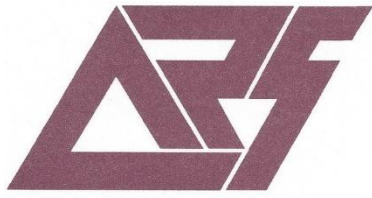


Appendix F
Preliminary Hydrology Study



ALAN R. SHORT, P.E.

PRELIMINARY HYDROLOGY STUDY

FOR

CITY OF GARDENA

TENTATIVE TRACT NO. 82945

1335, 1337, 1341 & 143

West 141st Street

PREPARED FOR:

THE OLSON COMPANY
3010 OLD RANCH PARKWAY, SUITE 100
SEAL BEACH, CA. 92740

PREPARED BY:

ALAN R. SHORT, P.E.
RCE 30873, EXPIRES 3/31/20



Latest Revision: January 20, 2020

▶ 7263 W. GALEN DR.
HERRIMAN, UT 84096
(949) 586-5200
ALANSHORTPE@GMAIL.COM

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10-Year Storm Event

50-Year Storm Event

3. Proposed Condition Hydrology Calculations

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50-Year Storm Event

85th Percentile SUSMP

4. Retention Basins Volume Calculations

5. Appendices:

Existing Hydrology Map

Proposed Hydrology Map

FEMA Flood Map

1. Introduction / Summary

This is a drainage and Standard Urban Stormwater Mitigation Plan (SUSMP) study for the proposed multifamily development, Tentative Tract No. 82945, located on the northeast corner of South Normandie Avenue and West 141st Street intersection, in the City of Gardena, Los Angeles County, California, as shown on the Vicinity Map.

The existing site is a landscape nursery lot that generally drains in a southwesterly direction into West 141st Street and South Normandie Avenue. In the existing condition, there are no water quality measures to provide treatment for the storm water runoff generated by this site.

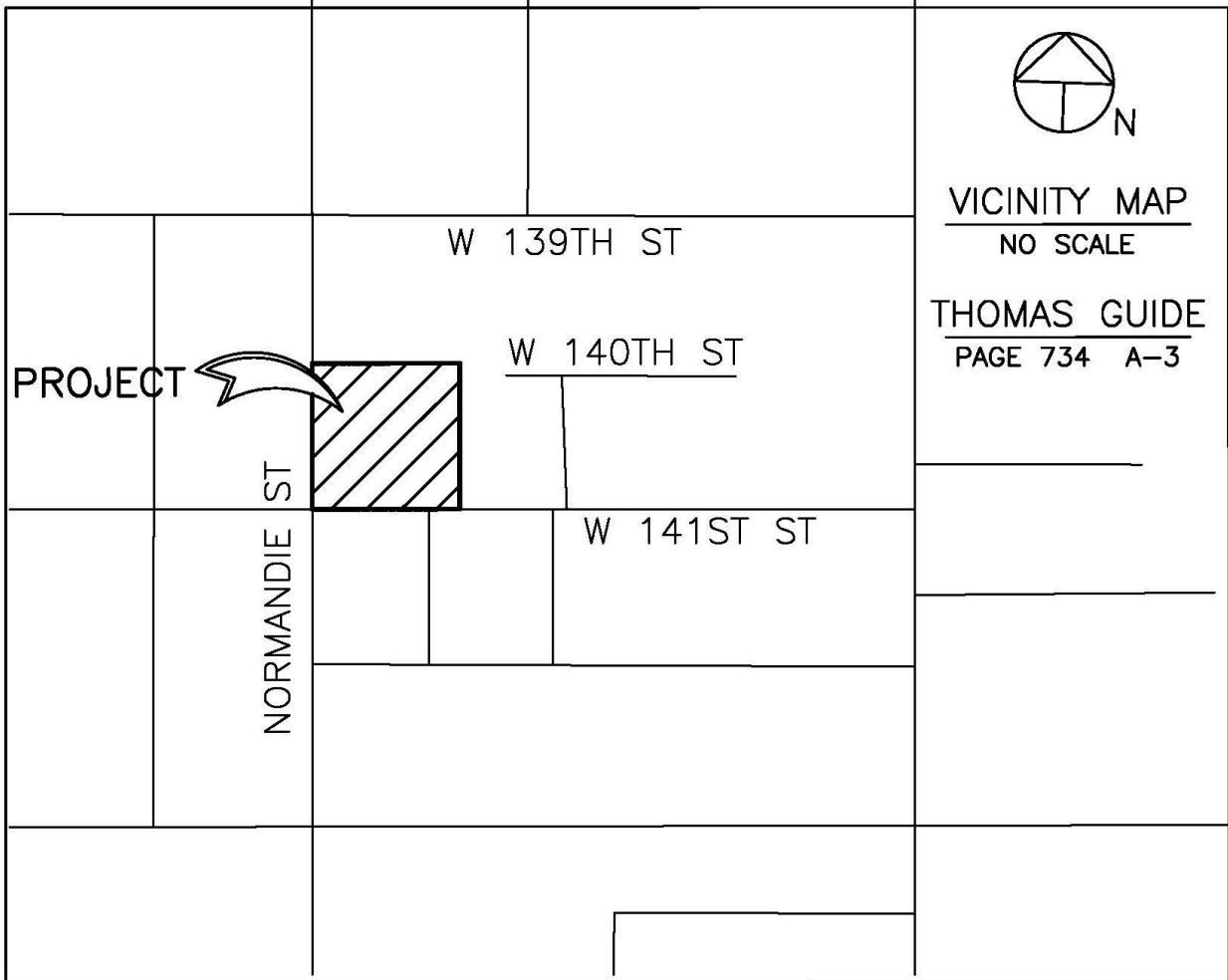
In the proposed condition, the storm runoff will be collected via a private area drain system consisting of PVC pipes and area drain inlets. The drainage pattern in the existing and proposed conditions are consistent. Since the site is in a flow-by condition, the on-site storm drain system will be designed for the 10-Year Storm Event.

In order to reduce the downstream impact of the increased runoff due to the development, the Post-developed 50-year peak flow of 4.84 cfs is reduced to the Pre-developed peak flow of 4.30 cfs, via a proposed onsite retention basin. The area above the hydrograph flow cut-off indicates the storage volume needed to achieve the required flow reductions. The minimum required volume for this flow reduction is 120 ft³. The total volume provided is 141 ft³ (20' of 36" HDPE).

Since the soils parameters for this project do not allow for filtration, per Los Angeles County LID requirements, the rainfall depth for the 85th percentile calculation has been increased by 50%.

Utilizing the County of Los Angeles' *HydroCals* software, Rational Method Hydrology was performed to calculate the 10- and 50-Year Storm Event flow rates. Using the same software, the Standard Urban Stormwater Mitigation Plan (SUSMP) flow rate was also computed based on the 85th percentile rainfalls as shown on exhibits from the <http://ladpw.org/wrd/hydrologygis/> Website.

The property is located within Flood Zone "X" (Outside the 0.2 chance flood), as shown on the National Flood Hazard Layer FIRMette, provided in the Appendices.



2. Existing Hydrology Calculations

10-Year Storm Event

50-Year Storm Event



About



Legend



Layers

Layers

50yr Two Tenths (Rainfall)

DPA Zones

Soils 2004

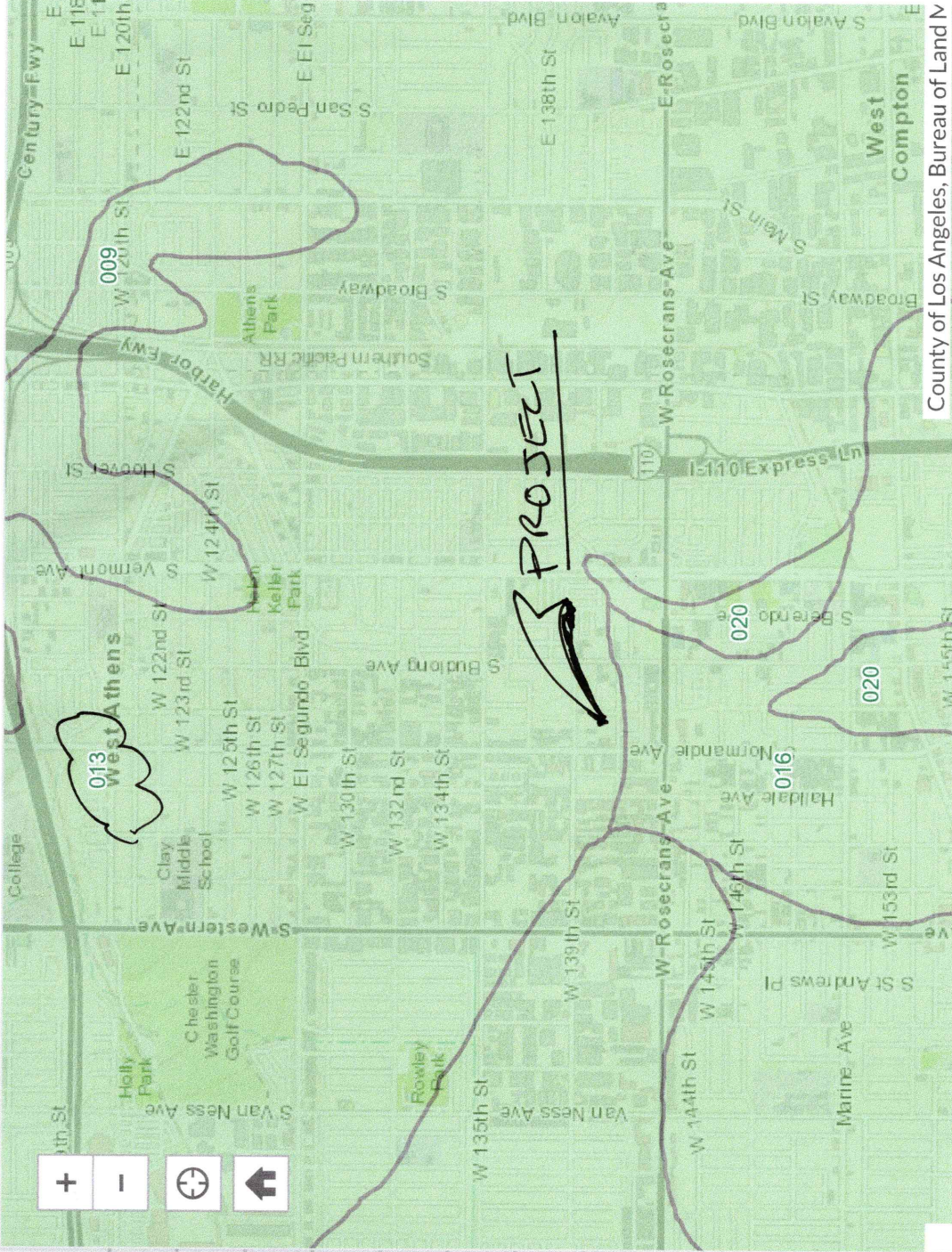
Final 85th Percentile, 24-hr Rainfall

Final 95th Percentile, 24-hr Rainfall

1-year, 1-hour Rainfall Intensity

LA County Parcel

LA County Hydrology Map



County of Los Angeles, Bureau of Land IV

	About
	Legend
	Layers
<input checked="" type="checkbox"/>	50yr Two Tenths (Rainfall)
<input type="checkbox"/>	DPA Zones
<input type="checkbox"/>	Soils 2004
<input type="checkbox"/>	Final 85th Percentile, 24-hr Rainfall
<input type="checkbox"/>	Final 95th Percentile, 24-hr Rainfall
<input type="checkbox"/>	1-year, 1-hour Rainfall Intensity
<input type="checkbox"/>	LA County Parcel

LA County Hydrology Map



County of Los Angeles, Bureau of Land Management

LA County Hydrology Map



About



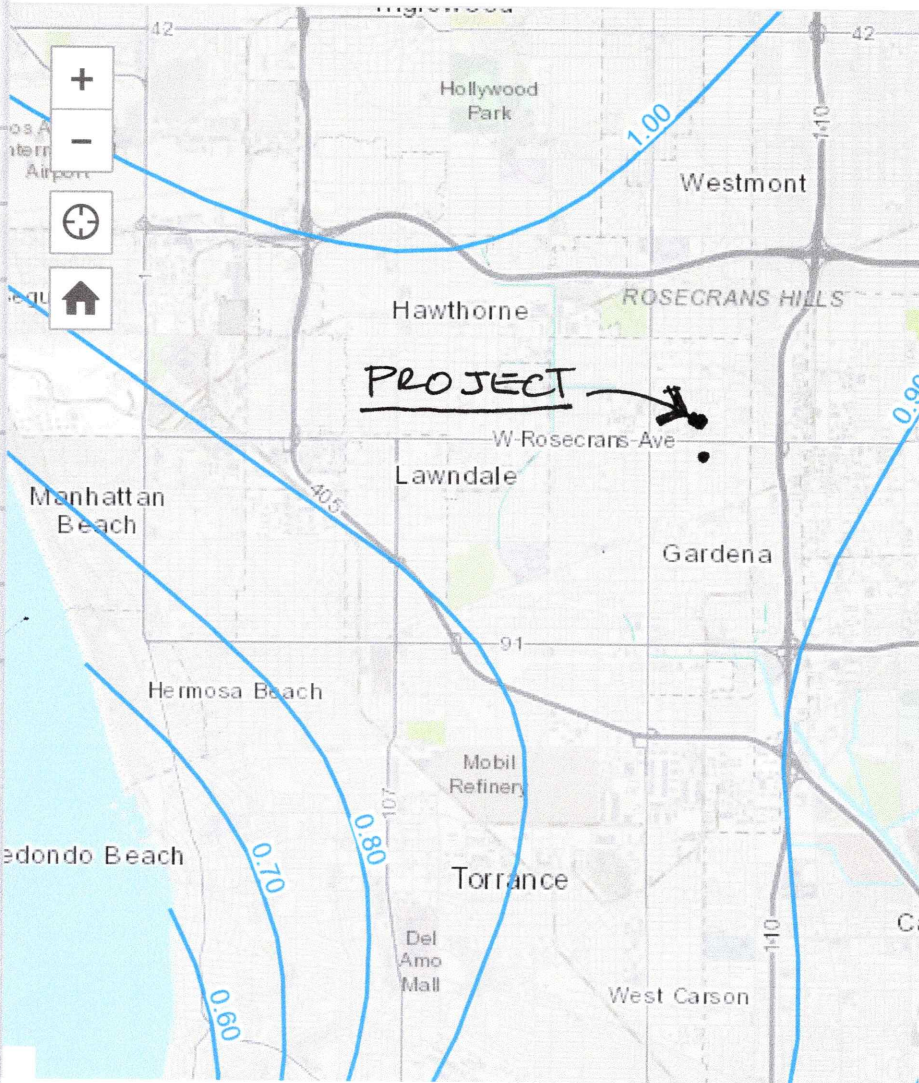
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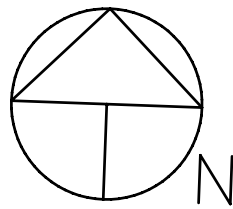


Layers

Layers

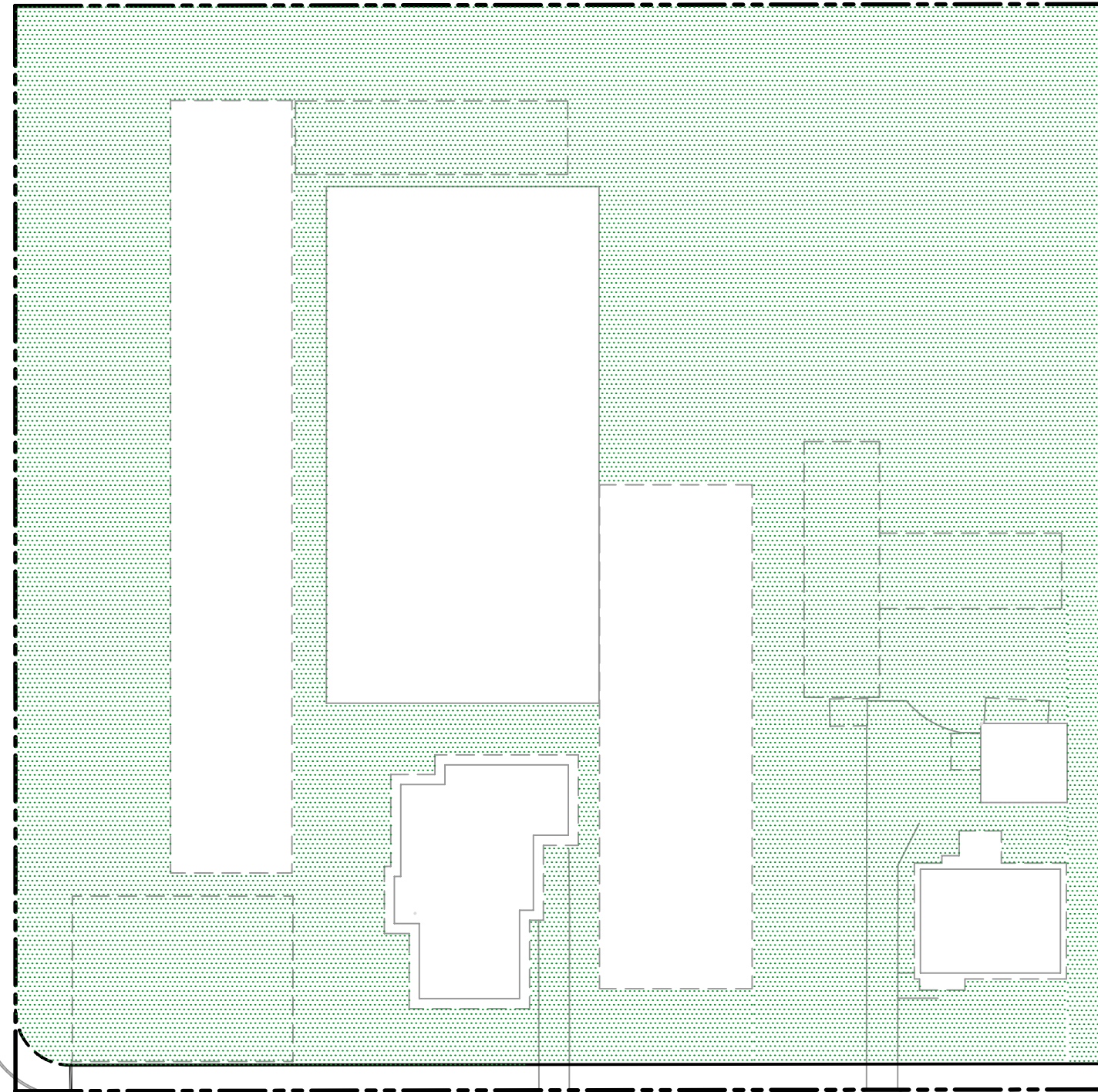
- 50yr Two Tenths (Rainfall)
- DPA Zones
- Soils 2004
- Final 85th Percentile, 24-hr Rainfall
- Final 95th Percentile, 24-hr Rainfall
- 1-year, 1-hour Rainfall Intensity
- LA County Parcel





1"=40'

NORMANDIE AVENUE



141st STREET

TOTAL AREA	1.97	AC
PERVIOUS AREA	1.40	AC
% PERVIOUS	70.9	%
% IMPERVIOUS	29.1	%

**PERVIOUS AREA
EXISTING CONDITION
TENTATIVE TRACT NO. 82945
GARDENA**

LATEST REVISION: 11/7/19

Peak Flow Hydrologic Analysis

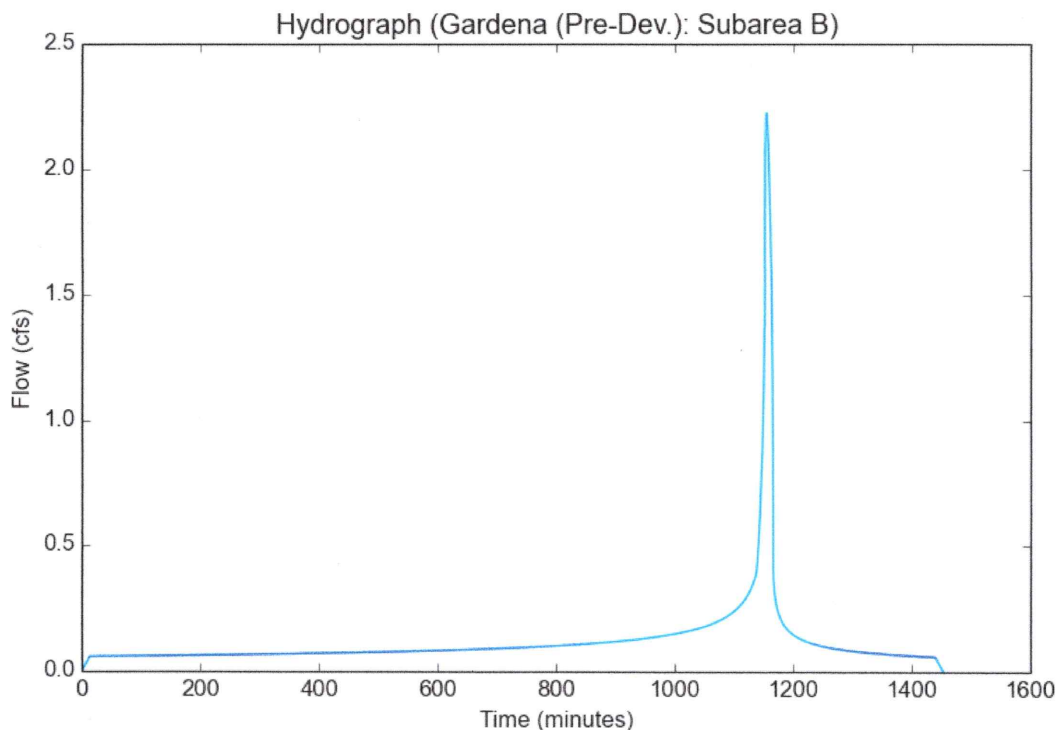
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Gardena (Pre-Dev.)
Subarea ID	Subarea B
Area (ac)	1.97
Flow Path Length (ft)	550.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.291
Soil Type	13
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.0698
Peak Intensity (in/hr)	1.4966
Undeveloped Runoff Coefficient (Cu)	0.6964
Developed Runoff Coefficient (Cd)	0.7557
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	2.2279
Burned Peak Flow Rate (cfs)	2.2279
24-Hr Clear Runoff Volume (ac-ft)	0.2444
24-Hr Clear Runoff Volume (cu-ft)	10646.6632



