PRELIMINARY

Low Impact Development (LID)

REPORT & CALCULATIONS

PREPARED FOR:

PICKARD ARCHITECTS

13215 PENN STREET SUITE 300

WHITTIER, CALIFORNIA, 90602.

P: 562-945-8821

PROJECT SITE:

6018 NORWALK BOULEVARD

WHITTIER, CALIFORNIA, 90606.

APN: 8174-041-028

PREPARED BY:

CRF Project No. 20-118

6782 STANTON AVENUE SUITE-A

BUENA PARK, CALIFORNIA, 90621.

WWW.CRFENGINEERING.COM

PHONE: 714-522-2266

DATE PREPARED: 06/27/2022

DATE REVISED: N/A

"For Review"

REGISTERED PROFESSIONAL ENGINEER
CESAR R. RAMIREZ
No. C 78100
CIVIL
STATE OF CALIFORNIA

06/30/20

Scope of Work

- The scope of work is to construct a new apartment complex including ADA parking spaces, storage space, and a trash enclosure as shown on preliminary grading plans.

BMP Design

The project has been designed to treat the 85th percentile storm water coming from the proposed roof of the new two-story building and other surfaces around the project. Runoff will be treated by using dry wells (RET-4) able to contain the 85th percentile storm water and infiltrating it back into the ground therefore replenishing the existing groundwater.

Area of Work

EXISTING SITE AREAS	
Existing Impervious Areas	19,936 SF.
Existing Pervious Areas	836 SF.
Total Existing Areas	20,772 SF. = 0.477 ACRES

PROPOSED REDEVELOPMENT SITE AREAS	
Total Proposed Impervious Areas	18,169 SF.
Total Proposed Pervious Areas	2,603 SF.
Total Area	20,772 SF. = 0.477 ACRES

Given Data: see research material located in the back of the report.

85^{th} Percentile Rainfall = 1 in. = (0.08333 ft)

CALCULATIONS

Also shown on LID plans.

Peak Mitigation
Flow Rate Using Ix = 1.00 in.

$Q = C_d * Ix * A_{total}$
$C_d = 0.9$
Ix = 1.00 in.
A_{total} = 0.477 acres
Q = 0.429 cfs

DMA#1

STORMWATER RUNOFF VOLUME

STEP 1: Catchment Area (CA):
CA = 0.9*18,169 + 0.1*2,603
CA = 16,612.40 ft^2

STEP 2: Stormwater Runoff Volume (Vm):
0.75 in Design Storm
V_m = 0.0625*CA = 1,038.28 ft^3
85^{th} Percentile Design Storm
V_m = 0.0833*CA = **1,384.37 ft^3 USE THIS VOLUME**

RET-4 DRY WELL CALCULATIONS

GIVENS:
V_m = 1,384.37 ft^3
Ksat,measured = 7.24 in/hr
Gravel void ration = 40%
Factor of Safety = 4 (Per page 5 of Soils Report)
T = 96 hours
H, Depth = 15 ft minimum required, use **40 ft**

STEP 1: Determine the design infiltration rate, Ksat,design:
Ksat,design = 7.24 in/hr / 4 = 1.81 in/hr (Per page 5 of Soils Report)

STEP 2: Determine the minimum bottom infiltration, Amin:
Amin = (Vm*12in/ft)/(Ksat,design*T)
Amin = (1384.37*12)/(1.81*96)
Amin = 95.61 SF

STEP 3: Determine minimum dry well radius size, R:
$R = -H +/- (H^2+Amin/\pi)^{1/2}$
$R = -40 +/- (40^2 + 89.86/\pi)^{1/2}$
R = -40 +/- 40.36
R = 0.36 ft, use **3 ft (6 ft diameter)**

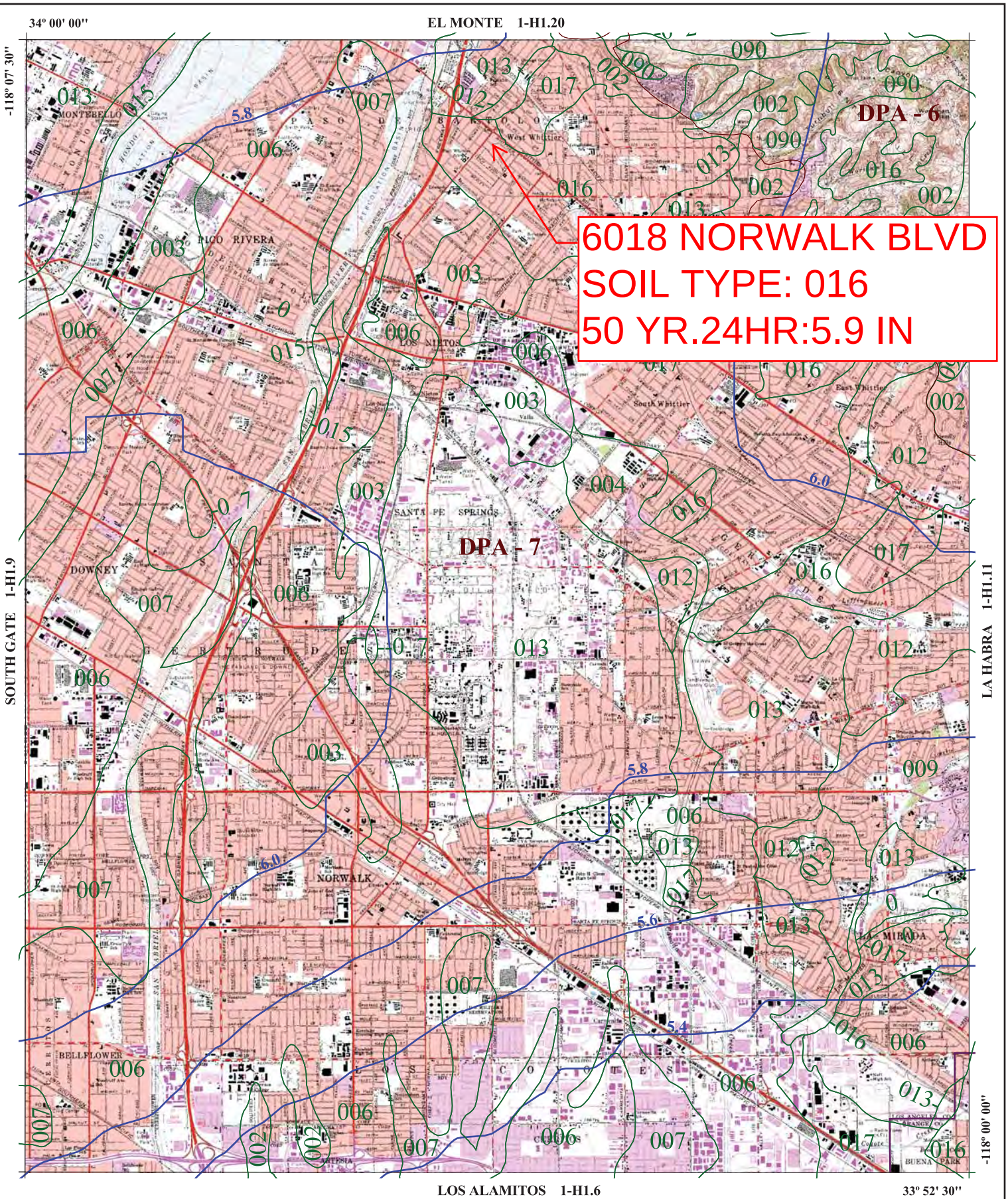
STEP 4: Determine the dry well storage volume, Vstorage:
$Vstorage = [\pi r^2 h]*0.4$
$Vstorage = \pi*9*40*0.4$
Vstorage = 452.39 ft^3

STEP 5: Determine 3-hr infiltration volume, V,3hr:
V,3hr = Amin * (ksat,design/12in/ft) * 3hrs
V,3hr = 95.61 SF * (1.81/12)*3
V,3hr = 43.26 ft^3

STEP 6: Determine additional required storage volume, Vadd,sto:
Vadd,sto = Vm – (Vstorage + V,3hr)
Vadd,sto = 1,384.37 – (452.39 + 43.26) = 888.72 ft^3
USE a total of 3 Drywells with a 6ft diameter at 40 ft depth.

“ATTACHMENT A”

Project Research Materials



N
W E
S

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

W H I T T I E R
50-YEAR 24-HOUR ISOHYET

1-H1.10

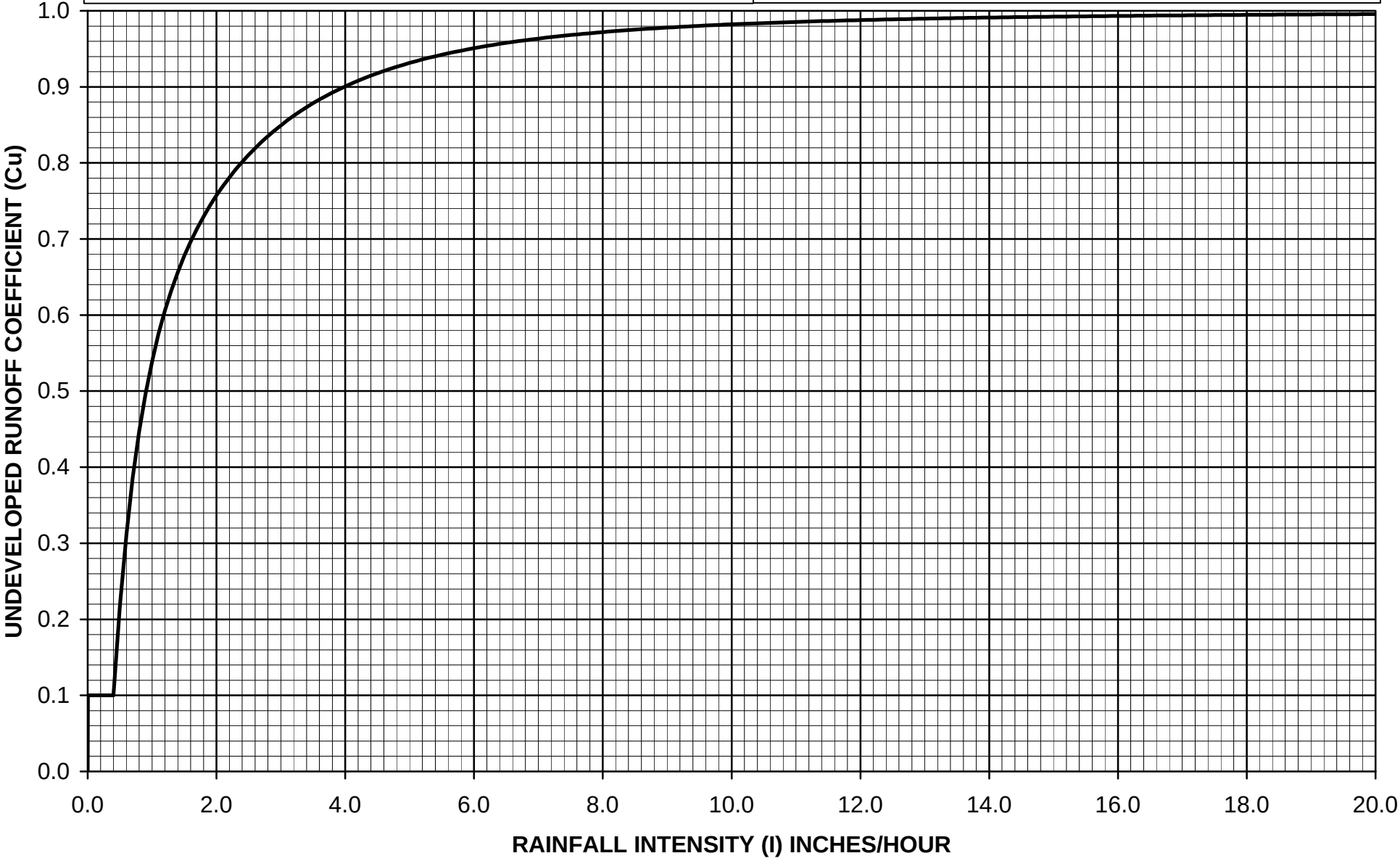
LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: C_D = Developed Runoff Coefficient
IMP = Proportion Impervious
C_U = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 016



