Appendix F.3

Stormwater Control Plan

Stormwater Control Plan

for

Olsen-Chandler Ranch Tentative Tract Map & Specific Plan

February 5, 2019

OLSEN 212
Danny Brose

prepared by:

Wallace Group
612 Clarion Court
San Luis Obispo, CA 93401
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I. Project Data

Table 1 - Project Data

Project Name/Number	Olsen-Chandler Ranch Tentative Tract Map No.
Application Submittal Date	12/2018
Project Location	3045 Linne Road, Paso Robles
Project Phase No.	All
Project Type and Description	Residential Subdivision
Total Project Site Area (acres)	14,955,629 SF (343 Acres)
Total New Impervious Surface Area	7,197,942 SF (165 Acres)
Total Replaced Impervious Surface Area	269,636 SF (6.2 Acres)
Total Pre-Project Impervious Surface Area	269,636 SF (6.2 Acres)
Total Post-Project Impervious Surface Area	7,467,578 SF (171.4 Acres)
Net Impervious Area	7,467,578 SF (171.4 Acres)
Watershed Management Zone	1
Design Storm Frequency and Depth	95th Percentile (1.4 inches)
Urban Sustainability Area	NA

II. Setting

II.A. Project Location and Description

The proposed Olsen-Chandler Ranch Project is situated east Highway 101 at the end of Niblick Road and drains toward the Salinas River. Access to the site is taken from Spring Street at the south end of the City of Paso Robles. The existing site is rural, non-grazed grasses that generally drain from east to west. The surrounding terrain to the north is as steep as 16% slope, and cropped in Vineyard Wine Grapes with grass covered rows between the vines. The proposed project landuse types are ranging from large lot residential single family homes and townhomes, to a high density apartment complex.

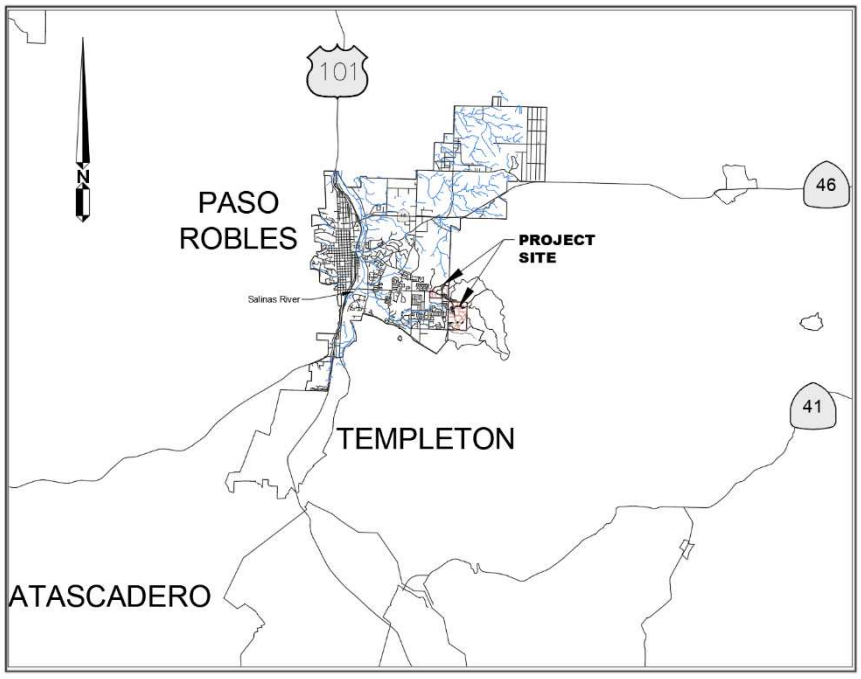


Figure 1 - Vicinity Map

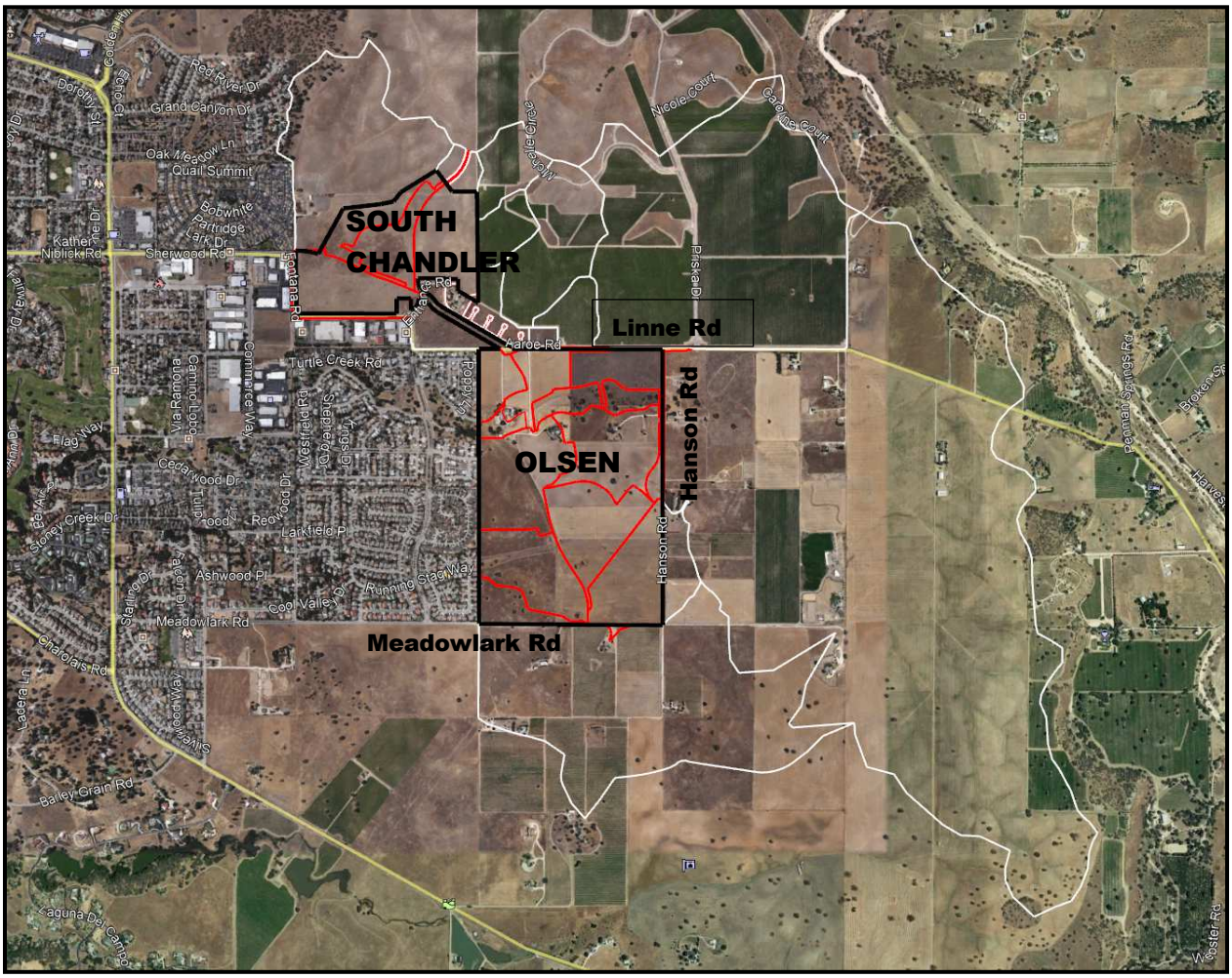


Figure 2 – Project Location Map

II.B. Existing Site Features and Conditions

The existing site has paved perimeter roads including Linne, Hansen and Fontana Roads. There are 5 major watersheds tributary to the project and historic flows tend east toward the Salinas River. There is a broad channel within the Northern subarea of the Olsen property that conveys upstream run-on from off-site during the rainy season. A drainage pond exists in the Southern subarea of the Olsen property, which flows into a Storm Drain System within Tract No. 1632 and drains west to the Salinas River. On the Chandler property there are a pair of CMP standpipe structures with grated tops and large side openings near the existing asphalt dike at the southwestern corner of the site at the intersection of Fontana and Linne Roads.

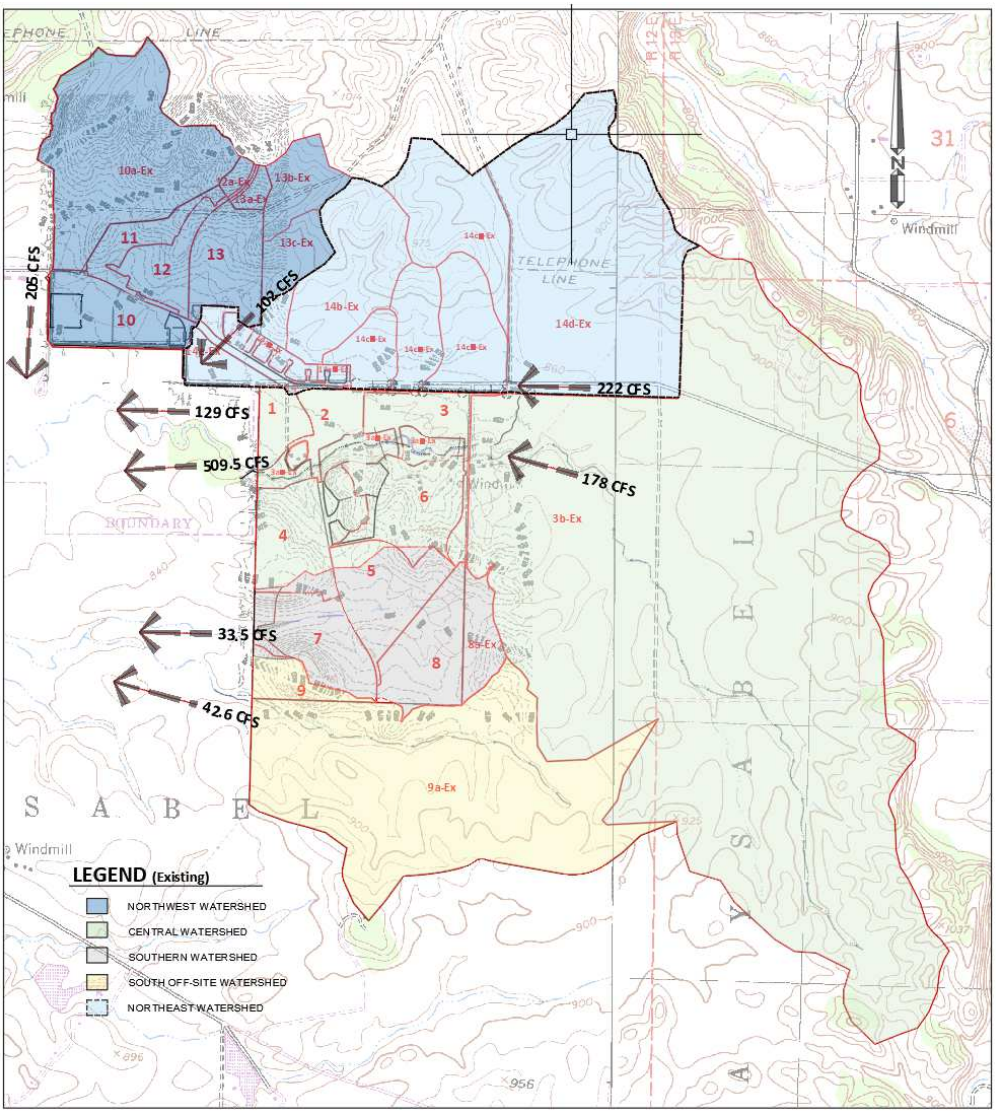


Figure 3 – Olsen-Chandler Ranch Project Site Existing Tributary Areas

Earth Strata Geotechnical Services, Inc. prepared a geotechnical report dated November 20, 2018 for the project, which included infiltration testing. Based on the report, the general subsurface profile consists of layered sandy soils with silts and clay lenses in underlying strata. The NRCS web soil data identifies the soils as Hydrologic Soil Group B and C, which is associated with good/fair infiltration rates. The design infiltration rate used for calculations is the City's Standard equal to 0.75 inches/hour.

II.C. Opportunities and Constraints for Stormwater Control

Considerations for stormwater treatment facilities are integrated into the project planning process through this Stormwater Control Plan document. Open space areas throughout the property are identified with bio-retention swales and reserved for stormwater treatment. The peak flow detention basins have significant surface area at their respective outlet elevations, and the basin bottoms are being utilized for bio-retention/infiltration areas. The conventional storm drain system will carry the water quality storm event (1.4 inch of Precipitation) for a varying number of developed lots directly to the detention basin. This 95th percentile rainfall event will be direct runoff from impervious areas (Roofs, flatwork, sidewalks & streets) to an area of storage and infiltration below the outfall of each detention basin. This network of bio-retention swales are very well distributed within the project boundary, and with the addition of structural control

measures for the lots and streets (landscape area bio-retention and pervious paver driveways) further away from each detention pond the goal is to spread out Structural Control Measures (SCMs) providing on-site retention.

