CONCEPTUAL WATER QUALITY MANAGEMENT PLAN

Tentative Tract Map No. 17779

Project Address:
1239 Victoria Street
Costa Mesa, CA

Prepared for:

TRUMARKHOMES

450 Newport Center Drive, Suite 300
Newport Beach, CA 92660
(949) 999-9820

Prepared by:

Hunsaker & Associates Irvine, Inc.
3 Hughes
Irvine, CA 92618
(949) 583-1010

WQMP Preparation Date:
December 8, 2014

W.O. 3593-2

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CONCEPTUAL WATER QUALITY MANAGEMENT PLAN

Tentative Tract Map No. 17779

City of Costa Mesa, CA

CONCEPTUAL WATER QUALITY MANAGEMENT PLAN (WQMP)

TENTATIVE TRACT MAP NO. 17779

APN 422-322-18

Located at 1239 Victoria Street

Costa Mesa, CA

Prepared for:

TRUMARKHOMES

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Irvine, CA 92618

(949) 583-1010

Contact: David Frattone

Prepared on: December 8, 2014

Project Owner's Certification			
Permit/Application No.	TBD	Grading Permit No.	TBD
Tract/Parcel Map No.	TTM 17779	Building Permit No.	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 422-322-18

This Water Quality Management Plan (WQMP) has been prepared for Trumark Homes by Hunsaker and Associates Irvine, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Trumark Homes			
Name/Title	Eric Nelson, Vice President – Land Development		
Company	Trumark Homes		
Address	450 Newport Center Drive, Suite 300 Newport Beach, CA 92660		
Email	enelson@trumarkco.com		
Telephone #	(949) 999-9820		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Signature		Date	

Preparer (Engineer): David Frattone			
Title	Principal/Project Engineer	PE Registration #	24695 Exp. 12/31/2015
Company	Hunsaker and Associates Irvine, Inc.		
Address	3 Hughes, Irvine, CA 92618		
Email	dfrattone@hunsaker.com		
Telephone #	(949) 583-1010		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.			
Preparer Signature		Date	
Place Stamp Here			

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Section I Discretionary Permit(s) and Water Quality Conditions

The project's discretionary permit and water quality information are provided in the following:

Project Infomation			
Permit/Application No. (If applicable)	TBD	Grading or Building Permit No. (If applicable)	TTM No. 17779
Address of Project Site (or Tract Map and Lot Number if no address) and APN	1239 Victoria Street, Costa Mesa, CA APN 422-322-18 TTM 17779		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim)	The project is subject to the water quality conditions set forth per City of Costa Mesa Municipal Code (Title 8, Chapter 3, Section 8-32), which requires all new development and significant redevelopment projects comply with the requirements of the County of Orange Drainage Area Management Plan (DAMP). There are currently no site-specific water quality conditions available for this project. Once the conditions have been provided by the City, they will be incorporated into this WQMP.		
Watershed-Based Plan Conditions			
Was a Conceptual Water Quality Management Plan previously approved for this project?	No.		
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The project is located within the Santa Ana River Watershed and discharges to Reach 1 of the Santa Ana River. There is currently no approved WIHMP for the Santa Ana River Watershed. There are currently no TMDLs applicable to Reach 1 of the Santa Ana River.		

Section II Project Description

II.1 Project Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Development Category (From Model WQMP, Table 7.11-2; or -3):</td><td colspan="4">Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.</td></tr>
<tr><td>Project Area (ft^2): 88,608 ft^2; 2.04 acres</td><td colspan="3">Number of Dwelling Units: 28</td><td>SIC Code: N/A. Project proposes residential units.</td></tr>
<tr><td rowspan="3">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area (acres or sq ft)</td><td>Percentage</td><td>Area (acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>0.22 ac</td><td>11%</td><td>1.82 ac</td><td>89%</td></tr>
<tr><td>Post-Project Conditions</td><td>0.71 ac</td><td>35%</td><td>1.33 ac</td><td>65%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">In the pre-development condition, runoff from the project site is conveyed as overland flow to concrete swales. Runoff is then conveyed northerly and discharged to the existing gutter located on the south side of Victoria Street. Runoff is then conveyed downstream westerly approximately 700′ prior to discharging to an existing catch basin. Runoff is then conveyed west prior to discharging to the Greenville-Banning Channel (D03), the Santa Ana River (E01) and the Pacific Ocean.</td></tr>
<tr><td>Narrative Project Description:</td><td colspan="4">The proposed project, “Tentative Tract Map No. 17779”, encompasses approximately 2.04 acres within the City of Costa Mesa. The site is bound to the north by Victoria Street to the east by a commercial plaza (“Victoria Square”) and residential homes; to the south by residential homes and Sea Bluff Drive beyond; and to the west by a proposed residential development (TTM 17508). Proposed entrance into the site will be consistent with the existing entrance, via Victoria Street to the north.

The proposed project will include 28 single-family detached residences, private alleys, landscaping, walkways, gutter and storm drain improvements and related infrastructure improvements. A lot summary table is provided below:
<table>
<tr><th>Lot</th><th>Use</th><th>Acreage</th></tr>
<tr><td>1-28</td><td>Residential</td><td>1.19</td></tr>
<tr><td>A, B, C, D</td><td>Common</td><td>0.13</td></tr>
<tr><td>--</td><td>Private Street</td><td>0.45</td></tr>
</table></td></tr>
</table>

Description of Proposed Project

--	Victoria Street R/W	0.27
Total		*2.04*

The proposed residential lots range from 1,756 square feet to 2,406 square feet and consist of three-story units ranging in size from 1,850 square feet of living area to 2,127 square feet of living area. A unit mix summary is as follows:

Plan	*Type*	*SQ. Ft. (Net)*	*Total Units*
Plan 1	3 Bed/3 Bath	1,850	14
Plan 2	3 Bed /3.5 Bath	2,127	14
Total	--	--	*28*

Parking will be provided via garage and un-covered parking. All units will have 2 car garages, with an additional two uncovered parking spaces per unit provided throughout the project site, in residential driveways and designated visitor spaces. Total parking spaces provided is 112 spaces (4/unit), which consists of 56 garage spaces, 42 driveway spaces and 14 visitor spaces.

Proposed open space/landscaping will consist of private areas located within each residential unit and common lot areas (Lots A through D) located at the northern and southern portions of the site. Total open space/landscaping area is estimated at approximately 35% of the project site.

Paved and other impervious areas of the site include the project's streets, curb, walkways and gutter improvements, driveways and the residential building footprint for each residential lot. Total impervious is anticipated to consist of approximately 65% of the project site.

No community facilities, such as pools, parks, community center, wash racks or designated trash areas have been proposed for the project.

No delivery or storage areas are proposed for the project.

Activities similar to those of residential developments can be anticipated for the project. These are anticipated to include day to day activities such as recreation, commuting and other activities typical of residential developments.

Typical household wastes are anticipated to be generated daily from the residential portion of the project. Each residential unit will have trash bins located/stored within the private residence of each unit, to be picked up for disposal on a weekly basis by the contracting waste hauler.

All improvements are shown in the WQMP Site Plan in Section VI of this WQMP.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (December 2013) lists the following Pollutants of Concern (POC's) associated with Attached Residential Development: Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease and Trash & Debris.

Pollutants of Concern			
Pollutant	E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E		Potential sources of sediment include existing landscaping areas and disturbed earth surfaces.
Nutrients	E		Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals	E		Potential sources include vehicles and automotive fluids as well as various construction materials.
Pathogens (Bacteria/Virus)	E		Potential sources of pathogens include pets, food wastes and landscaping/sediment areas.
Pesticides	E		Potential sources of pesticides include landscaping and open space areas.
Oil and Grease	E		Potential source of oil and grease is parked vehicles.
Toxic Organic Compounds	E		Potential sources include automobiles and other motor vehicles, parking areas, street and courts.
Trash and Debris	E		Potential sources include common litter and trash cans from residential homes.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2013 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent.