Los Angeles County, California, Southeastern Part

1137—Urban land-Ballona-Typic Xerorthents, fine substratum complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2pt41
Elevation: 10 to 630 feet
Mean annual precipitation: 13 to 19 inches
Mean annual air temperature: 62 to 66 degrees F
Frost-free period: 355 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Urban land: 45 percent
Ballona and similar soils: 20 percent
Typic xerorthents, fine substratum, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Typic Xerorthents, Fine Substratum

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human-transported material over young alluvium derived from sedimentary rock

Typical profile

^Au - 0 to 13 inches: loam
^Cu - 13 to 47 inches: clay loam
2C1 - 47 to 57 inches: clay
2C2 - 57 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Ballona

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over young alluvium derived from sedimentary rock

Typical profile

^A - 0 to 6 inches: loam
^A2 - 6 to 18 inches: loam
2A3 - 18 to 31 inches: clay loam
2Bk1 - 31 to 47 inches: clay
2Bk2 - 47 to 79 inches: clay

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Arbolado

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Cropley, coarse fill surface

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Azuvina

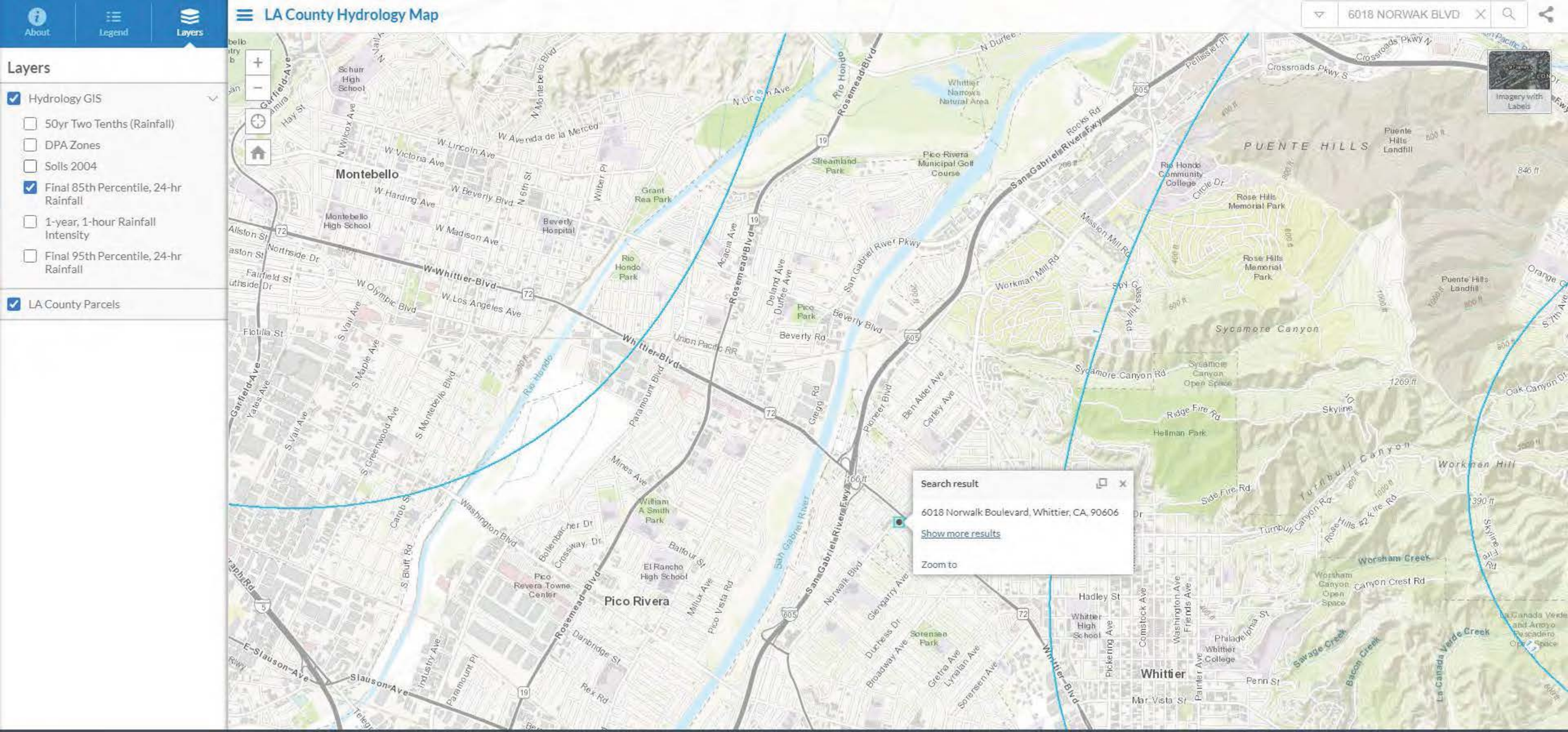
Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

San emigdio

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

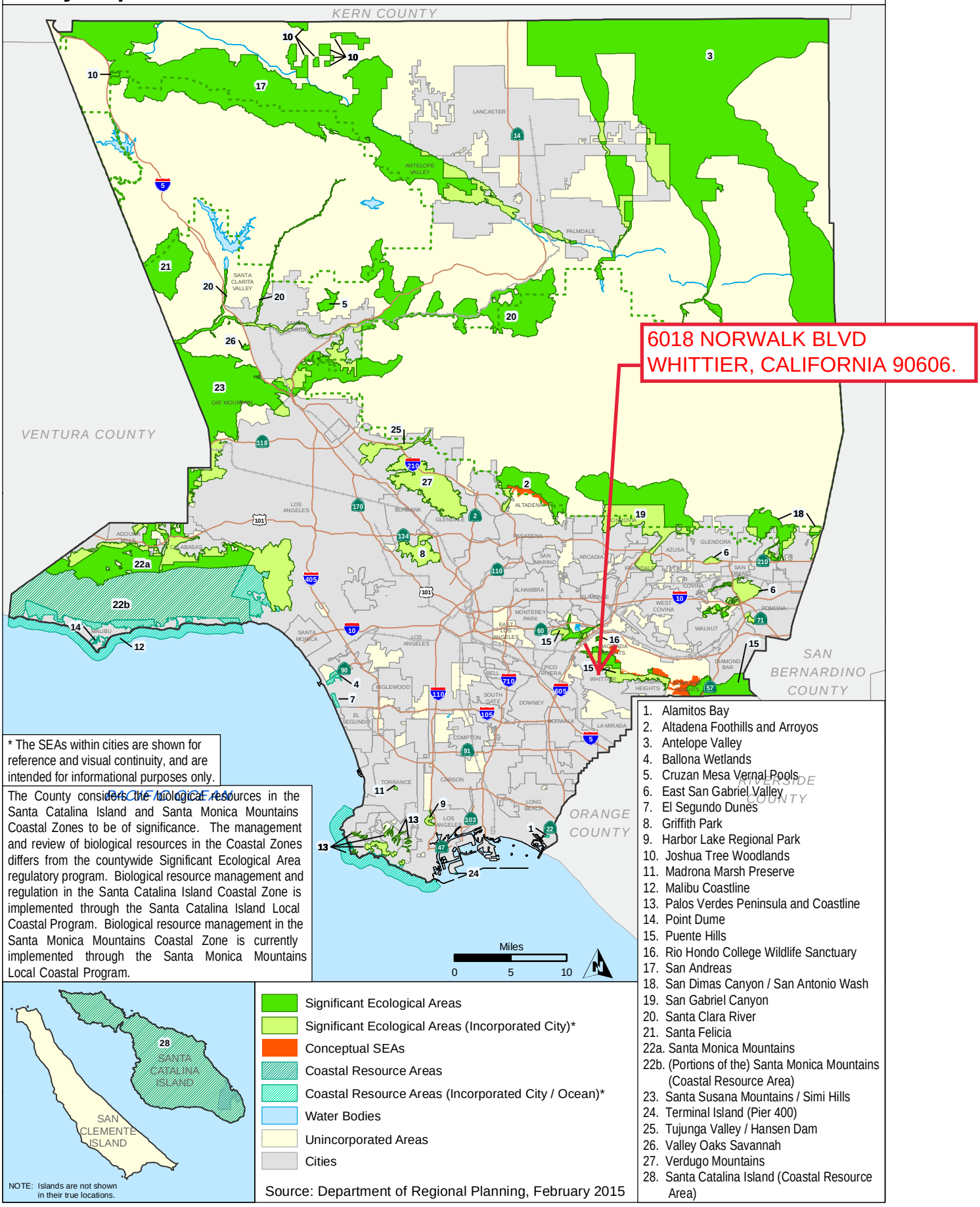
Data Source Information

Soil Survey Area: Los Angeles County, California, Southeastern Part
Survey Area Data: Version 7, May 27, 2020


About
Legend
Layers
LA County Hydrology Map
6018 NORWAK BLVD
Layers
Hydrology GIS
50yr Two Tenths (Rainfall)
DPA Zones
Soils 2004
Final 85th Percentile, 24-hr Rainfall
1-year, 1-hour Rainfall Intensity
Final 95th Percentile, 24-hr Rainfall
LA County Parcels
Imagery with Labels
Search result
6018 Norwalk Boulevard, Whittier, CA, 90606
Show more results
Zoom to
Montebello
Pico Rivera
Whittier
PUENTE HILLS
Rio Hondo
San Gabriel River
Whittier Narrows Natural Area
Sycamore Canyon
Workman Hill
Turnbull Canyon
Worsham Creek
Savage Creek
Bacon Creek
La Canada Verde Creek
Rosemead Blvd
Whittier Blvd
Slauson Ave
Beverly Blvd
Washington Blvd
Workman Mill Rd
Rose Hills Memorial Park
Puente Hills Landfill
Rio Hondo Community College
Whittier High School
Whittier College
Pico Rivera Municipal Golf Course
Streamland Park
Grant Rea Park
Beverly Hospital
Pico Park
William A Smith Park
El Rancho High School
Pico Rivera Towne Center
Sorensen Park
Hellman Park
Sycamore Canyon Open Space
Worsham Canyon Open Space
Schurr High School
Montebello High School

Significant Ecological Areas and Coastal Resource Areas Policy Map

Figure 9.3



* The SEAs within cities are shown for reference and visual continuity, and are intended for informational purposes only.

The County considers the biological resources in the Santa Catalina Island and Santa Monica Mountains Coastal Zones to be of significance. The management and review of biological resources in the Coastal Zones differs from the countywide Significant Ecological Area regulatory program. Biological resource management and regulation in the Santa Catalina Island Coastal Zone is implemented through the Santa Catalina Island Local Coastal Program. Biological resource management in the Santa Monica Mountains Coastal Zone is currently implemented through the Santa Monica Mountains Local Coastal Program.

NOTE: Islands are not shown in their true locations.

