APPENDIX G
Stormwater Control Plan

STORMWATER CONTROL PLAN

for

WORLD OIL FUEL STATION

16720 MONTEREY HWY
MORGAN HILL, CA 95037

prepared for:

WORLD OIL MARKETING COMPANY

9302 GARFIELD AVENUE
SOUTHGATE, CA 90280

prepared by:

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September 01, 2020

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Preparer's Printed Name

Preparer's Title/Position

Preparer's Licensure: CE 52001

Table of Contents

Attachments

I. A. Introduction

The following Post-Construction Stormwater Control Plan (SWCP), evaluation, and resulting design of the development project is in accordance with the Central Coast Water Quality Control Board's Post-Construction Stormwater Management Requirements (PCRs). This SWCP follows the outline format provided by the Regional Board and the Stormwater Management Guidance Manual for Low Impact Developments & Post-Construction Requirements for the City of Gilroy, City of Morgan Hill and County of Santa Clara, dated June 2015.

Documentation of the Applicable Post-Construction Stormwater Requirements

The proposed project will create and replace more than 15,000 square foot and Less than 22,000 square feet of impervious surface area; therefore, the proposed project is subject to Performance Requirements; PR-1, PR-2 and PR-3 shown below:

PR-1 - Site Design and Runoff Reduction
PR-2 - Water Quality Treatment
PR-3 - Runoff Retention

Table 1. Applicable Post-Construction Stormwater Requirements

Applicable Post-Construction Stormwater Requirements	
Type of Project Requirements	**Type of Project Requirements**
Tier 1 - Projects, including single-family homes, that create or replace 2,500 square feet or more of impervious surface.	**PR-1 -Implement LID Measures:** • Limit disturbance of natural drainage features. • Limit clearing, grading, and soil compaction. • Minimize impervious surfaces. • Minimize runoff by dispersing runoff to landscape or using permeable pavements.
Tier 2 - Projects, other than single-family homes, that create or replace 5,000 SF or more of net impervious surface. Detached single-family homes that create or Replace 15,000 SF or more of net impervious surface.	**PR-1 requirements, plus PR-2:** • Treat runoff with an approved and appropriately sized LID treatment system prior to discharge from the site.
Tier 3 - Projects, other than single-family homes, that create or replace 15,000 SF or more of impervious surface. Detached single-family homes that create or replace 15,000 SF or more of net impervious surface.	**PR-2 requirements, plus PR-3:** • Prevent offsite discharge from events up to the 95th percentile rainfall event using Stormwater Control Measures.

Tier 4 - Projects, including single-family homes, that create or replace 22,500 square feet or more of impervious surface.	**PR-3 requirements, plus PR-4:** • Control post-project peak flows to not exceed pre-project peak flows for the 2- through 10-year storm events. (May be satisfied by Tier 3 requirements for some projects.)

B. Project Data

Table 2. Project Data

Project Name/Number	World Oil Fuel Station WOF052 Application No. Pending
Owner	World Oil Marketing Company 9302 Garfield Avenue South Gate, CA. 90280
Project Location Parcel Number	16720 Monterey Rd, Morgan Hill, CA 95037-5105 817-01-002
Project Phase No.	N/A
Project Type and Description	Commercial
Total Project Site Area (acres)	0.48
1) Existing On-Site Impervious Surface Area	14,074 sf
2) New Impervious Surface Area	3,123 sf
3) Replaced Impervious Surface Area	14,074 sf
4) Net Impervious Surface Area	17,197 sf
5) Total of New + Replaced Impervious Surface Area	17,197 sf
6) Calculation of Net Impervious Surface Area	3,663 sf
K. Ten Percent of Equivalent Impervious Surface Area (EISA)	0.1(17,197 sf) = 1,720 sf
Watershed Management Zone(s)	WMZ1

Design Storm Frequency and Depth	Attachment D: Central Coast Region 95th Percentile 24-Hour Rainfall Depth Rainfall Depth = 1.73 inches Attachment D: Central Coast Region 85th Percentile 24-Hour Rainfall Depth Rainfall Depth = 1.1 inches
Regulated Project Requirements	Project subject to Performance Requirements 1 through 3 1. Site Design and Runoff Reduction 2. Water Quality Treatment 3. Runoff Retention (exempt – project complies with special circumstances exception per R3- 2013-0032. B.6.a.ii) 4. Peak Management (exempt – project complies with special circumstances exception 2013- 0032.B.6.a.ii 5. Special Circumstances

II. Setting

II.A. Project Location and Description

The regulated project area is located at the northeast corner of San Pedro Avenue and Monterey Road in the city of Morgan Hill. The developer is proposing a building of 2,109 sf and 15,065 sf of parking, drive aisles and sidewalk on the project site to a total buildup of 17,174 sf of impervious surface. The site is located within Mixed Use Zoning Districts Zoning Mixed Use Flex (MU-F). The neighborhood character is General Commercial (CG) and Highway Commercial (CH).

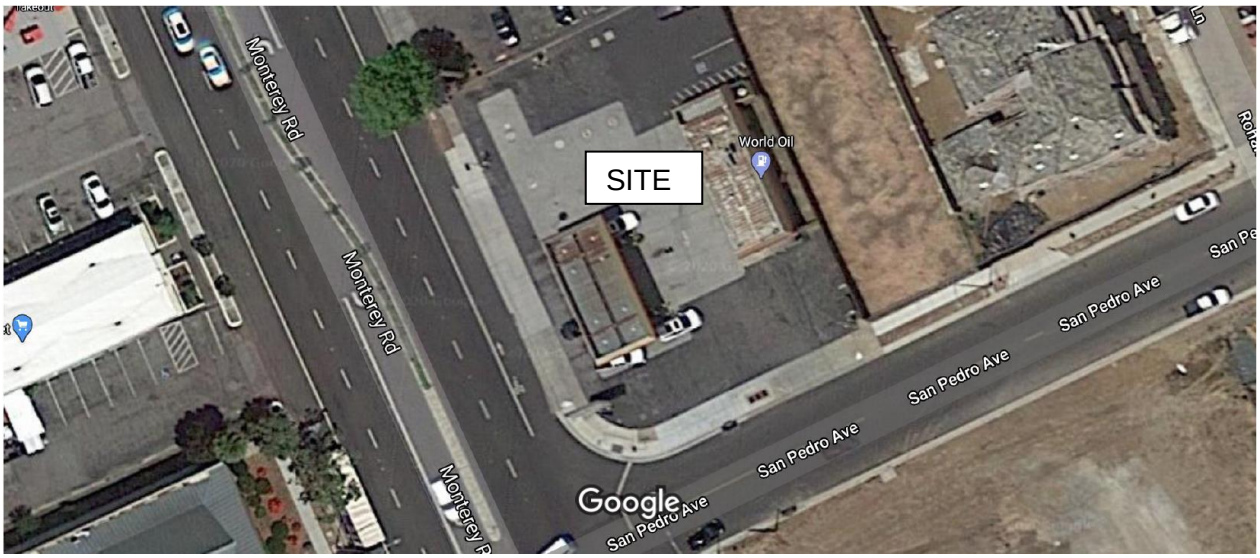


Figure. 1

The subject project site has storm water collection facilities that conveys stormwater to Bioretention Basins designated as Bioretention Basins D1 and D2 and to underground infiltration.

Bioretention Basins D1 and D2 and underground infiltration was designed to per City of Morgan Hill Storm Drain Design Standards, section 4.1600 for a (Bioretention Basin), which is substantially greater than: 85th percentile 24 hr. storm, depth = 1.10" and/or 95th percentile 24 hr. storm, depth =1.73"

II.B. Existing Site Features and Conditions

The project site is 0.48 acres of a developed area consisting of Station facility and an adjoining undeveloped rectangular area. The site is relatively flat with seasonal grasses, and generally slopes to the south. There are no existing retention/detention facilities within the site.

II.C. Opportunities and Constraints for Stormwater Control

Constraints: Geotechnical report recommended unfactored infiltration rate of 0.12 inches/hr.
Opportunities: The installation of landscape around the building and landscape planters will reduce the overall impervious area, therefore, stormwater runoff from the project site. The proposed convenience store's roof runoff is directed north into landscape/bioretention areas within the site. The installation of an underground infiltration structure with a pretreatment and trash capture unit will reduce the stormwater runoff from the project site, in addition to the retention of bioretention basins.

III. Low Impact Development Design Strategies

III.A. Optimization of Site Layout

III.A.1. Limitation of development envelope – None

III.A.2. Preservation of natural drainage features – N/A

III.A.3. Setbacks from creeks, wetlands, and riparian habitats – No adjoining creeks, wetlands or riparian habitats.

III.A.4. Minimization of imperviousness – The project proposes only the necessary amount of impervious surface to provide adequate parking & sidewalks for proposed buildings.

III.A.5. Use of drainage as a design element – the drainage will be directed to, Bioretention Basins and underground infiltration.

III.B. Use of Permeable Pavements – none

III.C. Dispersal of Runoff to Pervious Areas- the site, will drain to, Bioretention Basin D1/D2 and infiltration.

III.D. Stormwater Control Measures – the entirety of the project's stormwater will be treated in, Bioretention Basins and underground infiltration, by infiltration/percolation.

Applied Stormwater Control Measures:

a. Performance Requirements

Performance Requirement 1, Site Design and Runoff Reduction has been implemented on this project site by directing roof, canopy, and other impervious areas onto landscaped areas prior to entering the storm drain system.

Performance Requirement 2, Water Quality Treatment, is met through three Bioretention basins and underground infiltration system designed to retain more than the required 85th percentile storm. See PR-3 below for additional infiltration discussion.

