

## **APPENDIX G-2**

### **Preliminary Stormwater Plan**





JOB NO. 20210118

PRELIMINARY STORM WATER LOW  
IMPACT DEVELOPMENT PLAN

FOR

"DRY CREEK COMMONS"

155 Dry Creek Rd  
Santa Rosa, CA

APN 089-071-002

April 11, 2022

APPLICANT/OWNER

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As the Applicant/Owner, I declare that permanent storm water Best Management Practices will be installed and maintained in accordance with this document and municipal regulations.

CIVIL ENGINEER

This document was prepared by BKF Engineers to summarize storm water Best Management Practices proposed with this development. Storm water elements reflected in this document have been designed using sound engineering principals in general conformance with the municipality's guidelines.

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RICHARD CARLILE PE  
NO. 57885



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## GENERAL INFORMATION REGARDING THE PURPOSE OF STORM WATER BMPS

Storm water runoff Best Management Practices (BMPs) are programs, processes or engineered systems designed to reduce pollutants in storm water. Temporary Best Management Practices such as straw wattle and silt fence are used to reduce pollutants in storm water during construction while permanent storm water Best Management Practices are intended to reduce pollutants in storm water for the life of the development following construction.

Studies suggest that approximately 85% of our annual rainfall volume is produced from the predominant population of smaller storms. Therefore, in an effort to treat storm water in a cost effective manner, storm water quality management is typically designed to target these smaller events.

### The Low Impact Development Technical Design Manual

The Low Impact Development (LID) Technical Design Manual is a set of guidelines established for the Santa Rosa area and unincorporated areas around Sonoma County which requires certain projects to incorporate sustainable LID strategies that encourage infiltration and minimize the introduction of pollutants into downstream receiving waters. The manual requires that a "Determination Worksheet" be prepared by the Applicant to evaluate whether or not storm water BMPs are required with each development. Developments which require BMPs that are subject to planning review through the municipality must include a "Preliminary Storm Water Mitigation Plan". The purpose of this plan is to:

- Summarize the existing site condition and the proposed development.
- Describe storm water BMPs being incorporated into the development.
- Demonstrate by computation that the proposed measures are appropriately sized.
- Describe maintenance and funding for the BMPs.

Developments which require BMPs are required to include a "Final Storm Water Mitigation Plan" with ministerial permit submittals such as grading, building and encroachment permits. The "Final Storm Water Mitigation Plan" includes all of the elements required in the "Preliminary Storm Water Mitigation Plan" and a maintenance agreement between the municipality and owner which assigns the responsibility for maintaining BMPs. The agreement is recorded as a covenant, runs with the land and passes with Title.

Permanent storm water Best Management Practices are categorized in the LID Technical Design Manual as being Pollution Prevention Measures, Volume Control Measures or Treatment Control Measures which are described in the following sections of this document.

### Storm Water Pollution Prevention Measures

Pollution Prevention Measures, sometimes referred to as Source Control Measures, are practices such as street sweeping which help keep pollutants from coming into contact with storm water rather than attempting to remove pollutants after they have interacted with storm water. Educational outreach programs and stenciling storm water inlets with graphics which inform people that the storm water drains to the creek are effective Pollution Prevention Measures. Trees are another effective Pollution Prevention Measure and provide several storm water management benefits. They hold water on leaves / branches and allow water to evaporate, retaining flow and dissipating the energy of runoff. Trees also reduce the amount of water coming into contact with other impervious surfaces such as parking lots, which minimizes pollution in downstream water bodies

Our local municipalities recognize the environmental benefit to incorporating Pollution Prevention Measures into designs and allow area offset credits with the implementation of trees which intercept

falling precipitation, pervious pavements which encourage infiltration and storm water discharge through landscape areas as a pre-treatment measure. The pollution prevention credits reduce the size of required Volume and Treatment Control Measures.

#### Storm Water Volume Control Measures

Increasing the amount of impervious surface area with the development of bare land generally increases the rate which storm water flows across a site. While the impact of increasing the impervious area for a single site is often insignificant, the cumulative impact of increasing the impervious area for multiple sites may have an adverse affect on downstream facilities, because the cumulative increase has the potential to increase runoff causing downstream erosion and sediment load in the storm water conveyance system.

In order to minimize downstream erosion and protect stream habitat, the Storm Water LID Technical Design Manual prioritizes BMPs and requires that the designer first consider measures which capture storm water runoff from impervious surfaces and encourage infiltration. If this is impractical, then BMPs may be proposed which capture the difference in storm water runoff between the predevelopment and post development conditions, provided that all water discharged from impervious surfaces for the selected rainfall event is treated. Developments in areas subject to contaminated soil or high ground water are discouraged from integrating measures which infiltrate storm water, but they are required to incorporate alternative designs which harvest storm water and treat runoff from impervious surfaces. If volume control measures are not feasible at the project site, then the municipality will consider offset projects at a different location which accomplish this requirement. In some situations, payment of an offset cost may be allowed. Redevelopment projects which propose to decrease the amount of impervious surface are not required to integrate volume control measures, because decreasing the amount of impervious surface generally decreases the amount of storm water runoff.

#### Storm Water Treatment Control Measures

Treatment Control BMPs are engineered systems that are designed to remove pollutants from storm water and are often categorized as being landscape-based or mechanical. These types of BMPs are required whenever a development proposes to infiltrate less water than is discharged from new or redeveloped impervious surfaces during the target storm event.

Landscape-based treatment controls are required by most municipalities and include measures such as vegetated swales and bioretention systems. Mechanical treatment controls such as subsurface vaults that filter storm water through sand or engineered media are generally only allowed when used in conjunction with other landscape based BMPs.

## PROJECT DESCRIPTION

The proposed project site is located on the east side of US Route 101 in between Foss Creek and the Sonoma Marin Area Rail Transit (SMART) railway. The lot is currently undeveloped and is located immediately along Foss Creek just on the north side of Dry Creek Rd. The development proposes the installation of two multi-residential buildings totaling 16,300 sq-ft. The overall site development will create and replace approximately 59,800sf-ft of Building, AC roadway, and concrete walkways. Additional public right of way improvements include approximately 10,900sq-ft of impervious surface including sidewalk, curb and gutter, and AC roadway surface. Development within the existing floodway and wetlands area is going to include wetland mitigation which is not included in the stormwater treatment calculations.

Permanent Stormwater Best Management Practices are required with this development because the project proposes to create more than 10,000sf of impervious surface area. Since the overall site development includes the removal and replacement of greater than 1 acre of impervious area the project requires hydromodification measures which will capture and treat 100% of the runoff from the 1" storm event in accordance with the City's LID Technical Design Manual.

The existing site has a gradual slope toward the west across the site into Foss Creek. A majority of the drainage sheet flows across the site and concentrates at the southwest corner. Discharging into the creek. This creek travels south until it connects in with the Russian River. According to FEMA maps Foss Creek is a regulatory floodway and a portion of the site is within the "AE" flood zone which typically corresponds to a 100 year storm event.

The majority of drainage from the proposed Building and walkways is designed to be collected in drainage pipes and discharge via bubble-ups into bioretention basins within the vegetated areas. The bioretention measures will infiltrate the storage medium in accordance with Priority 1 objectives of the City's LID Technical Design Manual. Once the treatment medium is fully saturated the planters, stormwater will utilize drop inlets within the basins and discharge on-site into the wetlands area. In the event the system becomes overburdened, flow will have overland relief over the basin sides into the wetlands and is anticipated to drain into Foss Creek similar to the current condition. The parking area uses a similar sheet drainage west through curb cuts discharging to a vegetated area which infiltrated into larger adjacent stormwater storage structures. A permeable aggregate perimeter around the tanks allows the tanks to fill and infiltrate in accordance with Priority 1 objectives of the City's LID Technical Design Manual. Once fully saturated, storm water runoff discharges to the drop inlet structures which discharge similarly to the wetlands. The portions of the site which are to be developed utilize the LID retention measure and existing storm drain connections so the proposed development is not anticipated to significantly alter the drainage.

The proposed BMP's for this project are volume capture systems which utilizes a bioretention media section under vegetated areas. With this system the 100% volume capture and treatment is achieved while maintaining that over 50% of the treatment BMP is a vegetated area in accordance with the City's LID Technical Design Manual.

The site has been designed to have positive gradients away from structures with overland relief. The drainage basins proposed with this development are being installed as a matter of convenience to route excess storm water from the proposed LID features to the storm drain network.

## STORM WATER BMPs SELECTED FOR THIS SITE

Temporary, pollution prevention and permanent storm water Best Management Practices will be designed to minimize the introduction of pollutants in downstream water bodies following the Entitlement of this development,

### Temporary Measures

A "Sediment Control Plan" will be prepared and included with the construction drawings requiring the contractor to implement temporary storm water BMPs. The contractor will be required to use filter fabric, gravel bags, straw wattles or similar measures to collect sediment and filter water before allowing its discharge to downstream facilities. Construction entrances/exits will be designated on the drawings as having a blanket of rock, where applicable, to assist with removing dirt from trucks to minimize soil tracked into the public street during the early stages of construction. This drawing will also require that disturbed areas be seeded to help stabilize un-vegetated areas. The project is anticipated to disturb less than 1-acre with construction. A Storm Water Pollution Prevention Plan will be prepared which more precisely identifies temporary storm water BMPs required during different phases of construction.

### Pollution Prevention Measures

As part of this project, storm water inlets will be stenciled with graphics which identify that the inlets drain to the creek. The building is anticipated to have a slab on grade design which discourages pest entry. The trash enclosure will be roofed. Irrigation systems will be designed to minimize overspray.

### Pollution Prevention Credits

As was discussed earlier in this report, the LID Technical Design Manual allows area offset credits with the implementation of certain Pollution Prevention Measures. Although new trees will be planted with this development creating an opportunity to intercept precipitation falling on impervious surfaces beneath them, area reduction credits were not used when assessing the size of BMP areas with the final plan.

### Permanent Treatment Control Measures

A series of volume capture sections have been incorporated into the site to retain storm water during light precipitation events and promote infiltration for the life of the development. The proposed storm water measures include engineered soil which is anticipated to encourage storage and filtration.

a geotechnical report has yet to be prepared for this site improvement. According to the USGS Web Soil Survey the site is primarily "Zamora Silty Clay Loam" which is typically classified as a class "C" hydrologic soil having an infiltration rate ~0.05in/hr to ~0.15in/hr. According to the same investigation the water table is estimated to be greater than 200cm (6.5ft) which this does vary due to annual precipitation. The depth can be approximately verified by the water level of the adjacent dry creek.

Therefore, storm water is anticipated to infiltrate into the underlying soil well over time in accordance with the objectives of the LID Technical Design Manual.

The "State Water Resources Control Board's" "GeoTracker" system was observed and does not report groundwater contamination within 1000ft of proposed storm water treatment areas.

These measures were selected because they are the highest priority measures included in the LID Technical Design Manual which accomplishes the objectives of the manual and they can be reasonably incorporated into the site. An exhibit has been included in the Appendix of this report which reflects the proposed geometry and which identifies the location(s) of these elements.

## DESCRIPTION OF COMPUTATION METHODS USED TO SIZE BMPS

### Treatment Control Calculations

Computations were prepared to size each Bioretention Area using the municipality's storm water calculator to assess the post development storm water runoff volume. The preliminary civil drawings recommend that Bioswale Media Mix having a porosity of at least 60% be used throughout the Bioretention Areas to achieve the required capture volume. A material data sheet has been included with the calculations which suggest that this material is available having a porosity of nearly 65%. A porosity of 50% was used to conservatively assess the required capture volume and slightly increase storage to accommodate sediment accumulation. The storage structures used in the site are ACF R-Tanks which have an estimated void ratio of 95%. The roadside vegetated area utilizes structural soil in the bioretention area in accordance with city of Santa Rosa Low Impact Design Manual Reference Document "E". Storage is calculated using an assume porosity of 30%. The tank manufacturer recommends the use of a 24" wide permeable compacted backfill (drain rock) which is estimated to have a porosity of 40% for calculations. Computations are shown in the Appendix and the Exhibits of this document and reflect that the void space in the proposed measures exceeds the required storm water capture volume.

## MAINTENANCE OF THE SELECTED PERMANENT STORM WATER BMPS

Maintenance of permanent storm water Best Management Practices is essential to ensure that the BMPs continue to function effectively and that they do not become a nuisance. An exhibit has been included in the body of this report which identifies the locations of the permanent storm water BMPs referred to in this report which will require inspection and maintenance. It is the responsibility of the Applicant/Owner to ensure that permanent storm water BMPs are installed and maintained in accordance with municipal policy until this responsibility is legally transferred.

The Regional Water Quality Control Board requires the legally responsible party to inspect and maintain permanent storm water BMPs at least once a year. A sample inspection and reporting template has been included in the Appendix of this document for reference. Reports which document maintenance activities should be completed when maintenance is performed and kept on file for a period of at least five years. These reports shall be made available to City staff and the Regional Water Quality Control Board staff upon request.

The maintenance of permanent storm water Best Management Practices will be performed by the property owner and includes things such as pruning, weeding, mowing, trash/sediment removal, and the inspection/replacement of plants and media. The LID Technical Design Manual requires that the owner enter into a signed agreement and that this agreement be recorded as a perpetual covenant which runs with the land. A draft maintenance agreement has been included in the Appendix of this document for reference.

Every site requires some level of maintenance such as sweeping, restriping, pavement replacement, irrigation repair and replanting. The following inspection and maintenance activities are additional measures which are necessary with this development as a result of the required permanent storm water BMPs:

- Drainage inlets will be stenciled with verbiage or a graphic which suggests that the storm water system drains to a creek. Stenciling should be refreshed every 5 years. If the BMP has been removed or has experienced significant fading, then the BMP should be replaced.
- The surface of volume capture areas should be inspected on a quarterly basis, and following larger storm events for signs of erosion, damage to vegetation, foreign debris and sediment accumulation. The BMP should be repaired to maintain its character and function in substantial conformance with the original design.
- Additional information has been included in the Appendix of this report which describes the function and recommended maintenance of measures proposed in this report.

Although the proposed BMPs are anticipated to provide effective treatment for more than 10-years, their life will depend on the quality of water draining to them and how well these areas are maintained. BMP maintenance and replacement should be conducted as required to ensure that their character and function are in substantial conformance with the original design.

Approximate anticipated average annual costs are summarized below to assist the Owner(s) in budgeting for BMP inspection and maintenance activities. The costs reported are predicated on these activities being conducted while performing other routine maintenance which would ordinarily be performed on site.