- Significant Ecological Areas
- Significant Ecological Areas (Incorporated City)*
- Conceptual SEAs
- Coastal Resource Areas
- Coastal Resource Areas (Incorporated City / Ocean)*
- Water Bodies
- Unincorporated Areas
- Cities

Source: Department of Regional Planning, February 2015

1. Alamitos Bay
2. Altadena Foothills and Arroyos
3. Antelope Valley
4. Ballona Wetlands
5. Cruzan Mesa Vernal Pools
6. East San Gabriel Valley
7. El Segundo Dunes
8. Griffith Park
9. Harbor Lake Regional Park
10. Joshua Tree Woodlands
11. Madrona Marsh Preserve
12. Malibu Coastline
13. Palos Verdes Peninsula and Coastline
14. Point Dume
15. Puente Hills
16. Rio Hondo College Wildlife Sanctuary
17. San Andreas
18. San Dimas Canyon / San Antonio Wash
19. San Gabriel Canyon
20. Santa Clara River
21. Santa Felicia

22a. Santa Monica Mountains

22b. (Portions of the) Santa Monica Mountains (Coastal Resource Area)

23. Santa Susana Mountains / Simi Hills
24. Terminal Island (Pier 400)
25. Tujunga Valley / Hansen Dam
26. Valley Oaks Savannah
27. Verdugo Mountains
28. Santa Catalina Island (Coastal Resource Area)

Table 7-3. Typical Pollutants of Concern by Land Use [1]

Land Use	Pollutants of Concern [2]								
	Suspended Solids	Total Phosphorus	Total Nitrogen	Total Kjeldahl Nitrogen	Cadmium, Total	Chromium, Total	Copper, Total	Lead, Total	Zinc, Total
High Density Single Family Residential	X	X			[4]	[4]	X	X	X
Multi-Family Residential	X				[4]	[4]	X		X
Mixed Residential	X	X	X		[4]	[4]	X	X	X
Commercial	X	X	X	X	[4]	[4]	X	X	X
Industrial	X	X	X	X	[4]	[4]	X	X	X
Critical Facilities [3]	X	[4]	[4]	[4]	[4]	[4]	X	X	X
Transportation (streets, roads)	X	X	X	X	[4]	[4]	X	X	X
Institutional (educational facilities)	X				[4]	[4]	X		X

[1] Adapted from Table A-3 of the *Technical Manual for Stormwater Best Management Practices in the County of Los Angeles* (February 2004) and the Southern California Coastal Water Research Project Land Use Specific Storm Water Monitoring Data. X = exceedance of "standard" by observed median/average concentration; blank = no exceedance of "standard" by observed median/average concentration.

[2] Derived from Table 11 of the 2012 Los Angeles County MS4 Permit (page 104).

[3] Critical facilities include automobile dismantling (SIC 50xx), automobile repair (SIC 75xx), metal fabrication (SIC 34xx), motor freight (SIC 42xx), automobile dealerships (SIC 55xx), chemical manufacturing (SIC 28xx), and machinery manufacturing (SIC 35xx).

[4] No available data to determine if these pollutants of concern originate from this land use. Pollutant is assumed to be produced by this land use unless otherwise proven by the project applicant.

“ATTACHMENT B”

Soils Report

Older Alluvium (Qae)

Older alluvium deposits underlie the alluvium layer and were encountered in the borings. The older alluvium consists of layers of clayey sand, silty sand, sandy silt, sand, and gravelly sand that are generally yellowish-brown and light olive-brown, slightly moist to moist, stiff to very stiff, and medium dense to very dense, with varying amounts of fine- to coarse-grained gravel.

GEOTECHNICAL CHARACTERISTICS

In-Situ Percolation Testing

In-situ percolation testing was conducted in Boring 3, which was drilled to a depth of 31 feet below existing grade. The purpose of this test was to determine the infiltration rate and evaluate the infiltration characteristics of the earth materials underlying the subject site. The test was performed in accordance with the Administrative Manual of the County of Los Angeles, Department of Public Works, Section GS200.2, dated June 30, 2017. Following drilling and sampling, a PVC pipe was inserted into the boring, covered with a filter sock, and surrounded with the onsite excavated soil. The upper 5 feet of the pipe was solid and the lower 25 feet was screened to allow water infiltration below 5 feet. The boring was then presoaked utilizing water from the drill rig and was allowed to set for at least 30 minutes. Following presoaking, a falling-head percolation test was conducted. The test consisted of ceasing the flow of water into the boring and measuring the drop of the water surface (head) at 10-minute intervals. The test was repeated seven times.

The results of the infiltration rate calculations are shown on the enclosed Calculation Sheet #1. Based on the results of *in-situ* percolation testing, the design infiltration rate for the earth materials between the depths of 5 and 30 feet is estimated to be 1.81 inches-per-hour (1.3×10^{-3} centimeters-per-second). The calculations incorporate a reduction factor of 4 based on the guidelines of the Administrative Manual.

“ATTACHMENT C”

Operations and Maintenance (O&M) Plan

Operations and Maintenance (O&M) Plan

PRELIMINARY LOW IMPACT DEVELOPMENT

PREPARED FOR:

PICKARD ARCHITECTS

13215 PENN STREET SUITE 300

WHITTIER, CALIFORNIA, 90602.

P: 562-945-8821

PROJECT SITE:

6018 NORWALK BOULEVARD

WHITTIER, CALIFORNIA, 90606.

APN: 8174-041-028

PREPARED BY:

CRF Project No. 20-118

6782 STANTON AVENUE SUITE-A

BUENA PARK, CALIFORNIA, 90621.

WWW.CRFENGINEERING.COM

PHONE: 714-522-2266

DATE PREPARED: 06/27/2022

DATE REVISED: N/A

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes.	Education for Property Owners, Tenants and Occupants General education for protection of stormwater and maintaining stormwater quality.	Educational brochures to be provided. Annually.	*Owner*
Yes	Activity Restriction	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Ongoing.	*Owner*
Yes.	Common Area Landscape Management Maintenance of landscape area found within curb islands.	Appointed Property management company to provide maintenance of landscaping to meet current water efficiency and keep plants healthy and bio areas maintained with proper soil amendments. Once a week with monthly inspections for deficiencies.	*Owner*
Yes	BMP Maintenance Maintenance schedule for proposed structural BMP.	Maintenance of structural BMPs implemented at the project site shall be performed once every 6 months.	*Owner*
No.	Title 22 CCR Compliance N/A.	N/A	*Owner*
No.	Spill Contingency Plan No materials kept outside that are hazardous.	N/A	*Owner*
Yes	Underground Storage Tank Compliance ADS HDPE Pipe.	Maintenance of underground HDPE tanks once every 6 months.	*Owner*

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No.	Hazardous Materials Disclosure Compliance No hazardous materials.	N/A	*Owner*
No.	Uniform Fire Code Implementation N/A.	N/A	*Owner*
Yes.	Common Area Litter Control Maintenance and control of trash/debris to designated areas such as trash enclosures.	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	*Owner*
Yes.	Employee Training Employee training on maintaining stormwater quality.	Education program as it would apply to future employees of individual businesses. Once every 6 months.	*Owner*
No.	Housekeeping of Loading Docks	N/A	*Owner*
Yes.	Common Area Catch Basin Inspection Maintenance of on-site catch basins to prevent clogging.	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Inlets and other facilities shall be cleaned prior to the rainy season, by October 1st each year.	*Owner*
Yes.	Street Sweeping Private Streets and Parking Lots Sweeping of proposed parking lot to mitigate pollutants from vehicles.	Parking lots are required to be swept prior to the rainy season, by October 1st each year. Annually.	*Owner*
No.	Retail Gasoline Outlets No gasoline outlets on-site.	N/A	*Owner*

Structural Source Control BMPs			
No.	Provide Storm Drain System Stenciling and Signage Stenciling will be provided near inlets.	N/A	*Owner*
No.	Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction No outdoor storage areas.	N/A	*Owner*
Yes.	Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction Trash enclosure will be used on-site and will need to be maintained.	Sweep trash area at least one per week and before October 1st each year. Maintain area clean of trash and debris at all times. Weekly.	*Owner*
Yes.	Use Efficient Irrigation Systems & Landscape Design Efficient irrigation system to be used during drought times.	Check the connection on all of the wires. Twice seasonally.	*Owner*
No.	Protect Slopes and Channels and Provide Energy Dissipation N/A.	N/A	*Owner*
No.	Loading Docks Loading docks to be maintained.	N/A	*Owner*
No.	Maintenance Bays N/A.	N/A	*Owner*
No.	Vehicle Wash Areas No vehicle wash areas.	N/A	*Owner*
No.	Outdoor Processing Areas No outdoor processing areas.	N/A	Owner
No.	Equipment Wash Areas No equipment washes areas.	N/A	Owner
No	Fueling Areas No fueling areas on-site.	N/A	Owner
No.	Hillside Landscaping There is no hillside landscaping on-site.	N/A	Owner

No.	Wash Water Controls for Food Preparation Areas No food preparation areas.	N/A	Owner & Tenants
No	Community Car Wash Racks No car wash areas on-site.	N/A	Owner
Treatment Control BMPs			
Yes	Treatment Control BMP # 1 Dry Wells (RET-4)	Per attached operations and maintenance plan. 3 times during rainy season.	Owner
Yes	Oldcastle Flogard Catch Basin Insert Filter	Per attached operations and maintenance plan. 3 times during rainy season.	Owner

Operations and Maintenance Plan

Required Permits

At this time, the city has only required:

- LID Clearance
- Grading Permit

Responsible Party

The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the LID Plan. The contact information for the entity responsible is below:

Name:	
Company:	
Title:	Property Owner
Address 1:	
Address 2:	
Phone Number:	
Email:	

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached. All records must be made available for review upon request.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed
(1) Dry Wells (Ret-4) – 3 total	Per attached operation and maintenance plan attached hereon. (Property Owner to be responsible for Operation & Maintenance of BMP.)
(2) OldCastle Flogard Catch Basin Insert Filter Model No. FGP-24F – 1 total	Per attached operation and maintenance plan attached hereon. (Property Owner to be responsible for Operation & Maintenance of BMP.)
S3 – Design and construct trash and waste storage areas to reduce pollution introduction	Sweep trash area at least one per week and before October 1st each year. Maintain area clean of trash and debris at all times.
S4 – Use efficient irrigation system & landscape design, water conservation, smart controllers, and source controls	Check the connection on all of the wires.
N1 - Education for Property Owners, Tenants and Occupants	Educational materials will be provided to tenants annually
N2 – Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property
N3 - Common Area Landscape Management	Appointed Property management company to provide maintenance of landscaping to meet current water efficiency and keep plants healthy and bio areas maintained with proper soil amendments.
N4 – BMP Maintenance	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP.
N8 – Underground Storage Tank Compliance	Maintenance of underground HDPE tanks.
N11 – Common Area Litter Control	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed
N12 – Employee Training	Education program as it would apply to future employees of individual businesses.
N14 – Common Area Catch Basin Inspection	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Inlets and other facilities shall be cleaned prior to the rainy season, by October 1st each year.
N-15 – Street Sweeping Private Streets and Parking Lots	Parking lots are required to be swept prior to the rainy season, by October 1st each year.

- Trees and other large vegetation should be planted away from dry well such that drip lines do not overhang the infiltration area.

Restricted Construction Materials

Use of pressure-treated wood or galvanized metal at or around a dry well is prohibited.

Maintenance Access

The dry well must be safely accessible during wet and dry weather conditions if it is publicly-maintained. If the dry well becomes plugged and fails, access is needed to excavate the dry well and replace the filter bed media. To prevent damage and compaction, access must able to accommodate a backhoe working at "arm's length" from the dry well.