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event is less than the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

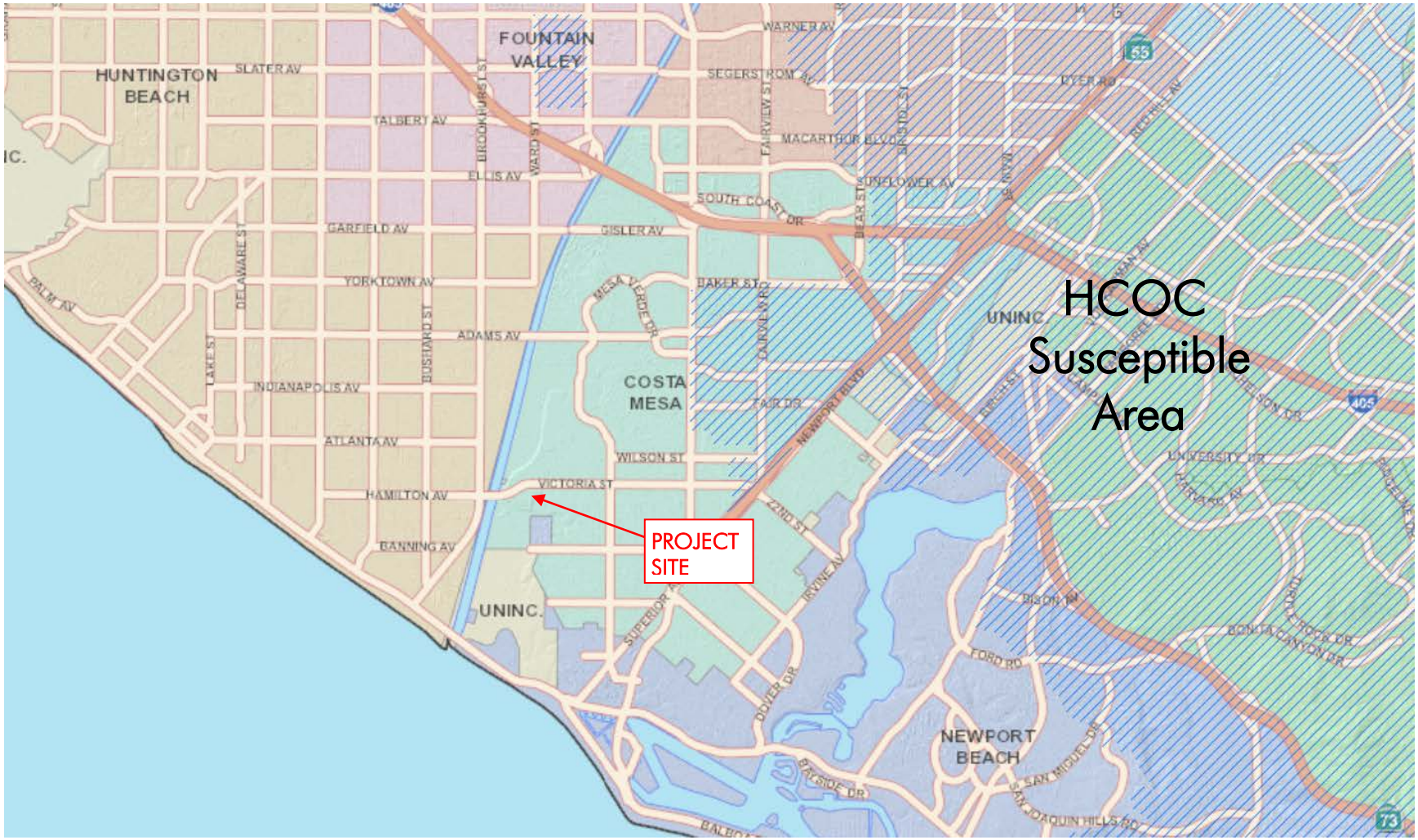
If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below

Based on County's current hydromodification susceptibility map (provided on the following page), the project is not subject to the specific 2-year criteria noted above. Runoff from the site is discharged to the existing storm drain system located in Victoria Street and conveyed to fully improved channels downstream.



Source: County of Orange Land Records GIS

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics.

In general, the developed site will slope to the north, with runoff from each residential lot discharging as overland to the gutter located in the private drive. Runoff is then conveyed northerly as gutter flow prior to discharging to the Victoria Street. Runoff is then conveyed westerly to the Greenville-Banning Channel (D03), the Santa Ana River (E01) and the Pacific Ocean, as in existing conditions.

Low Impact Development

To satisfy the project requirements for Low Impact Development (LID) and storm water treatment, water quality flows (non-storm water flows and the Design Capture Volume) from the project will be conveyed to one of two pervious pavement areas for retention/infiltration.

II.5 Property Ownership/Management

The property owner, Trumark Homes, shall assume all BMP maintenance and inspection responsibilities until the establishment of a Homeowners Association. Inspection and maintenance activities are in Section V of this WQMP.

Section III Site Description

III.1 Physical Setting

General descriptions of the project area are provided below:

Name of Planned Community/Planning Area	Tentative Tract Map No. 17779
Location/Address	1239 Victoria Street, Costa Mesa, CA
General Plan Land Use Designation	Existing: Professional Services Building Proposed: Residential
Zoning	Existing: Administrative and Professional Proposed: Single-Family Detached
Acreage of Project Site	2.04 acres
Predominant Soil Type	Per the NRCS's Websoil Survey and the project's geotechnical investigation, onsite soils consist primarily of Hydrologic Soil Group A soils.

III.2 Site Characteristics

The following table summarizes general characteristics of the project site:

Precipitation Zone	0.75 in.
Topography	The site is located in the western-central portion of the City of Costa Mesa. The site is bound to the north by Victoria Street, to the west by a proposed residential development (currently under construction), to the south by existing residential homes, and to the east by a shopping center and residential homes. The site currently consists of a professional services office building, with the site generally sloping to the north at approximately 5% gradient. Onsite elevations range from 91′ above mean sea level (MSL) in the southeast to 69′ above mean sea level (MSL) to the northwest.
Drainage Patterns/Connections	In the pre-development condition, runoff from the project site is conveyed as overland flow to concrete swales. Runoff is then conveyed northerly and discharged to the existing gutter located on the south side of Victoria Street. Runoff is then conveyed downstream westerly approximately 700′ prior to discharging to an existing catch basin. Runoff is then conveyed west prior to discharging to the Greenville-Banning Channel (D03), the Santa Ana River (E01) and the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	The subject site is generally located within the Peninsular Ranges Geomorphic Province of California, more specifically at the southern boundary of the Los Angeles Sedimentary Basin. The Los Angeles Basin is a northwest-plunging synclinal sedimentary deposit that is bounded near the subject site by the broadly uplifted coastal mesa of Newport Beach. The local Santa Ana River System deeply incised the local sedimentary deposits. A channelized portion of the Santa Ana River passes close by the site, trending roughly south. The river deposited widely dispersed sheet deposits prior to construction of the upstream Prado Dam and channelization. The primary geologic unit underlying the site is Quaternary Old Paralic deposits (Qop). These materials are defined as late to middle Pleistocene interfingered estuarine, beach, and colluvial deposits. The unit is known to consist of silt, sand and cobbles in general. At the subject site, there are likely thin layers of artificial fill associated with past uses of the area, not differentiated with this study. As encountered, these soils generally consist of clayey sand, sandy clay, and silty sand. Recommendations for remedial grading of the site are presented in the recommendations section of this report. From a geotechnical perspective, the existing soils are generally acceptable to be utilized as artificial fill materials provided they are moisture conditioned and properly compacted. The field explorations (borings) indicate primarily medium dense clayey sands and stiff sandy clays transitioning at greater depths to dense to very dense sands with varying amounts of silt to the maximum explored depth of approximately 50 feet. In general, the upper approximate 5 feet of the

	site consisted of medium dense clayey sands and stiff sandy clays. Based on information from the Natural Resource Conservation Service Web Soil Survey, onsite soils consists primarily of Hydrologic Group A Soils, characterized as having a high rate of water transmission when thoroughly wet. These soils are considered feasible for infiltration.
Hydrogeologic (Groundwater) Conditions	Groundwater was not encountered in any of the onsite borings conducted (to a maximum of 50' below ground surface) as part of the project's geotechnical investigation. Historic high groundwater for the project area is estimated at approximately 30' below ground surface.
Geotechnical Conditions (relevant to infiltration)	The project site consists of HSG "A" soils, which are feasible for infiltration. Based on the infiltration test conducted, the site's design infiltration rate has been determined to be 1.4 in/hr (with an applied safety factor of 3).
Off-Site Drainage	The project does not receive offsite run-on from adjacent properties.
Utility and Infrastructure Information	Wet and dry utilities are proposed for this tract and will connect to existing facilities located in Victoria Street to the north and existing connections to the south (Sea Bluff Drive).