Approximate Average Annual Inspection and Maintenance Costs

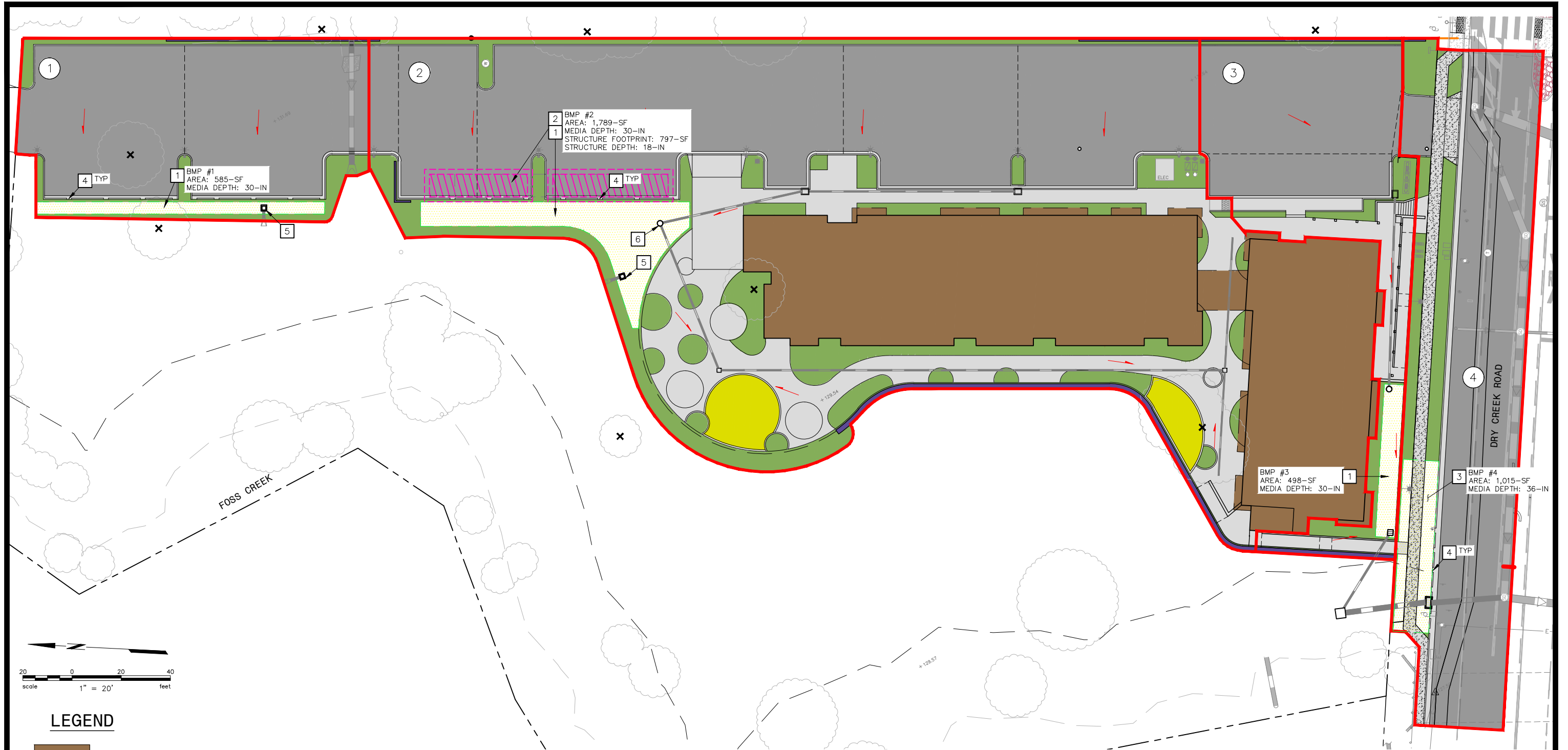
Inspections and Associated Paperwork	\$
Stenciling Inlets	\$
Storage Structure/Sediment Removal/Vacuum Truck	\$
Bioretention Area/Media Replacement	\$

# APPENDIX “A”

## SWMP SITE EXHIBIT



Plot Apr 11, 2022 at 12:06pm



## LEGEND

- Roof
- Concrete
- Pavement
- Playground Surface
- Landscape
- Bio-Retention
- Underground Storage

NOTE:  
A GEOTECHNICAL REPORT HAS YET TO BE PREPARED FOR THIS SITE IMPROVEMENT. ACCORDING TO THE USGS WEB SOIL SURVEY THE SITE IS PRIMARILY "ZAMORA SILTY CLAY LOAM" WHICH IS TYPICALLY CLASSIFIED AS A CLASS "C" HYDROLOGIC SOIL HAVING AN INFILTRATION RATE ~0.05in/hr TO ~0.15in/hr. ACCORDING TO THE SAME INVESTIGATION THE WATER TABLE IS ESTIMATED TO BE GREATER THAN 200cm (6.5ft). WHICH THIS DOES VARY DUE TO ANNUAL PRECIPITATION, THE DEPTH CAN BE APPROXIMATELY VERIFIED BY THE WATER LEVEL OF THE ADJACENT DRY CREEK.

DRAINAGE AREAS						
Tributary Area	Roof 98	Concrete 98	Pavement 98	Pavers 98	Planter 79	Total Area
1	-	327	7,976	-	1,690	9,993
2	16,317	8,950	17,942	1,164	10,573	54,946
3	-	2,369	4,843	-	1,334	8,546
4	-	2,308	8,595	-	2,293	13,196

COMPOSITE CN AND VOLUME REQUIREMENT							
Tributary Area	CN x Area	Composite CN	S (inch)	Area (acres)	P (inch)	Q (ft)	V (ft <sup>3</sup> )
1	947,204	94.0	0.638	0.23	1.33	0.066	656
2	5,183,821	94.0	0.638	1.26	1.33	0.066	3,610
3	812,162	94.0	0.638	0.20	1.33	0.066	561
4	1,249,641	94.0	0.638	0.30	1.33	0.066	867

BIO-RETENTION SIZING									
BIO-SWALE					ACF R-TANK				
BMP #	Area (ft <sup>2</sup> )	Depth (ft)	Volume Soil (ft <sup>3</sup> )	Porosity %	Volume Water Storage (ft <sup>3</sup> )	Area (ft <sup>2</sup> )	Depth (ft)	Volume (ft <sup>3</sup> )	Porosity %
1	585	2.5	1463	50%	731				
2	1789	2.5	4473	50%	2236	797	1.443	1150	95%
2(str)									
2(rock)	452	2.5	1130	40%	452				
3	498	2.5	1245	50%	623				
4	1015	3	3045	30%	914				
					TOTAL WATER STORAGE PROVIDED (ft <sup>3</sup> )				
					731				
					2236				
					1093				
					452				
					Total: 3781				
					623				
					914				

## DRY CREEK COMMONS STORM WATER LID EXHIBIT

CITY OF HEALDSBURG, CALIFORNIA  
APRIL 11, 2022

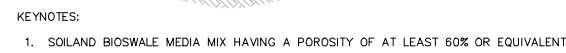


ENGINEERS / SURVEYORS / PLANNERS  
200 4TH ST, STE. 300 SANTA ROSA, CA 95401  
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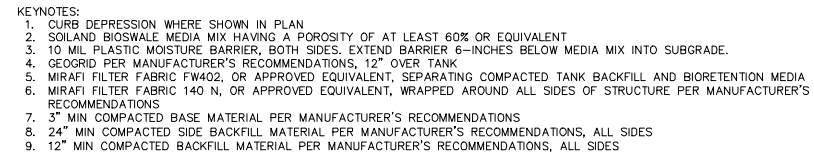
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SHEET 1 OF 2 SHEETS

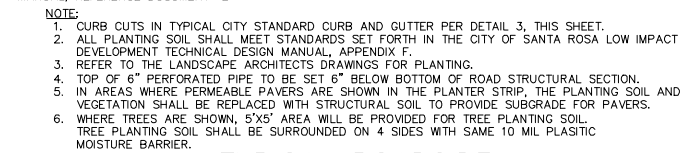
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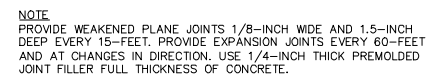
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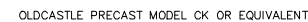
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## SHEET 2 OF 2 SHEETS



# APPENDIX "B"

## VOLUME CAPTURE CALCULATIONS

### C-FACTOR



## STORM WATER CALCULATOR

### LID BMP Summary Page & Site Global Values

<b>Project Information:</b> Project Name: <u>Dry Creek Commons</u> Address/Location: <u>155 Dry Creek Rd</u> Designer: <u>BKF Engineers</u> Date: <u>4/11/2022</u>	<b>Site Information:</b> Mean Seasonal Precipitation (MSP) of Project Site: <u>40.00</u> (inches) K=MSP/3( K= <u>1.33</u>  Impervious area - pre development: <u>0.0</u> ft <sup>2</sup> Impervious area - post development: <u>70,790.0</u> ft <sup>2</sup>	Based upon the pre and post development impervious area, the post construction BMP requirement is:  <b>100% Capture &amp; Treatment</b>
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### Summary of Saved BMP Results:

BMP ID:	Tributary Area		Requirements			BMP Design Results					
	Tributary Area (ft <sup>2</sup> .)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Type of BMP Design	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
						Required V <sub>Hydromod</sub> (ft <sup>3</sup> )	Achieved (ft <sup>3</sup> )	Required Q Treatment (cfs)	Achieved (ft <sup>3</sup> )	Required Vdelta (ft <sup>3</sup> )	Achieved (ft <sup>3</sup> )
1	Area 1	9,993	No	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	111.4	656.6400	731.2500			
2	Area 2	54,946	No	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	103.7	3610.5017	3743.1900			
3	Area 3	8,546	No	Hydromod Volume Capture	Priority 1: P1-06 Swale with Bioretention	110.9	561.5577	622.5000			
4	Area 4	13,196	No	Hydromod Volume Capture	Priority 2: P2-04 Roadside Bioretention - Curb Opening	105.4	867.1091	913.5000			
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## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Dry Creek Commons**

BMP ID: **Area 1**  
BMP Design Criteria: **100% Capture & Treatment**  
Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**  
BMP's Physical Tributary Area: **9,993.0** ft<sup>2</sup>  
Description/Notes:

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$  = **656.64** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **C: 0.05 - 0.15 in/hr infiltration (transmission) rate**

Post development ground cover description: **Urban districts - Commercial and business**

CN<sub>POST</sub>: **94**

User Composite post development CN: **0.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **111.36** %

	BMP Volume Below Ground
Porosity:	<b>0.50</b>
Depth below perforated pipe if present:	<b>2.50</b> ft
Width:	<b>0.00</b> ft
Length:	<b>0.00</b> ft
Area:	<b>585.00</b> ft <sup>2</sup>

	Ponded Water Above Ground
Depth:	<b>0.00</b> ft
Width:	<b>0.00</b> ft
Length:	<b>0.00</b> ft
Area:	<b>0.00</b> ft <sup>2</sup>



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Dry Creek Commons**

BMP ID: **Area 2**  
BMP Design Criteria: **100% Capture & Treatment**  
Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**  
BMP's Physical Tributary Area: **54,946.0 ft<sup>2</sup>**  
Description/Notes: **BMP uses a combination of structural soil vegetated area and storage structures. Combine storage calculation provided on exhibit.**

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$  = **3,610.50** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **C: 0.05 - 0.15 in/hr infiltration (transmission) rate**

Post development ground cover description: **Urban districts - Commercial and business**

CN<sub>POST</sub>: **94**

User Composite post development CN: **0.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **103.68** %

**BMP Volume Below Ground**  
Porosity: **0.99**  
Depth below perforated pipe if present: **1.00** ft  
Width: **0.00** ft  
Length: **0.00** ft  
Area: **3,781.00** ft<sup>2</sup>

**Ponded Water Above Ground**  
Depth: **0.00** ft  
Width: **0.00** ft  
Length: **0.00** ft  
Area: **0.00** ft<sup>2</sup>





## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Dry Creek Commons**

BMP ID: **Area 3**  
BMP Design Criteria: **100% Capture & Treatment**  
Type of BMP Design: **Priority 1: P1-06 Swale with Bioretention**  
BMP's Physical Tributary Area: **8,546.0** ft<sup>2</sup>  
Description/Notes:

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$  = **561.56** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **C: 0.05 - 0.15 in/hr infiltration (transmission) rate**

Post development ground cover description: **Urban districts - Commercial and business**

CN<sub>POST</sub>: **94**

User Composite post development CN: **0.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **110.85** %

	BMP Volume Below Ground
Porosity:	<b>0.50</b>
Depth below perforated pipe if present:	<b>2.50</b> ft
Width:	<b>0.00</b> ft
Length:	<b>0.00</b> ft
Area:	<b>498.00</b> ft <sup>2</sup>

	Ponded Water Above Ground
Depth:	<b>0.00</b> ft
Width:	<b>0.00</b> ft
Length:	<b>0.00</b> ft
Area:	<b>0.00</b> ft <sup>2</sup>





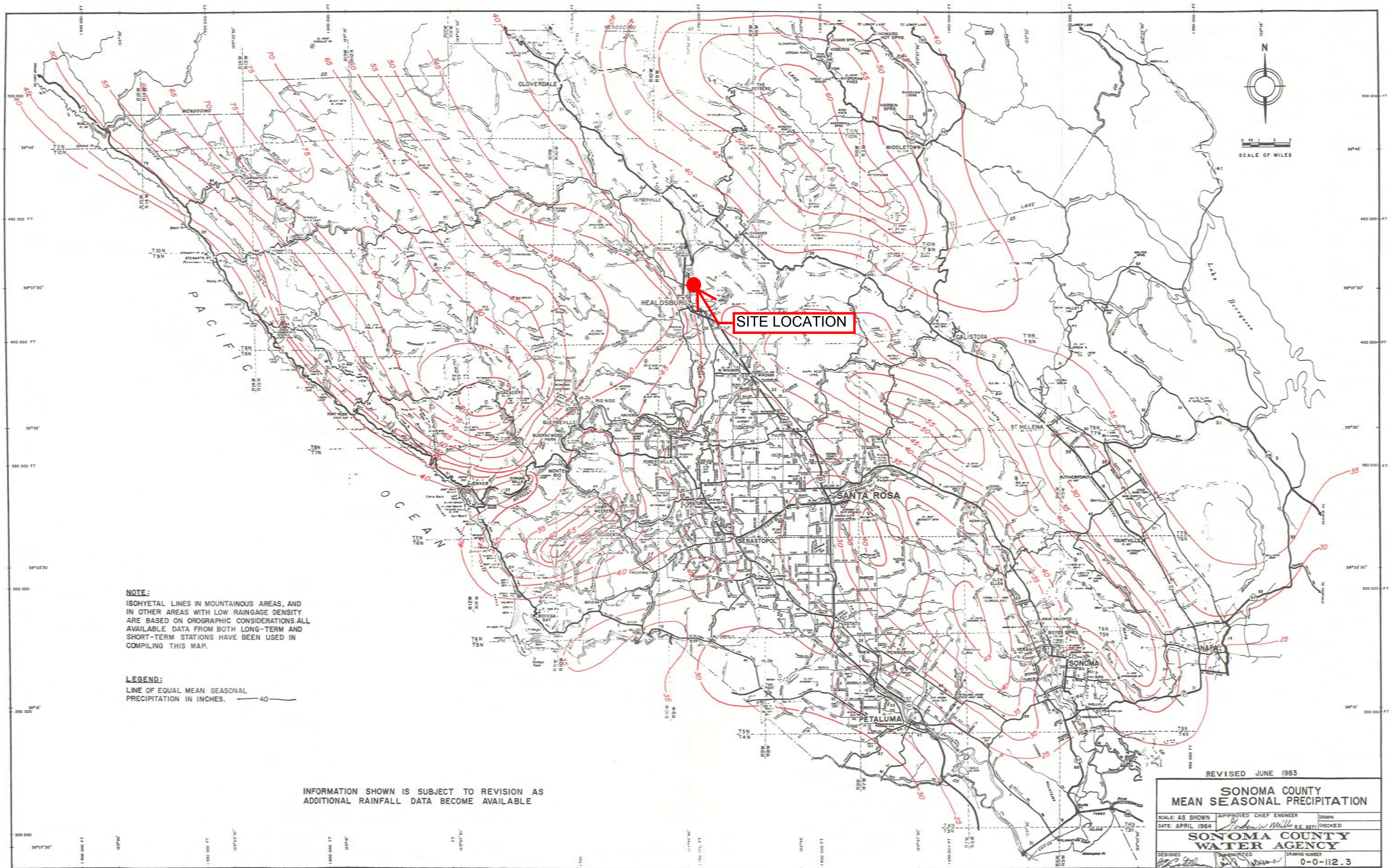
# STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name:	Dry Creek Commons
BMP ID:	Area 4		
BMP Design Criteria:	100% Capture & Treatment		
Type of BMP Design:	Priority 2: P2-04 Roadside Bioretention - Curb Opening		
BMP's Physical Tributary Area:	13,196.0	ft <sup>2</sup>	
Description/Notes:			

