Preliminary Stormwater Quality Mitigation Report

MGA Chatsworth Campus

20000 Prairie Street Chatsworth, CA

(Formerly LA Times)

Prepared For:
MGA NORTH LLC
16300 Roscoe Blvd.
Van Nuys, CA 91406

Prepared By:

Hall & Foreman, Inc.
Engineering ▪ Planning ▪ Surveying

Deering W. Volkmann Viola, P.E.
R.C.E. 72037

November 19, 2013
WW.080134.2000

TUSTIN
17782 17th Street
Suite 200
Tustin, CA 92780-1947
714.665.4500
Fax 714.665.4501

LOS ANGELES
811 Wilshire Blvd.
Suite 1450
Los Angeles, CA 90017-2606
213.758.7887

* **SANTA CLARITA**
25152 Springfield Court
Suite 350
Santa Clarita, CA 91355-1096
661.284.7400
Fax 661.284.7401

TEMECULA
41951 Remington Avenue
Suite 130
Temecula, CA 92590-2553
951.294-9300
Fax: 951.294-9301

VICTORVILLE
14297 Cajon Avenue
Suite 101
760.241.0595
Fax 760.241.1937

www.hfinc.com

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1.0 <u>INTRODUCTION</u>

This Standard Urban Stormwater Mitigation Program (SUSMP) was developed in the City of Los Angeles as part of the municipal stormwater program to address stormwater pollution from new development and redevelopment projects, in 2002. A recent stormwater management approach aimed at achieving this goal is the use of Low Impact Development (LID). LID is widely recognized and the preferred approach to stormwater management, including for the purpose of water quality compliance. LID is a stormwater management strategy that seeks to mitigate the impacts of increases in runoff and stormwater pollutants as close to its source as possible. LID comprises a set of site design approaches and Best Management Practices (BMPs) that promote the use of natural infiltration, evapotransportation and reuse of stormwater. With respect to urban development and redevelopment projects, it can be applied on-site to mimic the site's predevelopment drainage characteristics.

In November 2011, the City of Los Angeles adopted the Stormwater LID Ordinance (Ordinance# 181899) with the stated purpose of:

1. Requiring use of LID standards and practices in future development and redevelopment to encourage the beneficial use of rainwater and urban runoff:

2. Reducing stormwater/ runoff while improving water quality;

3. Promoting rainwater harvesting;

4. Reducing offsite runoff and providing increased groundwater recharge;

5. Reducing erosion and hydrologic impacts downstream; and

6. Enhancing the recreational and aesthetic values in our communities.

These mitigation requirements have been sourced and are incorporated herein by reference to the following stormwater quality literature:

- Development Best Management Practices Handbook, Low Impact Development Manual, part B Planning Activities, Fourth Edition, City of Los Angeles, Board of Public Works, June, 2011

Following a description of the existing conditions, potentially significant impacts associated with the proposed project are identified, along with mitigation measures to reduce project impacts. The primary objectives of this project's mitigation measures are to:

1. Effectively reduce the discharge of pollutants from stormwater conveyance systems to the Maximum Extent Practicable.

2. Reduce the quantity of stormwater discharge into public stormwater conveyance systems through on-site infiltration methods.

2.0 PROJECT DESCIPTION

This project, consisting of 23.60 acres, is located on the property formally occupied by the Los Angeles Times facility in Chatsworth. The site is bounded on the north by Prairie Street, on the west by Winnetka Avenue, the south by Southern Pacific Railroad, and the east by an existing commercial development. Please reference Figure I, “Vicinity Map”.

The MGA Chatsworth Campus project will renovate and expand the existing building facility. Additionally, the project will construct new apartment buildings consisting of 700 residential units, 244,263 square feet of office, and 13,000 square feet of retail space.

3.0 EXISTING HYDROLOGIC CONDITIONS

The project is located in the Chatsworth community of the City Of Los Angeles. The project area is fully developed with buildings, paved parking lot, and landscape areas.

There are two major existing storm drains channels within City of Los Angeles drainage easements on the project property. For reference purposes only, the channel adjacent to Winnetka Avenue will be referred to as the “Winnetka Channel” in this report. This channel is adjacent to the project’s westerly boundary and drains southerly to the south-west corner of the property where it junctions with the major channel adjacent to Southern Pacific Railroad. This channel will be referred to as the “S.P.R.R. Channel” in this report. Street flow on Winnetka Avenue is intercepted by side-opening catch basins connected to “Winnetka Channel”. Street flow in Prairie Street is intercept by five side-opening catch basins connected to the existing 39” mainline in Prairie Street.

In conjunction with the public storm drains, there is an on-site drainage system composed of various types and sizes of catch basins and storm drainpipes network ranging from 6” to 36”. This system connects to the City of Los Angeles “S.P.R.R. Channel” at the southeast corner of the site. The majority of the site drains in a southeasterly direction. The existing site was subdivided into five drainage sub-areas based on the topography and the locations of the existing on-site points of runoff interception. See Figure II, “Pre-Development Hydrology Map”

4.0 PROPOSED HYDROLOGIC CONDITIONS

The MGA Chatsworth Campus project proposes to renovate and expand the existing building and construct 700 apartment units, 244,263 square feet of office space, and 13,000 square feet of retail space. The proposed development will slightly increase the drainage area and storm drain runoff due to expansion of the building footprint and increased impervious areas. The proposed site was subdivided into four drainage sub-areas.

Sub-areas were established utilizing the existing and proposed topography and the existing storm drain network. Reference Figure III, “Post-Development Hydrology Map”. Hydrologic calculations can be referenced from the “Preliminary Hydrology Report,” created by Hall & Foreman, Inc. on November 2013.

5.0 MITIGATION REQUIREMENTS

The new project drainage system proposes to intercept and convey all on-site rainfall runoff trhough mitigation measures in order to capture the first ¾ inch (water quality design storm event) of stormwater runoff as is determined in Section 3.1.2 of the City of Los Angeles LID Best Management Practice Handbook. The LID BMP Handbook states that infiltration systems are the first priority type of BMP improvements, if possible, as they provide for percolation and infiltration of the storm water into the ground, which reduces the volume of runoff and in some cases contributes to groundwater recharge.