III.3 Watershed Description

The following table includes descriptions of the project's receiving waters:

Receiving Waters	Greenville-Banning Channel (OCFCD Facility D03) Santa Ana River (Reach 1)
303(d) Listed Impairments	None
Applicable TMDLs	None
Pollutants of Concern for the Project	Suspended Solids/Sediment, Heavy Metals, Nutrients, Pathogens, Pesticides, Oil & Grease, Toxic Organic Compounds, Trash & Debris
Environmentally Sensitive and Special Biological Significant Areas	There are no Areas of Special Biological Significance (ASBS) or ESA's within the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Project Performance Criteria		
(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	A WIHMP has not been approved for the **Santa Ana River** watershed.	
If HCOC exists, list applicable hydromodification control performance criteria	N/A. Per the most updated TGD Maps (from County of Orange GIS), the project does not reside within an HCOC area.	
List applicable LID performance criteria	The applicable LID performance criteria are as follows: • Retain, onsite (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the Design Capture Volume, and • Recover (i.e.) drawdown the storage volume as soon as possible after a storm event, and, if necessary • Biotreat, onsite, additional runoff, as feasible, up to 80 percent average annual capture efficiency, and, if necessary • Retain or biotreat, in a regional facility, the remaining runoff up to 80 percent average annual capture efficiency, and, if necessary • Fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency using treatment controls or other alternative approaches.	
List applicable treatment control BMP performance criteria	N/A. Project proposes the use of LID BMPs to address the project's design capture volume.	
Calculate LID design storm capture volume for Project.	Project's LID DCV has been determined using the following equation: DCV = C x D x A x 43560 sf/ac x 1ft/12in; Where: DCV = design storm capture volume, cu-ft = 3,072 cu-ft C = runoff coefficient = (0.75 x imp + 0.15) = 0.6375 Imp = impervious fraction of drainage area (ranges from 0 to 1) = 0.65 D = storm depth (inches) = 0.75" A* = tributary area (acres) = 1.77 acres	

*Estimate of project DCV. Drainage boundaries is not the same as tract boundary. For calculations based on actual drainage areas, see Section IV.2.2.

IV.2 Site Design and Drainage Plan

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

The project will reduce impervious surfaces as compared to pre-project conditions. Landscaping will be provided throughout the site, within the project's common areas and private residential lots.

Maximize Natural Infiltration Capacity

The project will consist of approximately 35% landscaping area to allow for some infiltration of the project's runoff. Additionally, project runoff will be allowed to infiltrate to the underlying soils via proposed pervious pavement areas.

Preserve Existing Drainage Patterns and Time of Concentration

The proposed drainage pattern is consistent with existing drainage patterns. In regards to the time of concentration for the project's runoff, due to the routing of project flows, the proposed site layout is not anticipated to increase the time of concentration from the site's existing condition.

Disconnect Impervious Areas

Landscaping will be provided adjacent to walkways, within common areas and private homeowner areas to break up the project's impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The site has minimal vegetation in the pre-project condition. There are no natural areas or critical landscaping areas to preserve. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.2.2 Drainage Management Areas

Per the TGD, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas tributary to the project's BMPs. DMA limits have been delineated based on the tributary drainage area for each BMP.

The design capture volume (DCV) and design flow rate utilizing the "Simple Method" and the "Capture Efficiency Method" described in the TGD Section III.3.1 and III.3.3 are provided below. Locations of DMAs and associated treatment BMPs are provided on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Attachment C of this WQMP.

DMA	Tributary Drainage Area (Ac.)	% Imp.	C-value	Design Storm Depth (in.)	Simple Method DCV (cu-ft)
1	0.743	65	0.6375	0.75	1,290
2	0.908	65	0.6375	0.75	1,576
3	0.016	5	0.1875	0.75	8.2
4	0.056	30	0.375	0.75	57.2
5	0.026	5	0.1875	0.75	13.3

IV.3 LID BMP Selection and Project Conformance Analysis

Per the 4th Term MS4 Storm Water Permit (Order No. R8-2009-0030, as amended by Order No. R8-2010-0062), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures in the following treatment hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of an infiltration based LID BMP to address pollutants from the project's runoff.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☒
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☒
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☒

The following HSCs have been selected for use on this project:

HSC-1 Localized On-Lot Infiltration

Where feasible, runoff from walkways and other areas will be directed to landscaping areas where feasible to allow for filtration and infiltration of runoff and volume reduction. Although these areas can generally be applied to the majority of the project's landscaping areas, they will be employed specifically in Lots A, B and C (corresponding to DMAs 2, 3 and 4) to address the portion of the project's DCV corresponding to each of the lots.

HSC-3 Street Trees

Trees will be planted along the project's private drive and within common areas to intercept rainfall and provide some volume reduction benefits for the project.

HSC BMP SUMMARY				
Drainage Area Name	% Impervious	Simple Method DCV (ft^3)	HSC BMP	HSC Capacity (ft^3)
DMA 2	5	8.2	HSC-1	57.9
DMA 3	30	57.2	HSC-1	141.8
DMA 4	3	13.3	HSC-1	89.3

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☒
Other:	☐

INF-6 Permeable Pavers

The project proposes the use of pervious pavement to capture and retain the project's DCV, thereby fulfilling the project's LID BMP requirements. Runoff from each of the project's residential units, parking spaces and private drive will be conveyed as overland flow to project gutters. Runoff will then be conveyed northerly prior to discharging to one of two pervious pavement areas located near the project's two entrances to retain/infiltrate runoff from the project site. The pavers will be designed with adequate

capacity to retain and infiltrate the project's DCV and with adequate set back from structural areas per the geotechnical consultants' recommendations.

BMP Sizing

Sizing of the proposed pervious pavement areas is as follows:

INFILTRATION BMP SUMMARY					
Drainage Area Name	% Impervious	Simple Method DCV (ft^3)	Pavement Area (ft^2)	Pavement Capacity (ft^3)*	Drawdown Time (hrs)
DMA 1	65	1,290	2,810	1,686	12.8
DMA 2	65	1,576	2,855	1,713	12.8

*1.5' depth at 0.40 void space.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

The project does not propose the use of Evapotranspiration or Harvesting BMPs. The project will satisfy LID BMP requirements via the use of infiltration BMPs.

Name	Included?
EVAPOTRANSPIRATION	
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
HARVEST & REUSE/ RAINWATER HARVESTING	
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

The project does not propose the use of Biotreatment BMPs. The project will satisfy LID BMP treatment requirements via the use of infiltration BMPs.

Biotreatment BMPs have been selected for the project to treat runoff prior to discharging to offsite. BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☐
	Stormwater planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☐
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐

IV.3.5 Hydromodification Control BMPs

Not applicable. Per discussion in Section II.3 of this WQMP, the project does not have hydrologic conditions of concern.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.7 Treatment Control BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.8 Non-Structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Not applicable to residential developments or parks.
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Project is for residential community development only.

A discussion of each selected Non-Structural Source Control BMP is provided in the following section. The implementation of each BMP is described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

N1 Education for Property Owners, Tenants and Occupants – Educational materials will be provided to homeowners at close of escrow by owner and periodically thereafter by the HOA to inform them of their potential impacts to downstream water quality. Materials include those described in Section VII of this WQMP and provided in Attachment A of this WQMP.

N2 Activity Restrictions – Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 Common Area Landscape Management – Maintenance activities for landscape areas shall be consistent with County and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 BMP Maintenance – Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in Section V of this WQMP, with documented records of inspections and maintenance activities completed.

N11 Common Area Litter Control – Litter control onsite will include the use of HOA litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 Employee Training – All employees, contractors and subcontractors of the HOA shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin – As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period.

N15 Street Sweeping Private Streets and Parking Lots – The project's private streets shall be swept, at minimum, prior to the start of the traditional rainy season and as needed.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No designated common trash area proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	Not applicable. No large slopes (hillside landscaping) proposed.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not applicable. Project resides in SARWQCB.
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S11	Fueling areas	☐	☒	None proposed.
S12	Hillside landscaping	☐	☒	None proposed
S13	Wash water control for food preparation areas	☐	☒	None proposed.
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected Structural Source Control BMP is provided in the following section. The implementation of each BMP and the responsible party are described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

S1 Storm Drain Stenciling – Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.