Maintenance Requirements

Maintenance and regular inspections are important for proper function of dry wells. The following are general maintenance requirements:

- Conduct regular inspection and routine maintenance for pretreatment devices.
- Inspect dry well and its observation well frequently to ensure that water infiltrates into the subsurface completely within maximum retention time of 96 hours. If water is present in the observation well more than 96 hours after a major storm, the dry well may be clogged. Maintenance activities triggered by a potentially clogged facility include:
    - Check for debris/sediment accumulation and remove sediment (if any) and evaluate potential sources of sediment and vegetative or other debris (e.g., embankment erosion, channel scour, overhanging trees, etc). If suspected upstream sources are outside of the County's jurisdiction, additional pretreatment operations (e.g., trash racks, vegetated swales, etc.) may be necessary.
    - Assess the condition of the top aggregate layer for sediment buildup and crusting. Remove the top layer of pea gravel and replace. If slow draining conditions persist, the entire dry well may need to be excavated and replaced.
- Eliminate standing water to prevent vector breeding.
- Remove and dispose of trash and debris as needed, but at least prior to the beginning of the wet season.

A summary of potential problems that may need to be addressed by maintenance activities is presented in Table E-8.

The County requires execution of a maintenance agreement to be recorded by the property owner for the on-going maintenance of any privately-maintained stormwater

quality control measures. The property owner is responsible for compliance with the maintenance agreement. A sample maintenance agreement is presented in Appendix H.

Table E-8. Dry Well Troubleshooting Summary

Problem	Conditions When Maintenance Is Needed	Maintenance Required
Trash and Debris	Trash and debris > 5 ft^3/1,000 ft^2	Remove and dispose of trash and debris.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Remove any evidence of visual contamination.
Erosion/Sediment Accumulation	Undercut or eroded areas at inlet structures	Repair eroded areas and re-grade if necessary.
	Accumulation of sediment, debris, and oil/grease in pretreatment devices	Remove sediment, debris, and/or oil/grease.
	Accumulation of sediment, debris, and oil/grease on surface or inlet	Remove sediment, debris, and/or oil/grease.
Water Drainage Rate	Standing water, or by inspection of observation wells	Remove the top layer of the dry well bottom and replace if necessary.

GENERAL SPECIFICATIONS FOR MAINTENANCE OF
***FLO-GARD+PLUS*® CATCH BASIN INSERT FILTERS**

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed Flo-Gard+Plus® Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per years).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing Flo-Gard+Plus® catch basin inserts.)
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc. shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium pouch exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium pouches will be replaced with new pouches. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.

“ATTACHMENT D”

Non-Structural Measures

Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Housekeeping Practices SC-60

Description

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Related information is provided in BMP fact sheets SC-11 Spill Prevention, Control & Cleanup and SC-34 Waste Handling & Disposal.

Approach

Pollution Prevention

- Purchase only the amount of material that will be needed for foreseeable use. In most cases this will result in cost savings in both purchasing and disposal. See SC-61 Safer Alternative Products for additional information.
- Be aware of new products that may do the same job with less environmental risk and for less or the equivalent cost. Total cost must be used here; this includes purchase price, transportation costs, storage costs, use related costs, clean up costs and disposal costs.

Suggested Protocols

General

- Keep work sites clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Dispose of wash water, sweepings, and sediments, properly.
- Recycle or dispose of fluids properly.
- Establish a daily checklist of office, yard and plant areas to confirm cleanliness and adherence to proper storage and security. Specific employees should be assigned specific inspection responsibilities and given the authority to remedy any problems found.
- Post waste disposal charts in appropriate locations detailing for each waste its hazardous nature (poison, corrosive, flammable), prohibitions on its disposal (dumpster, drain, sewer) and the recommended disposal method (recycle, sewer, burn, storage, landfill).
- Summarize the chosen BMPs applicable to your operation and post them in appropriate conspicuous places.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Require a signed checklist from every user of any hazardous material detailing amount taken, amount used, amount returned and disposal of spent material.
- Do a before audit of your site to establish baseline conditions and regular subsequent audits to note any changes and whether conditions are improving or deteriorating.
- Keep records of water, air and solid waste quantities and quality tests and their disposition.
- Maintain a mass balance of incoming, outgoing and on hand materials so you know when there are unknown losses that need to be tracked down and accounted for.
- Use and reward employee suggestions related to BMPs, hazards, pollution reduction, work place safety, cost reduction, alternative materials and procedures, recycling and disposal.
- Have, and review regularly, a contingency plan for spills, leaks, weather extremes etc. Make sure all employees know about it and what their role is so that it comes into force automatically.

Training

- Train all employees, management, office, yard, manufacturing, field and clerical in BMPs and pollution prevention and make them accountable.
- Train municipal employees who handle potentially harmful materials in good housekeeping practices.
- Train personnel who use pesticides in the proper use of the pesticides. The California Department of Pesticide Regulation license pesticide dealers, certify pesticide applicators and conduct onsite inspections.
- Train employees and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and Countermeasure (SPCC) plant up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- There are no major limitations to this best management practice.
- There are no regulatory requirements to this BMP. Existing regulations already require municipalities to properly store, use, and dispose of hazardous materials

Requirements

Costs

- Minimal cost associated with this BMP. Implementation of good housekeeping practices may result in cost savings as these procedures may reduce the need for more costly BMPs.

Maintenance

- Ongoing maintenance required to keep a clean site. Level of effort is a function of site size and type of activities.

Supplemental Information

Further Detail of the BMP

- The California Integrated Waste Management Board's Recycling Hotline, 1-800-553-2962, provides information on household hazardous waste collection programs and facilities.

Examples

There are a number of communities with effective programs. The most pro-active include Santa Clara County and the City of Palo Alto, the City and County of San Francisco, and the Municipality of Metropolitan Seattle (Metro).

References and Resources

British Columbia Lake Stewardship Society. Best Management Practices to Protect Water Quality from Non-Point Source Pollution. March 2000.
http://www.nalms.org/bclss/bmphome.html#bmp

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities, Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July, 1998, Revised by California Coastal Commission, February 2002.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Mateo STOPPP - (http://stoppp.tripod.com/bmp.html)

Drainage System Maintenance SC-74

Photo Credit: Geoff Brosseau

Objectives

- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Suggested Protocols

Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Record the amount of waste collected.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect flushed effluent and pump to the sanitary sewer for treatment.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

Open Channel

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS

Illicit Connections and Discharges

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections
  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).
- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

Spill Response and Prevention

- Refer to SC-11, Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Cleanup activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to

cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to re-collect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75 percent for organics and 55-65 percent for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm drain flushing.

Flow Management

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

Stream Corridor Planning

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for steam alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to he reclaimed.

Examples

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

References and Resources

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) Municipal Activities Model Program Guidance. 2001. Project Clean Water. November.

United States Environmental Protection Agency (USEPA). 1999. Stormwater Management Fact Sheet Non-stormwater Discharges to Storm Sewers. EPA 832-F-99-022. Office of Water, Washington, D.C. September.

United States Environmental Protection Agency (USEPA). 1999. Stormwater O&M Fact Sheet Catch Basin Cleaning. EPA 832-F-99-011. Office of Water, Washington, D.C. September.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Illegal Dumping Control. On line: http://www.epa.gov/npdes/menuofbmps/poll_7.htm

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line: http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓
Oxygen Demanding	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

CASQA California Stormwater Quality Association

- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

Surface cleaning

- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

Surface Repair

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of the parking facilities and stormwater conveyance systems associated with them on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, nad implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large, construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities on a regular basis to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

SC-43 Parking/Storage Area Maintenance

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Use only as much water as necessary for dust control, to avoid runoff.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) http://www.basma.org

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Road and Street Maintenance SC-70

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Streets, roads, and highways are significant sources of pollutants in stormwater discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. Stormwater pollution from roadway and bridge maintenance should be addressed on a site-specific basis. Use of the procedures outlined below, that address street sweeping and repair, bridge and structure maintenance, and unpaved roads will reduce pollutants in stormwater.

Approach

Pollution Prevention

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Enlist the help of citizens to keep yard waste, used oil, and other wastes out of the gutter.

Suggested Protocols

Street Sweeping and Cleaning

- Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of curbed streets.
- Perform street cleaning during dry weather if possible.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Avoid wet cleaning or flushing of street, and utilize dry methods where possible.
- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc. For example:
  - Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
  - Increase the sweeping frequency just before the wet season to remove sediments accumulated during the summer.
  - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
- Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
- Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.
- To increase sweeping effectiveness consider the following:
  - Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
  - Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
  - Develop and distribute flyers notifying residents of street sweeping schedules.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).
- Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
- Dispose of street sweeping debris and dirt at a landfill.
- Do not store swept material along the side of the street or near a storm drain inlet.
- Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

Street Repair and Maintenance

Pavement marking

- Schedule pavement marking activities for dry weather.

- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Paints containing lead or tributyltin are considered a hazardous waste and must be disposed of properly.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

Concrete installation and repair

- Schedule asphalt and concrete activities for dry weather.
- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small onsite vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Patching, resurfacing, and surface sealing

- Schedule patching, resurfacing and surface sealing for dry weather.
- Stockpile materials away from streets, gutter areas, storm drain inlets or watercourses. During wet weather, cover stockpiles with plastic tarps or berm around them if necessary to prevent transport of materials in runoff.
- Pre-heat, transfer or load hot bituminous material away from drainage systems or watercourses.
- Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered maintenance holes and storm drain inlets when the job is complete.
- Prevent excess material from exposed aggregate concrete or similar treatments from entering streets or storm drain inlets. Designate an area for clean up and proper disposal of excess materials.
- Use only as much water as necessary for dust control, to avoid runoff.
- Sweep, never hose down streets to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Equipment cleaning maintenance and storage

- Inspect equipment daily and repair any leaks. Place drip pans or absorbent materials under heavy equipment when not in use.
- Perform major equipment repairs at the corporation yard, when practical.
- If refueling or repairing vehicles and equipment must be done onsite, use a location away from storm drain inlets and watercourses.
- Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mud jacking equipment at the end of each day. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

Bridge and Structure Maintenance

Paint and Paint Removal

- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Do not transfer or load paint near storm drain inlets or watercourses.

- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.
- Plug nearby storm drain inlets prior to starting painting where there is significant risk of a spill reaching storm drains. Remove plugs when job is completed.
- If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.
- Perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters if the bridge crosses a watercourse. If sanding, use a sander with a vacuum filter bag.
- Capture all clean-up water, and dispose of properly.
- Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of unused paint at an appropriate household hazardous waste facility.

Graffiti Removal

- Schedule graffiti removal activities for dry weather.
- Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.
- When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area. If such an area is not available, filter runoff through an appropriate filtering device (e.g. filter fabric) to keep sand, particles, and debris out of storm drains.
- If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and vacuum/pump wash water to the sanitary sewer.
- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

Repair Work

- Prevent concrete, steel, wood, metal parts, tools, or other work materials from entering storm drains or watercourses.
- Thoroughly clean up the job site when the repair work is completed.
- When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in SC-71 Plaza & Sidewalk Cleaning fact sheet.

- If painting is conducted, follow the painting and paint removal procedures above.
- If graffiti removal is conducted, follow the graffiti removal procedures above.
- If construction takes place, see the Construction Activity BMP Handbook.
- Recycle materials whenever possible.

