Preliminary

Water Quality Management Plan

For:

Tract 20161 at the Preserve

Prepared for:

Chino Preserve Development Corp.

1156 N. Mountain Avenue

Upland, CA 91715

909-946-7513

Prepared by:

L. D. King, Inc.

10390 Commerce Center Drive, Suite 250

Rancho Cucamonga, CA. 91730

909-945-0526

Approval Date:_____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Lewis Investment Company by L. D. King, Inc. The WQMP is intended to comply with the requirements of the City of Chino and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. 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 San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	Tract 20161	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

Owner's Signature		
Owner Name: Pat Loy		
Title	Authorized Agent	
Company	Chino Preserve Development Corp.	
Address	1156 N. Mountain Avenue, Upland, CA. 91715	
Email	pat.loy@lewisop.com	
Telephone #	909-946-7513	
Signature		

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):	Tract 20161	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Carla E. Berard		PE Stamp Below
Title	CEO	
Company	L. D. King, Inc.	
Address	10390 Commerce Center Drive Rancho Cucamonga, CA 91730	
Email	cberard@ldking.com	
Telephone #	909-945-0526	
Signature		
Date		

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Forms

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Tract 20161				
Project Owner Contact Name:	Pat Loy				
Mailing Address:	1156 N. Mountain Avenue Upland, CA. 91715	E-mail Address:	pat.loy@lewisop.com	Telephone:	909-946-7513
Permit/Application Number(s):			Tract/Parcel Map Number(s):	Tract 20161	
Additional Information/ Comments:					
Description of Project:	Tract 20161 contains 744 single-family and apartment dwellings in the City of Chino. The project is a mixture of detached homes on individual lots, detached condominiums, attached multi-unit condominiums and apartment buildings. The site is located about 1000' West of Rincon Meadows Avenue between Bickmore Avenue to the north and Pine Avenue to the south in the City of Chino, Ca. just west of the Bickmore Basin. The site is approximately 70 acres				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	Storm runoff from the site generally flows south and west to a series of 24 catch basins spanning north and south along the central street of the tract. The catch basins are generally located along the length of Meadowhouse Avenue and various other streets that make up the backbone infrastructure of the tract. These catch basins drain into a detention and water quality basin located at the southwestern corner of Tract 20161. The detention basin serves to mitigate the storm runoff and to maintain a lower flowrate during periods of intense rain. Prior to draining into the basin, the water quality flows from Tract 20161 are diverted to a Treatment Train of BMPs that include a nutrient separating baffle box and a French Drain type bio-filtration system in the dry extended detention basin. The basin is drained through a pump system that will evacuate the basin within a 48 hour period. See the BMP Site Plan Exhibit and the Basin Concept Plan in Section 6. The site is located in the Santa Ana River Basin identified by the State of California Regional Water Quality Control Board as Region 8. More specifically, the site is part of the Santa Ana River Hydrologic Unit, 801.00, the Middle Santa Ana River Hydrologic Area, 801.20 and the Chino Hydrologic Sub-area Split, 801.21. The proximate entrance to the Santa Ana river system is through the southerly end of Chino Creek Reach 1, a tributary of the Prado Park Lake, which drains to the Santa Ana River, Reach 3. A copy of the "State of California Regional Water Quality Control Board, Santa Ana Region (8) Santa Ana Hydrologic Basin Planning Area Map (SA)" is included in Section 6. The apartment portion of this project was previously permitted under Order R8-2002-0012 per the WQMP for Tract 17571, Lot 11 Meadow Square Apartments (Chino Preserve – Planning Area 7) on file with the City of Chino. This report was prepared by Fuscoe Engineering on June 8, 2007 and Revised on July 23, 2007. See the approval page in Section6. This area is being added into the treatment area for Tract 20161, being tributary to the storm drain system, and the treatment provided by the current system is equal to or better than the previous system. This WQMP will supersede all previously approved WQMPs and incorporate all portions of Tract 17571, Lot 11 into the current drainage area and BMP coverage.				

Section 2 Project Description

2.1 Project Information

2.1.1 The Preserve Specific Plan Area

The Preserve is located in the southwest corner of San Bernardino County, about 37 miles east of Los Angeles and 115 mile north of San Diego. The Preserve is located in the vicinity of the incorporated cities of Chino, Chino Hills, Yorba Linda, Pomona, Ontario, Norco, and Corona. The Santa Ana River and the Prado Flood Control Basin are located to the south of the project site and the Chino Hills State Park is located to the west. The Preserve is about two miles in width and three miles in length, in total encompassing 5435.3 acres. The cities of Chino and Chino Hills border The Preserve to the west. Ontario and the Chino Airport are to the north. The City of Eastvale, in the County of Riverside, forms the eastern boundary. Finally, the Prado Flood Control Basin in the County of Riverside serves as the southern border.

The Preserve is a part of the Chino Valley, a generally flat sub-portion of San Bernardino Valley. Elevations in the Preserve vary from about 500 to 660 feet above sea level. The Santa Ana River drainage, which originates in the San Bernardino Mountains, highly influences Chino Valley. Southwest of the study area, the Santa Ana River drains through the narrow Santa Ana Canyon between the Chino Hills and the Santa Ana Mountains before eventually emptying 30 miles to the southwest into the Pacific Ocean.

The ground surface in The Preserve generally slopes from north to south, with about half (2,779 acres) within the impoundment area of the Prado Dam. Existing storm drainage facilities within The Preserve are minimal. There is a storm drain that extends north across Chino Airport runway as a 10-foot (wide) by 6-foot (high) double barrel reinforced box (RC box), thence as a trapezoidal concrete channel across the airport property at Merrill Avenue. In addition, the Cucamonga Creek Flood Control extends into the Preserve Planning Area at a location just west of Hellman Avenue and north of Chino-Corona road where it reverts back to Mill Creek, a natural water source.

Soils in the study area were found to contain varying amounts of silt and organic material including manure, artificial fill, and alluvium. The manure and artificial fill were found in stockpiles. The alluvium primarily consists of sandy silts and sand and silty clays. In general, the alluvial soils are stiff and have a moisture content ranging from about 4% to more than 15% above the optimum moisture content. Soils in the study area range in Soil Conservation Service (SCS) Soil Type. For example, some of the site consist of SCS Type A (sand, loamy sand or sandy loam), which have high infiltration and a high rate of water transmission, but some areas of the site consist of SCS Soil Type D (clay loam, silty clay loam, sandy clay, silty clay, or clay), which have high runoff potential and a very low rate of water transmission. These are classifications according to the United States Department of Agriculture Natural Resources Conservation Service.

2.1.2 This Project – Tract 20161

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532-7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☐ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements.*

2 Project Area (ft^2):	3,060,000	**3** Number of Dwelling Units:	716	**4** SIC Code:	

5 Is Project going to be phased? Yes ☒ No ☐ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☒ No ☐ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

This project (Tract 20161) conforms to the general conditions in The Preserve. The maximum elevation is 586 on the north boundary at Bickmore Avenue and slopes at approximately 1% toward the southerly boundary to an elevation of 566. The site was previously used as a dairy. The existing structures have been removed during the rough grading operation along with the manure and other unsuitable material. The soil has been processed and remediated to remove contaminants.

The older alluvium on the site is composed of medium dense to dense sandy silts, silts, clayey silts, silty clays and silty sands. In general the upper 4 to 6 feet of the alluvial soils are found to be medium dense to dense and typically slightly porous with localized moderately porous areas. Below this depth the alluvium generally becomes dense and non-to-slightly porous. In the western portion of the site a thin layer of carbonates was encountered at depths of 3 to 5 feet below ground surface.

2.2 Property Ownership/Management

In accordance with the Clean Water Act's National Pollutant Discharge Elimination System (NPDES), the California Environmental Protection Agency's State Water Resources Control Board has issued Municipal Separate Storm Sewer System (MS_4) Permits establishing municipal agency requirements as it relates to implementing/meeting storm water quality requirements/objectives. The applicable MS_4 Permit for the Preserve is Order No. R8-2002-0012, issued to those municipal agencies in San Bernardino County whose watersheds fall within the Santa Ana River Basin, including the City of Chino (the City). In accordance with MS_4 requirements, the City of Chino is responsible for ensuring new development projects implement Water Quality Management Plans (WQMPs) with the goal of eliminating the discharge of pollutants in storm water and thus protect the state's receiving waters.

Home Owners Associations (HOAs) are needed to address maintenance of private facilities held in common ownership. The City has, at the discretion of the Director of Community Development, required a HOA be established to ensure the long-term maintenance of projects. This HOA is the Preserve Master Maintenance Corporation (PMMC).

All projects in the Preserve are required to be reviewed and approved by the Design Review Board. The Design Review Board and procedures have been established by the City for approval of any development project within The Preserve and are be composed of City Staff, Planning Commissioners, City Council members, design professionals, an architect on contract, members of the public, or some combination thereof.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

This project is a combination of 758 SFR lots, SFR attached & detached condominiums and apartments in a non-gated neighborhood. The individual units or lots will be private ownership with the infrastructure maintained by a combination of the City of Chino and The Preserve Master Maintenance Corporation (PMMC).

The common area BMPs within the Public Right of Way and private landscape lots will be maintained by the Preserve Master Maintenance Corporation.

Ms. Katie Ward
c/o The Preserve Master Maintenance Corporation
15871 Main Street
Chino, CA 91710
(909) 606-7446

The gated community portion of the project will have a Sub-HOA to maintain the landscaping and any private utility infrastructure. The Apartments are owned by Western National Corp. and are maintained by the apartment management

The individual homeowner BMPs will be maintained by the homeowners of the property where they are located.

A summary matrix of BMP ownership and maintenances tasks has been developed and is included in Section 5 Inspection and Maintenance Responsibility for Post Construction BMP.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Expected for residential development , restaurants, and hillside development.
Phosphorous	E ☒	N ☐	Expected for residential development and hillside development.
Nitrogen	E ☒	N ☐	Expected for residential development and hillside development.
Sediment	E ☒	N ☐	Expected for residential development, streets/highways/freeways and hillside development.
Metals	E ☐	N ☒	Expected for parking lots and streets/highways/freeways.
Oil and Grease	E ☒	N ☐	Expected for all site development.
Trash/Debris	E ☒	N ☐	Expected for all site development.
Pesticides / Herbicides	E ☒	N ☐	Expected for residential development and hillside development.
Organic Compounds	E ☒	N ☐	Expected for automatic shops, parking lots, and streets/highways/freeways.
Other: Oxygen Demanding Substances	E ☒	N ☐	Expected for residential development, restaurants, and hillside development.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

There are no water quality credits for this project.

Form 2.4-1 Water Quality Credits			
1 Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit 0% *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)			

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

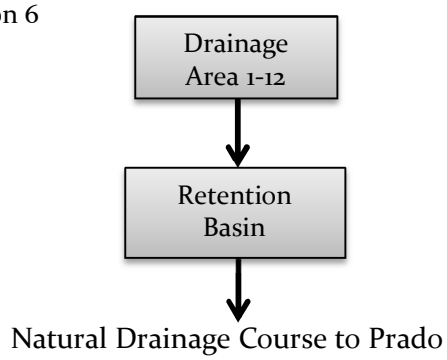
Form 3-1 Site Location and Hydrologic Features

Site coordinates. *Take GPS measurement at approximate center of site*	Latitude 33.95928	Longitude 117.64108	Thomas Bros Map page N/A

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes No If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached

See DMA Map is Section 6



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 – DA 12 to Basin	Street carries water to catch basins that collect flow into the storm drain conveying water to Meadowhouse, then outlets into the Basin. WQ flow diverted into NSBB, then to Subdrain System. Basin pumped to drainage ditch on Pine Avenue at low flow rate.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*				
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*				
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*				

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool -* *http://sbcounty.permitrack.com/WAP* *See 'Drainage Facilities" link at this website*	Prado Park Lake
Applicable TMDLs *Refer to Local Implementation Plan*	Middle Santa Ana River Bacteria TMDL
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Prado Park Lake – Bacteria Indicators/Pathogens and Nutrients
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	None
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Prado Park Lake
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No Regional Board has determined no HCOC is letter Dated 8-12-2014
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* ▪ *More Effective than On-site LID* ▪ *Remaining Capacity for Project DCV* ▪ *Upstream of any Water of the US* ▪ *Operational at Project Completion* ▪ *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Residential BMP Packets will be given to all first time homeowners as part of the disclosure exhibits ditributed by Home Builder. A copy of the educational materials is located in Section 6.4
N2	Activity Restrictions	☒	☐	Homeowners must prevent potential pollutant runoff. See Section 6.4 for a copy of The Preserve CC&Rs.
N3	Landscape Management BMPs	☒	☐	The PMMC will provide maintenance of all landscaping on the collector streets, parks and common areas. The Landscape Management Program will follow the guidelines provided in the CASQA BMP Fact Sheet SC-73.
N4	BMP Maintenance	☒	☐	BMP Maintenance of the On-Site Detention Basin, Nutrient Separating Baffle Box and future Regional Natural Treatment System will be provided by the City of Chino and the PMMC.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Individual home owners will be educated about household hazardous waste through the Property Owner Education materials and public notices of locations and times for Household Hazardous Waste collection and disposal provided by the City of Chino.
N6	Local Water Quality Ordinances	☒	☐	This WQMP has been prepared in compliance with the City of Chino Municipal Code: Stormwater Drainage System Regulations (Ch 13.25) requireing the adherence to a system of Best Management Practices (BMPs) and compliance with the National Pollution Discharge Elimination System (NPDES) Permit (MS4).
N7	Spill Contingency Plan	☐	☒	Tract 20161 is a residential development only. No Commercial or industrial hazardous wastes will be stored on-site.
N8	Underground Storage Tank Compliance	☐	☒	Tract 20161 is a residential development only. No underground storage tanks will be allowed on-site.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Tract 20161 is a residential development and will not allow the storage or handling of Hazardous Materials.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Tract No. 20161 will be inspected by the Chino Valley Independent Fire Dept.
N11	Litter/Debris Control Program	☒	☐	The HOA will provide Litter/ Debris Control for the Collector Streets, Parks and all Landscape Lots. Home Owners will provide Litter/ Debris control on private lots.
N12	Employee Training	☒	☐	A copy of this WQMP will be on file at the HOA office and board members will be educated on it. This WQMP is one of their guidelines and should be reviewed alongside the CASQA Stormwater BMP Handbook for New Development and Redevelopment by personnel prior to performing BMP maintenance. Training should be both formal and informal, occur on an ongoing basis when it is appropriate and convenient, and should include training/workshops offered by the SWRCB, RWQCB, or other locally recognized agencies or professional organizations.
N13	Housekeeping of Loading Docks	☐	☒	Tract 20161 is a residential development only. No loading docks will be allowed on-site.
N14	Catch Basin Inspection Program	☒	☐	The catch basins within the public streets will be inspected and maintained by the City of Chino Public Works Department.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	All Public streets will be swept by the City of Chino. Any Private streets will be swept by the Master Maintenance Corporation.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	N/A
N17	Comply with all other applicable NPDES permits	☒	☐	Compliance under the California CGP was obtained under WDID _____

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	All catch basins will be labeled with "No Polluting - Flows to River" plastic label provided by the City of Chino.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	Tract 20161 is a residential development only. No outdoor material storage areas will be allowed on-site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Tract 20161 is a Mixed Residential Development. The Gated neighborhood and Condominiums will have common area trash enclosures, but the non-gated SFR detached neighborhoods will not have any common area trash enclosures.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Homebuilder will provide compliance with CASQA BMP Fact Sheet SD-12.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Homebuilder will finish all landscape areas at 1 - 2 inches below adjacent hardscape areas.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	All slopes greater than 1.5 foot in height are landscaped to prevent erosion.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	Tract 20161 is a residential development only. No covered dock areas will be allowed on-site.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Tract 20161 is a residential development only. No Covered Maintenance bays will be allowed on-site.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Tract 20161 is a residential development only. No vehicle wash areas will be constructed on-site.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	Tract 20161 is a residential development only. No covered outdoor processing areas will be allowed on-site.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Tract 20161 is a residential development only. No equipment wash areas will be allowed on-site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Tract 20161 is a residential development only. No fueling areas will be allowed on-site.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	This project is not a hillside development.
S14	Wash water control for food preparation areas	☐	☒	Tract 20161 is a residential development only. No commercial food preparation areas will be constructed on-site.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Tract 20161 is a residential development only. No community car wash racks will be constructed on-site.

4.1.2 Preventative LID Site Design Practices

The LID Site Design Practices and rationale for incorporation of specific BMPs are shown in the table below. The previous site usage was for dairy prior to development and mitigation of previous pollutants was undertaken during the grading operation. Most of the site was open fallow ground for 5 years previous to development with only natural native vegetative cover. The natural infiltration rate for the site is 0.06 inches per hour. With a safety factor of 2 this is an effective infiltration rate of 0.03 inches per hour. The low rate makes infiltration not feasible as a Site Design BMP for the overall project, however landscape areas have been utilized to provide opportunity for any infiltration that can occur. All of the homesites and the club house will have enhanced landscaping and tree canopy provided to increase the amount of evapotranspiration.

See BMP Site Plan in Section 6.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: The guest builder will finalize the per-lot landscaping details Lettered landscape lots and pocket parks increase the permeable area of the tract. 10-foot wide landscaped strips are to be constructed between sidewalks and curb, with additional 16- to 30-foot medians on a portion of the backbone streets providing additional opportunities for infiltration. Please see the street sections for Tract 20161 included in Section 6 for specific widths of areas to be treated with landscaping. With the exception of Meadowhouse Avenue being a Van Vliet Entry Spine per The Preserve Specific Plan, all streets are designed to the minimum City requirements of 36', with sidewalks being 4' on the interior streets. A 10-foot landscaped strip between the curb and sidewalk is used. Please see the street sections for Tract 20161 included in Attachment B for specific street widths used.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Landscaped recreational park areas and 10-foot wide landscaped strips between sidewalks and curbs are to be constructed, and 16- to 30-foot landscaped medians will be constructed on a portion of the backbone streets. Additionally, about 5% of the Tract 20161 lies within the Southern California Edison Easement and will remain undeveloped and conducive to overland infiltration.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Tract 20161 follows the natural drainage conditions of the pre-developed site and all flows ultimately terminate into the Prado Dam area.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Roof and sidewalk drainage are directed to the landscaped areas for pretreatment and some infiltration before flowing to the detention and water quality basin.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: The site was formerly operated as a dairy. There are no natural areas to conserve.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: The guest builder will finalize the per-lot landscaping details. The existing condition is open space farmland. There are no existing native trees or vegetation to preserve. The landscaping will be turf, shrubs and street trees for the parkways that will have water efficient irrigation and be designed to minimize water use.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: The basin was constructed with the minimum compaction necessary.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: The guest builder will finalize the per-lot landscaping details and provide plans when available. The use of graded grass swales will be encouraged wherever possible for lot drainage purposes on the multi-family housing areas, which will be maintained by the HOA.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: The guest builder will finalize the per-lot landscaping details and provide plans when available.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 61.8 ac.	**2** Imperviousness after applying preventative site design practices (Imp%): 0.653	**3** Runoff Coefficient (R_c): _ 0.451 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.555 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.822 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 165,920 CF, or 3.81 AF *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☐

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)*

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** **0.68 AF** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** **28.45 cfs** *Form 4.2-5 Item 10*
Post-developed	**4** **6.83 AF** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** **50.61 cfs** *Form 4.2-5 Item 14*
Difference	**7** **6.15 AF** *Item 4 – Item 1*	**8** *Item 5 – Item 2*	**9** **22.16 cfs** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** **715 %** *Item 7 / Item 1*	**11** **%** *Item 8 / Item 2*	**12** **77.9 %** *Item 9 / Item 3*

The Detention Basin will capture the entire 2-yr 24 hr storm. The total capacity is 22.31 af. The interim pump station will outlet water at 10.5 cfs, which is about 1/3 the undeveloped 2yr Q.