Figure 4 represents the areas available for infiltration/retention within the 13 detention basin bottoms, and additional areas highlighted for small SCMs peppered within the upper reaches of each DMA/sub-catchment delineated on the map (outlined red).

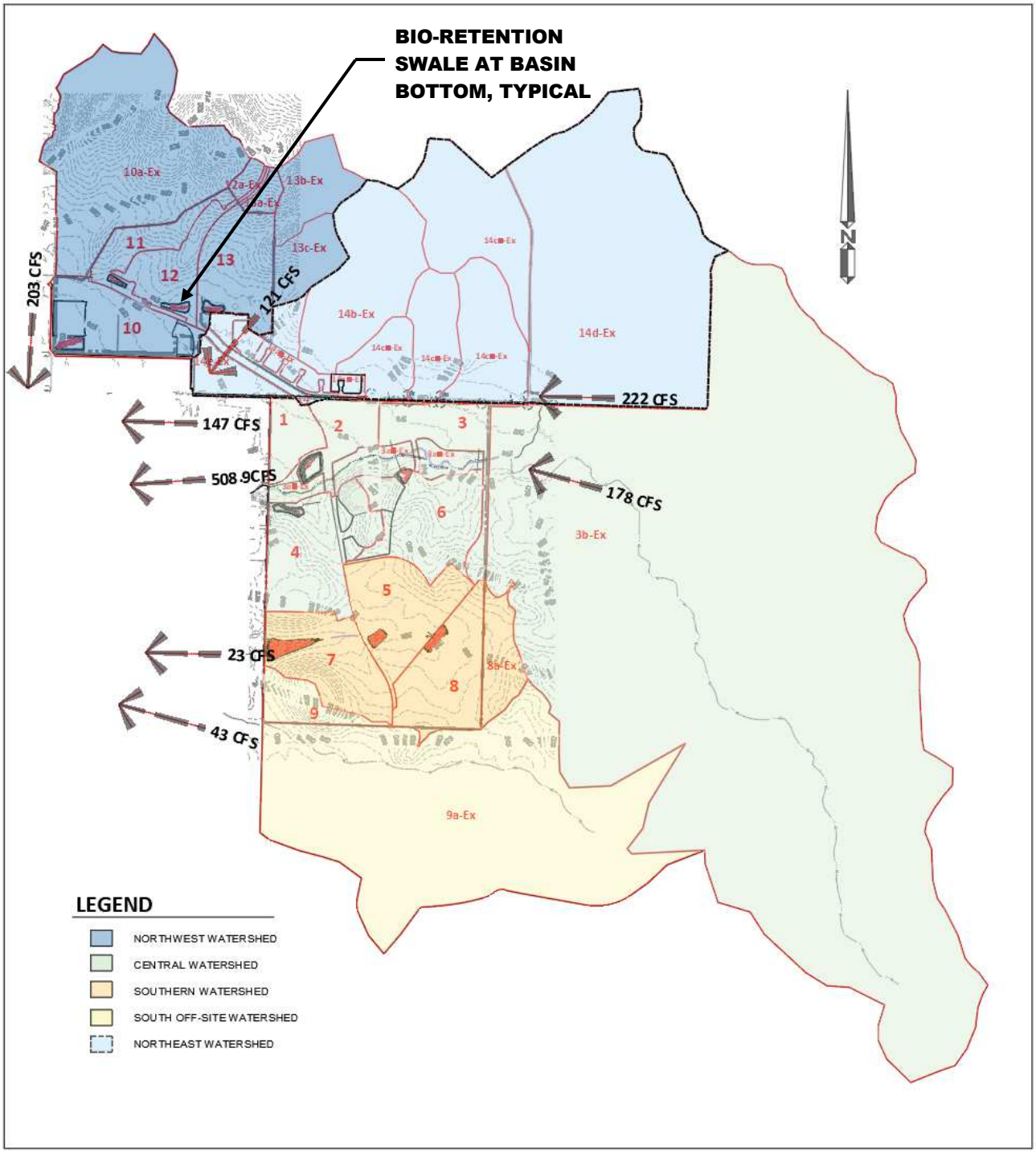


Figure 4 – Olsen-Chandler Ranch Project Site Infiltration/Retention Area Map

III. Low Impact Development Design Strategies

III.A. Optimization of Site Layout

The proposed project will increase the impervious area on the property by more than 22,500 SF. Post Construction Requirements (PCRs) 1-4 are planned for this subdivision. PR4 – Peak Flow Management criteria are meet and can be reviewed per the Preliminary Drainage Report for Tentative Tract Map and Specific Plan prepared by Wallace Group dated 1/31/2019. The strategy to manage the increase in the runoff for the 95th percentile storm event is to provide a series of bio-retention landscape areas and pervious driveways, which will cut off flow for water quality treatment and retention. Bio-retention swales will be implemented in the detention basin bottoms taking advantage of these vegetated open areas as much as possible. The project will hold the minimum setback from the "No-name Creek #1" (aka: Turtle Creek) flowline for grading design per PR#1 – site design performance requirement.

III.B. Stormwater Control Measures

The proposed stormwater Structural Control Measures (SCMs) will consist of bio-retention landscape infiltration areas located strategically throughout of the site, pervious paver driveways as required and bio-retention swales in the bottoms of the proposed detention basins. The subdivision stormwater control plan design has the capacity to store and retain on site the 95th percentile storm event in a well distributed manner. The calculations using the City's required Excel spreadsheet – PR PCSW Sizing-Calculator-XLS can be found in Appendix B.

IV. Documentation of Drainage Design

IV.A. Descriptions of each Drainage Management Area shown in the table below shows a sample of the way the sub-catchments developed to size each detention basin is further broken down to calculate the Low Impact Development (LID) SCMs that were considered in the design of the Stormwater Quality features recommended for this project site. The sub-catchment being used as an example is in the southeasterly corner of the Olsen property. Subcat 8 – has a lot layout as shown below:

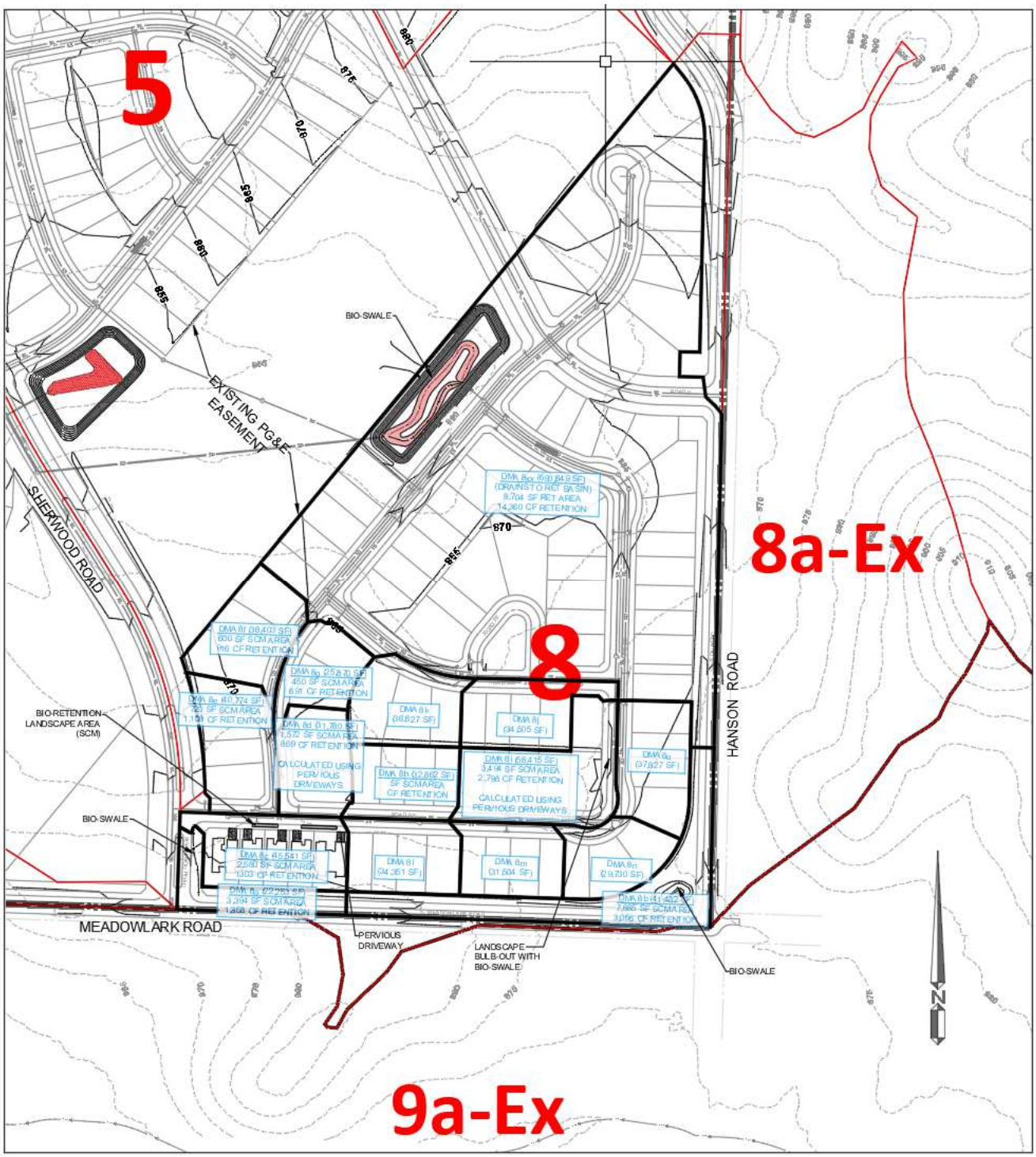


Figure 5 – Olsen-Chandler Ranch Sub-catchment 8 with Tentative Lot Layout

Table 2 - Drainage Management Areas					
Name	DMA Type	Area (SF)	Surface Type	New, or Replaced	Connection
DMA 8a	Drains to SCM	22,253	Asphalt	New	Surface runoff to Standard Curb & Gutter (C&G)
DMA 8b	Drains to SCM	41,482	Asphalt	New + Replaced	Surface runoff to Standard Curb & Gutter (C&G)
DMA 8d	Drains to SCM	31,780	Roofs & PCC. Flatwork	New	Surface flow to Pervious Driveway
DMA 8xx	Drains to SCM	690,649	Roofs, pavement & landscaping	New	Runoff from lots to SD system with outlet to basin bio-retention swale

DMA 8a: SCM capacity totaling 1,358 cubic feet (CF), flows overland to bio-retention/infiltration swale with a surface area of 3,394 square feet (SF). Includes existing asphalt area that will be new asphalt.
DMA 8b: SCM capacity totaling 3,066 CF, flows overland to bio-retention/infiltration pond SCM with a surface area of 7,665 SF. Includes existing asphalt area that will be removed and replaced with new asphalt.
DMA 8d, SCM capacity totaling 869 CF, flows overland through pervious pavers and into a bio-retention/infiltration SCM. Includes proposed asphalt area in addition to roofs and flatwork.
DMA 8xx, SCM capacity totaling 14,360 CF, 95th percentile storm flow drains to bio-swale in detention basin bottom. Consists of vegetated bio-retention swale with a 4 foot deep open graded gravel backfill below 18 inches of Bio-Soil Media.