Unpaved Roads and Trails

- Stabilize exposed soil areas to prevent soil from eroding during rain events. This is particularly important on steep slopes.
- For roadside areas with exposed soils, the most cost-effective choice is to vegetate the area, preferably with a mulch or binder that will hold the soils in place while the vegetation is establishing. Native vegetation should be used if possible.
- If vegetation cannot be established immediately, apply temporary erosion control mats/blankets; a comma straw, or gravel as appropriate.
- If sediment is already eroded and mobilized in roadside areas, temporary controls should be installed. These may include: sediment control fences, fabric-covered triangular dikes, gravel-filled burlap bags, biobags, or hay bales staked in place.

Non-Stormwater Discharges

Field crews should be aware of non-stormwater discharges as part of their ongoing street maintenance efforts.

- Refer to SC-10 Non-Stormwater Discharges
- Identify location, time and estimated quantity of discharges.
- Notify appropriate personnel.

Training

- Train employees regarding proper street sweeping operation and street repair and maintenance.
- Instruct employees and subcontractors to ensure that measures to reduce the stormwater impacts of roadway/bridge maintenance are being followed.
- Require engineering staff and/or consulting A/E firms to address stormwater quality in new bridge designs or existing bridge retrofits.
- Use a training log or similar method to document training.
- Train employees on proper spill containment and clean up, and in identifying non-stormwater discharges.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Densely populated areas or heavily used streets may require parking regulations to clear streets for cleaning.
- No currently available conventional sweeper is effective at removing oil and grease. Mechanical sweepers are not effective at removing finer sediments.
- Limitations may arise in the location of new bridges. The availability and cost of land and other economic and political factors may dictate where the placement of a new bridge will occur. Better design of the bridge to control runoff is required if it is being placed near sensitive waters.

Requirements

Costs

- The maintenance of local roads and bridges is already a consideration of most community public works or transportation departments. Therefore, the cost of pollutant reducing management practices will involve the training and equipment required to implement these new practices.
- The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between $60,000 and $120,000. Newer technologies might have prices approaching $180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.
- A street sweeping program may require the following.
  - Sweeper operators, maintenance, supervisory, and administrative personnel are required.
  - Traffic control officers may be required to enforce parking restrictions.
  - Skillful design of cleaning routes is required for program to be productive.
  - Arrangements must be made for disposal of collected wastes.

- If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as being a source of revenue.

Maintenance

- Not applicable

Supplemental Information

Further Detail of the BMP

Street sweeping

There are advantages and disadvantages to the two common types of sweepers. The best choice depends on your specific conditions. Many communities find it useful to have a compliment of both types in their fleet.

Mechanical Broom Sweepers - More effective at picking up large debris and cleaning wet streets. Less costly to purchase and operate. Create more airborne dust.

Vacuum Sweepers - More effective at removing fine particles and associated heavy metals. Ineffective at cleaning wet streets. Noisier than mechanical broom sweepers which may restrict areas or times of operation. May require an advance vehicle to remove large debris.

Street Flushers - Not affected by biggest interference to cleaning, parked cars. May remove finer sediments, moving them toward the gutter and stormwater inlets. For this reason, flushing fell out of favor and is now used primarily after sweeping. Flushing may be effective for combined sewer systems. Presently street flushing is not allowed under most NPDES permits.

Cross-Media Transfer of Pollutants

The California Air Resources Board (ARB) has established state ambient air quality standards including a standard for respirable particulate matter (less than or equal to 10 microns in diameter, symbolized as PM10). In the effort to sweep up finer sediments to remove attached heavy metals, municipalities should be aware that fine dust, that cannot be captured by the sweeping equipment and becomes airborne, could lead to issues of worker and public safety.

Bridges

Bridges that carry vehicular traffic generate some of the more direct discharges of runoff to surface waters. Bridge scupper drains cause a direct discharge of stormwater into receiving waters and have been shown to carry relatively high concentrations of pollutants. Bridge maintenance also generates wastes that may be either directly deposited to the water below or carried to the receiving water by stormwater. The following steps will help reduce the stormwater impacts of bridge maintenance:

- Site new bridges so that significant adverse impacts to wetlands, sensitive areas, critical habitat, and riparian vegetation are minimized.

- Design new bridges to avoid the use of scupper drains and route runoff to land for treatment control. Existing scupper drains should be cleaned on a regular basis to avoid sediment/debris accumulation.
- Reduce the discharge of pollutants to surface waters during maintenance by using suspended traps, vacuums, or booms in the water to capture paint, rust, and paint removing agents. Many of these wastes may be hazardous. Properly dispose of this waste by referring to CA21 (Hazardous Waste Management) in the Construction Handbook.
- Train employees and subcontractors to reduce the discharge of wastes during bridge maintenance.

De-icing

- Do not over-apply deicing salt and sand, and routinely calibrate spreaders.
- Near reservoirs, restrict the application of deicing salt and redirect any runoff away from reservoirs.
- Consider using alternative deicing agents (less toxic, biodegradable, etc.).

References and Resources

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Fresh Concrete and Mortar Application Best Management Practices for the Construction Industry. June.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Roadwork and Paving Best Management Practices for the Construction Industry. June.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Roadway and Bridge Maintenance. On-line
http://www.epa.gov/npdes/menuofbmps/poll_13.htm

“ATTACHMENT E”

Structural Measures

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

http://www.crfengineering.com
6782 Stanton Ave. Suite-A, Buena Park, California, 90621 // T: 714-522-2266// F: 714-752-5384

Date Prepared:	06/28/2022
Date Revised:	N/A
Attention:	County of Los Angeles
Subject:	Hydrology/Hydraulics Report
Reference Project:	CRF # 20-118
Prepared for:	Mr. David Pickard (Architect)
Phone Number:	562-945-8821
E-mail Address:	d3.pickard@pickard.com

PRELIMINARY HYDROLOGY / HYDRAULICS REPORT

6018 Norwalk Boulevard
Whittier, California, 90606.
APN: 8174-041-028

The scope of the project is to comply with city regulations for the design of drainage runoff needed for a 50-year 24 hr. storm event to maintain the project site with adequate drainage.

Existing Conditions: The project site consists of a liquor store market and an apartment building on a 20,772 SF lot. The site is in a mixed residential area, bounded by an alley to the South and East of the site, and by Norwalk Boulevard to the West. The existing conditions consists of 836 SF of pervious area and 19,936 SF of impervious area. The path of drainage is towards the alley and out to Norwalk Boulevard.

Proposed Conditions: The new development proposes two-story residential apartment buildings, driveways, walkways, and new perimeter walls. The development will consist of 18,169 SF of new impervious areas, and 2,603 SF of pervious areas. The site was designed to drain using one drainage management area. The proposed drainage pattern will sheet flow into proposed drain inlets, and be diverted into proposed drywells. Overflow will discharge to Alley street as shown on the "proposed conditions hydrology map" and "LID Site Plan".

The project site is regulated by the City of Whittier and shall be capable of sustaining a 50-year 24-hour storm event using the Los Angeles County Hydrology Manual.

Sincerely,
Cesar R. Ramirez, PE, PLS

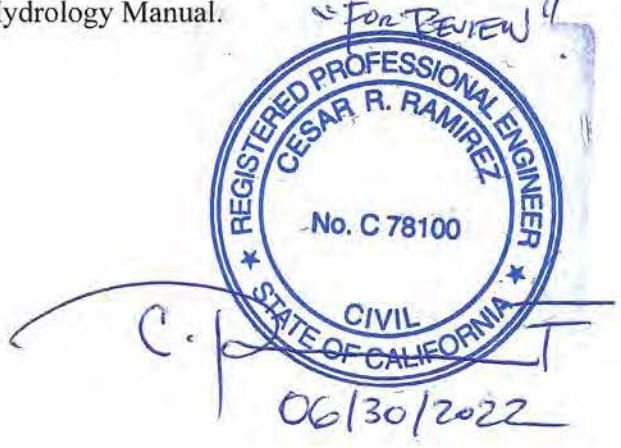


TABLE OF CONTENTS

1.0) HYDROLOGY CALCULATIONS

1.1) SITE CHARACTERISTICS

Total Area =	20,772 SF or 0.477 AC
Soil Type =	016
50-Yr Rainfall Depth =	5.80 Inches

1.2) DRAINAGE MANAGEMENT AREAS (DMA)

- Using the ***HydroCalc*** application from Los Angeles Public Works Website T_c and C_d were calculated. Please see attached sheets for input data and output results.

Existing Conditions:

Drainage Management Area (DMA) #1

Total Area =	20,772 sf./0.477 Acres
Pervious area =	836 sf.
Impervious area =	19,936 sf.
Flow Path Length:	82.2 ft.
Inlet Elevation:	179.39 ft.
Outlet Elevation:	176.77 ft.
Flow Path slope:	3.2%
24-HR, 50-YR Rainfall Depth (in):	5.80 In.
Percent impervious:	96%
Time of Concentration (T_c):	5.0 min
Peak Intensity (I):	3.46 in/hr.
Developed Runoff Coefficient (C_d):	0.8989

Proposed Conditions:

- Drainage Management Area (DMA) #1

Total Area =	20,772 sf./0.477 Acres
Pervious area =	2,603 sf.
Impervious area =	18,169 sf.
Flow Path Length:	18.9 ft.
Inlet Elevation:	177.25 ft.
Outlet Elevation:	176.87 ft.
Flow Path slope:	2.0%
24-HR, 50-YR Rainfall Depth (in):	5.80 In.
Percent impervious:	87.5%
Time of Concentration (T_c):	5.0 min
Peak Intensity (I):	3.46 in/hr.
Developed Runoff Coefficient (C_d):	0.8966

1.3) Clear Peak Flow Rate Q_{50}

$Q_{50} = C_d * I * A_{Total}$

EXISTING CONDITIONS

DMA#1

Developed Runoff Coefficient (Cd) =	0.8989
Peak Intensity (I) =	3.46 in/hr.
Tributary Area (At) =	0.477 AC

$Q_{50} = 0.8989 * 3.46 * 0.380$

Q_{50} = 1.48 ft^3/sec

Q_{50} = 664.3 gallon/minutes

PROPOSED CONDITIONS

DMA#1

Developed Runoff Coefficient (Cd) =	0.8966
Peak Intensity (I) =	3.46 in/hr.
Tributary Area (At) =	0.477 AC

$Q_{50} = 0.8966 * 3.46 * 0.477$

Q_{50} = 1.48 ft^3/sec

Q_{50} = 664.3 gallon/minutes

2.0) HYDRAULICS CALCULATIONS

2.1) MANNING'S EQUATION FOR HYDRAULICS

$$Q = \frac{1.49}{n}(A)(R_h^{\frac{2}{3}})(S_e^{\frac{1}{2}})$$

Q = flow rate [cfs]

A = cross-sectional area of flow [ft^2]

n = surface roughness (based on drainage pipe material and condition) – Appendix x,y

R_h = hydraulic radius (cross-sectional area divided by wetted perimeter) [ft]

S_e = slope of drainage pipe or slope of gutter

- Triangular Gutter

  T = top width [ft]

  P = wetted perimeter

  H = water depth

- Pipe

  y = vertical height of liquid inside drainage pipe [ft]

  D = diameter of drainage pipe [ft]