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): S = (1000 / Item 5) - 10	**9** Initial abstraction, I_a (in): I_a = 0.2 * Item 7
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): S = (1000 / Item 6) - 10	**10** Initial abstraction, I_a (in): I_a = 0.2 * Item 8

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)* ***0.68 AF***

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)* **6.83 AF**

14 Volume Reduction needed to meet HCOC Requirement, (ft^3): **6.15 AF**
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

See Unit Hydrographs in Section 6.

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o = *Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} = *(1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t = *Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c = *Item 5 + Item 11*								

13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ = *(Item 14 * 0.95) – Item 13*

See Unit Hydrographs in Section 6.

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (ft^2) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*

10 Peak runoff from pre-developed condition confluence analysis (cfs): **28.45 cfs** *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*

14 Peak runoff from post-developed condition confluence analysis (cfs): **50.61 cfs** *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

15 Peak runoff reduction needed to meet HCOC Requirement (cfs): **22.16 cfs** *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*

See Unit Hydrographs in Section 6.

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒

(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? The design rate is 0.03 in/hr. See Section 6 for Infiltration Report Yes ☒ No ☐

If Yes, Provide basis: (attach)

6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒

See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒

If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 9 below.

8 Any answer from Item 4 through Item 6 is "Yes": Yes ☒ No ☐

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

9 All answers to Item 1 through Item 6 are "No":

Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

To be filled out when final Housing Product is chosen.

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☐ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☐ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): $V_{retention}$ *=Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☐ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft_3): $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☒ No ☒ *If yes, complete Items 20-2. If no, proceed to Item 24*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft_3): $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrels/cisterns: Yes ☐ No ☐ *If yes, complete Items 27-28; If no, proceed to Item 29*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft^3): $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Infiltration has been determined to be infeasible; therefore Form 4.3-3 has been eliminated.

4.3.3 Harvest and Use BMP

Harvest and use BMP are not considered feasible for this site taking into account the sporadic nature of the rainfall & the local availability of recycled water that will be used for all public landscaping; therefore Form 4.3-4 has been eliminated.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (20161)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 165,920 CF, or 3.81 AF *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*

List pollutants of concern *Copy from Form 2.3-1.*
Bacteria, Nutrients, Phosphorous, Nitrogen, Sediment, Oil & Grease, Trash/Debris, Pesticides/Herbicides, Organic Compounds and Oxygen Demanding Substances.

2 Biotreatment BMP Selected (*Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*

Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
☒ Bioretention with underdrain	☐ Vegetated swale
☐ Planter box with underdrain	☐ Vegetated filter strip
☐ Constructed wetlands	☐ Proprietary biotreatment
☐ Wet extended detention	
☐ Dry extended detention	

3 Volume biotreated in volume based biotreatment BMP (ft^3): 22.31 AF *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*

4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*

5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*

6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*

7 Metrics for MEP determination:

Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*

Form 4.3-6 Volume Based Biotreatment (20161) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA 20161 Focal Point Bioretention Filter	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*	Bacteria, nutrients, Oil & Grease, Pesticides and Organic Compounds		
2 Amended soil infiltration rate. *Typical ~ 5.0*			
3 Amended soil infiltration safety factor. *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*	100 in/hr		
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*	45		
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	10’		
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*	4.5’		
8 Amended soil surface area (ft^2)	30,000		
9 Amended soil depth (ft) see *Table 5-6 of the TGD for WQMP for reference to BMP design details*	1.5		
10 Amended soil porosity, *n*			
11 Gravel depth (ft) see *Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, n			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	3.81 AF		

15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: **3.81 AF**

Sum of Item 14 for all volume-based BMPs included in this form

See Focal Pointe Calculations in Section 6.

Form 4.3-7 Volume Based Biotreatment (20161) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} *= Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ *=(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7) $^{\wedge 0.5}$]				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} *= (Item 8$_{forebay}$ + Item 8$_{basin}$) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ *= (Item 8$_{forebay}$ + Item 8$_{basin}$) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (20161)

1 Total LID DCV for the Project DA-1 (ft^3): 165,920, or 3.81 AF *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 0 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 22.3 AF *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☐ No ☒
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, Valt = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

The Regional Board has determined that HCOCs are not a problem for this portion of the Prado Dam area per Letter dated 8-12-2014.

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (1)

1 Volume reduction needed for HCOC performance criteria (ft^3): **6.15 AF** *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): 0 *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): **6.15 AF** *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): **22.31 AF** *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☒

  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)

  The Time of Concentration will be increased by the retention basin based upon the decrease in max flow rate of 28.45 cfs to max flow rate of 10.5 cfs.
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☒

  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)

  The peak flow rate will be the pumping rate of 10.5 cfs, which is below the pre-developed rate of 28.45 cfs.
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

There is no alternative compliance plan in place for this project.

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Responsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Basin	PMMC	Perform Maintenance to remove accumulated trash and debris in the basin at the middle and end of the wet season. The frequency may be altered to meet specific site conditions and aesthetic considerations such as those that may occur after a heavy storm.	Semiannual
Basin	PMMC	Vector Control to include inspection for possible vector harborage and notifying the Vector Control Agency immediately for vector abatement assessment. Housekeeping practices such as removal of debris accumulation and vegetation management.	In the event of standing water for mor than 72 hours
Basin	PMMC	Inspect for burrowing rodent activity such as ground squirrel holes, mole and gopher mounds. Abate or control rodents as necessary if their activity affects the performance of the Basin. Otherwise abate annually in September.	Quarterly
Basin	PMMC	Maintain emergent and perimeter shoreline vegetation as well as site and road access to facilitate vector surveillance and control activities.	With normal landscape maintenance.
Basin	PMMC	Remove accumulated sediment and re-grade basin.	Every 10 years or when the accumulated sediment volume exceeds 10% of the basin volume.
NSBB	PMMC	Please refer to the O&M manual for the Bio Clean Environmental Services nutrient separating baffle box model number NSBB 6-12-84 located in Section 6.	As Required

Focal Point Biofilter System	PMMC	Remove sediment & debris within filtration area. Repair any damage.	Quarterly
Landscape	PMMC	Mow all turf areas before they reach a height of three inches with mower set to two inches.	Ongoing
Landscape	PMMC	Remove all weeds, rock, debris, and other extraneous materials from the immediate area that may pose a hindrance to mowing, exercising care to avoid damage to roots of growing plants.	Ongoing
Landscape	PMMC	Replace missing mulch under shrubs as needed.	Ongoing
Landscape	PMMC	Adjust all sprinkler heads with screw as needed to ensure uniform coverage and to avoid overthrow onto walls, walks, and other hardscape areas. Adjust angle of risers on slopes, for maximum throw. Head to head coverage is required. Areas that do not have adequate irrigation coverage or which may require additional watering shall be watered by hand as required. Check/adjust watering schedule.	As Needed
Landscape	PMMC	All pruning shall be done in accordance with applicable standards; damaged, dead or drying branches shall be removed back to a point of growth.	Ongoing
Landscape	PMMC	Take any appropriate steps to eliminate any rodents encountered on site.	As Needed
Landscape	PMMC	Wastes to be recycled at an offsite facility.	Ongoing

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections


Tract No. 17571
Legend
33.959278, 117.641078
Bickmore Ave
Botany St
Hollyhock Ave
Tract 17571
Desert Holly St
Sultana Ave
Meadowhouse Ave
Rincon Meadows Ave
Pine Ave
Google earth
N
800 ft

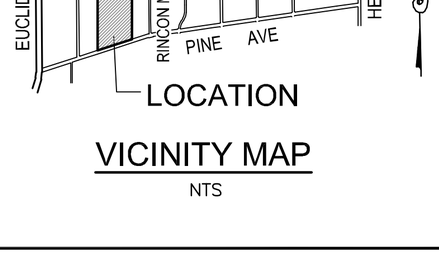
COMPOSITE MAP
TRACT No. 20161

L.D. KING, INC. **MARCH 2019**

BICKMORE AVENUE
OSPREY AVENUE
MERIDIAN STREET
MEADOWHOUSE AVENUE
TRACT No. 20169
TRACT No. 20171
TRACT No. 20170
TRACT No. 20172
SANDPIPER AVENUE
BOTANY STREET
BOTANY STREET
HOLLYHAWK AVENUE
CENTRAL PARK
NOT A PART
OLIVE GROVE AVENUE
TRACT No. 20270
CHANNEL VIEW STREET
TRACT No. 20171
MEADOWHOUSE AVENUE
TRACT No. 20173
NOT A PART
TRACT No. 20169
SANDPIPER AVENUE
DESERT HOLLY STREET
MEADOWHOUSE AVENUE
NOT A PART
SOUTHERN CALIFORNIA EDISON EASEMENT
TRACT No. 20271
N.A.P.
PINE AVENUE

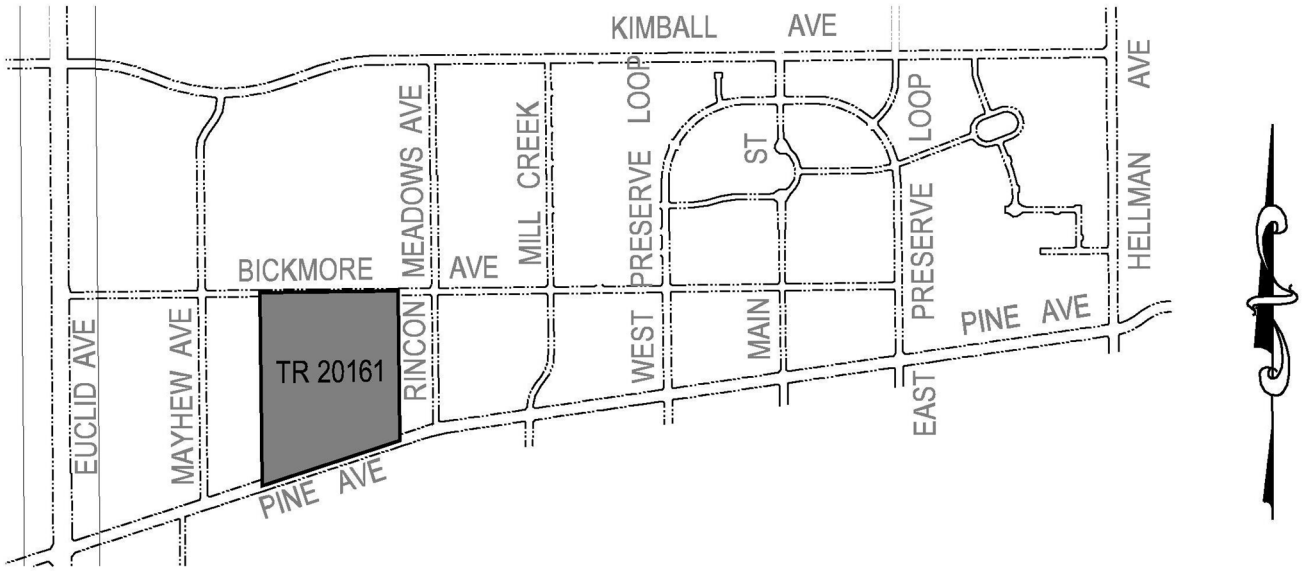
SCALE: 1"=80'

GRAPHIC SCALE
80 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.



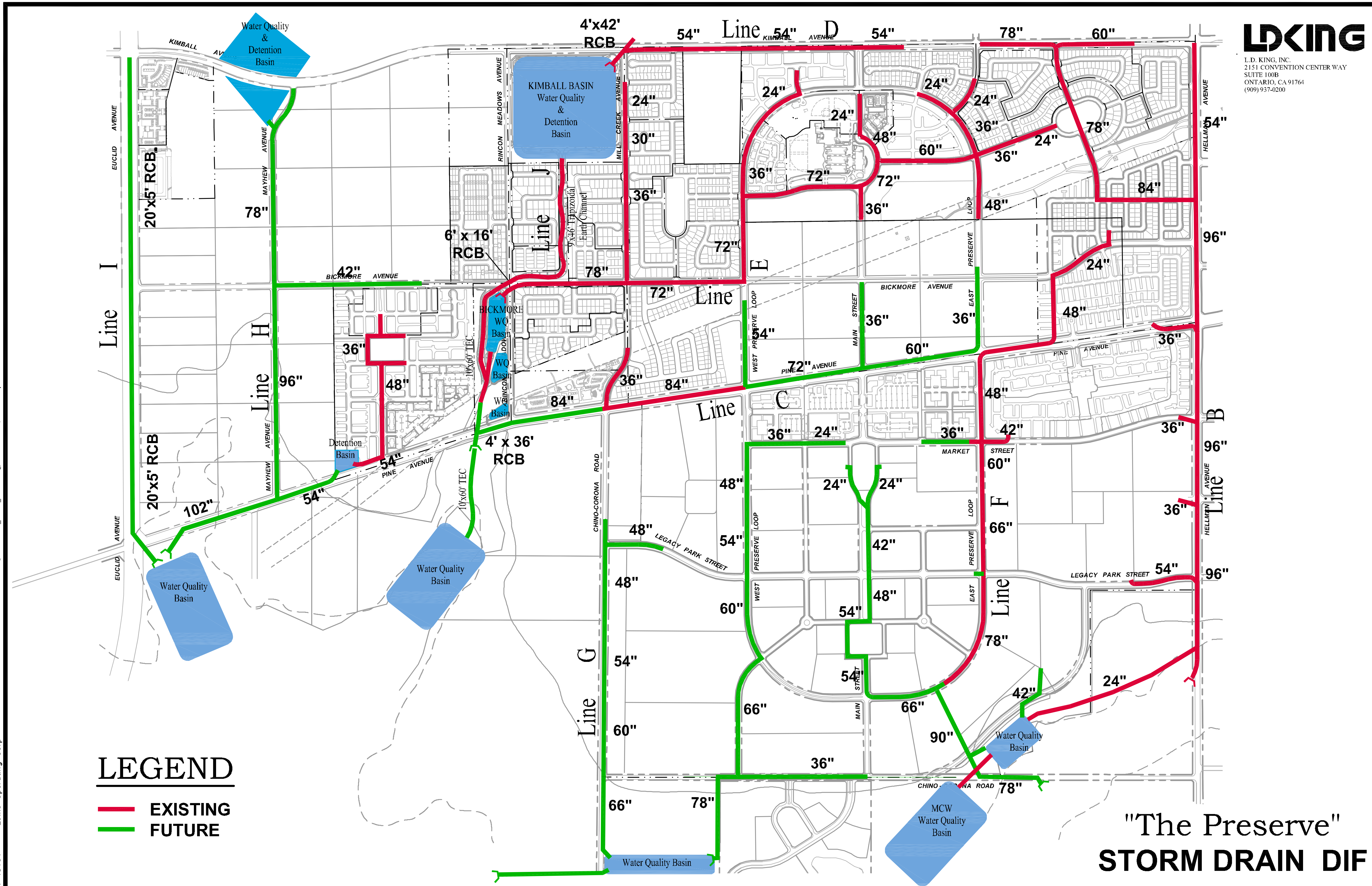
VICINITY MAP
NTS

Vicinity Map



VICINITY MAP

NOT TO SCALE



WQMP Site Plan – Storm Drain Plans

BMP SITE PLAN
TRACT No. 20161

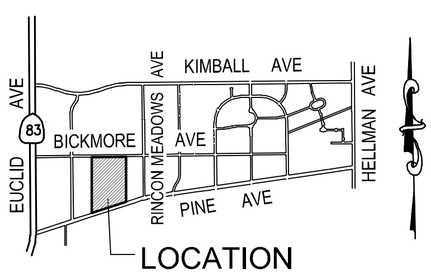
HOLSTEIN STREET
DEXTER STREET
OSPREY AVENUE
MOONFLOWER AVENUE
BICKMORE AVENUE
MEADOWHOUSE AVENUE
OSPREY AVENUE
MERIDIAN
STREET
SANDPIPER AVENUE
BOTANY STREET
HOLLYHOCK AVENUE
CENTRAL PARK
NOT A PART
OLIVE GROVE AVENUE
CHANNEL VIEW STREET
MEADOWHOUSE AVENUE
EXISTING MEADOWHOUSE
RENTAL COMMUNITY (PRIVATE)
DESERT HOLLY STREET
PRIVATE DRIVE
EXISTING MEADOWHOUSE
RENTAL COMMUNITY (PRIVATE)
SOUTHERN CALIFORNIA EDISON EASEMENT
SANDPIPER AVENUE
MEADOWHOUSE AVENUE
PRIVATE DRIVE
NSBB
RETENTION BASIN
EXISTING RETENSION BASIN
FRENCH DRAIN SYSTEM
NSBB
RISER
18" INLET
WET WELL/PUMP & BACKUP
12" PUMP DISCHARGE OUTLET
PINE AVENUE

SCALE: 1"=80'

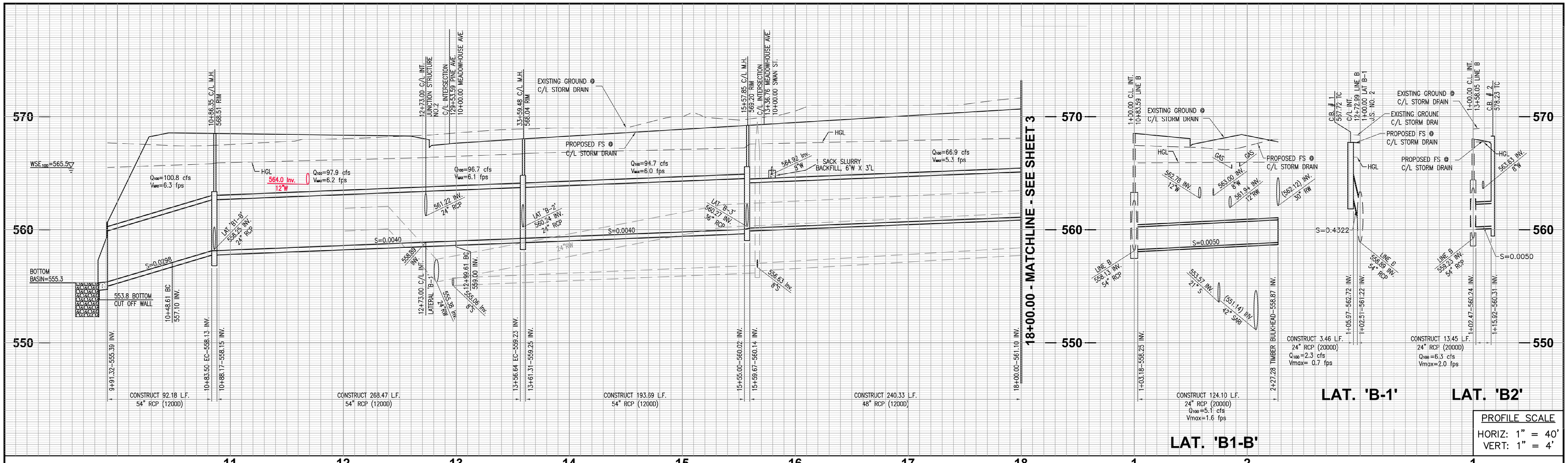
GRAPHIC SCALE
80 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.