Geotechnologies, Inc. completed a Geotechnical Engineering Investigation report for the project site, which included Percolation testing dated May 28, 2008 and revised October 18, 2013. Field testing resulted in medium percolation rates of six (6) inches per hour. Historic records indicate the highest ground water to be at forty (40) feet below ground surface. Reference Appendix “A”, located in the appendix section of this report, for excerpts of the geotechnical report.

Based on the factors above and according to Table 4.1 of the LID handbook, the project site will permit adequate surface infiltration and it is feasible for infiltration BMP’s to be incorporated into the project design. It is intended for this project to utilize dry wells or other infiltration systems in addition to a store and reuse system for the project and each sub-area. This report will provide preliminary calculations for the required areas and depths of the infiltration system for each treatment sub-area. Treatment areas were defined based on the perceived post development drainage patterns as determined by the “Post-Development Hydrology Map” in the “Preliminary Hydrology Report”, generated by Hall & Foreman, Inc.

The project development is expected to be constructed in multiple stages. Each portion of the project will implement a Storm Quality Mitigation System based on the final geotechnical report and site approvals. At this point in time, actual locations of the proposed systems cannot be precisely determined. The preliminary locations have been established to meet design standards outlined in the Geotechnical report findings.

All mitigation measures must comply with the final approved final geotechnical report. Please refer to Figure IV "SUSMP/ LID Mitigation Plan" for the treatment areas and Table 1.0, on page 5, for a summary of mitigated volumes, flows and infiltration system requirements.

6.0 MITIGATION REQUIREMENTS

Mitigated flow rates (Qpm) and volumes (Vpm) are calculated according to samle design calculations and worksheets provided in the Appendix "F" of the LID Handbook. The County of Los Angeles Department of Public Works program "LACoWQFlow.xls" was utilized for the mitigated flow rate calculations. The mitigated volume (Vpm) was calculated using the follow equation:

$$\boldsymbol{V_{pm}} = \left(\boldsymbol{2722.5\frac{ft^3}{Acre}}\right) * [\boldsymbol{0.9AI} + \boldsymbol{Cu}(\boldsymbol{Ap} + \boldsymbol{Au})]$$

Where:
AI = The impervious area in Acres
Au = The undeveloped area in Acres
Ap = The pervious area in Acres
Cu = The undeveloped coefficient = 0.10

Please refer to Appendices "B" & "C" for flow rates and volume calculations input and data files.

7.0 MITIGATION REQUIREMENTS

Per discussion in the "Mitigation Requirement" section, infiltration BMPs are feasible for the project and it is proposed to use dry well systems. Additional infiltration systems which can be incorporated include infiltration basins, infiltration trenches, bioretention areas, and permeable pavements.

For the purposes of this report, installation of dry wells will be incorporated into the design of the project. Dry well sizing calculations were performed based on the requirements and formulas in Section 4.4.3 "Calculating Size Requirements for Infiltration BMPs" in the LID Handbook.

Infiltration rates for the project were found to be six (6) inches per hour. The design infiltration rate (Ksat/design) yielding a factor of safety of 3 will reduce the infiltration rate to two (2) inches per hour. For each subarea, a total minimum required area of infiltration was calculated utilizing the mitigated volume and the infiltration rate as follows:

$$A_{min} = \frac{V_{pm}}{K_{sat/design} * T} * 12\ in/ft$$

Where:
A_{min} = minimum required area of infiltration, ft^2

V_{pm} = required mitigated volume, ft^3
$K_{sat/design}$ = design infiltration rate = 2 in/hr
T = draw down time = 48 hours

From this a minimum area, the required height of gravel bottom is determined from:

$$h = (A_{min} - \pi r^2)/2\pi r$$

where:
h = minimum height of gravel bottom
A_{min} = minimum required area of infiltration, ft^2
r = dry well radius = 4ft

TABLE 1.0 – Estimated Number of Drywell & Depths

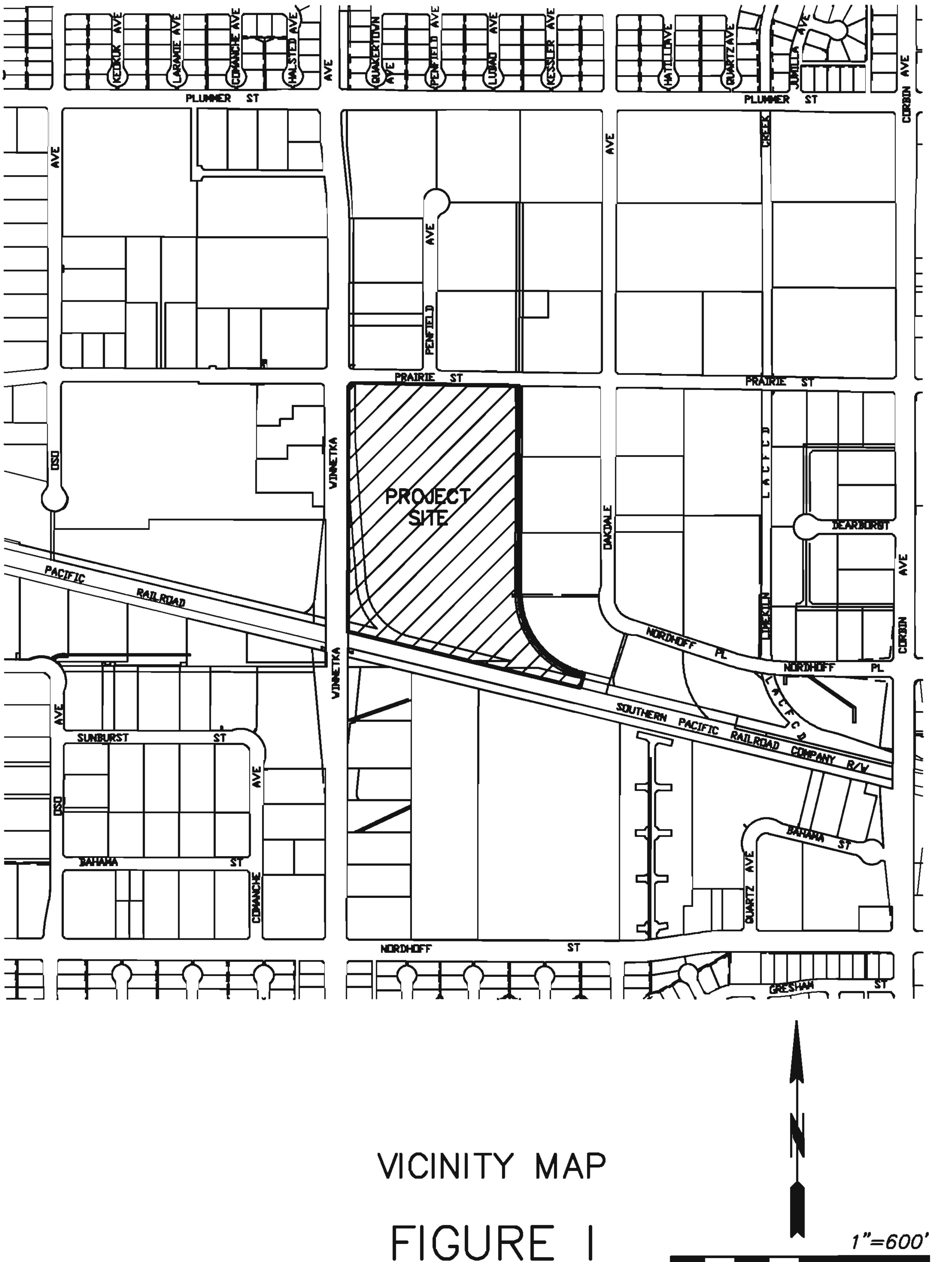
Sub-Area	Qpm (ft^3/s)	Vpm (ft^3)	Amin (ft^2)	Required Gravel Depth (ft)	No. of Drywells
A	0.82	11503	1438	55	3 @ 18'
B	1.16	16197	2025	79	4 @ 20'
C	0.88	12113	1514	58	3 @ 20'