  Θ = angle from center of drainage pipe to edges where water is flowing [radians]

ft = U.S. foot

DMA = drainage management area

PVC = polyvinyl chloride drainage pipe

RCP = reinforced concrete pipe

CFS = cubic feet per second

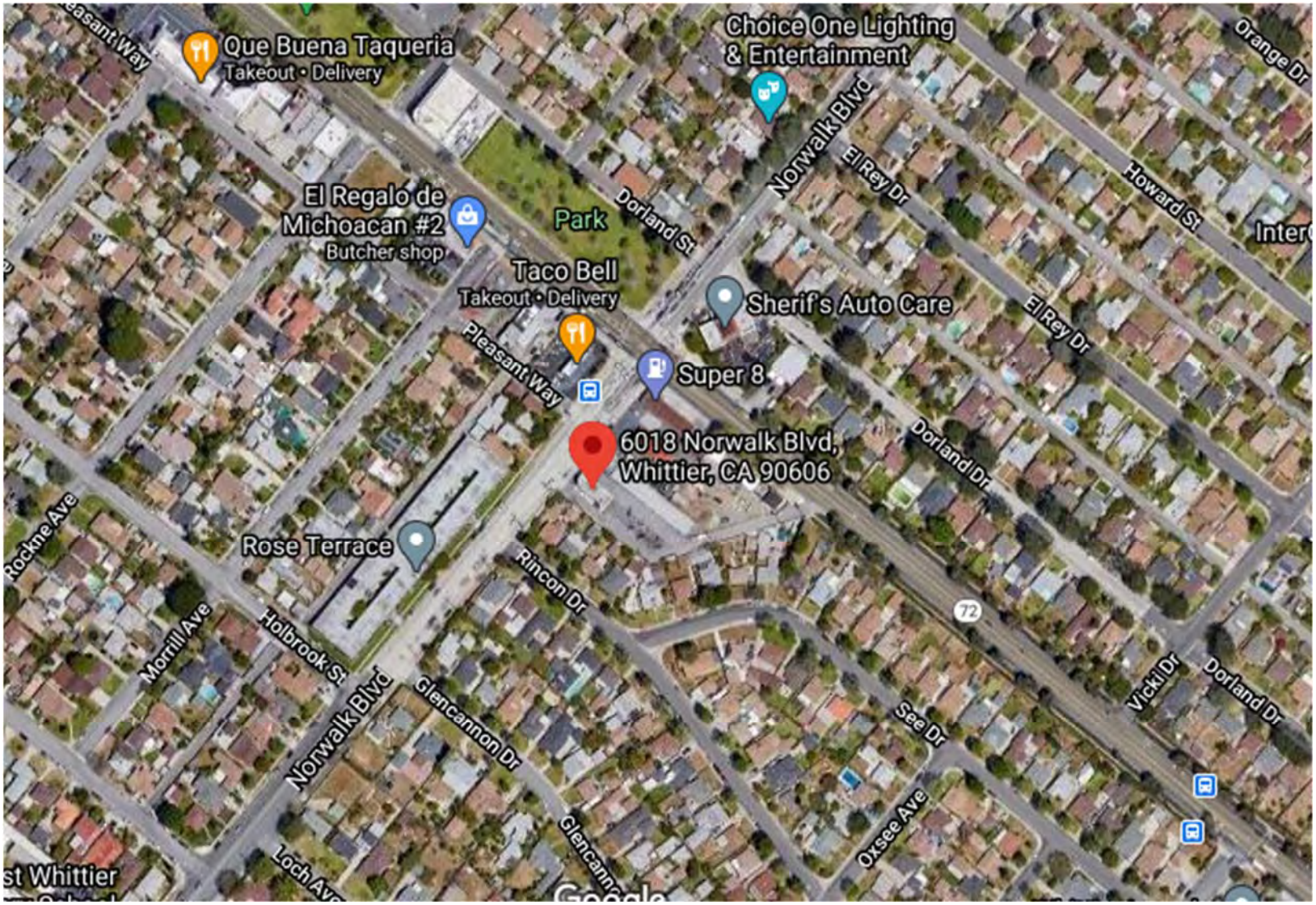
2.2) CALCULATIONS FOR CIRCULAR PIPE FLOW CAPACITY

For Proposed Conditions

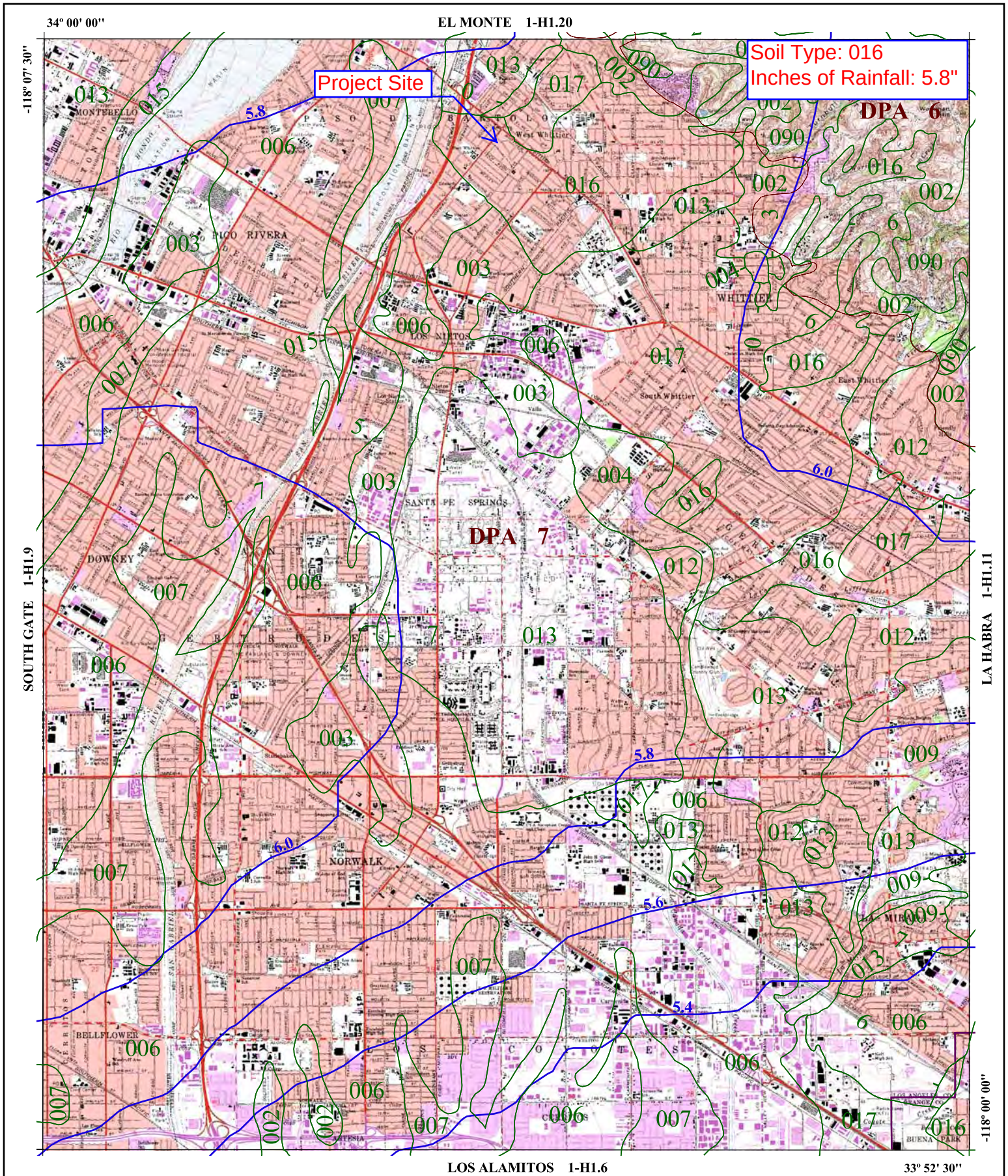
PIPE DEPTH CALCULATOR					
$Q = \frac{1.49}{n}(A)(R_h^{\frac{2}{3}})(S_e^{\frac{1}{2}})$		n=	0.009	Slope =	0.010
		D=	0.67	8" PVC	
Y(ft)	Y/D D=0.25	θ (rads)	Area(A)	Hyd. Rad. (Rh)	Q (cfs)
0.10	0.149	0.793	0.033	0.062	0.085
0.33	0.493	1.556	0.173	0.166	0.864
0.50	0.746	2.086	0.282	0.202	1.608
0.63	0.940	2.648	0.344	0.194	1.908
0.67	1.000	3.142	0.353	0.168	1.774

Design flow rate is 1.48 CFS.
8” PVC pipe with 1% slope can handle 1.91 CFS.
8” pvc pipe = 1.91 CFS > 1.48 CFS = Design Flow rate… Satisfied

VICINITY MAP ~ 6018 Norwalk Boulevard, Whittier, CA, 90606.



LATITUDE: 33° 59' 21.22" N, LONGITUDE 118° 3' 51.64" W



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA 6 DEBRIS POTENTIAL AREA

N W E S

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

W H I T T I E R
50-YEAR 24-HOUR ISOHYET

1-H1.10

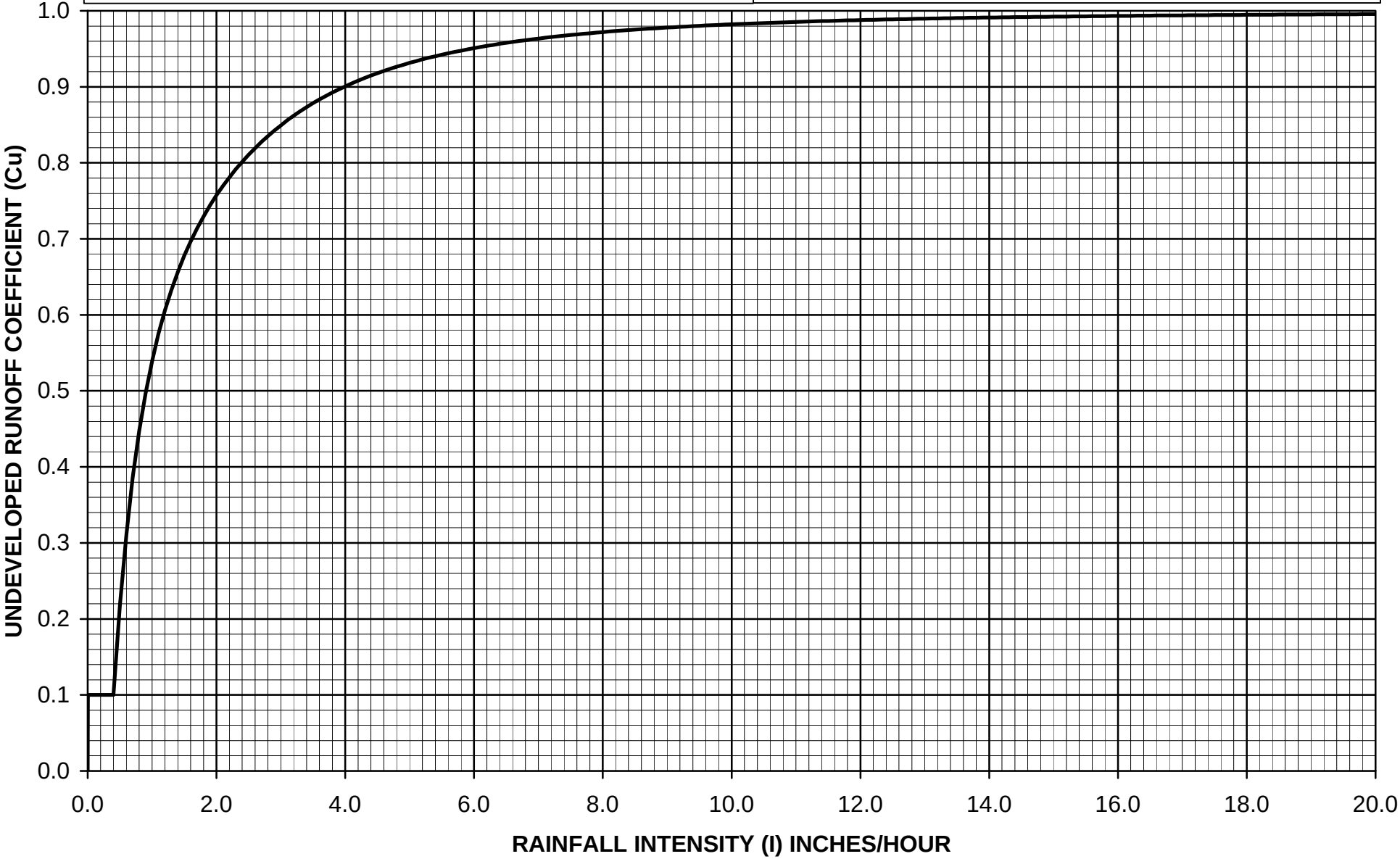
LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: C_D = Developed Runoff Coefficient
IMP = Proportion Impervious
C_U = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 016