Peak Flow Hydrologic Analysis

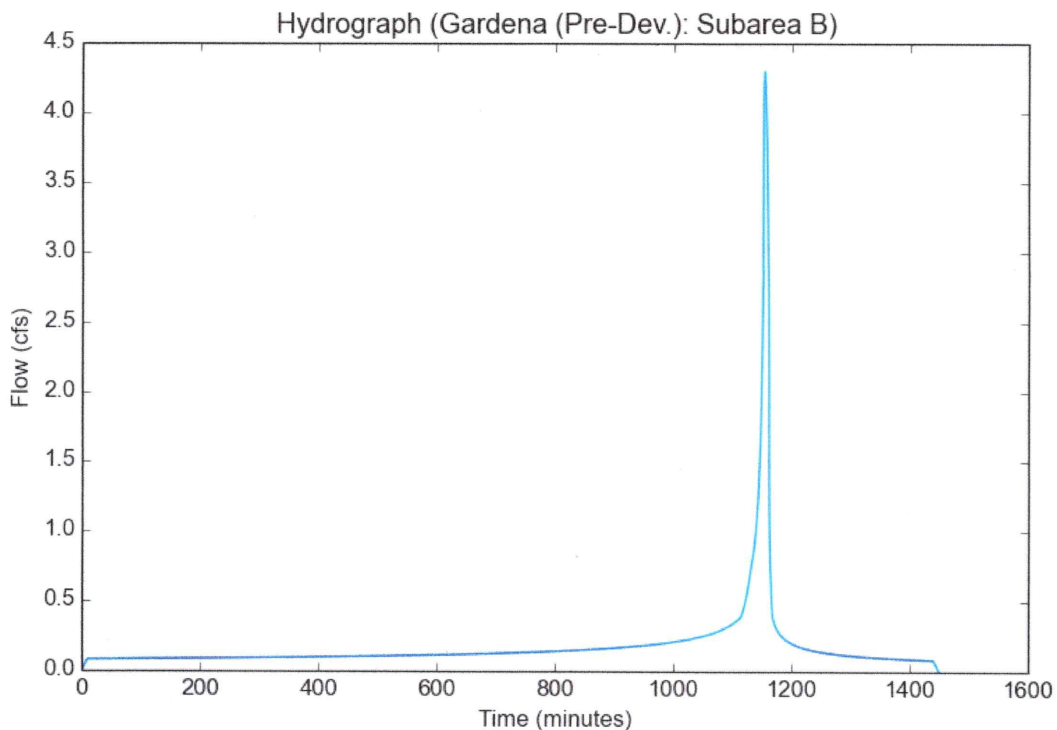
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Gardena (Pre-Dev.)
Subarea ID	Subarea B
Area (ac)	1.97
Flow Path Length (ft)	550.0
Flow Path Slope (vft/hft)	0.002
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.291
Soil Type	13
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

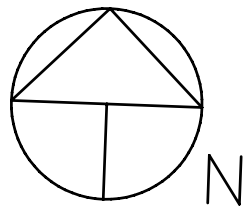
Output Results

Modeled (50-yr) Rainfall Depth (in)	5.7
Peak Intensity (in/hr)	2.4552
Undeveloped Runoff Coefficient (Cu)	0.885
Developed Runoff Coefficient (Cd)	0.8894
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	4.3018
Burned Peak Flow Rate (cfs)	4.3018
24-Hr Clear Runoff Volume (ac-ft)	0.3618
24-Hr Clear Runoff Volume (cu-ft)	15757.9174



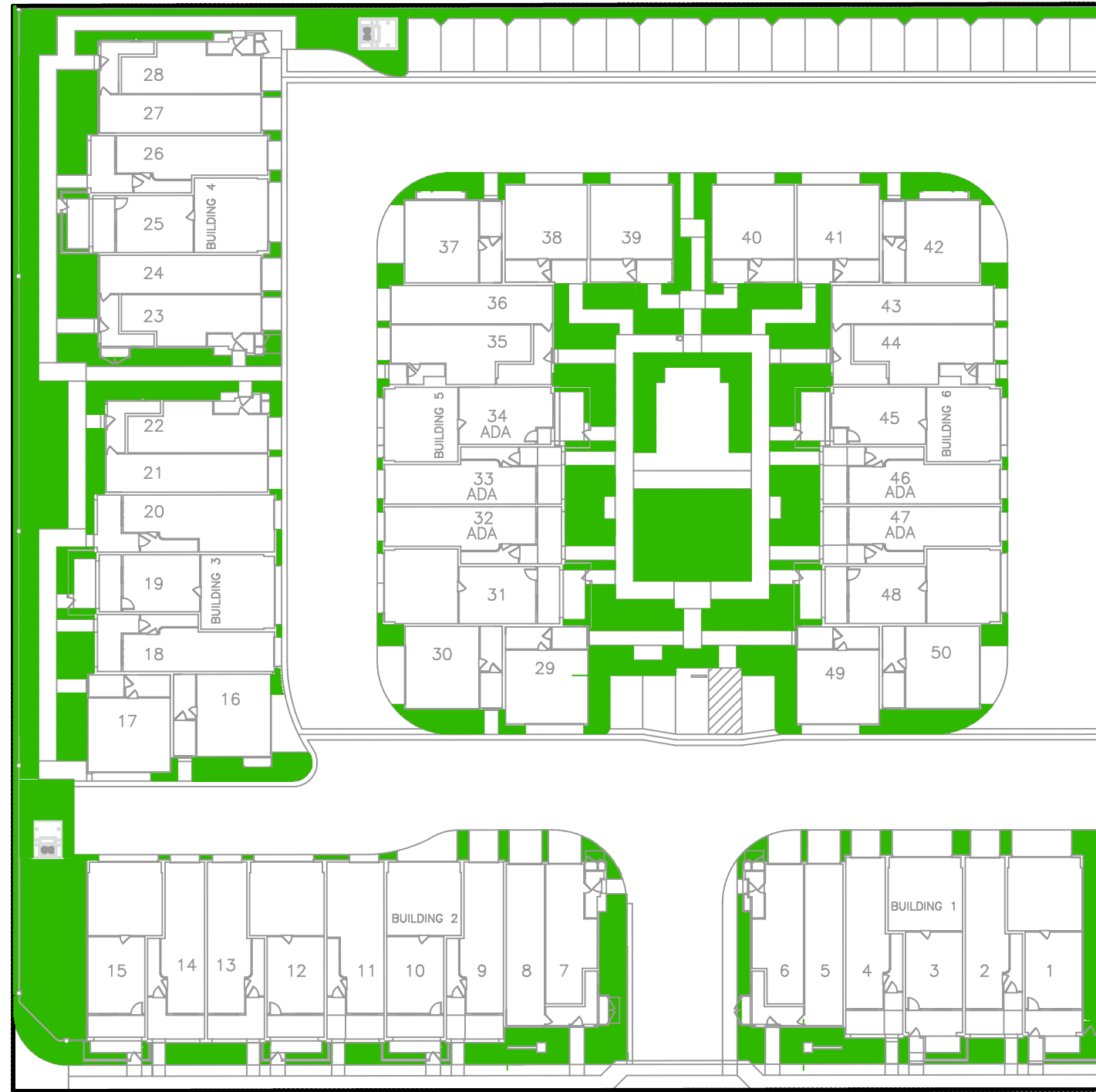
3. Proposed Condition Hydrology Calculations

10-Year Storm Event
50-Year Storm Event
85th Percentile SUSMP



1"=40'

NORMANDIE AVENUE



141st STREET

**PERVIOUS AREA
PROPOSED CONDITION
TENTATIVE TRACT NO. 82945
GARDENA**

TOTAL AREA	1.97	AC
PERVIOUS AREA	0.32	AC
% PERVIOUS	16.2	%
% IMPERVIOUS	83.8	%

LATEST REVISION: 11/7/19

Peak Flow Hydrologic Analysis

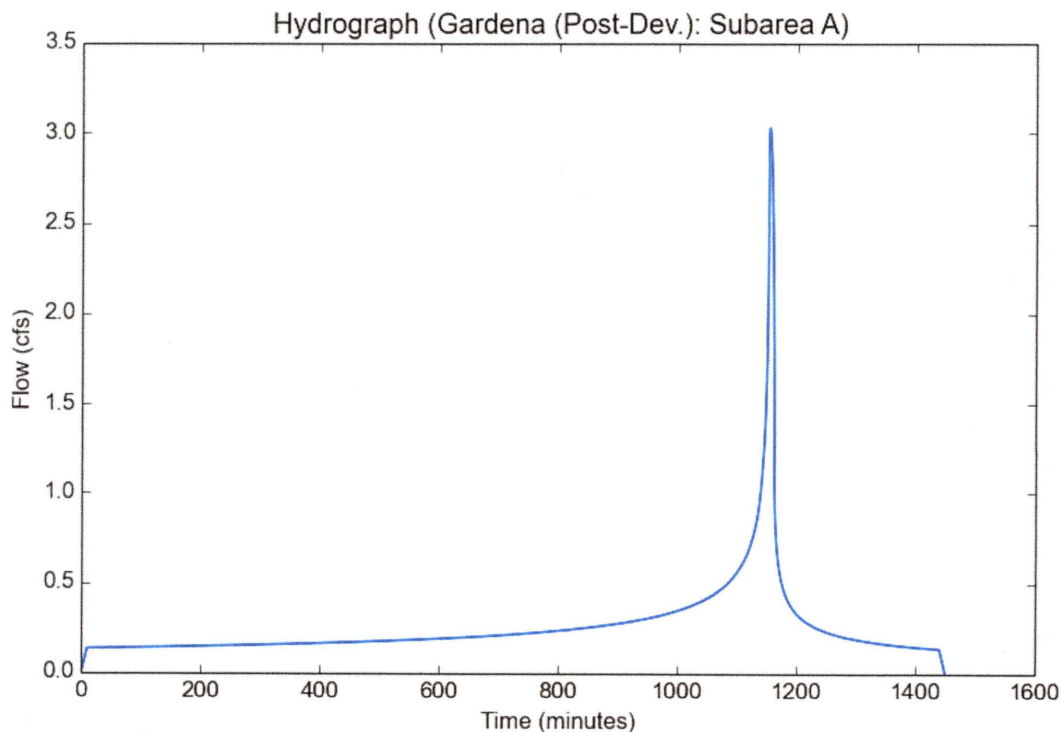
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	Gardena (Post-Dev.)
Subarea ID	Subarea A
Area (ac)	1.97
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.838
Soil Type	13
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.0698
Peak Intensity (in/hr)	1.753
Undeveloped Runoff Coefficient (Cu)	0.7624
Developed Runoff Coefficient (Cd)	0.8777
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	3.0312
Burned Peak Flow Rate (cfs)	3.0312
24-Hr Clear Runoff Volume (ac-ft)	0.5162
24-Hr Clear Runoff Volume (cu-ft)	22483.7245



Peak Flow Hydrologic Analysis

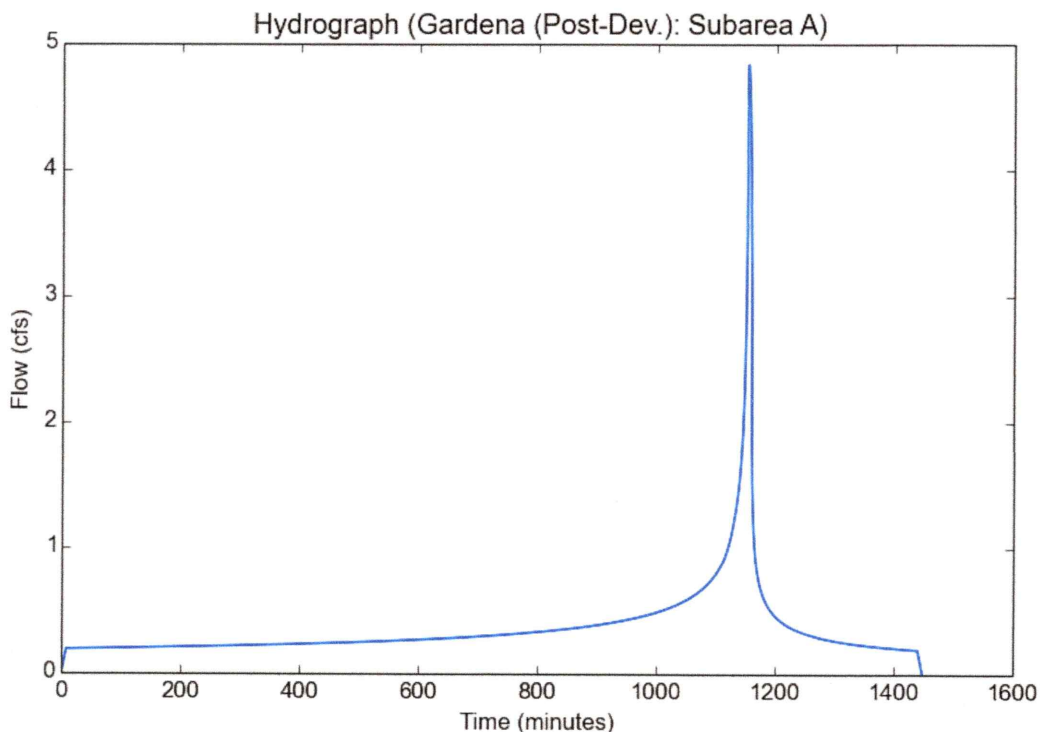
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	Gardena (Post-Dev.)
Subarea ID	Subarea A
Area (ac)	1.97
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.838
Soil Type	13
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.7
Peak Intensity (in/hr)	2.7267
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	4.8345
Burned Peak Flow Rate (cfs)	4.8345
24-Hr Clear Runoff Volume (ac-ft)	0.727
24-Hr Clear Runoff Volume (cu-ft)	31669.3179



Peak Flow Hydrologic Analysis

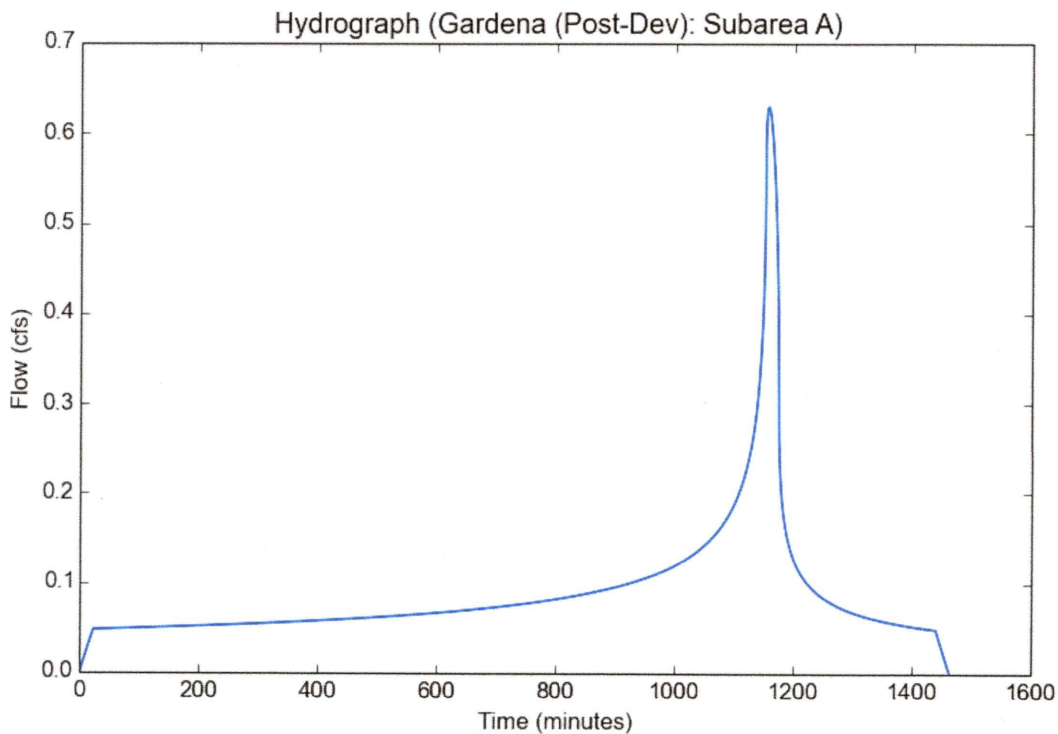
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	Gardena (Post-Dev)
Subarea ID	Subarea A
Area (ac)	1.97
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.005
85th Percentile Rainfall Depth (in)	1.425 (0.95 x 1.5 = 1.425)
Percent Impervious	0.838
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.425
Peak Intensity (in/hr)	0.415
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.7704
Time of Concentration (min)	23.0
Clear Peak Flow Rate (cfs)	0.6298
Burned Peak Flow Rate (cfs)	0.6298
24-Hr Clear Runoff Volume (ac-ft)	0.1787
24-Hr Clear Runoff Volume (cu-ft)	7785.7917



4. Retention Basins Volume Calculations

Peak Flow Hydrologic Analysis

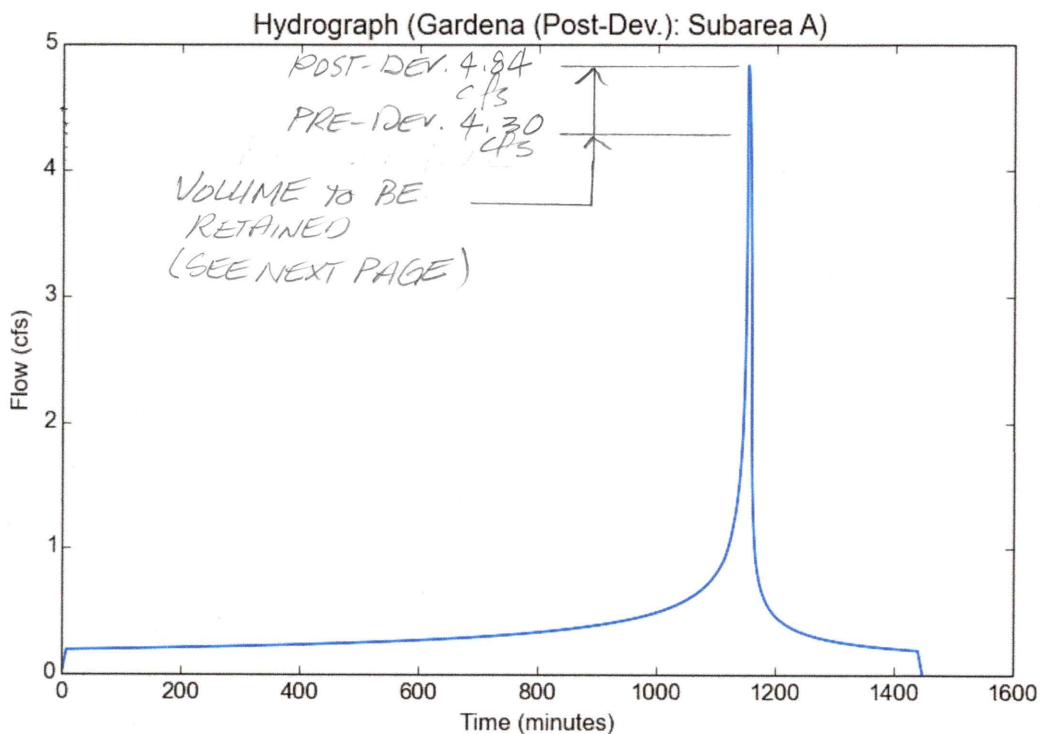
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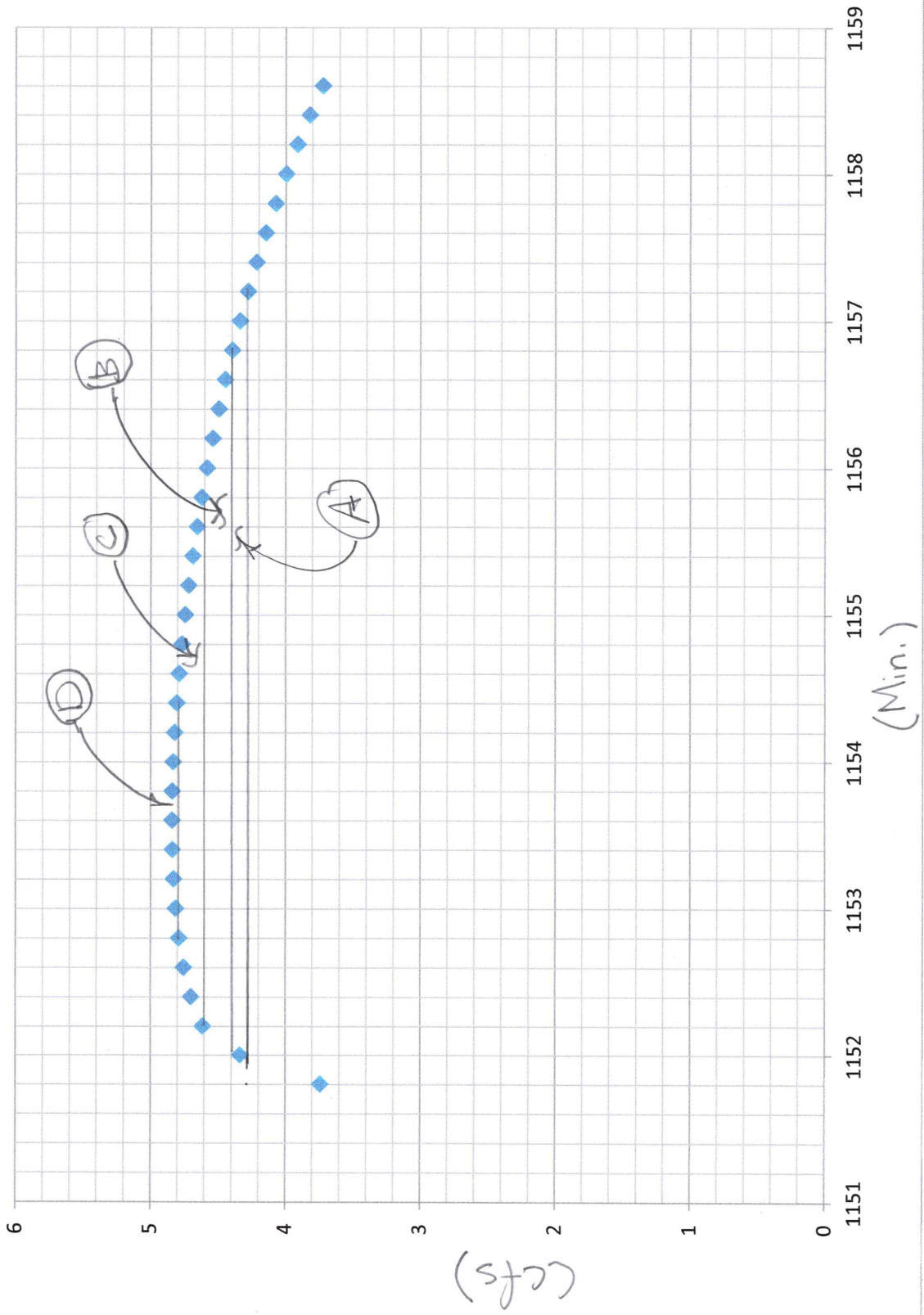
Input Parameters

Project Name	Gardena (Post-Dev.)
Subarea ID	Subarea A
Area (ac)	1.97
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.7
Percent Impervious	0.838
Soil Type	13
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.7
Peak Intensity (in/hr)	2.7267
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	4.8345
Burned Peak Flow Rate (cfs)	4.8345
24-Hr Clear Runoff Volume (ac-ft)	0.727
24-Hr Clear Runoff Volume (cu-ft)	31669.3179







25911 Pinewood Lane
Laguna Hills, CA 92653
(714) 586-5200
FAX (714) 586-5200

Project: _____

By: _____ Date: _____

DETENTION BASIN CALCULATIONS (50-YR. STORM)

$$\textcircled{A} \left(\frac{0.12 \text{ ft}^3}{\text{Sec.}} \times \frac{60 \text{ Sec.}}{1 \text{ Min.}} \right) \times 5.2 \text{ Min} = 37.4 \text{ ft}^3$$

$$\textcircled{B} (0.2 \text{ cfs}) \times (60) \times 3.6 \text{ Min} = 43.2 \text{ ft}^3$$

$$\textcircled{C} (0.2 \text{ cfs}) \times (60) \times 1.9 \text{ Min} = 22.8 \text{ ft}^3$$

$$\textcircled{D} [(0.04 \text{ cfs}) \times (60) \times 1.6] / 2 = 1.92 \text{ ft}^3$$

$$\text{TOTAL} = 105.3 \text{ ft}^3$$

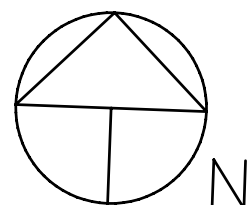
$$(105.3 \text{ ft}^3) \times (1.10) = 115.83$$

* $\left\{ \begin{array}{l} \uparrow \\ \leftarrow \end{array} \right. \text{ SAY } \underline{\underline{120 \text{ ft}^3}} \leftarrow$

* 10% for the effects of rising and descending limbs of the hydrograph during diversion.