Note: Minimum measured infiltration rate as established from geotechnical percolation report is 6 in/hr with a factor of safety of 3.

Calculations for each subarea are summarized in Table 1.0, above. The number of drywells estimated for each sub-area is based on the total required gravel depths (h). A maximum depth of twenty (20) feet for the drywells has been chosen for the purposes of these calculations. Fewer dry wells may be used in each sub-area if the gravel depths are great or if the percent pervious is increased in the project development.

Additionally, the calculation reflected above does not reflect any other types of infiltration devices which include: Infiltration basins, infiltration trenches, bioretention areas and permeable pavements. A more detail calculations will need to be incorporated to adjust and properly reflect the project development.

FIGURES



VICINITY MAP

FIGURE 1

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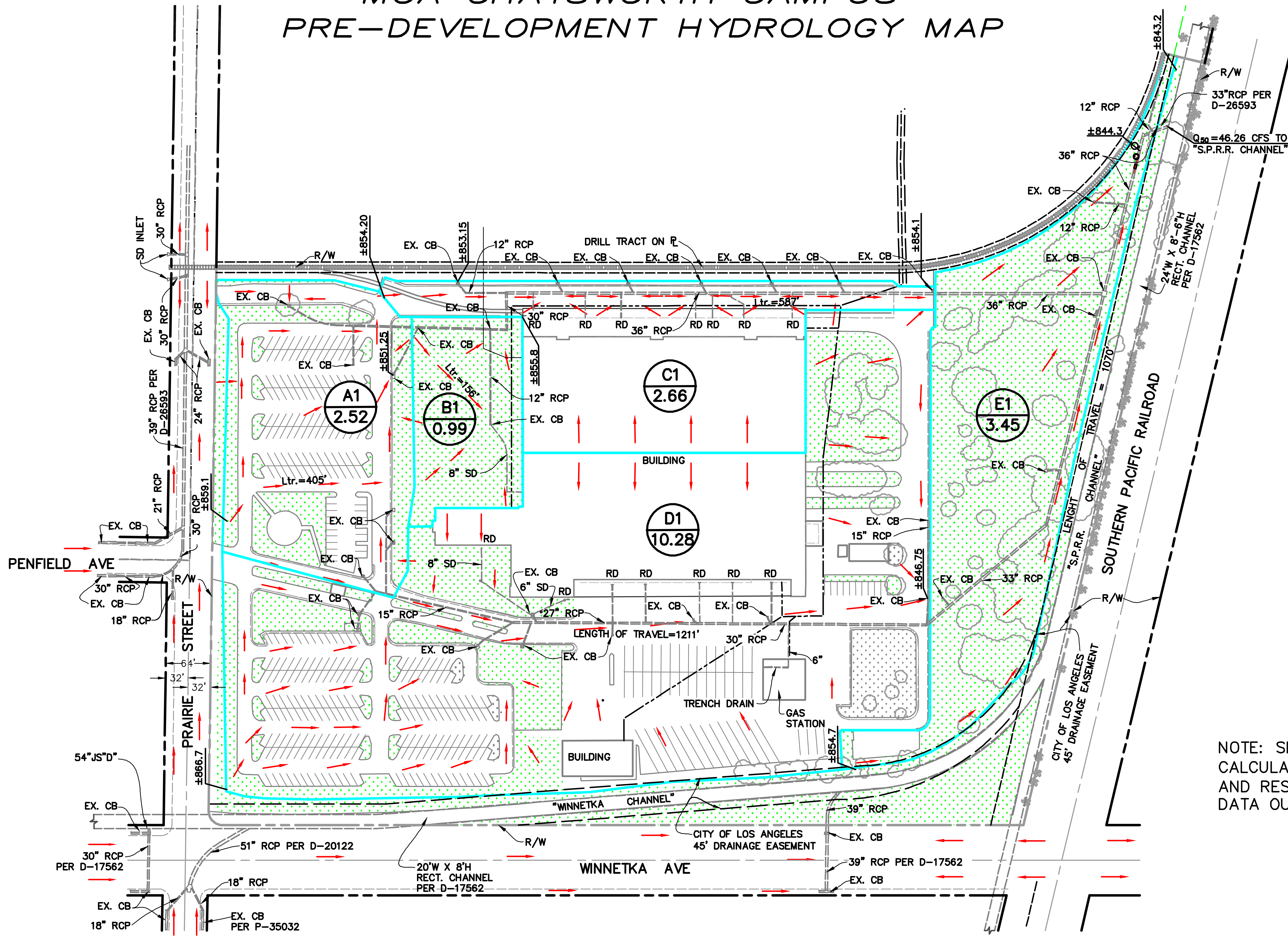
MGA CHATSWORTH CAMPUS
PRE-DEVELOPMENT HYDROLOGY MAP