<b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b>		$V_{HYDROMOD} =$	867.11	ft <sup>3</sup>
Post development hydrologic soil type within tributary area:	C: 0.05 - 0.15 in/hr infiltration (transmission) rate			
Post development ground cover description:	Urban districts - Commercial and business			
CN <sub>POST</sub> :	94			
User Composite post development CN:	0.0			

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved =	105.35	%
	<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>	
Porosity:	0.30			
Depth below perforated pipe if present:	3.00 ft	Depth:	0.00	ft
Width:	0.00 ft	Width:	0.00	ft
Length:	0.00 ft	Length:	0.00	ft
Area:	1,015.00 ft <sup>2</sup>	Area:	0.00	ft <sup>2</sup>





**NOTE:**  
ISOHYETAL LINES IN MOUNTAINOUS AREAS, AND  
IN OTHER AREAS WITH LOW RAINGAGE DENSITY  
ARE BASED ON OROGRAPHIC CONSIDERATIONS. ALL  
AVAILABLE DATA FROM BOTH LONG-TERM AND  
SHORT-TERM STATIONS HAVE BEEN USED IN  
COMPILING THIS MAP.

**LEGEND:**  
LINE OF EQUAL MEAN SEASONAL  
PRECIPITATION IN INCHES. — 40 —

INFORMATION SHOWN IS SUBJECT TO REVISION AS  
ADDITIONAL RAINFALL DATA BECOME AVAILABLE

REVISED JUNE 1983			
SONOMA COUNTY MEAN SEASONAL PRECIPITATION			
SCALE: AS SHOWN	APPROVED CHIEF ENGINEER	DRAWN	
DATE: APRIL 1964	<i>Robert W. Mills</i> R.E. 8271	CHECKED	
SONOMA COUNTY WATER AGENCY			
DESIGNED	ENGINEERED	DRAWING NUMBER	
<i>Robert W. Mills</i>	<i>Robert W. Mills</i>	0-0-112.3	



K FACTOR

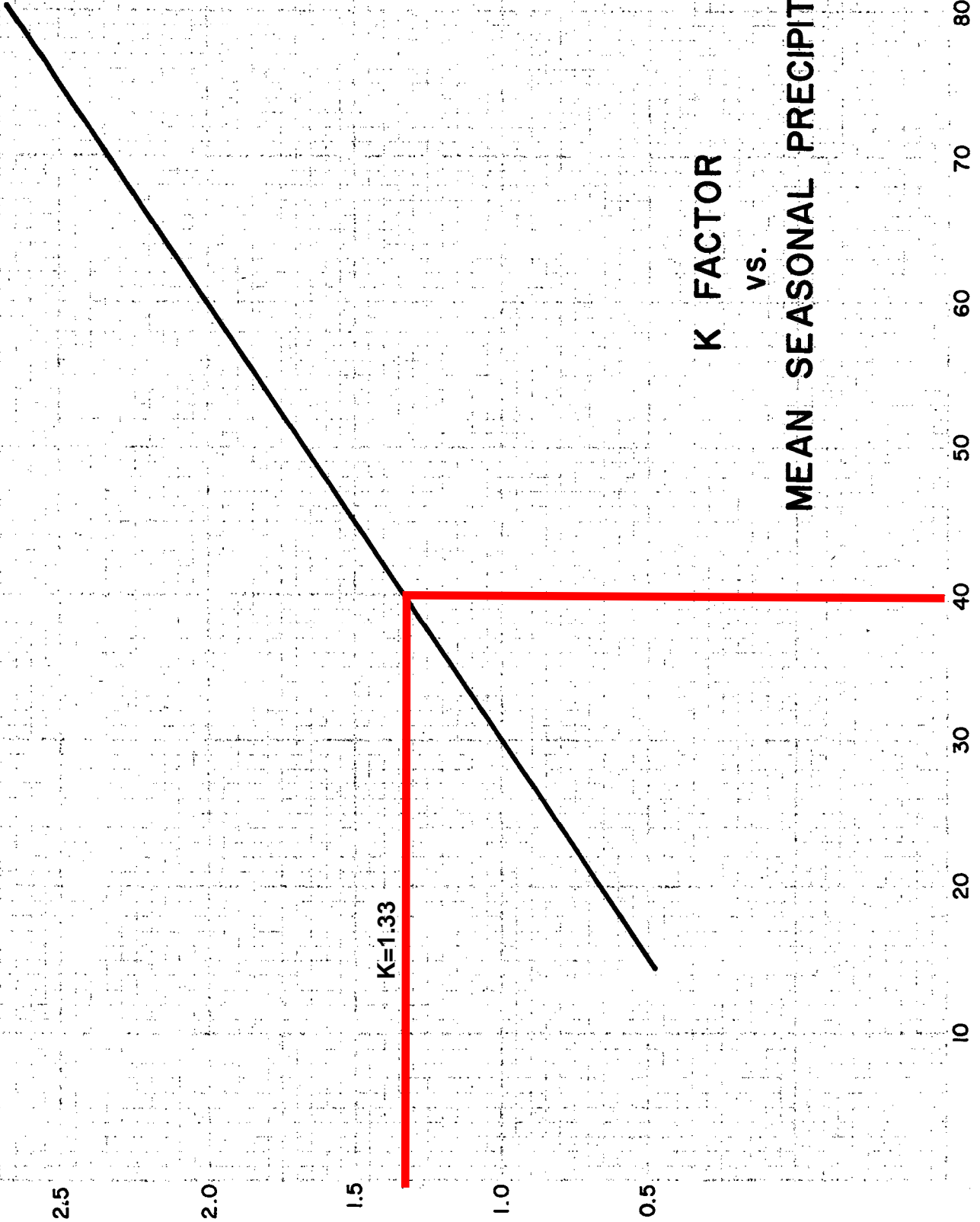
K FACTOR

vs.

MEAN SEASONAL PRECIPITATION

MEAN SEASONAL PRECIPITATION - INCHES

K=1.33



**Table 2-2a** Runoff curve numbers for urban areas <sup>1/</sup>

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area <sup>2/</sup>	A	B	C	D
<b>Fully developed urban areas (vegetation established)</b>					
Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>3/</sup> :					
Poor condition (grass cover < 50%) .....		68	79	86	89
Fair condition (grass cover 50% to 75%) .....		49	69	79	84
Good condition (grass cover > 75%) .....		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way) .....		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way) .....		98	98	98	98
Paved; open ditches (including right-of-way) .....		83	89	92	93
Gravel (including right-of-way) .....		76	85	89	91
Dirt (including right-of-way) .....		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) <sup>4/</sup> .....		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders) .....		96	96	96	96
Urban districts:					
Commercial and business .....	85	89	92	94	95
Industrial .....	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses) .....	65	77	85	90	92
1/4 acre .....	38	61	75	83	87
1/3 acre .....	30	57	72	81	86
1/2 acre .....	25	54	70	80	85
1 acre .....	20	51	68	79	84
2 acres .....	12	46	65	77	82
<b>Developing urban areas</b>					
Newly graded areas					
(pervious areas only, no vegetation) <sup>5/</sup> .....		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$ .<sup>2</sup> The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.<sup>3</sup> CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.<sup>4</sup> Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.<sup>5</sup> Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

**Table 2-2b** Runoff curve numbers for cultivated agricultural lands <sup>1/</sup>

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment <sup>2/</sup>	Hydrologic condition <sup>3/</sup>	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded or broadcast legumes or rotation meadow	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

<sup>1</sup> Average runoff condition, and  $I_a=0.2S$ <sup>2</sup> Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.<sup>3</sup> Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good  $\geq 20\%$ ), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

**Table 2-2c** Runoff curve numbers for other agricultural lands <sup>1/</sup>

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. <sup>2/</sup>	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. <sup>3/</sup>	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 <sup>4/</sup>	48	65	73
Woods—grass combination (orchard or tree farm). <sup>5/</sup>	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. <sup>6/</sup>	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 <sup>4/</sup>	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$ .<sup>2</sup> **Poor:** <50% ground cover or heavily grazed with no mulch.**Fair:** 50 to 75% ground cover and not heavily grazed.**Good:** > 75% ground cover and lightly or only occasionally grazed.<sup>3</sup> **Poor:** <50% ground cover.**Fair:** 50 to 75% ground cover.**Good:** >75% ground cover.<sup>4</sup> Actual curve number is less than 30; use CN = 30 for runoff computations.<sup>5</sup> CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.<sup>6</sup> **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.**Fair:** Woods are grazed but not burned, and some forest litter covers the soil.**Good:** Woods are protected from grazing, and litter and brush adequately cover the soil.

**Table 2-2d** Runoff curve numbers for arid and semiarid rangelands <sup>1/</sup>

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition <sup>2/</sup>	A <sup>3/</sup>	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$ . For range in humid regions, use table 2-2c.<sup>2</sup> Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: &gt; 70% ground cover.

<sup>3</sup> Curve numbers for group A have been developed only for desert shrub.

# APPENDIX "C"

DETERMINATION WORKSHEET

SUSMP SUBMITTAL GUIDE CHECKLIST

BMP SELECTION TABLES



**FOR OFFICE USE ONLY:**

Does this project require permanent storm water BMP's?

Y N

Date Submitted: \_\_\_\_\_



File No:	Quadrant
Related Files:	
Set:	
Department Use Only	

## 2017 Storm Water LID Determination Worksheet

**PURPOSE AND APPLICABILITY:** This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

### Part 1: Project Information

Project Name Applicant (owner or developer) Name

Project Site Address Applicant Mailing Address

Project City/State/Zip Applicant City/State/Zip

Permit Number(s) - (if applicable) Applicant Phone/Email/Fax

Designer Name Designer Mailing Address

Designer City/State/Zip Designer Phone/Email

### **Type of Application/Project:**

Subdivision      Grading Permit      Building Permit      Hillside Development  
 Design Review      Use Permit      Encroachment      Time Extensions      Other : \_\_\_\_\_

### PART 2: Project Exemptions

1. Is this a project that creates or replaces *less than* 10,000 square feet of impervious surface<sup>1</sup>, including all project phases and off-site improvements?

Yes No

<sup>1</sup> Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

## 2017 Storm Water LID Determination Worksheet

2. Is this project a routine maintenance activity<sup>2</sup> that is being conducted to maintain original line and grade, hydraulic capacity, and original purpose of facility such as resurfacing existing roads and parking lots?

Yes                  No

3. Is this project a stand alone pedestrian pathway, trail or off-street bike lane?

Yes                  No

4. **Did you answer "YES" to any of the questions in Part 2?**

**YES:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete the "Exemption Signature Section" on Page 4.**

**NO:** Please complete the remainder of this worksheet.

### **Part 3: Project Triggers**

#### **Projects that Trigger Requirements:**

Please answer the following questions to determine whether this project requires permanent Storm Water BMP's and the submittal of a SW LIDs as required by the NPDES MS4 Permit order No. R1-2015-0030.

1. Does this project create or replace a combined total of 10,000 square feet or more of impervious surface<sup>1</sup> including all project phases and off-site improvements?

Yes                  No

2. Does this project create or replace a combined total or 10,000 square feet or more of impervious streets, roads, highways, or freeway construction or reconstruction<sup>3</sup>?                  Yes                  No

3. Does this project create or replace a combined total of 1.0 acre or more of impervious surface<sup>1</sup> including all project phases and off-site improvements?                  Yes                  No

4. **Did you answer "YES" to any of the above questions in Part 3?**

**YES:** This project will need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete remainder of worksheet and sign the "Acknowledgement Signature Section" on Page 4.**

**NO:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 permit. **Please complete the "Exemption Signature Section" on Page 4.**

<sup>1</sup> Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

<sup>2</sup> "Routine Maintenance Activity" includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities per section VI.D.2.b.

<sup>3</sup> "Reconstruction" is defined as work that extends into the subgrade of a pavement per section VI.D.2.b.

1. Total Project area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

Commercial      Industrial      Residential      Public      Other

3. Existing impervious surface area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

Commercial      Industrial      Residential      Public      Other

5. Proposed impervious surface area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

## 2017 Storm Water LID Determination Worksheet

**Acknowledgment Signature Section:**

As the property owner or developer, I understand that this project is required to implement permanent Storm Water Best Management Practices and provide a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit Order No. R1-2015-0030. \*Any unknown responses must be resolved to determine if the project is subject to these requirements.

Karen Massey

Applicant Signature

Date

**Exemption Signature Section:**

As the property owner or developer, I understand that this project as currently designed does not require permanent Storm Water BMP's nor the submittal of a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit\*. I understand that redesign may require submittal of a new Determination Worksheet and may require permanent Storm Water BMP's.

Applicant Signature

Date

\* This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

**Implementation Requirements:** All calculations shall be completed using the "Storm Water Calculator" available at: [www.srcity.org/stormwaterLID](http://www.srcity.org/stormwaterLID)

**Hydromodification Control/100% Volume Capture:** Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

**Treatment Requirement:** Treatment of 100% of the flow calculated using the modified Rational Method and a known intensity of 0.20 inches per hour.