S4 Use Efficient Irrigation Systems and Landscape Design – In conjunction with routine landscaping maintenance activities, inspect irrigation for signs of leaks, overspray and repair or adjust accordingly. Adjust system cycle to accommodate seasonal fluctuations in water demand and temperatures. Ensure use of native or drought tolerant/non-invasive plant species to minimize water consumption.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

The proposed project is able to meet LID compliance via the employment of onsite LID practices. Therefore, water quality credits do not apply to this project.

Description of Proposed Project				
Project Types that Qualify for Water Quality Credits (Select all that apply):				
☐ Redevelopment projects that reduce the overall impervious footprint of the project site.	☐ Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.		☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).	
☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).		☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned		☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).
☐ Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐ Developments in a city center area.	☐ Developments in historic districts or historic preservation areas.	☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.
Calculation of Water Quality Credits (if applicable)	Not applicable to project.			

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

A Homeowners' association (HOA) shall be established for this project. The HOA shall be responsible the long-term funding, inspection and maintenance of all BMPs prescribed in this WQMP.

Until the project's HOA has been established, all responsibilities pertaining to this WQMP shall be that of the project developer, Trumark Homes. Contact for the interim responsible party is as follows:

Responsible Party:	Trumark Homes
Contact Name:	Eric Nelson, Vice President – Land Development
Address:	450 Newport Center Drive, Suite 300 Newport Beach, CA 92660
Phone:	(949) 999-9820
Email:	enelson@trumarkco.com

Inspection and maintenance activities, frequencies and responsibilities for the project's selected BMPs are provided in the following BMP matrix. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
HYDROLOGIC SOURCE CONTROL BMPs				
HSC-1	On-Lot Infiltration	Inspect for standing water and that water infiltrates into underlying soil completely. Remove accumulated sediment as needed.	After significant storm events and monthly with landscaping	Owner/HOA
HSC-3	Street Trees	Inspect plantings for overall health, including disease, signs of over or under watering. Trim as needed to maintain canopy volume and pedestrian/vehicle site lines.	After significant storm events and monthly with landscaping	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
INFILTRATION BMPs				
INF-7	Permeable Pavement	Inspect after rain events to ensure that water has drawn down within 48 hours. Inspect for evidence of leaks, spills and clogs. If needed, remove pavement block and clean underlying materials. Clean pavement via vacuum sweeper.	Annual vacuum and as needed.	Owner/HOA
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Close of escrow and annually	Owner/HOA
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a monthly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly	Owner/HOA
N4	BMP Maintenance	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing	Owner/HOA
N11	Common Area Litter control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Littler collection and removal shall be performed on a weekly basis.	Ongoing patrols. Weekly (minimum) pick up and removal	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N12	Employee Training	All employees, contractors and subcontractors of the HOA shall receive training regarding the potential impacts of their actions on downstream water quality, proper material use and staging (for landscaping and other materials) and proper clean up material	Annually and as needed	HOA
N14	Common Area Catch Basin Inspection	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Owner/HOA
N15	Street Sweeping Private Streets	Streets must be swept at minimum, prior to the start of the rainy season (October 1st). Streets shall also be swept as needed.	Annually and as needed	Owner/HOA
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/HOA

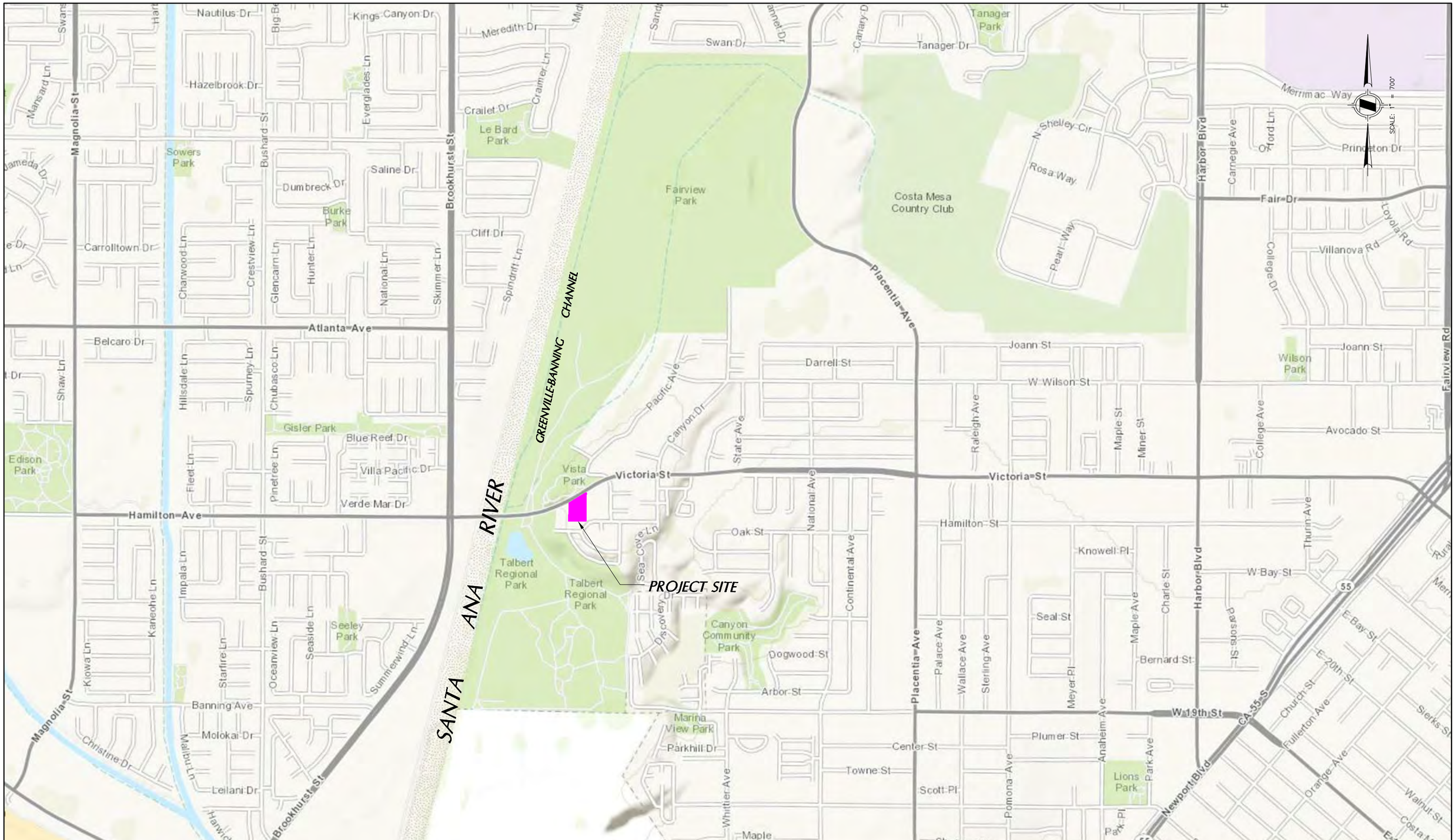
Section VI Site Plan and Drainage Plan

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

Exhibits

- Vicinity Map
- Conceptual WQMP Site Plan

Vicinity Map, Conceptual WQMP Site Plan



DRAWN BY: TIH	PREPARED BY: HUNSAKER & ASSOCIATES IRVINE, INC. PLANNING ▪ ENGINEERING ▪ SURVEYING Three Hughes, Irvine, CA 92618 ▪ Ph: (949) 583-1010 ▪ Fx: (949) 583-0759	PREPARED FOR: TRUMARK HOMES 450 NEWPORT CENTER DRIVE, SUITE 300 NEWPORT BEACH, CA 92660 (949) 999-9820	**TENTATIVE TRACT MAP NO. 17779 SOUTHWEST OF VICTORIA STREET AND VICTORIA PLACE CITY OF COSTA MESA, CA**
DATE: 12/08/14			
W.O.: 3593-2			

CONCEPTUAL WQMP VICINITY MAP

PLOTTED BY: Tommy Hsu DATE: Dec. 08, 2014 09:08:27 AM FILE: F:\0861\Planning\SY_WQ\WQMP\Exhibits\WQMP_VIC TR17779.dwg

DRAWN BY: TIH DATE: 12/08/14 W.O.: 3593-2	PREPARED BY: HUNSAKER & ASSOCIATES IRVINE, INC. PLANNING ▪ ENGINEERING ▪ SURVEYING Three Hughes, Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759	PREPARED FOR: TRUMARKHOMES 450 NEWPORT CENTER DRIVE, SUITE 300 NEWPORT BEACH, CA 92660 (949) 999-9820	TENTATIVE TRACT MAP NO. 17779 SOUTHWEST OF VICTORIA STREET AND VICTORIA PLACE CITY OF COSTA MESA, CA