LEGEND:

- A1 / 5.05 — SUBAREA / ACREAGE
- FLOW DIRECTION
- SUBAREA DRAINAGE BOUNDARY
- LANDSCAPE AREA
- BUILDING, CONCRETE OR ASPHALT PAVEMENT
- R/W
- RD — ROOF DRAIN
- EXISTING STORM DRAIN
- Ltr. — LENGTH OF TRAVEL

NOTE: SEE THE APPENDIX FOR THE TC CALCULATOR "TC-CALC-DEPTH.XLS" DATA AND RESULTS, "WMS" MODRAT ROUTING DATA OUTPUT AND HYDROGRAPH.

150 0 150 300
scale 1"= 150' feet

FIGURE II

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MGA CHATSWORTH CAMPUS PRE-DEVELOPEMENT HYDROLOGY MAP

SKY TECH MANAGEMENT & CONSTRUCTION
210 E. OLYMPIC BLVD., SUITE 212
LOS ANGELES, CA, 90015
213.747.7877

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Sheet 1 of 1 Sheets

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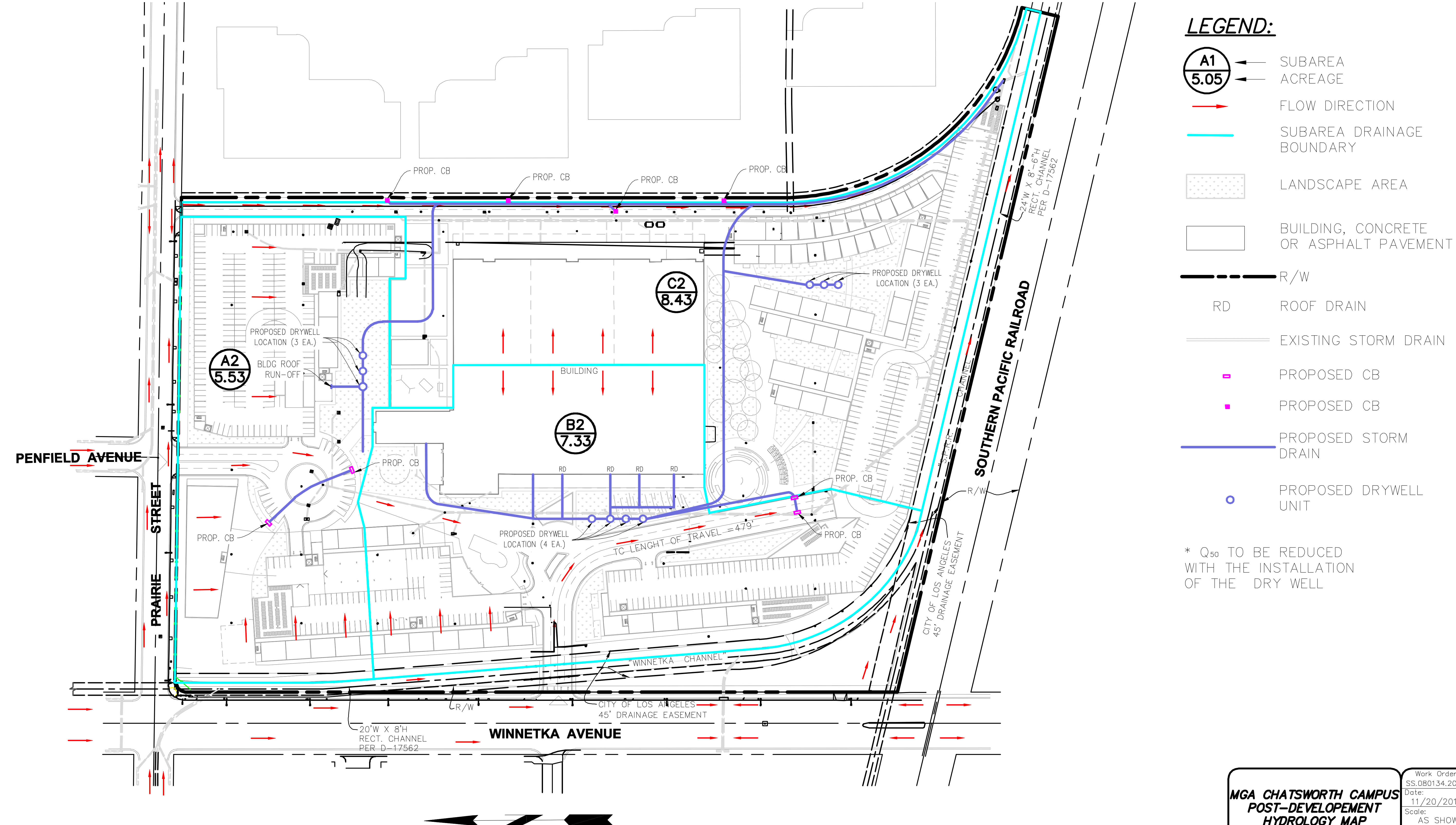
MGA CHATSWORTH CAMPUS POST–DEVELOPMENT HYDROLOGY MAP



150 0 150 300
scale 1"= 150' feet

FIGURE III

MGA CHATSWORTH CAMPUS POST–DEVELOPEMENT HYDROLOGY MAP

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LOS ANGELES, CA, 90015
213.747.7877

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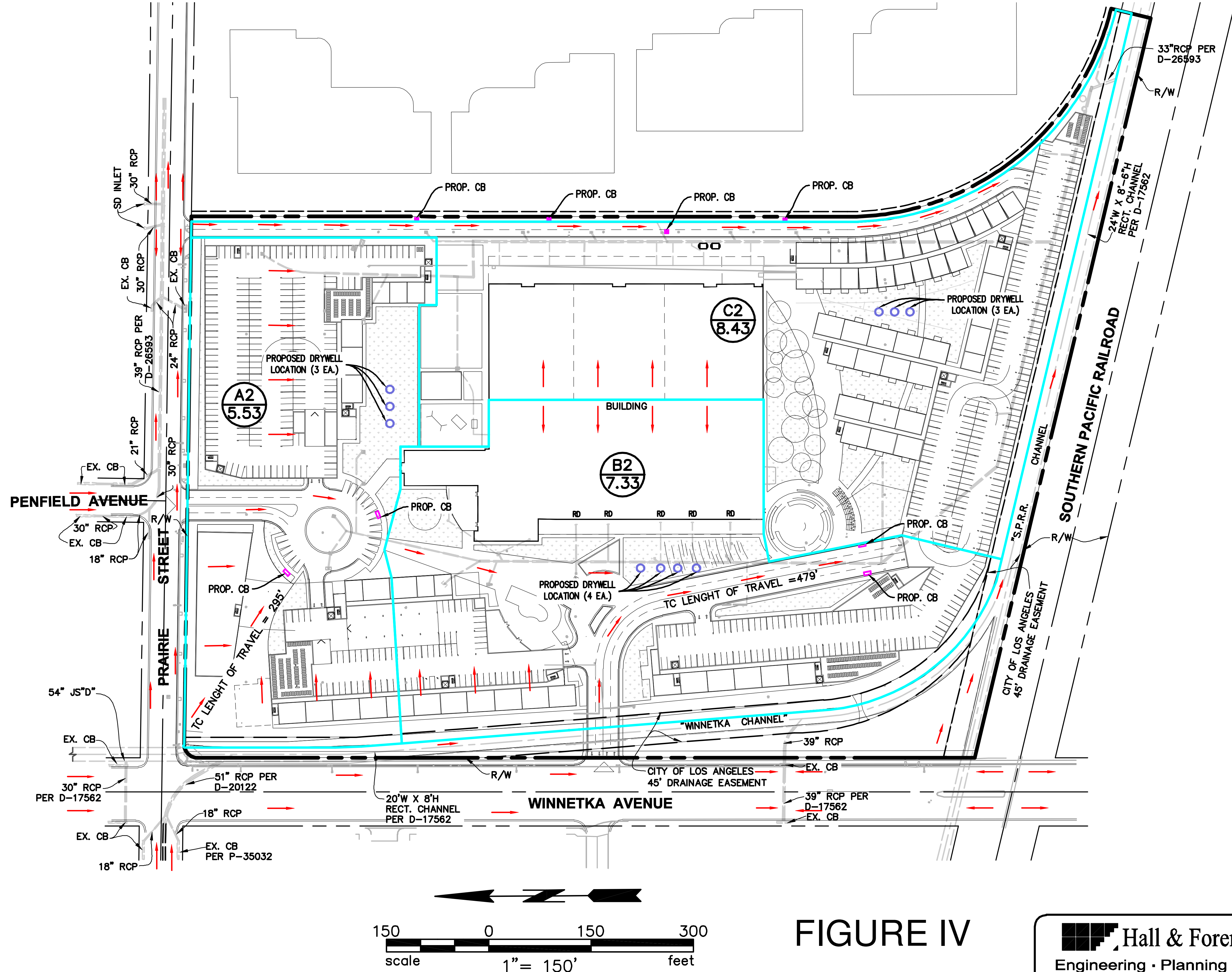
MGA CHATSWORTH CAMPUS
SUSMP/LID MITIGATION PLAN



LEGEND:

A1 / 5.05	SUBAREA / ACREAGE
(red arrow)	FLOW DIRECTION
(cyan line)	SUBAREA DRAINAGE BOUNDARY
(dotted area)	LANDSCAPE AREA
(outlined box)	BUILDING, CONCRETE OR ASPHALT PAVEMENT
(heavy dashed line)	R/W
RD	ROOF DRAIN
(grey line)	EXISTING STORM DRAIN
(open magenta square)	PROPOSED CB
(filled magenta square)	PROPOSED CB
(blue circle)	PROPOSED DRYWELL UNIT

* Q_{50} TO BE REDUCED WITH THE INSTALLATION OF THE DRY WELL

FIGURE IV

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MGA CHATSWORTH CAMPUS SUSMP/LID MITIGATION PLAN

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LOS ANGELES, CA, 90015
213.747.7877

Work Order SS.080134.2000
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Sheet 1 of 1 Sheets

Drawing Name: L:\080134\Eng\080134-2000\Hm\SUSMP-LID\SUSMP-LID FIG. 4.dwg
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APPENDIX A

Shoring Observations

It is critical that the installation of shoring is observed by a representative of Geotechnologies, Inc. Many building officials require that shoring installation should be performed during continuous observation of a representative of the geotechnical engineer. The observations insure that the recommendations of the geotechnical report are implemented and so that modifications of the recommendations can be made if variations in the geologic material or groundwater conditions warrant. The observations will allow for a report to be prepared on the installation of shoring for the use of the local building official, where necessary.

Raker Brace Foundations

An allowable bearing pressure of 4,000 pounds per square foot may be used for the design a raker foundations. This bearing pressure is based on a raker foundation a minimum of 4 feet in width and length as well as 4 feet in depth. The base of the raker foundations should be horizontal. Care should be employed in the positioning of raker foundations so that they do not interfere with the foundations for the proposed structure.

SLABS ON GRADE

Concrete Slabs-on Grade

Concrete floor slabs should be a minimum of 5 inches in thickness. Slabs-on-grade should be cast over properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent (or 95 percent for cohesionless soils having less than 15 percent finer than 0.005 millimeters) of the maximum dry density.