**Delta Volume Capture Requirement:** Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

Project Name: \_\_\_\_\_

	Best Management Practice (BMP)	Detail Sheet	Detail Title											BMP in priority selected?		Unique Identifier of BMP per planes	Explanation of selection	Other notes:
				Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Runoff Reduction Measure	Yes	No					
Universal BMP- to be considered on all projects.	Living Roof	N/A	N/A		X	X	X		X	X			X					
	Rainwater Harvesting	N/A	N/A		X	X	X			X			X					

Runoff Reduction Measures	Interceptor Trees	N/A	N/A	X	X	X			X		X						
	Bovine Terrace	RRM-01	Bovine Terrace	X					X		X						
	Vegetated Buffer Strip	RRM-02	Vegetated Buffer Strip						X		X						
	Impervious Area Disconnection	N/A	N/A	X	X	X			X		X						

Priority 1- to be installed with no underdrains or liners. Must drain all stading water within 72 hours.	Bioretention	P1-02	Roadside Bioretention - no C & G					X	X			X			bmp storage measure	fits well into site layout
	Vegetated Swale- with Bioretention	P1-06	Swale with Bioretention					X	X			X			bmp storage measure	fits well into site layout
	Constructed Wetlands	N/A	N/A					X	X				X			

Priority 2 BMPs- with subsurface drains installed above the capture volume.	Bioretention	P2-02	Roadside Bioretention - Flush Design Roadside					X	X		X					
		P2-03	Roadside Bioretention- Contiguous SW					X	X		X					
		P2-04	Roadside Bioretention- Curb Opening					X	X		X					
		P2-05	Roadside Bioretention- No C & G					X	X		X					
	Constructed Wetlands	N/A	N/A					X	X		X					

Date: \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...			Slope Constraints...			Volume Capture	Runoff Reduction Measure	BMP in priority selected?		Unique Identifier of BMP per plan	Explanation of selection	Other notes:
			High Ground Water	Contamination	Slope	Achieves...	Treatment	Volume			Yes	No			
Priority 3 BMPs- installed with subdrains and/or impermeable liner. Does not achieve volume capture and must be used as part of a treatment train.	Bioretention	P3-02	Roadside Bioretention - Flush Design Roadside	X	X	X	X				X				
		P3-03	Roadside Bioretention- Contiguous SW	X	X	X	X				X				
		P3-04	Roadside Bioretention- Curb Opening	X	X	X	X				X				
	Flow Through Planters	P3-05	Flow Through Planters	X	X	X	X				X				
	Vegetated Swale	P3-06	With Bioretention	X	X	X	X	X			X				
		P3-07	Vegetated Swale	X	X	X	X				X				
Priority 4 BMPs- does not achieve volume capture and must be used as part of a	Tree Filter Unit			X	X	X	X				X				
	Modular Bioretention			X	X	X	X				X				
Priority 5 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Chambered Separator Units			X	X	X	X				X				
	Centrifugal Separator Units			X	X	X	X				X				
	Trash Excluders			X	X	X	X				X				
	Filter Inserts			X	X	X	X				X				
Priority 6 BMPs- see the "Offset Program" chapter for details.	Offset Program							N/A	N/A	N/A		X			
Other	Detention			X											

# APPENDIX "D"

BIORETENTION AREA FACT SHEET

Bioretention Media Mix Data Sheet

ACF R-Tank Spec Sheets and Sample Installation Sheets

# FACT SHEET- BIORETENTION

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## BIORETENTION

Also known as: Street rain garden, roadside bioretention, and bioretention cell



## DESCRIPTION

The bioretention area best management practice (BMP) functions as a soil and plant-based filtration and infiltration feature that removes pollutants through a variety of natural physical, biological, and chemical treatment processes.

## ADVANTAGES

- Achieves both water quality and volume capture objectives.
- Bioretention areas provide storm water treatment that enhances the quality of downstream water bodies by using natural processes.
- The vegetation provides shade and wind breaks, absorbs noise, reduces heat island effects and improves an area's landscape.
- Bioretention provides habitat for birds and attracts other pollinators like butterflies and bees.
- Does not interrupt utility installation.
- Does not interfere with tree planting.



# FACT SHEET- BIORETENTION

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## LIMITATIONS

- Bioretention is not recommended for areas where street slopes exceed 10%.
- Should not be used in areas of known contamination. If soil and/or groundwater contamination is present on the site or within a 100' radius of the proposed BMP location, the North Coast Regional Water Quality Control Board will need to be contacted and the site reviewed.
- Should not be used in areas of high groundwater. In general a minimum of 2' of clearance should be provided between the bottom of the bioretention cell and seasonal high groundwater.
- Should not be used in areas of slope instability where infiltrated storm water may cause failure. Slope stability should be determined by a licensed geotechnical engineer.
- Do not use in locations that can negatively impact building foundation or footings. Location shall be approved by a licensed Geotechnical Engineer.

## KEY DESIGN FEATURES

### ALL BIORETENTION

- Structural soil should be used within the bioretention area consisting of:
  - $\frac{3}{4}$ "-1  $\frac{1}{2}$ " highly angular crushed stone (83% of mix, by weight)- with no fines
  - Clay loam (gravel<5%, sand 25%-30%, silt 20%-40%, clay 20%-40%, organic matter 2%-5%)
  - Hydrogel tackifier (0.03% of mix, by weight)
- Structural soil shall be installed as described in Appendix F.
- Native soil should remain uncompacted to preserve infiltration capacity. Fence off the area during construction to protect.
- Bottom of bioretention should be unlined to allow infiltration into native soil.
- Moisture barrier must be installed to protect road sub-base and any trenches adjacent to the bioretention area.
- Pervious concrete shall be designed and installed as described in Appendix F.
- Porous gutter must be protected during construction to prevent sediment loading.
- Bioretention areas shall be planted with plants from the approved plant and tree list included in Appendix G and shall be planted to achieve \_\_\_\_% cover.
- All bioretention areas shall be designed with a designated high flow bypass inlet for storms larger than the design storm.
- 6" perforated pipe to be installed at a depth of 6" below road structural section.
- Perforated pipe shall be installed in straight runs.
- The volume below the perforated pipe must be sufficient to hold and infiltrate the design volume.



# FACT SHEET- BIORETENTION

---

## SIZING DESIGN- GOAL AND REQUIREMENTS

- The **design goal** for all bioretention areas is to capture (infiltration and/or reuse) 100% of the volume of runoff generated by the 85<sup>th</sup> percentile 24 hour storm event. This is a retention requirement. If 100% volume capture is achieved than no additional treatment is required.
- If the design goal is not achievable, then the bioretention area *sizing requirement* is:
  - **Water Quality Treatment** of 100% of the flow generated by the 85th percentile 24 hour storm event, as calculated using the Rational Method and a known intensity of 0.92 inches per hour, **and**
  - **Volume Capture** (infiltration and/or reuse) of the increase in volume of storm water due to development generated by the 85th percentile 24 hour storm event. This is a retention requirement.
- All calculations shall be completed using the “Storm Water Calculator” available at [www.srcity.org/stormwaterLID](http://www.srcity.org/stormwaterLID).

## INSPECTION AND MAINTENANCE REQUIREMENTS

A maintenance plan shall be provided with the Final SUSMP. The maintenance plan shall include recommended maintenance practices, state the parties responsible for maintenance and upkeep, specify the funding source for ongoing maintenance with provisions for full replacement when necessary and provide site specific inspection checklist.

At a minimum maintenance shall include the following:

- Dry street sweeping upon completion of construction
- Dry street sweeping annually, and
  - When water is observed flowing in the gutter during a low intensity storm.
  - Algae is observed in the gutter.
  - Sediment/debris covers 1/3 of the gutter width or more.
- Inspect twice annually for sedimentation and trash accumulation in the gutter. Obstructions and trash shall be removed and properly disposed of.
- Inspect twice during the rainy season for ponded water.
- Pesticides and fertilizers shall not be used in the bioretention area.
- Plants should be pruned, weeds pulled and dead plants replaced as needed.





**ETS**  
**975 Transport Way, Suite 2**  
**Petaluma, CA 94954**  
**(707) 778-9605 / FAX 778-9612**  
**e-mail: entech@pacbell.net**

**Environmental  
 Technical Services**

-Soil, Water & Air Testing & Monitoring  
 -Analytical Labs  
 -Technical Support

**Serving people and the environment  
 so that both benefit.**

CLIENT: Soiland Company, 7171 Stony Point Road, Cotati, CA 94931	DATE COLLECTED 8/3/17	DATE RECEIVED 8/3/17	DATE REPORT 8/10/17
ATTN: Tom Shearer			
PROJECT: high porosity/high OM growth media			

MOISTURE, DENSITY, SPECIFIC GRAVITY & POROSITY TEST RESULTS												
SAMPLE NUMBER & ID	BORING/ SAMPLE ID	TEST MASS gm	BULK DENSITY lbs/cuft	% MOISTURE Dry Weight/ Wet Weight	SPECIFIC GRAVITY gm/cc	TOTAL TEST VOLUME cc	VOLUME SLDS/VOID cc	VOID VOLUMES		SATURATION PERCENT % of pore vol.	POROSITY (pore volume) PERCENT	SOIL/SEDIMENT GROSS TEXTURE
								AIR FILLED vol %	WATER FILLED vol %			
07456-1 GMM1/SGR	Bulk Sample #1	201.1	64.6	17.63 14.99	2.60 (2.01)	194.4	77.38 117.06	44.70	15.50	25.75	60.20	Dk Brn Sand w/ OM
07456-2 GMM2/SGR	Bulk Sample #2	179.6	57.7	18.57 15.66	2.60 (1.90)	194.4	69.11 125.34	49.99	14.46	22.44	64.46	Dk Brn Sand w/ OM

**NOTE:**

	Sample #1	Sample #2			
Specs/Smpl ID	GMM1/SGR	GMM2/SGR			
Volume (Q) [cm3]:	194.444	194.444			
Diameter (d) [cm]:	5.70	5.70			
Length (L) [cm]:	7.62	7.62			
Area (A) [cm2]:	25.518	25.518			
Sample Description	Dk Brn Sand w/ OM	Dk Brn Sand w/ OM			

**COMMENTS/NOTES:** These two samples both have very high proportions of organic matter matter including significant amounts of large organic particles as well as very fine sand-sized to silt-sized organic matter particles as well. As a result, the actual and functional porosities are very high in both samples, although there is a 4%-5% difference between the two samples. This difference could be result of either differences in amounts of actual OM materials in the two; or could be due to sampling bias; or could be due to sampling bias; or could be due to test aliquot bias. This cannot be know unless a statistical analysis is undertaken. In any case, the difference between the two is not really significant in the absence of more information and/or a statistical work up. Both the mineral component, i.e., the sand specific gravity and a material bulk specific gravity are recorded, but only the former is used for calculations as only that result yields porosity results consistent with the type of mix and its appearance.

**NOTES:** Testing follows methodology as defined by the American Society for Testing and Materials (ASTM) protocols, State of California Department of Transportation (CalTrans) protocols, or other entities as follows: ASTM D2937 Test Method for Density of Soil in Place by Drive-Cylinder - moisture and density (dry bulk & native densities), or Cal Tests 203/226, Analysis of Soil/Moisture; and Specific Gravity - ASTM D-854 Test Method for Specific Gravity of Soils, or Cal Test 207, Specific Gravity of Soils and Sediments.





## STORMWATER MANAGEMENT



LET'S GET IT DONE







# STORMWATER MANAGEMENT

R-Tank® stormwater systems provide underground storage of stormwater. After a rain event fills the R-Tank®, stormwater can flow into the drainage system, infiltrate into the ground, or be reused. The system is an alternative to stormwater basins and a more efficient, space saving alternative to other underground systems for detention, infiltration, and recycling stormwater.



R-Tank® is a modular system and can be assembled to a variety of heights from 2" to just under 7'. This rigid system can be placed beneath a variety of surfaces including: Parking Lots, Streets and Access Roads, Driveways, Landscaping, Athletic Fields/Playgrounds, Swales and Channels.

R-Tank® can be used for a variety of applications including: Retention and Infiltration, Detention, Recycling or Harvesting, Pond Retrofits, Dry Wells, and Bioretention.

With an unlimited array of possible design configurations, the R-Tank® can adapt to your project to make the most economical systems possible. Strength. Versatility. Cost-Effectiveness. And we're just getting started!

## BENEFITS

### High Capacity

- 95% void internal area

### Strength

- Easily supports traffic loading from parking lots and roads
- Backfill with sand - no stone required

### Design & Construction Versatility

- Combine modules into any shape to efficiently use space
- Vary height from 2 inches to 7 feet

### Increased Infiltration and Exfiltration

- Outer shell is 90% open
- Increases groundwater recharge, reducing post-construction discharge volumes

### Easy to Transport

- Can be supplied unassembled for reduced delivery costs

### Lightweight and Quick to Install

- Installed by hand; no cranes required
- Reduces site access delays

### Permanent and Maintainable Storage Volume

- All storage volume is isolated inside filter fabric envelope
- No reliance upon unsustainable, temporary, assumed void space in crushed gravel backfill

### Recycled Content

- Manufactured with recycled polypropylene



- Light Duty module (30 psi)
- Ideal for applications in green space
- Four internal plates
- 12" - 36" cover



- Heavy Duty module (33.4 psi)
- Standard module for HS-20 traffic application
- Five internal plates
- 18" - 84" cover



- Super Duty module (42.9 psi)
- Higher safety factors for shallow traffic applications and deeper cover
- Five internal plates
- 120" maximum cover



- Extreme Duty module (320 psi)
- Traffic loads with 6" cover or 16.5' maximum cover
- Available from 2" - 10'
- 90% void





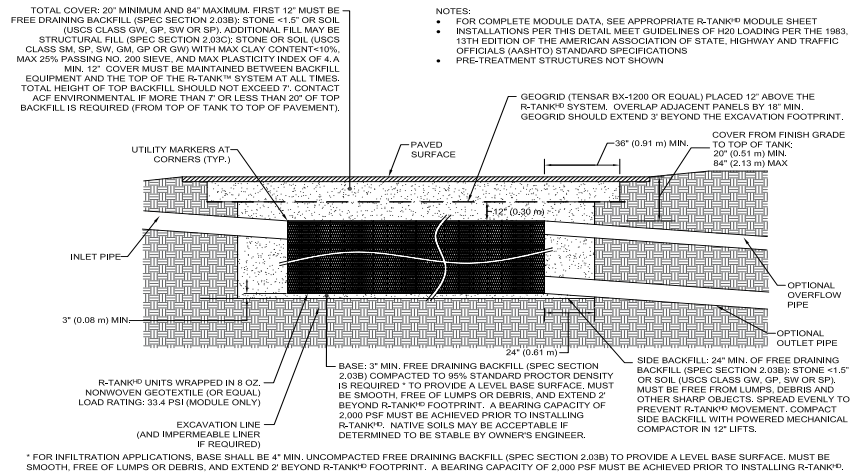
# DESIGN CONSIDERATIONS

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Many factors will influence the design of the R-Tank® system. While this list is not intended to be all-inclusive, several design considerations are worth highlighting:

1. PRE-TREATMENT
2. BACKFILL MATERIALS
3. RUNOFF REDUCTION
4. WATER TABLE
5. CONSTRUCTION LOADS
6. LATERAL LOADS
7. R-TANK® MODULES
8. LOAD MODELING



## 1. PRE-TREATMENT

Removing pollutants from runoff before they enter an underground detention system is the only smart way to design & build a system. The best way to do that is with the Trash Guard Plus® (see page 6), but many other ways exist. Be sure the system you select will remove:

- Heavy Sediments
- Gross Pollutants (trash)
- Biodegradable Debris

## 2. BACKFILL MATERIALS

Backfill materials should be stone (smaller than 1.5" in diameter) or soil (GW, GP SW or SP as classified by the Unified Soil Classification System). Material must be free from lumps, debris and any sharp objects that could cut the geotextile. See the R-Tank® narrative specification section 2.03B for additional information.