IV.B. Descriptions of Structural Control Measures (SCM)

Table 3 - Structural Control Measures Summarized for DMA 8				
Name	SCM Type	[1]Min. Required1 Storage Vol. (ft^3)	Infilt. Rate (in/hr)	Surface Area (sf)
Bio-Retention Landscape Area	Infiltration	11,880	0.75	12,544
Pervious Paver Driveways	Infiltration	1,740	0.75	3,144
Vegetated Bio-Retention Swale	Reduce Sedimentation and Infiltration	18,784	0.75	19,763

1 – Based on Central Coast Region Stormwater Control Measure Sizing Calculator

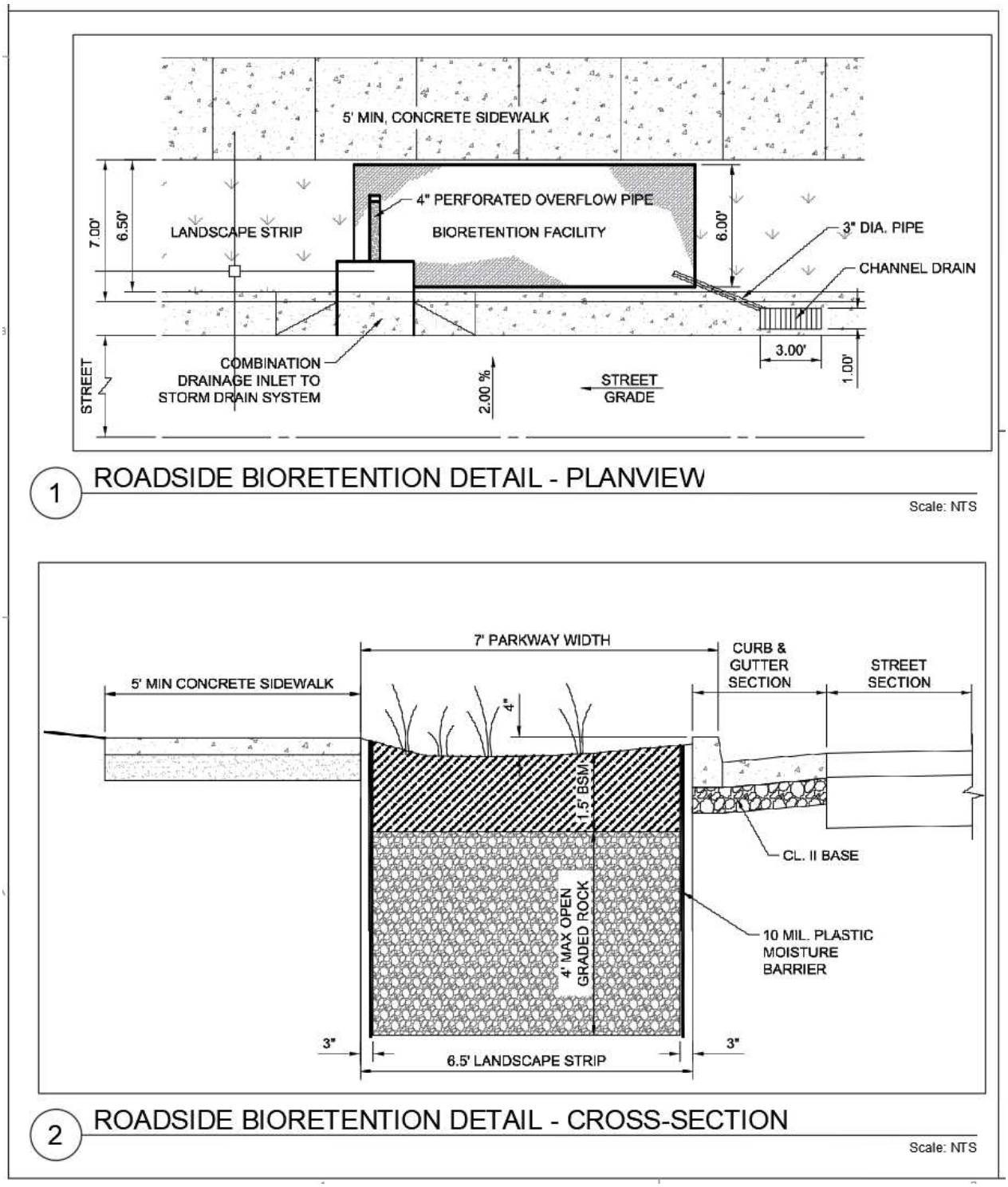


Figure 6 – Bio-retention Landscape Area Detail

A Stormwater Control Plan layout for all proposed landuse catagories are provided in Appendix A. Appendix B is output from the City of Paso Robles.

The use of permeable paver street sections in low volume traffic areas are placed to drain to a pervious paver section, which is designed to capture small storm event surface runoff and allow it to percolate between the pavers. The pervious pavers overlie a variable depth layer of angular open graded rock material which holds the runoff from small storm events. The base rock below the pavement filters the water as it is slowly released into the soil.

The finished paver surface together with the underlying layers of aggregate rock shown in Figure 7 are known as the Paver Profile or "PP". Infiltration to the soil below relies on the ability for water to move through tiny gaps in the material. Pervious pavers must be kept free of silt and debris to work properly. Sweeping or vacuuming should occur prior to rainy season, monthly during the rainy season and after major storm events (>1.4" in 24 hours). Inspections shall be performed on a regular basis during the rainy season to determine if the frequency of sweeping is adequate.

Inspect:

- Surface accumulation of sediment and debris from landscaping and trash
- Visual contaminants and non-stormwater pollutants (i.e. chemical spills, oil)
- Surface clogging of Paver Profile section
- Overflow clogging of the downstream overflow outlet
- Deterioration or roughening/crumbling of the PP finish surface
- Evidence of ponding on the surface suggesting PP section is clogged below grade
- Settling of PP due to heavy truck or equipment loading.

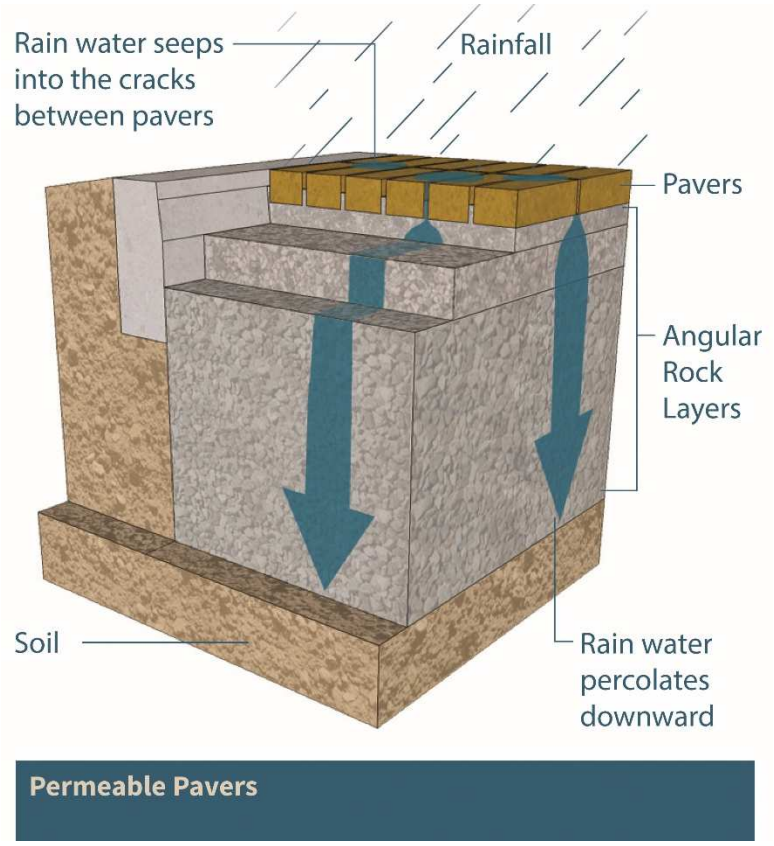


FIGURE 7 – PERMEABLE PAVER SECTION DETAIL

Table 4 describes the parameters of the hydrologic model prepared in HydroCAD.

Table 4 - Hydrograph Method	
Parameter	**Criteria**
Hydrograph Analysis Method	Santa Barbara Unit Hydrograph
Pond Routing Method	Dynamic Storage Indication
Infiltration Rate	0.75 in/hr
Rainfall Distribution	NRCS Type I – 24 Hour Duration
95th Percentile Precipitation Depth	1.4 inches
Time of Concentration	10 minute (minimum)
Time Increment	0.1 hour

The project site is in Watershed Management Zone 1.

V. Source Control Measures

V.A. Site activities and potential sources of pollutants

The proposed site grading & drainage concept will consist of Arterial Roadways, residences, utilities, Low Impact Development techniques of treating the runoff that falls on the project site during the 95th percentile storm event. The site will be used for maintenance and/or repair of Construction vehicles, storage of construction materials and ultimately a final product that has the stormwater features that provide an enhanced system for maintaining water quality. Table 5 summarizes four likely sources of contaminants that may cause an issue with stormwater quality while the project may be under construction and after the homes have transferred ownership.

The following list of Best Management Practices (BMPs) are recommendations on how to best treat the potential for a stormwater quality issue by slowing the migration of these contaminants during the life of the project.

Table 5- Source Control Measures		
Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
Landscape	Final landscaping plans will accomplish the following: Preserve existing native trees, shrubs and ground cover to the maximum extent possible. Design landscaping to minimize over-irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. To provide successful establishment, select plants appropriate to site conditions.	Maintain landscaping using minimum or no pesticides Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems. Use mulch or other erosion control measures on exposed soils
Refuse Areas	Signs posted on or near dumpsters with the words "Do not dump hazardous material here" or similar. Outdoor dumpsters to be covered and graded to landscape areas	Adequate number of receptacles to be provided. Inspect receptacles regularly; repair or replace leaky dumpsters, keep dumpsters covered, collect litter daily and clean up spills immediately. Keep spill control materials available onsite.
Outdoor storage of equipment	Maintenance and Construction vehicles to parked/stored onsite. Storage area should be paved and sufficiently impervious to contain leaks and spills Parking area directed to gravel infiltration swale for infiltration before discharging from the site.	Clean up spills or leaks immediately. Keep spill control materials available onsite. Inspect vehicles & equipment being stored onsite to identify spills and leaks. Address appropriately to reduce future spills and leaks.
Parking areas		Sweep parking areas regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

VI. Stormwater Peak Flow and Water Quality Facilities Maintenance

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

OLSEN 212, LLC shall accept responsibility for operation and maintenance of facilities as outlined in the Operations and Maintenance Plan to be submitted prior to Public Improvement Plan approval.

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

Table 6 - Maintenance Requirements		
INSPECTION ITEM	FREQUENCY	MAINTENANCE
Inspect the bio-retention landscape area & swale for litter, debris, leaves, dead vegetation and anything else that might interfere with flow and infiltration.	Monthly	Remove debris and other items from gravel swale area
Determine whether bio-retention swale area is draining correctly. Look for standing water which indicates poor infiltration and may lead to vector issues. Stormwater should drain from bio-retention swale within 48 hours of storm event.	After Storm Event	Determine cause of poor infiltration, remove and clean cobbles/gravel, remove silt from bottom, replace/remediate contaminated soils
Inspect discharge locations from the facility. Look for gullies, washouts, evidence of uncontrolled surface water flow or erosion to the existing slope.	Annually, After Storm Event	Repair bank by excavating washouts and replacing soil in its original condition, properly compacted. Replace rock slope protection or other erosion control device to mitigate future erosion
Inspect for growth of trees or invasive plants in the bio-retention swale.	Annually	Remove invasive plants and other vegetation from the gravel swale area
Inspect gravel swale for potential contaminants from spills or illicit discharge	Annually, After Storm Event	Remove and clean/replace cobble, gravel, and soils as needed, report hazardous discharges or spills

VII. Certifications

The preliminary design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the City of Paso Robles' Stormwater Technical Guide.

02/05/2019

Debra Tumler, PE 55205 (QSD/QSP)
Senior Civil Engineer

Date

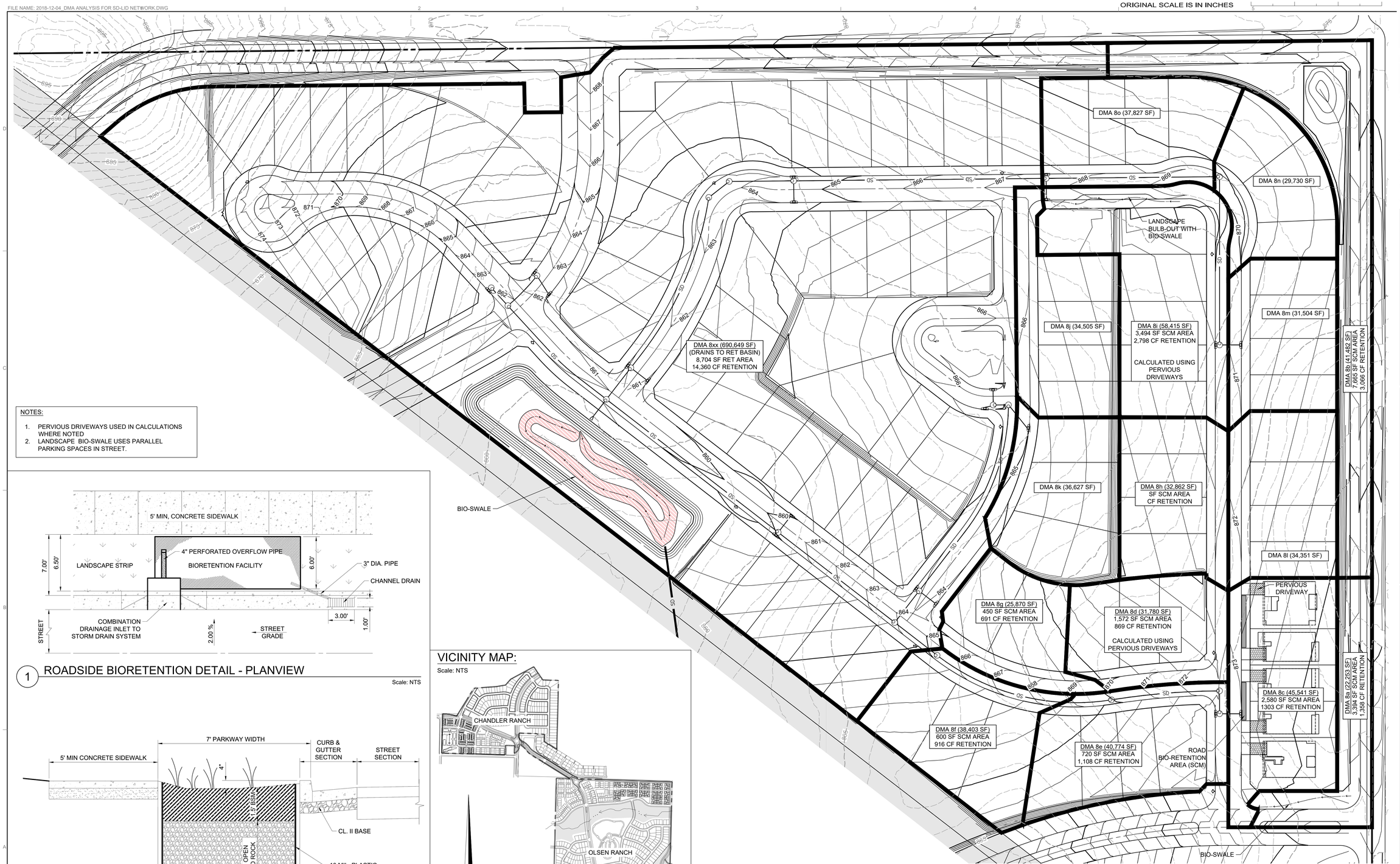
Attachments

Stormwater Control Plan Exhibits
Stormwater Control Measures Sizing Calculator Results