LEGEND:

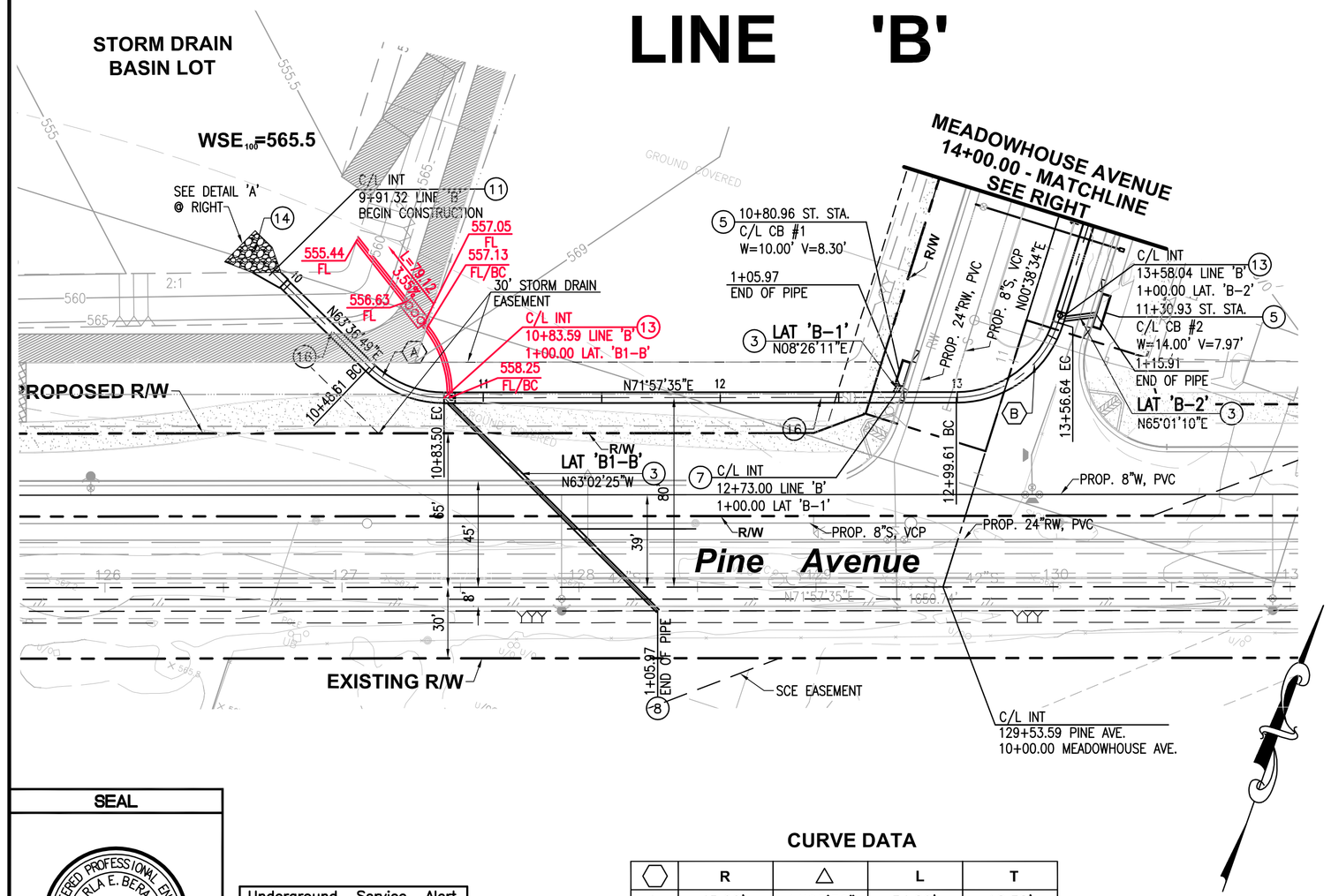
- CATCH BASIN STENCILS
- STORM DRAIN SYSTEM
- FOCAL POINT - FRENCH DRAIN SYSTEM
- NUTRIENT SEPARATING BAFFLE BOX
- TRACT 20161 WQMP DRAINAGE BOUNDARY



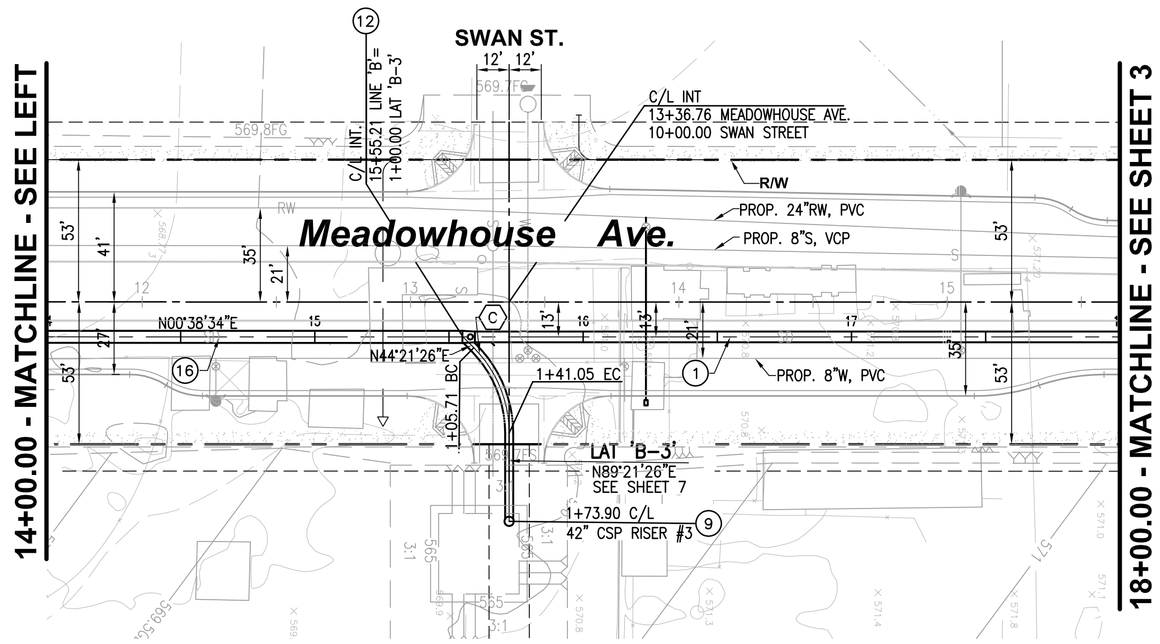
VICINITY MAP
NTS



LINE 'B'



LINE 'B'



CONSTRUCTION NOTES

1. CONSTRUCT 48" RCP (1200 D) CASE 3 BEDDING & BACKFILL PER L.A.C.D.P.W. STD. DWG. 3080-2
3. CONSTRUCT 24" RCP (2000 D) CASE 3 BEDDING & BACKFILL PER L.A.C.D.P.W. STD. DWG. 3080-2
5. CONSTRUCT CATCH BASIN II PER CITY STANDARD 340
7. CONSTRUCT JUNCTION STRUCTURE PER APWA STD. PLAN NO. 332-1
8. CONSTRUCT TIMBER BULKHEAD PER DETAIL ON SHEET 10
9. CONSTRUCT CSP RISER PER DETAIL ON SHEET 10, SIZE PER PLAN
11. CONSTRUCT HEADWALL PER DETAIL ON SHEET 10
12. CONSTRUCT JUNCTION STRUCTURE I PER CITY OF CHINO STD DWG. NO. 365A
13. CONSTRUCT JUNCTION STRUCTURE III PER CITY OF CHINO STD DWG. NO. 375A
14. CONSTRUCT 1/4 TON NON-GROUTED RIP RAP PAD, 4' DEEP, PER DETAIL ON SHEET 10
16. CONSTRUCT 54" RCP (1200 D) CASE 3 BEDDING & BACKFILL PER L.A.C.D.P.W. STD. DWG. 3080-2

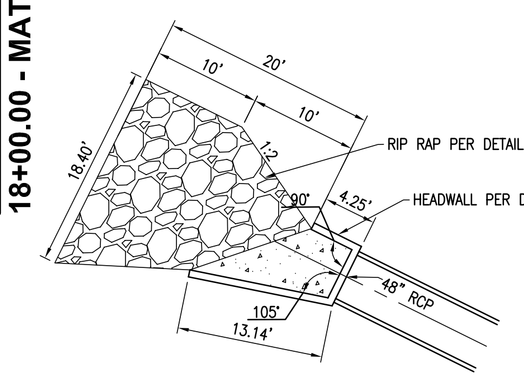
CURVE DATA

⬡	R	△	L	T
A	45.00'	44°25'36"	34.89'	18.38'
B	45.00'	72°36'09"	57.02'	33.06'
C	22.50'	45°00'00"	17.67'	09.32'

STRUCTURAL DATA

STATION	LATERAL NAME	TYPE	ANGLE/ A	INLET DIA./ B	C	UPSTREAM MAIN DIA./D1	DOWNSTREAM MAIN DIA./D2	INLET ELEV. / S
12+73.00 LINE B	LAT B-1	APWA 332-1	64°	24" RCP	–	54"	54"	561.22
13+58.04 LINE B	LAT B-2	JS I	66°	24" RCP	–	54"	54"	560.24
15+33.85 LINE B	LAT B-3	JS I	45°	36" RCP	–	48"	54"	560.15

NOTE: TRACTS 17057, 17571 & 17572 WILL BE CONSTRUCTED CONCURRENTLY



DETAIL 'A'
N.T.S.

LEGEND
PORTLAND CEMENT CONCRETE

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

SEAL
REGISTERED PROFESSIONAL ENGINEER CARLA E. BERG No. 45183 Exp. 9/30/08 CIVIL STATE OF CALIFORNIA

Underground Service Alert
Call: TOLL FREE 1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

PREPARED BY	REVISIONS	MADE BY	MADE DATE	APPROVED BY	APPROVED DATE	BENCH MARK DATA	REFERENCE DRAWINGS
FIRM: L.D. KING, INC.						NO. 157/71 ELEV. 595.256	
ADDRESS: 2151 Convention Center Way, Ste. 100 Ontario, CA. 91764						LOCATION: A 2 1/2" brass disk stamped "157/71" set in a traffic signal concrete base located at a northwest intersection of Euclid Avenue and Kimball Avenue	
TELEPHONE: (909)937-0200 FAX: (909)937-0202							
SIGNATURE RCE 45183 DATE							

REVIEWED BY STAFF	BY	DATE	CITY ENGINEER'S STAFF	BY	DATE
WATER:			DRAWN:		
SEWER:			DESIGNED:		
FIRE:			CHECKED:		
PLANNING:			RECOMMENDED:		
TRAFFIC:					
SERVICES:					

APPROVED BY:
DIRECTOR OF PUBLIC WORKS/CITY ENGINEER
DATE: _____

CITY OF CHINO ENGINEERING DIVISION

Storm Drain Improvement Plan & Profile

LINE 'B'

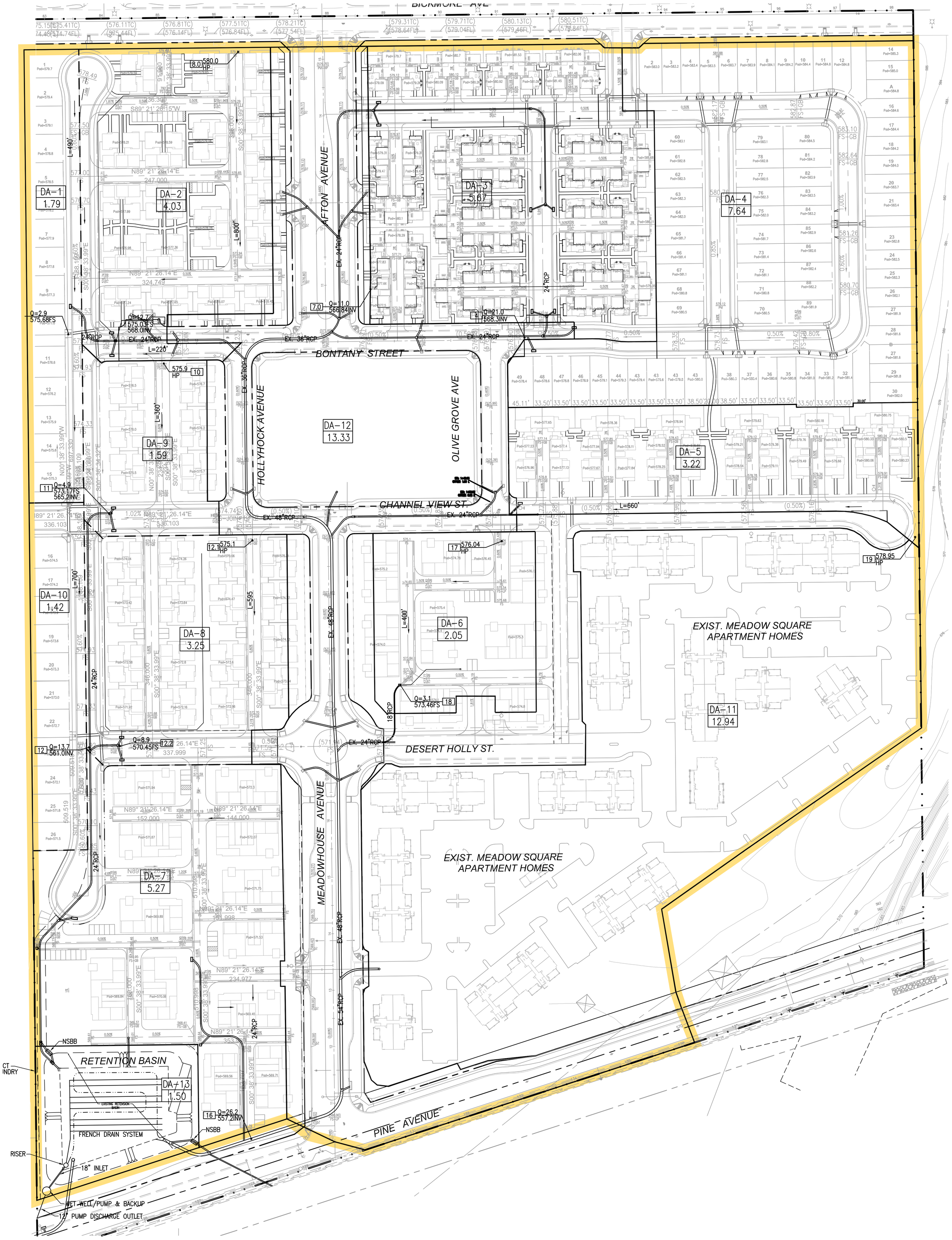
From Sta. 9+30.65 to Sta. 18+00.00

PROJECT NO. TR 17571 TR 17626
SHEET 2 OF 10
DRAWING NO.
JN 481126

LEWIS OPERATING CORP. E:\400-499\481\0481-126\PLANS\storm\481126sd02.dwg, Plotted: Jul 31, 2007 - 2:26pm

FINAL: 05/01/07

Drainage Maps



E:\400-499\481\0481-252\WQMP\481252WQMP-DMA MAP.dwg, Plotted: Mar 28, 2019 - 10:09am

JN 0481-252

LEGEND/ABBREVIATIONS

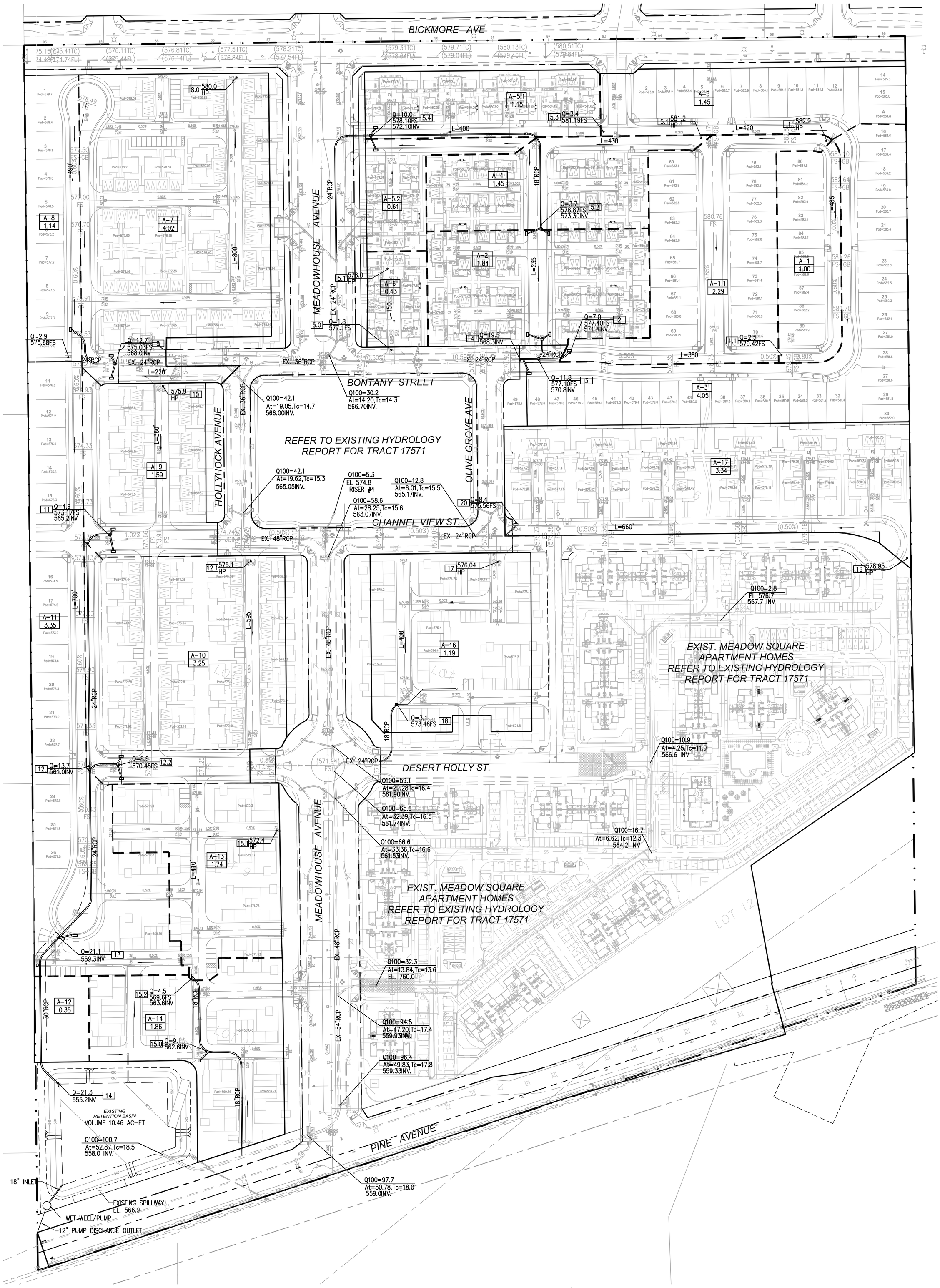
1	NODE NUMBER
Q=12.0 cfs	Q100 PEAK DISCHARGE IN CFS
Tc=10.2 MIN.	TIME OF CONCENTRATION IN MINUTES
L=554'	LENGTH OF A DRAINAGE COURSE
HP	HIGH POINT
FS	FINISH SURFACE ELEVATION
INV	PIPE INVERT ELEVATION
←	DIRECTIONAL FLOW ARROW
A-1 / 1.65	DRAINAGE SUBAREA DESIGNATION / DRAINAGE SUBAREA IN ACREAGE
———	DRAINAGE AREA BOUNDARY
- - -	SUB-DRAINAGE AREA BOUNDARY

80 0 40

1 INCH = 80 FT.

LDKING
10390 Commerce Center Drive, Ste. C-250
Rancho Cucamonga, California 91730
(909) 945-0526 Fax: (909) 945-0529

DRAINAGE AREA MAP
VAN VLIET SITE DEVELOPED CONDITION
Tract Map No. 20161 ('A' Map)
Tract Maps 20169, 20170, 20171, 20172, 20173, 20270 & 20271



LEGEND/ABBREVIATIONS

1	NODE NUMBER
Q=12.0 cfs	Q100 PEAK DISCHARGE IN CFS
Tc=10.2 MIN.	TIME OF CONCENTRATION IN MINUTES
L=554'	LENGTH OF A DRAINAGE COURSE
HP	HIGH POINT
FS	FINISH SURFACE ELEVATION
INV	PIPE INVERT ELEVATION
←	DIRECTIONAL FLOW ARROW
A-1 / 1.65	DRAINAGE SUBAREA DESIGNATION / DRAINAGE SUBAREA IN ACREAGE
———	DRAINAGE AREA BOUNDARY
– – –	SUB-DRAINAGE AREA BOUNDARY

LDKING
975 N. Haven Avenue, Suite 200
Ontario, California 91764
(909) 945-0526 Fax: (909) 945-0529

HYDROLOGY MAP
VAN VLIET SITE INTERIM CONDITION
T. M 20161 ('A' Map), 20169, 20170, 20171, 20172, 20173, 20270 & 20271

E:\400-499\481\0481-252\Maps\TTM\HydroTTM\481252hydroTTM-Interim.dwg, Plotted: Mar 28, 2019 - 10:21am