5. Appendices

Existing Hydrology Map
Proposed Hydrology Map
FEMA Flood Map

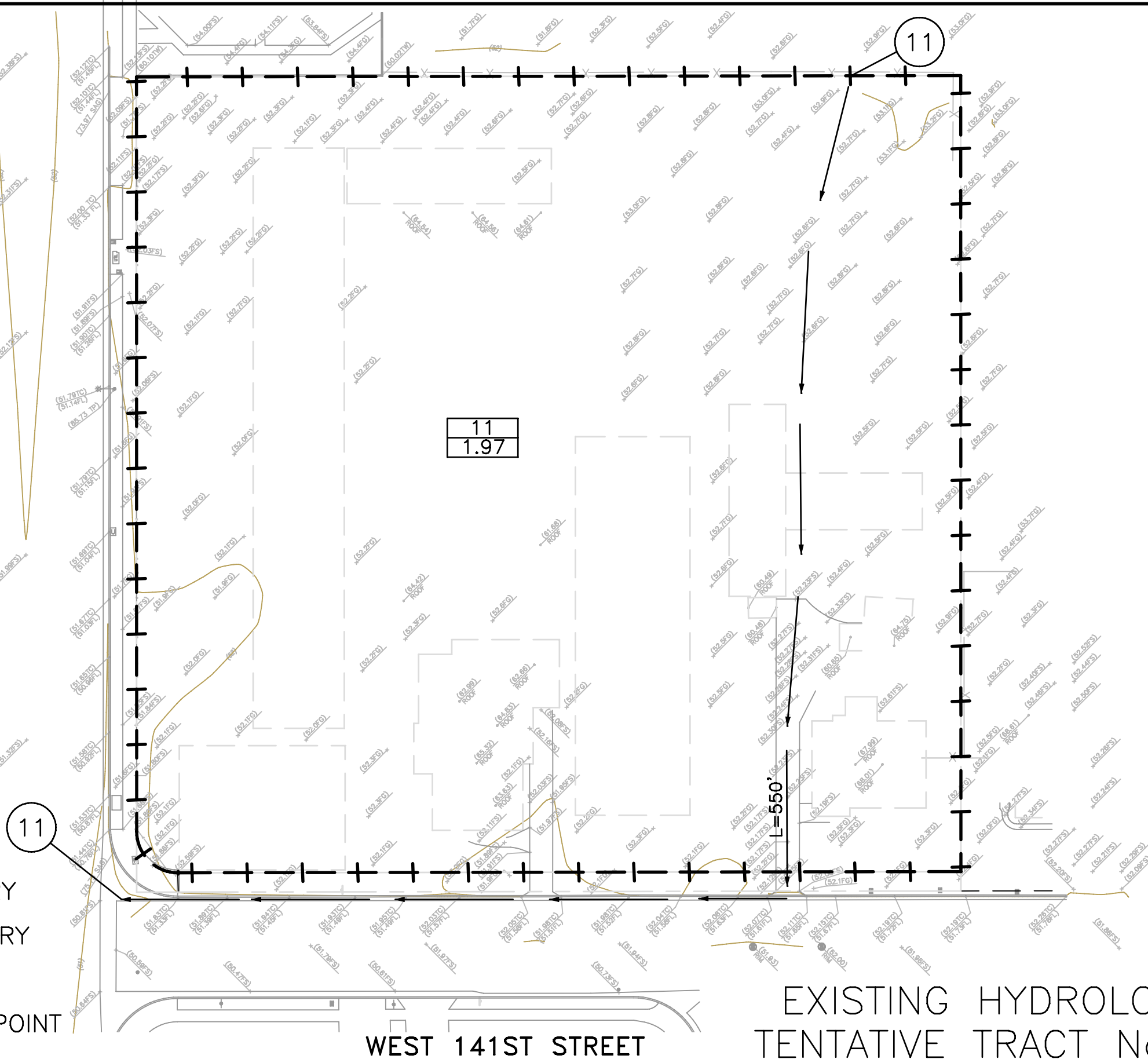


1"=40'

SOUTH NORMANDIE AVENUE

LEGEND

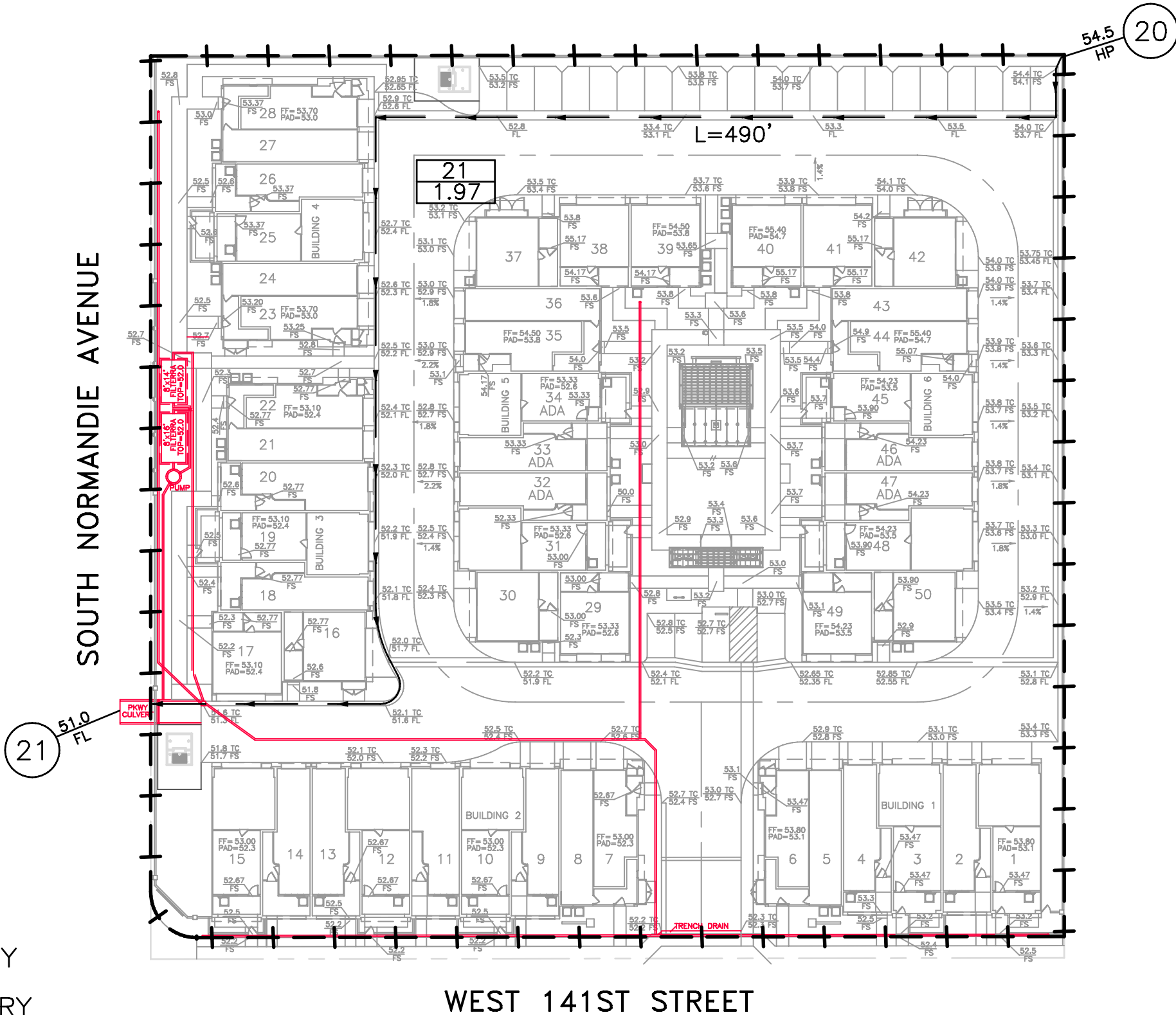
- DRAINAGE BOUNDARY
- SUB-AREA BOUNDARY
- NODAL POINT
- TRIBUTARY NODAL POINT
AREA (AC)






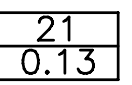
WEST 141ST STREET

EXISTING HYDROLOGY MAP
 TENTATIVE TRACT No. 82945
 CITY OF GARDENA

1/20/20



LEGEND

-  DRAINAGE BOUNDARY
-  SUB-AREA BOUNDARY
-  NODAL POINT
-  TRIBUTARY NODAL POINT AREA (AC)

1/20/20

EXISTING HYDROLOGY MAP
TENTATIVE TRACT No. 82945
CITY OF GARDENA

National Flood Hazard Layer FIRMette



33°54'30.37"N



CITY OF GARDENA
060119

AREA OF MINIMAL FLOOD HAZARD
Zone X

USGS The National Map: Orthoimagery. Data refreshed April, 2019.



118°17'41.06"W

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) Zone AE, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS

- Area of Minimal Flood Hazard Zone X
- Effective LOMRs Zone I
- Area of Undetermined Flood Hazard Zone I

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/13/2019 at 10:44:19 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

PRELIMINARY LOW IMPACT DEVELOPMENT (LID) REPORT

TENTATIVE TRACT NO. 82945
1335, 1337, 1341, & 1343 West 141st Street
Gardena, CA 90247

Prepared for:

THE OLSON COMPANY
3010 Old Ranch Parkway, Suite 100
Seal Beach, CA 92740-2751
(562) 596-4770

Prepared by:

ALAN R. SHORT, P.E.
25911 Pinewood Lane
Laguna Hills, CA 92653
(949) 586-5200

Date Prepared: January 18, 2020

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<i>Appendix 4: Source Control BMP Fact Sheets</i>	
<i>Appendix 5: Public Education Materials</i>	
<i>Appendix 6: Master Covenant and Agreement (placeholder for Final LID Report only)</i>	

OWNER CERTIFICATION

LOW IMPACT DEVELOPMENT PLAN

This Low Impact Development Report has been prepared for The Olson Company, by ALAN R. SHORT, P.E. It is intended to comply with the requirements of the County of Los Angeles National Pollution Discharge Elimination Permit (Order No. R4-2012-0175-A01) issued by the Los Angeles Regional Water Quality Control Board. The undersigned is authorized to approve implementation of the provisions of this plan as appropriate and will strive to have the plan carried out by successors consistent with the City of Gardena Low Impact Development requirements and the intent of the NPDES storm water program requirements.

I certify under penalty of law that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature

Date

Name

Title

THE OLSON COMPANY
 3010 Old Ranch Parkway, Suite 100
 Seal Beach, CA 92740-2751
 (562) 596-4770

I. INTRODUCTION

This LID Report covers the post-construction operations on Tentative Tract No. 82945, in the City of Gardena, California (see Figure 1, Vicinity Map). It has been developed as required under State Water Resources Control Board (SWRCB) Municipal NPDES Storm Water Permit for the County of Los Angeles and the Incorporated Cities of Los Angeles County, the County of Los Angeles Department of Public Works Low Impact Development Standards Manual dated February 2014 (LID Standards Manual), and in accordance with good engineering practices.

This LID Report shall identify, at a minimum, the routine resources specified in the City of Gardena Low Impact Development requirements and the County of Los Angeles Department of Public Works Low Impact Development Standards Manual, which details implementation of Low Impact Development (LID) BMPs whenever they are applicable to a project; the assignment of long-term maintenance responsibilities; and show the Design Plan that will be implemented in order to mitigate post-construction stormwater runoff pollution.



Figure 1 Vicinity Map (1335, 1337, 1341, & 1343 West 141st Street)

II. EXISTING SITE AND WATERSHED DESCRIPTION

SITE DESCRIPTION

The site is located at 1335, 1337, 1341, & 1343 West 141st Street in the city of Gardena, California. The site is bordered by residential developments to the north and east, West 141st Street to the south, and South Normandie Avenue to the west. The location of the site and its relationship to the surrounding areas are shown on Figure 1, Vicinity Map.

The site is rectangular in shape and comprises approximately 1.97 acres of land. The site is currently occupied by a plant nursery with several greenhouse structures throughout the site. Two single-story residential buildings are also located at the southern portion of the site. A base covered interior street is adjacent to the north property line and then runs north to south. Two concrete driveways along the south property line were observed to be in good condition.

A wooden fence bounds the property along the north and east property line. The site is relatively level and the elevation ranges from 46 to 47 feet above mean sea level (MSL). Drainage within the site is generally directed to the west and south toward West 141st Street and South Normandie Avenue. Vegetation within the nursery area of the site is sparse and only includes a few medium sized-trees and medium to large-sized shrubs.

SOIL CONDITIONS & INFILTRATION CHARACTERISTICS

Soils encountered at the site consist of artificial fill materials overlying alluvial deposits. The artificial fill materials typically consist of brown silty sand and sandy clay. The artificial fill was typically slightly moist and dense / very stiff to hard. The maximum thickness of the fill encountered from approximately 2 feet below existing grades. The project site is comprised of Soil Group No. 013 soils, according to the Los Angeles County Department of Public Works web-based Hydrology Map (<http://dpw.lacounty.gov/wrd/hydrologygis/>).

The alluvial deposits were encountered below the artificial fill materials to the maximum depth of exploration, 51.5 feet below the ground surface. The alluvial deposits consisted of interlayered coarse-grained and fine-grained material. The coarse-grained material was typically brown sand with varying amounts of fines. These deposits are slightly moist to very moist and medium dense to very dense. The fine-grained material consisted of brown clay and silt. These deposits are typically slightly moist to moist and hard to very stiff.

Groundwater was observed at 30 feet during this firm's subsurface investigation. A review of the CDMG Seismic Hazard Zone Report 027 indicates that historical high groundwater levels for the general site area is as shallow as 30 feet below the existing ground surface.

Percolation testing was performed on May 6, 2019, in general conformance with the constant-head test procedures outlined in the referenced Well Permeameter Method (USBR 7300-89). Based on the results, the infiltration at the site would be too low to meet the minimum requirements set by the Los Angeles County Regional Water Quality Board of 0.3 inch/hour. The fine-grained nature of the subsurface soils which have impeded infiltration was observed in all of the exploratory borings. Infiltration of storm water through the use of a shallow chamber system

or dry well at the site is deemed unfeasible. Therefore, treatment of storm water will require the use of other methods such as biofiltration. The infiltration study is provided in Appendix 2.

WATERSHED DESCRIPTION

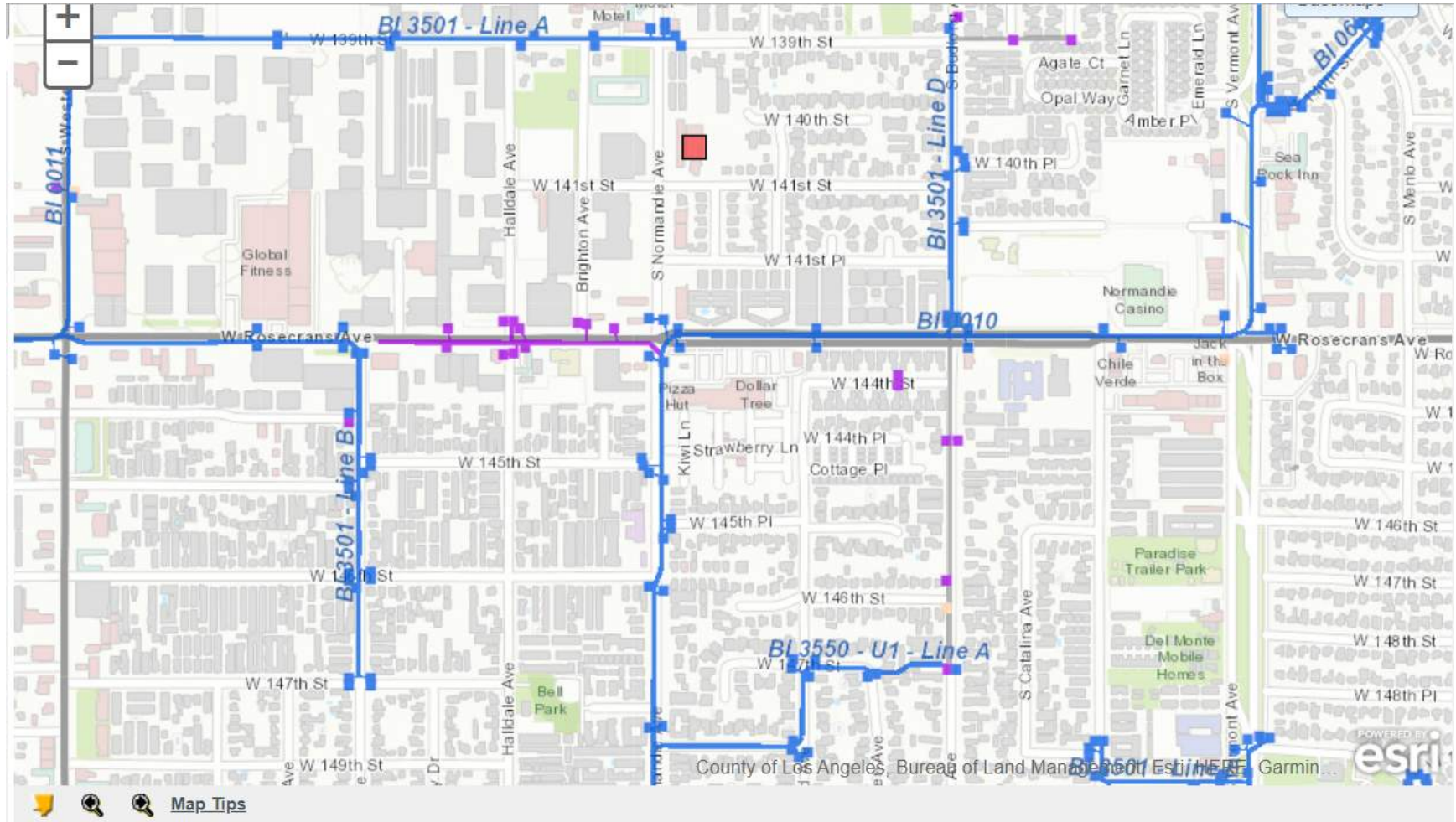
The proposed project resides within the Dominguez Channel Watershed. The Dominguez Channel WMA is located within the southern portion of Los Angeles County, California, and encompasses approximately 133 square miles of land and water, including the Upper Dominguez Channel Watershed, the Machado Lake Watershed, and the Los Angeles/Long Beach Harbors Watershed.

As illustrated in the screen captures below, the proposed project discharges south onto Normandie Avenue, where it travels via curb and gutter to the City MS4 at Normandie and Rosecrans. The storm drain then travels south for quite a distance before discharging to Dominguez Channel, just south of Artesia Blvd. Dominguez Channel ultimately reaches the ocean at Long Beach. Dominguez Channel is a hardline channel above Vermont Avenue. From thereon, it is a soft bottom channel to its outlet to the Pacific Ocean. It has TMDLs for toxics and metals and its Tier 3 Pollutants of Concern are summarized in the table below.