Stormwater Control Plan Exhibits

FILE NAME: 2018-12-04_DMA ANALYSIS FOR SD-LID NETWORK.DWG

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3
5



NOTES:

1. PERVIOUS DRIVEWAYS USED IN CALCULATIONS WHERE NOTED
2. LANDSCAPE BIO-SWALE USES PARALLEL PARKING SPACES IN STREET.

1 ROADSIDE BIORETENTION DETAIL - PLANVIEW

Scale: NTS

2 ROADSIDE BIORETENTION DETAIL - CROSS-SECTION

Scale: NTS

VICINITY MAP:

Scale: NTS

LOW IMPACT DEVELOPMENT TEMPLATE FOR SUB-CATCHMENT/DMA 8 LARGE LOT SINGLE-FAMILY RESIDENTIAL

GRAPHIC SCALE
0 30 60 120
(IN FEET)
1 IN = 60 FT

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SIGNATURE

DATE SIGNED

TRACT xxxx, OLSEN RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 8

JOB #:	1465-0001
DESIGNERS:	DRT
DRAWN BY:	ZKP
DATE:	12-11-2018

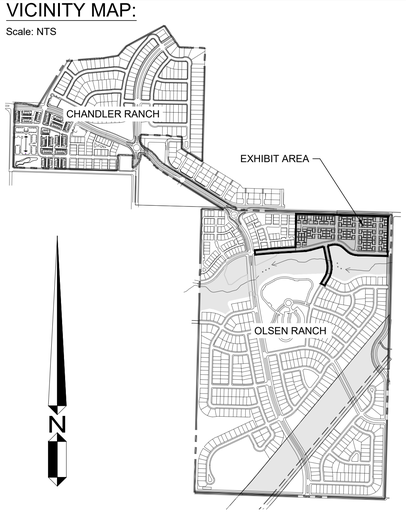
DRAWING NO.
1
OF 1 SHEET

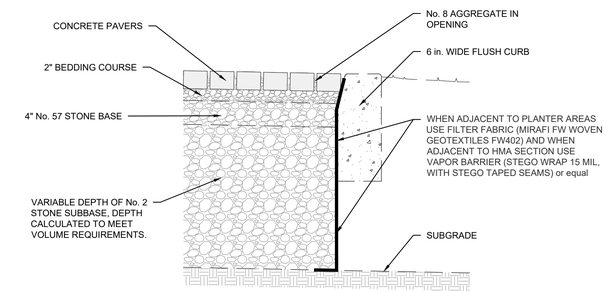
FILE NAME: 2018-12-04_DMA ANALYSIS FOR SD-LID NETWORK.DWG

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3
5

VICINITY MAP:

Scale: NTS





A PERMEABLE PAVER CROSS SECTION

NTS

LOW IMPACT DEVELOPMENT TEMPLATE FOR SUB-CATCHMENT/DMA 3 MOTORCOURT 6-PACK RESIDENTIAL LOTS

N

GRAPHIC SCALE
0 40 80 160
(IN FEET)
1 IN = 80 FT

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DATE SIGNED

TRACT xxxx, OLSEN RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 3

JOB #:	1465-0001
DESIGNERS:	DRT
DRAWN BY:	ZKP
DATE:	12-13-2018

DRAWING NO.
2
OF 2 SHEET

FILE NAME: 2018-12-04_DMA ANALYSIS FOR SD-LID NETWORK.DWG

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3
5

DMA 12a (36,861 SF)
1,040 SF LANDSCAPE AREA
443 CF RETENTION

DMA 12b (35,050 SF)
715 SF LANDSCAPE AREA
848 CF RETENTION

DMA12c (36,385 SF)
1,040 SF LANDSCAPE AREA
440 CF RETENTION

DMA 12e (8,513 SF)

DMA 12f (35,999 SF)
1,040 SF PERV DWY AREA
440 CF RETENTION

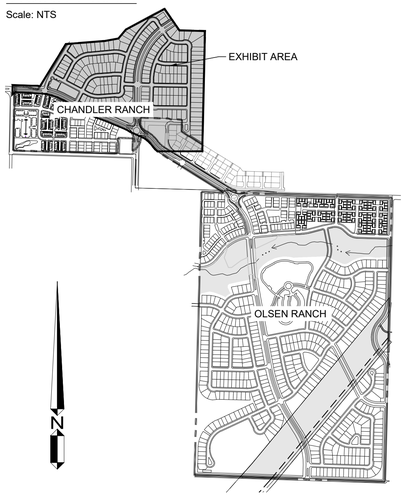
DMA 12g (30,001 SF)
1,000 SF LANDSCAPE AREA
400 CF RETENTION

DMA 12H (34,370 SF)
1,020 SF LANDSCAPE AREA
420 CF RETENTION

DMA12D (35,288 SF)
1,040 SF LANDSCAPE AREA
440 CF RETENTION

DMA 12xx (417,121 SF)
5,760 SF BIO-SWALE AREA
9,024 CF RETENTION

VICINITY MAP:
Scale: NTS



LOW IMPACT DEVELOPMENT
TEMPLATE FOR SUB-CATCHMENT/DMA 12
SINGLE FAMILY RESIDENTIAL LOTS

N

GRAPHIC SCALE
0 50 100 200
(IN FEET)
1 IN = 100 FT

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TRACT xxxx, CHANDLER RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 12

JOB #: 1465-0001
DESIGNERS: DRT
DRAWN BY: ZKP
DATE: 12-13-2018
DRAWING NO.
3
OF 3 SHEET

Stormwater Control Measures Sizing Calculator Results

Central Coast Region Stormwater Control Measure Sizing Calculator

Sub-catchment 8
WALLACE GROUP Job No.: 1465.01
Date: 2/5/2019

Version: 7/2/2018

1. Project Information

Project name:	Olsen-Chandler Ranch
Project location:	N. of Meadowlark, West of Hansen Rd
Tier 2/Tier 3:	Tier 3 - Retention
Design rainfall depth (in):	1.4
Total project area (ft2):	1020734.743
Total DMA area (ft2):	1020734.743
Total new impervious area (ft2):	618462.452
Total replaced impervious within a USA (ft2):	
Total replaced impervious not in a USA (ft2):	
Total pervious/landscape area (ft2):	402272.2914
Total SCM area (ft2):	34771.21

Check Total DMA and SCM areas to ensure they match total project area

2. DMA Characterization

Name	DMA Type	Area (ft2)	Surface Type	New, Replaced?	Connection
8a: Local Road Frontage	Drains to SCM	11084.6	Concrete or asphalt	New	8a Bio Ret Area
8a: LA (BioSw)	Drains to SCM	11184.12	Landscape	New	8a Bio Ret Area
8c1: Lot Imperv (FY)	Drains to SCM	3897.328	Roof	New	8c1 Pervious 2-DWYs
8c1: Street	Drains to SCM	4434.39	Concrete or asphalt	New	8c Bio Ret LA
8c1: LA (Lot/Strip)	Drains to SCM	7026.744	Landscape	New	8c Bio Ret LA
8c1: Pervious DWYs	Drains to SCM	768	Unit pavers set in sand	New	8c Bio Ret LA
8c1: Lot Imperv (BY)	Drains to SCM	3897.328	Roof	New	8c Bio Ret LA
8c2: Lot Imperv (FY)	Drains to SCM	5340	Roof	New	8c2 Pervious 3-DWYs
8c2: Lot Imperv (BY)	Drains to SCM	5340	Roof	New	8c Bio Ret LA
8c2: Street	Drains to SCM	4083	Concrete or asphalt	New	8c Bio Ret LA
8c2: LA (Lot/Strip)	Drains to SCM	9588	Landscape	New	8c Bio Ret LA
8c2: Pervious DWYs	Drains to SCM	1152	Unit pavers set in sand	New	8c Bio Ret LA
8b: Local Road Frontage	Drains to SCM	22769.34	Concrete or asphalt	New	8b Bio Ret Area
8b: LA	Drains to SCM	37240	Landscape	New	8b Bio Ret Area
8d: Lot Imperv (FY)	Drains to SCM	6100.0088	Roof	New	8d Pervious 3-DWYs
8d: Lot Imperv (BY)	Drains to SCM	6100.0088	Roof	New	8d Bio Ret LA
8d: Street	Drains to SCM	7068	Concrete or asphalt	New	8d Bio Ret LA
8d: LA (Lot/Strip)	Drains to SCM	1692	Landscape	New	8d Bio Ret LA
8d: Pervious DWYs	Drains to SCM	420	Unit pavers set in sand	New	8d Bio Ret LA
8e: Lot Imperv (FY)	Drains to SCM	8046.2948	Roof	New	8e Bio Ret LA
8e: Lot Imperv (BY)	Drains to SCM	8046.2948	Roof	New	8e Bio Ret LA
8e: Street	Drains to SCM	10086.73	Concrete or asphalt	New	8e Bio Ret LA
8e: LA (Lot/Strip)	Drains to SCM	14994.5304	Landscape	New	8e Bio Ret LA
8e: Pervious DWYs	Drains to SCM	1536	Concrete or asphalt	New	8e Bio Ret LA
8f: Lot Imperv (FY)	Drains to SCM	8822.1779	Roof	New	8f Bio Ret LA
8f: Lot Imperv (BY)	Drains to SCM	8822.1779	Roof	New	8f Bio Ret LA
8f: Street	Drains to SCM	4814	Concrete or asphalt	New	8f Bio Ret LA
8f: LA (Lot/Strip)	Drains to SCM	1200	Landscape	New	8f Bio Ret LA
8f: Pervious DWYs	Drains to SCM	1152	Concrete or asphalt	New	8f Bio Ret LA
8g: Lot Imperv (FY)	Drains to SCM	5523.63	Roof	New	8g Bio Ret LA
8g: Lot Imperv (BY)	Drains to SCM	5523.63	Roof	New	8g Bio Ret LA
8g: Street	Drains to SCM	5491	Concrete or asphalt	New	8g Bio Ret LA
8g: LA (Lot/Strip)	Drains to SCM	9331.74	Landscape	New	8g Bio Ret LA
8g: Pervious DWYs	Drains to SCM	768	Concrete or asphalt	New	8g Bio Ret LA
8h: Lot Imperv (FY)	Drains to SCM	6832.5491	Roof	New	8i Bio Ret Area
8h: Lot Imperv (BY)	Drains to SCM	6832.5491	Roof	New	8i Bio Ret Area
8h: Street	Drains to SCM	5291	Concrete or asphalt	New	8i Bio Ret Area
8h: LA (Lot/Strip)	Drains to SCM	12333.6918	Landscape	New	8i Bio Ret Area
8h: Pervious DWYs	Drains to SCM	1536	Concrete or asphalt	New	8i Bio Ret Area
8i: Lot Imperv (FY)	Drains to SCM	10942.16	Roof	New	8i Bio Ret Area
8i: Lot Imperv (BY)	Drains to SCM	10942.16	Roof	New	8i Pervious 6-Dwys
8i: Street	Drains to SCM	13360	Concrete or asphalt	New	8i Bio Ret Area
8i: LA (Lot/Strip)	Drains to SCM	20899.68	Landscape	New	8i Bio Ret Area
8i: Pervious DWYs	Drains to SCM	2304	Unit pavers set in sand	New	8i Bio Ret Area
8i: LA	Drains to SCM	0	Landscape	New	8i Bio Ret Area
8xx: Lot Imperv	Drains to SCM	236539.9848	Roof	New	8xx Basin BioRet Area
8xx: Street	Drains to SCM	177440.11	Concrete or asphalt	New	8xx Basin BioRet Area
8xx: LA (Lot/Strip)	Drains to SCM	272137.7852	Landscape	New	8xx Basin BioRet Area