HYDROLOGY MAP
TR. 17626
UNDEVELOPED CONDITION

SCALE: 1"=80'

1 ELEV=583.0

A–1 / 2.98

L=313'

2 ELEV=581.0

A–2 / 8.89

L=310'

3 ELEV=578.5

A–3 / 11.5

L=310'

4 ELEV=576.4

A–4 / 10.4

L=290'

5 ELEV=575.2

A–5 / 9.50

L=278'

6 ELEV=572.9

A–6 / 7.79

L=254'

7 ELEV=571.8

A–7 / 10.2

L=404'

8 ELEV=568.8

A–8 / 4.62

L=512'

Q100=89.3
ELEV=566.9
Tc=30.9
8

LEGEND

ELEV=608	ELEVATION IN FEET
Q100=263.8	100–YEAR STORM PEAK FLOW IN CFS
Tc=66.6	TOTAL TIME OF CONCENTRATION IN MINUTES
L=350'	LENGTH OF SUBAREA DRAINAGE COURSE
	DIRECTIONAL FLOW ARROW
H–4 / 77.1	DRAINAGE SUBAREA DESIGNATION
	DRAINAGE SUBAREA IN ACREAGE
	DRAINAGE AREA BOUNDARY
	DRAINAGE SUBAREA BOUNDARY

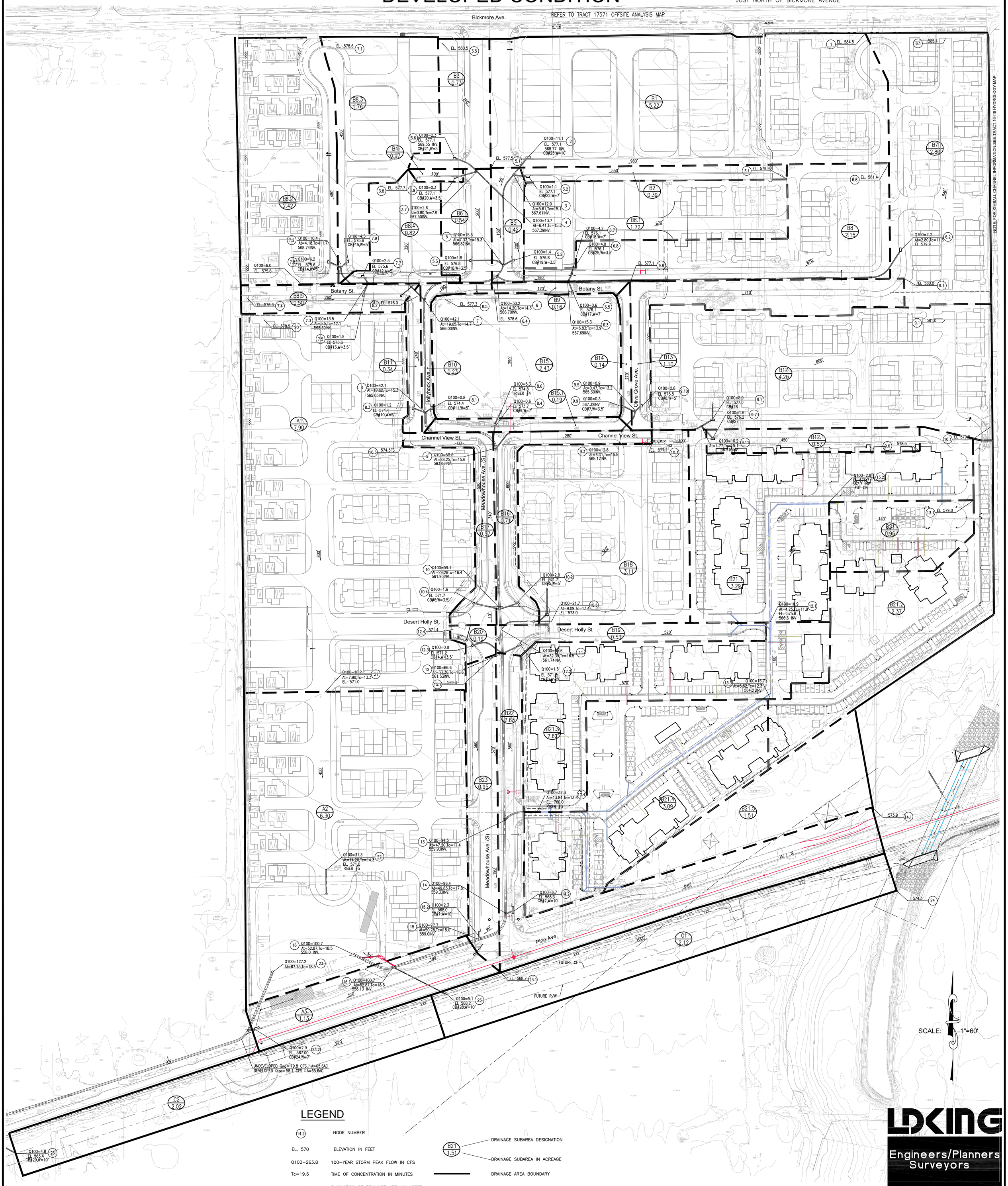
STUDY FILES

481126exrathyd100

LDKING
Engineers/Planners
Surveyors
L.D. King, Inc.
2151 Convention Center Way
Suite 100
Ontario, CA 91764-4464
Phone (909) 937-0200
Fax (909) 937-0202

HYDROLOGY MAP
TR. 17571
DEVELOPED CONDITION

NOTE:
OFFSITE RUNOFF NORTH OF THE PROJECT SITE IS DIVERTED SOUTHWESTERLY BY EXISTING BERMS JUST NORTH OF BICKMORE AVENUE



LEGEND

(14.2)	NODE NUMBER
EL. 570	ELEVATION IN FEET
Q100=263.8	100-YEAR STORM PEAK FLOW IN CFS
Tc=19.6	TIME OF CONCENTRATION IN MINUTES
At=27.4	SUMMATION OF DRAINAGE AREA IN ACRES
980'	LENGTH OF DRAINAGE AREA
B21 / 1.51	DRAINAGE SUBAREA DESIGNATION / DRAINAGE SUBAREA IN ACREAGE
	DRAINAGE AREA BOUNDARY
	SUB-DRAINAGE AREA BOUNDARY
	PROPOSED STORM DRAIN

STUDY FILES

481126DEVF

SCALE: 1"=60'

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NOAA Atlas 14 Rainfall Chart

NOAA Atlas 14, Volume 6, Version 2
Location name: Chino, California, USA*
Latitude: 33.9593°, Longitude: -117.6411°
Elevation: 577.82 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.115** (0.096-0.139)	**0.151** (0.126-0.183)	**0.199** (0.166-0.242)	**0.238** (0.197-0.292)	**0.293** (0.233-0.371)	**0.335** (0.261-0.434)	**0.378** (0.287-0.503)	**0.423** (0.312-0.580)	**0.486** (0.343-0.695)	**0.534** (0.364-0.793)
10-min	**0.164** (0.137-0.199)	**0.216** (0.181-0.262)	**0.285** (0.237-0.346)	**0.342** (0.282-0.418)	**0.419** (0.334-0.532)	**0.480** (0.374-0.622)	**0.542** (0.412-0.721)	**0.607** (0.448-0.831)	**0.696** (0.491-0.996)	**0.766** (0.522-1.14)
15-min	**0.199** (0.166-0.240)	**0.262** (0.219-0.317)	**0.345** (0.287-0.419)	**0.413** (0.341-0.506)	**0.507** (0.404-0.643)	**0.580** (0.452-0.752)	**0.656** (0.498-0.872)	**0.734** (0.541-1.00)	**0.842** (0.594-1.20)	**0.926** (0.631-1.37)
30-min	**0.289** (0.241-0.349)	**0.380** (0.317-0.460)	**0.501** (0.417-0.608)	**0.600** (0.495-0.734)	**0.736** (0.586-0.933)	**0.842** (0.656-1.09)	**0.951** (0.723-1.26)	**1.07** (0.786-1.46)	**1.22** (0.862-1.75)	**1.35** (0.916-1.99)
60-min	**0.422** (0.353-0.510)	**0.555** (0.463-0.672)	**0.732** (0.609-0.888)	**0.876** (0.723-1.07)	**1.08** (0.857-1.36)	**1.23** (0.959-1.60)	**1.39** (1.06-1.85)	**1.56** (1.15-2.13)	**1.79** (1.26-2.55)	**1.97** (1.34-2.91)
2-hr	**0.629** (0.526-0.760)	**0.827** (0.690-1.00)	**1.08** (0.902-1.32)	**1.29** (1.07-1.58)	**1.58** (1.25-2.00)	**1.79** (1.40-2.32)	**2.01** (1.53-2.68)	**2.24** (1.65-3.06)	**2.54** (1.80-3.64)	**2.78** (1.89-4.12)
3-hr	**0.786** (0.657-0.950)	**1.03** (0.862-1.25)	**1.35** (1.13-1.64)	**1.61** (1.33-1.97)	**1.96** (1.56-2.48)	**2.22** (1.73-2.88)	**2.49** (1.89-3.31)	**2.76** (2.04-3.79)	**3.13** (2.21-4.48)	**3.42** (2.33-5.07)
6-hr	**1.10** (0.921-1.33)	**1.45** (1.21-1.76)	**1.90** (1.58-2.30)	**2.26** (1.86-2.76)	**2.74** (2.18-3.47)	**3.11** (2.42-4.03)	**3.47** (2.64-4.62)	**3.85** (2.84-5.28)	**4.36** (3.08-6.24)	**4.75** (3.24-7.05)
12-hr	**1.45** (1.21-1.75)	**1.91** (1.59-2.31)	**2.51** (2.09-3.05)	**2.99** (2.47-3.67)	**3.65** (2.90-4.62)	**4.14** (3.23-5.37)	**4.64** (3.53-6.17)	**5.15** (3.80-7.06)	**5.84** (4.13-8.36)	**6.37** (4.34-9.45)
24-hr	**1.91** (1.69-2.20)	**2.54** (2.25-2.93)	**3.37** (2.97-3.90)	**4.04** (3.53-4.71)	**4.95** (4.19-5.97)	**5.65** (4.68-6.95)	**6.35** (5.15-8.01)	**7.08** (5.58-9.17)	**8.07** (6.10-10.9)	**8.83** (6.46-12.3)
2-day	**2.32** (2.05-2.68)	**3.14** (2.78-3.63)	**4.22** (3.72-4.89)	**5.11** (4.47-5.97)	**6.33** (5.36-7.63)	**7.28** (6.04-8.95)	**8.25** (6.68-10.4)	**9.25** (7.29-12.0)	**10.6** (8.05-14.3)	**11.7** (8.57-16.3)
3-day	**2.50** (2.21-2.88)	**3.42** (3.02-3.95)	**4.65** (4.10-5.38)	**5.66** (4.95-6.61)	**7.06** (5.98-8.51)	**8.15** (6.76-10.0)	**9.28** (7.52-11.7)	**10.5** (8.25-13.6)	**12.1** (9.15-16.3)	**13.4** (9.79-18.7)
4-day	**2.71** (2.39-3.12)	**3.73** (3.30-4.31)	**5.10** (4.49-5.90)	**6.23** (5.45-7.27)	**7.80** (6.60-9.40)	**9.02** (7.48-11.1)	**10.3** (8.33-13.0)	**11.6** (9.15-15.0)	**13.4** (10.2-18.1)	**14.9** (10.9-20.8)
7-day	**3.10** (2.74-3.58)	**4.29** (3.79-4.95)	**5.88** (5.18-6.81)	**7.19** (6.29-8.40)	**9.01** (7.63-10.9)	**10.4** (8.65-12.8)	**11.9** (9.63-15.0)	**13.4** (10.6-17.4)	**15.5** (11.8-21.0)	**17.2** (12.6-24.0)
10-day	**3.37** (2.98-3.88)	**4.67** (4.13-5.40)	**6.42** (5.66-7.43)	**7.86** (6.87-9.17)	**9.86** (8.35-11.9)	**11.4** (9.48-14.1)	**13.0** (10.6-16.4)	**14.7** (11.6-19.1)	**17.1** (12.9-23.0)	**18.9** (13.8-26.4)
20-day	**4.02** (3.56-4.64)	**5.63** (4.97-6.50)	**7.79** (6.87-9.02)	**9.61** (8.40-11.2)	**12.2** (10.3-14.7)	**14.2** (11.8-17.4)	**16.3** (13.2-20.5)	**18.5** (14.6-24.0)	**21.6** (16.4-29.1)	**24.1** (17.6-33.6)
30-day	**4.77** (4.22-5.51)	**6.69** (5.91-7.72)	**9.31** (8.21-10.8)	**11.5** (10.1-13.5)	**14.7** (12.4-17.7)	**17.2** (14.3-21.2)	**19.9** (16.1-25.1)	**22.8** (17.9-29.5)	**26.8** (20.3-36.1)	**30.0** (22.0-41.9)
45-day	**5.64** (4.99-6.51)	**7.89** (6.97-9.11)	**11.0** (9.71-12.8)	**13.7** (12.0-16.0)	**17.6** (14.9-21.2)	**20.8** (17.2-25.5)	**24.1** (19.5-30.4)	**27.8** (21.9-36.0)	**33.0** (25.0-44.5)	**37.3** (27.3-52.0)
60-day	**6.51** (5.76-7.51)	**9.04** (7.99-10.4)	**12.6** (11.1-14.6)	**15.7** (13.7-18.3)	**20.3** (17.1-24.4)	**24.0** (19.9-29.5)	**28.0** (22.7-35.3)	**32.4** (25.6-42.0)	**38.8** (29.4-52.3)	**44.1** (32.3-61.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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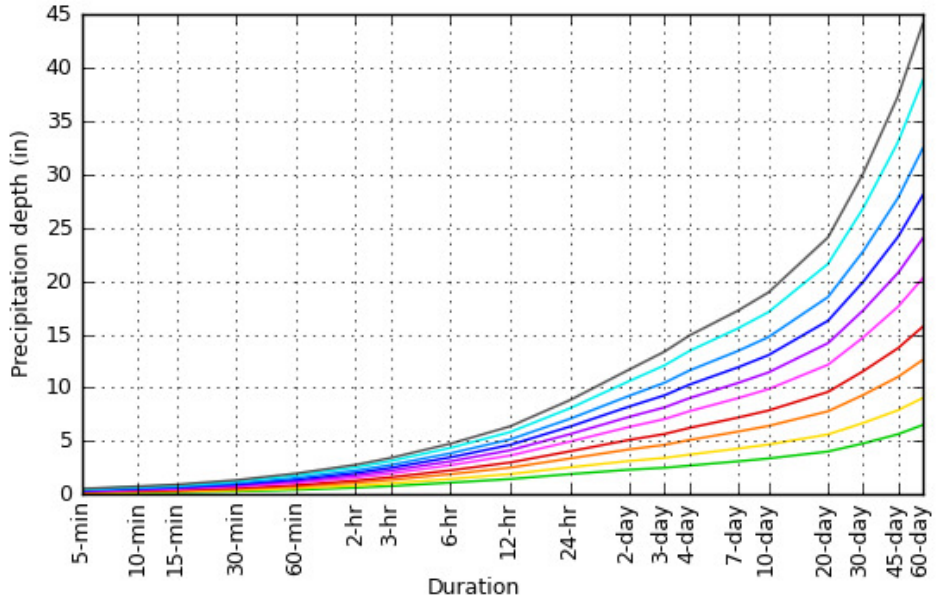
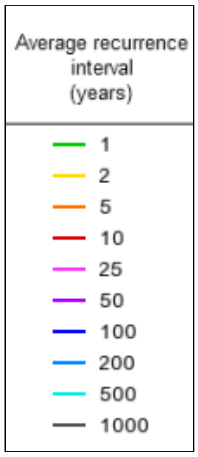
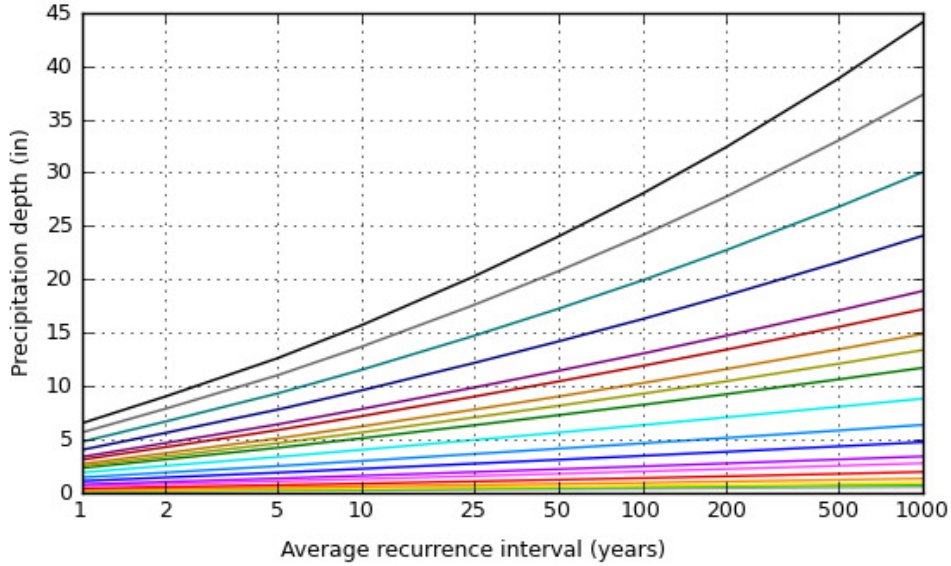
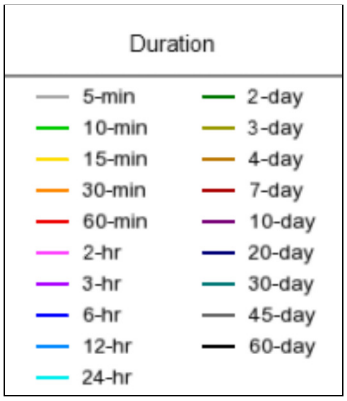
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.9593°, Longitude: -117.6411°









NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Nov 15 02:45:05 2018

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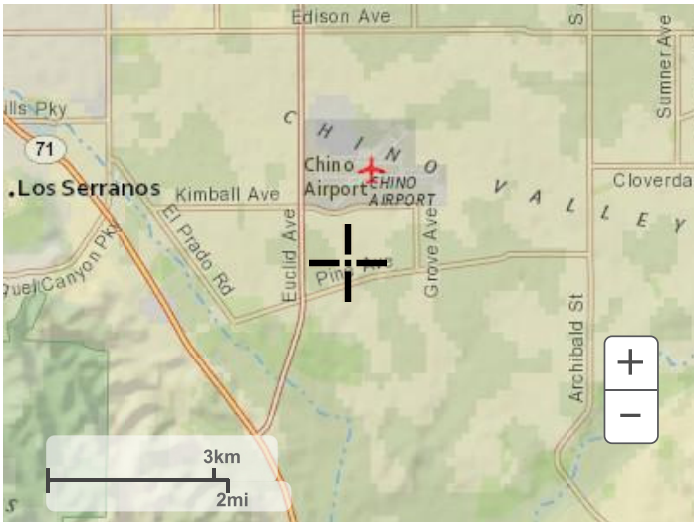
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Soils Report Dated 1-2-15 with Infiltration Test.

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GEOTECHNICAL CONSULTANTS

March 25, 2015 RMA Project No.: 15-132-01

Lewis Operating Corp
1156 Mountain Avenue
Upland, CA 91785

Attention: Mr. Joel Macy
Vice President – Planned Communities

Subject: Soil Infiltration Testing
Tract 17626 (former Van Vliet Dairy)
South of Bickmore and Meadowhouse Avenues
Chino, CA

Gentlemen:

In accordance with your request and authorization, we have prepared this report to present anticipated soil infiltration rates for Tract 17626. The tests were performed using a Double-Ring Infiltrometer (ASTM Test Method D3385).