DOMINGUEZ CHANNEL WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Cyanide, Total Recoverable
<i>E. coli</i> Bacteria	Copper, Total Recoverable
Total Coliform Bacteria ¹	Lead, Total Recoverable
Fecal Coliform Bacteria ¹	Mercury, Total Recoverable
Enterococcus Bacteria ¹	Selenium, Total Recoverable

¹ Apply only to discharges to the estuary and the ocean



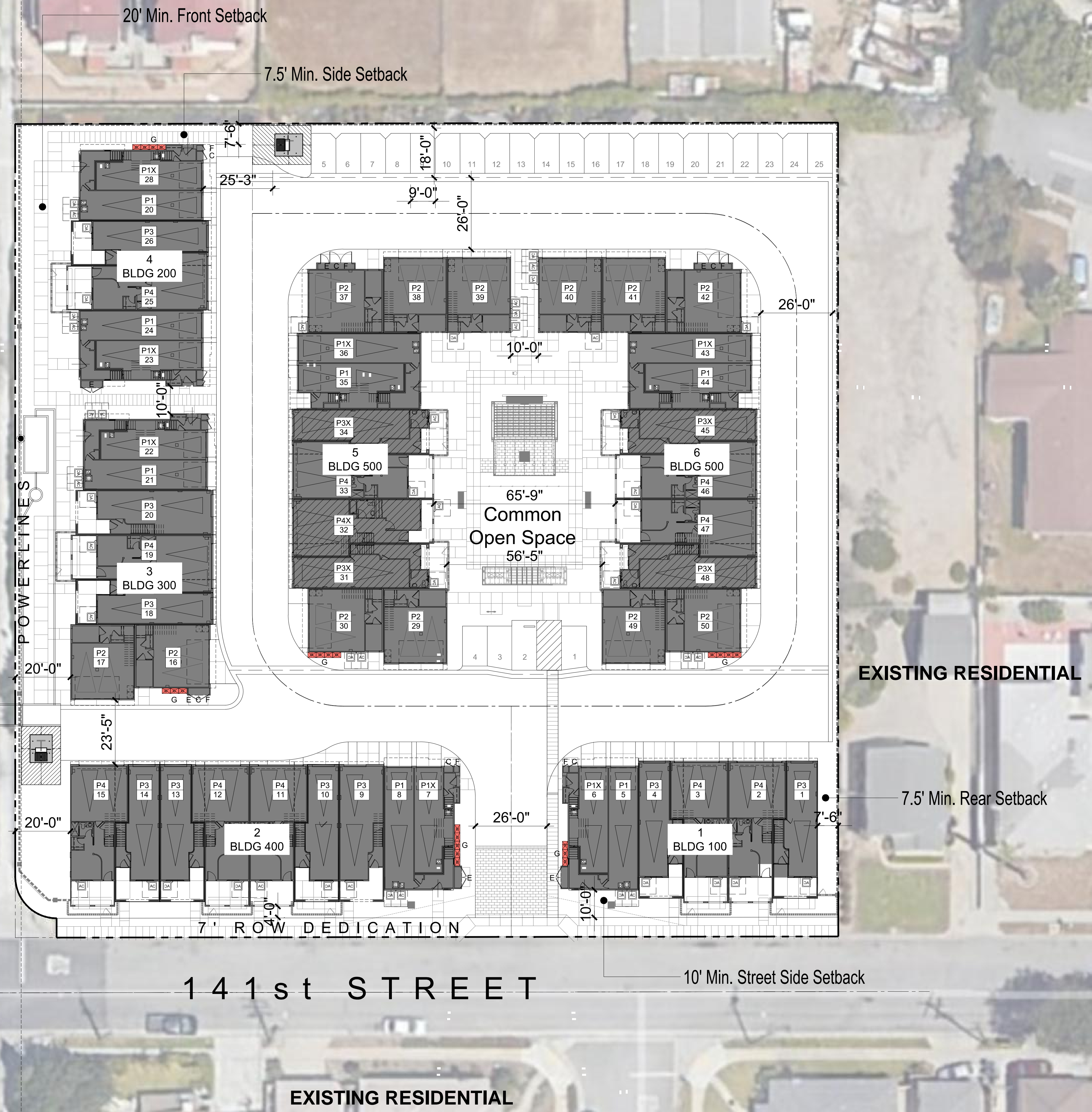
III. PROJECT DESCRIPTION

The proposed Tentative Tract 82945 project will develop 50 single-family attached townhomes on the 1.97-acre property. There will be 6 buildings with a driveway providing 23 uncovered surface parking stalls and two handicap spaces. Under proposed conditions, the project site will be approximately 83.8% impervious, an increase from 29.1% impervious in existing conditions.

The proposed project will generally be drained via area drains as well as curb and gutter flows along the drive aisles of the property to one drop inlet catch basin located near Normandie Avenue on the southwest corner of the property. Storm water runoff flows will generally drain in a southwesterly direction towards Normandie Avenue. Prior to discharge offsite, the LID stormwater runoff flows will be treated by a Filterra 8x18 Offline proprietary biofiltration BMP that will be located in the landscape area between Residential Unit #22 and Normandie Avenue. LID treated flows will be pumped and discharged via storm drain to a proposed parkway culvert that outlets to Normandie Avenue.

An HOA will be formed upon project completion. All driveways within the project site are considered private, to be maintained by the HOA. All storm water BMPs specified in this LID Report will also be maintained by the HOA. There are no trash enclosures or community trash bins, as each individual homeowner will be responsible for their respective homes, with regularly scheduled trash pickup at each home.

NORMANDIE



Property Address	Legal Description
1335, 1337, 1341, & 1343 West 141st Street Gardena, CA 90247	Pin No. : n/a Assessors No TTM No.

Building Code Summary	
Occupancy	R-2
Construction Type	Type V-B (non rated)
Fire Sprinkler	NFPA 13
Building Type	On-Grade
Number of Stories	3

Zoning	
Current Zoning	R-1 & R-3
Proposed Zoning	R-4
Hillside Area (Zoning Code)	No

Site Summary	Site Area
	87,991 SF
	2.02 AC
Dwelling Units*	50 DU
Net Density	24.8 DU/AC
Lot Coverage (LA County County Code Title 22.84.080)	
Permitted Lot Coverage	50 %
Provided Lot Coverage	38.87 % Provided
Density	
Permitted Density (30 DU/AC)	60.6 DU
Provided Density	50 DU
Building Height	
Allowed	35'
Proposed	35'

Townhomes Plan Summary					
	#	GFA	Beds	%	Total GFA + Garage
P1	7	1,252	2	14.0%	8,764 11,830
P1X	7	1,313	2	14.0%	9,191 12,502
P2	12	1,332	2	24.0%	15,984 21,660
P3	13	1,415	3	26.0%	18,395 24,362
P4	11	1,689	3	22.0%	18,579 22,638
Total	50			100.0%	70,913 92,992
Type					
2 bedroom total	26			52.0%	
3 bedroom total	24			48.0%	
Total	50			100%	

Bedroom Count		
Type	#	%
2 bedroom total	52	41.9%
3 bedroom total	72	58.1%
Total	124	100%

Parking Summary			
Required	Spaces/ Unit	Req.	
Resident	2.0	100	
Guest	0.5	25	
Total Required Parking	2.5	125	

Parking Provided			
	Spaces/ Unit	Provided	
Garage Spaces	2.0	100	
Guest Spaces	0.46	23	
Accessible Space	0.04	2	
Total Provided Parking	2.50	125	

Open Space			
	±	SF	%
Common Open Space	±	7,932 SF	56 %
Private Open Space	±	6,234 SF	44 %
Total Provided Open Space	±	14,166 SF	283.3 SF/UNIT
Building Coverage			
Building Coverage	±	34,199 SF	38.87 %
Pavement Coverage	±	29,581 SF	33.62 %
Landscape Coverage	±	24,211 SF	27.52 %

Accessible Units (5)



Architecture + Planning
17911 Von Karman Ave,
Suite 200
Irvine, CA 92614
949.851.2133
ktgy.com

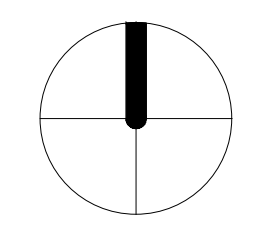


The Olson Company
3010 Old Ranch Parkway,
Suite 100
Seal Beach, CA 90704

GARDENA - 141st & NORMANDIE
GARDENA, CA # 2019-0355

Plot Date: 11.07.2019

**CONCEPTUAL
SITE PLAN**



SCALE: 1"=20'-0"
0 10 20 40

AI.0

TENTATIVE TRACT No. 82945

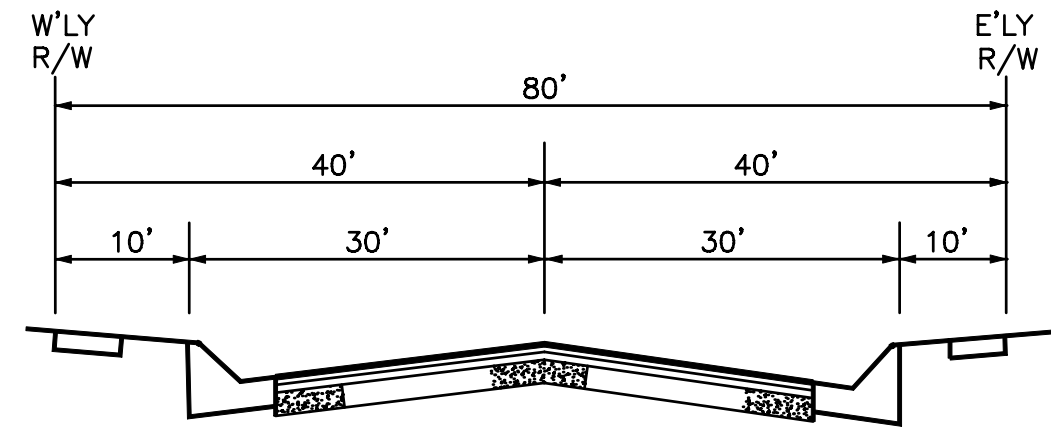
FOR CONDOMINIUM PURPOSES

A VESTING TENTATIVE TRACT MAP

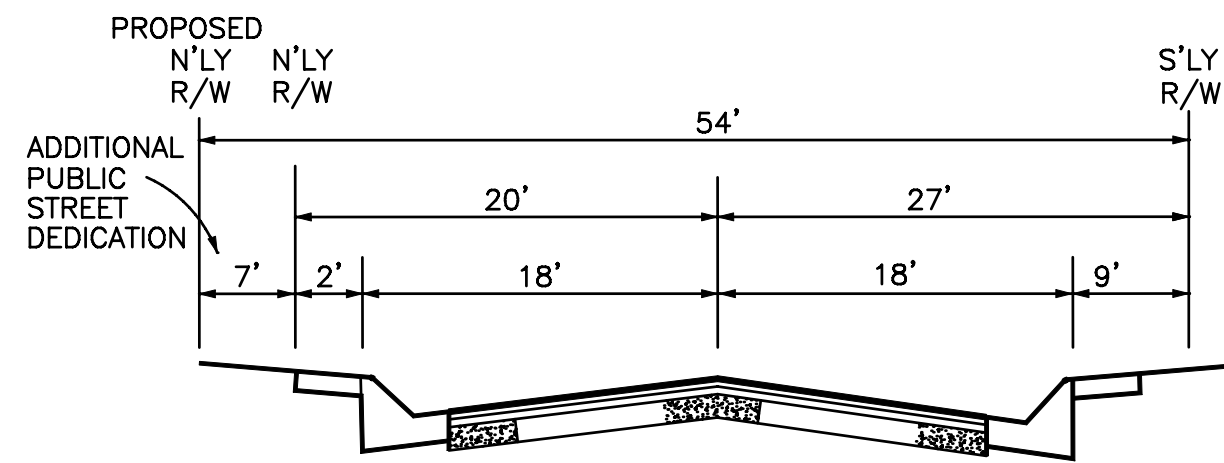
CONCEPTUAL GRADING

LEGEND:

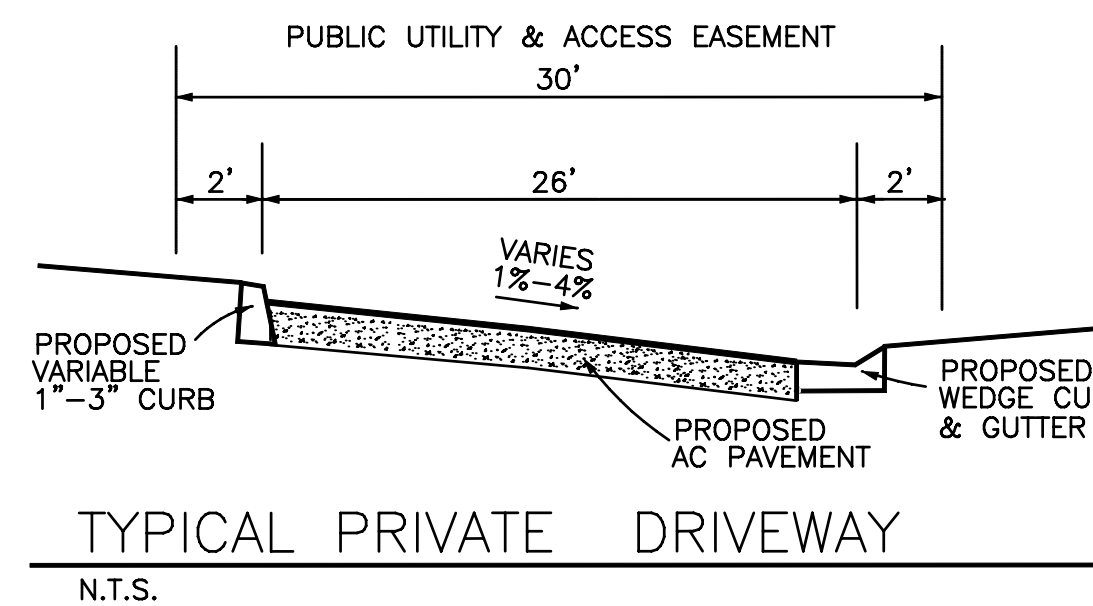
- FF= 207.50 TENTATIVE TRACT BOUNDARY
- PAD= 206.8 FINISHED FLOOR ELEVATION
- TC TOP OF CURB ELEVATION
- FL FLOW LINE ELEVATION
- FS FINISHED SURFACE ELEVATION
- 1 PROPOSED LOT NUMBER



S NORMANDIE AVENUE— PUBLIC STREET
N.T.S.

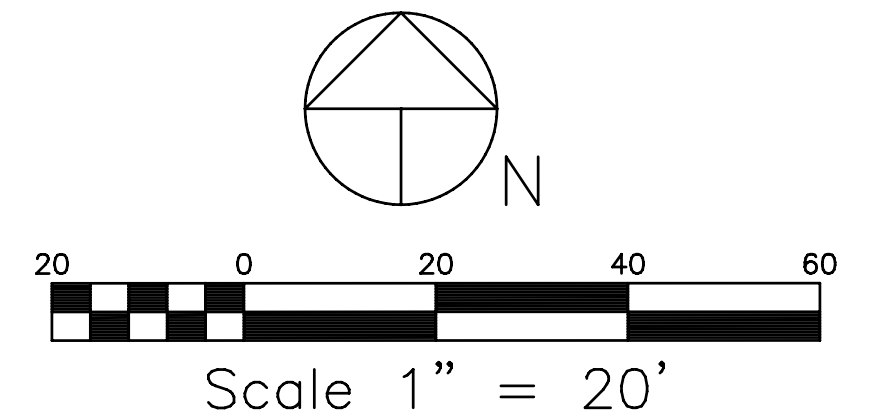
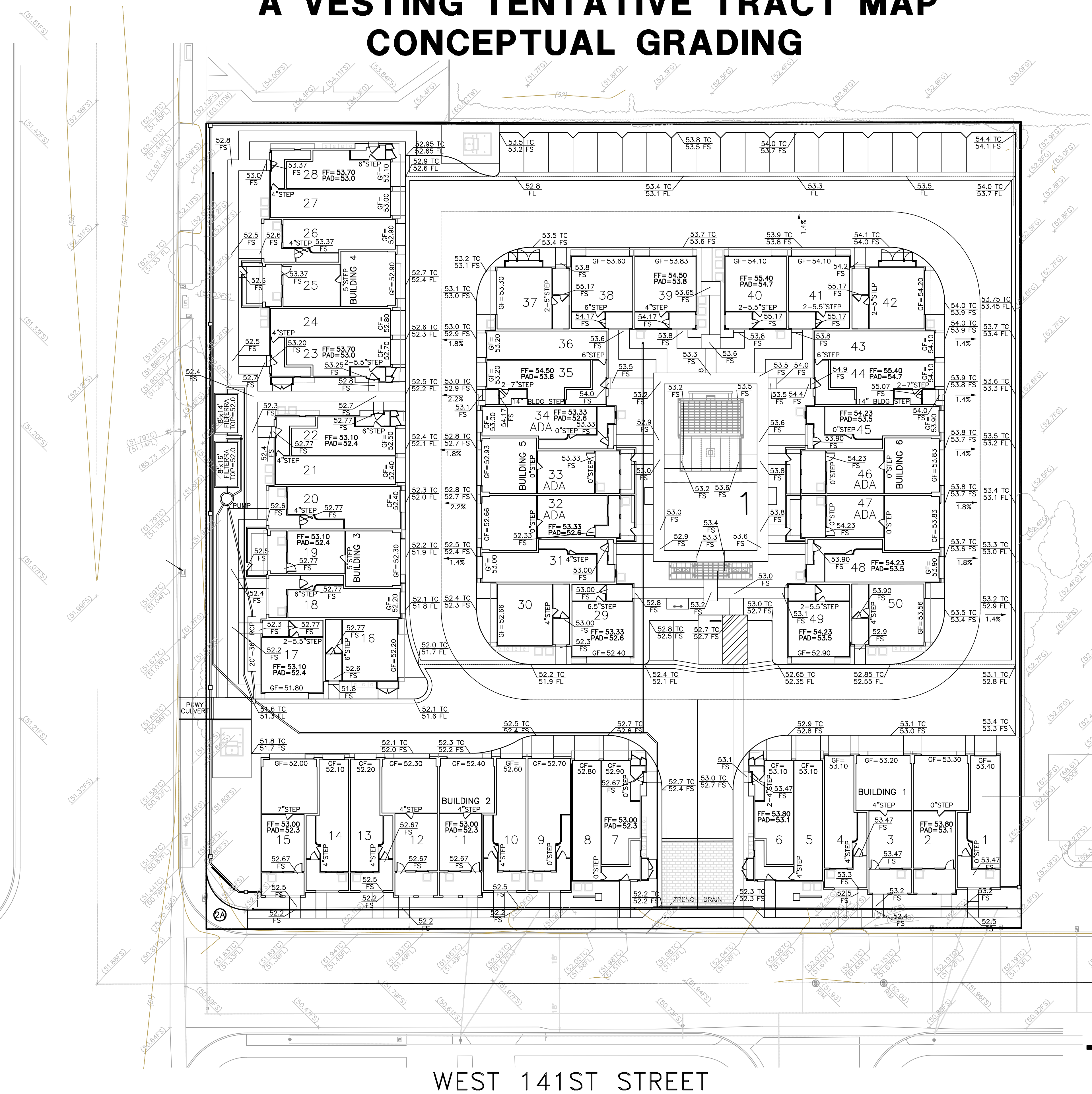


W 141st STREET— PUBLIC STREET
N.T.S.



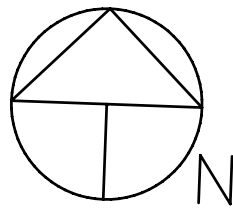
TYPICAL PRIVATE DRIVEWAY
N.T.S.

SOUTH NORMANDIE AVENUE



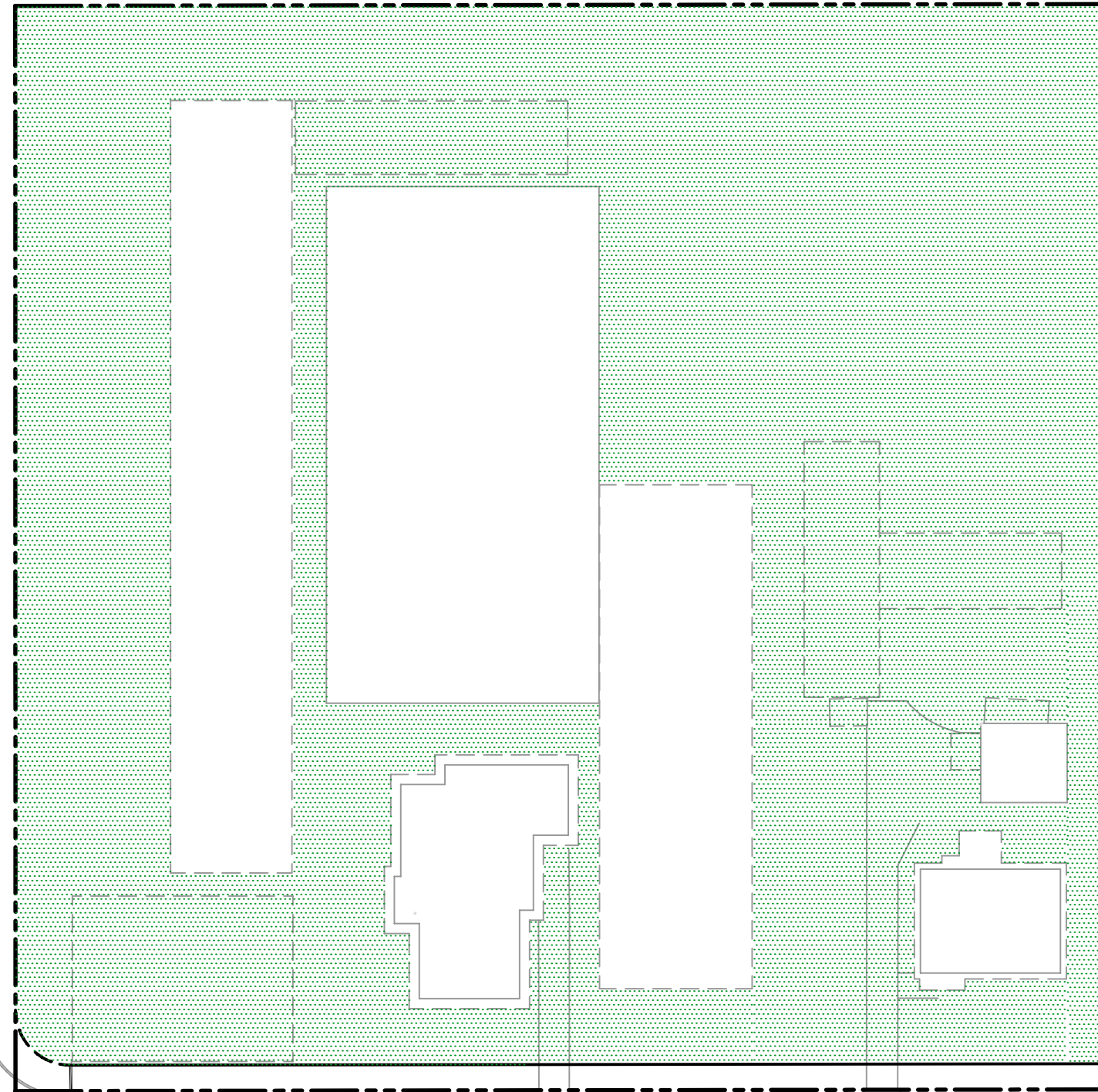
SCALE: 1" = 20'
DATE: 1/20/20
GROSS AREA: ±12.0 AC
CONTOUR: 1'
TOTAL LOTS: 1 NUMBERED
0 LETTERED

VESTING TENTATIVE TRACT NO. 82945



1"=40'