Sub-catchment 8
WALLACE GROUP **Job No.: 1465.01**
Date: 2/5/2019

DMA Summary Area	
Total assigned DMA area (ft2):	1020734.743
New impervious area (ft2):	618462.452
Replaced impervious within a USA (ft2):	0
Replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	402272.2914

3. SCM Characterization

						Flow Control	Reservoir
Name	SCM Type	Safety Factor	SCM Soil Type	Infilt. Rate (in/hr)	Area (ft2)	Orifice?	Depth (in)
8a Bio Ret Area	Bioretention	1	HSG A/B	0.75	3394.21	Yes	6
8c Bio Ret LA	Bioretention	1	HSG A/B	0.75	**660**	Yes	6
8c1 Pervious 2-DWYs	Direct Infiltration	2	HSG A/B	0.75	768		
8c2 Pervious 3-DWYs	Direct Infiltration	2	HSG A/B	0.75	1152		
8b Bio Ret Area	Bioretention	1	HSG A/B	0.75	7665	Yes	6
8d Pervious 3-DWys	Direct Infiltration	2	HSG A/B	0.75	1152		
8d Bio Ret LA	Bioretention	1	HSG A/B	0.75	**420**	Yes	6
8e Pervious 4-DWYs	Direct Infiltration	2	HSG A/B	0.75	1536		
8e Bio Ret LA	Bioretention	1	HSG A/B	0.75	**720**	Yes	6
8f Pervious 3-DWys	Direct Infiltration	2	HSG A/B	0.75	1152		
8f Bio Ret LA	Bioretention	1	HSG A/B	0.75	**600**	Yes	6
8g Bio Ret LA	Bioretention	1	HSG A/B	0.75	**450**	Yes	6
8g Pervious 2-DWYs	Direct Infiltration	2	HSG A/B	0.75	768		
8h Pervious 4-DWys	Direct Infiltration	2	HSG A/B	0.75	1536		
8h Bio Ret LA	Bioretention	1	HSG A/B	0.75	600	Yes	6
8i Bio Ret Area	Bioretention	1	HSG A/B	0.75	**1190**	Yes	6
8i Pervious 6-Dwys	Direct Infiltration	2	HSG A/B	0.75	2304		
8xx Basin BioRet Area	Bioretention	1	HSG A/B	0.75	**8704**	Yes	14

4. Run SBUH Model

5. SCM Minimum Sizing Requirements

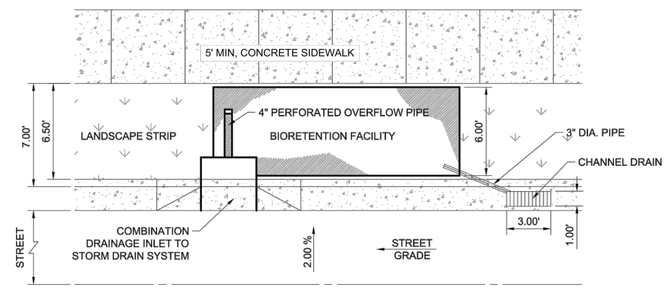
SCM Name	Min. Required Storage Vol. (ft3)	Depth Below Underdrain (ft)	Drain Time (hours)	Orifice Diameter (in)
8a Bio Ret Area	1358	1.00	0.0	0.26
8c Bio Ret LA	535	2.03	12.9	0.33
8c1 Pervious 2-DWYs	307	1.00	1.5	
8c2 Pervious 3-DWYs	461	1.00	0.3	
8b Bio Ret Area	3066	1.00	0.0	0.37
8d Pervious 3-DWys	461	1.00	2.1	
8d Bio Ret LA	408	2.43	15.5	0.28
8e Bio Ret LA	1108	3.85	24.6	0.40
8f Bio Ret LA	916	3.82	24.4	0.37
8g Bio Ret LA	691	3.84	24.6	0.32
8i Bio Ret Area	1876	3.94	25.2	0.52
8i Pervious 6-Dwys	922	1.00	0.6	
8xx Basin BioRet Area	14360	4.12	22.0	1.56

6. Self-Retaining Area Sizing Checks

Self-Retaining DMA Name	Self-Retaining DMA Area (ft2)	Tributary DMA Name(s)	Eff. Tributary DMA Area (ft2)	Effective Tributary / SRA Area Ratio

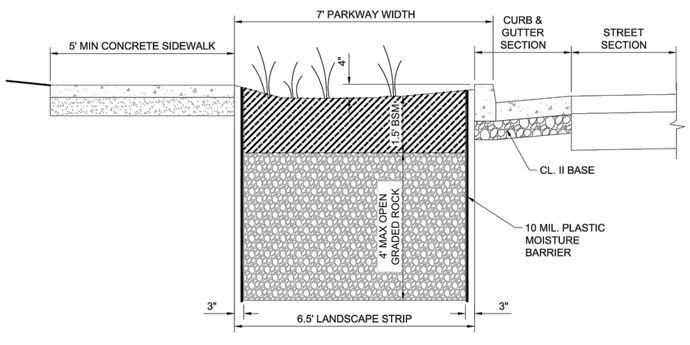
NOTES:

1. PERVIOUS DRIVEWAYS USED IN CALCULATIONS WHERE NOTED
2. LANDSCAPE BIO-SWALE USES PARALLEL PARKING SPACES IN STREET.



1 ROADSIDE BIORETENTION DETAIL - PLANVIEW

Scale: NTS

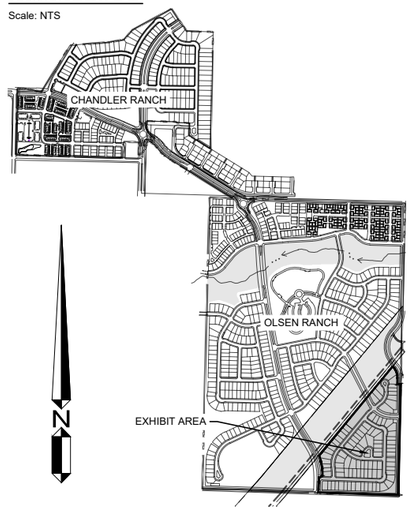


2 ROADSIDE BIORETENTION DETAIL - CROSS-SECTION

Scale: NTS

VICINITY MAP:

Scale: NTS



LOW IMPACT DEVELOPMENT TEMPLATE FOR SUB-CATCHMENT/DMA 8 LARGE LOT SINGLE-FAMILY RESIDENTIAL

GRAPHIC SCALE

0 30 60 120

(IN FEET)

1 IN = 60 FT

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DATE SIGNED

TRACT xxxx, OLSEN RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 8

JOB #:	1465-0001
DESIGNERS:	DRT
DRAWN BY:	ZKP
DATE:	12-11-2018

DRAWING NO.

1

OF 1 SHEET

Central Coast Region Stormwater Control Measure Sizing Calculator

Sub-catchment 3
WALLACE GROUP **Job No.: 1465.01**
Date: 2/5/2019

Version: 7/2/2018

1. Project Information

Project name:	Olsen/Chandler
Project location:	N. of Meadowlark, West of Hansen Rd
Tier 2/Tier 3:	Tier 3 - Retention
Design rainfall depth (in):	1.4
Total project area (ft2):	553594.38
Total DMA area (ft2):	553594.38
Total new impervious area (ft2):	368324.184
Total replaced impervious within a USA (ft2):	
Total replaced impervious not in a USA (ft2):	
Total pervious/landscape area (ft2):	185270.196
Total SCM area (ft2):	55934

Check Total DMA and SCM areas to ensure they match total project area

2. DMA Characterization

Name	DMA Type	Area (ft2)	Surface Type	New, Replaced?	Connection
3a: Imperv	Drains to SCM	43504.784	Roof	New	3a Swale
3a: Pervious	Drains to SCM	10876.196	Landscape	New	3a Swale
3a: DWY	Drains to SCM	14488	Concrete or asphalt	New	3a Swale
3a: Swale	Drains to SCM	3064	Landscape	New	3a Swale
3b: Imperv	Drains to SCM	51690.4	Roof	New	3b Swale
3b: Pervious/ LA	Drains to SCM	21744.6	Landscape	New	3b Swale
3b: DWY	Drains to SCM	24636	Concrete or asphalt	New	3b Swale
3b: Swale	Drains to SCM	7220	Landscape	New	3b Swale
3c: Imperv	Drains to SCM	48087.2	Roof	New	3c Swale
3c: Pervious/ LA	Drains to SCM	50489.2	Landscape	New	3c Swale
3c: DWY	Drains to SCM	21612	Concrete or asphalt	New	3c Swale
3c: Swale	Drains to SCM	5718	Landscape	New	3c Swale
3d: Imperv	Drains to SCM	57238.4	Roof	New	3d Swale
3d: Pervious/ LA	Drains to SCM	24694.6	Landscape	New	3d Swale
3d: DWY	Drains to SCM	20941	Concrete or asphalt	New	3d Swale
3d: Swale	Drains to SCM	7663	Landscape	New	3d Swale
3e: Imperv	Drains to SCM	86126.4	Roof	New	3e Pervious DWY
3e: Pervious/ LA	Drains to SCM	21531.6	Landscape	New	3e Pervious DWY
3e: DWY	Drains to SCM	32269	Unit pavers set in sand	New	3e Pervious DWY

DMA Summary Area	
Total assigned DMA area (ft2):	553594.38
New impervious area (ft2):	368324.184
Replaced impervious within a USA (ft2):	0
Replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	185270.196

3. SCM Characterization

						Flow Control	Reservoir
Name	SCM Type	Safety Factor	SCM Soil Type	Infilt. Rate (in/hr)	Area (ft2)	Orifice?	Depth (in)
3a Swale	Bioretention	1	HSG A/B	0.75	3064	No	
3b Swale	Bioretention	1	HSG A/B	0.75	7220	No	
3c Swale	Bioretention	1	HSG A/B	0.75	5718	No	
3d Swale	Bioretention	1	HSG A/B	0.75	7663	No	
3e Pervious DWY	Direct Infiltration	2	HSG A/B	0.75	32269		

4. Run SBUH Model

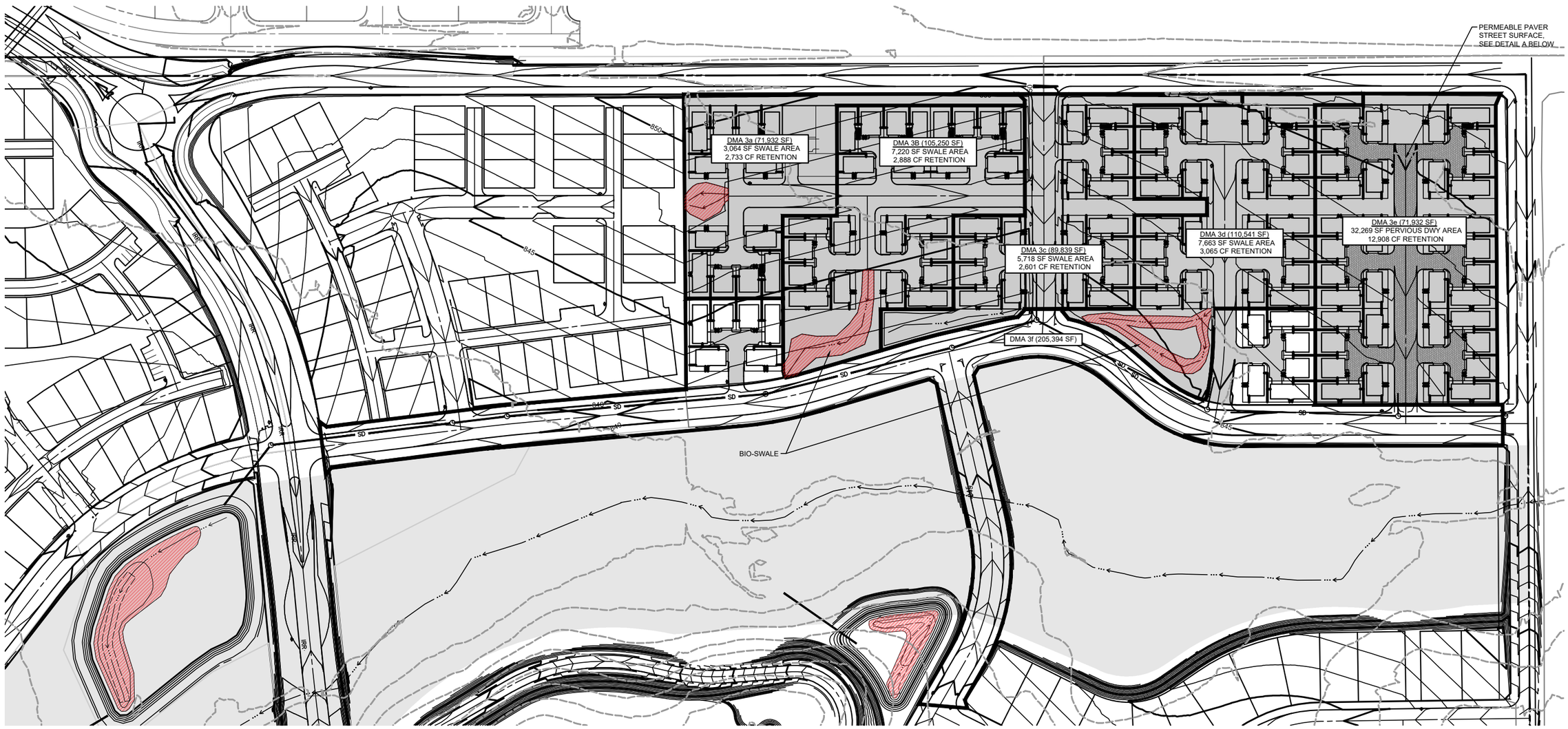
5. SCM Minimum Sizing Requirements

SCM Name	Min. Required Storage Vol. (ft3)	Depth Below Underdrain (ft)	Drain Time (hours)	Orifice Diameter (in)
3a Swale	2733	2.23	12.7	
3b Swale	2888	1.00	0.9	
3c Swale	2601	1.14	3.4	
3d Swale	3065	1.00	0.4	
3e Pervious DWY	12908	1.00	0.0	