The type and location of any proposed infiltration structures for Tract 17626 were not known at the time of this report. A detention basin is shown on the conceptual parcel map provided by Lewis Operating Corp. in the southwest corner of Tract 17626.

Our scope of work included review of the referenced geotechnical report prepared by this office including soil conditions encountered during the prior investigation and regional groundwater data and preparation of this report.

Site Description and Proposed Usage

The site is located in the City of Chino, California. The site is bounded by Bickmore Avenue to the north, flood control basins to the east, an existing multi-family housing complex to the southeast, Pine Avenue to the south and a dairy property to the west. A detention basin is located in the southwest corner of the site. The site was previously graded in 2004 to 2006. The fill placed during grading is 5 to 14 feet thick. Existing improvements include asphalt paving for Meadowhouse Avenue and portions of Desert Holly, Channel View and Botany Streets, a masonry screen wall along the south side of the site and landscaping along Meadowhouse Avenue.

Based upon a site plan, Tract 17626 will be developed with residential lots, three parks and a recreation center.

Subsurface Exploration and Earth Materials

A previous geotechnical report was completed by this office in 2003 for the site. The investigation included subsurface exploration consisting of 10 borings that extended up to 51.5 feet below the ground surface and 11 exploratory trenches that extended to a maximum depth of 15 feet below the existing ground surface.

The field investigations encountered alluvium consisting of silt and clay, with a thin, surficial layer of silty sand.

The infiltration tests were conducted in fill and alluvial soils at the existing ground surface. Tests P-1, P-2, P-3 and P-4 were done within the previously placed fill that consisted of stiff light brown silty clay. P-5 was done in the bottom of the detention basin located on the east side of the site and the soil at the test location consisted of dense light brown silty clay alluvium.

Groundwater Conditions

At the time of our initial infiltration testing on February 24 and 25, 2015, the detention basin in the southwest corner of the site contained up 1 foot of water across the entire basin bottom. Testing in the detention basin was done on March 24, 2015, when the basin was dry.

Groundwater was encountered during our prior subsurface explorations, at depths of 21 to 31 feet. According to regional groundwater contour maps prepared by the Chino Basin Watermaster, the U.S. Geological Survey and the California Division of Mines and Geology, the historic depth to groundwater beneath the site has been on the order of 50 to 75 feet below the ground surface.

Infiltration Test Procedure

The infiltrometer equipment consisted of two calibrated plastic cylinders, two aluminum rings, constant level float values, shutoff values, and plastic tubing to connect the cylinders and aluminum rings. Calibrations were marked directly on the plastic cylinders. The cylinders were connected to special supports to prevent tipping and to maintain proper height. The aluminum rings were 12 and 24 inches in diameter and 20 inches high. The float valves were used to maintain a constant water level in the aluminum rings. Infiltration rate of water during the test was determined by monitoring volume changes in the calibrated cylinders. Testing was continued until a relatively uniform infiltration rate was obtained.

Infiltration Test Results

The testing yielded the following infiltration rates:

Location	Infiltration Rate (cm/hr)	Infiltration Rate (in/hr)
P-1	0.0	0.0
P-2	0.14	0.06
P-3	0.14	0.06
P-4	0.42	0.17
P-5	0.014	0.006

The San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP) indicates that infiltration is not required for sites where the measured infiltration rates are less than 0.3 inches per hour. Infiltration of water into the alluvial soils consisting of silty clay at the depths tested ranged from 0.006 to 0.17 in/hr. Measurable infiltration did not occur over the last 45 minutes of the test at location P-1. Therefore, based on the San Bernardino County Stormwater Program Technical Guidance Document for Water Quality Management Plans (WQMP) criteria the site is not feasible for infiltration. Infiltration test result sheets are included in Appendix A.

Closure

This report is subject to review of the local building official who may request clarification or modifications of the report prior to approval.

We appreciate this opportunity to be of continued service to you. If you have any questions regarding this report, please do not hesitate to contact us at your convenience.

Respectfully,

RMA Group

Kenneth Dowell, PG, CEG
Project Geologist
CEG 2470

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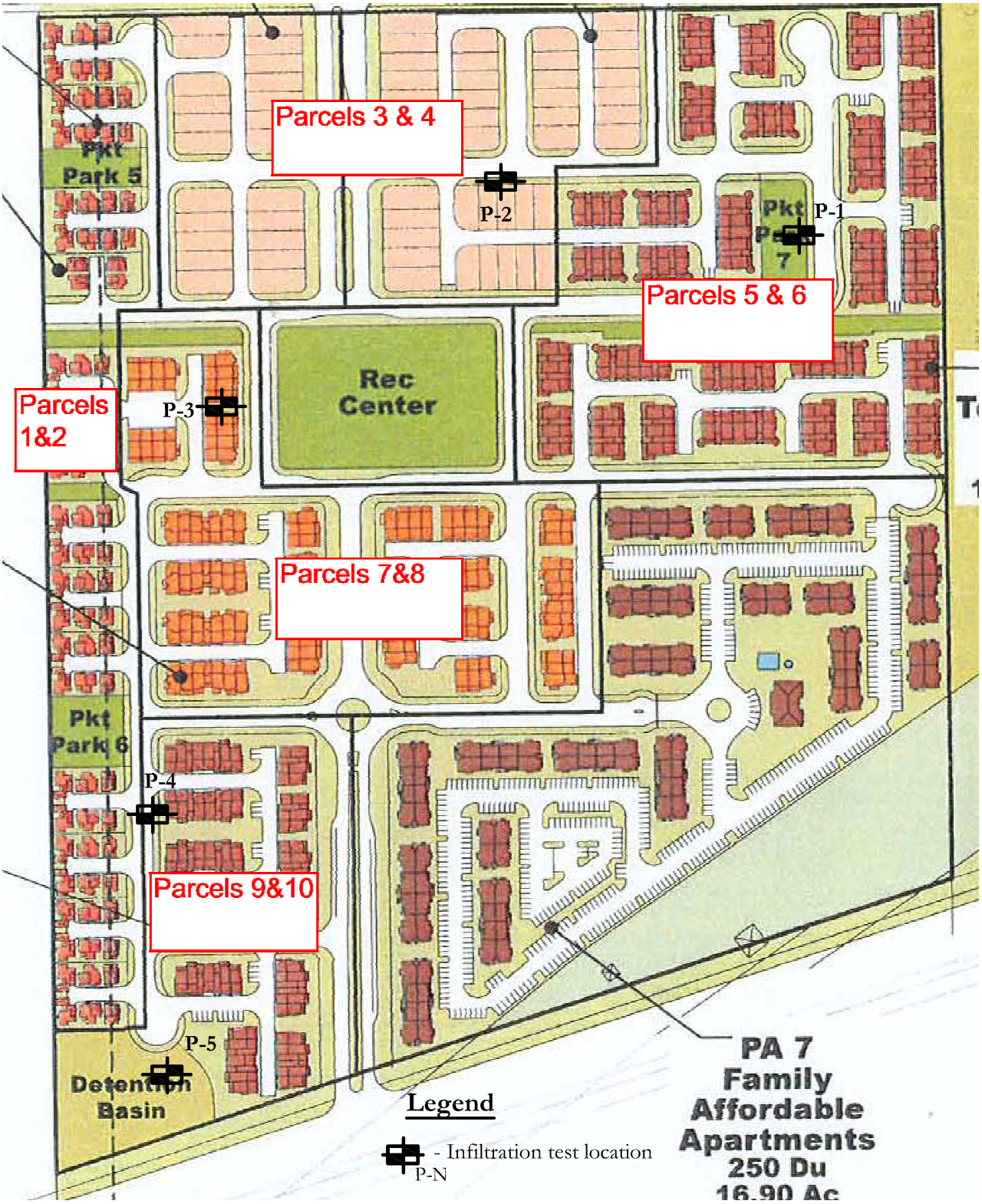
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Attachments: Figure 1: Test Location Map
Appendix A: Infiltration Test Results
Appendix B: References

FIGURE



INFILTRATION TEST LOCATION MAP

Base map provided by LD King

APPENDIX A

INFILTRATION TEST RESULTS

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GEOTECHNICAL CONSULTANTS

INFILTRATION TEST RESULTS

Project ID	15-132-01
Test Location	P-1
Tested By	520DKR
Date	2/24/15

Constants	Area (cm^2)	Depth of Liq (cm)
Inner Ring	707	7.6
Anlr. Space	2106	7.6

No.	S or E	Date Yr 2015	Time hr (min)	Elpd Time (min)	Flow Readings Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (in/hr)	Remarks
1	S	2/24	8:50:00	0	0	100	200	4,000	0.57	7.60	0.22	2.99	
	E	2/24	9:05:00	15	100		4,200						
2	S	2/24	9:05:00	15	100	25	4,200	2,900	0.14	5.51	0.06	2.17	
	E	2/24	9:20:00	30	125		7,100						
3	S	2/24	9:20:00	15	125	25	7,100	1,800	0.14	3.42	0.06	1.35	
	E	2/24	9:35:00	45	150		8,900						
4	S	2/24	9:35:00	15	150	0	8,900	100	0.00	0.19	0.00	0.07	
	E	2/24	9:50:00	60	150		9,000						
5	S	2/24	9:50:00	15	150	0	9,000	100	0.00	0.19	0.00	0.07	
	E	2/24	10:05:00	75	150		9,100						
6	S	2/24	10:05:00	15	150	0	9,100	0	0.00	0.00	0.00	0.00	
	E	2/24	10:20:00	90	150		9,100						

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GEOTECHNICAL CONSULTANTS

INFILTRATION TEST RESULTS

Project ID	15-132-01
Test Location	P-2
Tested By	520DKR
Date	2/24/15

Constants	Area (cm^2)	Depth of Liq (cm)
Inner Ring	707	7.6
Anlr. Space	2106	7.6

No.	S or E	Date Yr 2015	Time hr (min)	Elpd Time (min)	Flow Readings Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (in/hr)	Remarks
1	S	2/24	10:42:00	0	0	1,350	0	2,300	7.64	4.37	3.01	1.72	
	E	2/24	10:57:00	15	1,350		2,300						
2	S	2/24	10:57:00	15	1,350	100	2,300	1,500	0.57	2.85	0.22	1.12	
	E	2/24	11:12:00	30	1,450		3,800						
3	S	2/24	11:12:00	15	1,450	75	3,800	1,200	0.42	2.28	0.17	0.90	
	E	2/24	11:27:00	45	1,525		5,000						
4	S	2/24	11:27:00	15	1,525	50	5,000	1,000	0.28	1.90	0.11	0.75	
	E	2/24	11:42:00	60	1,575		6,000						
5	S	2/24	11:42:00	15	1,575	25	6,000	1,200	0.14	2.28	0.06	0.90	
	E	2/24	11:57:00	75	1,600		7,200						
6	S	2/24	11:57:00	15	1,600	25	7,200	1,000	0.14	1.90	0.06	0.75	
	E	2/24	12:12:00	90	1,625		8,200						
7	S	2/24	12:12:00	15	1,625	25	8,200	900	0.14	1.71	0.06	0.67	
	E	2/24	12:27:00	105	1,650		9,100						

Project ID	15-132-01
Test Location	P-3
Tested By	520DKR
Date	2/24/15

Constants	Area (cm^2)	Depth of Liq (cm)
Inner Ring	707	7.6
Anlr. Space	2106	7.6

No.	S or E	Date Yr 2015	Time hr (min)	Elpd Time (min)	Flow Readings Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (in/hr)	Remarks
1	S	2/24	12:57:00	0	0	1,250	0	2,600	7.07	4.94	2.78	1.94	
	E	2/24	1:12:00	15	1,250		2,600						
2	S	2/24	1:12:00	15	1,250	550	2,600	1,400	3.11	2.66	1.23	1.05	
	E	2/24	1:27:00	30	1,800		4,000						
3	S	2/24	1:27:00	15	1,800	400	4,000	1,000	2.26	1.90	0.89	0.75	
	E	2/24	1:42:00	45	2,200		5,000						
4	S	2/24	1:42:00	15	2,200	200	5,000	800	1.13	1.52	0.45	0.60	
	E	2/24	1:57:00	60	2,400		5,800						
5	S	2/24	1:57:00	15	2,400	175	5,800	700	0.99	1.33	0.39	0.52	
	E	2/24	2:12:00	75	2,575		6,500						
6	S	2/24	2:12:00	15	2,575	125	6,500	700	0.71	1.33	0.28	0.52	
	E	2/24	2:27:00	90	2,700		7,200						
7	S	2/24	2:27:00	15	2,700	25	7,200	1,200	0.14	2.28	0.06	0.90	
	E	2/24	2:42:00	105	2,725		8,400						
8	S	2/24	2:42:00	15	2,725	25	8,400	500	0.14	0.95	0.06	0.37	
	E	2/24	2:57:00	120	2,750		8,900						
9	S	2/24	2:57:00	15	2,750	25	8,900	400	0.14	0.76	0.06	0.30	
	E	2/24	3:12:00	135	2,775		9,300						

INFILTRATION TEST RESULTS

Project ID	15-132-01
Test Location	P-4
Tested By	520DKR
Date	2/25/15

Constants	Area (cm^2)	Depth of Liq (cm)
Inner Ring	707	7.6
Anlr. Space	2106	7.6

No.	S or E	Date Yr 2015	Time hr (min)	Elpd Time (min)	Flow Readings Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (in/hr)	Remarks
1	S	2/25	8:38:00	0	0	400	0	1,600	2.26	3.04	0.89	1.20	
	E	2/25	8:53:00	15	400		1,600						
2	S	2/25	8:53:00	15	400	300	1,600	750	1.70	1.42	0.67	0.56	
	E	2/25	9:08:00	30	700		2,350						
3	S	2/25	9:08:00	15	700	100	2,350	400	0.57	0.76	0.22	0.30	
	E	2/25	9:23:00	45	800		2,750						
4	S	2/25	9:23:00	15	800	50	2,750	450	0.28	0.85	0.11	0.34	
	E	2/25	9:38:00	60	850		3,200						
5	S	2/25	9:38:00	15	850	50	3,200	500	0.28	0.95	0.11	0.37	
	E	2/25	9:53:00	75	900		3,700						
6	S	2/25	9:53:00	15	900	100	3,700	600	0.57	1.14	0.22	0.45	
	E	2/25	10:08:00	90	1,000		4,300						
7	S	2/25	10:08:00	15	1,000	75	4,300	300	0.42	0.57	0.17	0.22	
	E	2/25	10:23:00	105	1,075		4,600						
8	S	2/25	10:23:00	15	1,075	75	4,600	300	0.42	0.57	0.17	0.22	
	E	2/25	10:38:00	120	1,150		4,900						
9	S	2/25	10:38:00	15	1,150	75	4,900	400	0.42	0.76	0.17	0.30	
	E	2/25	10:53:00	135	1,225		5,300						
10	S	2/25	10:53:00	15	1,225	75	5,300	400	0.42	0.76	0.17	0.30	
	E	2/25	11:08:00	150	1,300		5,700						

INFILTRATION TEST RESULTS

Project ID	15-132-01
Test Location	P-5
Tested By	520DKR
Date	3/23/15

Constants	Area (cm^2)	Depth of Liq (cm)
Inner Ring	707	7.6
Anlr. Space	2106	7.6

No.	S or E	Date Yr 2015	Time hr (min)	Elpd Time (min)	Flow Readings Inner Ring Rg (cm^3)	Inner Ring Flow (cm^3)	Anlr Space Ring (cm^3)	Anlr Space Flow (cm^3)	Iner Infil Rate Inr (cm/hr)	Iner Infil Rate Anlr (cm/hr)	Iner Infil Rate Inr (in/hr)	Iner Infil Rate Anlr (in/hr)	Remarks
1	S	3/23	9:26:00	0	0	0	0	3,800	0.00	3.61	0.00	1.42	
	E	3/23	9:56:00	30	0		3,800						
2	S	3/23	9:56:00	30	0	5	3,800	550	0.01	0.52	0.01	0.21	
	E	3/23	10:26:00	60	5		4,350						
3	S	3/23	10:26:00	30	5	5	4,350	350	0.01	0.33	0.01	0.13	
	E	3/23	10:56:00	90	10		4,700						
4	S	3/23	10:56:00	30	10	5	4,700	200	0.014	0.19	0.006	0.07	
	E	3/23	11:26:00	120	15		4,900						

APPENDIX B

REFERENCES

APPENDIX B

REFERENCES

1. Carson, S.E. and Matti, J.C., 1985, Contour Map Showing Minimum Depth to Ground Water, Upper Santa Ana River Valley, California, 1973-1979: U.S. Geological Survey Map MF - 1802.

2. Chino Basin Watermaster, 2002, Optimum Basin Management Program, prepared by Wildermuth Environmental, Inc.

3. Dibblee, T.W., and Ehrenspeck, H.E., 2001, Yorba Linda and Prado Dam Quadrangles (eastern Puente Hills), Los Angeles, Orange, San Bernardino and Riverside Counties, Dibble Geological Foundation, Dibblee Foundation Map DF-75, scale 1:24,000.

4. Fife, D.L. and others, 1976, Geologic Hazards in Southwestern San Bernardino County, California: California Division of Mines and Geology Special Report 113.

5. California Department of Water Resources, 1970, Meeting Water Demands in the Chino-Riverside Area, Bulletin No. 104-3.

6. San Bernardino County Stormwater Program, 2013, Technical Guidance Document for Water Quality Management Plans (WQMP) approval date June 21, 2013, effective date September 19, 2013.

7. Geotechnical Engineering Reports for Tract 16418 Van Vilet Property lots 1, 2, 3, & 4 by RMA Group dated June 10, 2003 (Job No. 02-268-01).