Performance Requirement 3, Runoff Retention, is met through the infiltration of the required 95th percentile storm event in the Bioretention Basins and the underground infiltration system. Due to the poor infiltration rate per the Geotechnical Report, the drawdown time of the 5' deep infiltration system is excessively high (approximately 500 hours). Per the Stormwater management Guidance Manual for Low Impact Development & Post-Construction Requirements dated June 2015, a 1.20 multiplier has been added to the required volume for the drawdown time greater than 48hrs. This factor is from the manuals Appendix D, Page D-4, and Appendix H, Page H-5. Due to the excessively high drawdown time, an outlet control structure is proposed to reduce the drawdown time and meter the stormwater runoff flows.

b. Runoff Reduction Measures

Runoff reduction measures used on this project site include landscape areas and an underground infiltration structure sized to retain and infiltrate the 95th percentile 24-hr storm. The convenience store roof is routed north to landscape prior to entering the storm drain system and infiltration basin.

c. Delineation of Drainage Management Areas

Attachment “A”, Stormwater Control Exhibits. Two DMAs are delineated; DMA-1 and DMA-2 are directed to Bioretention Facilities and underground infiltration.

IV. Documentation of Drainage Design

IV.A. Descriptions of each Drainage Management Area

The stormwater control measures used in DMA-1 and DMA-2 are Bioretention Basins with underdrain and underground infiltration structures with a CDS units for pretreatment and trash capture. Both DMA's are conveyed to the Contech CDS unit for pretreatment and trash capture prior to the stormwater entering the Oldcastle StormCapture underground infiltration structure. A storm drain connection to the public system is included downstream.

IV.A.1. Table of Drainage Management Areas

DMA Name	DMA TYPE	Area
DMA 1	Drainage area to Bioretention Basin D1 and Underground infiltration	9,528 SF
DMA 2	Drainage area to Bioretention Basin D2 and Underground infiltration	11,332 SF

IV.A.2.

Drainage Management Area Descriptions

DMA 1, 0.22 Acre, is the area that drains to Bioretention Basin D1 and Underground infiltration with area of 650 sf. Underground detention includes eight (8) 7'x15'x6' storage units.

DMA 2, 0.26 Acre, is the area that drains to Bioretention Basin D2 and Underground Infiltration with area of 528 sf. Underground detention includes four (4) 7'x15'x6' storage units.

IV.B. Tabulation and Sizing Calculations

Stormcapture sizing chart

Table 3

DMA name (If applicable)	Flow reduction calculations required runoff to be controlled (See CalcS in attachment B)	Provided lid bioretention Volume (See attachment C)	SCM Tpye (s)	Required Underground Detention= 1.2*(Required Detention Volume-Provided surface Retention Volume) CF	SCM treatment method(s) (lid, biofiltration, non-retention based)	Volume retained in storm capture
DMA-1	1,782.9 CF	1,170 CF	Bioretention and Infiltration	(1,782.9-1,170) *1.2 = 735.48	Oldcastle Stormcapture Underground Infiltration with CDS Pretreatment	8 units= 5,520
DMA-2	6,930.1 CF	950 CF	Bioretention and Infiltration	(6,930.14-950) *1.2 = 7,176.168	Oldcastle Stormcapture Underground Infiltration with CDS Pretreatment	4 units= 2,760
Total*				7913.65	+7913.65/690 = 11.5 units, Say 12 7'x15'x6'	8,280

Size	Capacity	Size	Capacity
7x15x2	226 ft^3	7x15x9	1027 ft^3
7x15x3	343 ft^3	7x15x10	1144 ft^3
7x15x4	460 ft^3	7x15x11	1257 ft^3
7x15x5	577 ft^3	7x15x12	1374 ft^3
7x15x6	690 ft^3	7x15x13*	1491 ft^3
7x15x7	807 ft^3	7x15x14*	1608 ft^3
7x15x8	910 ft^3		

* Special design considerations required and limited availability

IV.B.1. Information Summary for LID Facility Design

See calculations in Attachments "B" and "C" for Bioretention Basins and Underground Infiltration sizing.

IV.B.2. Self-Treating Areas: None

IV.B.3. Self-Retaining Areas: None

IV.B.4. Areas Draining to Stormwater Control Measure Facilities: None

V. Source Control Measures

V.A. Site activities and potential sources of pollutants

V.B. Source Control Table

Table 4

Potential source of runoff pollutants	**Permanent source control BMPs**	**Operational source control BMPs**
Onsite storm drain inlet (unauthorized non-stormwater discharges)	Mark inlets with "No Dumping. Flows to Creek".	Maintain and periodically repaint or replace markings.

Landscape Outdoor Pesticide use	Preserve existing native 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 stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of 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, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks see appendix Provide IPM information to new owners, lessees, and operators.
Trash Enclosure	Design Trash container areas to avoid run on. Screen trash container areas to contain trash Pave trash storage areas with impervious surface to mitigate spills.	Monthly inspect to collect and dispose of debris in the trash enclosure.

VI. Stormwater Facility Maintenance

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The owner and their successors (1) a commitment to execute any necessary agreements, and (2) a statement accepting responsibility for operation and maintenance of facilities until that responsibility is formally transferred.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

Proper operation and maintenance of Stormwater Management Facilities will be the responsibility of the property owner in perpetuity. The property owner will be required to provide assurance of long-term maintenance.
The applicant will prepare and submit, for the City's review, an acceptable Stormwater Control Operation and Maintenance Plan prior to completion of construction and will execute a Stormwater Management Facilities Operation and Maintenance Agreement before project completion. The applicant accepts responsibility for maintenance of stormwater management facilities until such responsibility is transferred to another entity.
See attached Operation and Maintenance information for the Bioretention, CDS and StormCapture structures, Attachment N: Contech CDS Operations and Maintenance Information and Attachment O: Oldcastle StormCapture Infiltration Operations and Maintenance Information.

VII. Construction Checklist

Stormwater Control Plan
Page # BMP Description

See Plan Sheet #s

N/A	Stormwater Management Plan	

VIII. Certifications

Please see attachment for certifications

Attachment A

Stormwater Control Plan Exhibit

Attachment B

Stormwater Control Measures Sizing Calculator

DMA1

Stormwater Control Measures

1.) Determination of Retention Tributary Area

1a.) Compute the Retention Tributary Area (sf)

Description 9,528 = Atotal = total area (sf)

7,170 = Aimp = Total Impervious areas (sf) 2,358 = Aperv = Total Pervious Areas (sf)

0.753 = i = Fraction of site that is impervious $0.55 = C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$

Impervious Areas in retention tributary area

2,111	= A_{bldg} = Area of Buildings (sf)
0	= A_{PCC} = Area of Concrete (sf)
5,059	= A_{AC} = Area of Asphalt (sf)
7,170	= A_{imp} = Total Impervious Areas (sf)

1b.) Adjustments for Redevelopment Project:

9,528 = A_{DMA} = Entire DMA Area

5,770.5= A_{PA} = Undisturbed or Planted Areas

0 = A_{IADIA} = Impervious Areas that discharge to Infiltrating Area

3,767.5 = A_{rep} = Replaced impervious surface areas

$A_{ret} = A_{DMA} - A_{PA} - A_{IADIA} - (0.5 * A_{rep})$

=9,528.5,770.5-0-(0.5*3767.5)

1,873.75= A_{ret} = Retention Tributary Area (sf)

2.) Determination of Retention Volume

2a.) Project Watershed Management Zone per attach 1b

1 = $WMZ_{project}$

Runoff Retention Requirement = Prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event

2b.) Determine the 95th percentile 24-hour rainfall event

1.73 = D = 95th % 24-hour rainfall per 95th percentile poster for posting (in.)

2c.) Compute the Runoff Coefficient

$0.55 = C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$

2d.) Compute Required Retention Volume

$Retention\ Volume_{DMA\#} = C_{DMA\#} * D * A_{ret}$

= 0.55*1.73*1,873.75=1,782.9 CF

DMA2

Stormwater Control Measures

1.) Determination of Retention Tributary Area

1a.) Compute the Retention Tributary Area (sf)

Description

11,332 = Atotal = total area (sf)

10,027 = Aimp = Total Impervious areas (sf)

1,305 = Aperv = Total Pervious Areas (sf)

0.885 = i = Fraction of site that is impervious 0.707 = C =

$0.858i^3 - 0.78i^2 + 0.774i + 0.04$

Impervious Areas in retention tributary area

0	= A_{bldg} = Area of Buildings (sf)
10,027	= A_{PCC} = Area of Concrete (sf)
0	= A_{AC} = Area of Asphalt (sf)
10,027	= A_{imp} = Total Impervious Areas (sf)

1b.) Adjustments for Redevelopment Project

11,332 = A_{DMA} = Entire DMA Area

0 = A_{PA} = Undisturbed or Planted Areas

0 = A_{IADIA} = Impervious Areas that discharge to Infiltrating Area

11,332 = A_{rep} = Replaced impervious surface areas

$A_{ret} = A_{DMA} - A_{PA} - A_{IADIA} - (0.5 * A_{rep})$

=11,332-0-(0.5*11,332) =

5,666= A_{ret} = Retention Tributary Area (sf)

2.) Determination of required Retention Volume

2a.) Project Watershed Management Zone per attach 1b

1 = $WMZ_{project}$

Runoff Retention Requirement = Prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event

2b.) Determine the 95th percentile 24-hour rainfall event

1.73 = D = 95th % 24-hour rainfall per 95th percentile poster for posting (in.)