NORMANDIE AVENUE

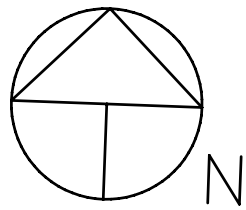


141st STREET

TOTAL AREA	1.97	AC
PERVIOUS AREA	1.40	AC
% PERVIOUS	70.9	%
% IMPERVIOUS	29.1	%

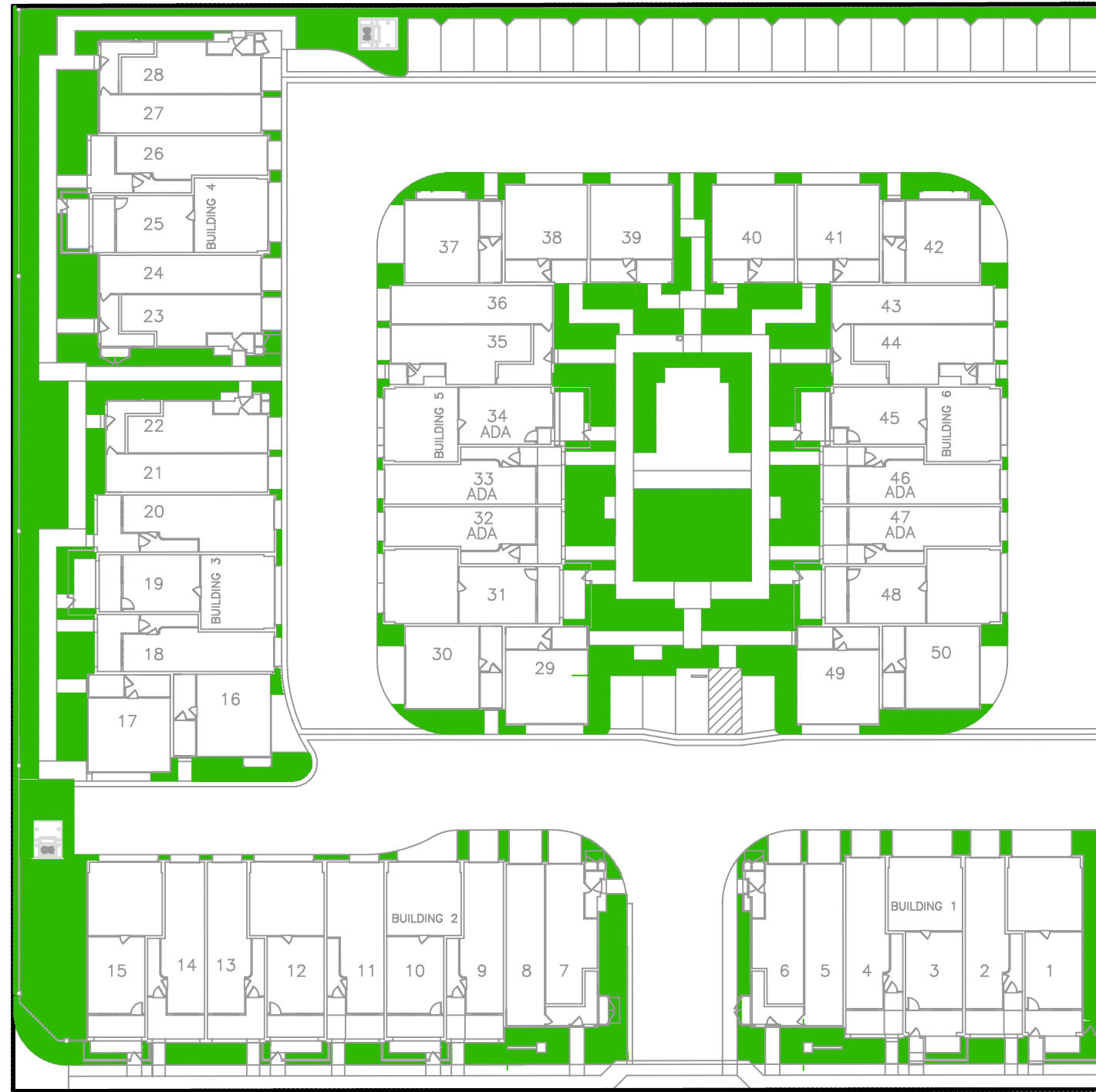
**PERVIOUS AREA
EXISTING CONDITION
TENTATIVE TRACT NO. 82945
GARDENA**

LATEST REVISION: 11/7/19




1"=40'

NORMANDIE AVENUE



141st STREET

**PERVIOUS AREA
PROPOSED CONDITION
TENTATIVE TRACT NO. 82945
GARDENA**

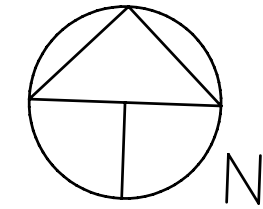
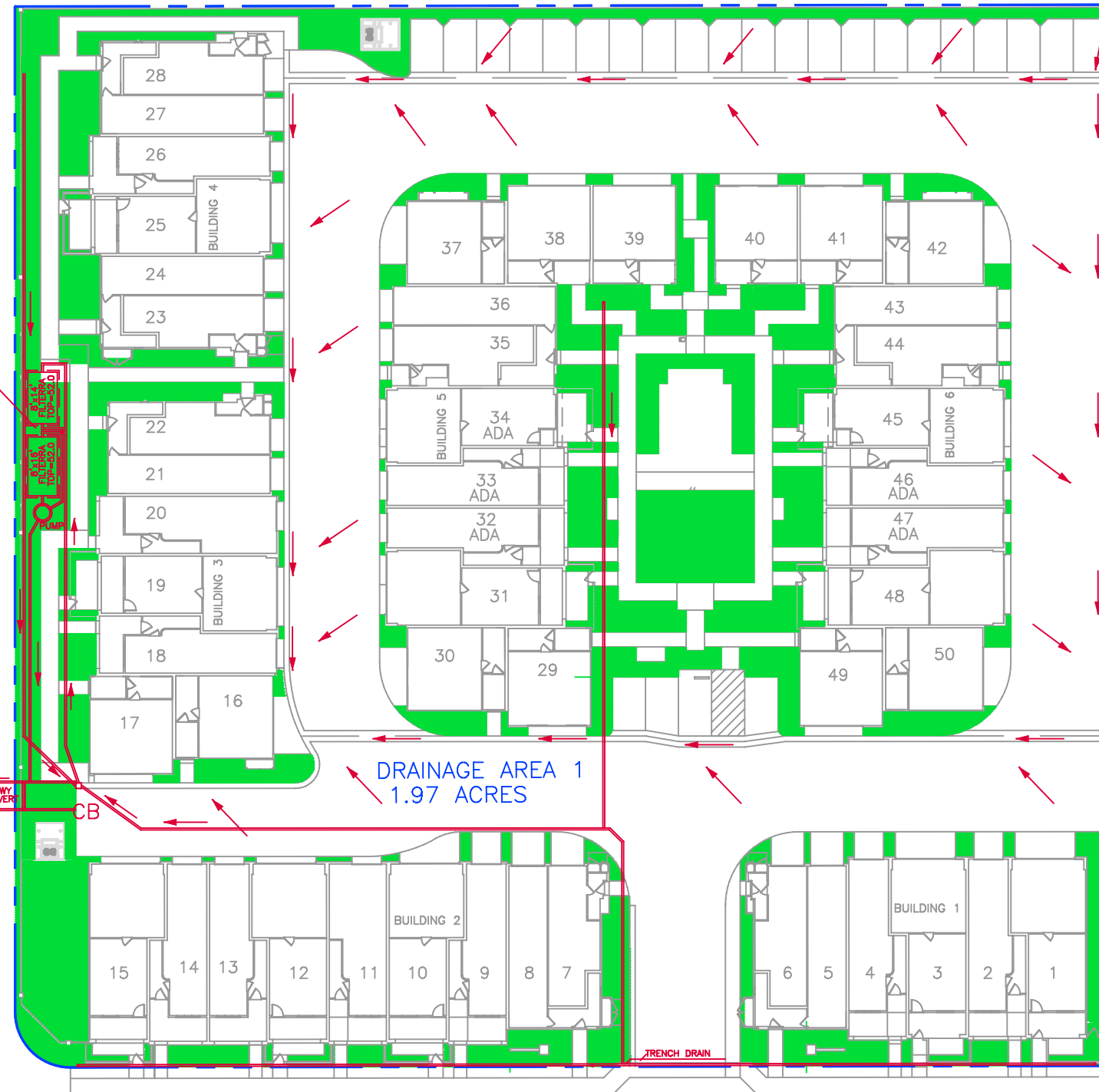
	TOTAL AREA	1.97	AC
	PERVIOUS AREA	0.32	AC
	% PERVIOUS	16.2	%
	% IMPERVIOUS	83.8	%

LATEST REVISION: 11/7/19

INFILTRATION IS NOT FEASIBLE
REQUIRED TREATMENT FLOW RATE
@ 150% OF 85TH PERCENTILE STORM

PROPOSED TREATMENT USING FILTERRA BASIN
8'x16' and 8'x14'
TREAT CAPACITY = 0.77 cfs (FLOW BASED)


NORMANDIE AVENUE



1"=40'

NOTE: STORM DRAIN INLET STENCILING
TO BE PROVIDED AT ALL CATCH BASINS.

141st STREET



25911 Pinewood Lane
Laguna Hills, CA 92653
(949) 586-5200
ALANSHORT@COX.NET

Alan R. Short 1/13/20
RCE 30873 EXP. 3/31/20

**LID SCHEMATIC
CITY OF GARDENA
LOT 1
TENTATIVE TRACT
NO. 82945**

IV. SITE ASSESSMENT AND DESIGN CONSIDERATIONS

When implementing storm water control measures for a project, the project is required to provide treatment to remove pollutants of concern for the project. The BMP matrix labeled Table 7.3 on the following page lists the land use categories and their pollutants of concern for the Los Angeles River Watershed. This report is responsible for determining, evaluating, and selecting the appropriate and applicable measures to treat the targeted pollutants to the MEP standard. One or a combination of two or more suggested LID/treatment control BMPs can be selected as deemed applicable.

The proposed project is considered a High-Density Single-Family Residential land use at 24.8 Dwelling Units per acre. The anticipate pollutants for the project include suspended solids, total phosphorus, copper, lead, and zinc. See table 7.3 below. LID Report treatment control BMPs must address these pollutants to the MEP.

BMP MATRIX TABLES FOR LID REPORT PROJECT CATEGORIES

(Excerpted from County of Los Angeles Department of Public Works, Low Impact Development Standards Manual, February 2014)

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.

Table 5-1. Source Control Measures Selection Matrix

Project Type	Source Control Measure										
	Storm Drain Message and Signage (S-1)	Outdoor Material Storage Area (S-2)	Outdoor Trash Storage/Waste Handling Area (S-3)	Outdoor Loading/Unloading Dock Area (S-4)	Outdoor Vehicle/Equipment Repair/Maintenance Area (S-5)	Outdoor Vehicle/Equipment/Accessory Wash Area (S-6)	Fuel & Maintenance Area (S-7)	Landscape Irrigation Practices (S-8)	Building Materials (S-9)	Animal Care and Handling Facilities (S-10)	Outdoor Horticulture Areas (S-11)
<i>Designated Projects – New Development</i>											
Development ≥1 acre and ≥10,000 ft ² new impervious area	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹
Industrial parks (≥10,000 ft ²)	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	-	-
Commercial malls (≥10,000 ft ²)	R	R ¹	R ¹	R ¹	R ¹	R ¹	-	R	R	R ¹	R ¹
Retail gasoline outlets (≥5,000 ft ²)	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	-	-
Restaurants (≥5,000 ft ²)	R	R ¹	R ¹	R ¹	-	-	-	R	R	-	-
Parking lots (≥5,000 ft ² or ≥25 parking spaces)	R	R ¹	R ¹	R ¹	-	-	-	R	R	R ¹	R ¹
Automotive service facilities (5,000 ft ²)	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	-	-
Projects in/around Significant Ecologic Areas	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹
Projects potentially impacting sensitive biological species or habitats	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹
Projects adding ≥2,500 ft ² of impervious area	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹

R = required; R¹ = required if outdoor activity area is included in project; R² = required for multi-family dwellings

Table 5-1. Source Control Measures Selection Matrix (continued)

Project Type	Source Control Measure										
	Storm Drain Message and Signage (S-1)	Outdoor Material Storage Area (S-2)	Outdoor Trash Storage/Waste Handling Area (S-3)	Outdoor Loading/Unloading Dock Area (S-4)	Outdoor Vehicle/Equipment Repair/Maintenance Area (S-5)	Outdoor Vehicle/ Equipment/ Accessory Wash Area (S-6)	Fuel & Maintenance Area (S-7)	Landscape Irrigation Practices (S-8)	Building Materials (S-9)	Animal Care and Handling Facilities (S-10)	Outdoor Horticulture Areas (S-11)
<i>Designated Projects – Redevelopment</i>											
Projects creating or adding $\geq 5,000$ ft ²	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹
Projects altering existing impervious surface	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹
<i>Non-Designated Projects</i>											
Small-Scale Residential Projects	R	R ¹	R ²	-	-	-	-	R	R	-	-
Large-Scale Projects	R	R ¹	R ¹	R ¹	R ¹	R ¹	R ¹	R	R	R ¹	R ¹

R = required; R¹ = required if outdoor activity area is included in project; R² = required for multi-family dwellings

SOURCE CONTROL BMPS

Source control BMPs are required to be incorporated in all new development and redevelopment projects unless not applicable. The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

The specific source control BMPs for the Tentative Tract No. 82945 Project include:

INCORPORATED SOURCE CONTROL BMP:	YES	N/A	DESCRIPTION
Storm Drain Message and Signage (S-1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inlets will be stenciled with the appropriate message.
Outdoor Material Storage Area (S-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Outdoor Trash Storage/Waste Handling Area (S-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Outdoor Loading/Unloading Dock Area (S-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Outdoor Vehicle/Equipment Repair/Maintenance Area (S-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Outdoor Vehicle/Equipment/Accessory Wash Area (S-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Fuel & Maintenance Area (S-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Landscape Irrigation Practices (S-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Efficient irrigation systems and smart controllers are proposed.
Building Materials (S-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Animal Care and Handling Facilities (S-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.
Outdoor Horticulture Areas (S-11)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None proposed.

The following source control BMP fact sheets are provided in Appendix 4 of this report as a reference to the design plans and/or specifications for the Tentative Tract No. 82945 Project:

- Storm Drain Message and Signage (S-1)
- Landscape Irrigation Practices (S-8)

SITE DESIGN BMPS

The following table describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

SITE DESIGN PRINCIPLES			
DESIGN CONSIDERED: SPECIFIC BMP	YES	NO	DESCRIPTION
Site Planning	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Building roof runoff will be directed to landscaping prior to discharge onto pavement or into area drains.
Protect and Restore Natural Areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	There are no natural areas to conserve. Site is already developed.
Minimize Land Disturbance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The project site is in an area that is considered built-out and is on an existing developed property.
Minimize Impervious Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Approximately 10,000 square feet of common open space is provided, contributing to the majority of the 25.3% pervious area (0.3 acres) for the project.

VI. STORMWATER QUALITY CONTROL MEASURES

This section describes the storm water quality control measures or LID BMPs proposed to treat the project site's storm water runoff. Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in stormwater discharges. LID BMPs are engineered facilities that are designed to retain or biofilter runoff on the project site. The Los Angeles County MS4 Stormwater Permit (Order No. R4-2012-0715) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, harvest/reuse, and biofiltration.

The design storm, from which the SWQDv is calculated, is defined as the greater of:

- The 0.75-inch, 24-hour rain event; or
- The 85th percentile, 24-hour rain event as determined from the Los Angeles County 85th percentile precipitation isohyetal map.¹

Per the Los Angeles County 85th percentile precipitation isohyetal map, the 85th percentile, 24-hour storm event is **0.9-inch** (see Figure 2). BMPs selected for the site shall rely on infiltration, bioretention, rainfall storage and reuse, and/or biofiltration, as feasible. In addition, any biofiltration features will be designed to biofiltrate 1.5 times the portion of the SWQDv that is not retained onsite (**1.35-inch storm**).

INFILTRATION BMP FEASIBILITY

As described in Section II, the soil percolation tests conducted on the site found infiltration rates of less than 0.3 inch/hour. Since the measured rates fall below the LID Standards Manual's minimum requirement for feasibility, infiltration on the project site is therefore considered infeasible. Infiltration test results are included in Appendix 2.

STORMWATER CAPTURE & REUSE FEASIBILITY

In accordance with the County of Los Angeles Low Impact Development Standards Manual (LID Standards Manual), storage and reuse shall be considered should infiltration be determined infeasible. Since the primary use of captured runoff is for subsurface drip irrigation purposes, the proposed onsite irrigation demand was calculated for wet season months (October through April) to evaluate reuse feasibility. Demand requirements were calculated based on the proposed landscaping area, 1.97 acres (83.8% % site imperviousness), and compared with the minimum LID design capture runoff volume of 7,786 ft³ for the project site.

At a minimum, storage and reuse BMPs must be designed and maintained to ensure adequate capacity is available to capture the stormwater quality design volume (SWQDv) within 3 days (72 hours) of a likely storm event. The evaluation performed herein is derived from City of Los Angeles feasibility screening guidelines for capture and use, which initially screens to see if the 7-month wet season irrigation demand (ETWU_{7-month}) is more than the LID design volume or SWQDv. Once this threshold is met, a final determination is made by assessing the estimated daily average water usage during the wet season, to ensure that there is enough irrigation demand from the project

¹ County of Los Angeles Department of Public Works. (2004, February). Analysis of 85th Percentile 24-hour Rainfall Depth Analysis within the County of Los Angeles (February 2004). Retrieved September 30, 2019, from <http://ladpw.org/wrd/hydrologygis/>

site during the rainy season to effectively utilize and draw down the SWQDv during a 72-hour period.²

Based on the initial screening method, storage and reuse of stormwater runoff is considered potentially feasible since the $SWQDv \leq ETWU_{7\text{-month}}$. See calculations below.

Given for Proposed Project:

Impervious Area	1.65 acres
Pervious Area	0.32 acres
Total Tributary Area	1.97 acres
Total Site Irrigated Area	13,939 ft ²
ET _o Wet Season (Oct-April)	21.7 (Los Angeles area) ³ = ET ₇
Planting Factor (PF)	0.5 = Medium Planting Type, moderate water use.

Step 1: Calculate the Design Volume in Gallons (for 72-hour holding time)

$$SWQDv = 7,786 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = 58,239 \text{ gallons}$$

Step 2: Determine Planter Factor

$$\begin{aligned} \text{Planter Factor (PF)} &= \text{Planting Factor} \times \text{Irrigated Area} \\ &= 0.5 \times 13,939 \text{ ft}^2 \\ &= 6,970 \text{ ft}^2 \end{aligned}$$

Step 3: Determine the 7-Month (Oct 1 – April 30) Estimated Total Water Use (ETWU)

$$\begin{aligned} \text{Wet Season Estimated Total Water Use (ETWU}_{7\text{-month}}) &= ET_7 \times 0.62 \times PF \\ &= 21.7 \times 0.62 \times 6,970 \text{ ft}^2 \\ &= 93,774 \text{ gallons} \end{aligned}$$

Step 4: Determine if Captured Volume is Equal or Less Than Irrigation Demand (ETWU)

Is $SWQDv \leq ETWU_{7\text{-month}}$?

Yes – Demand ($ETWU_{7\text{-month}}$) is greater than SWQDv. Storage and reuse is potentially feasible.

STORAGE & REUSE FEASIBILITY SCREENING SUMMARY					
Project Acreage	Irrigated Area	SWQDv	Plant Factor (PF)	7-Month ETWU	Meets Initial Screening Criteria?
1.97	13,939 ft ²	58,239 gal.	6,970 ft ²	93,774 gal.	Yes

² City of Los Angeles Department of Public Works, Watershed Protection Division. (2011, June). Development Best Management Practices Handbook Low Impact Development Manual Part B Planning Activities. 4th Edition.

³ Reference Evapotranspiration (ET_o) Table from City of Los Angeles Irrigation Guidelines (Local Implementation of AB 1881).

Despite the feasibility screening resulted in stormwater storage and reuse being potentially feasible, it is necessary to determine that the Stormwater Quality Design Volume can be adequately drawn down within 72 hours in order for it to be implemented on the project. This is determined by estimating the daily average water demand during the wet season. Since the $ETWU_{7\text{-month}}$ is approximately 93,774 gallons, the average daily water demand is roughly 410 gallons per day (229 days). Over a 72 hour period, it appears that the daily average water usage during the wet season is insufficient to utilize and draw down the onsite SWQDv, since the total water demand is 820 gallons, assuming that the first 24 hours after a rain event there is no water demand. Only 1.4% of the onsite SWQDv (820 gallons of 58,239 gallons) would be used for irrigation of the landscaped area within the project site over a 72-hour period, with approximately 57,419 gallons remaining in storage and unutilized. A significant amount of runoff treatment would be bypassed should a subsequent storm event follow shortly after the first. Therefore, stormwater runoff storage and reuse is considered not feasible.

BIOFILTRATION

Due to the infeasibility of the project site for retention, the project site will be treated by biofiltration, with two Filterra (8x18 and 8x14) proprietary BMPs. The entire 1.97-acre property will be treated by the Filterra unit and, therefore, the project site has one Drainage Area.

The table below provides the retention and biofiltration (1.5x) volumes and flow-rates for the project site under proposed conditions. BMPs selected for the project must be sized to provide the equivalent or greater treatment capacities than the listed volumes/flow-rates below. Calculations were performed utilizing the hydrologic calculator "HydroCalc" developed by the Los Angeles County Department of Public Works. HydroCalc completes the full Modified Rational Method (MODRAT) calculation process and produces the peak stormwater runoff flow rates and volumes for single subareas. Detailed calculations for the proposed treatment control BMPs, based on the HydroCalc tool, are provided in Appendix 1 of this report.

STORMWATER QUALITY DESIGN CALCULATIONS

Since stormwater retention is infeasible at the project site due to measured infiltration rates being less than 0.3 inches/hour, the project will rely on biofiltration to treat the LID volume. As such, the LID volume/rate to biofilter will be expressed as 1.5 times what would otherwise be retained. The Hydrocalc calculations for the proposed Tract No. 82945 project site is summarized below.