Existing 2 year Unit Hydrograph

Developed 2 year Unit Hydrograph

Calculations

- Design Capture Volume
- Basin Design
- Basin Outflow Design
- Nutrient Separating Baffle Box Design

WATER QUALITY MANAGEMENT PLAN (WQMP)

FOR COMPLIANCE WITH SANTA ANA REGIONAL WATER QUALITY CONTROL BOARD
ORDER NUMBER R8-2002-0012 (NPDES PERMIT NO. CAS618036)

CHINO PRESERVE – PLANNING AREA 7

located between
Pine Avenue and Bickmore Avenue
in the
City of Chino
County of San Bernardino, California

APPROVED
CITY OF CHINO ENGINEERING
DATE 8-22-07 BY

INTER-OFFICE ONLY
CITY OF CHINO
PUBLIC WORKS / ENGINEERING
44h Plan Check Submittal Sending Date 8/1/07
TO Dave C. DEPT / DIV WATER
Project TR 17511 Return To Saul By 8/22/07
Lot 11

Prepared for:

WESTERN NATIONAL REALTY ADVISORS
8 Executive Circle
Irvine, CA 92614
949.862.6200

Prepared by:

FUSCOE ENGINEERING, INC.
10390 Commerce Center Drive, Suite 200
Rancho Cucamonga, CA 91730
909.581.0676

REGISTERED PROFESSIONAL ENGINEER
No. C
Exp. 12/31/07
CIVIL
STATE OF CALIFORNIA

Date Prepared: June 8, 2007
Date Revised: July 23, 2007

Water Quality Design Capture Volume

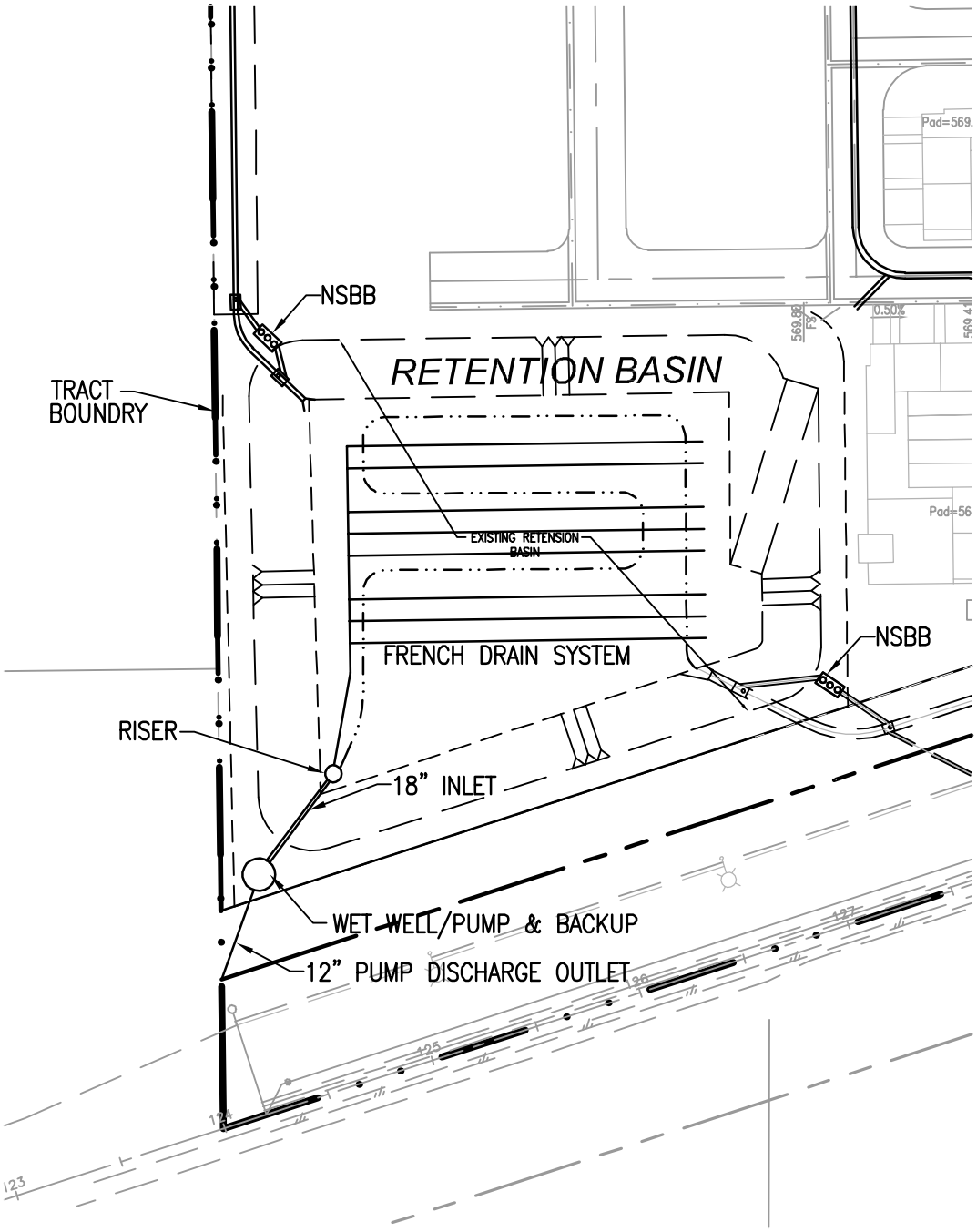
Project Name: Van Vliet **Tract No.: 20161**

City: Chino **Client: Chino Preserve Development Corp**

$P_{2\text{-yr},1\text{hr}}$ Rainfall Depth=	0.555
a1 (climatic region)=	1.4807
a2 (drawdown time)=	1.963
P6 =	0.822

Landuse	i Range-Percent	i Recommended	Area (acres)	C	DCV (ac-ft)	DCV cu. ft.
Tr 20169 DA-1	**35 - 55**	**0.40**	**1.79**	**0.280**	**0.07**	**2926**
Tr 20169 DA-10	**35 - 55**	**0.40**	**1.42**	**0.280**	**0.05**	**2320**
Tr 20170 DA-3	**50 - 70**	**0.56**	**5.67**	**0.380**	**0.29**	**12610**
Tr 20170 DA-5	**50 - 70**	**0.56**	**3.22**	**0.380**	**0.16**	**7161**
Tr 20171 DA-2	**50 - 70**	**0.60**	**4.03**	**0.409**	**0.22**	**9642**
Tr 20171 DA-8	**50 - 70**	**0.60**	**3.25**	**0.409**	**0.18**	**7780**
Tr 20171 DA-9	**50 - 70**	**0.60**	**1.59**	**0.409**	**0.09**	**3809**
Tr 20172 DA-4	**35 - 55**	**0.45**	**7.64**	**0.309**	**0.32**	**13808**
Tr 20173 DA-6	**50- 70**	**0.60**	**2.05**	**0.409**	**0.11**	**4906**
Tr 20173 DA-7	**50- 70**	**0.60**	**5.27**	**0.409**	**0.29**	**12609**
Apartments	65 - 90	0.75	**12.94**	0.544	0.95	41203
Central Park and Streets	60 - 85	0.80	**13.33**	0.599	1.07	46794
Basin	0 - 0	0.00	**1.51**	0.040	0.01	353
Total			**61.92**		**3.81**	**165920**
Average		0.6628	61.92	0.460	3.83	166830

Basin Design



80 0 40

1 INCH = 80 FT.

LDKING
10390 Commerce Center Drive, Ste. C-250
Rancho Cucamonga, California 91730
(909) 945-0526 Fax: (909) 945-0529

BASIN CONCEPT EXHIBIT
Tract Map No. 20161
Dry Extended Detention Basin with Nutrient Separating Baffle Box & French Drain

TABLE 2 - VAN VLEIT SITE
Basin Volume Calculation

Cul. Depth (ft)	elevation (ft)	depth (ft)	area (sf)	volume (ft^3)	volume (ac-ft)	Cul. Volume (ac-ft)
2	554.5	2	0	33292	1.53	1.53
2.5	556.5	0.5	66583	70578	0.81	2.34
3.5	557	1	67676	72300	1.66	4.00
4.5	558	1	69952	74628	1.71	5.71
5.5	559	1	72252	76979	1.77	7.48
6.5	560	1	74573	80581	1.85	9.33
7.5	561	1	76924	81756	1.88	11.21
8.5	562	1	79303	84129	1.93	13.14
9.5	563	1	81706	86867	1.99	15.13
10.5	564	1	84135	88329	2.03	17.16
11.5	565	1	86588	87772	2.01	19.17
12.5	566	1	88955	90491	2.08	21.25
12.7	567	0.2	92027	92275	0.42	21.67
12.9	567.2	0.2	92522	92770	0.43	22.10
13	567.4	0.1	93017	93142	0.21	22.31
	567.5		93266			

TABLE 3 - VAN VLEIT SITE
Depth, Flow v.s. Storage

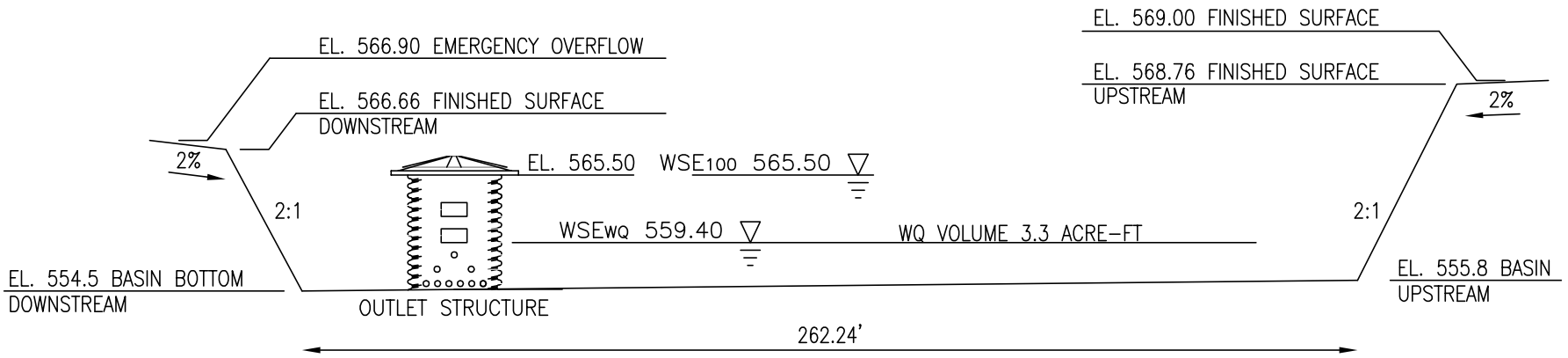
	Elevation (ft)	Depth (ft)	Storage (ac-ft)	Flow (cfs)
1	554.5	0	0	0
2	555	0.5	0.58	5.5
3	556.5	2	1.53	5.5
4	557	2.5	2.34	5.5
5	558	3.5	4	5.5
6	559	4.5	5.71	5.5
7	560	5.5	7.48	5.5
8	561	6.5	9.33	5.5
9	562	7.5	11.21	5.5
10	563	8.5	13.14	5.5
11	564	9.5	15.13	5.5
12	565	10.5	17.16	5.5
13	566	11.5	19.17	5.5
14	567	12.5	21.25	5.5
15	567.2	12.7	21.67	27.8
16	567.3	12.8	22.1	46.4
17	567.4	12.9	22.31	68.5

SPILLWAY OUTFLOW @ EXISTING RETENTION BASIN

Q=CLH^3/2 C=2.62; L-95'

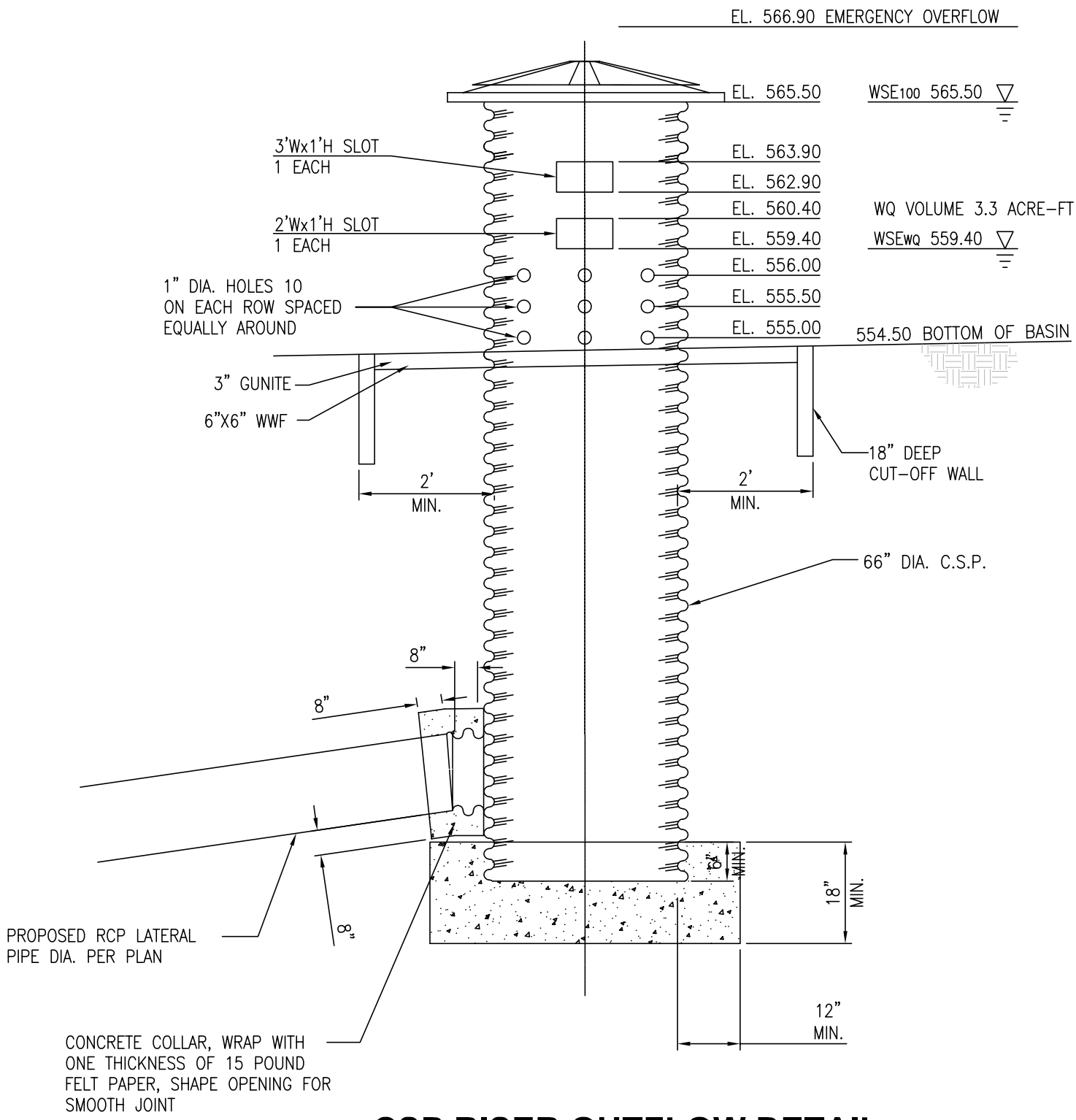
At Elev 567.1: H=0.1', Q=7.9 cfs
At Elev 567.2: H=0.2', Q=22.3 cfs
At Elev 567.3: H=0.3', Q=40.9 cfs
At Elev 567.4: H=0.4', Q=63.0 cfs

BASIN SECTION - TR 17571



NTS

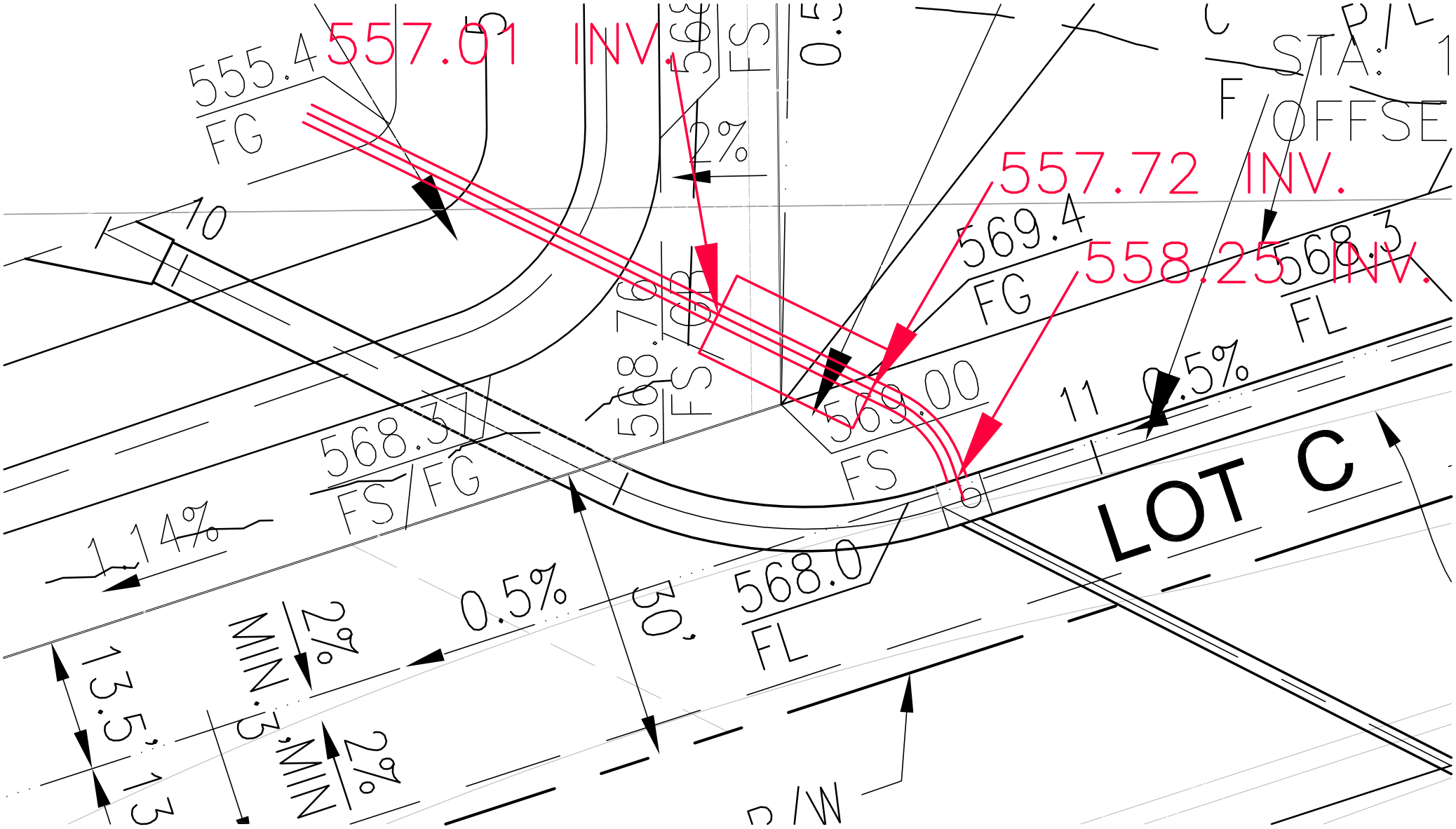
PLEASE SEE THE FOLLOWING PAGE FOR OUTLET STRUCTURE DETAILS



CSP RISER OUTFLOW DETAIL

NTS

Nutrient Separating Baffle Box


555.4
FG
557.01 INV.
568.7
FS
2%
568.37
FS/FG
568.00
FS
557.72 INV.
569.4
FG
558.25
568.3
INV.
FL
11
0.5%
LOT C
1.14%
0.5%
50'
568.0
FL
MIN.
2%
13.5'
3'
MIN.
2%
10
STA: 1
F/OFFSE
P/L
P/W

BIO CLEAN ENVIRONMENTAL MODEL NO. NSBB 6—12—84

RECOMMENDED PIPE SIZES: 18" to 36"

FLOW, TREATMENT, & BYPASS SPECIFICATIONS FOR THE BIOMASS SEPARATING BASKET

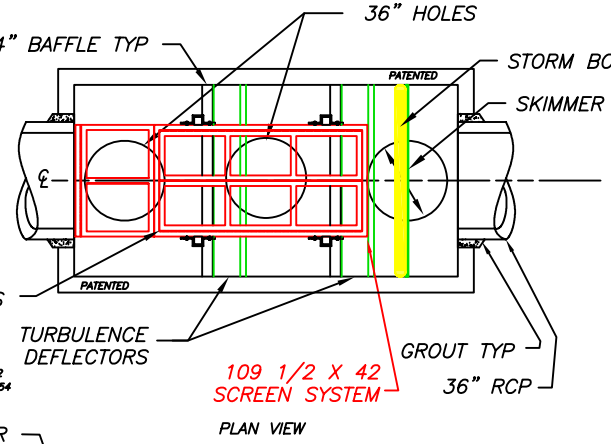
1. Inflow Pipe Area	7.0 SQ.FT.
2. Open Orifice Area in Biomass Separating Basket	34.5 SQ.FT.
3. Treatable Flow Area With No Blockage	34.5 SQ.FT.
4. Treatable Flow Area With 50% Blockage	17.2 SQ.FT.
5. Treatable Flow Area With 75% Blockage	25.8 SQ.FT.
6. Minimum Bypass Available (With Basket 100% Full)	7.7 SQ.FT.

BASKET STORAGE = 58 CU. FT. (2.1 YDS.)

SEDIMENT STORAGE

Lower Front Chamber	72 CU. FT.
Lower Middle Chamber	66 CU. FT.
Lower Rear Chamber	66 CU. FT.
TOTAL	204 CU. FT. (7.5 YDS.)