2c.) Compute the Runoff Coefficient

$0.707 = C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$

2d.) Compute Retention $Volume_{DMA\#} = C_{DMA\#} * D * A_{ret}$

= 0.707*1.73*5,666=6,930.14 CF

C Bioretention Basin Sizing

(calcs plans sheets, and record maps)

Minimum Area requirements for Water Quality Treatment Bioretention Facility

DMA Name	DMA Area (sq ft)	Post-project surface type	DMA Runoff Factor	DMA Area x runoff factor	Facility Sizing Factor	Minimum Facility Size (sq ft)	Provided Facility Size (sq ft)
DMA-1	9,528	Landscape, Roof & Pavement	0.78	7,431.8	0.04	297.3	650.0
DMA-2	11,332	Landscape, Roof & Pavement	0.90	10,198.8	0.04	407.9	527.0
Total				17,197	0.04	705.2	1,177

DMA-1 Runoff Factor 2,358 (0.1) + 7,170(1.0) =0.78

DMA-2 Runoff Factor 1,305(0.1) + 10,027 (1.0) =0.90

California Phase II LID Sizing Tool - BMP Details

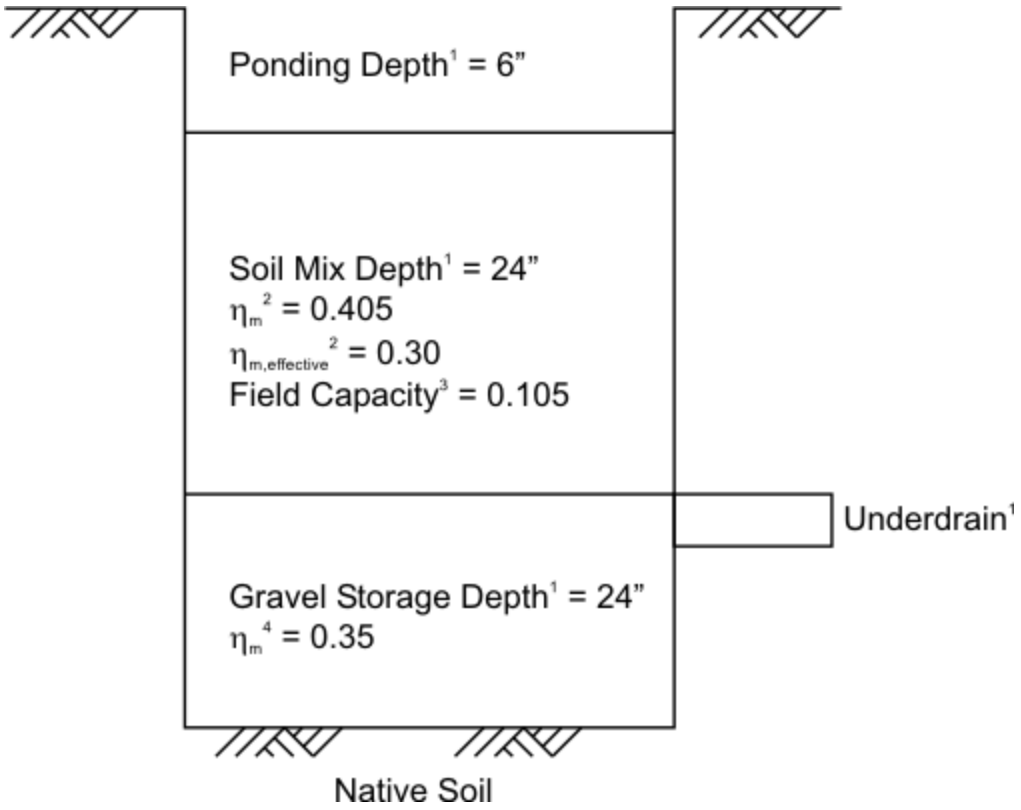
Summary

Climate station	SAN JOSE
Saturated hydraulic conductivity	0.12 in/hr
Impervious area	0.22 acres
LID area	0.015 acres
Total area	0.235 acres
Percent Accomplished	136.36%
LID BMP	Bioretention Cell - 24" Soil - 24" Gravel Storage
Methodology	Design Storm User selected design storm is 1.10 inches 85th % design storm is 0.57 inches
Design storm volumetric runoff coefficient	0.892

Description

Bioretention cells are depressed landscapes into which runoff is directed and allowed to pond, filter, and infiltrate. Some bioretention cells modeled by the CA Phase II LID Sizing Tool consist of the design parameters specified in Section E.12.e.ii.f.3 of the Phase II permit, including a 6” ponding depth underlain by 18” of bioretention soil mix and 12”, 24”, or 36” of gravel storage. (The Phase II permit requires a minimum storage depth of 12”.) The ponding zone allows for temporary storage of runoff and promotes percolation into the bioretention mix. The runoff is also stored in the mix’s pore structure, as well as being filtered and biotreated. It eventually drains into the gravel layer below which provides a third storage component. A perforated underdrain is located at the top of the gravel storage component to prevent overflow of the system. This system is unlined to allow infiltration into the underlying native soils. The Central Coast Regional Water Quality Control Board (Region 3) has adopted a variation on the permit-prescribed bioretention cell, where the soil mix depth is to be 24”, and so the tool includes bioretention cells having 6” of ponding, 24” of soil mix, and 12”, 24”, or 36” of gravel storage (with an underdrain).

LID BMP - Bioretention Cell - 24" Soil - 24" Gravel Storage



Depths

LID Layer	Depth (inches)
Ponding	6
Soil mix	24
Gravel storage	24

Notes

1. SWRCB 2013, LID standard for bioretention, p. 54; CCRWQCB 2013, post-construction requirement for water quality treatment, p. 4.
2. Effective porosity (total porosity – field capacity): VA DCR 2011, 25%; District DOE 2013, 30%; WI DNR 2010, 27%; Prince George 2013, 30%; NC Co-op 2009, 30%; LID Center 2010, 30%. Assume Total porosity = 30% + field capacity.
3. Caltrans 2010, 35% for infiltration trenches; City of Santa Barbara 2008, 30-40% commonly 32%; WI DNR 2010, 33%; NC Co-op 2009, effective porosity 25%. Assume field capacity = 0.
4. USEPA 2010. Field capacity for loamy sand = 0.105.

Note: Excavation depths should consider root uplift and expansion within the soil mix layer

Methodology: Design Storm

The Design Storm Method is based on Section E.12.e.ii.c.1.a of the permit, which allows LID stormwater retention and treatment facilities that evapotranspire, infiltrate, harvest/use, and biotreat stormwater to be designed as follows (SWRCB 2013):

> "The maximized capture storm water volume for the tributary area, on the basis of historical precipitation records, determined using the formula and volume capture coefficients in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event)".

The area reported for the Design Storm Method is based on a default 85th percentile, 24-hour design storm as specified in the Phase II permit. Some areas of the state require use of a different design storm, such as the Central Coast Regional Water Quality Control Board (RWQCB) where the 95th percentile design storm is a common requirement. For such cases, the user my over-ride the default design storm (i.e., the 85th percentile storm) with an alternative precipitation depth in the "Select a design storm depth in inches" cell located below the table and clicking "Submit".

, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

DMA-1 BIORETENTION VOLUME provided = Ponding volume + water in Soil Volume + Water in Gravel volume = (650*0.5) + (650*2*0.3) + (650*2*0.35)= 1,170 CF = Percent Accomplished 136.36% (Per California Phase II LID Sizing Tool - v1.2 calculations).

,

DMA-2

California Phase II LID Sizing Tool - v1.2

California Phase II LID Sizing Tool - BMP Details

Summary

Climate station	SAN JOSE
Saturated hydraulic conductivity	0.12 in/hr
Impervious area	0.23 acres
LID area	0.012 acres
Total area	0.242 acres
Percent Accomplished	109.09%
LID BMP	Bioretention Cell - 24" Soil - 24" Gravel Storage
Methodology	Design Storm User selected design storm is 1.10 inches 85th % design storm is 0.57 inches
Design storm volumetric runoff coefficient	0.892

Description

Bioretention cells are depressed landscapes into which runoff is directed and allowed to pond, filter, and infiltrate. Some bioretention cells modeled by the CA Phase II LID Sizing Tool consist of the design parameters specified in Section E.12.e.ii.f.3 of the Phase II permit, including a 6” ponding depth underlain by 18” of bioretention soil mix and 12”, 24”, or 36” of gravel storage. (The Phase II permit requires a minimum storage depth of 12”.) The ponding zone allows for temporary storage of runoff and promotes percolation into the bioretention mix. The runoff is also stored in the mix’s pore structure, as well as being filtered and biotreated. It eventually drains into the gravel layer below which provides a third storage component. A perforated underdrain is located at the top of the gravel storage component to prevent overflow of the system. This system is unlined to allow infiltration into the underlying native soils. The Central Coast Regional Water Quality Control Board (Region 3) has adopted a variation on the permit-prescribed bioretention cell, where the soil mix depth is to be 24”, and so the tool includes bioretention cells having 6” of ponding, 24” of soil mix, and 12”, 24”, or 36” of gravel storage (with an underdrain).

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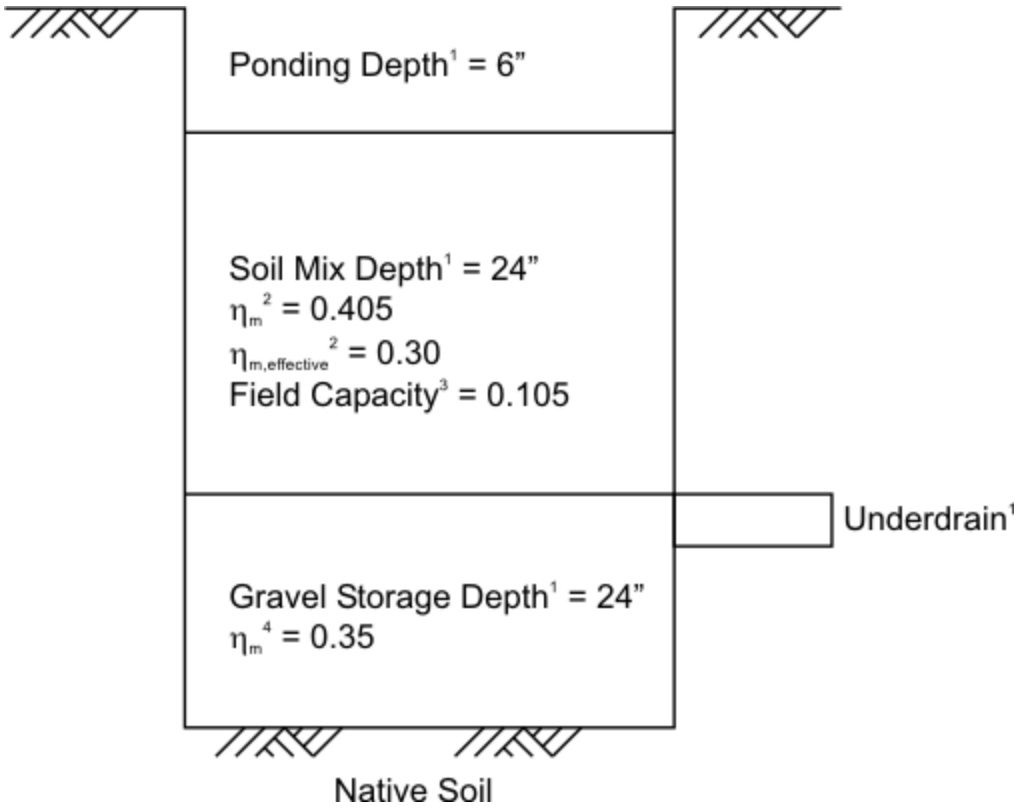

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Further details on this method are provided in the Documentation Manual.

DMA-2 BIORETENTION VOLUME provided = Ponding volume + water in Soil Volume + Water in Gravel volume

= (528*0.5) + (528*2*0.3) + (528*3*0.35) = 950.0 CF = Percent Accomplished 109.09% (Per California Phase II LID Sizing Tool - v1.2 calculations).

Attachment D

Soil type - Infiltration info. – Drainage Maps - 85th percentile chart - 95 percentile chart

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

7/24/2020
Page 1 of 3

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

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: Eastern Santa Clara Area, California
Survey Area Data: Version 16, May 29, 2020

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

Date(s) aerial images were photographed: Mar 31, 2019—Apr 24, 2019

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SdA	San Ysidro loam, 0 to 2 percent slopes, MLRA 14	0.8	100.0%
Totals for Area of Interest		**0.8**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

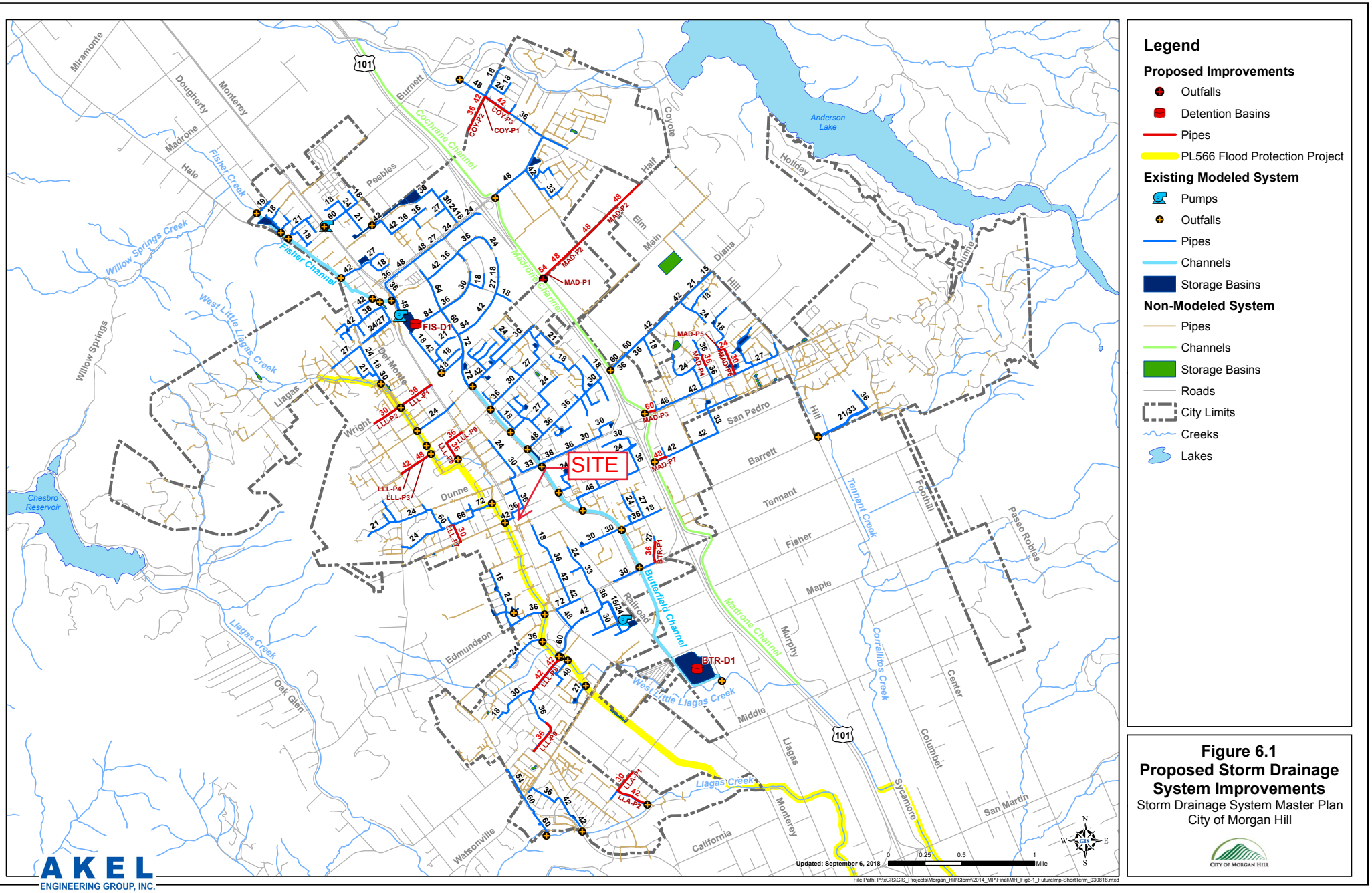
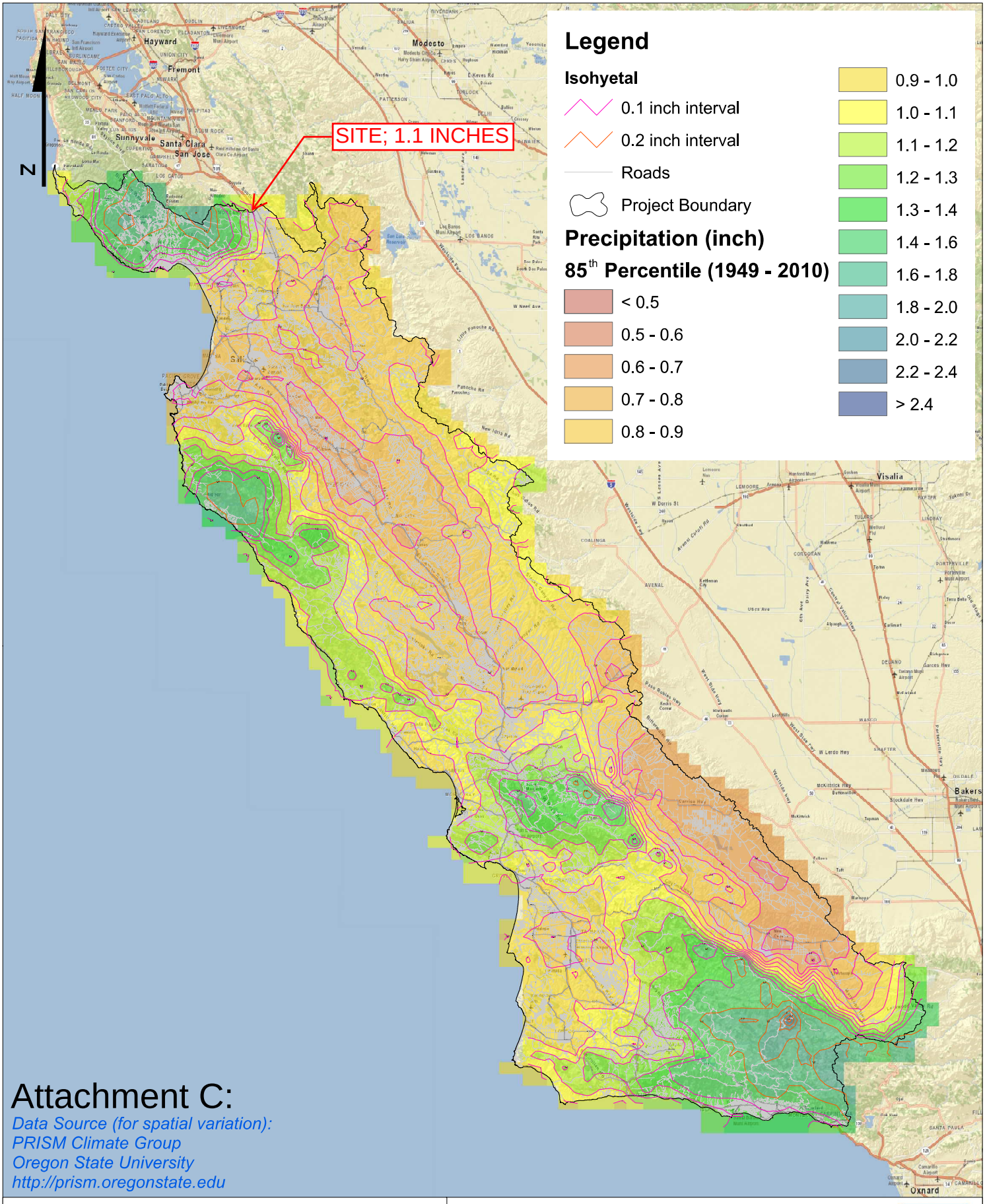


Figure 6.1
Proposed Storm Drainage System Improvements
Storm Drainage System Master Plan
City of Morgan Hill

AKEL
ENGINEERING GROUP, INC.