CONCEPTUAL WQMP SITE MAP

PLOTTED BY: Tommy Hsu DATE: Dec. 08, 2014 09:06:58 AM FILE: F:\0861\Planning\SY_WQ\WQMP\Exhibits\WQMP_SP TR17779.dwg

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☒		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A

Educational Materials

(To be provided at Final WQMP)

Attachment B

O & M Plan

Operations and Maintenance (O&M) Plan

Water Quality Management Plan

for

Tentative Tract Map No. 17779

City of Costa Mesa

APN 422-322-18

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	Non-Structural Source Control BMPs		
Yes	**N1. Education for Property Owners, Tenants and Occupants** Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of the project WQMP and any updated materials.	At close of escrow and annually thereafter.	Owner/HOA
Yes	**N2. Activity Restrictions** The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/HOA
Yes	**N3. Common Area Landscape Management** Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly	Owner/HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N4. BMP Maintenance** Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing, as prescribed per WQMP.	Owner/HOA
No	**N5. Title 22 CCR Compliance** Not applicable to residential projects.		
No	**N6. Local Water Quality Permit Compliance** Not applicable. No local water quality permits are required for the operation of the project.		
No	**N7. Spill Contingency Plan** Not applicable to residential projects.		
No	**N8. Underground Storage Tank Compliance** Not applicable. None onsite.		
No	**N9. Hazardous Materials Disclosure Compliance** Not applicable to residential projects.		
No	**N10. Uniform Fire Code Implementation** Not applicable to residential projects.		
Yes	**N11. Common Area Litter Control** Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with landscape maintenance activities.	Ongoing patrols. Weekly (minimum) pick up and removal.	Owner/HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N12. Employee Training** Train employees, contractors and subcontractors of HOA on the potential impacts of their actions on water quality. Provide training on proper material use and storage and proper clean up and disposal methods.	Annually and as needed	Owner/HOA
No	**N13. Housekeeping of Loading Docks** Not applicable. No loading docks onsite.		
Yes	**N14. Common Area Catch Basin Inspection** Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Owner/HOA
Yes	**N15. Street Sweeping Private Streets and Parking Lots** Streets must be swept at minimum, prior to the start of the rainy season (October 1st). Streets shall also be swept as needed.	Annually and as needed.	Owner/HOA
Structural Source Control BMPs			
Yes	**S1. Provide Storm Drain System Stenciling and Signage** Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**S2. Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction** Not applicable. No outdoor storage of hazardous materials onsite.		
No	**S3. Design Trash Enclosures to Reduce Pollutant Introduction** Not applicable. None proposed.		
Yes	**S4. Use Efficient Irrigation Systems and Landscape Design** In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/HOA
No	**S5. Protect Slopes and Channels** Not applicable. Site is flat.		
No	**S6. Loading Dock Areas** Not applicable. No loading docks onsite.		
No	**S7. Maintenance Bays and Docks** Not applicable. No maintenance bays onsite.		
No	**S8. Vehicle Wash Areas** Not applicable. Not vehicle wash areas onsite.		
No	**S9. Outdoor Processing Areas** Not applicable. No outdoor processing onsite.		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	S10. Equipment Wash Areas Not applicable. No equipment wash areas onsite.		
No	S11. Fueling Areas Not applicable. No fueling areas onsite.		
No	S12. Site Design and Landscape Planning (Hillside Landscaping) Not applicable. Project is not hillside development.		
No	S13. Wash Water Controls for Food Preparation Areas Not applicable. No restaurant facilities onsite.		
No	S14. Community Car Wash Racks Not applicable. No community car wash areas onsite.		
Low Impact Development BMPs			
Hydrologic Source Control #1 HSC-1 On-Lot Infiltration – Inspect dispersion area for signs of scouring, standing water, saturated conditions and dead/dying vegetation. Repair and replace as necessary. Mow/trim dispersion area as needed.		Monthly	Owner/HOA
Hydrologic Source Control #2 HSC-3. Street Trees – Inspect plantings for overall health, including disease, signs of over or under watering. Trim as needed to maintain canopy volume and pedestrian/vehicle site lines.		Monthly	Owner/HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Infiltration BMP #1	**INF-7. Permeable Pavement** – Inspect after rain events to ensure that water has drawn down within 48 hours. Inspect for evidence of leaks, spills and clogs. If needed, remove pavement block and clean underlying materials. Clean pavement via vacuum sweeper.	Annually and as needed	Owner/HOA

Required Permits

No additional permits are necessary for the operation and maintenane of the proposed BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

MAINTENANCE AGREEMENT

Attachment C

BMP Calculations, Feasibility Worksheets and Details

BMP Calculations

Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID	DMA 3	
Total drainage area	0.016	acres
Total drainage area Impervious Area (IA_{total})	0.0008	acres

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
Landscape	HSC-1 Landscaping area with 1" of ponding. Retention volume = 697sf * 0.083ft = 57.9 cf/35sf = 1,654 cf per 1,000 sf impervious	Greater than 1	0.0008	0.0008
	Box 1:	$\sum d_i \times IA_i =$		0.0008
	Box 2:	$IA_{total} =$		0.0008
	[Box 1]/[Box 2]:	$d_{HSC\ total} =$		1
		Percent Capture Provided by HSCs (Table III.1)		80%

Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID	DMA 4	
Total drainage area	0.056	acres
Total drainage area Impervious Area (IA_{total})	0.017	acres

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
Landscape	HSC-1 Landscaping area with 1" of ponding. Retention volume = 1708sf * 0.083ft = 141.8 cf/741sf = 191cf per 1,000 sf impervious	Greater than 1	0.017	0.017
	Box 1:	$\sum d_i \times IA_i =$		0.017
	Box 2:	$IA_{total} =$		0.017
	[Box 1]/[Box 2]:	$d_{HSC\ total} =$		1
		Percent Capture Provided by HSCs (Table III.1)		80%

Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID	DMA 5	
Total drainage area	0.026	acres
Total drainage area Impervious Area (IA_{total})	0.0013	acres

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
Landscape	HSC-1 Landscaping area with 1" of ponding. Retention volume = 1076sf * 0.083ft = 89.3cf/57sf = 1567cf per 1,000 sf impervious	Greater than 1	0.0013	0.0013
Box 1:		$\sum d_i \times IA_i =$		0.0013
Box 2:		$IA_{total} =$		0.0013
[Box 1]/[Box 2]:		$d_{HSC\ total} =$		1
		Percent Capture Provided by HSCs (Table III.1)		80%

Worksheet B: Simple Design Capture Volume Sizing Method – DMA 1

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.743	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.65	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.6375	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	1,290	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	4.2	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	3	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	1.4	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	5.6	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	231	sq-ft

Summary:

DCV from DMA 1 will be conveyed via gutter to a permeable pavement section located at the northern portion of the project site. Runoff will be allowed to infiltrate through pervious pavement section.

Minimum area needed for 48 hour drawdown time is 231 square feet at 5.6 feet depth. Current footprint for permeable pavement area is 2,810 square feet at 1.5 feet depth. Drawdown time estimated at: 1.5 ft X 12 in/ft X (1hr/1.4 in) = 12.8 hr.

Pavement sizing will be finalized at FWQMP.

Worksheet B: Simple Design Capture Volume Sizing Method – DMA 1

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.908	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.65	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.6375	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	1,576	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	4.2	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	3	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	1.4	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	5.6	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	282	sq-ft

Summary:

DCV from DMA 2 will be conveyed via gutter to a permeable pavement section located at the northern portion of the project site. Runoff will be allowed to infiltrate through pervious pavement section.

Minimum area needed for 48 hour drawdown time is 282 square feet at 5.6 feet depth. Current footprint for permeable pavement area is 2,855 square feet at 1.5 feet depth. Drawdown time estimated at: 1.5 ft X 12 in/ft X (1hr/1.4 in) = 12.8 hr.

Pavement sizing will be finalized at FWQMP.

Feasibility Worksheets

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.5
		Predominant soil texture	0.25	2	0.5
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.5
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.0

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	3
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	4.2
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$	1.4

Supporting Data

Briefly describe infiltration test and provide reference to test forms:
Test was conducted using TGD's percolation test guidelines for sandy soils.