## 3. RUNOFF REDUCTION

Runoff Reduction – Most designs incorporate an outlet to drain the system at a controlled rate and/or an overflow to prevent flooding in extreme events. But be sure to take advantage of any infiltration you can achieve on the site. Consider raising the invert of your outlet or creating a sump to capture and infiltrate the water quality volume whenever possible.

## 4. WATER TABLE

While installing the R-Tank® below the water table is manageable, designers must be able to create a stable base and account for the system's ability to drain this water out or limit its ability to enter the system. If a liner is used to prevent ground water from entering the system, measures must be taken to prevent the system from floating.

## 5. CONSTRUCTION LOADS

Construction loads are often the heaviest loads the system will see throughout its life. Care must be taken during backfilling and compaction using the proper equipment (see specification section 3.05), and post-installation construction traffic should be routed around the system (Installation Guide step 12).

## 6. LATERAL LOADS

As systems get deeper, the loads acting on the side of the tank increase. These lateral loads should be considered when the bottom of the system is 10' or more below finished grade.

## 7. R-TANK® MODULES

Be sure to select the right module for your application. See the information on page 3 for more details on which module is the best fit. Also refer to the specifications for each module on the back of this brochure or call us for assistance.

## 8. LOAD MODELING

A safety factor of 1.75 or higher is required when designing with R-Tank®. Be sure to run your own loading model with all requirements specific to your site. Several example models can be found in our Tech Note on loading capabilities, and minimum cover requirements for various loads can be found in the spec on the back of this brochure.

# INTEGRATED INFRASTRUCTURE



It's no secret that much of the nation's infrastructure will be rebuilt in the coming years. This reconstruction must include moving beyond traditional systems that do ONE THING very well to systems that accomplish MULTIPLE objectives. R-Tank® can play a significant role in this process when used as an integrated alternative to stormwater pipe.

## BENEFITS:

### Pipes

- Moves runoff from its origination point to a discharge point
- Typically solid, preventing exfiltration
- Smooth surfaces move 100% of contents
- Round flow area concentrates flows into the center of the pipe
- Highly efficient, providing a low Manning's N (typically .010 - .013), which short-circuits time of concentration

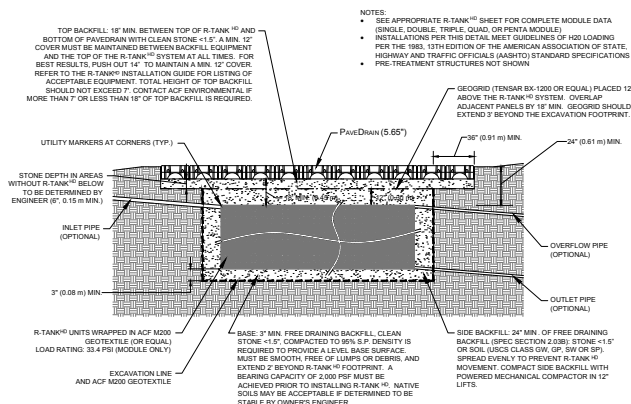
### R-Tank®

- Moves runoff from its origination point to a discharge point
- 90% open exterior encourages exfiltration
- Contoured bottom plate retains runoff and reduces outflows
- Square flow area spreads flows across the bottom, encouraging infiltration
- Highly turbulent, providing higher Manning's N (typically .025), which extends time of concentration

## PAVEDRAIN

Traditional pavements move vehicles efficiently, but are easily damaged by stormwater. PaveDrain handles both traffic and stormwater with ease, making it a critical component of an integrated infrastructure plan.

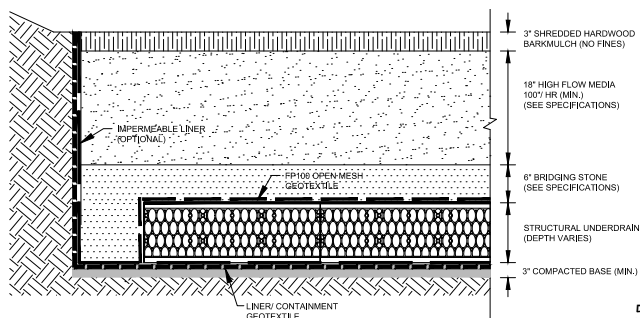
- Handles all vehicular loads
- Drains ten times faster than competing pervious pavements: over 4,000 inches/hour
- Reduces long-term maintenance costs
- Provides detention volume within the block and in base materials
- Encourages infiltration
- Pair with R-Tank® to maximize water storage and transport



## FOCALPOINT

Traditional landscaping adds aesthetic value to projects, but has more potential. Many developers turn to bioretention, but are forced to surrender massive land areas to accomplish modest goals. FocalPoint reduces the space requirements of bioretention by up to 90% while providing all the water purification benefits.

- Adds aesthetic value to properties
- Cleans runoff to improve water quality
- Reduces space requirements of traditional bioretention systems
- Encourages infiltration to reduce volume of water discharged
- Pair with R-Tank® to maximize water storage and transport





# MAINTENANCE

Maintaining the pre-treatment systems on a site is the most important factor in keeping an R-Tank® System healthy. However, there are a few ways to make flushing out the R-Tank® a snap.

## 1. PRE-TREATMENT

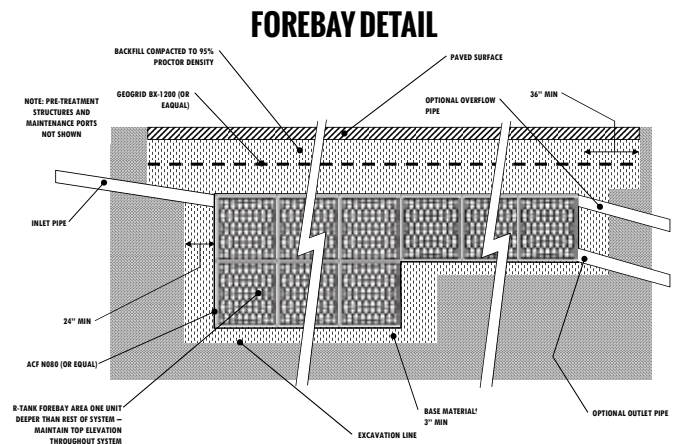
Trash Guard Plus® units (see below) will prevent unwanted trash and sediments from entering the R-Tank®. You may also want to consider having the R-Tank® units penetrate the connecting structure, which allows the use of the R-Tank® as its own trash screen. This works best with a structure that includes a sump.

## 2. SEDIMENT FOREBAY

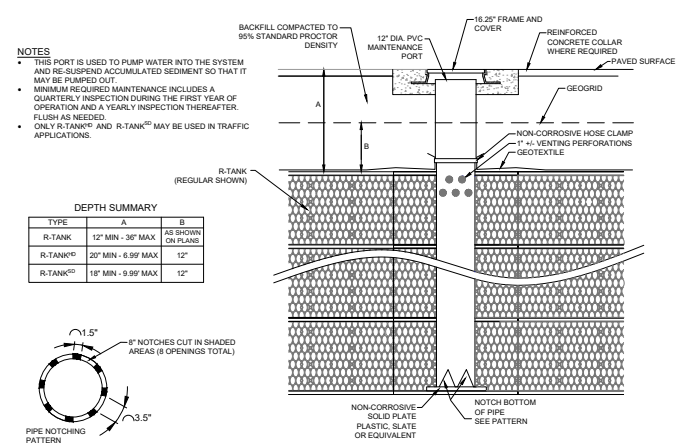
Forebays can be easily formed out of the R-Tank® itself, helping to facilitate maintenance by reducing the time and expense of maintenance efforts, as well as improving performance.

## 3. MAINTENANCE PORT

These ports allow access for backflushing the system, and should be included within 10' of all inlet and outlet connections, and roughly 50' on center.



## MAINTENANCE PORT DETAIL



# MAINTENANCE PREVENTION

## TRASH GUARD®

Trash Guard® is a patented stormwater pretreatment device that captures debris, sediment and floatables. Easy to install and maintain, it is a fraction of the cost of other pretreatment devices.

### Benefits of Trash Guard®

- Simple retrofit to existing catch basins
- Installs without heavy equipment
- Quick and easy assembly
- Adjusts to irregular catch basin bottoms and/or walls
- Eliminates eyesore stormwater trash at public parks, beaches, and waterways
- Removes harmful nutrients and regulated metals





# PRODUCT SPECIFICATION

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and



## Dimensions & Capacity

Module (Units)	Width (inches)	Length (inches)	Height (inches/ft)	Tank Vol (cf)	Storage Vol (cf)	Weight* (lbs)
Mini	15.75	28.15	9.45" / 0.79'	2.42	2.30	10.19 / 10.95
Single (1)	15.75	28.15	17.32" / 1.44'	4.44	4.22	15.73 / 17.35
Single + Mini (1.5)	15.75	28.15	25.98" / 2.17'	6.67	6.33	23.61 / 25.98
Double (2)	15.75	28.15	33.86" / 2.82'	8.69	8.25	29.15 / 32.37
Double + Mini (2.5)	15.75	28.15	42.52" / 3.54'	10.91	10.36	37.02 / 41.01
Triple (3)	15.75	28.15	50.39" / 4.20'	12.93	12.28	42.56 / 47.40
Triple + Mini (3.5)	15.75	28.15	59.06" / 4.92'	15.15	14.39	50.43 / 56.03
Quad (4)	15.75	28.15	66.93" / 5.58'	17.17	16.31	55.97 / 62.43
Quad + Mini (4.5)	15.75	28.15	75.59" / 6.30'	19.39	18.42	63.85 / 71.06
Pent (5)	15.75	28.15	83.46" / 6.96'	21.41	20.34	69.38 / 77.45

\* Weights Shown are for Standard R-Tank and R-Tank<sup>HD</sup>



## Dimensions & Capacity

Module (Units)	Width (inches)	Length (inches)	Height (inches/ft)	Tank Vol (cf)	Storage Vol (cf)	Weight (lbs)
Single (1)	15.75	28.15	9.45" / 0.79'	2.42	2.30	10.95
Double (2)	15.75	28.15	18.12" / 1.51'	4.64	4.41	19.58
Triple (3)	15.75	28.15	26.79" / 2.23'	6.86	6.52	28.21
Quad (4)	15.75	28.15	35.46" / 2.96'	9.08	8.63	36.84
Pent (5)	15.75	28.15	44.13" / 3.68'	11.30	10.74	45.47
Hex (6)	15.75	28.15	52.80" / 4.40'	13.52	12.84	54.10
Septa (7)	15.75	28.15	61.47" / 5.12'	15.74	14.95	62.73
Octo (8)	15.75	28.15	70.14" / 5.85'	17.96	17.06	71.36
Nono (9)	15.75	28.15	78.81" / 6.57'	20.18	19.17	79.99
Decka (10)	15.75	28.15	87.48" / 7.29'	22.40	21.28	88.62



## Dimensions & Capacity

Module (Units)	Width (inches)	Length (inches)	Height (inches/ft)	Tank Vol (cf)	Storage Vol (cf)	Weight (lbs)
Single Panel	19.68	23.62	1.97" / 0.164'	0.53 cf	0.48	4.00 lbs

\*Stack Individual Units to Make Any Height Up To 10'



## Specifications

Item	Description	R-Tank Value	R-Tank <sup>HD</sup> Value	R-Tank <sup>SD</sup> Value	R-Tank <sup>XD</sup> Value
<b>Void Area</b>	Volume available for water storage	95%	95%	95%	90%
<b>Surface Area Void</b>	% of exterior available for infiltration	90%	90%	90%	90%
<b>Compressive Strength</b>	ASTM D 2412 / ASTM F 2418	30.0 psi	33.4 psi	42.9 psi	320 psi*
<b>Unit Weight</b>	Weight of plastic per cubic foot of tank	3.29 lbs/cf	3.62 lbs/cf	3.96 lbs/cf	7.55 lbs/cf
<b>Rib Thickness</b>	Thickness of load-bearing members	0.18 inches	0.18 inches	0.18 inches	
<b>Service Temperature</b>	Safe temperature range for use	-14 - 167° F	-14 - 167° F	-14 - 167° F	-14 - 185° F
<b>Recycled Content</b>	Use of recycled polypropylene	100%	100%	100%	100%
<b>Minimum Cover</b>	Cover required for HS-20 loading	Green Space Only	20"	18"	6"
<b>Minimum Cover</b>	Cover required for HS-25 loading	Green Space Only	24"	18"	6"
<b>Maximum Cover</b>	Maximum allowable cover depth	36"	6.99'	9.99'	16.7'

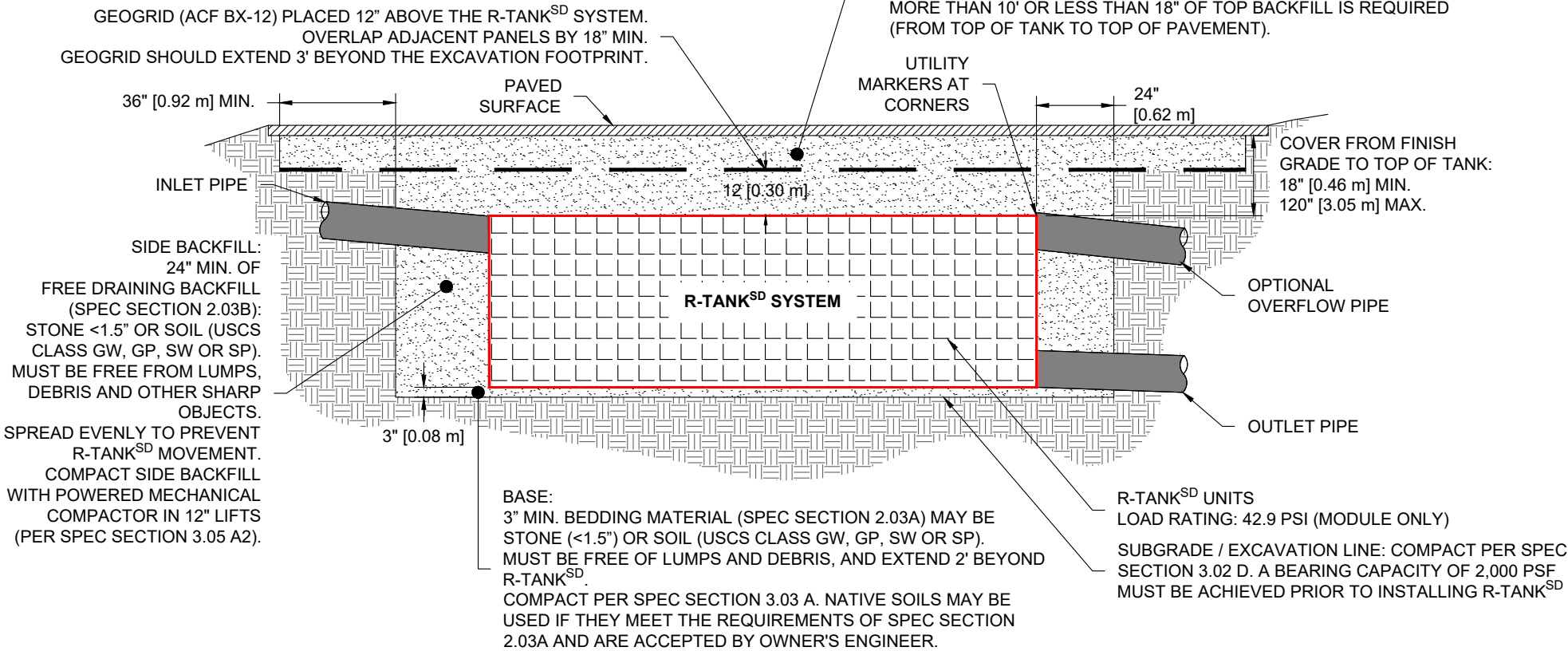
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For more information about Stormwater Management, contact us at 800.448.3636  
email at info@acfen.com