SUMMARY OF STORMWATER QUALITY DESIGN CALCULATIONS									
Drainage Area	Acres	Imp. Ratio	Soil No.	Slope Length (ft)	Slope	Tc (min)	Storm Depth 1.5x (in.)	1.5x LID SWQDv (ft ³)	1.5x LID flow rate (cfs)
1	1.97	0.77	013	490	0.005	23	1.425	7,786	0.630

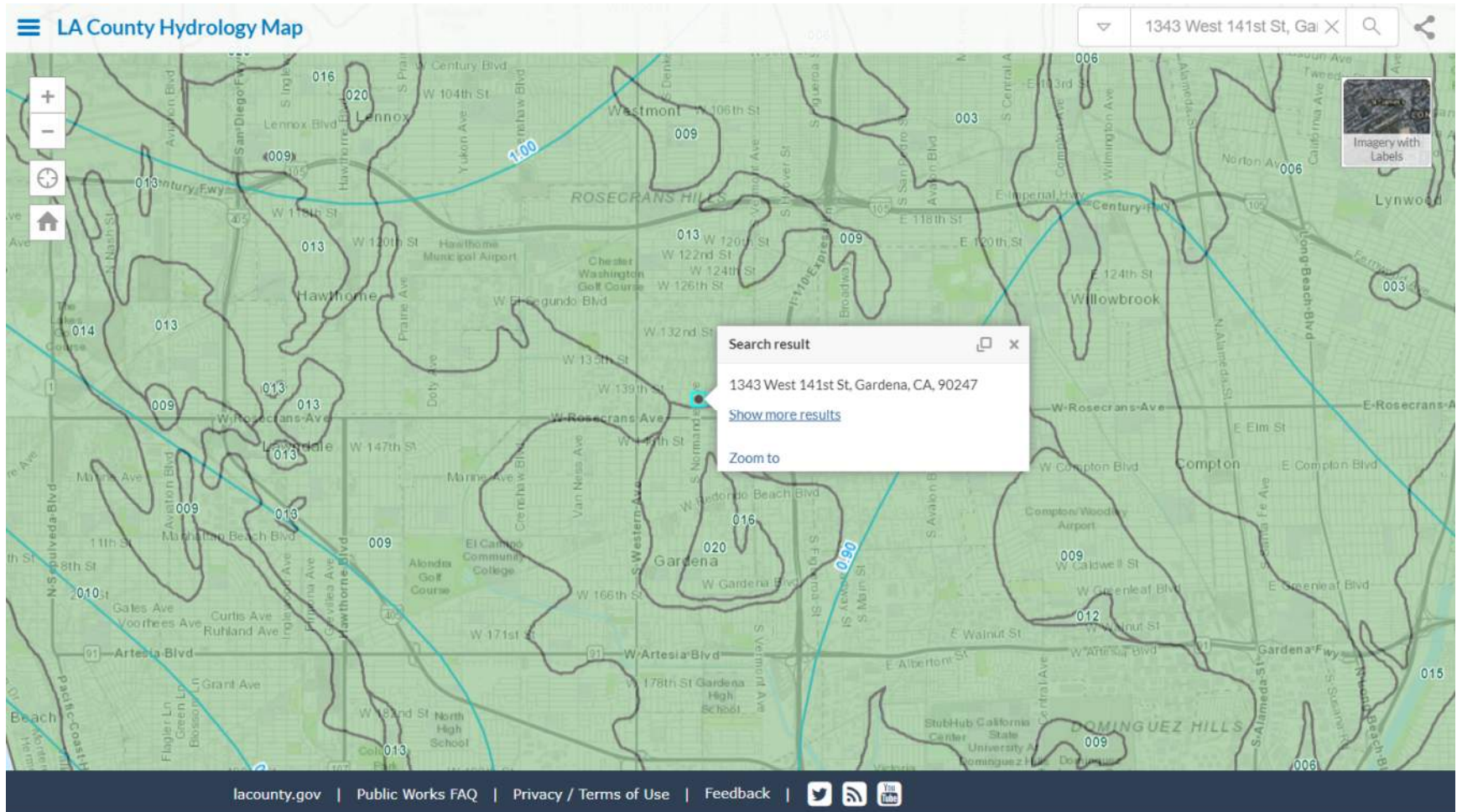


Figure 2 Project Site Predominant Soil Type Number = 013 | 85th Percentile, 24-hr Rainfall = 0.95 inch (<http://dpw.lacounty.gov/wrd/hydrologygis/>)

DESIGN STANDARDS FOR STORMWATER QUALITY CONTROL MEASURES/LID BMPS

In order to be consistent with Los Angeles Regional Water Quality Control Board approval of Filterra Bioretention System on October 9, 2017 as an alternative biofiltration specification from Attachment H of the MS4 Permit, Filterra must be designed and sized using the methodology in Section 4 of the August 2015 report prepared by Geosyntec Consultants, entitled "Filterra Equivalency Analysis and Design Criteria". The Contech Filterra Sizing Sheet utilizing this methodology is presented below. Based on the sizing sheet the project will require an 8x16 and an 8x14 Filterra to mitigate the project's LID volume.

STORMWATER QUALITY CONTROL MEASURES/LID BMP SIZING

LID BMPs are sized based on the tributary area draining to them. Based on the project site's grading and drainage design, the property is comprised of one drainage area that covers the entire 1.97-acre site. Therefore, the drainage area's LID flow rate is equivalent to the project's design flow rate of 0.71 cfs (see Filterra Sizing Sheet). For this reason, two Filterra units with a treatment flow rate capacity of 0.77 cfs is prescribed. See Section III LID Schematic Exhibit and Filterra Offline – Pipe (FT-P) standard detail below for further details.



Filterra Sizing Tool

Applicable in the Area Governed by the Los Angeles County MS4 Permit
(NPDES PERMIT NO. CAS004001; ORDER NO. R4-2012-0175)

For final design please contact:

Alexandra Dubrock - Stormwater Consultant
adubrock@conteches.com
 Phone: 949-217-4663

Contact Information	Project Information
Engineer of Record Name	Project Name
Engineer of Record Company Name	Project Location
Engineer of Record Office Zip Code	Catchment Name

Drainage Area Inputs		
Drainage Area	85813	ft ²
Runoff coefficient	0.77	-
Time of concentration	23	min
Long term reliable infiltration rate	0.00	in/hr
85th percentile, 24-hour depth (see hyperlink below)	1.43	in

Filterra Configuration (Select from Drop-Down)	
Refer to "Filterra Configurations" tab for descriptions and detail drawings for download.	Offline

Constants		
LAX Airport 85th Percentile, 24-hour depth (for reference only)	1.02	in
Filterra hydraulic loading capacity	1.45	gpm/ft ²

Outputs		
Stormwater Quality Design Volume	7,847	ft ³
Design Rainfall Intensity for Equivalent Long Term Capture	0.332	in/hr
Site Scaling Factor	1.40	-
Stormwater Quality Design Flow Rate	0.71	cfs
Design Alternatives Available	Stand Alone Filterra Permitted	

Design Recommendations		
<i>Primary Recommendation - Stand Alone Filterra</i>		
Adjusted Filterra Design Intensity	0.361	in/hr
Stormwater Quality Design Flow Rate	0.77	cfs
Required Filterra Area	239	ft ²
Filterra Model ID	See Note	

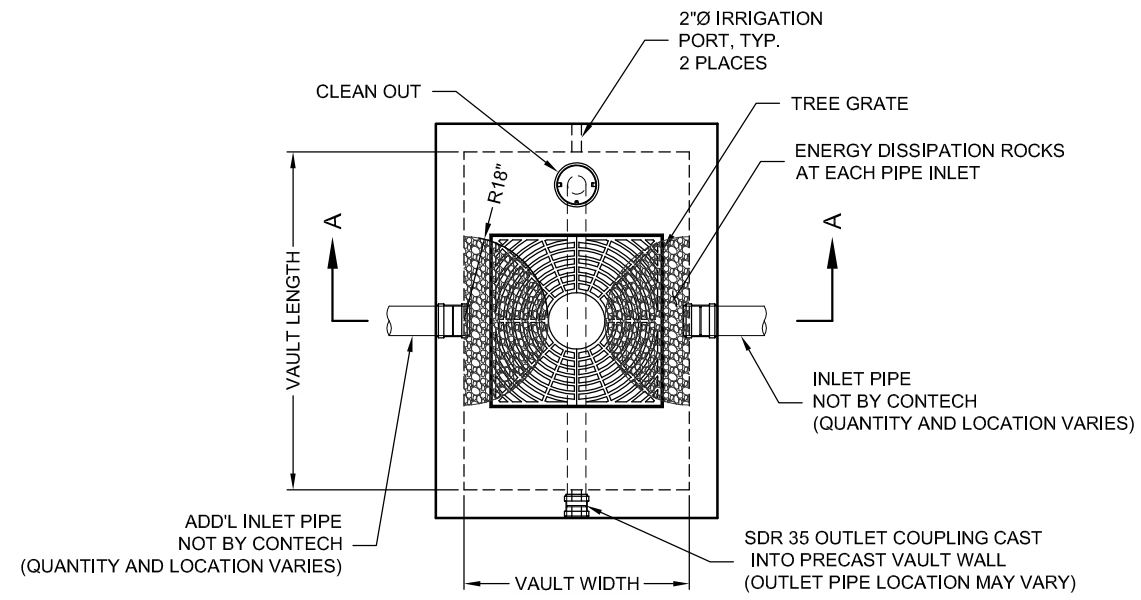
An 8x16 and an 8x14 Filterra, working in parallel, is sufficient to meet the required Filterra area.

Alternative Recommendation - Filterra + Infiltration Storage		
Required Filterra Area	220	ft ²
Filterra Model ID	See Note	
ChamberMaxx volume	0	ft ³
ChamberMaxx count	0	chambers

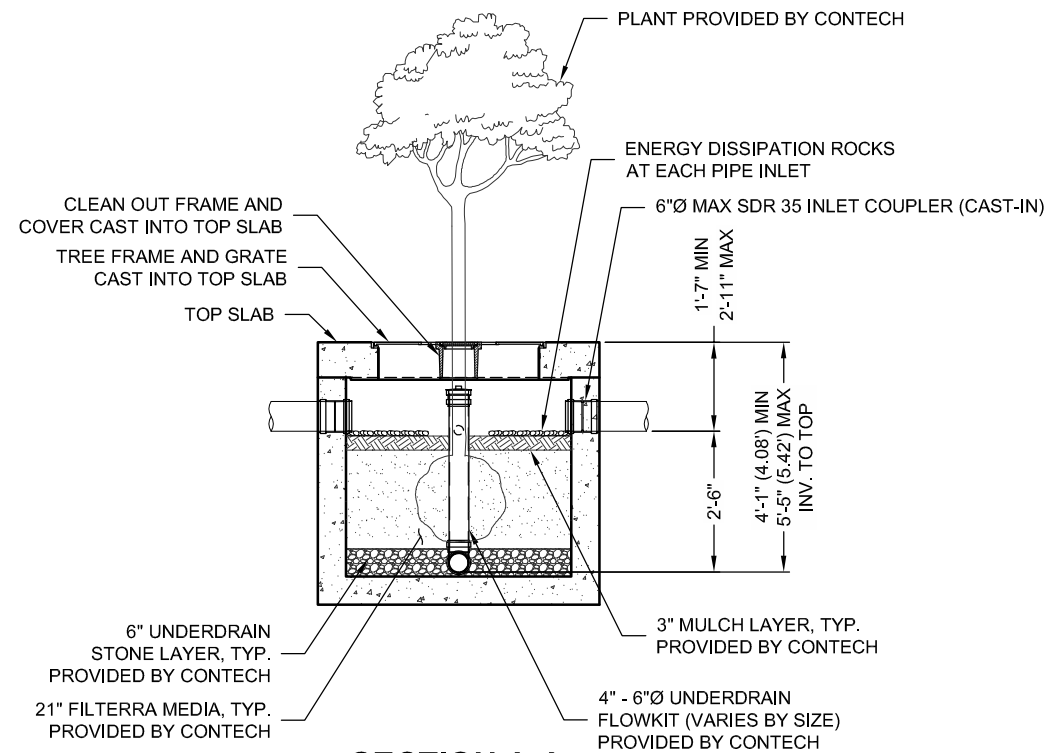
Note: Drainage area is too large for single Filterra system. Consider a different Filterra configuration, utilizing multiple structures, or utilizing Filterra Bioscape. Contact Contech for more info.

- To be consistent with approval of the Filterra Bioretention System as an alternative biofiltration specification granted by the Los Angeles Regional Water Quality Control Board on October 9, 2017, Filterra use is subject to the following conditions:
1. Filterra systems must be designed and sized following the methodology in Section 4 of the August 2015 report prepared by Geosyntec Consultants, entitled "Filterra Equivalency Analysis and Design Criteria" which is the basis for this design tool.
 2. Filterra systems use an engineered biofiltration media. Filterra systems, including the engineered biofiltration media, must be provided by the manufacturer. No substitution of materials/media is allowed.
 3. Filterra is only applicable as an alternative on-site biofiltration design in situations where a project applicant has demonstrated that it is technically infeasible to retain 100 percent of the SWQDV on-site.
 4. Hydromodification requirements of Section VI.D.7.c.iv of the Los Angeles County MS4 Permit must be considered separately regardless of what type of biofiltration is used.
 5. Operation and maintenance of Filterra systems must be conducted consistent with the recommendations in the Filterra maintenance manual provided by Contech Engineered Solutions.
 6. In the area governed by the Los Angeles Region Phase I stormwater permit, conventional biofilters must be sized to treat 1.5X the SWQDV. This results in an average annual capture rate of 93%. Filterra systems sized using this tool will also treat at least 93% of the average annual runoff volume.

I:\COMMUNICATIONS\TREATMENT\54 FILTERRA\40 STANDARD DRAWINGS\FT-PIPE\PIPELAYOUT DETAILS\DWG\FILTERRA PIPE CONFIG DTL.DWG 11/1/2017 2:04 PM



PLAN VIEW



SECTION A-A

FT-P STANDARD OFFLINE CONFIGURATION						
DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE	TREE GRATE QTY & SIZE	MIN NO. OF INLET PIPES
FT0404-P	ALL	4 x 4	4 x 4	4" SDR 35	(1) 3' x 3'	1
FT0604-P	N/A CA	6 x 4	6 x 4	4" SDR 35	(1) 3' x 3'	1
FT0606-P	ALL	6 x 6	6 x 6	4" SDR 35	(1) 3' x 3'	1
FT06504-P	CA ONLY	6.5 x 4	6.5 x 4	4" SDR 35	(1) 3' x 3'	1
FT078045-P	MID-ATL ONLY	7.83 x 4.5	7.83 x 4.5	4" SDR 35	(1) 3' x 3'	1
FT0804-P	N/A MID-ATL	8 x 4	8 x 4	4" SDR 35	(1) 3' x 3'	1
FT0806-P	ALL	8 x 6	8 x 6	4" SDR 35	(1) 4' x 4'	1
FT1006-P	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'	2
FT1206-P	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'	2
FT1307-P	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'	2
FT1408-P	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'	3
FT1608-P	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'	3
FT1808-P	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'	3
FT2008-P	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'	4
FT2208-P	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'	4

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.



www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA OFFLINE - PIPE (FT-P)
CONFIGURATION DETAIL

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC or one of its affiliated companies ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use. If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

VII. HYDROLOGIC CONDITIONS OF CONCERN

There are no hydrologic conditions of concern for the project site. Although the project site drains to a Dominguez Channel via City MS4 where the channel is soft bottom, its estimated 100-year peak flow is greater than 25,000 cfs, which means it is not susceptible to hydromodification impacts. Therefore, the project site is considered exempt from hydromodification and will not be required to mitigate for 2-year pre- and post-development peak flow runoff changes. For drainage details, see Section II of this LID Plan.

VIII. STORMWATER QUALITY CONTROL MEASURE MAINTENANCE**RESPONSIBLE PARTY**

It has been determined that The Olson Company (owner) shall assume all BMP inspection and maintenance responsibilities for the Tract No. 82945 Project until an HOA is established. An HOA will be established for the property and the Owner will transition to an HOA Corporation. The Owner will be responsible for maintenance of all storm drain inlets, collectors, v-ditches or any other related flood control or storm water control device. Furthermore, all interior streets and/or roadways, landscape, recreation areas, facilities and/or open space within the project limits will be maintained by the Owner.

Long-term funding for BMP maintenance will be provided by the Owner or HOA. Maintenance will be funded through HOA fees.

RESPONSIBLE PARTY CONTACT INFORMATION

Name: The Olson Company

Contact: Tom Moore, Senior Director of Operations

Address: 3010 Old Ranch Parkway, Suite 100
Seal Beach, CA 92740-2751

Phone: (562) 596-4770

Email:

MAINTENANCE PLAN

Proper O&M is an important element of a stormwater mitigation plan to ensure BMPs remove pollution effectively. Routine maintenance or service also contributes to the efficiency and continuous operation of a system. The post development BMP maintenance responsibility and frequency matrix provided in this section detail the specific party to perform the inspection and maintenance of each BMP for the Tentative Tract No. 82945 Project and details the maintenance and inspection activities to be performed, and the frequency with which each shall be performed.

Structural BMP Maintenance Responsibility / Frequency Matrix

BMP	Responsibility	Maintenance Frequency
Catch Basin Cleaning	Owner / HOA	Minimum Frequency: Catch basin/storm drain inlets within the project site will be cleaned out at least once per year, prior to the rainy season (October 1).
Storm Drain Stenciling	Owner / HOA	Minimum Frequency: Storm drain inlet stenciling and signage will be inspected for legibility at least once per year. Any illegible stencils/signage will be replaced immediately.
Filterras (FT1808-LSI and FT1408-LSI)	Owner / HOA	Minimum Frequency: 1x per Year. The Filterra unit shall be maintained in accordance with manufacturer's specifications provided in Appendix 3.

IX. APPENDICES

Appendix 1: Hydrocalc Calculations

Appendix 2: Geotechnical / Infiltration Report

Appendix 3: Filterra O&M Manual

Appendix 4: Source Control BMP Fact Sheets

Appendix 5: Public Education Materials

Appendix 6: Master Covenant and Agreement (Placeholder for Final LID Report)

APPENDIX 1
HYDROCALC CALCULATIONS

Peak Flow Hydrologic Analysis

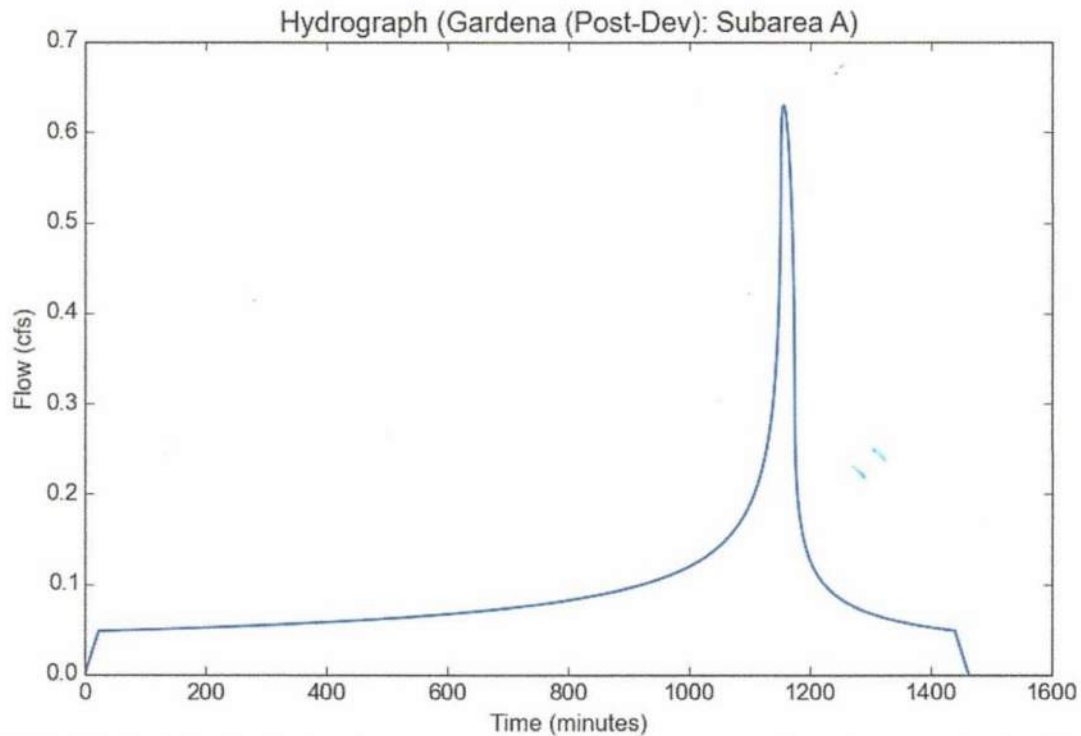
File location: C:/Users/Alan/Documents/Drainage/Projects (H&H)/2019-10-17 Gardena/Gardena (Post-Dev.) 85th Perc. Subarea A (Rev).pdf
Version: HydroCalc 1.0.3

Input Parameters

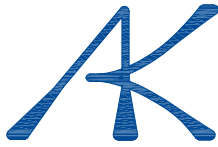
Project Name	Gardena (Post-Dev)
Subarea ID	Subarea A
Area (ac)	1.97
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.005
85th Percentile Rainfall Depth (in)	1.425 (0.95 x 1.5 = 1.425)
Percent Impervious	0.838
Soil Type	13
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.425
Peak Intensity (in/hr)	0.415
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.7704
Time of Concentration (min)	23.0
Clear Peak Flow Rate (cfs)	0.6298
Burned Peak Flow Rate (cfs)	0.6298
24-Hr Clear Runoff Volume (ac-ft)	0.1787
24-Hr Clear Runoff Volume (cu-ft)	7785.7917



APPENDIX 2
GEOTECHNICAL / INFILTRATION REPORT



November 14, 2019
J.N.: 2811.00

Ms. Doris Nguyen
The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, California 90740

Subject: Infiltration Study for Storm Water Quality, Proposed Multi-Family Residential Development, 1335, 1337, 1341, & 1343 West 141st Street, Gardena, California

Dear Ms. Nguyen,

Albus-Keefe & Associates, Inc. has completed a geotechnical investigation of the site for evaluation of the percolation characteristics of the site soils. The scope of this investigation consisted of the following:

- Exploratory drilling, soil sampling and percolation test well installation
- Field percolation testing
- Laboratory testing of selected soil samples
- Engineering analysis of the data
- Preparation of this report