Worksheet I: Summary of Groundwater-related Feasibility Criteria

1	Is project large or small? (as defined by Table VIII.2) circle one	Large	**Small**	
2	What is the tributary area to the BMP?	A	0.743 0.908	acres
3	What type of BMP is proposed?	Permeable Pavement		
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	2,810 2,855	sq-ft
5	What land use activities are present in the tributary area (list all) Typical residential related activities, such as driving, recreating, sports, etc.			
6	What land use-based risk category is applicable?	**L**	M	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): N/A. Tributary runoff considered low risk.			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section VIII.2 (circle one)	**5 ft**	10 ft	
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater: Based on TGD INF-6, minimum separation to seasonally high mounded groundwater for permeable pavement is 5 feet.			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	**28**	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	**28**	ft
12	Describe assumptions and methods used for mounding analysis: Based on geotechnical investation.			
13	Is the site within a plume protection boundary (See Figure VIII.2)?	Y	**N**	N/A
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y	**N**	N/A
15	Is the site within 250 feet of a contaminated site?	Y	**N**	N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: Based on geotechnical investigation, infiltration is feasible for project site. LGC Geotechnical, Inc. "Preliminary Geotechnical Evaluation for the Proposed Residential Development at 1239 Victoria Street, City of Costa Mesa, California". April 28, 2014.			
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y	**N**	N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	**Y**	N	

Worksheet I: Summary of Groundwater-related Feasibility Criteria

Provide rationale for feasibility determination: Based on project's soils report and information provided in the TGD, retention/infiltration of project runoff is feasible.

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		X
Provide basis: Based on TGD and Count of Orange GIS data, there are no restrictions for infiltration.			
2	Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): The BMP can only be located less than 50 feet away from slopes steeper than 15 percent The BMP can only be located less than eight feet from building foundations or an alternative setback. A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis: Per NRCS and project's geotechnical investigation, site resides on HSG Group A soils, capable of infiltrating runoff. Based on geotechnical report, site soils is favorable for infiltration.			
3	Would infiltration of the DCV from drainage area violate downstream water rights?		X
Provide basis: No restrictions on water rights for project site.			
	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility located on HSG D soils or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?		X
Provide basis: Per NRCS and project's geotechnical investigation, site resides on HSG Group A soils, capable of infiltrating runoff. Based on geotechnical report, site soils is favorable for infiltration			
5	Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.		X
Provide basis: Geotechnical Report			
6	Would reduction of over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X

Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Project discharges to fully improved storm drain and channels that are not ephemeral.			
7	Would an increase in infiltration over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Based on TGD and county GIS records, no restrictions on infiltration due to groundwater concerns.			
Infiltration Screening Results (check box corresponding to result):			
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Per TGD and County of Orange GIS data, project is located in an area where increase in I&I to the sanitary sewer is of concern. However, infiltration area is located away from existing sanitary sewer connections.		X
9	If any answer from row 1-3 is yes: infiltration of any volume is not feasible within the DMA or equivalent. Provide basis: Answers to all questions are "no".	Infiltration is feasible	
10	If any answer from row 4-7 is yes, infiltration is permissible but is not presumed to be feasible for the entire DCV. Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Answers to items 4-7 are "no".	Infiltration is feasible	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable. Provide basis: Project proposes the use of infiltration BMPs	Infiltration is feasible	

BMP Details

Hydrologic Source Controls (HSC)

XIV.1. Hydrologic Source Control Fact Sheets (HSC)

HSC-1: Localized On-Lot Infiltration

'Localized on-lot infiltration' refers to the practice of collecting on-site runoff from small distributed areas within a catchment and diverting it to a dedicated on-site infiltration area. This technique can include disconnecting downspouts and draining sidewalks and patios into french drains, trenches, small rain gardens, or other surface depressions. For downspout disconnections and other impervious area disconnection involving dispersion over pervious surfaces, but without intentional ponding, see HSC-2: Impervious Area Dispersion.

Also known as:

- *Downspout infiltration*
- *Retention grading*
- *French drains*
- *On-lot rain gardens*

On-lot rain garden
Source: lowimpactdevelopment.org

Feasibility Screening Considerations

- 'Localized on-lot infiltration' shall meet infiltration infeasibility screening criteria to be considered for use.

Opportunity Criteria

- Runoff can be directed to and temporarily pond in pervious area depressions, rock trenches, or similar.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Shallow utilities are not present below infiltration areas.

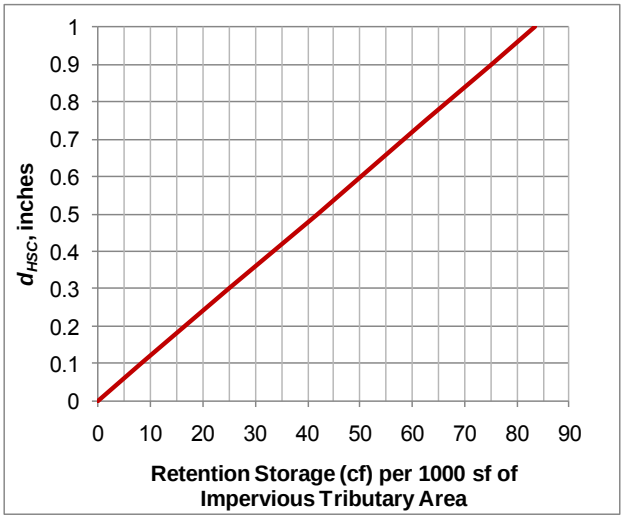
OC-Specific Design Criteria and Considerations

- ☐ A single on-lot infiltration area should not be sized to retain runoff from impervious areas greater than 4,000 sq. ft.; if the drainage area exceeds this criteria, sizing should be based on calculations for bioretention areas or infiltration trenches.
- ☐ Soils should be sufficiently permeable to eliminate ponded water within 24 hours following a 85th percentile, 24-hour storm event.
- ☐ Maximum ponding depth should be should be less than 3 inches and trench depth should be less than 1.5 feet.
- ☐ Infiltration should not be used when the depth to the mounded seasonally high table is within 5 feet of the bottom of infiltrating surface.
- ☐ Infiltration via depression storage, french drains, or rain gardens should be located greater than 8 feet from building foundations.
- ☐ Site slope should be less than 10%.
- ☐ Infiltration unit should not be located within 50 feet of slopes greater than 15 percent.
- ☐ Side slopes of rain garden or depression storage should not exceed 3H:1V.
- ☐ Effective energy dissipation and uniform flow spreading methods should be employed to prevent erosion resulting fromwater entering infiltration areas.

☐ Overflow should be located such that it does not cause erosion orand is conveyed away from structures toward the downstream conveyance and treatment system. .

Calculating HSC Retention Volume

- The retention volume provided by localized on-lot infiltration can be computed as the storage volume provided by surface ponding and the pore space within an amended soil layer or gravel trench.
- Estimate the average retention volume per 1000 square feet impervious tributary area provided by on-lot infiltration.
- Look up the storm retention depth, d_{HSC} from the chart to the right.
- The max d_{HSC} is equal to the design capture storm depth for the project site.



Configuration for Use in a Treatment Train

- Localized on-lot infiltration would typically serve as the first in a treatment train and should only be used where tributary areas do not generate significant sediment that would require pretreatment to mitigate clogging.
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or conventional treatment control BMPs.

Additional References for Design Guidance

- LID Center – Rain Garden Design Template. http://www.lowimpactdevelopment.org/raingarden_design/
- University of Wisconsin Extension. Rain Gardens: A How-To Manual for Homeowners. http://learningstore.uwex.edu/assets/pdfs/GWQ037.pdf

HSC-3: Street Trees

By intercepting rainfall, trees can provide several aesthetic and stormwater benefits including peak flow control, increased infiltration and ET, and runoff temperature reduction. The volume of precipitation intercepted by the canopy reduces the treatment volume required for downstream treatment BMPs. Shading reduces the heat island effect as well as the temperature of adjacent impervious surfaces, over which stormwater flows, and thus reduces the heat transferred to downstream receiving waters. Tree roots also strengthen the soil structure and provide infiltrative pathways, simultaneously reducing erosion potential and enhancing infiltration.

Also known as:

- *Canopy interception*

Street trees
Source: Geosyntec Consultants

Feasibility Screening Considerations

- Not applicable

Opportunity Criteria

- Street trees can be incorporated in green streets designs along sidewalks, streets, parking lots, or driveways.
- Street trees can be used in combination with bioretention systems along medians or in traffic calming bays.
- There must be sufficient space available to accommodate both the tree canopy and root system.