Los Angeles County, California, Southeastern Part

1137—Urban land-Ballona-Typic Xerorthents, fine substratum complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2pt41
Elevation: 10 to 630 feet
Mean annual precipitation: 13 to 19 inches
Mean annual air temperature: 62 to 66 degrees F
Frost-free period: 355 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Urban land: 45 percent
Ballona and similar soils: 20 percent
Typic xerorthents, fine substratum, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Typic Xerorthents, Fine Substratum

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human-transported material over young alluvium derived from sedimentary rock

Typical profile

^Au - 0 to 13 inches: loam
^Cu - 13 to 47 inches: clay loam
2C1 - 47 to 57 inches: clay
2C2 - 57 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Ballona

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over young alluvium derived from sedimentary rock

Typical profile

^A - 0 to 6 inches: loam
^A2 - 6 to 18 inches: loam
2A3 - 18 to 31 inches: clay loam
2Bk1 - 31 to 47 inches: clay
2Bk2 - 47 to 79 inches: clay

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Arbolado

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Cropley, coarse fill surface

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Azuvina

Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

San emigdio

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Los Angeles County, California, Southeastern Part
Survey Area Data: Version 7, May 27, 2020

Map Scale: 1:507 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Los Angeles County, California, Southeastern Part
Survey Area Data: Version 7, May 27, 2020

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

Date(s) aerial images were photographed: Apr 8, 2019—Apr 13, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1137	Urban land-Ballona-Typic Xerorthents, fine substratum complex, 0 to 5 percent slopes	0.5	100.0%
Totals for Area of Interest		**0.5**	**100.0%**

Peak Flow Hydrologic Analysis

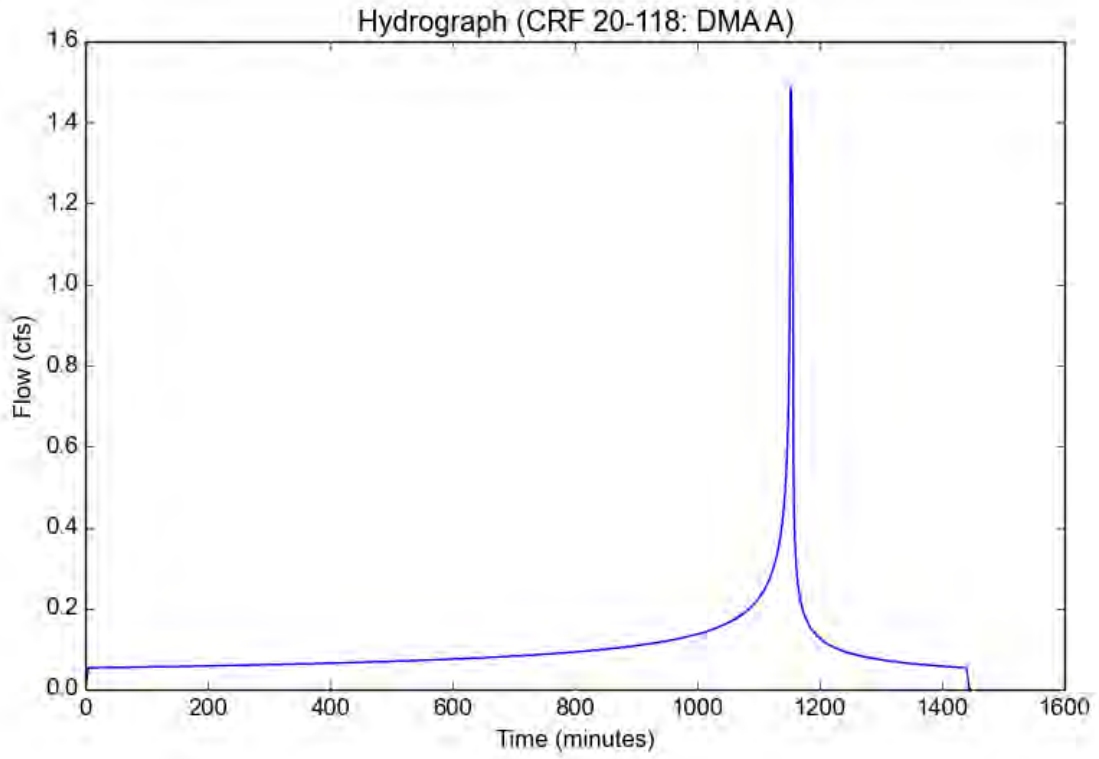
File location: C:/Users/crfin/Dropbox (CRF Engineering, INC)/CRF Engineering, INC's shared workspace/CRF-ENG-CLOUD/20-118/PRELIMINARY/HYD
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CRF 20-118
Subarea ID	DMA A
Area (ac)	0.477
Flow Path Length (ft)	82.2
Flow Path Slope (vft/hft)	0.032
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.873
Developed Runoff Coefficient (Cd)	0.8989
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.4838
Burned Peak Flow Rate (cfs)	1.4838
24-Hr Clear Runoff Volume (ac-ft)	0.1993
24-Hr Clear Runoff Volume (cu-ft)	8683.0584



Peak Flow Hydrologic Analysis

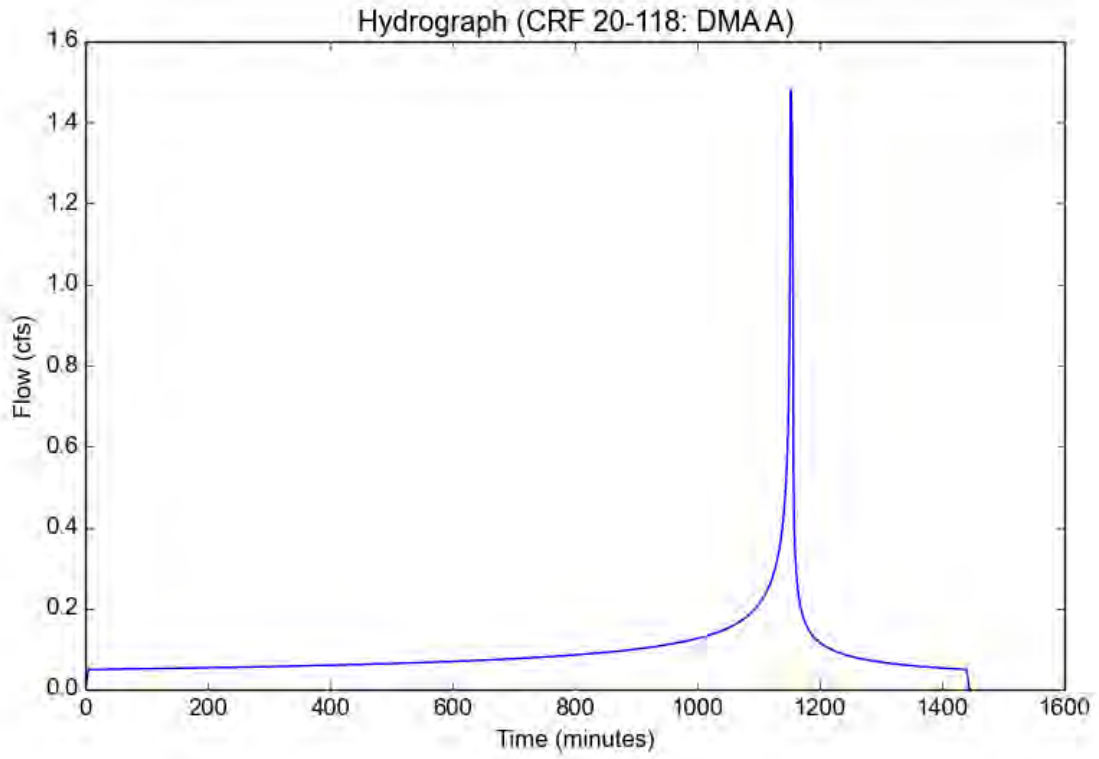
File location: C:/Users/crf12/Dropbox (CRF Engineering, INC)/CRF Engineering, INC's shared workspace/CRF-ENG-CLOUD/20-118/Hydrology/ATTACH
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CRF 20-118
Subarea ID	DMA A
Area (ac)	0.477
Flow Path Length (ft)	18.9
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.875
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

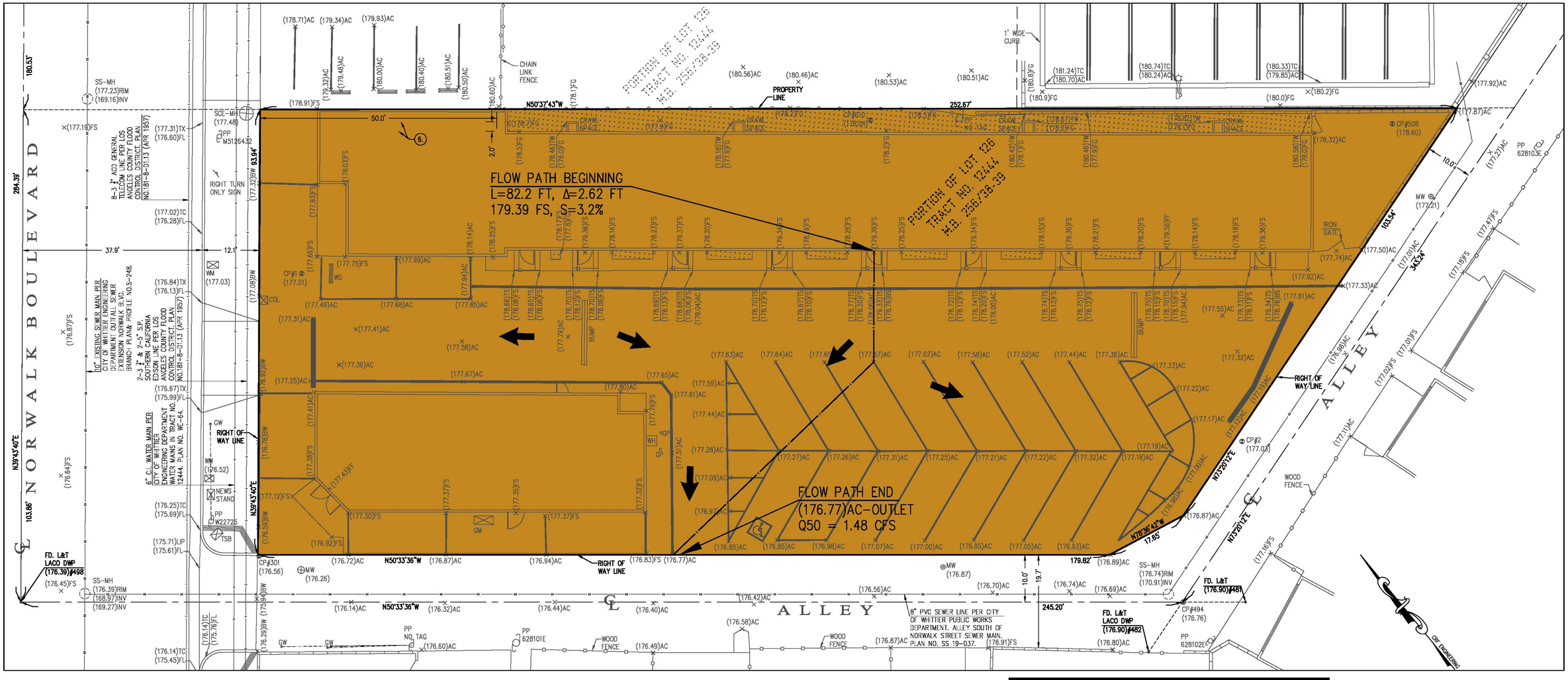
Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.873
Developed Runoff Coefficient (Cd)	0.8966
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.48
Burned Peak Flow Rate (cfs)	1.48
24-Hr Clear Runoff Volume (ac-ft)	0.1856
24-Hr Clear Runoff Volume (cu-ft)	8086.5105