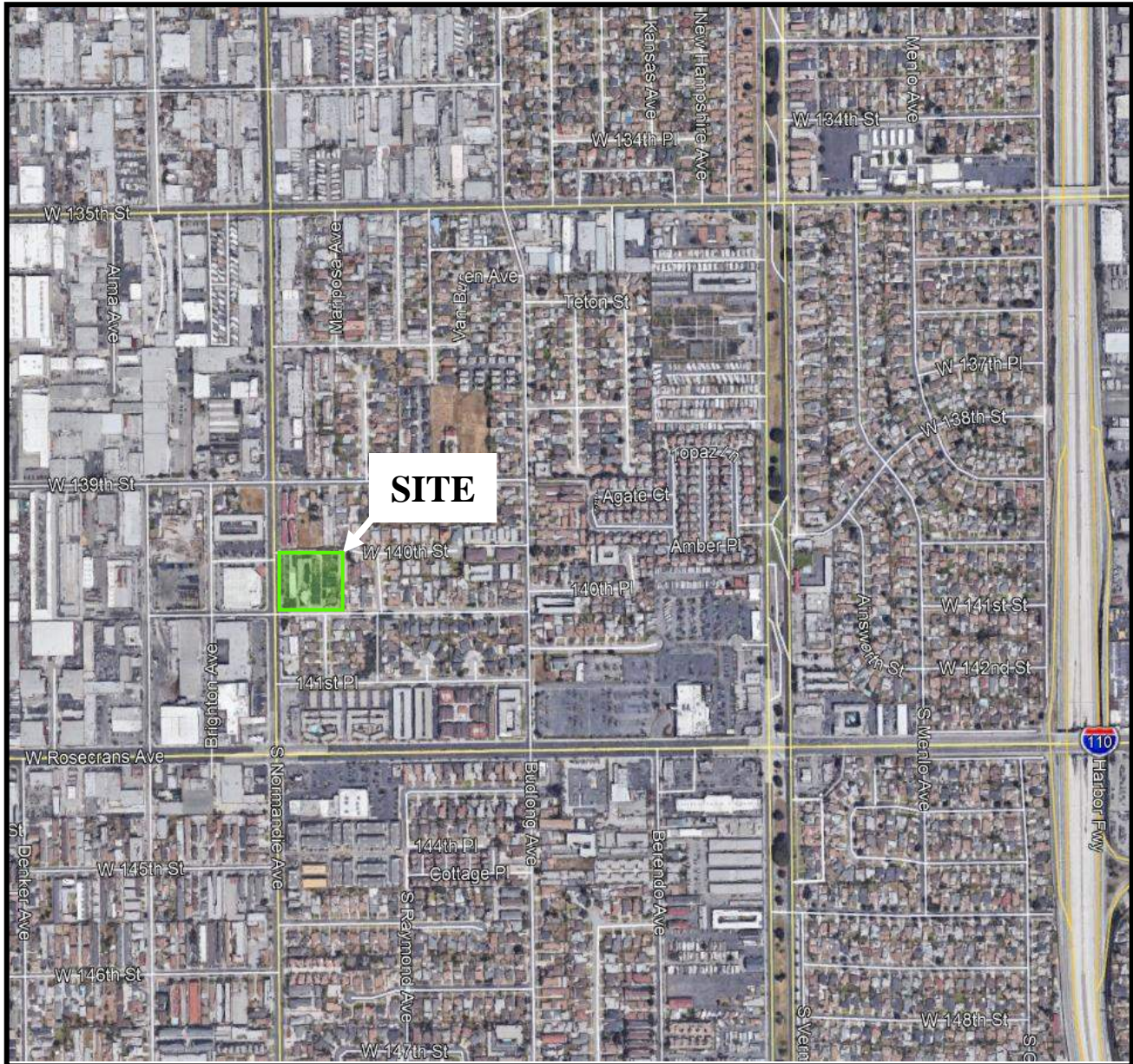
SITE DESCRIPTION AND PROPOSED DEVELOPMENT

Site Location and Description

The site is located at 1335, 1337, 1341, & 1343 West 141st Street in the city of Gardena, California. The site is bordered by residential developments to the north and east, West 141st Street to the south, and South Normandie Avenue to the west. The location of the site and its relationship to the surrounding areas is shown on the Site Location Map, Figure 1.

The site is rectangular in shape and comprises approximately 2.04 acres of land. The site is currently occupied by a plant nursery with several greenhouse structures throughout the site. Two single-story residential buildings are also located at the southern portion of the site. A base covered interior street is adjacent to the north property line and then runs north to south. Two concrete driveways along the south property line were observed to be in good condition.

A wooden fence bounds the property along the north and east property line. The site is relatively level and the elevation ranges from 46 to 47 feet above mean sea level (MSL). Drainage within the site is generally directed to the west and south toward West 141st Street and South Normandie Avenue. Vegetation within the nursery area of the site is sparse and only includes a few medium sized-trees and medium to large-sized shrubs.



© 2019 Google



SITE LOCATION MAP

The Olson Company
Proposed Residential Development
1335, 1337, 1341, & 1343 West 141st Street
Gardena, California

NOT TO SCALE

FIGURE 1

Proposed Development

We understand that the site will be redeveloped for multi-family residential use. We anticipate the proposed site development will consist of three-story townhomes, associated interior driveways, perimeter/retaining walls, underground utilities, and a storm water infiltration system.

No grading or structural plans were available in preparing of this report. However, we anticipate that minor rough grading of the site will be required to achieve future surface configuration and we expect the proposed residential dwellings will be wood-framed structures with concrete slabs on grade yielding relatively light foundation loads.

SUMMARY OF FIELD AND LABORATORY WORK

Subsurface Investigation

Subsurface exploration for this investigation was conducted at the site on May 6, 2019, and consisted of drilling four (4) exploratory borings. The borings were drilled to maximum depths of approximately 51.5 feet below the existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. Representatives of *Albus-Keefe & Associates, Inc.* logged the exploratory excavations. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory boring for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. The borings were backfilled with auger cuttings upon completion of sampling.

In addition, one percolation test boring, P-1, was also excavated to an approximate depth of 20 feet in the vicinity of exploratory boring B-1 for subsequent percolation testing. The percolation test well was later backfilled with auger cuttings upon completion of testing.

Percolation Testing

Percolation testing was performed on May 6, 2019, in general conformance with the constant-head test procedures outlined in the referenced Well Permeameter Method (USBR 7300-89). A water hose attached to a water source on site was connected to an inline flowmeter to measure the water flow. The flowmeter is capable of measuring flow rates up to 13 gallons per minute and as low as 0.06 gallons per minute. A valve was connected in line with the flowmeter to control the flow rate. A filling hose was used to connect the flowmeter and the test well. Water was then introduced by

the filling hose near the bottom of the test well. A water level meter with 1/100-foot divisions was used to measure the depths to water surface from the top of well casings.

Flow to the well was terminated upon either completion of testing of all the pre-determined water levels or if the flow rate exceeded the maximum capacity of the flowmeter. Measurements obtained during the percolation testing are provided on Appendix C, Plates C-1.

Laboratory Testing

Selected soil samples of representative earth materials were tested to assist in the formulation of conclusions and recommendations presented in this report. Tests consisted of in-situ moisture content and dry density, and grain-size analysis. Results of laboratory testing relevant to percolation characteristics are presented in the Appendix B.

ANALYSIS OF DATA

Subsurface Conditions

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soils encountered at the site consist of artificial fill materials overlying alluvial deposits. The artificial fill materials typically consist of brown silty sand and sandy clay. The artificial fill was typically slightly moist and dense / very stiff to hard. The maximum thickness of the fill encountered from approximately 2 feet below existing grades.

The alluvial deposits were encountered below the artificial fill materials to the maximum depth of exploration, 51.5 feet below the ground surface. The alluvial deposits consisted of interlayered coarse-grained and fine-grained material. The coarse-grained material was typically brown sand with varying amounts of fines. These deposits are slightly moist to very moist and medium dense to very dense. The fine-grained material consisted of brown clay and silt. These deposits are typically slightly moist to moist and hard to very stiff.

Groundwater

Groundwater was observed at 30 feet during this firm's subsurface investigation. A review of the CDMG Seismic Hazard Zone Report 027 indicates that historical high groundwater levels for the general site area is as shallow as 30 feet below the existing ground surface.

Percolation Data

An analysis was performed to evaluate permeability using the flow rate obtained at the end of the constant-head stage of field percolation testing. The analysis was performed in accordance with the procedures provided in the referenced USBR 7300-89. The procedure essentially uses a closed-form solution to the percolation out of a small-diameter well. Using this method, we calculated a composite permeability value for the head condition maintained in each well. Since the flow to the well was less than the lower limit of our equipment, the minimum flow rate of the equipment was

used. The result is summarized in Table 1 below and the supporting analysis is included in Appendix C, Plates C-2.

TABLE 1
Summary of Back-Calculated Permeability Coefficient

Location	Total Depth of Well (ft)	Depth to Water in Well (ft)	Height of Water in Well (ft)	Static Flow Rate (gal./min.)	Estimated Permeability, ks (in/hr.)
P-1	20.0	15.0	5.0	< 0.06	< 0.09

CONCLUSIONS AND RECOMMENDATIONS

Based on our observations in the field, we anticipate that the infiltration at the site would be too low to meet the minimum requirements set by the Los Angeles County Regional Water Quality Board. The fine-grained nature of the subsurface soils which have impeded infiltration was observed in all of the exploratory borings. Infiltration of storm water through the use of a shallow chamber system or dry well at the site is deemed unfeasible. Therefore, treatment of storm water will require the use of other methods such as biofiltration.

LIMITATIONS

This report is based on the geotechnical data as described herein. The materials encountered in our boring excavations and utilized in our laboratory testing for this investigation are believed representative of the project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil and bedrock materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observations by a geotechnical consultant during the construction phase of the storm water infiltration systems are essential to confirming the basis of this report.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **The Olson Company** to assist the project consultants in the design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.



Mark Principe
Staff Engineer



Paul Hyun Jin Kim
Associate Engineer
P.E. 77214



Enclosures: Plate 1- Geotechnical Map
Appendix A - Exploratory Logs
Appendix B – Relevant Soil Laboratory Testing
Appendix C - Percolation Testing and Analyses

REFERENCES

Publications and Reports

California Department of Conservation, Division of Mines and Geology, Seismic Hazard Report 027, "Seismic Hazard Zone Report for the El Monte 7.5-Minute Quadrangles, Los Angeles County, California", 1998.



"Procedure for Performing Field Permeability Testing by the Well Permeameter Method", United States Department of The Interior, Bureau of Reclamation (USBR 7300-89).

Saxton, K.E., W.J. Rawls, J.S. Romberger, and R.I. Papendick. 1986, "Estimating generalized soil-water characteristics from texture", Soil Sci. Soc. Am. J. 50(4):1031-103



EXPLANATION

(Locations Approximate)

-  - Exploratory Boring
-  - Exploratory Percolation Test Boring



GEOTECHNICAL MAP

APPENDIX A
EXPLORATORY LOGS

EXPLORATION LOG

Project:		Location:	
Address:		Elevation:	
Job Number:	Client:	Date:	
Drill Method:	Driving Weight:	Logged By:	

Depth (feet)	Lithology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		<u>EXPLANATION</u>							
		Solid lines separate geologic units and/or material types.							
5		Dashed lines indicate unknown depth of geologic unit change or material type change.							
		Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).			■				
		Double triangle in core column represents SPT sampler.			▲▼				
10		Vertical Lines in core column represents Shelby sampler.			▤				
		Solid black rectangle in Bulk column represents large bag sample.				■			
15		<u>Other Laboratory Tests:</u> Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content DSR = Direct Shear, Remolded DS = Direct Shear, Undisturbed SA = Sieve Analysis (1" through #200 sieve) Hydro = Particle Size Analysis (SA with Hydrometer) 200 = Percent Passing #200 Sieve Consol = Consolidation SE = Sand Equivalent Rval = R-Value ATT = Atterberg Limits							
20									

EXPLORATION LOG

Project: Olson - Gardena		Location: B-1
Address: 1343 W 141st St, Gardena, CA 90247		Elevation: 52.9
Job Number: 2810.00	Client: The Olson Company	Date: 5/6/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SD



Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests			
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		ARTIFICIAL FILL (Af) <u>Silty Sand (SM)</u> : Dark reddish brown, slightly moist, dense, fine to medium grained sand							DS
5		ALLUVIUM (Qal) <u>Sandy Clay (CL)</u> : Mottled reddish brown and dark brown, slightly moist, hard, fine to medium grained sand, pockets of fine to medium grained sand, trace gravel, trace pores		62			14.4	116.3	
				63			14	117.9	
		<u>Silty Sand (SM)</u> : Light brown, moist, medium dense, fine to medium grained sand		36			11.5	115.9	Consol
		<u>Sandy Clay (CL)</u> : Brown, moist, very stiff, some pores, mica present, trace silt							
10		<u>Clayey Sand/ Sandy Clay (SC/CL)</u> : Brown, moist, dense/hard, fine to medium grained sand, trace pinhole pores, mica present		54			13	119.9	
		<u>Silty Sand (SM)</u> : Brown, slightly moist, dense, fine to coarse grained sand, mica present							
15				30					SA Hydro
		<u>Clayey Sand (CL)</u> : Reddish brown, moist, dense, fine to medium grained sand, mica present, some silt, increased sand toward sampler tip							
20				26					SA Hydro
		<u>Silty Sand (SM)</u> : Grayish brown, moist, dense, fine grained sand							

EXPLORATION LOG

Project: Olson - Gardena		Location: B-1
Address: 1343 W 141st St, Gardena, CA 90247		Elevation: 52.9
Job Number: 2810.00	Client: The Olson Company	Date: 5/6/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SD

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30	[Dotted Pattern]	<u>Sand (SP)</u> : Yellowish brown, moist to very moist, dense, fine to medium grained sand, iron oxide	▽	31	▲			
	[Diagonal Lines]	<u>Lean Clay (CL)</u> : Reddish brown, moist, hard, mica present, iron oxide		25	▲			ATT
	[Diagonal Lines]	<u>Sandy Clay (CL)</u> : Reddish brown, moist, hard, fine grained sand, mica present, iron oxide, some silt						
35	[Diagonal Lines]			21	▲			
	[Diagonal Lines]	<u>Clay with Sand (CL)</u> : Grayish brown, moist, hard, fine to medium grained sand, mica present						
40	[Dotted Pattern]			30	▲			
	[Dotted Pattern]	<u>Sand with Silt (SP-SM)</u> : Grayish brown, moist, very dense, fine to medium grained sand, mica present, some silt						
45	[Dotted Pattern]			69	▲			
	[Diagonal Lines]	<u>Lean Clay (CL)</u> : Dark brown, moist, hard, fine to medium grained sand, mica present						

EXPLORATION LOG

Project: Olson - Gardena				Location: B-1					
Address: 1343 W 141st St, Gardena, CA 90247				Elevation: 52.9					
Job Number: 2810.00		Client: The Olson Company		Date: 5/6/2019					
Drill Method: Hollow-Stem Auger		Driving Weight: 140 lbs / 30 in		Logged By: SD					
Depth (feet)	Lith- ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
				27					ATT
		End of boring at depth of 51.5. Groundwater observed at depth of 30 ft. Backfilled with soil cuttings.							

EXPLORATION LOG

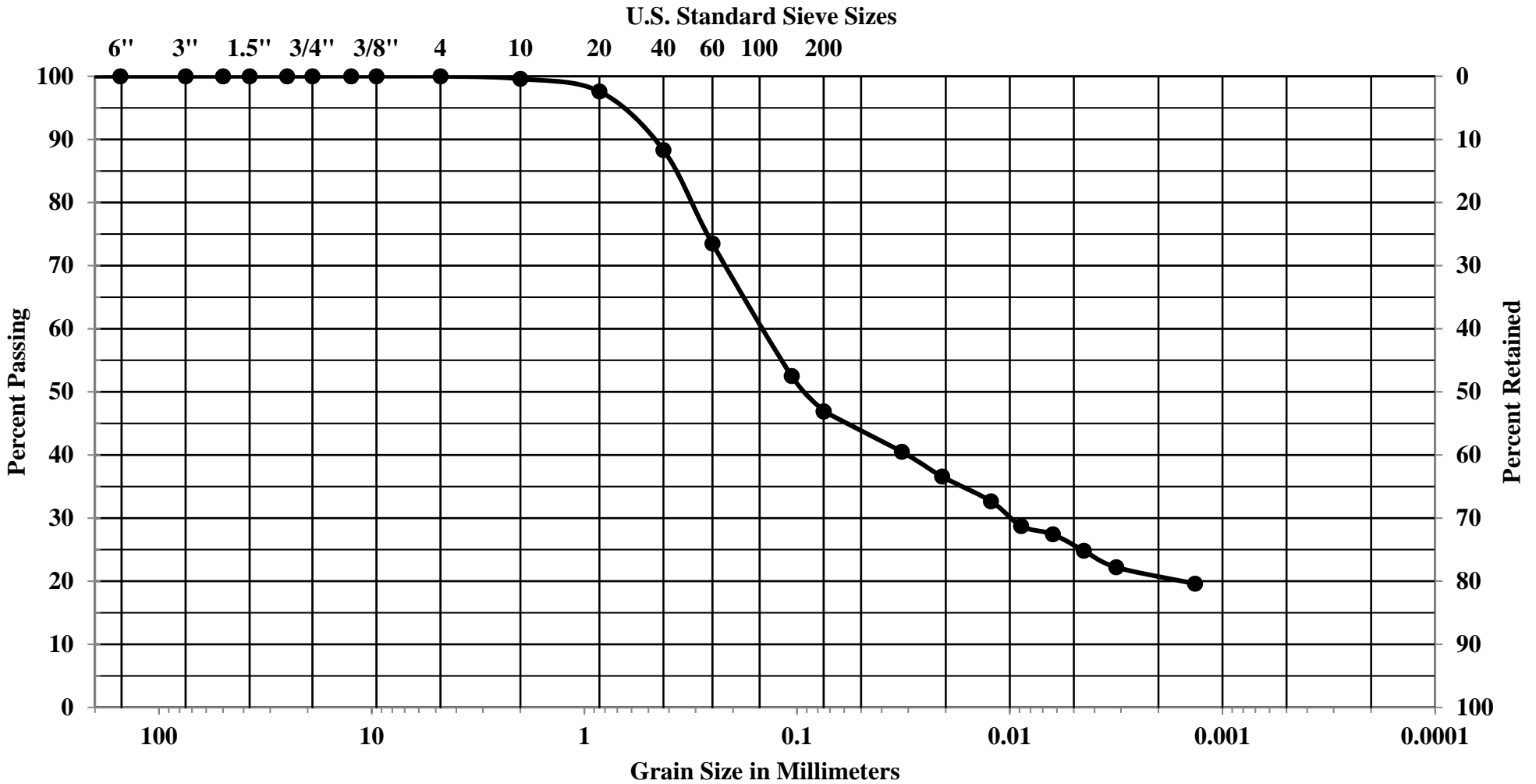
Project: Olson - Gardena		Location: B-2	
Address: 1343 W 141st St, Gardena, CA 90247		Elevation: 53.5	
Job Number: 2810.00	Client: The Olson Company	Date: 5/6/2019	
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SD	

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)
	[Diagonal Hatching]	ARTIFICIAL FILL (Af) <u>Sandy Clay (CL)</u> : Reddish dark brown, slightly moist, hard, fine to medium grained sand						
5	[Diagonal Hatching]	ALLUVIUM (Qal) <u>Sandy Clay (CL)</u> : Reddish brown, slightly moist, hard, fine to medium grained sand, mica present @ 4 ft, increased sand		50	[Core]		15.1	105.7
				56	[Core]		13.9	117.6
				47	[Core]		19.3	111.1
10	[Diagonal Hatching]	@ 10 ft, increased sand, decreased clay, some silt		42	[Core]		19.5	110.8
15	[Vertical Dotted]	<u>Silty Sand (SM)</u> : Reddish brown, moist, dense, with clay @ 15.5 ft, yellowish brown, increased silt		31	[Core]			
20	[Vertical Striped]	<u>Silt (ML)</u> : Light brown, moist, very stiff, mica present, iron oxide						
	[Diagonal Hatching]	<u>Sandy Clay (CL)</u> : Light brown, moist, very stiff, iron oxide		20	[Core]			
	[Vertical Dotted]	<u>Sand (SP)</u> : Light brown, moist, medium dense, fine to medium grained sand						
		End of boring at depth of 21.5 ft. No groundwater encountered. backfilled with soil cuttings.						

