOR-1B	STORAGE	0.00	1.03	18857 11:46	0	0.741	0.097
STOR-2	STORAGE	0.00	0.30	18857 11:46	0	0.437	0.033

****
Node Flooding Summary
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No nodes were flooded.

****
Storage Volume Summary
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	Average Volume	Avg Pcnt	Evap Pcnt	Exfil Pcnt	Maximum Volume	Max Pcnt	Time of Max Occurrence	Maximum Outflow

Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days hr:min		CFS
STOR-1A	0.000	0	0	0	0.783	53	18857	12:21	0.48
STOR-1B	0.000	0	0	0	1.642	67	15835	16:18	0.68
STOR-2	0.000	0	0	0	0.199	53	18857	12:13	0.30

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	11.47	0.04	5.74	55.418
System	11.47	0.04	5.74	55.418

****
Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
BYPASS-1A	DUMMY	0.65	18857 12:01			
DUM_1A	DUMMY	0.02	141 07:56			
DUM_1B	DUMMY	0.02	2351 22:04			
BYPASS-1B	DUMMY	1.03	18857 11:46			
DUM_2	CONDUIT	0.01	11721 20:33	0.21	0.01	0.08
BYPASS-2	DUMMY	0.30	18857 11:46			
STOR-1A-ORIFICE	DUMMY	0.48	18857 12:22			
STOR-1B-ORIFICE	DUMMY	0.68	15835 16:19			
STOR-2-ORIFICE	DUMMY	0.30	18857 12:14			

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Conduit Surcharge Summary
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No conduits were surcharged.

Analysis begun on: Wed Jan 30 15:30:00 2019
Analysis ended on: Wed Jan 30 15:31:17 2019
Total elapsed time: 00:01:17

ATTACHMENT 10

Drawdown Calculations

Drawdown Calculations - WQ-1A

Surface Ponding Depth:	PD	49.2	in
Ponding Depth Surface Area:	A_{PD}	379	ft^2
Surface Ponding Volume:	V_{PD}	1,554	ft^3
Low Flow Orifice Diameter:	D	0.5	in
Flow Rate (volumetric):	Q	0.018	ft^3/s
Drawdown Time:		23.65	hrs

Drawdown Calculations - WQ-1B

Surface Ponding Depth:	PD	48	in
Ponding Depth Surface Area:	A_{PD}	615	ft^2
Surface Ponding Volume:	V_{PD}	2,460	ft^3
Orifice Diameter:	D	0.58	in
Flow Rate (volumetric):	Q	0.025	ft^3/s
Drawdown Time:		27.823	hrs

Drawdown Calculations - WQ-2

Surface Ponding Depth:	PD	39	in
Ponding Depth Surface Area:	A_{PD}	187	ft^2
Surface Ponding Volume:	V_{PD}	608	ft^3
Orifice Diameter:	D	0.3	in
Flow Rate (volumetric):	Q	0.005	ft^3/s
Drawdown Time:		31.205	hrs

ADDITIONAL SUPPORTING DOCUMENTATION