CITY OF MORGAN HILL



Attachment C:

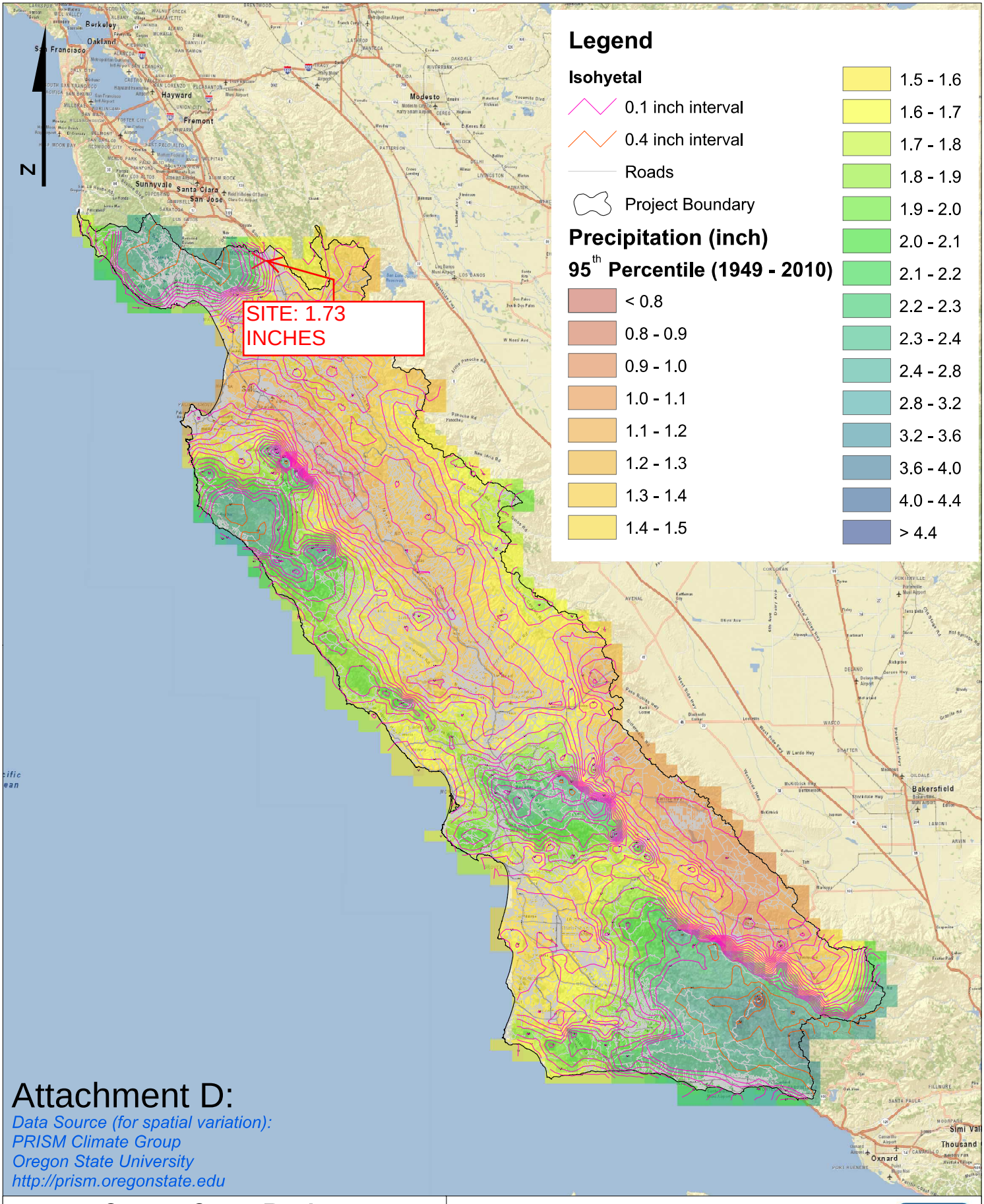
Data Source (for spatial variation):
PRISM Climate Group
Oregon State University
http://prism.oregonstate.edu

Central Coast Region
85th Percentile 24-hour Rainfall Depth

NAD 1983 California Teale Albers

0 20 40 80 Kilometers NTS

0 15 30 60 Miles



Attachment D:

Data Source (for spatial variation):
PRISM Climate Group
Oregon State University
http://prism.oregonstate.edu

Central Coast Region
95th Percentile 24-hour Rainfall Depth
NAD 1983 California Teale Albers

0 20 40 80 Kilometers NTS
0 20 40 80 Miles

Percolation Test Worksheet

Project:	**Petroleum Station**	**Job No.:**	**5-220-0505**	Length of Pipe	3.33
		Date Drilled:	**7/15/2020**	Pipe stickup:	0.17 ft ##
		Soil Classification:		Hole Dia.:	6 in.
				Pipe Dia.:	3 in.
Test Hole No.:	**P-1**			Gravel Below Pipe:	2.0 in.
Tested By:	**Alaa G.**	**Presoaking Date:**	**7/15/2020**	Gravel pack porosity:	0.4
Drilled Hole Depth:	**3.3 Feet**	**Test Date:**	**7/16/2020**	Gravel Correc Factor:	0.6

Time Start	Time Finish	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
12:00	12:15	N	00:15	1.76	1.85	1.08	15	13.9	25.3	0.16
12:15	12:30	N	00:15	1.85	1.95	1.20	15	12.5	22.7	0.19
12:30	12:45	N	00:15	1.95	2.04	1.08	15	13.9	25.3	0.18
12:45	13:00	N	00:15	2.04	2.13	1.08	15	13.9	25.3	0.19
13:00	13:15	N	00:15	2.13	2.21	0.96	15	15.6	28.4	0.18
13:15	13:30	N	00:15	2.21	2.29	0.96	15	15.6	28.4	0.19
13:30	13:45	N	00:15	2.29	2.36	0.84	15	17.9	32.5	0.18
13:45	14:00	N	00:15	2.36	2.43	0.84	15	17.9	32.5	0.19
14:00	14:15	N	00:15	2.43	2.50	0.84	15	17.9	32.5	0.20
14:15	14:30	N	00:15	2.50	2.57	0.84	15	17.9	32.5	0.21
14:30	15:00	N	00:30	2.57	2.64	0.84	30	35.7	64.9	0.11
15:00	15:30	N	00:30	2.64	2.70	0.72	30	41.7	75.8	0.10
15:30	16:00	N	00:30	2.70	2.77	0.84	30	35.7	64.9	0.13
								Estimated Unfactored Infiltration Rate (in/hr)		0.12

(+ or - from grade)

** Top of water to base of hole (below approximately 2" of gravel)

* last reading

[1] For Correction Explanation see attached "Notes"

SALEM engineering group, inc.

Percolation Test Worksheet

Project:	**Petroleum Station**	**Job No.:**	**5-220-0505**	Length of Pipe	5
		Date Drilled:	**7/15/2020**	Pipe stickup:	0.2 ft ##
		Soil Classification:		Hole Dia.:	6 in.
Test Hole No.:	**P-2**			Pipe Dia.:	3 in.
Tested By:	**Alaa G.**	**Presoaking Date:**	**7/15/2020**	Gravel Below Pipe:	2.0 in.
Drilled Hole Depth:	**5.0 Feet**	**Test Date:**	**7/16/2020**	Gravel pack porosity:	0.4
				Gravel Correc Factor:	0.6

Time Start	Time Finish	Refill- Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
12:00	12:15	N	00:15	3.58	3.67	1.08	15	13.9	25.3	0.18
12:15	12:30	N	00:15	3.67	3.77	1.20	15	12.5	22.7	0.21
12:30	12:45	N	00:15	3.77	3.86	1.08	15	13.9	25.3	0.20
12:45	13:00	N	00:15	3.86	3.95	1.08	15	13.9	25.3	0.21
13:00	13:15	N	00:15	3.95	4.02	0.84	15	17.9	32.5	0.18
13:15	13:30	N	00:15	4.02	4.09	0.84	15	17.9	32.5	0.19
13:30	13:45	N	00:15	4.09	4.15	0.72	15	20.8	37.9	0.17
13:45	14:00	N	00:15	4.15	4.22	0.84	15	17.9	32.5	0.21
14:00	14:15	N	00:15	4.22	4.29	0.84	15	17.9	32.5	0.22
14:15	14:30	N	00:15	4.29	4.35	0.72	15	20.8	37.9	0.20
14:30	15:00	Y	00:30	3.55	3.65	1.20	30	25.0	45.5	0.10
15:00	15:30	N	00:30	3.65	3.74	1.08	30	27.8	50.5	0.09
15:30	16:00	N	00:30	3.74	3.82	0.96	30	31.3	56.8	0.09
								Estimated Unfactored Infiltration Rate (in/hr)		0.09

(+ or - from grade)
** Top of water to base of hole (below approximately 2" of gravel)
* last reading
[1] For Correction Explanation see attached "Notes"

SALEM engineering group, inc.