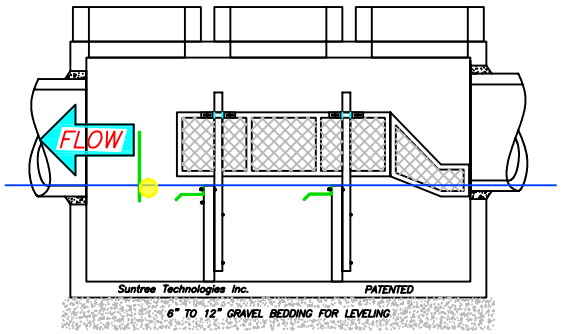
Suntree Technologies Inc.
798 Clearlake Road, Cocoa, Florida 32922
PH: 321-637-7552 Fax: 321-637-7554



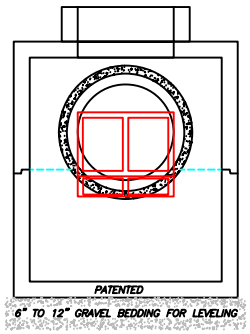
PLAN VIEW

PATENTED

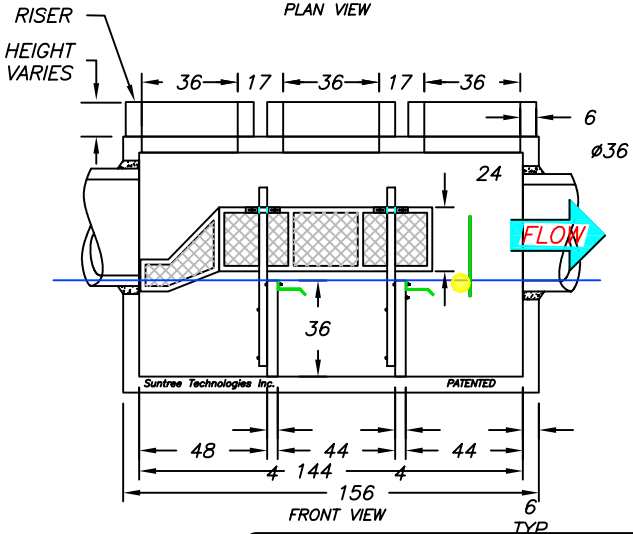
THE STRUCTURE IN THIS DRAWING IS PRIMARILY INTENDED TO BE INSTALLED IN OFF ROAD LOCATIONS WITH LESS THAN 5' OF COVER. STRUCTURES ARE READILY AVAILABLE FOR ALL OTHER CONDITIONS. CONSULT SUNTREE TECHNOLOGIES' REPRESENTATIVE FOR DETAILS.



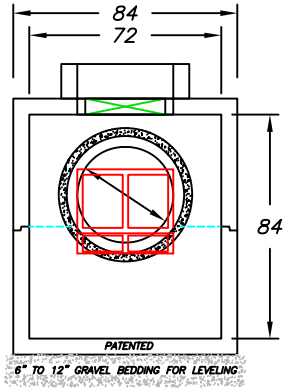
REAR VIEW



LEFT END VIEW



FRONT VIEW



RIGHT END VIEW

NOTES:

1. CONCRETE 28 DAY COMPRESSIVE STRENGTH fc=5,000 PSI.
2. REINFORCING: ASTM A-615, GRADE 60.
3. SUPPORTS AN H20 LOADING AS INDICATED BY AASHTO.
4. JOINT SEALANT: BUTYL RUBBER SS-S-00210
5. ALL WALLS, TOP + BOTTOM ARE 6" THICK.

PEAK DESIGN FLOW
42.4 C.F.S.

(BASED ON 6 FT. PER SEC. FLOW MULTIPLIED BY THE MIN. BYPASS AVAILABLE.)

DISTRIBUTED BY:
BIO CLEAN ENVIRONMENTAL SERVICE
P.O. BOX 869, OCEANSIDE, CA. 92049
TEL. 760-433-7640 FAX:760-433-3176
Email: info@biocleanenvironmental.net

SUNTREE TECHNOLOGIES, INC. 798 CLEARLAKE RD. SUITE #2 COCOA, FL. 32922	PROJECT: SUNTREE TECHNOLOGIES SPEC.	
	REVISIONS: BASKET SYSTEM	DATE: 01/06/04
NUTRIENT SEPARATING BAFFLE BOX MODEL NO.NSBB 6-12-84	REVISIONS:	DATE:
DATE: 01/01/04 SCALE:SF = 72	REVISIONS:	DATE:
DRAFTER: N.R.B. UNITS =INCHES	REVISIONS:	DATE:

NSBB Flow-Velocity Calculator

This calculator computes the water velocity directly above the divider partitions. Depending on a range of conditions, the water velocities at other points over the sediment chambers may be less. See notes below for other limitations and restrictions on use.

1. Enter the Interior Width of the Baffle Box (in Inches) and Press Enter:		**72**
Interior Width Converted to Feet:		6.00
2. Enter the Width of the Basket (in Inches):		**42**
Basket Width Converted to Feet:		3.50
3. Enter the Diameter of the Outlet Pipe (in Inches):		**24**
Outlet Pipe Diameter Converted to Feet:		2.00
4. Enter Desired Flow (Q) through the Baffle Box (in Cubic Feet per Second):		**7.90**
5. Beginning with 1.0, Increase or Decrease Value until Accepted:	**Accepted**	**1.000**
Flow (Q) Used in Calculations (Appropriately Rounded, Cubic Feet per Second)		7.90
Hydraulic Depth (HGL) in Outlet Pipe (Feet):		1.00
Velocity of Exit Water in Outlet Pipe (Feet per Second):		5.03
Hydraulic Depth (HGL) at Baffle Box Entrance (Feet above Outlet Pipe Invert):		1.59
Internal Flow Velocity with Basket Fully Unobstructed (Feet per Second):		**0.84**
Velocity within baffle box is well below critical velocity.		
Internal Flow Velocity with Basket Fully Obstructed (Feet per Second):		**2.1**
Velocity around basket is well below critical velocity.		

Limitations and Restrictions on Use (Assumptions required for calculations to be valid)

1. Inlet and outlet pipe sizes are the same diameter.
2. Inlet-pipe flow is subcritical.
3. Flow in outlet-pipe at the exit is critical (no further restrictions down stream).
4. Tops of sediment partitions, inlet-pipe inverts, and outlet-pipe inverts are at the same elevation.
5. Baffle-box ceiling height is always above the water level.
6. Sediment in final chamber does not significantly restrict flow under skimmer panel (if present).
7. Baffle box is significantly wider than outlet pipe diameter.
8. Top of basket is above water height.

Parameters Used in Calculations:

Hd Sq Pipe	Hd Rd Pipe	Angle	Surface	Area	Hmc	Vc	Qc	Hd Ent
0.79	1.00	90.0	2.00	1.57	0.79	5.03	7.90	1.59

Vbu	Vbo	Hvbu	Hvbo	Vbu2	Vbo2	Hvbu2	Hvbo2	Bill Wolf
0.83	1.99	0.01	0.06	0.83	2.07	0.01	0.07	07/07/06

NSBB Head-Loss Calculator

This calculator computes head losses through baffle boxes with and without partitions known as skimmers providing that the skimmers do not otherwise obstruct flow under or over the vertical skimmer partition. See notes below for other limitations and restrictions on use.

1. Enter the Diameter of the Outlet Pipe (in Inches) and Press Enter:		**24**
Outlet Pipe Diameter Converted to Feet:		2.00
2. Enter Desired Flow (Q) through the Baffle Box (in Cubic Feet per Second):		**7.90**
3. Beginning with 1.0, Increase or Decrease Value until Accepted:	**Accepted**	**1.000**
Flow (Q) Used in Calculations (Appropriately Rounded, Cubic Feet per Second)		7.90
Hydraulic Depth (HGL) in Outlet Pipe (Feet):		1.00
Velocity of Exit Water in Outlet Pipe (Feet per Second):		5.03
Hydraulic Depth (HGL) at Baffle Box Entrance (Feet above Outlet Pipe Invert):		1.59
Physical Depth of Inlet Water in Entrance Pipe in Feet (assuming level NSBB):		1.59
Velocity of Inlet Water in Entrance Pipe (Feet per Second):		2.95
Calculated Head Loss through Baffle Box (Feet):		0.33
Conservative Value to Specify for Head Loss (Feet):		**0.4**

Limitations and Restrictions on Use (Assumptions required for calculations to be valid)

1. Inlet and outlet pipe sizes are the same diameter.
2. Inlet-pipe flow is subcritical.
3. Flow in outlet-pipe at the exit is critical (no further restrictions down stream).
4. Tops of sediment partitions, inlet-pipe inverts, and outlet-pipe inverts are at the same elevation.
5. Baffle-box ceiling height is always above the water level.
6. Sediment in final chamber does not significantly restrict flow under skimmer panel (if present).
7. Baffle box is significantly wider than outlet pipe diameter.
8. Top of basket is above water height. (This requirement does not affect these head loss calculations, but affects retention of floatable debris.)

Parameters Used in Calculations:

Hd Sq Pipe	Hd Rd Pipe	Ext Angle	Surface	Ext Area	Hmc	Vc	Qc
0.79	1.00	90.0	2.00	1.57	0.79	5.03	7.90
		Ent Angle		Ent Area		V ent	
		126.1		2.68		2.95	

Bill Wolf
Revision C
01/27/07

NSBB Treament Flow Calculator

This calculator computes treatment flows for 80% removal of TSS at different particle sizes. This calculator allows the designer to size a Nutrient Separating Baffle Box to specifically meet the performance requirements of a given area of juristiction. A Bio Clean Representative can assit you in determining the specific requirement of that juristiction. See notes below for other limitations or restrictions.

1. Enter Interior Width of Nutrient Separating Baffle Box (in Feet):	**6.0**
2. Enter Interior Length of Nurient Separating Baffle Box (in Feet):	**12.0**
Area of Settling (Hydrodynamic) Chamber (in Square Feet):	**72.0**
Treatment Flows for Nutrient Separating Baffle Box (in CFS):	
TSS of **50 Micron** Particle Size - 80% Removal (in CFS)	2.40
TSS of **75 Micron** Particle Size - 80% Removal (in CFS)	3.52
TSS of **125 Micron** Particle Size - 80% Removal (in CFS)	5.92
TSS of **150 Micron** Particle Size - 80% Removal (in CFS)	9.92
TSS of **250 Micron** Particle Size - 80% Removal (in CFS)	19.20

Limitations and Restrictions on Use (Assumptions required for calculations to be valid)

1. Flow in outlet-pipe at the exit is critical (no further restrictions down stream).
2. Tops of sediment partitions, inlet-pipe inverts, and outlet-pipe inverts are at the same elevation.
3. Baffle-box ceiling height is always above the water level.
4. Sediment in final chamber does not significantly restrict flow under skimmer panel (if present).
5. Baffle box is significantly wider than outlet pipe diameter.
6. Baffle box settling chambers are less than 2/3 full of captured sediment.

Parameters Used in Calculations:

50 µm - 80%	75 µm - 80%	125 µm - 80%	150 µm - 80%	250 µm - 80%
15 gpm/sq ft	22 gpm/sq ft	37 gpm/sq ft	62 gpm/sq ft	120 gpm/sq ft

SPECIFICATIONS

Nutrient Separating Baffle Box

I. Specifications

Track Record: The Nutrient Separating Baffle Box is manufactured by a company whom is regularly engaged in the engineering design and production of treatment systems for stormwater. The Nutrient Separating Baffle Box has been installed and in use as designed in field locations for a duration of over 10 years.

Coverage: The nutrient separating baffle box is of inline design and has the ability to treat the entire storm event. One hundred percent of low and high flows are treated. Thus, no bypass system is required.

Non-Corrosive Materials: Aluminum will be 6061-T6. The screen used to span the aluminum frame is described as follows: Flattened expanded stainless steel sheet ¾ No. 13; Open area = 75%; Grade = 304 Stainless Steel. The screen will be attached to the screen system frame by sandwiching the screen to the aluminum frame between a series of 1 ¼" x 1 ¼" x 3/16" aluminum angle beams and welded in place. A turbulence deflector will be attached near the top of each of the baffles with ½" stainless steel through bolts and stainless steel fender washers. The turbulence deflectors will be made of laminated fiberglass.

Durability: The structure of the box will be precast concrete. The concrete will be 28 day compressive strength fc = 5,000 psi. Steel reinforcing will be ASTM A – C857. Structure will support an H20 loading as indicted by AASHTO. The joint between the concrete sections will ship lap and joint sealed with ram-nek. Filter (excluding oil absorbent media) and support structures are of proven durability, with an expected service life of 15 to 20 years. The filter and mounting structures are of sufficient strength to support water, sediment, and debris loads when the filter is full, with no slippage, breaking, or tearing. All filters are warranted for a minimum of five (5) years.

Oil Absorbent Media: A skimmer and boom system will be positioned near the outflow end of the structure between the second baffle and the end wall of the concrete structure. The skimmer will consist of a steel reinforced concrete structure via keyways in the walls of the structure. The bottom of the skimmer will be positioned so that it is 6" below the static water level. Two storm booms type 4 will float in front of the skimmer and serve to capture hydrocarbons. The storm boom will be contained in an aluminum framed stainless steel screened basket with a hinged lid. The storm boom basket will be attached to the concrete skimmer with stainless steel fasteners.

Overflow Protection: The design of the Nutrient Separating Baffle Box allows the system to treat one-hundred percent of the flow at any level; therefore, no overflow protection is necessary.

Filter Bypass: Water will not bypass the Nutrient Separating Baffle Box at any flow rate.

Pollutant Removal Efficiency: The Nutrient Separating Baffle Box is capable of removing over 90% of the net annual total suspended solids (TSS) load based on a 380-micron particle size. Annual TSS removal efficiency models are based on documented removal efficiency performance from full-scale laboratory tests. Annual TSS removal efficiency models can be considered valid since they are corroborated by independent third party field-testing. Field-testing included influent composite samples from three or more storms at one location. The Nutrient Separating Baffle Box separates solids (e.g. floatable organic matter and trash) from static water within the system.

POLLUTANT	NSBB
Trash & Litter	90 to 95%
Oil & Grease	54% to 96%
Sediments/TSS	95%
Organics	90%
Total Nitrogen	47 to 71.65%
Total Phosphorus	53 to 60%
Total Metals	22 to 66%

Non-Scouring: During heavy storm events the filter water turbulence deflection shield prevents washout of debris and floatables in the filter basket. The system will not re-suspend solids at design flows.

II. Installation

Installation: The Nutrient Separating Baffle Box is constructed according to the sizes shown on the drawings and as specified herein. Install at elevations and locations shown on drawings or as otherwise directed by engineer. Place the pre-cast base unit on a granular subbase of minimum thickness of six inches (152mm) after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5%, the base section shall be removed and the granular subbase material re-leveled.

Installation Notes:

1. The Nutrient Separating Baffle Box shall be installed pursuant to the manufacturer's recommendations and the details on this sheet.
2. Attachments to inlet walls shall be made of non-corrosive hardware.
3. Filtration basket fine screen and coarse containment screen shall be manufactured of stainless steel.
4. Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C 990 along the construction joint in the section that is already in place.
5. Any holes made in the concrete sections for handling or other purposes shall be plugged with a non-shrink grout or by using grout in combination with concrete plugs.
6. Where holes must be cut in the pre-cast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring, which may loosen the mortar joints. The contractor shall make all pipe connections.

III. Maintenance

Maintenance: The Nutrient Separating Baffle Box is designed to allow for the use of vacuum removal of captured materials in the filter screens and sediment chambers, serviceable by centrifugal compressor vacuum units without causing damage to the filter or during normal cleaning and maintenance. Filters can be cleaned and vacuumed from the standard manhole access.

Maintenance Notes:

1. Bio Clean Environmental Services, Inc. recommends the Nutrient Separating Baffle Box be inspected a minimum of once every six months. The cleaning and debris removal maintenance a minimum of once year and replacement of hydrocarbon booms once a year. The procedure is easily done with the use of any standard vacuum truck.
2. Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of filter.
3. The owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.
4. Any person performing maintenance activities must have completed a minimum of OSHA 24-hour hazardous waste worker (hazwoper) training.
5. Remove access manholes lid to gain access to filter screens and sediment chambers. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
6. Remove all trash, debris, and organics from the Nutrient Separating Screen with the vacuum hose.
7. The Nutrient Separating Screen has 3 hinged panels which will open into an upright position. This will expose the baffles. Using a vacuum hose, remove the sediment in the baffle chambers.
8. Evaluation of the hydrocarbon boom shall be performed at each cleaning. If the boom is filled with hydrocarbons and oils it should be replaced. Place new booms properly in media cage.
9. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
10. The hydrocarbon boom is classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

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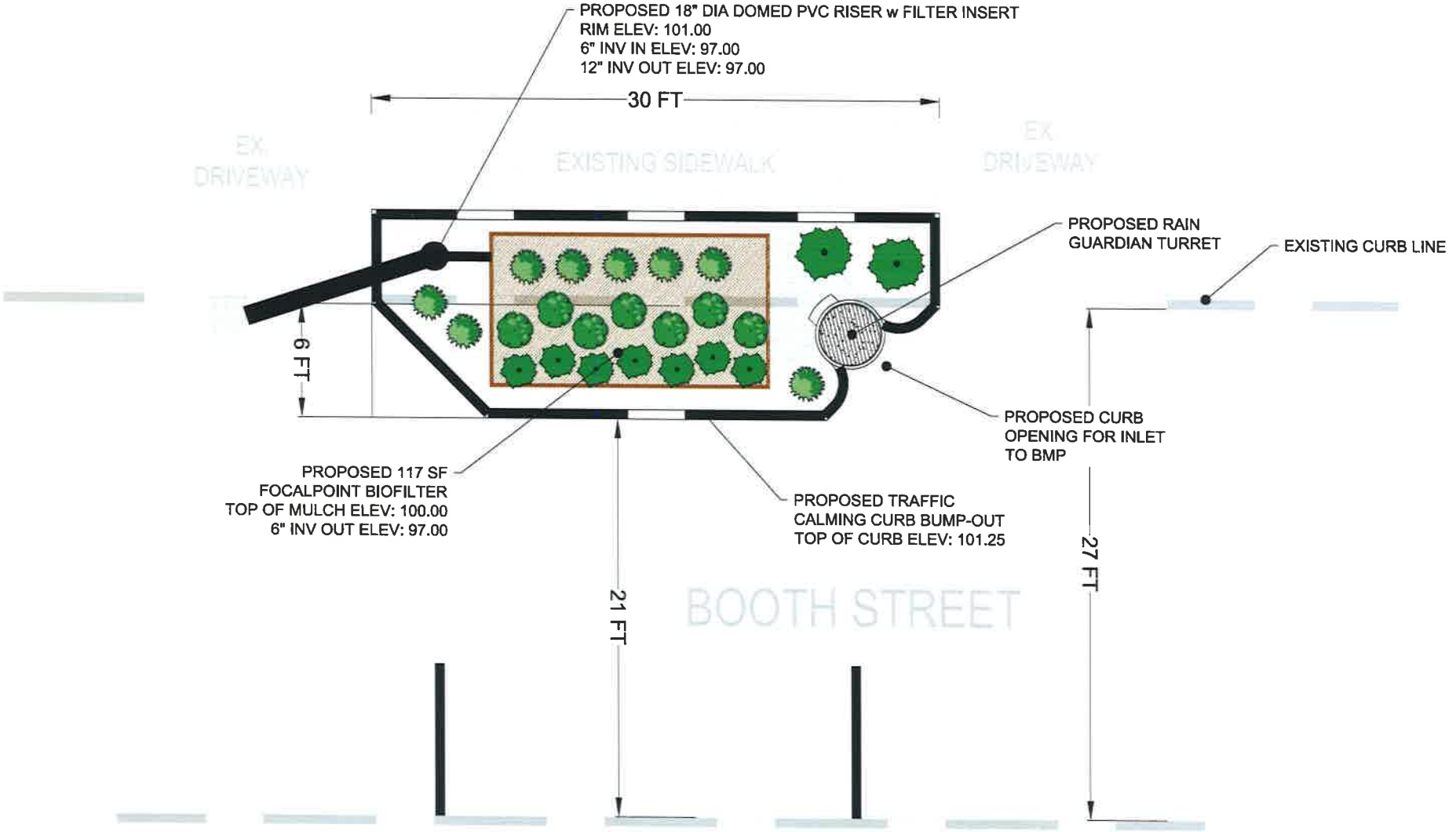


SCALE 1":8'