APPENDIX B
LABORATORY TESTING

GRAIN SIZE DISTRIBUTION

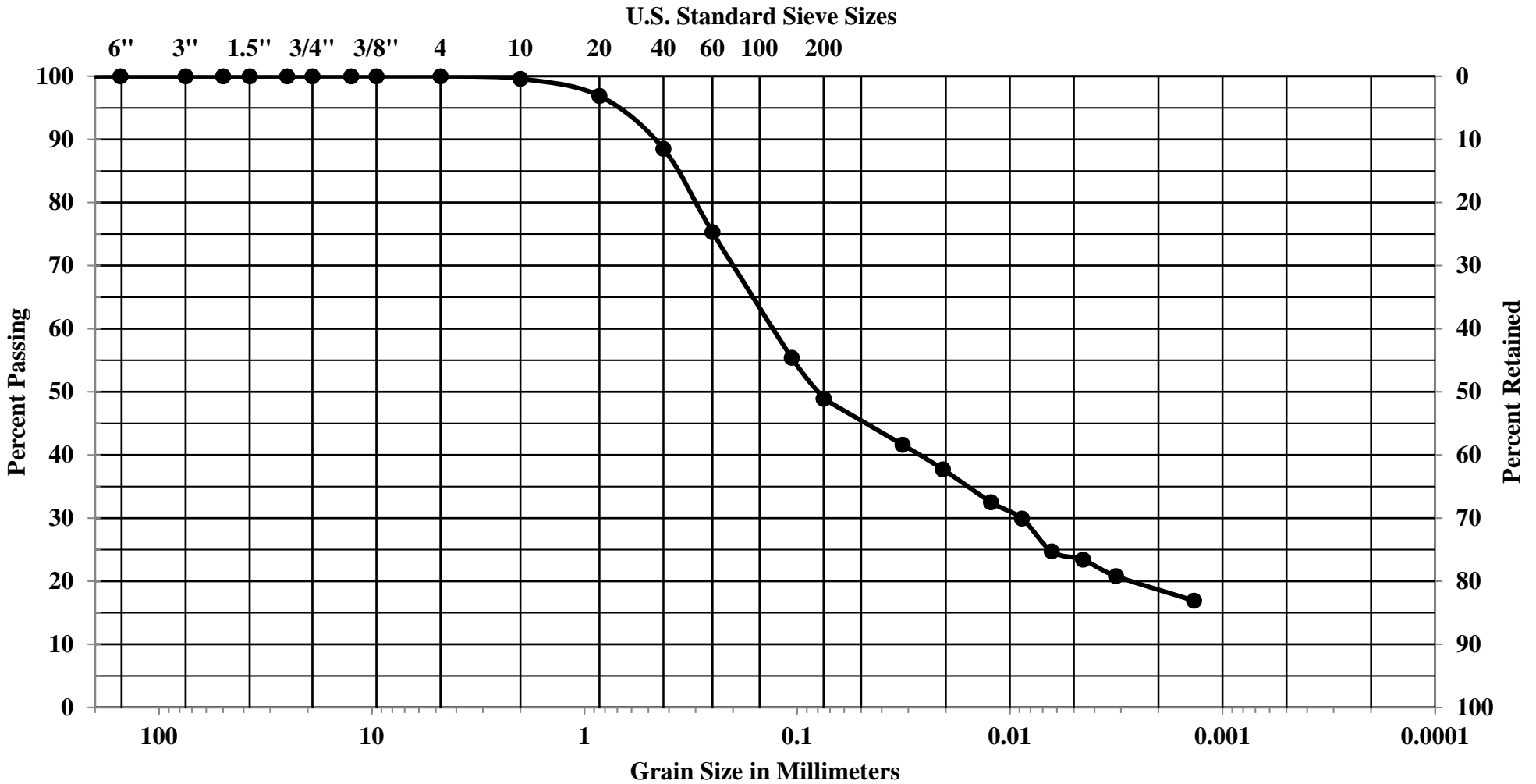
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Job Number	Location	Depth	Description
2810.00	B-1	15	Silty Sand (SM)

GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Job Number	Location	Depth	Description
2810.00	B-1	20	Clayey Sand (SC)

APPENDIX C
PERCOLATION TESTING AND ANALYSES

Field Percolation Testing - Constant Head

Client: Olson
 Date Tested: 5/6/2019
 Location: P-1

Job. No.: 2810.00
 Test by: MP

Top of Casing to Bottom of Well (ft): 20
 Elev. of Ground Surface (ft): 52.9
 Diam. of Test Hole (in): 8
 Diam. of Casing (in): 4
 Ht. to Top of Casing (ft): 0
 Water Temperature (C°): 21

Constant Head

Elapsed Time (minutes)	Time	Depth to H ₂ O (ft)	Flow Rate (gal./min.)	Total H ₂ O used (gal)
0	11:00	15	< 0.06	0.00
0	11:30	15	< 0.06	0.00

INFILTRATION WELL DESIGN

Constant Head

USBR 7300-89 Method

J.N.: 2810.00

Client: Gardena

Well No.: P-1

Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	1	
Ground Surface to Bottom of Well (h_1):	20	feet
Depth to Water (h_2):	15	feet
Height of Water in the Well ($h_1-h_2=h$):	5	feet
Radius of Well (r):	4.0	Inches
Minimum Volume Required:	1473.4	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (q):	< 0.06	Gal/min.
Temperature (T):	21	Celsius
(Viscosity of Water @ Temp. T) / (Viscosity of water @ 20° C) (V):	0.9647	ft ³ /min.
Unsaturated Distance Between the Water Surface in the Well and the Water table (T_u):		Ignore T_u
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (k_{20}):	1.23E-04	ft/min.
Design k_{20}:	< 0.09	in./hr.

The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as **Condition I**, **Condition II**, **Condition III**.

Low Water Table-When the distance from the water surface in the test well to the ground water table, or to an impervious soil layer which is considered for test purposes to be equivalent to a water table, is greater than three times the depth of water in the well, classify as **Condition I**.

High Water Table-When the distance from the water surface in the test well to the ground water table or to an impervious layer is less than three times the depth of water in the well, a high water table condition exists. Use **Condition II** when the water table or impervious layer is below the well bottom. Use **Condition III** when the water table or impervious layer is above the well bottom.

APPENDIX 3
FILTERRA O&M MANUAL

Filterra Owner's Manual



filterra[®]
Bioretention Systems

C NTECH[®]
ENGINEERED SOLUTIONS



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Filtererra Plant Selection Overview	6
Warranty Overview	6
Routine Maintenance Guidelines.....	6
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Appendix 2 – Planting Requirements for Filtererra Systems.....	13

Enclosed

Local Area Filtererra Plant List



Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation **MUST** be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.



Minimum Requirements

The minimum requirements for Filterra Activation are as follows:

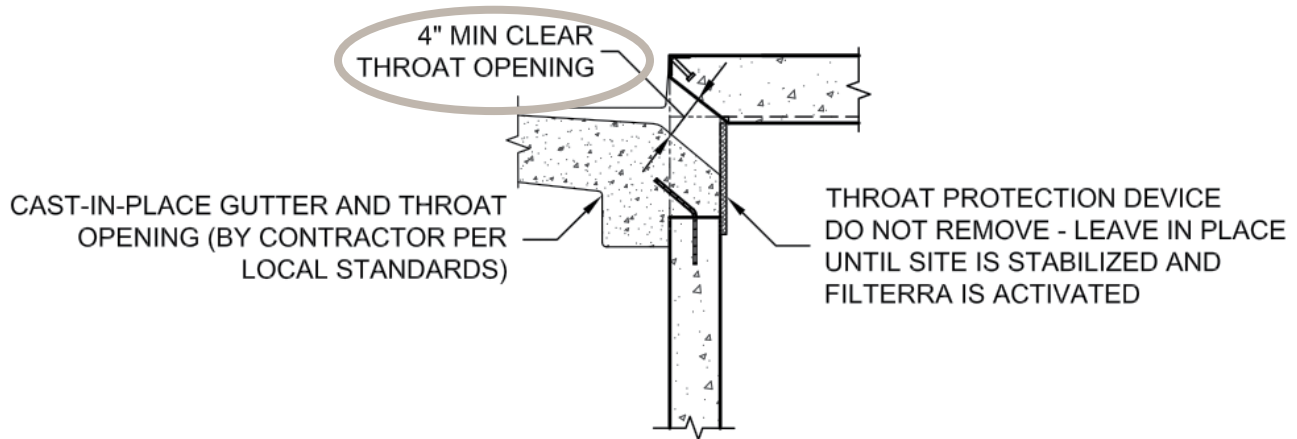
1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.



3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.



Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.



Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft ²)	Volume at 3" (ft ³)	# of 2 ft ³ Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes		no
Damage to Box Structure	yes		no
Damage to Grate	yes		no
Is Bypass Clear	yes		no

If yes answered to any of these observations, record with close-up photograph (numbered).



2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes		no
Cups/ Bags	yes		no
Leaves	yes		no
Buckets Removed	_____		



- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions



Record on Maintenance Report the following:

Height above Grate	_____	(ft)
Width at Widest Point	_____	(ft)
Health		healthy unhealthy
Damage to Plant		yes no
Plant Replaced		yes no



6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.

Filterra Inspection & Maintenance Log

Filterra System Size/Model: _____ Location: _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	5 – 5 gal Buckets	3"	Lowe's Premium Brown Mulch	4'	Galaxy Magnolia	- Standing water in downstream structure	- Removed blockage in downstream structure

Appendix 1 – Filterra® Activation Checklist



Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Attach additional sheets as necessary.

NOTE: A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

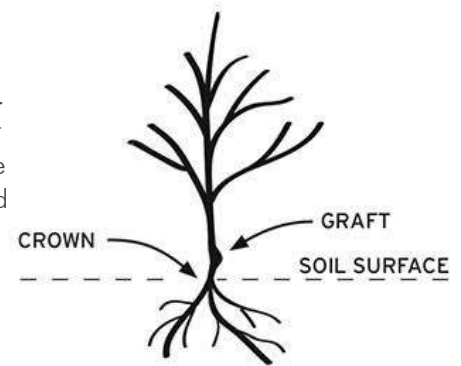
Signature _____

Date _____

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection

- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.



Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.





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APPENDIX 4
SOURCE CONTROL BMP FACT SHEETS

S-1: Storm Drain Message and Signage

Purpose

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

General Guidance

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

Design Specifications

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.
- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., “No Dumping – Drains to the Ocean”) are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

Maintenance Requirements

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner’s association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.

S-1: Storm Drain Message and Signage

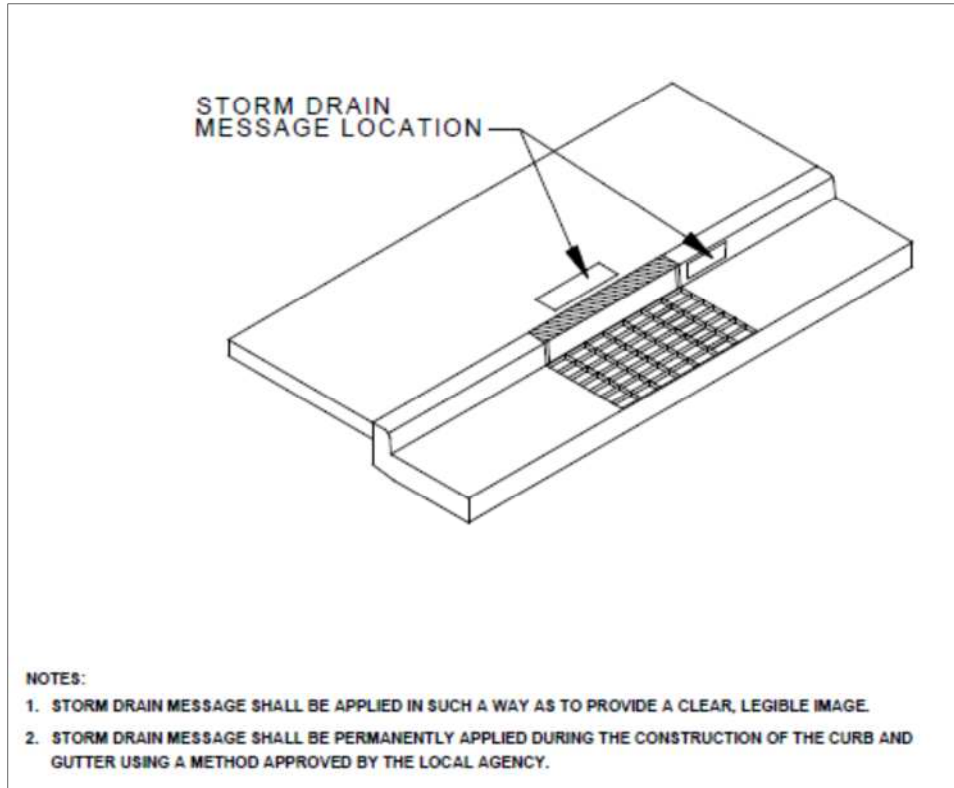


Figure D-1. Storm Drain Message Location – Curb Type Inlet

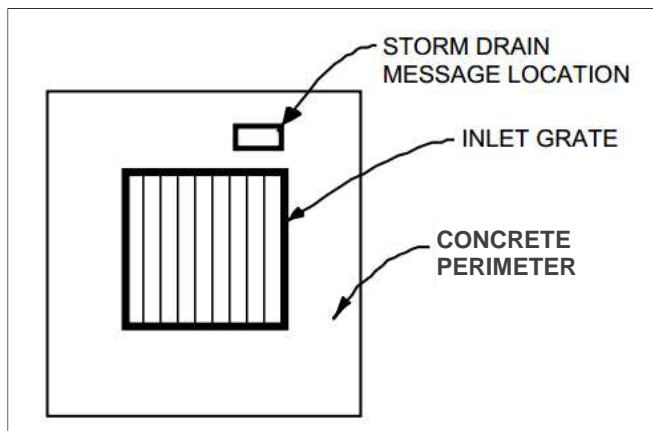


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet

S-8: Landscape Irrigation Practices

Purpose

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

General Guidance

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

Design Specifications

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.¹ The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

¹ If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.

S-8: Landscape Irrigation Practices

- For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.²
- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

Maintenance Requirements


Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

² As determined by the City of Los Angeles, Building and Safety Division

APPENDIX 5
PUBLIC EDUCATION MATERIALS

Storm Drains are for Rain...

More than 50% of the automotive oil sold to do-it-

yourself oil changers is not recycled. There are more than 600 State-certified used oil collection centers within Los Angeles County.

Never dispose of automotive fluids in the street or gutter. Take them to your local auto parts store, gas station or repair shop, or a household hazardous waste Roundup for recycling.

...not automotive fluids.



1 (888)CLEAN LA
www.888CleanLA.com

Car Care Tips:

You can keep your car running smoothly and efficiently, and at the same time help prevent stormwater pollution by taking these easy steps...


- When changing vehicle fluids — motor oil, transmission, brake and radiator fluids — drain them into separate drip pans to avoid spills. Do not combine these fluids. Do not dispose of these fluids in the street, gutter or garbage. It is illegal.
- If a spill occurs, use kitty litter, sawdust or cornmeal for cleanup. Do not hose or rinse with water.
- Regularly check and maintain your car to keep it running safely and efficiently. Water runoff from streets, parking lots and driveways picks up oil and grease drippings, asbestos from brake linings, zinc from tires and organic compounds and metals from spilled fuels and carries them to the ocean.
- Recycle all used vehicle fluids. Call 1(888)CLEAN LA or visit www.888CleanLA.com for the location of an auto parts store or gas station that recycles these fluids, or for the location of a local household hazardous waste Roundup.



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Car Care Tips:

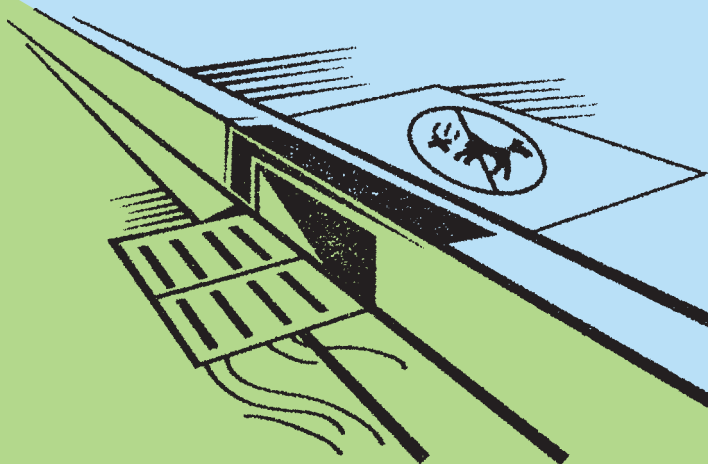
You can keep your car running smoothly and efficiently, and at the same time help prevent stormwater pollution by taking these easy steps...

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- Recycle all used vehicle fluids. Call 1(888)CLEAN LA or visit www.888CleanLA.com for the location of an auto parts store or gas station that recycles these fluids, or for the location of a local household hazardous waste Roundup.



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Pick Up After Your Pooch!



Storm drains are for rain...
they're not pooper scoopers.

L.A. County residents walk a dog without picking up the droppings more than **62,000** times per month.

Disease-causing dog waste washes from the ground and streets into storm drains and flows straight to the ocean — untreated.

Remember to bring a bag and clean up after your dog.

1 (888) CLEAN LA
www.888CleanLA.com

Tips for Dog Owners:

Dog owners can help solve the stormwater pollution problem by taking these easy steps...

- Clean up after your dog every single time.
- Take advantage of the complimentary waste bags offered in dispensers at local parks.
- Ensure you always have extra bags in your car so you are prepared when you travel with your dog.
- Carry extra bags when walking your dog and make them available to other pet owners who are without.
- Teach children how to properly clean up after a pet. Encourage them to throw the used bags in the nearest trash receptacle if they are away from home.
- Put a friendly message on the bulletin board at the local dog park to remind pet owners to clean up after their dogs.
- Tell friends and neighbors about the ill effects of animal waste on the environment. Encourage them to clean up after their pets as well.

PROJECT
Pollution
PREVENTION

A Yard is a Terrible Thing to Waste!

Storm drains are for rain...**not yard waste.**

Residential yard waste represents about **13 percent** of the total waste generated in L.A. County.

Pesticides, fertilizer and yard waste such as leaves and mowed grass wash from the ground and streets into storm drains and flow straight to the ocean — **untreated.**

Remember to use pesticides and fertilizer wisely and pick-up yard waste.



1 (888) CLEAN LA
www.888CleanLA.com

Tips For Yard Care:

L.A. County residents can help solve the stormwater pollution problem by taking these easy steps...

- Do not over-fertilize and do not use fertilizer or pesticides near ditches, gutters or storm drains.
- Do not use fertilizer or pesticides before a rain.
- Follow the directions on the label carefully.
- Use pesticides sparingly — more is not better. “Spot” apply, rather than “blanket” apply.
- When watering your lawn, use the least amount of water possible so it doesn't run into the street carrying pesticides and other chemicals with it.
- Use non-toxic products for your garden and lawn whenever possible.
- If you must store pesticides or fertilizer, make sure they are in a sealed, water-proof container in a covered area to prevent runoff.
- Do not blow, sweep, hose or rake leaves or other yard trimmings into the street, gutter or storm drain.



A message from the County of Los Angeles Department of Public Works.
Printed on recycled paper.

Don't Paint the Town Red!

Storm drains are for rain...
they're not for paint disposal.

More than **197,000** times each month, L.A. County residents wash their dirty paint brushes under an outdoor faucet.

This dirty rinse water flows into the street, down the storm drain and straight to the ocean — **untreated.**

Remember to clean water-based paint brushes in the sink, rinse oil-based paint brushes with paint thinner, and take old paint and paint-related products to a Household Hazardous Waste/E-Waste collection event.

1 (888) CLEAN LA
www.888CleanLA.com



Tips for Paint Clean-Up:

L.A. County residents can help solve the stormwater pollution problem by taking these easy steps when working with paint and paint-related products...

- Never dispose of paint or paint-related products in the gutters or storm drains. This is called illegal dumping. Take them to a Household Hazardous Waste/E-Waste collection event. Call 1 (888) CLEAN LA or visit www.888CleanLA.com to locate an event near you.
- Buy only what you need. Reuse leftover paint for touch-ups or donate it to a local graffiti abatement program. Recycle or use excess paint.
- Clean water-based paint brushes in the sink.
- Oil-based paints should be cleaned with paint thinner. Filter and reuse paint thinner. Set the used thinner aside in a closed jar to settle-out paint particles.
- Store paints and paint-related products in rigid, durable and watertight containers with tight-fitting covers.

PROJECT
Pollution
PREVENTION

A message from the County of Los Angeles Department of Public Works.
Printed on recycled paper.

Storm Drains are for Rain...

More than 200,000 times each month,



lawns and gardens throughout LA County are sprayed with pesticides. Overwatering or rain causes pesticides on leaves and grass to flow into the storm drain and to the ocean — untreated.

Please use pesticides wisely, not before a rain, and water carefully.

...not pesticides.



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www.888CleanLA.com

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Please use pesticides wisely, not before a rain, and water carefully.

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1(888)CLEAN LA
www.888CleanLA.com

Pesticide Tips:

You can keep your lawn and garden green and at the same time solve the pollution problem by taking these easy steps...

- Never dispose of lawn or garden chemicals in storm drains. This is called illegal dumping. Take them to a household hazardous waste roundup. Call 1(888)CLEAN LA or visit www.888CleanLA.com to locate a roundup or collection facility near you.
- More is not better. Use pesticides sparingly. "Spot" apply, rather than "blanket" apply.
- Read labels! Use only as directed.
- Use non-toxic products for your garden and lawn whenever possible.
- If you must store pesticides, make sure they are in a sealed, water-proof container that cannot leak.
- When watering your lawn, use the least amount of water possible so it doesn't run into the street and carry pesticide chemicals with it. Don't use pesticides before a rain storm. You will not only lose the pesticide, but also will be harming the environment.



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PROJECT
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PREVENTION

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- When watering your lawn, use the least amount of water possible so it doesn't run into the street and carry pesticide chemicals with it. Don't use pesticides before a rain storm. You will not only lose the pesticide, but also will be harming the environment.



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Pollution
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Are You a Litter Bug and Don't Know It?

Take our quiz!

Have you ever...

- Dropped a cigarette butt or trash on the ground?
- Failed to pick up after your dog while out on a walk?
- Overwatered your lawn after applying fertilizers/pesticides?
- Disposed of used motor oil in the street, gutter or garbage?

If you answered **yes** to any of these actions, then
YOU ARE A LITTER BUG!

Each of these behaviors contribute to stormwater pollution, which contaminates our ocean and waterways, kills marine life and causes beach closures.

You can become part of the solution!

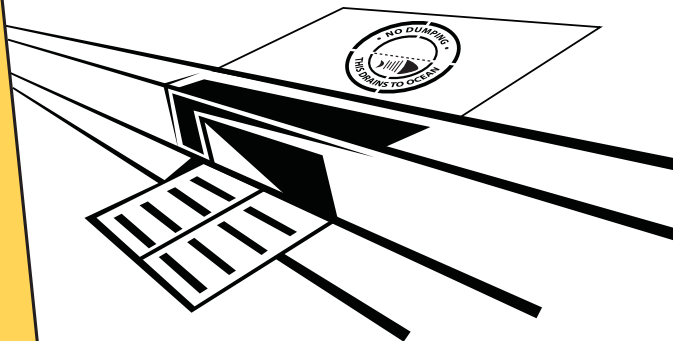
To find out how, flip this card over.

For more information, call or visit:

1 (888) CLEAN LA
www.888CleanLA.com

Follow these simple steps to prevent stormwater pollution:

- Put your garbage where it belongs — in the trash can.
- Pick up after your dog when out on a walk.
- Reduce pesticide and fertilizer use; don't overwater after application or apply if rain is forecast.
- Dispose of used motor oil at an oil recycling center or at a free Household Hazardous Waste/E-Waste collection event.



A message from the County of Los Angeles Department of Public Works.
Printed on recycled paper.

Storm Drains are for Rain...

More than 50% of the automotive oil sold to do-it-



yourself oil changers is not recycled. There are more than 600 State-certified used oil collection centers within Los Angeles County.

Never dispose of automotive fluids, recyclable products, or household hazardous wastes into the street or gutter. Take them to your local auto repair station, recycling center or a household hazardous waste roundup.

...they're not recycling centers.



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Recycling Tips:

You can help keep your community clean, protect our area waterways and make the beaches safe for ocean swimmers by putting recyclable materials where they belong — at a recycling center or household hazardous waste roundup. Never throw or pour anything into the streets or gutters...

- When changing vehicle fluids – transmission, hydraulic and motor oil, brake and radiator fluid – drain them into a drip pan to avoid spills. Do not combine these fluids. Do not dispose of them in the street, gutter or in the garbage. It is illegal.
- Other materials that should be taken to a household hazardous waste Roundup are: paint and paint-related materials, household cleaners, batteries, pesticides and fertilizers, pool chemicals, and aerosol products.
- Recycle all used vehicle fluids. Call 1(888)CLEAN LA or visit www.888CleanLA.com for the location of a center that recycles these fluids, or for the location of a local household hazardous waste Roundup.
- Aluminum, glass, plastic and newspapers should be placed in your curbside recycling bin or taken to a local recycling center.



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