Attachment E

Certifications

PERFORMANCE REQUIREMENT NO. 1 SITE DESIGN AND RUNOFF REDUCTION CERTIFICATION

DESIGN STRATEGY	INCORPORATED?
1. Limit disturbance of creeks and natural drainage features.	N/A
2. Minimize compaction of highly permeable soils.	No
3. Limit clearing and grading of native vegetation at the site to the minimum area needed to build the project, allow access, and provide fire protection.	No
4. Minimize impervious surfaces by concentrating improvements on the least sensitive areas of the site, while leaving the remaining land in a natural undisturbed state.	No
5. Minimize stormwater runoff by implementing one or more of the following design measures:	
a) Direct roof runoff into cisterns or rain barrels for reuse.	No
b) Direct roof runoff onto vegetated areas safely away from building foundations and footings.	Yes
c) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings.	Yes
d) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings.	Yes
e) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces.	No

I, Imad Abu-Gharbieh, acting as the Project Engineer for RAMCAM Engineering Group, Inc. Project, located at **16720 Monterey Road, Morgan Hill, CA 95037,** hereby state that the Site Design and Runoff Reduction design strategies indicated above have been incorporated into the design of the project.

Signature _____ Date _____

SOURCE CONTROL CHECKLIST

ON-SITE SOURCE CONTROL MEASURES	INCORPORATED?
Wash area/racks, drain to sanitary sewer[1]	☐
Covered dumpster area, drain to sanitary sewer[1]	☒
Sanitary sewer connection or accessible cleanout for swimming pool/spa/fountain[1]	☐
Parking garage floor drains plumbed to sanitary sewer[1]	☐
Fire sprinkler test water/condensate drain lines drain to landscape/sanitary sewer[1]	☒
Interior floor drains/boiler drain lines plumbed to sanitary sewer	☒
Beneficial landscaping/IPM (minimize irrigation, runoff, pesticides and fertilizers; promotes treatment)	☒
Outdoor material storage protection	☐
Covers, drains for loading docks, maintenance bays, fueling areas	☒
Maintenance (pavement sweeping, catch basin cleaning, good housekeeping)	☒
Storm drain labeling	☐
Other[2] _____	☐

Notes:

[1] Subject to sanitary sewer authority requirements.

[2] See CASQA Stormwater BMP Handbook for New Development and Redevelopment for additional BMPs for vehicle service repair facilities, fuel dispensing areas, industrial processes, rooftop equipment and other pollutant generating activities and sources:
https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook

PERFORMANCE REQUIREMENT NO. 2: WATER QUALITY TREATMENT

CERTIFICATION

	ON-SITE WATER QUALITY TREATMENT MEASURES (IN ORDER OF PRIORITY)	INCORPORATED?
1.	Low Impact Development (LID) Treatment Systems designed to retain stormwater runoff generated by the 85th percentile 24-hour storm. Stormwater Control Measures implemented (circle all that apply, design documentation is required): • Harvesting and Use, • Infiltration, • Evapotranspiration	Yes
2.	Biofiltration Treatment Systems – with the following design parameters: a) Maximum surface loading rate appropriate to prevent erosion, scour and channeling within the biofiltration treatment system itself and equal to 5 inches per hour, based on the flow of runoff produced from a rain event equal to or at least: i. 0.2 inches per hour intensity; or ii. Two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depth b) Minimum surface reservoir volume equal to the biofiltration treatment system surface area times a depth of 6 inches c) Minimum planting medium depth of 24 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used. A Regulated Project may utilize an alternative planting medium if it demonstrates its planting medium is equal to or more effective at attenuating pollutants than the specified planting medium mixture. d) Proper plant selection[13] e) Subsurface drainage/storage (gravel) layer with an area equal to the biofiltration treatment system surface area and having a minimum depth of 12 inches f) Underdrain with discharge elevation at top of gravel layer g) No compaction of soils beneath the biofiltration facility (ripping/loosening of soils required if compacted) h) No liners or other barriers interfering with infiltration, except for situations where lateral infiltration is not technically feasible	No

[13] Technical guidance for designing bioretention facilities is available from the Central Coast LID Initiative. The guidance includes design specifications and plant lists appropriate for the Central Coast climate: http://www.centralcoastlidi.org/Central_Coast_LIDI/LID_Structural_BMPs.html

3.	Non-Retention Based Treatment Systems – designed to meet at least one of the following hydraulic sizing criteria:	Yes
	(a) Volume Hydraulic Design Basis – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, based on local rainfall data.	
	(b) Flow Hydraulic Design Basis – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat: (i) The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or (ii) The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.	

I, Imad Abu-Gharbieh, acting as the Project Engineer for RAMCAM Engineering Group, Inc. project, located at **16720 Monterey Road, Morgan Hill, CA 95037**, hereby state that the Site Design and Runoff Reduction design strategies indicated above have been incorporated into the design of the project.

_____ _____

Signature Date

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

Design Rainfall Events & Treatment Requirements for WMZs

WMZ[1]	Treatment Options & Design Rainfall	Check Applicable WMZs
WMZ 1	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	X
WMZ 2	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	
WM 4 *	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 5	Via optimized infiltration[2] prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 6	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 9	Via storage, rainwater harvesting, infiltration, and/or evapotranspiration, prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.	
WMZ 10 *	Via optimized infiltration[2], prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data	

Notes:

* Applicable only to those areas that overlay designated Groundwater Basins

1. Includes only those WMZs contained in Santa Clara County.
2. Storage, rainwater harvesting, and/or evapotranspiration may be used when infiltration is optimized.

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

LID Site Assessment Checklist

ITEMS TO DOCUMENT:	INCLUDED?
1. Site topography	☒
2. Hydrologic features including contiguous natural areas, Wetlands watercourses, seeps, or springs.	☐
3. Depth to seasonal high groundwater	☒
4. Locations of groundwater wells used for drinking water	☐
5. Depth to an impervious layer such as bedrock	☐
6. Presence of unique geology (e.g., karst)	☐
7. Geotechnical hazards	☐
8. Documented soil and/or groundwater contamination	☐
9. Soil types and hydrologic soil groups	☒
10. Vegetative cover/trees	☐
11. Run-on characteristics (source and estimated runoff from offsite which discharges to the project area)	☐
12. Existing drainage infrastructure for the site and nearby areas including the location of municipal storm drains	☒
13. Structures including retaining walls	☐
14. Utilities	☐
15. Easements	☐
16. Covenants	☐
17. Zoning/Land Use	☐
18. Setbacks	☐
19. Open space requirements	☐
20. Other pertinent overlay(s)	☐

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

LID Site Design Measures

	DESIGN MEASURE	INCORPORATED?
1.	Defining the development envelope, identifying the protected areas, and identifying areas that are most suitable for development and areas to be left undisturbed	No
2.	Identifying conserved natural areas, including existing trees, other vegetation, and soils (shown on the plans)	No
3.	Limit the overall impervious footprint of the project	Yes
4.	Design of streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided that public safety or mobility uses are not compromised	Yes
5.	Set back development from creeks, wetlands, and riparian habitats	N/A
6.	Design conforms the site layout along natural landforms	No
7.	Design avoids excessive grading and disturbance of vegetation and soils	No

I, Imad Abu-Gharbieh, acting as the Project Engineer for RAMCAM Engineering Group, Inc.

Project, located at 16720 Monterey Road, Morgan Hill, CA 95037, hereby state that the Site Design and Runoff Reduction design strategies indicated above have been incorporated into the design of the project.

_____ _____

Signature Date

PERFORMANCE REQUIREMENT NO. 3: RUNOFF RETENTION

Technical Infeasibility Checklist

	Site Conditions	Check If Applicable
1.	Depth to seasonal high groundwater limits infiltration and/or prevents construction of subgrade stormwater control measures[14]	☐
2.	Depth to an impervious layer such as bedrock limits infiltration	☐
3.	Sites where soil types significantly limit infiltration	☒
4.	Sites where pollutant mobilization in the soil or groundwater is a documented concern	☐
5.	Space constraints (e.g., infill projects, some redevelopment projects, high density development)	☐
6.	Geotechnical hazards	☐
7.	Stormwater Control Measures located within 100 feet of a groundwater well used for drinking water	☐
8.	Incompatibility with surrounding drainage system (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning treatment or flow control facility)	☐

STORMWATER CONTROL PLAN CHECKLIST

Stormwater Control Plan Required Contents	**PR Level**	**Done?**
1. Project Information	All	√
• Project name		
• Application number		
• Address and assessor's parcel number		
• Name of Applicant		
• Project Phase number (if project is being constructed in phases)		
• Project Type (e.g., commercial, industrial, multi-unit residential, mixed-use, public), and description		
2. Project Areas	All	√
• Total project site area		
• Total new impervious surface area		
• Total replaced impervious surface area		
• Total new pervious area		
• Calculation of Net Impervious Area		
3. Statement of Performance Requirements that apply to the project:	All	√
• Performance Requirement No.1 – Site Design and Runoff Reduction		
• Performance Requirement No.2 – Water Quality Treatment		
• Performance Requirement No. 3 – Runoff Retention		
• Performance Requirement No. 4 – Peak Management		
4. Delineation of Drainage Management Areas (DMAs)	All	√
5. Summary of Site Design and Runoff Reduction Performance Requirement measures selected for the project (see PR-1 checklist)	PR-1	√
6. Description of Runoff Reduction Measures and Structural Stormwater Control Measures, by Drainage Management Area and for entire site	PR-2, 3, and 4	√
7. Water quality treatment calculations used to comply with the Water Quality Treatment Performance Requirement and any analysis to support infeasibility determination	PR-2	√
8. Documentation certifying that the selection, sizing, and design of the Stormwater Control Measures meet the full or partial Water Quality Treatment Performance Requirements (see PR-2 checklist)	PR-2	√

Stormwater Control Plan Required Contents	PR Level	Done?
9. Statement that Water Quality Treatment Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements. • Statement of intent to comply with Water Quality Treatment Performance Requirement through Alternative Compliance	PR-2	√
10. LID Site Assessment Summary (see PR-3 checklist)	PR-3	√
11. LID Site Design Measures Used (see PR-3 checklist)	PR-3	√
12. Supporting calculations used to comply with the applicable Runoff Retention Performance Requirements	PR-3	√
13. Documentation demonstrating infeasibility where Site Design and Runoff Reduction measures and retention-based Stormwater Control Measures cannot retain required runoff volume	PR-3	√
14. Documentation demonstrating percentage of the project's Equivalent Impervious Surface Area dedicated to retention-based Stormwater Control Measures	PR-3	N/A
15. Statement that Runoff Reduction Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements • Statement of intent to comply with Runoff Retention Performance Requirements through an Alternative Compliance agreement	PR-3	√
16. Supporting calculations used to comply with the applicable Peak Management Performance Requirements	PR-4	
17. Documentation demonstrating infeasibility where on-site compliance with Peak Management Performance Requirements cannot be achieved	PR-4	

18. Statement that Peak Management Performance Requirement has been met on-site, or, if not achievable: • Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements • Statement of intent to comply with Peak Management Requirements through an Alternative Compliance agreement		
19. O&M Plan for all structural SCMs to ensure long-term performance	PR-2, 3, and 4	√
20. Owner of facilities and responsible party for conducting O&M	PR-2, 3, and 4	√

Attachment F

Maintenance and Inspection Checklists

Stormwater Treatment Measure Operation and Maintenance
Inspection Report to the City of Morgan Hill, California

This report and attached Inspection and Maintenance Checklists document the inspection and maintenance conducted for the identified stormwater treatment measure(s) subject to the Maintenance Agreement between the City of Morgan Hill and the property owner during the annual reporting period indicated below.