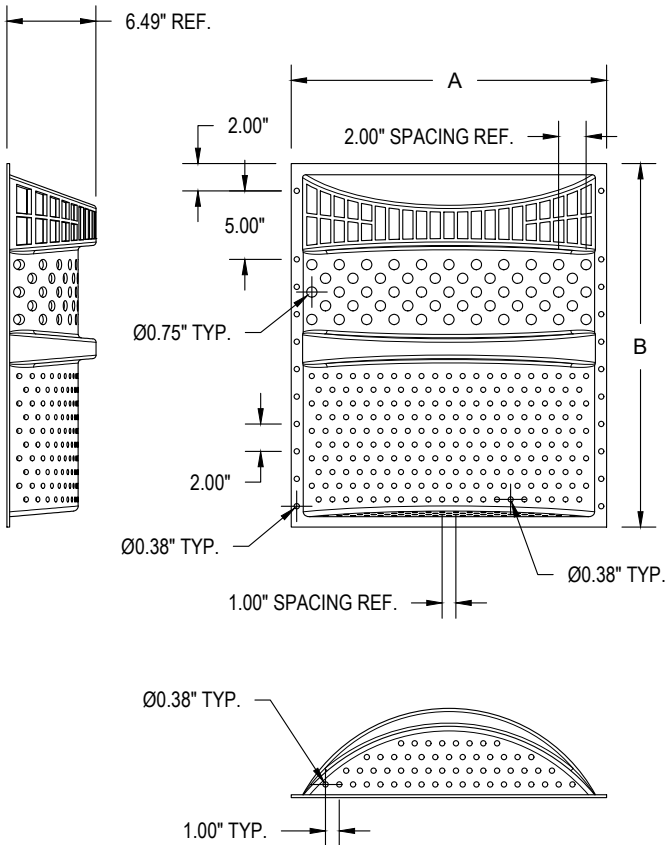




- NOTES:
- FOR COMPLETE MODULE DATA, SEE APPROPRIATE R-TANK<sup>SD</sup> MODULE SHEET .
  - INSTALLATIONS PER THIS DETAIL MEET GUIDELINES OF HL-93 LOADING PER THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, CUSTOMARY U.S. UNITS, 7TH EDITION, 2014 WITH 2015 AND 2016 INTERIM REVISIONS.
  - PRE-TREATMENT STRUCTURES NOT SHOWN.
  - FOR INFILTRATION APPLICATIONS, GEOTEXTILE ENVELOPING R-TANK SHALL BE ACF M200 (PER SPEC SECTION 2.02A) AND BASE SHALL BE 4" MIN. UNCOMPACTED FREE DRAINING BACKFILL (SPEC SECTION 2.03A) TO PROVIDE A LEVEL BASE. SURFACE MUST BE SMOOTH, FREE OF LUMPS OR DEBRIS, AND EXTEND 2' BEYOND R-TANK<sup>SD</sup> FOOTPRINT.



R-TANK<sup>SD</sup> & HS-20 LOADS - SECTION VIEW



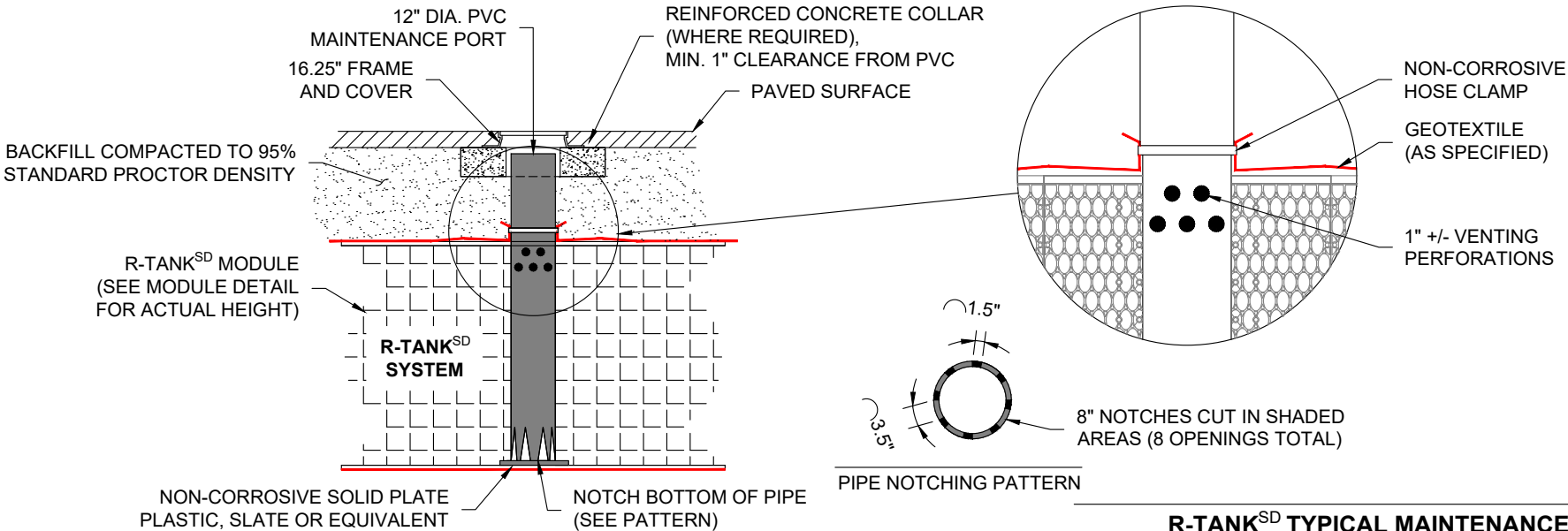
SIZE	A	B
23" x 24"	23"	26.51"
28" x 30"	28"	33.15"
34" x 36"	34"	38.69"

±0.25" TOLERANCE ON DIMENSIONS

TRASHGUARD PLUS PRETREATMENT DETAIL

NOTES

- THIS PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
- MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
- SEE TRAFFIC LOADING DETAIL FOR MINIMUM & MAXIMUM COVER REQUIREMENTS.
- IF MAINTENANCE PORT IS LOCATED IN A NON-TRAFFIC AREA, A PLASTIC CAP CAN BE USED IN LEU OF A FRAME AND COVER WITH CONCRETE COLLAR.



R-TANK<sup>SD</sup> TYPICAL MAINTENANCE PORT



ENGINEER OF RECORD TO REVIEW, APPROVE AND ENDORSE FINAL SITE SPECIFIC DESIGN.



FOR ADDITIONAL INFORMATION PLEASE CONTACT:  
FERGUSON WATERWORKS,  
1-800-448-3636, [www.ferguson.com](http://www.ferguson.com)

R-TANK<sup>SD</sup> SYSTEM DETAILS  
3575 MENDOCINO AVE SENIOR HOUSING  
SANTA ROSA, CA  
SITE DESIGNATION: TANK 4

DRAWN BY

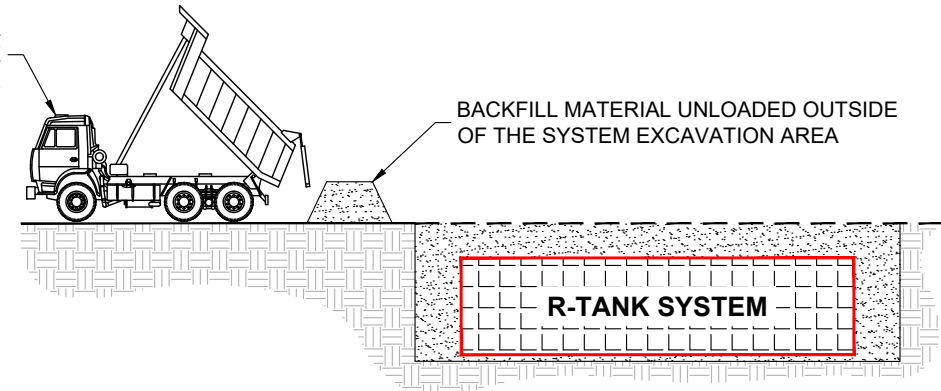
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DATE

3/22/2022

SHEET NO.

DUMP TRUCKS AND PANS SHALL NOT OPERATE OVER THE SYSTEM EXCAVATION AREA



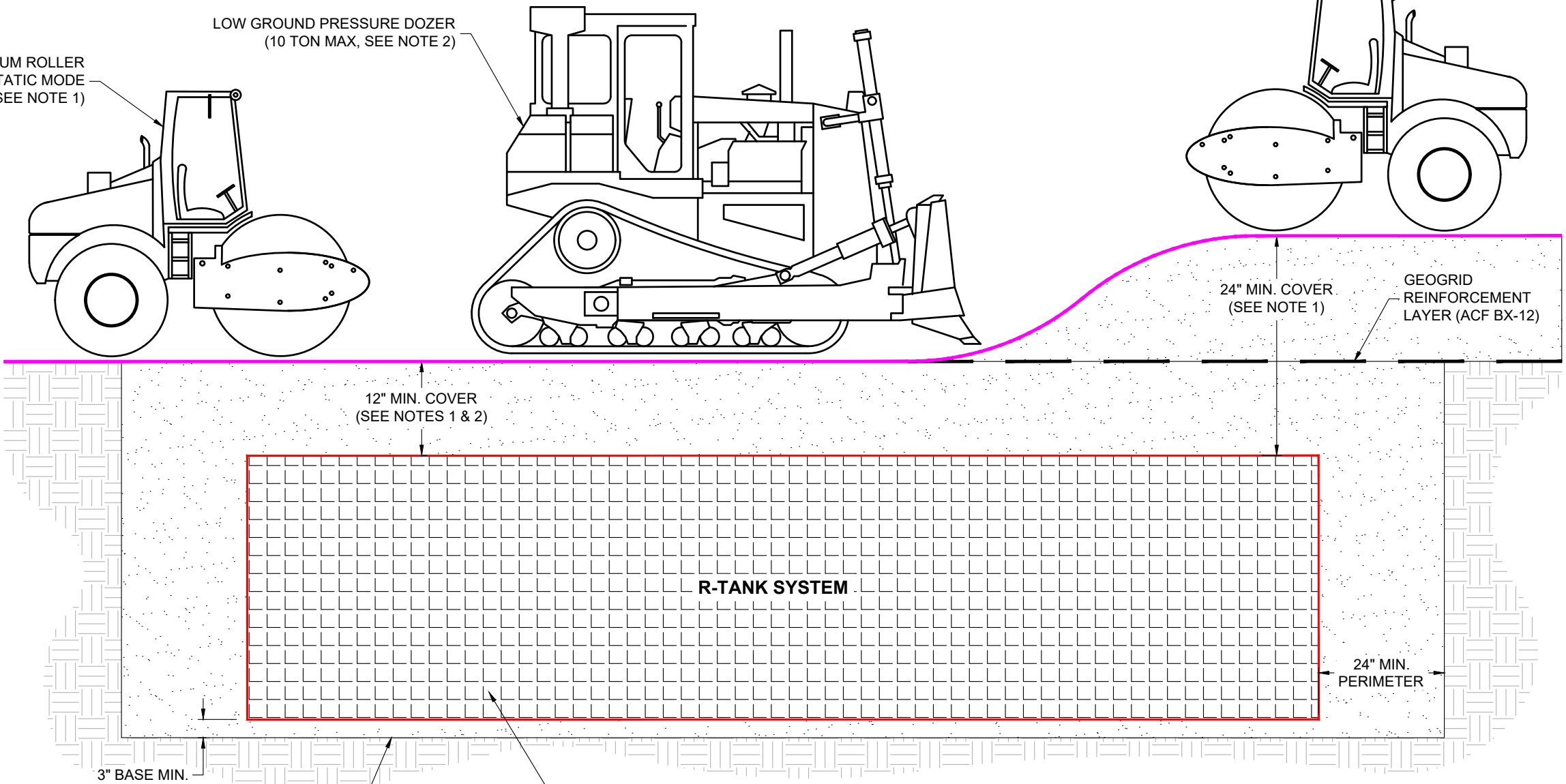
DUMP TRUCK DETAIL (SEE NOTE 3)

- NOTES:
1. FOLLOWING PLACEMENT OF SIDE BACKFILL, A UNIFORM 12" LIFT OF THE FREELY DRAINING MATERIAL (SPEC SECTION 2.03 B) SHALL BE PLACED OVER THE R-TANK AND LIGHTLY COMPACTED USING A WALK-BEHIND TRENCH ROLLER. ALTERNATELY, A ROLLER (MAXIMUM GROSS VEHICLE WEIGHT OF 6 TONS) MAY BE USED. ROLLER MUST REMAIN IN STATIC MODE UNTIL A MINIMUM OF 24" OF COVER HAS BEEN PLACED OVER THE MODULES. SHEEP FOOT ROLLERS SHOULD NOT BE USED. **SPEC SECTION 3.05 A**
  2. ONLY LOW PRESSURE TIRE OR TRACK VEHICLES (LESS THAN 7 PSI AND OPERATING WEIGHT OF LESS THAN 20,000 LBS) SHALL BE OPERATED OVER THE R-TANK SYSTEM DURING CONSTRUCTION. **SPEC SECTION 3.05 B**
  3. DUMP TRUCKS AND PANS SHALL NOT BE OPERATED WITHIN THE R-TANK SYSTEM AT ANY TIME. WHERE NECESSARY, THE HEAVY EQUIPMENT SHOULD UNLOAD IN AN AREA ADJACENT TO THE R-TANK SYSTEM AND THE MATERIAL SHOULD BE MOVED OVER THE SYSTEM WITH TRACKED EQUIPMENT. **SPEC SECTION 3.05 B**
  4. ENSURE THAT ALL UNRELATED CONSTRUCTION TRAFFIC IS KEPT AWAY FROM THE LIMITS OF EXCAVATION UNTIL THE PROJECT IS COMPLETE AND FINAL SURFACE MATERIALS ARE IN PLACE. NO NON-INSTALLATION RELATED LOADING SHOULD BE ALLOWED OVER THE R-TANK SYSTEM UNTIL THE FINAL DESIGN SECTION HAS BEEN CONSTRUCTED (INCLUDING PAVEMENT). **SPEC SECTION 3.05 C**
  5. SEE R-TANK INSTALLATION GUIDE OR CONTACT YOUR LOCAL ACF REPRESENTATIVE FOR ADDITIONAL INFORMATION.