Outdoor concrete flatwork should be a minimum of 4 inches in thickness. Outdoor concrete flatwork should be cast over undisturbed alluvial soils, or properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent (or 95 percent for cohesionless soils having less than 15 percent finer than 0.005 millimeters) of the maximum dry density.

Design of Slabs That Receive Moisture-Sensitive Floor Coverings

Geotechnologies, Inc. does not practice in the field of moisture vapor transmission evaluation and mitigation. Therefore it is recommended that a qualified consultant be engaged to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The qualified consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the structure.

Where dampness would be objectionable, it is recommended that the floor slabs should be waterproofed. A qualified waterproofing consultant should be retained in order to recommend a product or method which would provide protection for concrete slabs-on-grade.

All concrete slabs-on-grade should be supported on vapor retarder. The design of the slab and the installation of the vapor retarder should comply with the most recent revisions of ASTM E 1643 and ASTM E 1745. Where a vapor retarder is used, a low-slump concrete should be used to minimize possible curling of the slabs. The barrier can be covered with a layer of trimable, compactible, granular fill, a minimum of 2 inches in thickness, where it is thought to be beneficial. See ACI 302.2R-32, Chapter 7 for information on the placement of vapor retarders and the use of a fill layer.

Concrete Crack Control

The recommendations presented in this report are intended to reduce the potential for cracking of concrete slabs-on-grade due to settlement. However even where these recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete cracking may be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement and curing, and by placement of crack control joints at reasonable intervals, in particular, where re-entrant slab corners occur.

For standard control of concrete cracking, a maximum crack control joint spacing of 12 feet should not be exceeded. Lesser spacings would provide greater crack control. Joints at curves and angle points are recommended. The crack control joints should be installed as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by a structural engineer.

Complete removal of the existing fill soils beneath outdoor flatwork such as walkways or patio areas, is not required, however, due to the rigid nature of concrete, some cracking, a shorter design life and increased maintenance costs should be anticipated. In order to provide uniform support beneath the flatwork it is recommended that a minimum of 12 inches of the exposed subgrade beneath the flatwork be scarified and recompacted to 90 percent relative compaction.

Slab Reinforcing

Concrete slabs-on-grade should be reinforced with a minimum of #4 steel bars on 16-inch centers each way. Outdoor flatwork should be reinforced with a minimum of #3 steel bars on 18-inch centers each way.

APPENDIX B

PROVIDE PROPOSED PROJECT CHARACTERISTICS

A_{Total}	5.53	Acres
Type of development	MGA Campus Sub-Area A	
Predominate Soil Type #	016	
% of project impervious	83	
% of project pervious	17	
% of project contributing undeveloped area	0	
A_I	4.59	Acres
A_P	0.94	Acres
A_U	0.00	Acres
Length (ft)	846	
Slope (ft/ft)	0.01	

DETERMINING THE PEAK MITIGATED FLOW RATE (Q_{PM}):

Location: WO# 080134, MGA

In order to determine the peak mitigated flow rate (Q_{PM}) from the new development, use the Los Angeles County Department of Public Works *Hydrology Manual* . Use the Modified Rational Method for calculating the peak mitigation Q_{PM} for compliance with the Standard Urban Stormwater Mitigation Plan (SUSMP). Use attached **Table 1** for all maximum intensity (I_X) values used.

By trial and error, determine the time of concentration (T_C), as shown below:

CALCULATION STEPS:

1. Assume an initial T_C value between 5 and 30 minutes.

T_C 6 minutes

2. Using Table 1, look up the assumed T_C value and select the corresponding I_X intensity in inches/hour.

I_X 0.411 inches/hour

3. Determinhe the value for the Undeveloped Runoff Coefficient, C_U, using the runoff coefficient curve corresponding to the predominant soil type.

C_U 0.2

4. Calculate the Developed Runoff Coefficient, C_D=(0.9*Imp.)+[(1.0-Imp)*C_U]

C_D 0.764

5. Calculate the value for C_D*I_X

C_D*I_X 0.31

6. Calculate the time of concentraion, $T_C=10^{-0.507}*(C_D*I_X)^{-0.519}*Length^{0.483}*Slope^{-0.135}$

Calculated T_C 30.0 minutes

7. Calculate the difference between the initially assumed T_C and the calculated T_C, if the difference is greater than 0.5 minute. Use the calculated T_C as the assumed initial T_C in the second iteration. If the T_C value is within 0.5 minute, round the acceptable T_C value to the nearest minute.

TABLE FOR ITERATIONS:

Iteration no.	Initial T_C (min)	I_X (in/hr)	C_U	C_D	C_D*I_X (in/hr)	Calculated T_C (min)	Difference (min)
1	6	0.411	0.1	0.764	0.31	27.4	21.4
2	27	0.203	0.2	0.781	0.16	39.1	12.1
3	30	0.193	0.1	0.764	0.15	40.6	0.0
4	0	0.000	0.2	0.000	0.00	0.0	0.0
5	0	0.000		0.000	0.00	0.0	0.0
6	0	0.000		0.000	0.00	0.0	0.0
7	0	0.000		0.000	0.00	0.0	0.0
8	0	0.000		0.000	0.00	0.0	0.0
9	0	0.000		0.000	0.00	0.0	0.0
10	0	0.000		0.000	0.00	0.0	0.0

Acceptable T_C value 30 minutes

8. Calculate the Peak Mitigation flow Rate,
   $Q_{PM}=C_D*I_X*A_{Total}*(1.008333\ ft^3\text{-hour / acre-inches-seconds})$

Q_{PM}=	**0.82**	**cfs**

C_D=	**0.764**	
I=	**0.193**	**in/hr**
A_{Total}=	**5.53**	**Acres**

PROVIDE PROPOSED PROJECT CHARACTERISTICS

A_{Total}	7.33	Acres
Type of development	MGA Campus Sub-Area B	
Predominate Soil Type #	016	
% of project impervious	89	
% of project pervious	11	
% of project contributing undeveloped area	0	
A_I	6.52	Acres
A_P	0.81	Acres
A_U	0.00	Acres
Length (ft)	842	
Slope (ft/ft)	0.012	

DETERMINING THE PEAK MITIGATED FLOW RATE (Q_{PM}):

Location: WO# 080134, MGA

In order to determine the peak mitigated flow rate (Q_{PM}) from the new development, use the Los Angeles County Department of Public Works *Hydrology Manual* . Use the Modified Rational Method for calculating the peak mitigation Q_{PM} for compliance with the Standard Urban Stormwater Mitigation Plan (SUSMP). Use attached **Table 1** for all maximum intensity (I_X) values used.