I. Property Information:

Property Address or APN:_____ Property Owner:_____

II. Contact Information:

Name of person to contact regarding this report: TBD

Phone number of contact person:_____ Email:_____

Address to which correspondence regarding this report should be directed:

_____

_____

III. Reporting Period:

This report, with the attached completed inspection checklists, documents the inspections and maintenance of the identified treatment measures during the time period from _____ _____to_____.

IV. Stormwater Treatment Measure Information:

The following stormwater treatment measures (identified treatment measures) are located on the property identified above and are subject to the Maintenance Agreement:

Identifying Number of Treatment Measure	Type of Treatment Measure	Location of Treatment Measure on the Property

V. Summary of Inspections and Maintenance:

Summarize the following information using the attached Inspection and Maintenance Checklists:

Identifying Number of Treatment Measure	Date of Inspection	Operation and Maintenance Activities Performed and Date(s) Conducted	Additional Comments

VI. Sediment Removal:

Total amount of accumulated sediment removed from the stormwater treatment measure(s) during the reporting period:_____cubic yards.

How was sediment disposed?

- □ landfill
- □ other location on-site as described in and allowed by the maintenance plan
- □ other, explain _____

VII. Inspector Information:

The inspections documented in the attached Inspection and Maintenance Checklists were conducted by the following inspector(s):

Inspector Name and Title	Inspector's Employer and Address

VIII. Certification:

I hereby certify, under penalty of perjury, that the information presented in this report and attachments is true and complete:

_____ _____

Signature of Property Owner or Other Responsible Party Date

_____

Type or Print Name

_____

Company Name

_____

Address

Phone number:_____ Email:_____

Any major maintenance (such as replanting, re-grading, subdrain replacement, soil replacement, or similar effort) of the Bioretention Basin should only be conducted by a competent professional, such as a licensed landscape contractor.

Landscape contractors must familiarize themselves with the purposes, design specifications, features, and mode of operation of the Bioretention Basins. Maintenance service providers (landscape maintenance and other maintenance), including maintenance supervisors and employees, need to be informed of the specific maintenance requirements for the Bioretention Basins and should review both the Stormwater Control Plan.

III. General Maintenance Requirements:

A. Bioretention Basins, Private Storm Drain System, and Site Landscaping:

I. Routine Maintenance Activities

The principal maintenance objective is to prevent sediment buildup and clogging, which reduces pollutant removal efficiency. Routine maintenance activities, and the frequency at which they will be conducted, are shown in Table **5**.

Table 5
Routine Maintenance Activities for Bioretention Basins, Private Storm Drain System, and Site Landscaping

No.	Maintenance Task	Frequency of Task
	Evaluate the health of the vegetation and remove and replace any dead or dying plants	Semi-Annually
2	Remove Trash and/or Debris	Semi-Annually
3	Inspect the outlet, embankments, dikes, berms, and side slopes for structural integrity and signs of erosion or rodent burrows. Fill in any holes detected in the side slopes.	Semi-Annually
4	Examine outlets and overflow structures and remove any debris plugging the outlets. Identify and minimize any sources of sediment and debris. Check rocks or other erosion control and replace, if necessary.	Semi-Annually
5	Check inlets to make sure piping is intact and not plugged. Remove accumulated sediment and debris on or near the inlet. Ensure that engineered energy dissipation is functioning adequately by checking for evidence of local scour around the inlet.	Semi-Annually
6	Additional Measure for Bioretention Basin - Inspect for standing water and correct any problems that prevent the detention basin from draining as designed.	Semi-Annually
7	If you observe mosquito larvae, contact the Mosquito and Vector Control Association of California (916) 440-0826	Semi-Annually and as necessary.
8	Maintain site landscaping as need. Additional Measure for Bioretention Basins - Mow side slopes (and bottom as needed).	Annually and as needed.
9	Additional Measure for Bioretention Basins - Monitor sediment accumulation and remove sediment and regrade when the accumulated sediment volume exceeds 10-20% of the basin volume or when accumulation reaches 6 inches. Clean in early spring so vegetation damaged during cleaning has time to re-establish.	Every 10-25 Years
10	On-site Storm Drain Inlets shall be checked to ensure that the storm drain marker "no dumping, drains to creek" is legible. Replace or	Annually
	Maintenance shall be conducted during dry weather when no flow is entering the system. Confined space entry is usually required to maintain the StormCapture. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Once safety measures such as traffic control have been deployed, the access covers may be removed, and the following activities may be conducted to complete maintenance:	Annually

11	Remove trash and debris using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely remove accumulated sediment. Some jetting may be necessary to fully evacuate sediment from the system floor or sump. Jetting is acceptable in systems with solid concrete floors or base slabs (referred to as closed-bottom systems). However, jetting is not recommended for open- bottom systems with a gravel foundation since it may cause bedding displacement, undermining of the foundation, or internal disturbance. • All material removed from the system during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes. • Inspect inlet and outlet pipe penetrations for cracking and other signs of movement that may cause leakage. • Inspect the concrete splashpads (applicable for open-bottom systems only) for proper function and placement. • Inspect the system for movement of modules. There should be less than 3/4-inch spacing between modules. • Inspect the general interior condition of modules for concrete cracking or deterioration. If the system consists of horizontal joints as part of the modules, inspect those joints for leakage, displacement or deterioration.	

III. Inspections

The attached Bioretention areas Inspection and Maintenance Checklist shall be used to conduct inspections monthly (or as needed), identify needed maintenance, and record maintenance that is conducted. Additionally, Included

IV: Vector Controls:

Standing water shall not remain in the treatment measures for more than five days, to prevent mosquito generation. Should any mosquito issues arise, contact the Santa Clara County Vector Control District (SCCVCD), as needed for assistance. Mosquito larvicides shall be applied only when necessary, as indicated by the SCCVCD, and then only by a licensed professional or contractor. Contact information for SCCVCD is provided below:

Santa Clara County Vector Control District 1555 Berger Dr., Suite 300
San Jose, CA 95112
(408) 918-4770 or (800) 675-1155
www.sccvector.org

V: Logs and Annual Reporting:

The Property Owner shall maintain a log of the inspections and maintenance performed throughout the year on the stormwater quality measures and shall provide this documentation to the City on an annual basis in an Annual Report that shall be submitted to the Construction Inspection Supervisor of the City no later than December 31st of each year. The log of inspections and maintenance shall include the date of the inspection or maintenance, the type of stormwater quality measure and location, the name of the inspector, the specific maintenance activities performed, any problems identified, and corrective actions taken. The log shall also note the volume of sediment removed during maintenance and corrective actions.

B. Contech CDS Operations and Maintenance Information

CONTECH® ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on-site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent

material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allow both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that
for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of
sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment.
However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may
be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support
- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treatment products. For information, visit www.ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450
related foreign patents or other patents pending.

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

CDS Maintenance Guide - 7/18 (PDF)

c. Oldcastle StormCapture Infiltration Operations and Maintenance Information

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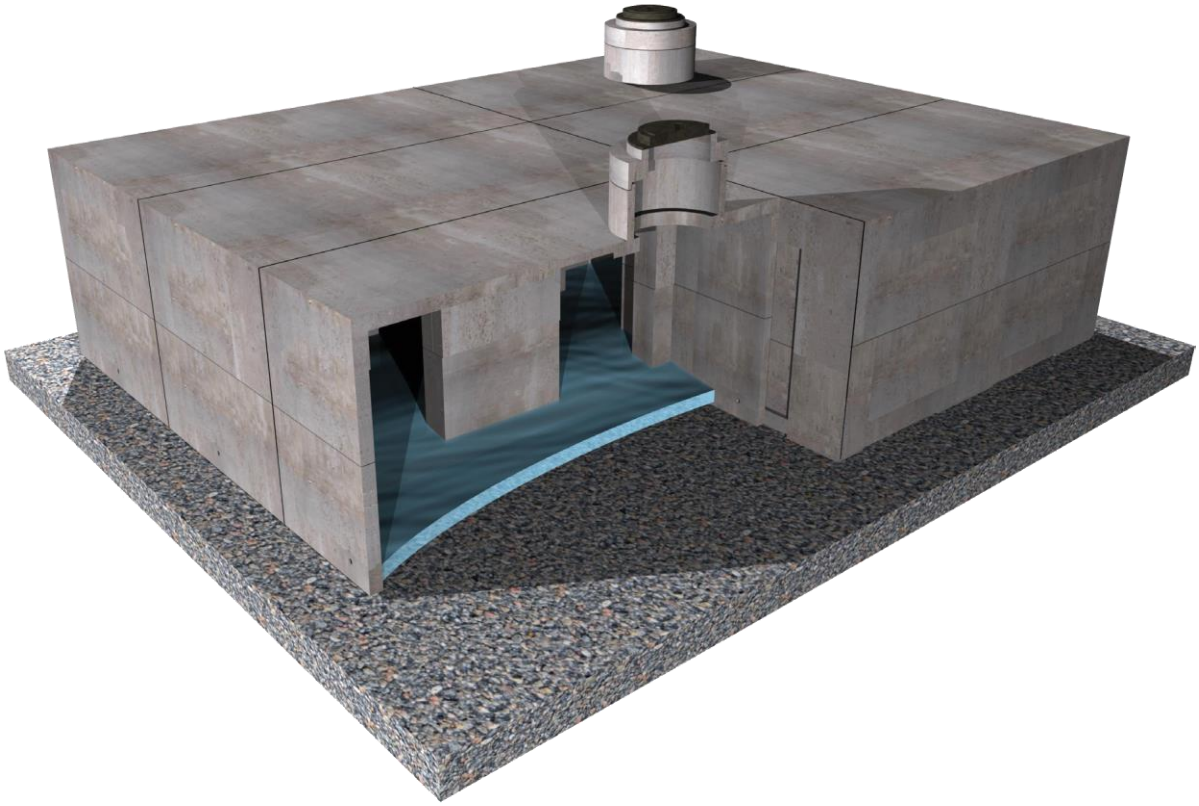
Oldcastle Precast®