6. Self-Retaining Area Sizing Checks

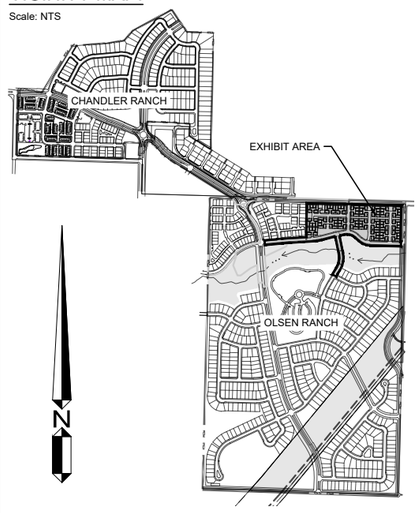
Self-Retaining DMA Name	Self-Retaining DMA Area (ft2)	Tributary DMA Name(s)	Eff. Tributary DMA Area (ft2)	Effective Tributary / SRA Area Ratio

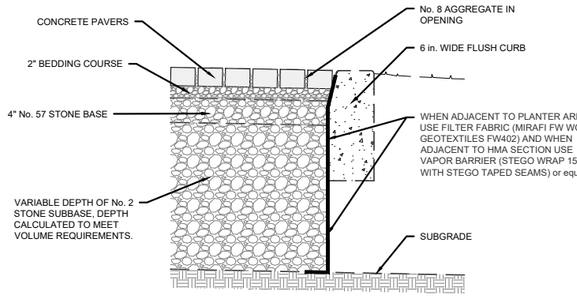
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3



VICINITY MAP:

Scale: NTS





A PERMEABLE PAVER CROSS SECTION

NTS

LOW IMPACT DEVELOPMENT TEMPLATE FOR SUB-CATCHMENT/DMA 3 MOTORCOURT 6-PACK RESIDENTIAL LOTS

N

GRAPHIC SCALE
0 40 80 160
(IN FEET)
1 IN = 80 FT

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TRACT xxxx, OLSEN RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 3

JOB #: 1465-0001
DESIGNERS: DRT
DRAWN BY: ZKP
DATE: 12-13-2018

DRAWING NO.
2
OF 2 SHEET

Central Coast Region Stormwater Control Measure Sizing Calculator

Sub-catchment 12
WALLACE GROUP **Job No.: 1465.01**
Date: 2/6/2019

Version: 7/2/2018

1. Project Information

Project name:	Olsen/Chandler
Project location:	N. of Meadowlark, West of Hansen Rd
Tier 2/Tier 3:	Tier 3 - Retention
Design rainfall depth (in):	1.4
Total project area (ft2):	489032
Total DMA area (ft2):	489032
Total new impervious area (ft2):	374810.9784
Total replaced impervious within a USA (ft2):	
Total replaced impervious not in a USA (ft2):	
Total pervious/landscape area (ft2):	114221.0216
Total SCM area (ft2):	8219

2. DMA Characterization

Name	DMA Type	Area (ft2)	Surface Type	New, Replaced?	Connection
12a: Lot Impv	Drains to SCM	14600.92	Roof	New	12a Bio Ret Area
12a: LA (Lot/Strip)	Drains to SCM	12893.58	Landscape	New	12a Bio Ret Area
12a: Street	Drains to SCM	9366.5	Concrete or asphalt	New	12a Bio Ret Area
12b: Street	Drains to SCM	6046.5	Concrete or asphalt	New	12b Bio Ret LA
12b: LA (Lot/Strip)	Drains to SCM	13157.9	Landscape	New	12b Pervious 2-DWYs
12b: Pervious DWYs	Drains to SCM	792	Unit pavers set in sand	New	12b Pervious 2-DWYs
12b: Lot Imperv	Drains to SCM	15053.6	Roof	New	12b Bio Ret LA
12xx: Lot Imperv	Drains to SCM	108345.4384	Roof	New	12xx Basin BioRet Area
12xx: Street	Drains to SCM	221398.02	Concrete or asphalt	New	12xx Basin BioRet Area
12xx: LA (Lot/Strip)	Drains to SCM	87377.5416	Landscape	New	12xx Basin BioRet Area

DMA Summary Area	
Total assigned DMA area (ft2):	489032
New impervious area (ft2):	374810.9784
Replaced impervious within a USA (ft2):	0
Replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	114221.0216

3. SCM Characterization

						Flow Control	Reservoir
Name	SCM Type	Safety Factor	SCM Soil Type	Infilt. Rate (in/hr)	Area (ft2)	Orifice?	Depth (in)
12a Bio Ret Area	Bioretention	1	HSG A/B	0.75	**1040**	Yes	6
12b Bio Ret LA	Bioretention	1	HSG A/B	0.75	**715**	Yes	6
12b Pervious 2-DWYs	Direct Infiltration	2	HSG A/B	0.75	704		
12xx Basin BioRet Area	Bioretention	1	HSG A/B	0.75	**5760**	Yes	18

4. Run SBUH Model

5. SCM Minimum Sizing Requirements

SCM Name	Min. Required Storage Vol. (ft3)	Depth Below Underdrain (ft)	Drain Time (hours)	Orifice Diameter (in)
12a Bio Ret Area	443	1.07	6.6	0.37
12b Bio Ret LA	566	1.98	12.5	0.35
12b Pervious 2-DWYs	282	1.00	0.0	
12xx Basin BioRet Area	9024	3.92	20.9	1.38

6. Self-Retaining Area Sizing Checks

Self-Retaining DMA Name	Self-Retaining DMA Area (ft2)	Tributary DMA Name(s)	Eff. Tributary DMA Area (ft2)	Effective Tributary / SRA Area Ratio

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

DMA 12a (36,861 SF)
1,040 SF LANDSCAPE AREA
443 CF RETENTION

DMA 12b (35,050 SF)
715 SF LANDSCAPE AREA
848 CF RETENTION

DMA12c (36,385 SF)
1,040 SF LANDSCAPE AREA
440 CF RETENTION

DMA 12e (8,513 SF)

DMA 12f (35,999 SF)
1,040 SF PERV DWY AREA
440 CF RETENTION

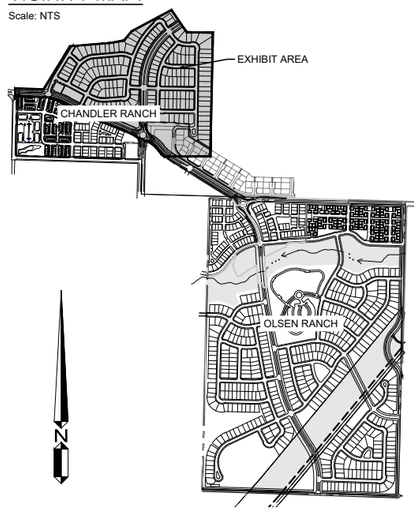
DMA 12g (30,001 SF)
1,000 SF LANDSCAPE AREA
400 CF RETENTION

DMA 12H (34,370 SF)
1,020 SF LANDSCAPE AREA
420 CF RETENTION

DMA12D (35,288 SF)
1,040 SF LANDSCAPE AREA
440 CF RETENTION

DMA 12xx (417,121 SF)
5,760 SF BIO-SWALE AREA
9,024 CF RETENTION

VICINITY MAP:
Scale: NTS



LOW IMPACT DEVELOPMENT
TEMPLATE FOR SUB-CATCHMENT/DMA 12
SINGLE FAMILY RESIDENTIAL LOTS

N

GRAPHIC SCALE
0 50 100 200
(IN FEET)
1 IN = 100 FT

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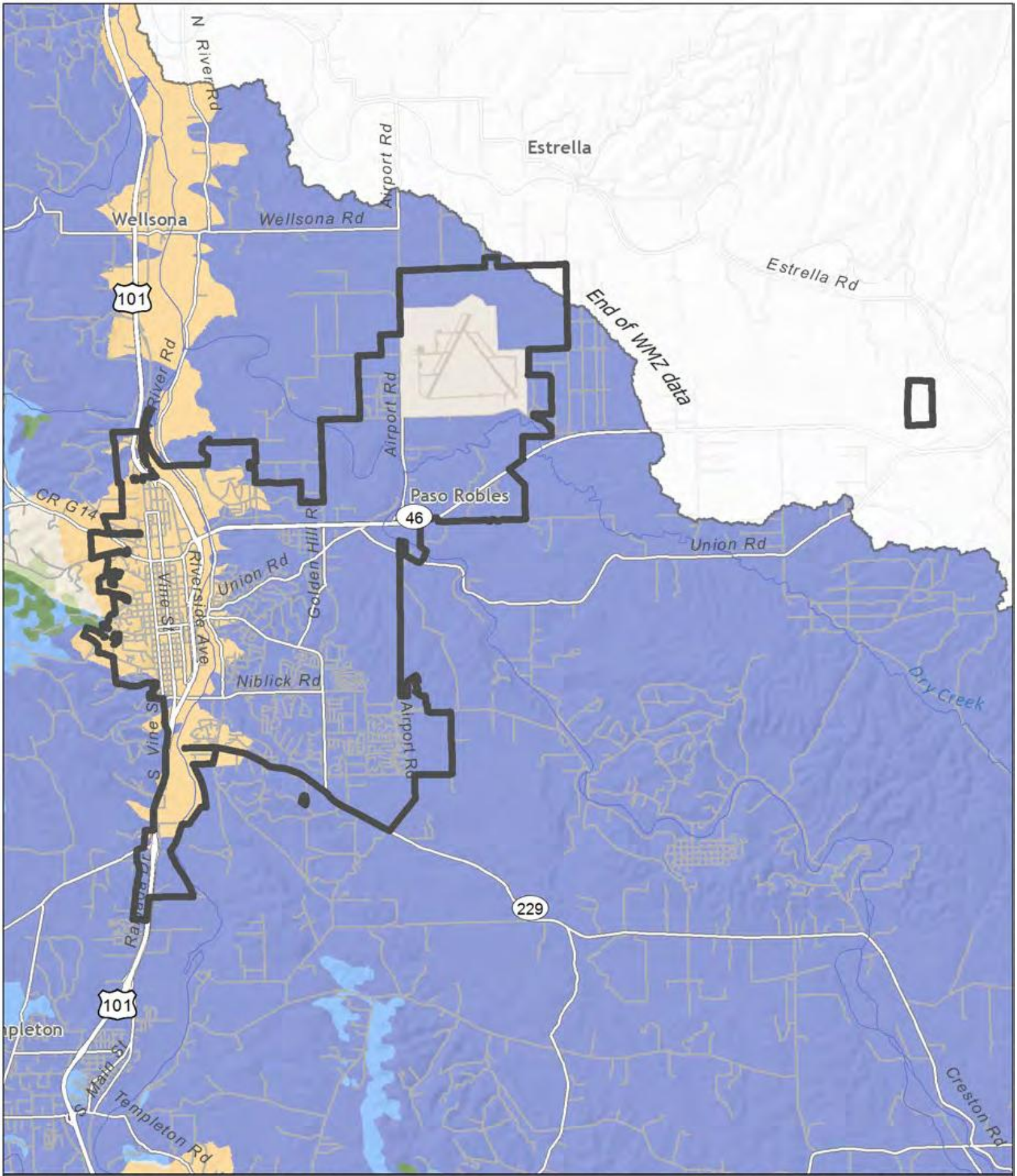
TRACT xxxx, CHANDLER RANCH
PRELIMINARY STORM WATER CONTROL PLAN
DRAINAGE MANAGEMENT AREA (DMA) 12