OC-Specific Design Criteria and Considerations

- ☐ Mature tree canopy, height, and root system should not interfere with subsurface utilities, suspended powerlines, buildings and foundations, or other existing or planned structures. Required setbacks should be adhered to.
- ☐ Depending on space constarints, a 20 to 30 foot diameter canopy (at maturity) is recommended for stormwater mitigation.
- ☐ Native, drought-tolerant species should be selected in order to minimize irrigation requirements and improve the long-term viability of trees.
- ☐ Trees should not impede pedstrian or vehicle sight lines.
- ☐ Planting locations should receive adequate sunlight and wind protection; other environmental factors should be considered prior to planting.
- ☐ Frequency and degree of vegetation management and maintenance should be considered with respect to owner capabilities (e.g., staffing, funding, etc.).
- ☐ Soils should be preserved in their natural condition (if appropriate for planting) or restored via soil amendments to meet minimum criteria described in MISC-2: Amended Soils. If necessary, a landscape architect or plant biologist should be consulted.
- ☐ A street tree selection guide, such as that specific to the City of Los Angeles, may need to be consulted to select species appropriate for the site design constraints (e.g., parkway size, tree height, canopy spread, etc.)
- ☐ Infiltration should not cause geotechnical hazards related to adjacent structures (buildings,

roadways, sidewalks, utilities, etc.)

Calculating HSC Retention Volume

- The retention volume provided by streets trees via canopy interception is dependent on the tree species, time of the year, and maturity.
- To compute the retention depth, the expected impervious area covered by the full tree canopy after 4 years of growth must be computed (IA_{HSC}). The maximum retention depth credit for canopy interception (d_{HSC}) is 0.05 inches over the area covered by the canopy at 4 years of growth.

Configuration for Use in a Treatment Train

- As a HSC, street trees would serve as the first step in a treatment train by reducing the treatment volume and flow rate of a downstream treatment BMP.

Additional References for Design Guidance

- California Stormwater BMP Handbook. **http://www.cabmphandbooks.com/Documents/Development/Section_3.pdf**
- City of Los Angeles, Street Tree Division - Street Tree Selection Guide. **http://bss.lacity.org/UrbanForestryDivision/StreetTreeSelectionGuide.htm**
- Portland Stormwater Management Manual. **http://www.portlandonline.com/bes/index.cfm?c=35122&a=55791**
- San Diego County – Low Impact Development Fact Sheets. **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

INF-6 Permeable Pavement

INF-6: Permeable Pavement (concrete, asphalt, and pavers)

Also known as:

- *Pervious pavement*
- *Porous concrete*
- *Pavers*
- *Permeable asphalt*

Permeable Pavement
Source: Geosyntec Consultants

Permeable pavements contain small voids that allow water to pass through to a gravel base. They come in a variety of forms; they may be a modular paving system (concrete pavers, grass-pave, or gravel-pave) or poured in place pavement (porous concrete, permeable asphalt). All permeable pavements treat stormwater and remove sediments and metals to some degree within the pavement pore space and gravel base. While conventional pavement result in increased rates and volumes of surface runoff, properly constructed and maintained porous pavements, allow stormwater to percolate through the pavement and enter the soil below. This facilitates groundwater recharge while providing the structural and functional features needed for the roadway, parking lot, or sidewalk. The paving surface, subgrade, and installation requirements of permeable pavements are more complex than those for conventional asphalt or concrete surfaces. For porous pavements to function properly over an expected life span of 15 to 20 years, they must be properly sited and carefully designed and installed, as well as periodically maintained. Failure to protect paved areas from construction-related sediment loads can result in their premature clogging and failure.

Feasibility Screening Considerations

- Permeable pavement shall pass infiltration infeasibility screening to be considered for use.
- Permeable pavements pose a potential risk of groundwater contamination; they may not provide significant attenuation of stormwater pollutants if underlying soils have high permeability.

Opportunity Criteria

- Permeable pavement areas can be applied to individual lot driveways, walkways, parking lots, low-traffic roads, high-traffic (with low speeds) roads/lots, golf cart paths, within road right-of-ways, and in parks and along open space edges. Impervious surfaces draining to the BMP are limited to surfaces immediately adjacent to the permeable pavement, rooftop runoff, and other nearby surfaces that do not contain significant sediment loads.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.

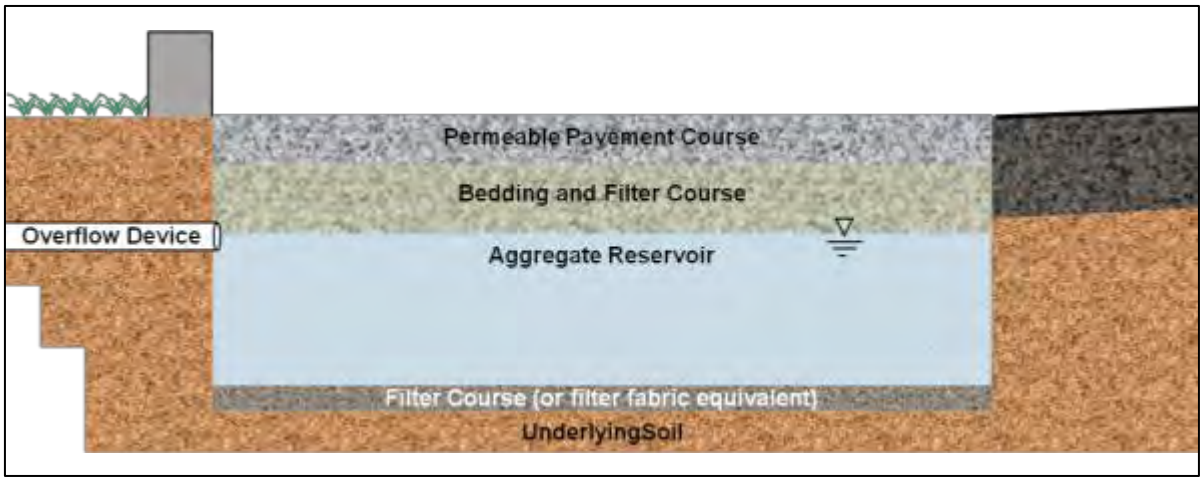
OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc)

☐ Minimum separation to mounded seasonally high groundwater of 5 feet shall be observed.

- ☐ A biotreatment BMP should be provided for all runoff from off-site sources that are not directly adjacent to the permeable pavement, with the exception of rooftops.
- ☐ Permeable pavement should not be used for drainage areas with high sediment production potential (e.g., landscape areas) unless preceded by full treatment control with a BMP effective for sediment removal
- ☐ All aggregate used to construct permeable pavement shall be thoroughly washed before being delivered to the construction site.
- ☐ The top or wearing layer course (permeable pavement course) should consist of asphalt or concrete with greater than normal percentage of voids, or paving stones.
- ☐ A layer of washed fine aggregate (e.g., No. 8) just under the permeable pavement course may be installed to provide a level surface for installing the permeable pavement and also acts as a filter to trap particles and help prevent the reservoir layer from clogging. This layer can also act as interstitial media between pavers.
- ☐ Below this layer, the bedding and filter course course should be 1.5 to 3 inches deep and may be underlain by choking stone to prevent the smaller sized aggregate from migrating into the large aggregate base layer.
- ☐ The bedding, filter, and choke stone layers, as applicable, are referred to collectively as the bedding and filter course.
- ☐ The aggregate reservoir layer should be designed to function as a support layer as well as a reservoir layer the reservoir layer should be washed, open-graded No. 57 aggregate without any fine sands.
- ☐ The type of pedestrian traffic should be considered when determining which type of permeable pavement to use in particular locations (e.g., pavers may not be a good option for locations where people wearing high heels will be walking).
- ☐ An overflow device is required in the form of perimeter control or overflow pipes. This should generally be set at an elevation to prevent ponding of water into the bedding and filter course.

Figure XIV.1: Schematic Diagram of Permeable Pavement without Underdrains



Simple Sizing Method for Permeable Pavement

Permeable pavement that manages only direct rainfall and runoff from adjacent impermeable surfaces less than 50 percent the size of the permeable pavement are are not required to conduct sizing calculations. These areas are assumed to be self-retaining for the purpose of drainage planning.For permeable pavement with larger tributary area ratios, sizing calculations must be performed.