STORMCAPTURE®

Inspection and Maintenance Guide



Description

The StormCapture® system is an underground, modular, structural precast concrete storage system for stormwater detention, retention, infiltration, harvesting and reuse, and water quality volume storage. The system's modular design utilizes multiple standard precast concrete units with inside dimensions of 7 feet by 15 feet (outside dimensions of 8 feet by 16 feet) to form a larger storage system. The inside height of the StormCapture system can range from 2 feet to 14 feet. This modular design provides limitless configuration options for site-specific layouts.

StormCapture components can be provided as either open-bottom modules to promote infiltration or closed- bottom modules for detention. In some cases, StormCapture modules can be placed in a checkerboard configuration for an even more efficient design. A Link Slab, with a footprint of 9 feet by 17 feet, is then used to bridge each space without a module.

The standard StormCapture design incorporates lateral and longitudinal passageways between modules to accommodate internal stormwater conveyance throughout the system. These passageways may be classified as either a "window configuration" with standard 12-inch tall sediment baffles extending up from the floor of the module to the bottom of the window, or a "doorway configuration" without the sediment baffles. The function and drainage rate of a StormCapture system depends on site-specific conditions and requirements.

Stormwater typically enters the StormCapture system through an inlet pipe. Grated inlets can also be used for direct discharge into the system. The StormCapture system is rated for H-20 traffic loading with limited cover. Higher load requirements can also be accommodated. In addition, StormCapture systems are typically equipped with a limited number of maintenance modules that provide access to the system for ongoing inspection and maintenance.

Function

The StormCapture system is primarily used to manage water quantity by temporarily storing stormwater runoff from impervious surfaces to prevent flooding, slow down the rate at which stormwater leaves the site, and reduce receiving stream erosion. In addition, the StormCapture system can be used to capture stormwater runoff for water quality treatment. Regardless of how the StormCapture system is used, some sedimentation may occur in the modules during the time water is stored.

Configurations

The configuration of the StormCapture systems may vary, depending on the water quality and/or quantity requirements of the site. StormCapture configurations for detention, retention/infiltration, and retention/ harvesting are described below.

Detention

StormCapture Detention systems are designed with a closed bottom to detain stormwater runoff for controlled discharge from the site. This design may incorporate a dead storage sump and a permanent pool of water if the outlet pipe is higher than the floor elevation. Discharge from the system is typically controlled by an outlet orifice and/or outlet weir to regulate the rate of stormwater leaving the system. StormCapture Detention systems are typically designed with silt-tight joints, however when conditions exist that require a StormCapture system to be watertight, the system may be wrapped in a continuous, impermeable geomembrane liner. If the StormCapture Detention system includes Link Slabs, a liner must be used to detain water since the chambers under each Link Slab have no floor slab. In this case, care must be taken by maintenance personnel not to damage the exposed liner beneath each Link Slab.

Retention/Infiltration

StormCapture Retention/Infiltration systems are designed with an open bottom to allow for the retention of stormwater onsite through infiltration into the base rock and surrounding soils. For infiltration systems, the configuration of the base of the StormCapture system may vary, depending on the needs of the site and the height of the system. Some systems may use modules that have fully open bottoms with no concrete floor, while other systems may use modules that incorporate floor openings in the base of each module. These are typically 24-inch by 24-inch openings. For open-bottom systems, concrete splash pads may be installed below inlet grate openings and pipe inlets to prevent erosion of base rock. A StormCapture Infiltration system may have an elevated discharge pipe for peak overflow.

Retention/Harvesting

StormCapture Retention/Harvesting systems are like detention systems using closed-bottom modules, but stormwater is typically retained onsite for an extended period and later reused for non-potable applications or irrigation. For rainwater harvesting systems, an impermeable geomembrane liner is typically installed around the modules to provide a water-tight system.

Inspection and Maintenance Overview

State and local regulations typically require all stormwater management systems to be inspected on a regular basis and maintained as necessary to ensure performance and protect downstream receiving waters. Inspections should be used to evaluate the conditions of the system. Based on these inspections, maintenance needs can be determined. Maintenance needs vary by site and system. Using this Inspection & Maintenance Guide, qualified maintenance personnel should be able to provide a recommendation for maintenance needs. Requirements
may range from minor activities such as removing trash, debris or pipe blockages to more substantial activities such as vacuuming and removal of sediment and/or non-draining water. Long-term maintenance is important to the operation of the system since it prevents excessive pollutant buildup that may limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Only authorized personnel shall inspect and/or enter a StormCapture system. Personnel must be properly trained and equipped before entering any underground or confined space structure. Training includes familiarity with and adherence to all local, state and federal regulations governing confined space access and the operation, inspection, and maintenance of underground structures.

Inspection and Maintenance Frequency

The StormCapture system should be inspected on a regular basis, typically twice per year, and maintained as required. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. Local jurisdictions may also dictate inspection and maintenance frequencies.

Inspection Equipment

The following equipment is helpful when conducting StormCapture inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

A typical StormCapture system provides strategically placed access points that may be used for inspection. StormCapture inspections are usually conducted visually from the ground surface, without entering the unit. This typically limits inspection to the assessment of sediment depth, water drain down, and general condition of the modules and components, but a more detailed assessment of structural condition may be conducted during a maintenance event.

To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be inspected and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Observe inlet and outlet pipe penetrations for blockage or obstruction.
- If possible, observe internal components like baffles, flow control weirs or orifices, and steps or ladders to determine whether they are broken, missing, or possibly obstructed.
- Observe, quantify, and record the sediment depths within the modules.
- Retrieve as much floating trash as possible with a long-handled net. If a significant amount of trash remains, make a note in the Inspection & Maintenance Log.
- For infiltration systems, local regulations may require monitoring of the system to ensure drain down is occurring within the required permit time (typically 24 to 72 hours). If this is the case, refer to local regulations for proper inspection procedure.

Maintenance Indicators

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Inlet or outlet piping is blocked or obstructed.
- Internal components are broken, missing, or obstructed.
- Accumulation of more than six inches of sediment on the system floor or in the sump, if applicable.
- Significant accumulation of floating trash and debris that cannot be retrieved with a net.
- The system has not drained completely after it hasn't rained for one to three days, or the drain down does not meet permit requirements.
- Any hazardous material is observed or reported.

Maintenance Equipment

The following equipment is helpful when conducting StormCapture maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Vacuum truck

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is usually required to maintain the StormCapture. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Once safety measures such as traffic control have been deployed, the access covers may be removed, and the following activities may be conducted to complete maintenance:

- Remove trash and debris using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely remove accumulated sediment. Some jetting may be necessary to fully evacuate sediment from the system floor or sump. Jetting is acceptable in systems with solid concrete floors or base slabs (referred to as closed-bottom systems). However, jetting is not recommended for open- bottom systems with a gravel foundation since it may cause bedding displacement, undermining of the foundation, or internal disturbance.
- All material removed from the system during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from summed catch basins or manholes.
- Inspect inlet and outlet pipe penetrations for cracking and other signs of movement that may cause leakage.
- Inspect the concrete splash pads (applicable for open-bottom systems only) for proper function and placement.
- Inspect the system for movement of modules. There should be less than 3/4-inch spacing between modules.
- Inspect the general interior condition of modules for concrete cracking or deterioration. If the system consists of horizontal joints as part of the modules, inspect those joints for leakage, displacement, or deterioration.

Be sure to securely replace all access covers, as appropriate, following inspection and/or maintenance. If the StormCapture modules or any of the system components show significant signs of cracking, spalling, or deterioration or if there is evidence of excessive differential settlement between modules, contact Oldcastle Stormwater at **800-579-8819**.

StormCapture
Inspection & Maintenance Log

Refer to as-built records for details about system size and location onsite

Location _____

System Configuration: Inspection Date _____

☐ Detention ☐ Infiltration ☐ Retention/Harvesting

Inlet or Outlet Blockage or Obstruction

Notes:

☐ Yes ☐ No

Condition of Internal Components

Notes:

☐ Good ☐ Damaged ☐ Missing

Sediment Depth Observed

Notes:

☐ Inches of Sediment: _____

☐ Significant ☐ Not Significant

☐ Appropriate Time Frame ☐ Inappropriate Time Frame

☐ Yes - Schedule Maintenance ☐ No - Inspect Again in _____ Months

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