By trial and error, determine the time of concentration (T_C), as shown below:

<u>CALCULATION STEPS:</u>

1. Assume an initial T_C value between 5 and 30 minutes.

T_C 6 minutes

2. Using Table 1, look up the assumed T_C value and select the corresponding I_X intensity in inches/hour.

I_X 0.411 inches/hour

3. Determinhe the value for the Undeveloped Runoff Coefficient, C_U, using the runoff coefficient curve corresponding to the predominant soil type.

C_U 0.2

4. Calculate the Developed Runoff Coefficient, C_D=(0.9*Imp.)+[(1.0-Imp)*C_U]

C_D 0.812

5. Calculate the value for C_D*I_X

C_D*I_X 0.33

6. Calculate the time of concentraion, $T_C=10^{-0.507}*(C_D*I_X)^{-0.519}*Length^{0.483}*Slope^{-0.135}$

Calculated T_C 30.0 minutes

7. Calculate the difference between the initially assumed T_C and the calculated T_C, if the difference is greater than 0.5 minute. Use the calculated T_C as the assumed initial T_C in the second iteration. If the T_C value is within 0.5 minute, round the acceptable T_C value to the nearest minute.

TABLE FOR ITERATIONS:

Iteration no.	Initial T_C (min)	I_X (in/hr)	C_U	C_D	C_D*I_X (in/hr)	Calculated T_C (min)	Difference (min)
1	6	0.411	0.1	0.812	0.33	25.9	19.9
2	26	0.206	0.2	0.823	0.17	36.7	10.7
3	30	0.193	0.1	0.812	0.16	38.3	0.0
4	0	0.000	0.2	0.000	0.00	0.0	0.0
5	0	0.000		0.000	0.00	0.0	0.0
6	0	0.000		0.000	0.00	0.0	0.0
7	0	0.000		0.000	0.00	0.0	0.0
8	0	0.000		0.000	0.00	0.0	0.0
9	0	0.000		0.000	0.00	0.0	0.0
10	0	0.000		0.000	0.00	0.0	0.0

Acceptable T_C value 30 minutes

8. Calculate the Peak Mitigation flow Rate,
   $Q_{PM}=C_D*I_X*A_{Total}*(1.008333\ ft^3\text{-hour / acre-inches-seconds})$

Q_{PM}=	**1.16**	**cfs**

C_D= **0.812**

I= **0.193 in/hr**

A_{Total}= **7.33 Acres**

PROVIDE PROPOSED PROJECT CHARACTERISTICS

A_{Total}	5.53	Acres
Type of development	MGA Campus Sub-Area C	
Predominate Soil Type #	016	
% of project impervious	88	
% of project pervious	12	
% of project contributing undeveloped area	0	
A_I	4.87	Acres
A_P	0.66	Acres
A_U	0.00	Acres
Length (ft)	1364	
Slope (ft/ft)	0.01	

DETERMINING THE PEAK MITIGATED FLOW RATE (Q_{PM}):

Location: WO# 080134, MGA

In order to determine the peak mitigated flow rate (Q_{PM}) from the new development, use the Los Angeles County Department of Public Works *Hydrology Manual* . Use the Modified Rational Method for calculating the peak mitigation Q_{PM} for compliance with the Standard Urban Stormwater Mitigation Plan (SUSMP). Use attached **Table 1** for all maximum intensity (I_X) values used.

By trial and error, determine the time of concentration (T_C), as shown below:

CALCULATION STEPS:

1. Assume an initial T_C value between 5 and 30 minutes.

T_C 6 minutes

2. Using Table 1, look up the assumed T_C value and select the corresponding I_X intensity in inches/hour.

I_X 0.411 inches/hour

3. Determinhe the value for the Undeveloped Runoff Coefficient, C_U, using the runoff coefficient curve corresponding to the predominant soil type.

C_U 0.2

4. Calculate the Developed Runoff Coefficient, C_D=(0.9*Imp.)+[(1.0-Imp)*C_U]

C_D 0.804

5. Calculate the value for C_D*I_X

C_D*I_X 0.33

6. Calculate the time of concentraion, $T_C=10^{-0.507}*(C_D*I_X)^{-0.519}*Length^{0.483}*Slope^{-0.135}$

Calculated T_C 30.0 minutes

7. Calculate the difference between the initially assumed T_C and the calculated T_C, if the difference is greater than 0.5 minute. Use the calculated T_C as the assumed initial T_C in the second iteration. If the T_C value is within 0.5 minute, round the acceptable T_C value to the nearest minute.

TABLE FOR ITERATIONS:

Iteration no.	Initial T_C (min)	I_X (in/hr)	C_U	C_D	C_D*I_X (in/hr)	Calculated T_C (min)	Difference (min)
1	6	0.411	0.1	0.804	0.33	33.6	27.6
2	30	0.193	0.2	0.816	0.16	49.4	0.0
3	0	0.000	0.1	0.000	0.00	0.0	0.0
4	0	0.000	0.2	0.000	0.00	0.0	0.0
5	0	0.000		0.000	0.00	0.0	0.0
6	0	0.000		0.000	0.00	0.0	0.0
7	0	0.000		0.000	0.00	0.0	0.0
8	0	0.000		0.000	0.00	0.0	0.0
9	0	0.000		0.000	0.00	0.0	0.0
10	0	0.000		0.000	0.00	0.0	0.0

Acceptable T_C value 30 minutes

8. Calculate the Peak Mitigation flow Rate,
   $Q_{PM}=C_D*I_X*A_{Total}*(1.008333\ ft^3\text{-hour / acre-inches-seconds})$

Q_{PM}=	**0.88**	**cfs**

C_D=	**0.816**	
I=	**0.193**	**in/hr**
A_{Total}=	**5.53**	**Acres**

APPENDIX C

MGA Campus

Post Development -Volume Based Calcs

Site Properties -	**(Sub-Area A)**
Undeveloped Coefficient (C_u)	0.1
Impervious Area (A_I)	4.59 acres
Undeveloped Area (A_U)	0 acres
Pervious Area (A_p)	0.94 acres
Total Area	5.53 acres

Code Requirements - Total Rainfall Mitigated	
V_m = (2722.5 ft^3/acre)*[(A_I)(0.9)+(A_p+A_u)(C_u)] =	11502.56 ft^3

MGA Campus

Post Development -Volume Based Calcs

Site Properties -	**(Sub-Area B)**
Undeveloped Coefficient (C_u)	0.1
Impervious Area (A_I)	6.52 acres
Undeveloped Area (A_U)	0 acres
Pervious Area (A_p)	0.81 acres
Total Area	7.33 acres

Code Requirements - Total Rainfall Mitigated	
V_m = (2722.5 ft^3/acre)*[(A_I)(0.9)+(A_p+A_u)(C_u)] =	16196.15 ft^3

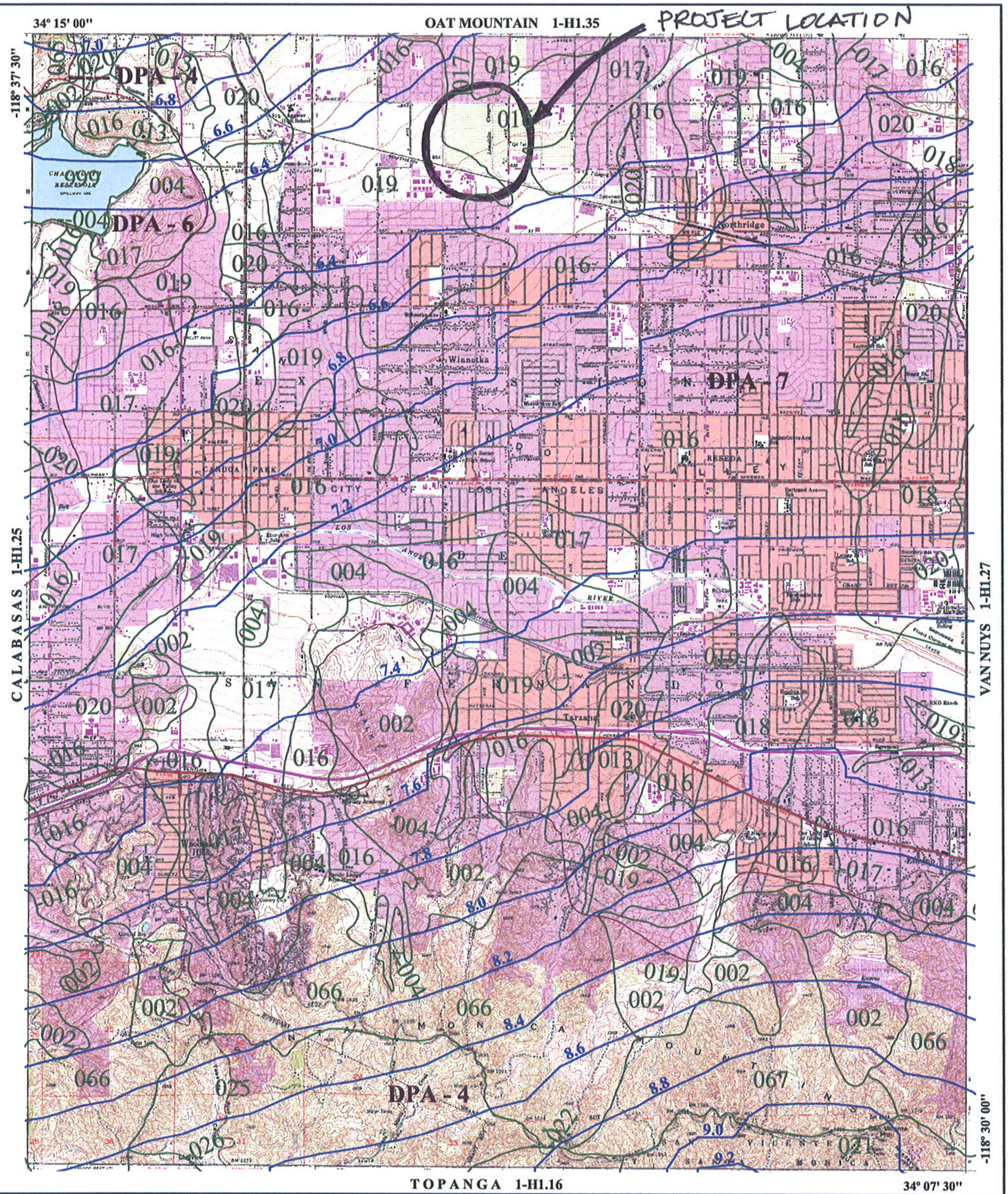
MGA Campus

Post Development -Volume Based Calcs

Site Properties -	**(Sub-Area C)**	
Undeveloped Coefficient (C_u)	0.1	
Impervious Area (A_I)	4.87	acres
Undeveloped Area (A_U)	0	acres
Pervious Area (A_p)	0.66	acres
Total Area	5.53	acres

Code Requirements - Total Rainfall Mitigated	
V_m = (2722.5 ft^3/acre)*[(A_I)(0.9)+(A_p+A_u)(C_u)] =	12112.40 ft^3

APPENDIX D



016	SOIL CLASSIFICATION AREA
7.2	INCHES OF RAINFALL
DPA - 6	DEBRIS POTENTIAL AREA

1 0 1 2 Miles

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

CANOGA PARK
50-YEAR 24-HOUR ISOHYET

1-H1.26

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

APPENDIX E

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

Where: C_D = Developed Runoff Coefficient

IMP = Proportion Impervious

C_U = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 020