HYDROLOGY LEGEND

- DMA EXISTING CONDITIONS
- SURFACE DRAINAGE PATTERN
- HYDROLOGIC PATH OF TRAVEL

TOTAL AREA OF WORK =	20,772 SF OR 0.477 AC
EXISTING CONDITIONS	
IMPERVIOUS AREA =	19,936 SF
PERVIOUS AREA =	836 SF
AREA =	0.477 AC
FLOW PATH LENGTH =	82.2 FT
FLOW PATH SLOPE =	3.2%
50YR RAINFALL DEPTH =	5.80 IN
% IMPERVIOUS =	96%
SOIL TYPE =	016
CLEAR PEAK FLOWRATE Q_{50} =	**1.48 CFS**



CRF PROJECT #20-118

"WORK IN PROGRESS ~ FOR REVIEW PURPOSES ONLY"

CRF ENGINEERING.
CESAR R. RAMIREZ, P.E.

6782 STANTON AVENUE, SUITE A
BUENA PARK, CALIFORNIA, 90621.

P: 714-522-2266

06/28/2022
SIGNATURE DATE

CIVIL ENGINEER

BYER GEOTECHNICAL
RAFFI S. BABAYAN, M.S., P.E.

1461 E. CHEVY CHASE DRIVE, SUITE 200
GLENDALE, CALIFORNIA, 91206.

T: 818-549-9959
T: 818-903-8296
E: RBABAYAN@BYERGEO.COM

SIGNATURE DATE

SOILS ENGINEER

I HEREBY CERTIFY THAT THE WORK SHOWN HEREON, MARKED AS 'AS-BUILT', HAS BEEN CONSTRUCTED IN CONFORMANCE WITH LINES AND GRADES AS SHOWN ON SAID PLANS, DRAWINGS, REFERENCE SPECIFICATIONS, AND APPROVED CHANGE ORDERS, AS INDICATED IN THE REVISION BLOCK.

SIGNATURE DATE

AS-BUILT DRAWING

MARK	DATE	DESCRIPTION	BY	CHKD.	APPROVED

REVISIONS

REFERENCE PLANS

BENCHMARK

DESIGNATION: SY6627

BASE: B
ELEVATION: 179.466 FT.
QUAD: 2013.

VERTICAL DATUM

DATUM: NAVD 88

APPROVED

KYLE CASON DATE
INTERIM CITY ENGINEER

COMMUNITY DEVELOPMENT

REVIEWED BY
IN ACCORDANCE WITH CITY POLICIES AND CONDITIONS CONDITIONS OF APPROVAL.

SIGNATURE DATE
TITLE

PUBLIC WORKS

REVIEWED BY
IN ACCORDANCE WITH CITY POLICIES AND CONDITIONS CONDITIONS OF APPROVAL.

SIGNATURE DATE
TITLE

10' 0' 10' 20'
SCALE: 1"=10'

DIG ALERT
DIAL TOLL FREE 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT
OF SOUTHERN CALIFORNIA

CITY OF WHITTIER DEPARTMENT OF PUBLIC WORKS
PRELIMINARY
EXISTING CONDITIONS HYDROLOGY MAP

6018 NORWALK BOULEVARD
WHITTIER, CALIFORNIA, 90606.
APN: 8174-041-028

SHEET: H1 OF 2

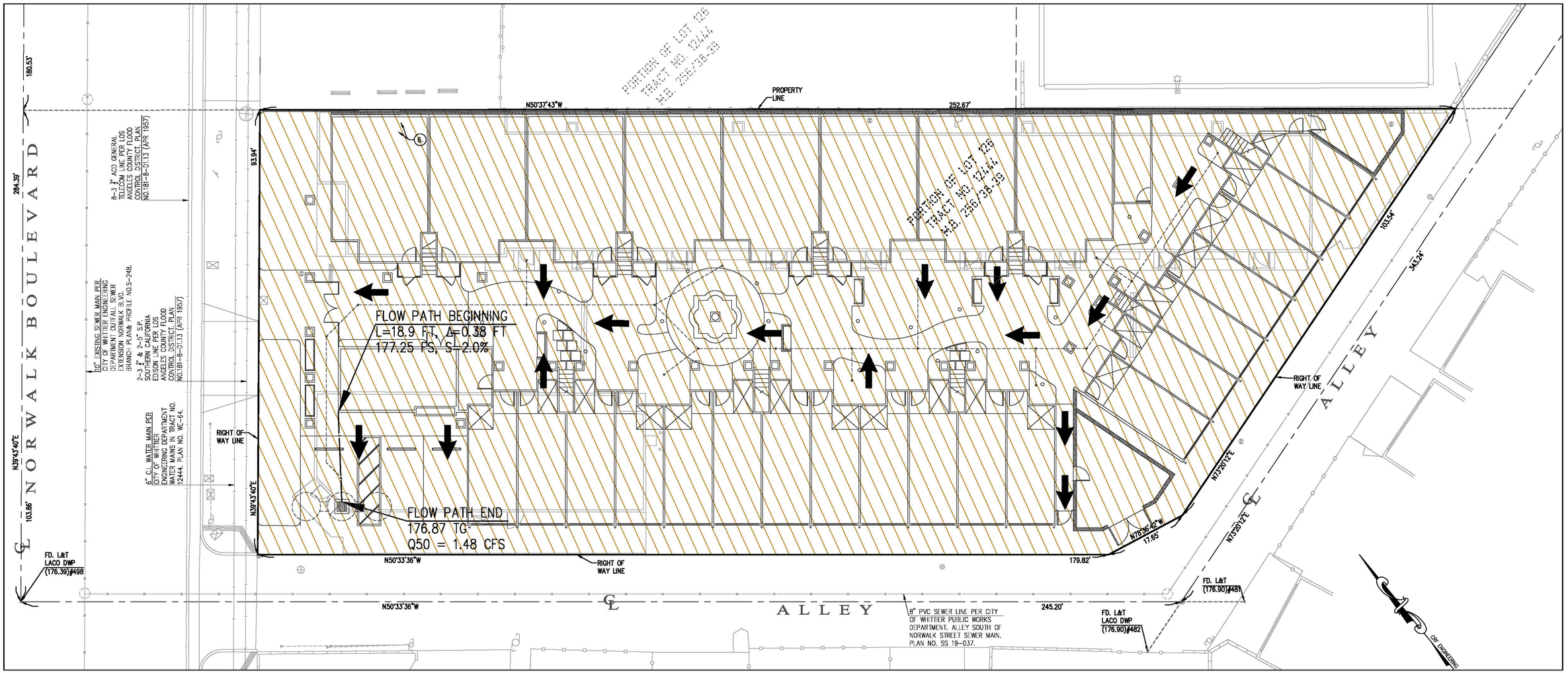
GRADING PERMIT
NO. XXX

PREPARED FOR: PICKARD ARCHITECTS MR. DAVID PICKARD
13215 PENN STREET SUITE 300, WHITTIER, CALIFORNIA, 90602
T: 562-945-8821; T: 562-652-2072; E: R.ARROYO@PICKARD.COM

HYDROLOGY LEGEND

- DMA PROPOSED CONDITIONS
- SURFACE DRAINAGE PATTERN
- HYDROLOGIC PATH OF TRAVEL

TOTAL AREA OF WORK =	20,772 SF OR 0.477 AC
PROPOSED CONDITIONS	
IMPERVIOUS AREA =	18,169 SF
PERVIOUS AREA =	2,603 SF
AREA =	0.477 AC
FLOW PATH LENGTH =	18.9 FT
FLOW PATH SLOPE =	2.0%
50YR RAINFALL DEPTH =	5.80 IN
% IMPERVIOUS =	87.5%
SOIL TYPE =	016
CLEAR PEAK FLOWRATE Q_{50} =	**1.48 CFS**



REFERENCE PLANS	APPROVED
	KYLE CASON INTERIM CITY ENGINEER — DATE

10' 0' 10' 20'
SCALE: 1"=10'

DIG ALERT
DIAL TOLL FREE 811
AT LEAST TWO DAYS
BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

CRF PROJECT #20-118

"WORK IN PROGRESS ~ FOR REVIEW PURPOSES ONLY"

BENCHMARK	COMMUNITY DEVELOPMENT
DESIGNATION: SY6627 BASE: B ELEVATION: 179.466 FT. QUAD: 2013.	REVIEWED BY_____ IN ACCORDANCE WITH CITY POLICIES AND CONDITIONS CONDITIONS OF APPROVAL. SIGNATURE DATE TITLE
VERTICAL DATUM	**PUBLIC WORKS**
DATUM: NAVD 88	REVIEWED BY_____ IN ACCORDANCE WITH CITY POLICIES AND CONDITIONS CONDITIONS OF APPROVAL. SIGNATURE DATE TITLE

CITY OF WHITTIER DEPARTMENT OF PUBLIC WORKS
PRELIMINARY
PROPOSED CONDITIONS HYDROLOGY MAP

6018 NORWALK BOULEVARD
WHITTIER, CALIFORNIA, 90606.
APN: 8174-041-028

SHEET: H2 OF 2

GRADING PERMIT NO. XXX

PREPARED FOR: PICKARD ARCHITECTS MR. DAVID PICKARD
1.3215 PENN STREET SUITE 300, WHITTIER, CALIFORNIA, 90602
T: 562-945-8821; T: 562-552-2072; E: R.ARROYO@PICKARD.COM

CRF ENGINEERING.
CESAR R. RAMIREZ, P.E.
6782 STANTON AVENUE, SUITE A
BUENA PARK, CALIFORNIA, 90621.
P: 714-522-2266
06/28/2022
SIGNATURE DATE
CIVIL ENGINEER

BYER GEOTECHNICAL
RAFFI S. BABAYAN, M.S., P.E.
1461 E. CHEVY CHASE DRIVE, SUITE 200
GLENDALE, CALIFORNIA, 91206.
T: 818-549-9959
T: 818-903-8296
E: RBABAYAN@BYERGEO.COM
SIGNATURE DATE
SOILS ENGINEER

I HEREBY CERTIFY THAT THE WORK SHOWN HEREON, MARKED AS 'AS-BUILT', HAS BEEN CONSTRUCTED IN CONFORMANCE WITH LINES AND GRADES AS SHOWN ON SAID PLANS, DRAWINGS, REFERENCE SPECIFICATIONS, AND APPROVED CHANGE ORDERS, AS INDICATED IN THE REVISION BLOCK.

SIGNATURE DATE
AS-BUILT DRAWING

MARK	DATE	DESCRIPTION	BY	CHKD.	APPROVED

REVISIONS