JOB #:	1465-0001
DESIGNERS:	DRT
DRAWN BY:	ZKP
DATE:	12-13-2018

DRAWING NO.
3
OF 3 SHEET



CENTRAL COAST JOINT EFFORT — **El Paso de Robles, California**

Watershed management zones

1 2 3 4 5 6 7 8 9 10

Urban area boundary

0 0.25 0.5 1 Miles
0 0.5 1 2 km

Data sources
Watershed management zones: Stillwater Sciences, 2012
Base data: ESRI 2010

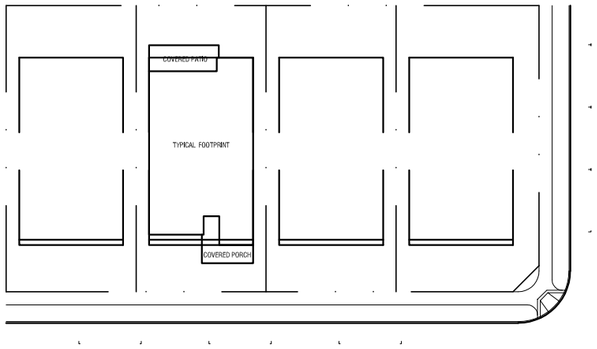
N

Stillwater Sciences
www.stillwatersci.com

OLSEN-CHANDLER PROJECT

LOT COVERAGE CALCULATIONS

Development Type	# Units	Lot Area, SF	FP Area SF	Patio Area SF	Dwy Area SF	Total Impervious SF	% Impervious	
SFR 50x110	1	5500	2596	471	352	3419	62%	
SFR 60x110	1	6600	2996	360	368	3724	56%	
SFR 70x110	1	7700	3604	392	320	4316	56%	
		6600	3065			3820	58%	Average % Imp
						58%		
Small Lot SF 40x80	1	3200	1418	268	48	1734	54%	
Motorcourt SF	2	2546	1421	83	506	2010	79%	
	2	2025	1109	54	506	1669	82%	
	2	2196	1207	35	506	1748	80%	
		2256	1245					
		16334	SF				80%	Average % Imp
		0.37	Ac					
		21.5	# of Courts					
		129	# of Units					
		8.06	Total Acres					
		16	DU					



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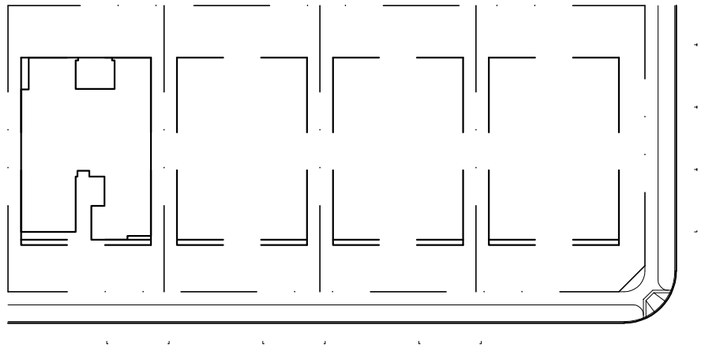

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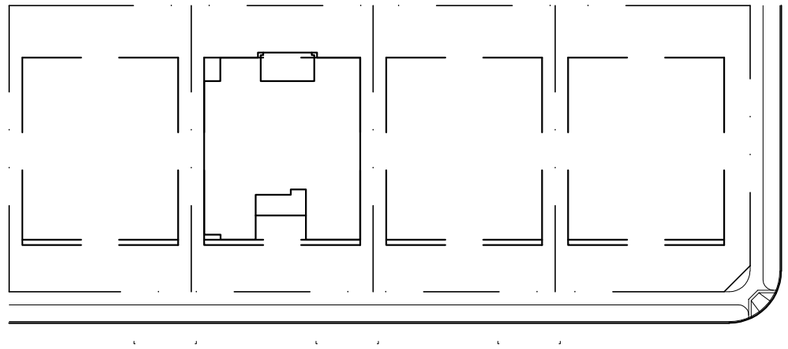

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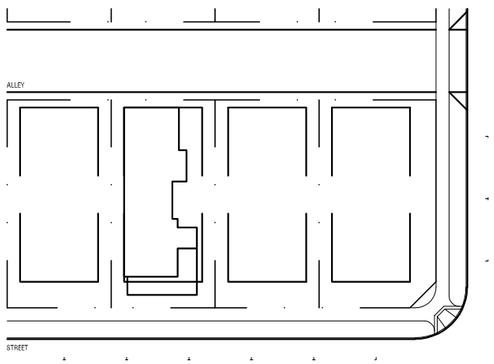

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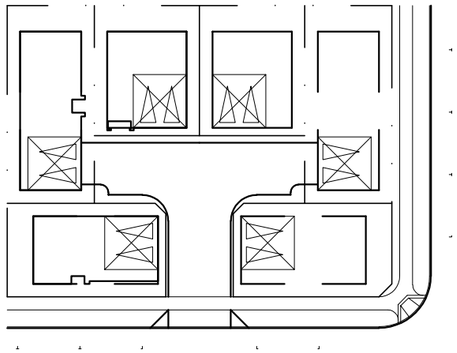
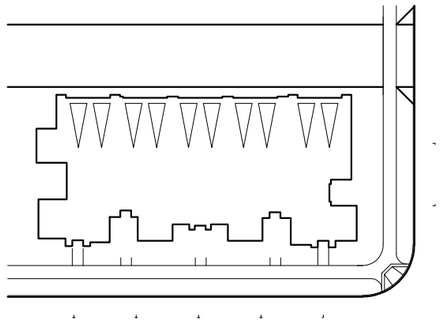


Motorcourts



Townhomes

Central California Coast

Technical Assistance Memo (TAM)

LID Plant Guidance for Bioretention

Low Impact Development

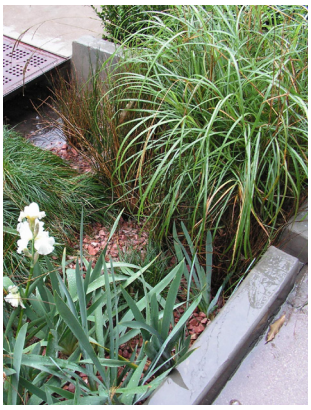
This Technical Assistance Memo (TAM) provides plant selection guidance for the most common bioretention features, such as bioretention swales, stormwater planters and rain gardens. Bioretention systems are low impact development (LID) features that use landscaped areas to slow, treat, retain and infiltrate stormwater runoff, mimicking the natural, pre-development hydrology of a site.

The intent of this TAM is to offer designers, municipalities, developers and homeowners with guidelines for selecting plants for bioretention areas, including a list of appropriate species for the Central Coast. Bioretention systems look like regular landscaped areas, but are designed (engineered) to manage stormwater runoff created by urbanization. Specifying the appropriate plants and soil mix for a bioretention system is critical to its function.

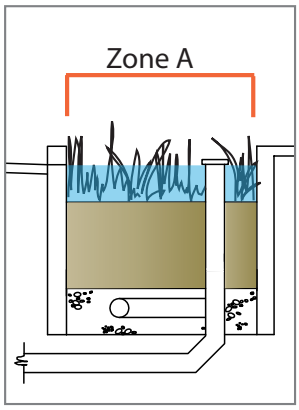
This step-by-step guidance is specific to LID landscapes and will take you from plant selection and layout to installation and on-going maintenance. This guidance is intended to accompany standard landscape methods and point out areas where LID methods may differ.

Step 1: LID Type and Plant Selection

Surface grade and **ponding area** of a bioretention structure are the first factors to consider when choosing which plants to specify. Is the soil surface of the structure sloped or uniform? Stormwater planters and some rain gardens have uniform surface grades. In these designs, ponding will be equal across the structure and all plants will have the same conditions (Zone A). In bioretention swales and some rain gardens, soil surface is sloped, resulting in differing planting conditions across the structure (Zones A and B). Plants located at the bottom where ponding occurs, will have different requirements than those placed on the sideslopes, which receive runoff, but not ponding. A third planting area may occur outside of Zones A and B, on the upper edges of rain gardens and bioswales. This area is not a functional component of the bioretention area, and therefore can be treated as a traditional landscape area.



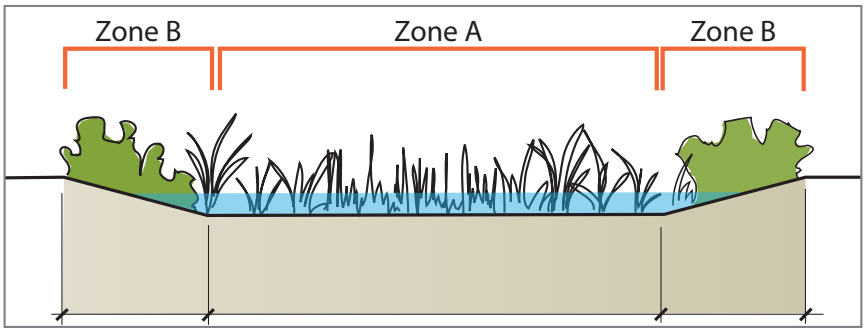
Source: AHBE Landscape Architects



Uniform surface grade: This stormwater planter has a flat bottom with consistent depth of ponding across the structure. All of the plants selected for this design must be tolerant of periodic inundation (**Zone A**).

Varying slope and ponding levels: Varying slope and ponding levels: This bioretention planting area has sloped edges. Plants in the bottom area will be inundated during storms (**Zone A**). Those planted on the sideslopes are above the level of ponding, but will experience seasonally wet conditions (**Zone B**).

Source: Rana Creek



Step 2: Plant Species Selection

Once the plant zones are identified (Zone A only or both Zone A and Zone B) for a structure, the plants may be selected. This TAM includes a plant list for bioretention areas (Table 1). There exist other LID plant lists for California and the Central Coast, but this "short list" was refined based on the following criteria: 1) Tolerant of varied moisture conditions (wet and dry), 2) tolerant of varied soil types and growing conditions, 3) available in Central Coast plant nurseries, 4) low maintenance requirements, 5) are not invasive weeds, 6) do not have aggressive/invasive root systems, and 6) exhibit an attractive appearance. When selecting plants from a list, additional site-specific information, such as tolerance to high and low temperatures, coastal conditions and prevailing winds should be considered. In addition, project specific aspects of the design, for example right-of-way vegetation height limits, approved street and parking lot tree lists and fire hazard landscape requirements may further influence selection. Although this plant list includes some non natives, using native plants is highly recommended because of the wide range of benefits they offer (food and forage for native wildlife, adaptation to local climate, low/no water use once established). Knowledge of invasive species is constantly evolving. To avoid specifying noxious plants on a project, check the California inventory at www.cal-ipc.org. Local agencies may also track potential invasives for your area.

Leymus condensatus 'Canyon Prince': This selection grows to 3' and is tolerant of a wide range of conditions, including drought, seasonal wet conditions, poor soils and some shade.

Achillea millefolium: A native perennial that attracts polinators and is tolerant of poor soils, seasonal flooding and deer. Available in many flower colors.

Source : Native Sons Nursery

Muhlenbergia rigens: A native grass with dense bright, grey-green, evergreen foliage. It tolerates a range of soils, sun to part-shade, seasonal flooding and drought.

Source unless noted: Las Pilitas Nursery

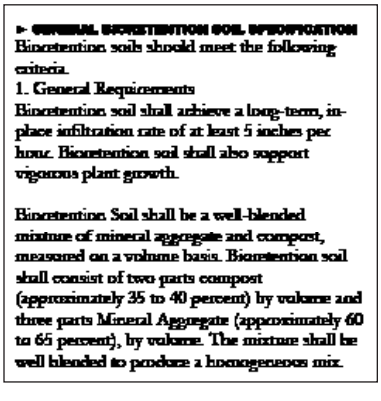
Juncus patens: An easy to grow native rush. It tolerates poor drainage, flooding, drought and shade. A strong performer in bioretention areas, more drought tolerant than J. effusus.

Step 3: Soil Specification for Biofiltration

Specifying the correct soils for bioretention areas is critical in order to achieve stormwater objectives and plant health. Soils must balance three primary design objectives: 1) High enough infiltration rates to meet surface water draw down requirements, 2) infiltration rates that are not so high that they preclude pollutant removal function of soils and 3) soil composition that supports plant establishment and long-term health.

Landscape design documents for LID projects must include a bioretention soil specification that specifies the exact materials to be used in the mix (aggregates and compost), the percent of each material included in the mix, how they are to be placed (i.e. in 8" to 12" lifts) and the soil mix depth. Sample bioretention soil specifications and detailed information on BMP design and construction may be found in the LID documents listed under Additional Resources in this TAM.

Organic Compost: A main ingredient of biofiltration soil mixes, compost is the product of natural decomposition of organic wastes by bacteria, fungi, worms and other beneficial organisms. Compost increases the soil's water holding capacity and improves soil structure, nutrient levels and biology, all of which support plant health.



Bioretention Soil Mix: Construction documents for any LID project should include specifications for the bioretention soil mix that define the ratio of materials in the mix, and the content, gradation, quality analysis and other requirements for each of the materials. Specifications will also provide guidelines for blending and placement of the soil mix.

Table 1. Plants for Bioretention Areas[1]

Zone A: Periodic inundation, area ponds following storm events (24 - 72 hours).
Zone B: Above area of ponding, side slope areas receive runoff, but are never inundated.

Common Name	Scientific Name	Zone(s)	Height/ Width	Light	Notes:	Climate Zones[2]
Trees						
Western Redbud	*Cercis occidentalis*	B	20'/20'	sun	small tree or large shrub, tolerates clay, winter wet, drought, flowers stronger with frost	all but coastal
Desert Willow	*Chilopsis linearis*	B	25'/30'	sun	tolerates alkaline soil, sand, clay, seasonal flooding and drought, not coastal condition	all, but 1A-3A
Western Sycamore	*Platanus racemosa*	B	40'-80'/40'-70'	sun	tolerates sand and clay soils, seasonal flooding, needs space to grow, avoid underground water/sewer pipes	all, but 1A-3A
Coast Live Oak	*Quercus agrifolia*	B	25'-60'/40'-70'	sun - shade	tolerates drought and winter wet conditions, mature trees produce significant litter limiting understory plantings, need space to grow	all, but 1A-3A
Large Shrubs						
Toyon, Christmas Berry	*Heteromeles arbutifolia*	B	8'-20'/8'-20'	sun-pt shade	tolerates sand, clay and serpentine soils, seasonal water with good drainage	all, but 1A-3A
Pacific Wax Myrtle	*Myrica californica*	B	10'-30'/10'-30'	sun-pt shade	large shrub or small tree, tolerates coastal conditions, sand, clay and seasonal inundation	all, but 1A-3A
Western Elderberry	*Sambucus mexicana*	B	10'-30'/8'-20'	sun-pt shade	large shrub to tree, tolerates clay, seasonal flooding and drought, good wildlife food source	all, but 1A-3A
Shrubs and Subshrubs						
Coyote Brush	*Baccharis pilularis*	B	wide variation	sun	adaptable evergreen shrub, provides quick cover and bank stabilization, tolerant of coastal conditions, alkaline soil, sand, clay and seasonal wet	all, but 1A-3A
California Wild Rose	*Rosa californica*	A,B	3'-6'/spreads	sun-pt shade	tolerates a wide variety of soils, seasonal flooding and some drought, spreads aggresively, avoid edges of walkways because of thorns	all
Perennials						
Yarrow	*Achillea millefolium*	B	1'-3'/2'	sun-pt shade	tolerates alkaline soil, sand, clay, seasonal wet conditions, foot traffic and deer, will self sow	all
Beach Strawberry	*Fragaria chiloensis*	B	2-4"/spreads	sun-pt shade	vigorous spreading groundcover, tolerates sand, clay, wet conditions, prefers good drainage	all, but 1A-3A
Douglas Iris	*Iris douglasiana*	B	1.5'-3'/spreads	sun - shade	tolerates sand, clay and serpentine soils, seasonal wet (but not soggy) soils and drought	all, but 1A-3A
Hummingbird Sage	*Salvia spathacea*	B	1'-3'/4'-5'	pt sun-pt shade	low growing perennial, tolerates clay, winter wet, summer drought, prefers light shade, provides nectar for birds and insects, does well under oaks	all, but 1A-3A
Bog Sage	*Salvia uliginosa**	B	3'-6'/spreads	sun	quick growing, spreading perennial, tolerates wet to dry, cut back winter, divide rhizomes	all, but 1A-3A
Blue-eyed Grass	*Sisyrinchium bellum*	B	6"-1'/6"-1'	sun	a semi-evergreen perennial, tolerates sand, clay, seasonal wet soils and deer, dormant in summer, but can be delayed with supplemental irrigation	all, but 1A-3A
California Goldenrod	*Solidago californica*	B	1'-4'/1'-4'	sun-pt shade	tolerates poor soils, seasonal wet and drought, can spread aggressively if over irrigated	all, but 24
Grasses and Grass-like Plants						
Berkeley Sedge, Grey Sedge	*Carex divulsa**	A,B	12"-18"/12"-18"	sun-pt shade	tolerates foot traffic, some drought and boggy soils	all, but 1A-3A
California Meadow Sedge	*Carex pansa*	A,B	6"-12"/spreads	sun - shade	good lawn substitute, tolerates wide range of growing conditions, seasonal inundation, drought, foot traffic and mowing	all, but 1A-3A
Clustered Field Sedge	*Carex praegracilis*	A	1'/spreads	sun-pt shade	useful lawn substitute and bank stabilizer, good planted in masses, tolerates wide range of growing conditions, foot traffic and mowing, may look weedy when mixed with other plants	all, but 1A-3A
San Diego Sedge	*Carex spissa*	A	3'-6'/2'-5'	pt sun-shade	a large grass, tolerates alkaline soil, clay, serpentine, seasonal inundation, and deer	all, but 1A-3A
Small Cape Rush	*Chondropetalum tectorum**	A,B	2'-3'/3'-4'	sun-pt shade	A tough, attractive reed-like plant, tolerates boggy or clay soils and drought once established, Chondropetalum elephantinum is a much larger species	all, but 1A, 2A, 3A, 7
Molate Red Fescue	*Festuca rubra 'Molate'*	A,B	8"-12" /spreads	pt sun-shade	a tufted, spreading bunchgrass, good lawn substitute, provides erosion control, tolerates wet conditions, but looks best with regular water, tolerates drought once established	all
Soft Rush	*Juncus effusus*	A	2'-3'/2'-3'	sun-pt shade	tolerates poor drainage, heavy soils, needs more supplemental water than Juncus patens	all
Wire Grass, Blue Rush	*Juncus patens*	A	1'-2'/1'-2'	sun - shade	strong performance in bioretention ares, tolerates poor drainage, seasonal inundation, drought, shade	all, but 1A-3A
Canyon Prince Wild Rye	*Leymus condensatus 'Canyon Prince'*	B	2'-3'/spreads	sun-pt shade	tolerates drought, wet, but not soggy soils, looks best with supplemental irrigation, spreads by rhizomes	all, but 1A-3A
Deer Grass	*Muhlenbergia rigens*	B	4'-5'/4'-6'	sun-pt shade	a large grass, tolerates sandy and clay soils, seasonal inundation, best when cut back annually to remove old thatch	all, but 1A-3A

[1] See: **www.centralcoastlidi.org** for a photo gallery of the plants in this list.
[2] Refers to Sunset Western Garden Book Climate Zones. The Central Coast includes Zones 1A, 2A, 3A, 7, 9, and 14-24. www.sunset.com/garden/climate-zones
* Indicates non native species. Non natives are only recommended for use in urbanized settings and should not be used on sites in proximity to natura areas.

Step 4: Plant Establishment and Care

Like traditional landscapes, LID planting areas require care and ongoing maintenance for optimal health. Due to the functional nature of LID landscapes and their connectivity to natural receiving water bodies, there are some differences between conventional landscape maintenance and LID maintenance.

Irrigation is an important aspect of any landscape establishment. Typically new plantings need two to three years of irrigation to become established. After that period, native plants will need little to no supplemental irrigation to survive. Plants may enter a dry season dormancy, which affects their appearance. Where this "dry look" is not desired, summer irrigation may be utilized. Systems should include a weather-based controller to avoid watering

during wet weather. Because bioretention soils are formulated to infiltrate, irrigation application rates must be properly designed to avoid overwatering and prevent potential discharges via underdrains.

Compost Mulch (1" - 2") should be applied to bioretention areas to retain moisture, prevent erosion and suppress weed growth. Reapply annually as the mulch breaks down. Use a specified compost mulch and avoid bark mulches that can float during storm events.

Fertilizer should not be used in bioretention areas. Instead, a compost top dressing or application of compost tea can be used to introduce nutrients and beneficial microorganisms to the soil. Apply compost mulch once per year in spring or fall or spray apply compost tea once per year between March and June.

Synthetic herbicides and pesticides should not be used in bioretention areas because of their potential toxicity risk to aquatic organisms. There are a variety of natural methods and products that can be used to control weeds and pests. See the technical manuals included under Additional Resources.

Plant Establishment and Care (cont.)

Source: SVR Design Company

Provide extra support to trees planted in bioretention areas, especially in high wind areas. They should be securely staked during establishment and inspected once or twice a year and following storm events. Stakes should be removed as soon as they are no longer needed to stabilize the tree (between one and two years).

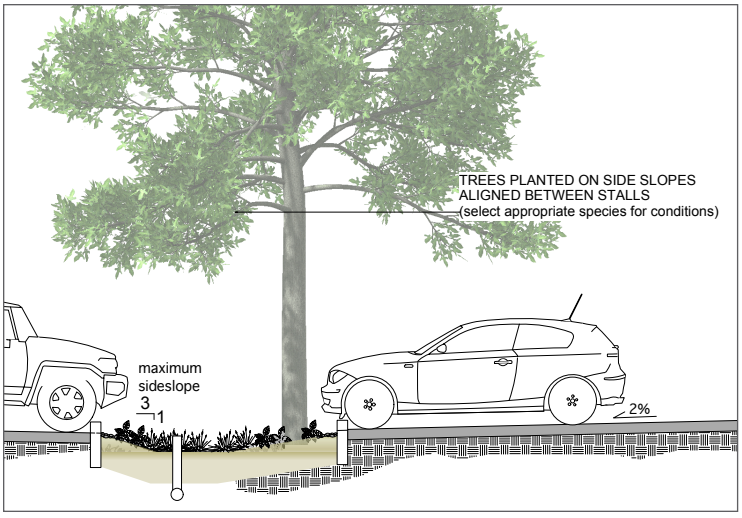
Weeds compete with plants for nutrients, water and sunlight. They should be regularly removed, with their roots, by hand pulling or with manual pincer-type weeding tools. Care should be given to avoid unnecessary compaction of soils while weeding.

Replace plants that die due to unsuitable plant conditions, disease, underwatering or other unforeseen issues. Dead and dying plants must be removed and replaced to avoid spreading disease, establishment of weeds in bare areas and reduced LID function. Before replacing with the same species, determine if another species may be better suited to the conditions.

Tree Placement Guidance

Including trees in bioretention areas provides additional aesthetic and performance benefits. Following these guidelines will maximize their success and survival:

- Provide sufficient landscape width (a rule of thumb is 8' min.)
- Locate trees on the side slopes (Zone B), not in areas that pond (Zone A). Trees improperly located, in narrow planters that pond, are unlikely to thrive and may eventually fail.
- Select trees that will tolerate seasonally wet soils.
- Do not specify trees with invasive roots.



Guidelines for Municipalities

Project managers who are preparing RFPs or bid packages for public projects that include bioretention systems should clearly define expectations for the following:

- Bioretention soil mix specification
- Guidance for plant species selection
- Appropriate plant zone placement
- Operations and maintenance protocols

To assist in defining vegetative requirements for LID projects, Central Coast municipalities may use this TAM as a reference or attachment to their project description.

Plant Nurseries

This is a partial list of Central Coast nurseries who regularly stock the plants included in this TAM.

Source: Las Pilitas Nursery

- Central Coast Wilds, Santa Cruz
  831-459-0656
  www.centralcoastwilds.com
- Last Pilitas, Santa Margarita
  805-438-5992
  www.laspilitas.com
- Native Sons, Arroyo Grande
  805-481-5996
  www.nativesonsnursery.com
- Rana Creek, Carmel Valley
  831-659-3820
  www.ranacreeknursery.com
- San Marcos Growers, Santa Barbara
  805-683-1561
  www.sanmarcosgrowers.com
- Santa Barbara Natives, Santa Barbara
  805-698-4994
  www.sbnatives.com

Additional Resources

- The Low Impact Development Manual for Southern California: Technical Guidance and Site Planning Strategies
  http://www.casqa.org/LID/tabid/186/Default.aspx
- The California Stormwater Quality Association (CASQA) BMP Handbook for New Development and Redevelopment
  http://www.cabmphandbooks.com/
- Contra Costa Clean Water Program (C3 Guidebook)
  http://www.cccleanwater.org/c3.html
- City of Santa Barbara: Storm Water BMP Guidance Manual
  http://www.santabarbaraca.gov/Resident/Major_Planning_Efforts/Storm_Water_Management_Program/

For additional resources on bioretention plant guidance:

www.centralcoastlidi.org

For questions or to contact the
Central Coast Low Impact Development Initiative:

info@centralcoastlidi.org

Central Coast Water Board

UC Davis LID Initiative