SMOOTH DRUM ROLLER  
STATIC MODE  
(6 TON MAX, SEE NOTE 1)

LOW GROUND PRESSURE DOZER  
(10 TON MAX, SEE NOTE 2)

SMOOTH DRUM ROLLER  
VIBRATORY MODE  
(6 TON MAX, SEE NOTE 1)



SUBGRADE / EXCAVATION LINE: COMPACT PER SPEC SECTION 3.02 D. A BEARING CAPACITY OF 2,000 PSF MUST BE ACHIEVED PRIOR TO INSTALLING R-TANK<sup>HD</sup> OR R-TANK<sup>SD</sup>

R-TANK<sup>HD</sup> OR R-TANK<sup>SD</sup> UNITS  
HD: LOAD RATING: 33.4 PSI (MODULE ONLY)  
SD (HD MINI): LOAD RATING: 42.9 PSI (MODULE ONLY)

CONSTRUCTION EQUIPMENT COVER DETAIL - VEHICULAR TRAFFIC



ENGINEER OF RECORD TO REVIEW, APPROVE AND ENDORSE FINAL SITE SPECIFIC DESIGN.



FOR ADDITIONAL INFORMATION PLEASE CONTACT:  
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R-TANK<sup>SD</sup> CONSTRUCTION EQUIPMENT COVER DETAIL  
3575 MENDOCINO AVE SENIOR HOUSING  
SANTA ROSA, CA  
SITE DESIGNATION: TANK 4

DRAWN BY

EDQ

DATE

3/22/2022

SHEET NO.

R-TANK SPECIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, technical specification and general provisions of the Contract as modified herein apply to this section.

1.02 DESCRIPTION OF WORK INCLUDED

- A. Provide excavation and base preparation per geotechnical engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse. Excavations shall be in accordance with the owner's and OSHA requirements.
- B. Provide and install R-TankLD/, R-TankHD/, R-TankSD/, or R-TankU/D/ system (hereafter called R-Tank) and all related products including fill materials, geotextiles, geogrids, inlet and outlet pipe with connections per the manufacturer's installation guidelines provided in this section.
- C. Provide and construct the cover of the R-Tank system including; stone backfill, structural fill cover, and pavement section as specified.
- D. Protect R-Tank system from construction traffic after installation until completion of all construction activity in the installation area.

1.03 QUALITY CONTROL

- A. All materials shall be manufactured in ISO certified facilities.
- B. Installation Contractor shall demonstrate the following experience:
1. A minimum of three R-Tank or equivalent projects completed within 2 years; and,
2. A minimum of 25,000 cubic feet of storage volume completed within 2 years.
3. Contractor experience requirement may be waived if the manufacturer's representative provides on-site training and review during construction.
- C. Installation Personnel: Performed only by skilled workers with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.
- D. Contractor must have manufacturer's representative available for site review if requested by Owner.

1.04 SUBMITTALS

- A. Submit proposed R-Tank layout drawings. Drawings shall include typical section details as well as the required base elevation of stone and tanks, minimum cover requirements and tank configuration.
- B. Submit manufacturer's product data, including compressive strength and unit weight.
- C. Submit manufacturer's installation instructions.
- D. Submit R-Tank sample for review. Reviewed and accepted samples will be returned to the Contractor.
- E. Submit material certificates for geotextile, geogrid, base course and backfill materials.
- F. Submit required experience and personnel requirements as specified in Section 1.03.
- G. Any proposed equal alternative product substitution to this specification must be submitted for review and approved prior to bid opening. Review package should include third party reviewed performance data that meets or exceeds criteria in Table 2.01 B.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect R-Tank and other materials from damage during delivery, and store UV sensitive materials under tarp to protect from sunlight when time from delivery to installation exceeds two weeks. Storage of materials should be on smooth surfaces, free from dirt, mud and debris.
- B. Handling is to be performed with equipment appropriate to the materials and site conditions, and may include hand, handcart, forklifts, extension lifts, etc.
- C. Cold weather:
1. Care must be taken when handling plastics when air temperature is 40 degrees or below as plastic becomes brittle.
2. Do not use frozen materials or materials mixed or coated with ice or frost.
3. Do not build on frozen ground or wet, saturated or muddy subgrade.

1.06 PREINSTALLATION CONFERENCE.

- A. Prior to the start of the installation, a preinstallation conference shall occur with the representatives from the design team, the general contractor, the excavation contractor, the R-Tank installation contractor, and the manufacturer's representative.

1.07 PROJECT CONDITIONS

- A. Coordinate installation for the R-Tank system with other on-site activities to eliminate all non-installation related construction traffic over the completed R-Tank system. No loads heavier than the design loads shall be allowed over the system, and in no case shall loads higher than a standard AASHTO HS20 (or HS25, depending on design criteria) load be allowed on the system at any time.
- B. Protect adjacent work from damage during R-Tank system installation.
- C. All pre-treatment systems to remove debris and heavy sediments must be in place and functional prior to operation of the R-Tank system. Additional pretreatment measures may be needed if unit is operational during construction due to increased sediment loads.
- D. Contractor is responsible for any damage to the system during construction.

PART 2 - PRODUCTS

2.01 R-TANK UNITS

- A. R -Tank - Injection molded plastic tank plates assembled to form a 95% void modular structure of predesigned height (custom for each project).
- B. R-Tank units shall meet the following Physical & Chemical Characteristics:

PROPERTY	DESCRIPTION	R-Tank <sup>HD</sup> VALUE	R-Tank <sup>HD</sup> VALUE	R-Tank <sup>SD</sup> VALUE	R-Tank <sup>SD</sup> VALUE
Void Area	Volume available for water storage	95%	95%	95%	95%
Surface Void Area	Percentage of exterior available for infiltration	90%	90%	90%	90%
Vertical Compressive Strength	ASTM D 2412 / ASTM F 2418	30.0 psi	33.4 psi	42.9 psi	134.2 psi
Lateral Compressive Strength	ASTM D 2412 / ASTM F 2418	20.0 psi	22.4 psi	28.9 psi	N/A
HS-20 Minimum Cover	Cover required to support HS-20 loads	N/A	20"	18"	12" (STONE BACKFILL)
HS-25 Minimum Cover	Cover required to support HS-25 loads	N/A	24"	19"	15" (STONE BACKFILL)
Maximum Cover	Maximum allowable cover depth	3 feet	< 7 feet	< 10 feet	5 feet
Unit Weight	Weight of plastic per cubic foot of tank	3.29 lbs / cf	3.62 lbs/cf	3.96 lbs / cf	4.33 lbs / cf
Rib Thickness	Thickness of load-bearing members	0.18 inches	0.18 inches	0.18 inches	N/A
Service Temperature	Safe temperature range for use	-14 – 167° F	-14 – 167° F	-14 – 167° F	-14 – 167° F

- C. Supplier: Ferguson Waterworks 2831 Cardwell Road Richmond, VA 23234 (T): 800-448-3636; (F): 804-743-7779 www.ferguson.com

2.02 GEOSYNTHETICS

- A. Geotextile. A geotextile envelope is required to prevent backfill material from entering the R-Tank modules.
1. Standard Application: The standard geotextile shall be an 8 oz per square yard nonwoven geotextile (ACF N080 or equivalent).
2. Infiltration Applications: When water must infiltrate/exfiltrate through the geotextile as a function of the system design, a woven monofilament (ACF M200 or equivalent) shall be used.
- B. Geogrid. For installations subject to traffic loads and/or when required by project plans, install geogrid (ACF BX12 or equivalent) to reinforce backfill above the R-Tank system. Geogrid is not always required for R-TankUD/ installations, and is often not required for non-traffic load applications.

2.03 BACKFILL & COVER MATERIALS

- A. Bedding Materials: Stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) shall be used below the R-Tank system (3" minimum). Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation. For infiltration applications bedding material shall be free draining.
- B. Side and Top Backfill: Material must be free from lumps, debris and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.
1. Traffic Applications - Free draining material shall be used adjacent to (24" minimum) and above (for the first 12") the R-Tank system.
- a. For HD, and SD modules, backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System).
- b. For UD modules with less than 14" of top cover, backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter). The use of soil backfill on the sides and top of the UD module is not permitted unless the modules are installed outside of traffic areas or with cover depths of 14" or more. Top backfill material (from top of module to bottom of pavement base or 12" maximum) must be consistent with side backfill.
2. Non-Traffic / Green Space Applications - For all R-Tank modules installed in green spaces and not subjected to vehicular loads, backfill materials may either follow the guidelines for Traffic Applications above, or the top backfill layer (12" minimum) may consist of AASHTO #57 stone blended with 30-40% (by volume) topsoil to aid in establishing vegetation.
- C. Additional Cover Materials: Structural Fill shall consist of granular materials meeting the gradational requirements of SM, SP, SW, GM, GP or GW as classified by the Unified Soil Classification System. Structural fill shall have a maximum of 25 percent passing the No. 200 sieve, shall have a maximum clay content of 10 percent and a maximum Plasticity Index of 4. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

2.04 OTHER MATERIALS

- A. Utility Marker: Install metallic tape at corners of R-Tank system to mark the area for future utility detection.

PART 3 - EXECUTION

3.01 ASSEMBLY OF R-TANK UNITS

- A. Assembly of modules shall be performed in accordance with the R-Tank Installation Manual, Section 2.

3.02 LAYOUT AND EXCAVATION

- A. Installer shall stake out, excavate, and prepare the subgrade area to the required plan grades and dimensions, ensuring that the excavation is at least 2 feet greater than R-Tank dimensions in each direction allowing for installation of geotextile filter fabric, R-Tank modules, and free draining backfill materials.
- B. All excavations must be prepared with OSHA approved excavated sides and sufficient working space.
- C. Protect partially completed installation against damage from other construction traffic by establishing a perimeter with high visibility construction tape, fencing, barricades, or other means until construction is complete.
- D. Base of the excavation shall be uniform, level, and free of lumps or debris and soft or yielding subgrade areas. A minimum 2,000 pounds per square foot bearing capacity is required.
1. Standard Applications: Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density or as required by the Owner's engineer.
2. Infiltration Applications: Subgrade shall be prepared in accordance with the contract documents. Compaction of subgrade should not be performed in infiltration applications.
- E. Unsuitable Soils or Conditions: All questions about the base of the excavation shall be directed to the owner's engineer, who will approve the subgrade conditions prior to placement of stone. The owner's engineer shall determine the required bearing capacity of the R-Tank subgrade; however in no case shall a bearing capacity of less than 2,000 pounds per square foot be provided.
1. If unsuitable soils are encountered at the subgrade, or if the subgrade is pumping or appears excessively soft, repair the area in accordance with contract documents and/or as directed by the owner's engineer.
2. If indications of the water table are observed during excavation, the engineer shall be contacted to provide recommendations.
3. Do not start installation of the R-Tank system until unsatisfactory subgrade conditions are corrected and the subgrade conditions are accepted by the owner's engineer.

3.03 PREPARATION OF BASE

- A. Place a thin layer (3" unless otherwise specified) of bedding material (Section 2.03 A), over the subgrade to establish a level working platform for the R-Tank modules. Level to within 1/8" (+/- 1/4") or as shown on the plans. Native subgrade soils or other materials may be used if determined to meet the requirements of 2.03 A and are accepted by the owner's engineer.
1. Standard Applications: Static roll or otherwise compact bedding materials until they are firm and unyielding.
2. Infiltration Applications: Bedding materials shall be prepared in accordance with the contract documents.
- B. Outline the footprint of the R-Tank system on the excavation floor using spray paint or chalk line to ensure a 2' perimeter is available around the R-Tank system for proper installation and compaction of backfill.

3.04 INSTALLATION OF THE R-TANKS

- A. Where a geotextile wrap is specified on the stone base, cut strips to length and install in excavation, removing wrinkles so material lays flat. Overlap geotextile a minimum 12" or as recommended by manufacturer. Use tape, special adhesives, sandbags or other ballast to secure overlaps. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.
- B. Where an impervious liner (for containment) is specified, install the liner per manufacturer's recommendations and the contract documents. The R-Tank units shall be separated from impervious liner by a non-woven geotextile fabric installed accordance with Section 3.04A.
- C. Install R-Tank modules by placing side by side, in accordance with the design drawings. No lateral connections are required. It is advisable to use a string line to form square corners and straight edges along the perimeter of the R-Tank system. The modules are to be oriented as per the design drawing with required depth as shown on plans.
1. For LD, HD, and SD installations, the large side plate of the tank should be placed on the perimeter of the system. This will typically require that the two ends of the tank area will have a row of tanks placed perpendicular to all other tanks. If this is not shown in the construction drawings, it is a simple field adjustment that will have minimal effect on the overall system footprint. Refer to R-Tank Installation Guide for more details
2. For UD installations, there is no perpendicular end row required.
- D. Wrap the R-Tank top and sides in specified geotextile. Cut strips of geotextile so that it will cover the sides and top, encapsulating the entire system to prevent backfill entry into the system. Overlap geotextile 12" or as recommended by manufacturer. Take great care to avoid damage to geotextile (and, if specified, impervious liner) during placement.
- E. Identify locations of inlet, outlet and any other penetrations of the geotextile (and optional liner). These connections should be installed flush (buted up to the R-Tank) and the geotextile fabric shall be cut to enable hydraulic continuity between the connections and the R-Tank units. These connections shall be secured using pipe boots with stainless steel pipe clamps. Support pipe in trenches during backfill operations to prevent pipe from settling and damaging the geotextile, impervious liner (if specified) or pipe. Connecting pipes at 90 degree angles facilitates construction, unless otherwise specified. Ensure end of pipe is installed snug against R-Tank system.
- F. Install Inspection and Maintenance Ports in locations noted on plans. At a minimum one maintenance port shall be installed within 10' of each inlet & outlet connection, and with a maximum spacing of one maintenance port for every 2,500 square feet. Install all ports as noted in the R-Tank Installation Guide.
- G. If required, install ventilation pipes and vents as specified on drawings to provide ventilation for proper hydraulic performance. The number of pipes and vents will depend on the size of the system. Vents are often installed using a 90 degree elbow with PVC pipe into a landscaped area with "U" bend or venting bollard to inhibit the ingress of debris. A ground level concrete or steel cover can be used.

3.05 BACKFILLING OF THE R-TANK UNITS

- A. Backfill and fill with recommended materials as follows:
1. Place freely draining backfill materials (Section 2.03 B) around the perimeter in lifts with a maximum thickness of 12". Each lift shall be placed around the entire perimeter such that each lift is no more than 24" higher than the side backfill along any other location on the perimeter of the R-Tank system. No fill shall be placed over top of tanks until the side backfill has been completed.
2. Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk behind compaction equipment. Even when "self-compacting" backfill materials are selected, a walk behind vibratory compactor must be used.
3. Take care to ensure that the compaction process does not allow the machinery to come into contact with the modules due to the potential for damage to the geotextile and R-Tank units.
4. No compaction equipment is permissible to operate directly on the R-Tank modules.
5. Top Backfill: Only low pressure track vehicles shall be operated over the R-Tank system during construction. Dump Trucks and Pans shall not be operated within the R-Tank system footprint at any time. Heavy equipment should unload in an area adjacent to the R-Tank system and the material should be moved over the system using tracked equipment with an operating weight of less than 10 tons.
- a. Typical Applications: Install a 12" (or as shown on plans) lift of freely draining material (Section 2.03 B) over the R-Tank Units, maintaining 12" between equipment tracks and R-Tank System. Lightly compacted using a walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode until a minimum of 24" of cover has been placed over the modules. Sheep foot rollers should not be used.
- b. Shallow Applications (< 18" total cover): Install top backfill in accordance with plans.
6. If required, install a geogrid as shown on plans. Geogrid shall extend a minimum of 3 feet beyond the limits of the excavation wall.
7. Following placement and compaction of the initial cover, subsequent lifts of structural fill (Section 2.03 C) shall be placed at the specified moisture content and compacted to a minimum of 95% of the Standard Proctor Density and shall cover the entire footprint of the R-Tank system. During placement of fill above the system, unless otherwise specified, a uniform elevation of fill shall be maintained to within 12" across the footprint of the R-Tank system. Do not exceed maximum cover depths listed in Table 2.01 B.
8. Place additional layers of geotextile and/or geogrid at elevations as specified in the design details. Each layer of geosynthetic reinforcement placed above the R-Tank system shall extend a minimum of 3 feet beyond the limits of the excavation wall.
- B. Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the R-Tank system until the final design section has been constructed (including pavement).
- C. Place surfacing materials, such as groundcovers (no large trees), or paving materials over the structure with care to avoid displacement of cover fill and damage to surrounding areas.
- D. Backfill depth over R-Tank system must be within the limitations shown in the table in Section 2.01 B. If the total backfill depth does not comply with this table, contact engineer or manufacturer's representative for assistance.

3.06 MAINTENANCE REQUIREMENTS

- A. A routine maintenance effort is required to ensure proper performance of the R-Tank system. The Maintenance program should be focused on pretreatment systems. Ensuring these structures are clean and functioning properly will reduce the risk of contamination of the R-Tank system and stormwater released from the site. Pre-treatment systems shall be inspected yearly, or as directed by the regulatory agency and by the manufacturer (for proprietary systems). Maintain as needed using acceptable practices or following manufacturer's guidelines (for proprietary systems).
- B. All inlet pipes and Inspection and/or Maintenance Ports in the R-Tank system will need to be inspected for accumulation of sediments at least quarterly through the first year of operation and at least yearly thereafter.
- C. If sediment has accumulated to the level noted in the R-Tank Maintenance Guide or beyond a level acceptable to the Owner's engineer, the R-Tank system should be flushed.
- D. All inspection and maintenance activities should be performed in accordance with the R-Tank Operation, Inspection & Maintenance Manual.



ENGINEER OF RECORD TO REVIEW, APPROVE AND ENDORSE FINAL SITE SPECIFIC DESIGN.



FOR ADDITIONAL INFORMATION PLEASE CONTACT:  
FERGUSON WATERWORKS,  
1-800-448-3636, www.ferguson.com

R-TANK SPECIFICATION

3575 MENDOCINO AVE SENIOR HOUSING

SANTA ROSA, CA

SITE DESIGNATION: TANK 4

DRAWN BY

EDQ

DATE

3/22/2022

SHEET NO.

6 of 6



# APPENDIX "E"

## SAMPLE OPERATION AND MAINTENANCE INSPECTION CHECKLISTS

# PLANTER STRIP BIORETENTION- CHECKLIST

## Planter Strip Bioretention

### Inspection and Maintenance Checklist

(aka: Street Rain Garden, Roadside Bioretention, Bioretention Cell)

Date of Inspection: \_\_\_\_\_  
Inspector(s): \_\_\_\_\_  
BMP ID #: \_\_\_\_\_  
Property Owner: \_\_\_\_\_

Location Description: \_\_\_\_\_

Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

*This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.*

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water in the Bioretention area after 3 days of dry weather?		<ul style="list-style-type: none"><li>• Check perforated pipe outlet for obstruction or damage. *</li><li>• Flush perforated pipe to remove obstructions/sediment. *</li><li>• Remove and replace the first few inches of topsoil.</li><li>• Remove soil and inspect perforated pipe. Repair or replace perforated pipe, replace with new soil and regrade.</li></ul>	
		Is water not draining into catch basin from the overflow pipe during a high intensity storm? *			
	PRS RS ARS	Is there sediment visible in the gutter?		<ul style="list-style-type: none"><li>• In dry weather, use a mechanical sweeper or a Vactor truck to clean gutter pan.</li></ul>	
	RS	Is there water flowing in the pervious concrete gutter section during a low intensity storm? *		<ul style="list-style-type: none"><li>• In wet weather, use a Vactor truck to clean gutter pan.</li></ul>	

\* If perforated pipe is present.



# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting the planter strip?		<ul style="list-style-type: none"> <li>Fill in eroded areas and regrade.</li> </ul>	
	RS ARS	Is there channelization (gully) forming along the length of the planter area?		<ul style="list-style-type: none"> <li>Fill in eroded areas and regrade.</li> </ul>	
	RS ARS	Is there accumulation of sediment (sand, dirt, mud) in the planter?		<ul style="list-style-type: none"> <li>Remove sediment and check the grading. Add replacement soil and/or mulch.</li> </ul>	
	PRS RS ARS	Is the mulch unevenly distributed in the planter area?		<ul style="list-style-type: none"> <li>Redistribute and add additional mulch if needed.</li> <li>Regrade planter area.</li> </ul>	
	PRS RS ARS	Are there voids or deep holes present?  Is there sediment present in the catch basin and in the overflow pipe?		<ul style="list-style-type: none"> <li>Check the perforated pipe for damage.*</li> </ul>	
	PRS RS ARS	Is there evidence of animal activity such as holes or dirt mounds from digging or borrowing?		<ul style="list-style-type: none"> <li>Repair and fill in damage areas.</li> <li>Rodent control activities must be in accordance with applicable laws and do not affect any protected species.</li> </ul>	

\* If perforated pipe is present.

# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		<ul style="list-style-type: none"><li>• Trim and/or remove the excess vegetation.</li></ul>	
	PRS RS ARS	Is the mulch distributed evenly throughout the planter area?		<ul style="list-style-type: none"><li>• Redistribute and add additional mulch if needed.</li><li>• Regrade planter area.</li></ul>	
	PRS RS ARS	Are there dead or dry plants/weeds? Is the vegetation over grown?		<ul style="list-style-type: none"><li>• Remove dead and/or dry vegetation. Replace as needed.</li><li>• Remove or trim any vegetation that is causing a visual barrier, trip, and or obstruction hazard.</li></ul>	

# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash in the planter area?		<ul style="list-style-type: none"> <li>Remove all trash and debris.</li> </ul>	
	PRS RS ARS	Is graffiti present?		<ul style="list-style-type: none"> <li>Remove all graffiti from the area.</li> </ul>	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		<ul style="list-style-type: none"> <li>Replace and/or reposition aesthetics features to original placement.</li> <li>Placement should not disrupt flow characteristics/design.</li> </ul>	
	PRS RS ARS	Is the vegetation irrigation functional?		<ul style="list-style-type: none"> <li>Repaired broken missing spray/drip emitters.</li> <li>Reposition and/or adjust to eliminate over spray and/or over watering.</li> </ul>	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		<ul style="list-style-type: none"> <li>Repair and/or replace loose or damage features.</li> </ul>	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		<ul style="list-style-type: none"> <li>Remove and replace damaged areas.</li> </ul>	

# APPENDIX "F"

## MAINTENANCE DECLARATION

RECORDING REQUESTED BY  
AND WHEN RECORDED MAIL TO:

City of Healdsburg  
City Clerk  
401 Grove St  
Healdsburg, CA 95448

Project/Property: 155 Dry Creek Rd, **Healdsburg, California**  
APN(s): **089-071-002**

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**DECLARATION OF COVENANTS REGARDING  
MAINTENANCE OF STORM WATER BMP FACILITIES**

This Declaration of Covenants ("Declaration") regarding Maintenance of Post Construction Storm Water Best Management Practices Facilities (BMPs) is made on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ ("Landowner").

RECITALS

WHEREAS, Landowner is the fee simple owner of certain real property located in the City of Healdsburg ("City"), Sonoma County, California, at **155 Dry Creek Rd** and more fully described in Exhibit A to this Declaration ("Property").

WHEREAS, the National Pollutant Discharge Elimination System ("NPDES") Municipal Separate Storm Sewer System ("MS4") Permit, Order number R1-2015-0030, issued by the North Coast Regional Water Quality Control Board (NCRWQCB), requires the City to implement and enforce specific requirements for the construction and maintenance of onsite storm water management facilities/best management practices (collectively, "BMP") for development, redevelopment, and other applicable projects with the goal of mitigating impacts to storm water quality and runoff volume discharges into the MS4.

WHEREAS, provisions of Title 13 - 17 and other applicable sections of the Healdsburg City Code shall apply to the construction, inspection and maintenance of BMP facilities and the enforcement of MS4 Permit requirements.

WHEREAS, the City has approved a project on the Property consisting of creating or replacing impervious surfaces.

WHEREAS, the Project includes a final Standard Urban Stormwater Mitigation Plan (SUSMP) or Storm Water Low Impact Development Submittal (SWLID) for the Property that has been submitted, reviewed, and approved, and that includes provisions for the construction of BMPs identified in Exhibit B, attached hereto and incorporated as though fully set forth herein. The

Plan and SUSMP/ SWLID may be inspected at the City of Healdsburg, Department of Public Works, 401 Grove St, Healdsburg, CA upon appointment.

WHEREAS, the NPDES Permit further specifically requires The property owner's signed declaration accepting responsibility for maintenance of BMPs until the responsibility is legally transferred;

WHEREAS, the NPDES Permit further specifically requires written conditions in any sales, in enough detail to be easily understood by the future owner, that require the property owner to assume responsibility for BMP maintenance and conduct a maintenance inspection at least once a year; and by retaining copies and presenting copies.

WHEREAS, maintenance and monitoring responsibility of the post-construction storm water management BMPs to the project owner, includes preparing and retaining Inspection and Maintenance Checklists, identified in Exhibit C, that indicate when and how BMPs will be inspected, when maintenance will be required, and how maintenance has or will be conducted

#### DECLARATION OF COVENANTS

NOW, THEREFORE, in consideration of the foregoing recitals, Landowner hereby covenants, agrees and declares as follows:

1. Landowner shall, at Landowner's sole cost and expense, construct, inspect, and maintain the BMP Facilities in accordance with the Plan and the SUSMP.
2. Landowner shall assure that all BMPs remain fully functional and that all areas identified in the Plan and SUSMP for treatment and/or volume capture discharge to the specified BMP as designed.
3. Landowner accepts sole responsibility for all inspection, maintenance, remediation, and replacement of the BMPs.
4. Landowner hereby grants permission to the City and its authorized agents and employees to enter the Property and inspect the storm water management/BMP facilities whenever the City deems necessary. The purpose of the inspection is to assure safe and proper functioning of the facilities, including any berms, inlet and outlet structures, vegetation, infiltration media, pond areas, underground retention areas, and access roads. If deficiencies are noted, City shall notify Landowner and provide the inspection findings.
5. Landowner shall keep all records related to annual inspections of BMP's and all records related to BMP maintenance for a period of at least five years. The records shall include records of any BMP Facilities corrections, repairs, and replacements. Landowner shall make these records available to the City upon request.
6. In the event Landowner fails to maintain the BMP Facilities in good working condition as solely determined by the City, the City may enter upon the Property and take whatever steps it deems reasonably necessary to maintain and/or make in good

working condition, such BMP Facilities. It is expressly understood that the City is under no obligation to maintain or repair the BMP Facilities, and in no event shall this Declaration be construed to impose such an obligation on the City.

7. In the event that the City performs work of any nature, or expends any funds in the performance of such work for labor, use of equipment, supplies, materials, or the like, due to failure of the Landowner to perform its maintenance obligations under this Declaration, as solely determined by City, Landowner shall reimburse the City within 60 days of receipt of notice for all costs incurred by the City to undertake such work. Costs shall include, but are not limited to, the actual cost of construction, maintenance and/or repair, and administrative costs directly related to such work.
8. Any violation of the Plan or SUSMP by Landowner shall be deemed a public nuisance under Chapter 1.12 of the Healdsburg City Code and City shall be entitled to the remedies available to it under Chapter 1.12 in addition to those available to it under Title 13 - 17. The remedies identified herein shall be in addition to and cumulative of all other remedies, criminal or civil, which may be pursued by the City.
9. Landowner shall indemnify, defend and hold harmless the City and its employees, officials, and agents, from and against any liability, (including liability for claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, expenses or costs of any kind, whether actual, alleged or threatened, interest, defense costs, and expert witness fees), where the same relates to, or arises out of, the construction, presence, existence, inspection, or maintenance of BMP Facilities on the Property or the performance of the covenants underlying this Declaration by Landowner, its officers, employees, agents, contractors or sub- contractors, excepting only that resulting from the sole, active negligence or intentional misconduct of the City, its employees, officials, or agents. This indemnification obligation is not limited in any way by any limitation on the amount or type of damages or compensation payable to or for the Landowner or its agents under workers' compensation acts, disability benefits acts or other employees' benefits acts. If any judgment or claim against the City, its officials, agents, or employees, shall be entered, Landowner shall pay all cost and expenses in connection therewith.
10. If any provisions of this Declaration shall be held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.
11. This Declaration shall be governed according to the laws of the State of California. The parties hereto agree that the forum for the adjudication of any dispute related to this Declaration shall be brought exclusively and solely in Sonoma County, California.
12. Landowner shall not assign this Declaration to a third party without the express prior written consent of the City, provided that such consent will not be unreasonably withheld and that such consent shall not be required for Landowner to sell or lease the property to a third party.
13. Landowner binds itself, its partners, successors, legal representatives and assigns to the City, and to the partners, successors, legal representatives and assigns of the City with respect to all promises and agreements contained herein.
14. This Declaration shall be recorded by Landowner, and shall: a) constitute a "covenant running with the land;" b) be binding upon Landowner and Landowner's successors,

heirs, and assigns in perpetuity; and, 3) benefit the City of Healdsburg, its successors, and assigns. Any breach of this Declaration shall render Landowner or Landowner's heirs, successors or assigns liable pursuant to the provisions of the Healdsburg City Code.

15. Any notice, submittal or communication required or permitted to be served on Landowner or City may be served by personal delivery to the person or the office of the person identified below. Service may also be made by mail, by placing first-class postage, and addressed as indicated below, and depositing in the United States mail to:

City Representative:

Landowner or Landowner Representative:

City of Healdsburg  
City Engineer  
Department of Public Works  
401 Grove St  
Healdsburg CA 95448

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Executed as of the day and year first above stated.

**LANDOWNER:**

Name: \_\_\_\_\_

*Signatures of Authorized Persons:*

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**ATTACHMENTS:**

Exhibit A – Property Description  
Exhibit B – Location Map and Description of BMPs  
Exhibit C – Inspection & Maintenance Checklist  
Notary Acknowledgment