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size permeable pavement, the user calculates the DCV, designs the geometry required to draw down the DCV in 48 hours, then determines the area that is needed for the BMP. The area of the porous pavement itself as well as the area of the tributary areas should be considered in calculating the DCV. The sizing steps are as follows:

Step 1: Determine Permeable Pavement DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Determine the 48-hour Effective Depth

The depth of water that can be drawn down in 48 hours can be calculated using the following equation:

$d_{48} = K_{DESIGN} \times 48 \text{ hours} \times 1 \text{ ft}/12 \text{ inches}$

Where:

d_{48} = pavement effective 48-hour drawdown depth, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See **Appendix VII**)

This is the maximum effective depth of water storage in the aggregate reservoir to achieve drawdown in 48 hours.

Step 3: Determine the Aggregate Reservoir Depth

The depth of water stored in the gravel reservoir should be equal or less than d_{48}. Determine the reservoir depth such that:

$d_{48} \geq (n_R \times d_R)$

Where:

d_{48} = trench effective 48-hour depth, ft (from Step 2)

n_R = porosity of aggregate reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of trench fill, ft

Step 4: Calculate the Required Infiltrating Area

The required infiltrating area can be calculated using the following equation:

$A = DCV / (n_R \times d_R)$

Where:

A = required footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_R = porosity of trench fill; 0.35 may be assumed where other information is not available

d_R = depth of trench fill, ft

This area is equal to the required pavement area.

The ratio total tributary area (including the porous pavement) to the area of the porous pavement should not exceed 4:1.

Capture Efficiency Method for Permeable Pavement

If BMP geometry has already been defined and deviates from the 48 hour drawdown time, the designer can use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Option 1: Pavement Geometry is Predefined

Step 1: Determine the Drawdown Time Associated with the Selected Pavement Geometry

$DD = ((n_R \times d_R) / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain pavement, hours

n_R = porosity of reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of reservoir, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See **Appendix VII**)

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the draw-down adjusted DCV that the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the pavement drawdown time calculated above.

Step 3: Determine the Pavement Infiltrating Area Needed

The required infiltrating area can be calculated using the following equation:

$A = DCV / (n_R \times d_R)$

Where:

A = required footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_R = porosity of reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of reservoir, ft

If the area required is greater than the selected pavement area, adjust reservoir depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Permeable pavement may be preceded in a treatment train by HSCs in the drainage area, which would reduce the runoff volume to be infiltrated by the permeable pavement
- Permeable pavement areas can be designed to be self-retaining to lessen the pollutant and volume load on downstream BMPs.

Additional References for Design Guidance

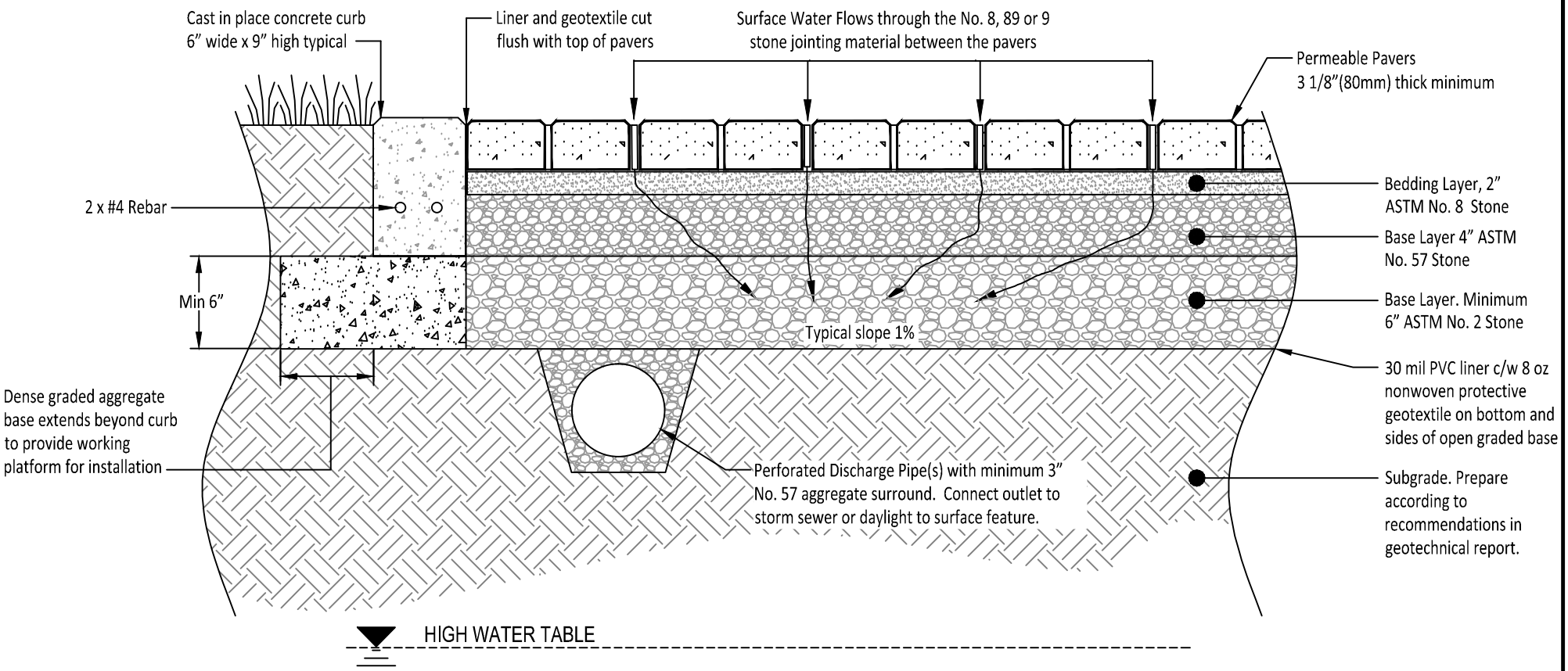
- SMC LID Manual (pp 84): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- City of Portland Stormwater Management Manual (Pervious Pavement, page 2-40) **http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883**

  San Diego County LID Handbook Appendix 4 (Factsheets 8, 9 & 10): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

  City of Santa Barbara Storm Water BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

  County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**



Design Notes:

1. Depth of subbase subject to site specific hydraulic and structural requirements. Contact Oldcastle Architectural for design assistance.
2. Paver thickness subject to aspect ratio requirements based on traffic loading.
3. Diameter, and number, of horizontal discharge pipe(s) subject to permitted stormwater discharge rate from the site.
4. The need for a nonwoven protective geotextile underneath the liner is subject to the subgrade soil conditions.
5. ASTM #2 stone may be substituted with #3 or #4 stone.

OLDCASTLE ARCHITECTURAL, INC.
375 NORTH RIDGE ROAD, SUITE 250
ATLANTA, GEORGIA 30350
PHONE NO. (770) 804-3369

Belgard Permeable Paving Detail

PICP No Exfiltration Boulevard Design

This cross section drawing is intended for preliminary design purposes only. The actual structural design and site evaluation shall be performed by a qualified Professional Engineer. Oldcastle accepts no liability for the improper use of this detail.

Attachment D

WQMP Notice of Transfer of Responsibility

Water Quality Management Plan

Notice of Transfer of Responsibility

Tracking No. Assigned by the City of Costa Mesa: _____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of Costa Mesa that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further discussed.

I. Previous Owner/Previous Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	Zip:	Phone:

II. Information about Site Transferred

Name of Project (if applicable): TTM 17779		Contact Person:	
Title of WQMP applicable to Site: Conceptual WQMP for TTM 17779			
Planning Area (PA) and/or Tract Number(s) for Site Lot Numbers (if Site is a portion of a tract): TTM 17779			
Date WQMP Prepared (and revised if applicable):			
Street Address of Site: 1239 Victoria Street			
City: Costa Mesa	State: CA	Zip: 92626	Phone:

III. New Owner/New Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	Zip:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/Parcel Subject to WQMP Retained by Owner (if any):
Lot/Tract Numbers of Site Transferred to New Owner:	
Remaining Lot/Tract Numbers Subject to WQMP Still Held by Owner (if any):	
Date of Ownership Transfer:	

Note: When the Previous Owner is transferring a site that is a portion of a larger project/parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/parcel not transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled "Previous Owner," and those portions previously transferred by Previous Owner shall be labeled as "Previously Transferred."

V. Purpose of Transfer

The purpose of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Owner is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I Certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I Certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature of New Owner Representative:	Date:

Attachment E

Geotechnical Investigation