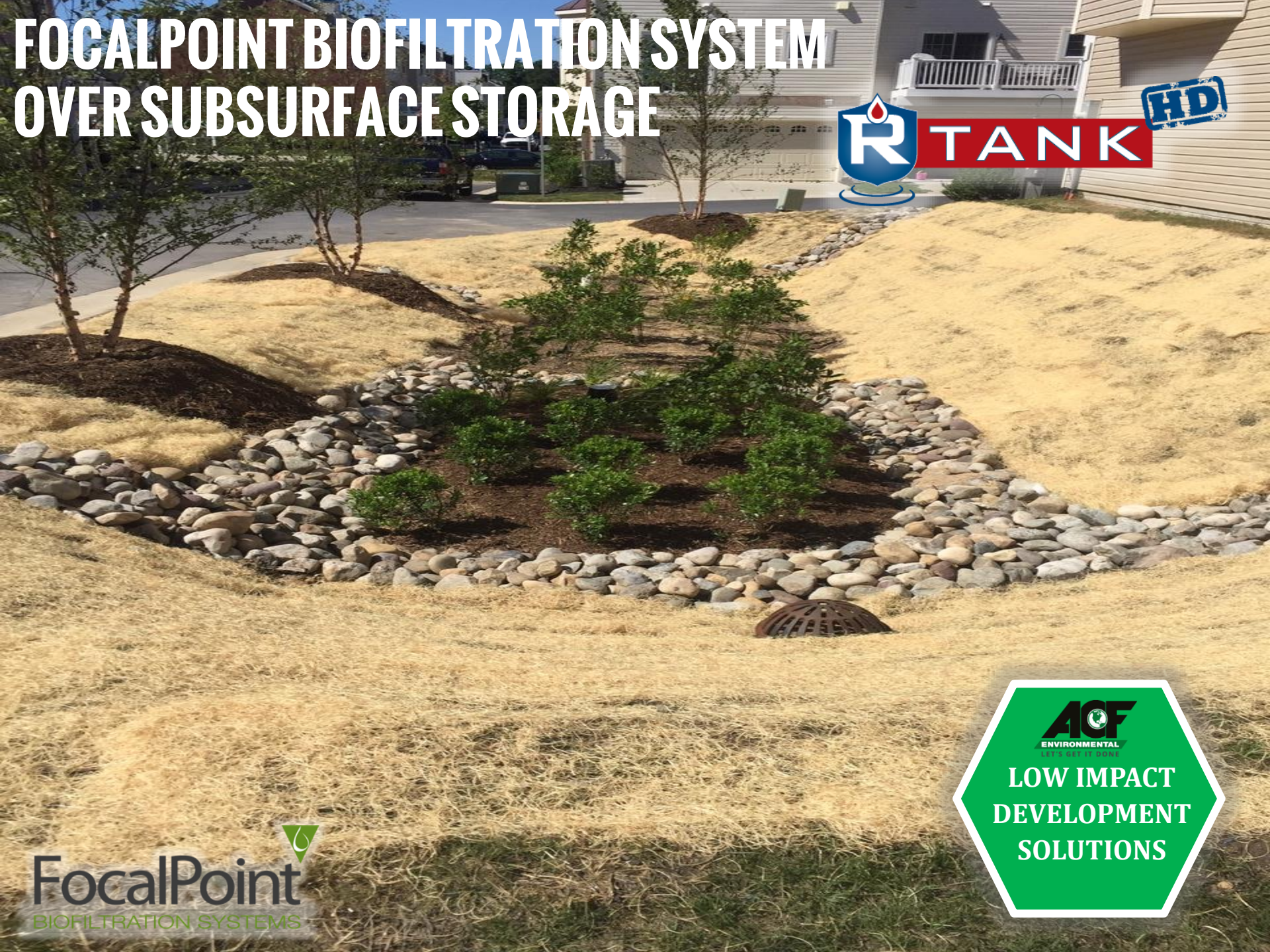
LAYOUT TO BE REVIEWED AND APPROVED BY ENGINEER OF RECORD

JAN 29, 2018

BOOTH STREET - BURLINGTON, VT
CONCEPT STORMWATER MANAGEMENT PLAN
FOCALPOINT BIOFILTER SYSTEM

FOR ADDITIONAL INFORMATION PLEASE CONTACT: ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

FOCALPOINT BIOFILTRATION SYSTEM OVER SUBSURFACE STORAGE



SPECIFICATION
HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS)
Material, Performance and Installation Specification

I. Summary

The following general specifications describe the components and installation requirements for a volume based High Performance Modular Biofiltration System (HPMBS) that utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban storm water runoff. The modular treatment system in which the biologically active biofiltration media is used shall be a complete, integrated system designed to be placed in Square Foot or Linear Foot increments per the approved drawings to treat contaminated runoff from impervious surfaces.

The High Performance Modular Biofiltration System (HPMBS) is comprised of the following components:

A. Plant Component

1. Supplier shall provide a regionalized list of acceptable plants.

2. Plants, as specified in the approved drawings/supplier's plant list, shall be installed at the time the HPMBS is commissioned for use.

3. Plants and planting are typically included in landscape contract.

B. Biofilter Component

1. This component employs a high performance cross-section in which each element is highly dependent on the others to meet the performance specification for the complete system. It is important that this entire cross-section be provided as a complete system, and installed as such.

2. As indicated in the approved drawings, the elements of the Biofilter include:

    A. *A mulch protective layer (if specified).*

    B. *An advanced high infiltration rate biofiltration planting media bed which utilizes physical, chemical and biological mechanisms of the soil, plant, and microbe complex, to remove pollutants found in storm water runoff.*

    C. *A separation layer which utilizes the concept of 'bridging' to separate the biofiltration media from the underdrain without the use of geotextile fabrics.*

D. *A wide aperture mesh layer utilized to prevent bridging stone from entering the underdrain/storage element.*

E. *A modular, high infiltration rate 'flat pipe' style underdrain/storage system which is designed to directly infiltrate or exfiltrate water through its surface. The modular underdrain must provide a minimum of 95% void space.*

C. Energy Dissipation Component

1. An Energy Dissipation Component is typically specified to slow and spread out water as it enters the system. This component is dependent upon the design in the approved drawings, but typically consists of a rock gabion, rock filter dam or dense vegetation element, such as native grasses, either surrounding the Biofiltration Component or located immediately upstream of it.

D. Pretreatment Component

1. Pretreatment, when specified, is typically accomplished by locating the Biofiltration Component within a traditional vegetated BMP such as a vegetated swale, vegetated depression, traditional bioretention system, vegetated filter strip, sediment forebay, etc. These BMPs provide primary TSS removal when desirable.

E. Observation and Maintenance Component

1. An Observation and Maintenance Port shall be installed per the approved drawings to provide for easy inspection of the underdrain/storage element, and cleanout access if needed.

F. Extreme Event Overflow (by others)

1. An Extreme Event Overflow should be located external to, but near the Biofiltration element to provide bypass when needed. This may be an overland flow bypass structure, beehive overflow grate structure, or equivalent that serves the purpose. If a beehive overflow structure is utilized it should include a removable filter insert to provide for effective control of gross pollutants, trash and floatables.

II. Quality Assurance and Performance Specifications

The quality and composition of all system components and all other appurtenances and their assembly process shall be subject to inspection upon delivery of the system to the work site.

Installation is to be performed only by skilled work people with satisfactory record of performance on earthworks, pipe, chamber, or pond/landfill construction projects of

comparable size and quality.

A. Plants

1. Plants must be compatible with the HPMBS media and the associated highly variable hydrologic regime. Plants are typically facultative with fibrous roots systems such a native grasses and shrubs.

2. Supplier shall provide a regionalized list of acceptable plants but is not responsible for furnishing or installing the plants.

3. All plant material shall comply with the type and size required by the approved drawings and shall be alive and free of obvious signs of disease.

B. Mulch

1. Mulch, typically double shredded hardwood (non-floatable), shall comply with the type and size required by the approved drawings, and shall be screened to minimize fines.

C. Biofiltration Media

1. Biologically active biofiltration media shall be visually inspected to ensure appropriate volume, texture and consistency with the approved drawings, and must bear a batch number marking from the supplier which certifies performance testing of the batch to meet or exceed the required infiltration rate (100 in/hr). A third party laboratory test must be provided to certify the 100 in/hr rate.

2. Each correctly installed and properly protected HPMBS will have the infiltration rate confirmed at the supplier's expense, by a wetted condition hydraulic conductivity test. It is recommended the test be run within no sooner than 90 days of commissioning, but no more than 270 days, after commissioning.

    a. *Failure to pass this test will result in removal and replacement of system media at no cost to the project owner/operator.*

    b. *Test must utilize the equipment and follow the standard operating procedures found in HPMBS Installation Guide or the Harris County Texas manual entitled, Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management (2011).*

    c. *Replacement media, if required, must be taken from a different batch than the original.*

3. Supplier shall provide, at no additional cost to the project owner/operator, maintenance of the biofiltration system for a period of one year.

4. Pollutant removal performance, composition and characteristics of the

biofiltration media must meet or exceed the following minimum standards. Pollutant performance shall be demonstrated by a full-scale field study that follows Technology Assessment Protocol – Ecology (TAPE) testing or other approved method.

Pollutant	Removal Efficiency
TSS	> 80%
Phosphorus	≥ 60%
Nitrogen	≥ 48%
Fecal	≥ 60%
Enterococci	≥ 50%
Composition and Characteristics	
Sand - Fine	< 5%
Sand – Medium	10% - 15%
Sand – Coarse	15% - 25%
Sand – Very Coarse	40% - 45%
Gravel	10% - 20%
Infiltration Rate	>100 inches per hour
Peat Moss*	5% - 15%
*** Peat Moss Specification**	
Listed by Organic Materials Review Institute 100% natural peat (no composted, sludge, yard or leaf waste) Total Carbon >85% Carbon to Nitrogen Ratio 15:1 to 23:1 Lignin Content 49% to 52% Humic Acid >18% pH 6.0 to 7.0 Moisture Content 30% to 50% 95% to 100% passing 2.0mm sieve > 80% passing 1.0mm sieve	

D. Underdrain/Storage System

1. Underdrain/storage components shall be manufactured in an ISO certified facility and be manufactured from at least 90% post consumer recycled materials.

2. Underdrain/storage components shall meet or exceed the following characteristics:

Property	Value
Surface Void Area	≥ 85%
Unit Weight	3.25 lbs/cf
Service Temperature	-14° to 167°
Unconfined Crush Strength	32.48 psi
180 Day Creep Test	
Load Applied – Initial and Sustained	11.16 psi
• Creep Sustained – After 180 Days	0.20 inches
• Creep Sustained – After 180 Days	1.13 %
• Projected Creep – 40 years	1.72%

E. Separation Mesh

1. Separation Mesh shall be composed of high-tenacity monofilament polypropylene yarns that are woven together to produce an open mesh geotextile which shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. The mesh shall meet or exceed the following characteristics:

Properties	Test Method	Unit	Min Ave Roll Value	
			MD	CD
Tensile Strength	ASTM D4595	kN/m (lbs/ft)	21 (1440)	25.3 (1733)
Creep Reduced Strength	ASTM D5262	kN/m (lbs/ft)	6.9 (471)	8.3 (566)
Long Term Allowable Design Load	GRI GG-4	kN/m (lbs/ft)	5.9 (407)	7.2 (490)
UV Resistance (at 500 hours)	-	% strength retained	90	
Aperture Size (machine direction)	-	mm (in)	2 (0.08)	
Aperture Size (cross machine direction)	-	mm (in)	2 (0.08)	
Mass/Unit Area	ASTM D5261	g/m^2 (oz/yd^2)	197 (5.8)	

F. Bridging Stone

1. Bridging Stone shall be 3/8" pea gravel, or other diameter sized to prevent migration of filter media, as specified by supplier.

2. Stone must be washed and free from sediment, soil and contaminants.

III. Delivery, Storage and Handling

A. Protect all materials from damage during delivery and store UV sensitive

materials under tarp to protect from sunlight including all plastics, when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.

B. Biofiltration media shall be segregated from any other aggregate materials and shall be protected against contamination, including contamination from any stormwater runoff from areas of the site which are not stabilized.

IV. Submittals

A. Product Data

1. Submit supplier's product data and approved Installation Manual as well as supplier's Operations and Maintenance Manual for the system. It will be the responsibility of the system owner/operator or their contractor to ensure the system is operated and maintained in accordance with the manual.

B. Certification

1. Supplier shall submit a letter of certification that the complete system meets or exceeds all technical and packaging requirements. Biofiltration media packaging must bear a batch number marking from the supplier which matches a letter from the supplier certifying performance testing of the batch to meet or exceed the required infiltration rate.

C. Drawings

1. Supplier shall provide dimensional drawings including details for construction, materials, specifications and pipe connections.

D. Warranty

1. Supplier shall provide a warranty for all components of the HPMBS for a period of one year provided the unit is installed, operated and maintained in accordance with the manual. Improper operation, maintenance or accidental or illegal activities (i.e. dumping of pollutants, vandalism, etc.) will void the warranty. Biofiltration media shall be warranted to pass the post-installation infiltration test described in this document.

E. Design Computations

1. The HPMBS must be sized using a volume based sizing criteria and demonstrate, using a stormwater modeling software/spreadsheet calculator, that the required water quality volume (defined by the Engineer of Record) passes through the HPMBS prior to activation of the overflow device. Design computations must be provided as part of the submittal process. Sizing based solely on a filter surface area to drainage area ratio method will not be accepted.

F. Substitutions

1. Any proposed equal alternative product substitution to this specification must be submitted for review and approved prior to bid opening. Review package should include third party performance data of the biofiltration media that includes saturated conductivity measurements and pollutant removal efficiency. Pollutant removal data should be from a full-scale field study that follows TAPE or other approved protocol. All components must meet or exceed Quality Assurance and Performance Criteria indicated herein.

V. Project Conditions

A. Review supplier's recommended installation procedures and coordinate installation with other work affected, such as grading, excavation, utilities, construction access and erosion control to prevent all non- installation related construction traffic over the completed HPMBS.

B. Cold Weather

1. Do not use frozen materials or materials mixed or coated with ice or frost.

2. Do not build on frozen ground or wet, saturated or muddy subgrade.

3. Care must be taken when handling plastics when air temperature is at 40 degrees or below as plastic becomes brittle.

C. Protect partially completed installation against damage from other construction traffic when work is in progress and following completion of backfill by establishing a perimeter with highly visible construction tape, fencing, or other means until construction is complete.

D. Soil stabilization of the surrounding site must be complete before the Biofiltration System can be brought online. Soil stabilization occurs when 90% of the site has been paved or vegetated. Temporary erosion control and/or sedimentation prevention measures shall be implemented to reduce the possibility of sediments being transported into the Biofiltration System prior to full stabilization of the site. Significant sediment loads can damage the HPBMS and lead to failure if not prevented or remediated promptly.

VI. PRODUCTS

A. Acceptable HPBMS

FocalPoint High Performance Biofiltration System

B. Acceptable Beehive Overflow Grate Structure (Optional)

Beehive Overflow Grate Structure with removable StormSack

C. Acceptable System Supplier

Convergent Water Technologies, Inc.
(800) 711-5428
www.convergentwater.com

Authorized Value Added Reseller

ACF Environmental
2831 Cardwell Road
Richmond, VA 23234
(800 448-3636
www.acfenvironmental.com

VII. Packaging

A. HPMBS is assembled on site.

B. Modular underdrain/storage unit is shipped flat and modules are assembled prior to installation.

C. Biofiltration media is delivered in one ton super sacks each labeled with supplier's batch number and/or in bulk with accompanying supplier's certification.

D. Other components are delivered in bulk or super sacks

VIII. Execution

A. Excavation and Backfill

1. Base of excavation shall be smooth, level and free of lumps or debris, and compacted unless infiltration of storm water into subgrade is desired. A thin layer (3") of compacted base material is recommended to establish a level working platform (may not be needed in sandy soils). If the base of the excavation is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice. In many cases, a stabilization geotextile and 6" of compactable material that drains well will be sufficient to amend the bearing capacity of the soil.

2. Most applications require 8 oz Non-Woven Geotextile or equivalent nonwoven geotextile with a nominal weight of 8 oz per square yard to line the excavation to separate in situ soils and the HPMBS. (Applications requiring water to infiltrate the in situ sub-soils should use a bridging stone rather than geotextile to provide a separation layer between the HPMBS and the in situ soils). Geotextile, when utilized, should be placed on the bottom and up the sides of the excavation. Absolutely no geotextiles should be used in the water column. If an impermeable

liner is specified, it shall be installed according to supplier's instructions and recommendations.

3. Specified backfill material must be free from lumps, debris and any sharp objects that could penetrate the geotextile. Material is used for backfill along the sides of the system as indicated in engineering detail drawings.

B. Inspection

1. Examine prepared excavation for smoothness, compaction and level. Check for presence of high water table, which must be kept at levels below the bottom of the under drain structure at all times. If the base is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice.

2. Installation commencement constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found to be unsatisfactory, contact Project Manager or Engineer for resolution prior to installation.

IX. Cleanup and Protection during Ongoing Construction Activity

A. Perform cleaning during the installation and upon completion of the work.

B. Remove from site all excess materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation.

C. If surrounding drainage area is not fully stabilized, a protective covering of geotextile fabric should be securely placed to protect the Biofiltration Media.

D. Construction phase erosion and sedimentation controls shall be placed to protect the inlet(s) to the Biofiltration System. Excessive sedimentation, particularly prior to establishment of plants may damage the HPMBS.

E. Strictly follow supplier's guidelines with respect to protection of the HPMBS between Installation and Commissioning phases.

X. Commissioning

A. Commissioning should only be carried out once the contributing drainage area is fully stabilized. If Commissioning must be carried out sooner, it is imperative that appropriate erosion and sediment controls be placed to prevent the entry of excessive sediment/pollutant loads into the system.

B. Commissioning entails removing the protective covering from the Biofiltration Media, planting the plant material in accordance with the approved drawings, and placing mulch if specified.

1. Dig planting holes the depth of the root ball and two to three times as wide

as the root ball. Wide holes encourage horizontal root growth that plants naturally produce.

2. With trees, you must ensure you are not planting too deep. Don't dig holes deeper than root balls. The media should be placed at the root collar, not above the root collar. Otherwise the stem will be vulnerable to disease.

3. Strictly follow supplier's planting guidance.

C. Cover the exposed root ball top with mulch. Mulch should not touch the plant base because it can hold too much moisture and invite disease and insects. Evenly place 3 inches of double-shredded hardwood mulch (if specified) on the surface of the media.

D. Plantings shall be watered-in at installation and temporary irrigations shall be provided, if specified.

XI. Using the HPMBS

A. Maintenance Requirements

1. Each correctly installed HPMBS is to be maintained by the supplier for a minimum period of one year. The cost of this service is to be included in the supplier's price of the system.

2. Annual maintenance consists of two (2) scheduled visits unless otherwise specified.

3. Each maintenance visit consists of the following:

    1. Complete system inspection

    2. Removal of foreign debris, silt, plant material, trash and mulch (if needed)

    3. Evaluation of biofiltration media

    4. Evaluation of plant health

    5. Inspection of underdrain/storage system via Observation/Maintenance Port

    6. Properly dispose of all maintenance refuse items (trash, mulch, etc.)

    7. Take photographs documenting plant growth and general system health

    8. Update and store maintenance records

    9. To ensure long term performance of the HPMBS, continuing annual

maintenance should be performed per the supplier's Operations and Maintenance Manual.

4. If sediment accumulates beyond an acceptable level in the underdrain/storage system, it will be necessary to flush the underdrain. This can be done by pumping water into the Observation/Maintenance Port or adjacent overflow structure, allowing the turbulent flows through the underdrain to re- suspend the fine sediments. If multiple Observation/Maintenance Ports have been installed, water should be pumped into each port to maximize flushing efficiency.

   Sediment-laden water can be pumped out and either captured for disposal or filtered through a Dirtbag filter bag, if permitted by the locality.

XII. Measurement and Payment

Given the integrated nature of the HPMBS, measurement and payment will be based not on the individual component prices, but on the size of the Biofiltration Media bed. The external dimension as indicated in the approved plans and executed in the installation will be measured in Square Feet and payment will be made per HPMBS system.

Measurement and payment of beehive overflow grate structure with removable filter insert will be based on per unit price.

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements