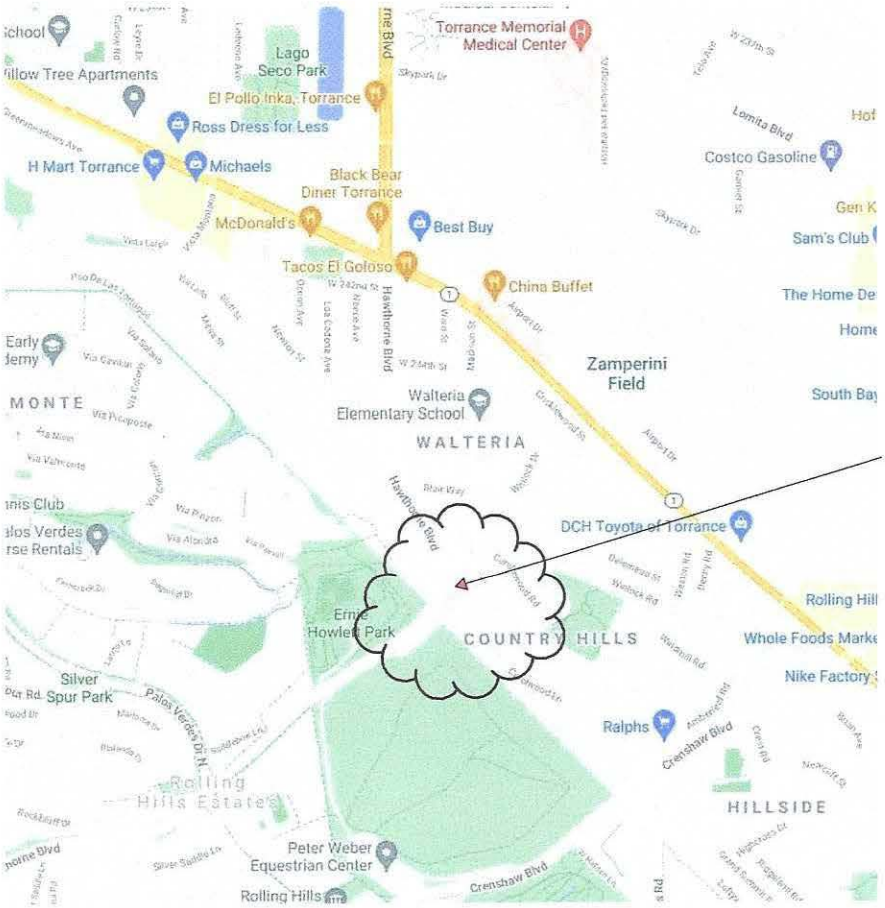
West Coast Technical Consultants, Inc.
1197 E. Los Angeles Ave. C115 Simi Valley, CA 93065
Business: 818-216-0504 Fax: 805-624-7816

HYDROLOGIC DEVELOPMENT STUDY

FOR

25480 HAWTHORNE BLVD, TORRANCE, CA 90505



PREPARED BY WEST COAST TECHNICAL CONSULTANTS, INC.

1197 E. LOS ANGELES AVE., C115

SIMI VALLEY, CA. 93065

Phillip M. Berger, P.E.

West Coast Technical Consultants, Inc.

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Business: 818-216-0504 Fax: 805-624-7816

July 27, 2021

Ms. Zeina Awad

ZS Development

11646 Praire Ave.

Hawthorne, Ca. 90250

Ref Project: Walteria Townhomes ~ 25480 Hawthorne Blvd, Torrance, Ca. 90250

Ms. Awad;

The offices of West Coast Technical Consultants, Inc, has completed a Hydrology and Hydraulic study for the above mentioned project at your request. It was the understanding at the time of writing this report, this study was for the purposes of Planning Department clearances towards a future permitting of project construction plans. At that time, when complete Architectural plans and roof design concepts have been provided, as well as Civil engineered Grading and Drainage plans showing site grading, grade elevations, precise directions of flow, we can formalize this report for approval by permitting departments within the City of Torrance. Some assumptions were made in lieu of these formal construction plans but we believe this report itemizes the different drainage areas for both Pre-Development and Post-Development rain event quantities to the best extent possible, using sound engineering practices and commonly accepted standards of the industry digital programs developed by Los Angeles County Department of Public Works, Water Resources Division, to help develop our results.

The *existing site* is located at 25480 Hawthorne Blvd., in an area referred to as "Walteria". A 0.566 acre site located roughly 210 feet north of Rolling Hills Rd., this site is currently vacant. A moderate hillside property, with a relatively level pad facing Hawthorne Blvd., the rear descending slope faces the property bordering local residences on Eleda Drive. A majority of the site encompasses this descending slope facing the east southeast covered with light native grasses, thick brushes and trees. A thick row of hedges and trees line the southernmost property line with adjacent commercial property, as well as to the eastern property line bordering residential properties on Eleda Drive.

No Soils report was provided at the time of writing this report. Soil values were taken from the LACDPW Hydrology Manual.

The *planned development* is called "Walteria Townhomes" and consists of a multi-use, 3-story structure, 18 individual residential units and office spaces on basement parking. The development covers roughly 60% of the total site area of either impervious roof areas, patios, walkways and (2) driveways accessing the building from Hawthorne Blvd.

The basis of our hydrologic study was derived using the Los Angeles County Department of Public Works "Hydrology Manual" for inputs to the "HydroCalc" program, Peak Flow Hydrologic Analysis, 50 yr. storm event. Using L.A. County 50-year 24-hour Isohyet, Torrance quadrant (1-H1.4), we find the "Soil Classification Area" is 004, "Inches of Rainfall", 5.4 inches, and within "Debris Potential Area", DPA-6. These parameters were used to calculate the quantity of storm waters for a 50 yr. storm event for the total site area determining the Pre-Development of existing site conditions and Post-Development, or proposed site structure storm event water quantities.

The *Pre-Development* time of concentration was developed taking the furthest site elevation to the point of storm water exit at the east south east portion of the property. A slope was derived and a Time of Concentration of 5 min. was used to determine the existing generated Q(50) of roughly 1.39 cubic feet per second (c.f.s.). With this total we can then identify the different existing site drainage areas to quantify how much water contributes to each individual drainage outlet. As discussed above, the majority of the site and the respective individual drainage areas drain towards the east southeast to the Eleda Drive residences. No visual drainage devices were found along residences on Lots 46-47; a 3 feet wide concrete swale was surveyed, by others, behind Lots 48-50. Condition and functionality of this drainage device is undermined, however hydraulics find the device adequately sized provided its' maintained properly.

The *Post-Development* time of concentration was developed with assumptions for roof design, roof routing, piping within the building and conveyance devices used to outlet to the Hawthorne Blvd. With a Time of Concentration of 6 min, the proposed development Q(50) was grossly unchanged at 1.39 c.f.s., given routing length and pipe slope within the interior of the structure. Roughly 60% of the impervious site area would drain towards Hawthorne Blvd, leaving the remainder natural sloping area draining towards Eleda Drive. This reduces the potential amount of storm waters and or debris flow to adjacent neighbors along Eleda Drive by roughly 50% or 0.44 c.f.s. These new impervious areas, roof and hardscape areas will be directed to Hawthorne Blvd. Again, individual site areas where considered and pro-rated to develop various proposed drainage areas to determine storm water quantities and ultimately pipe sizes used to outlet to Hawthorne Blvd. These hydraulic calculations are included within the report along with "Hydrology Maps" for both Pre & Post Development Site conditions to help in understanding how this report was formulated. We find that commonly used parkway drains can be outletted thru the existing stand up concrete curb face lining the roadway of Hawthorne Blvd. In larger proposed drainage areas, a 3" x 12" c.i.p. box culvert can be used and are over-designed. These devices will be formalized with details when construction documents are prepared for permitting purposes.

The basement parking located under the structure is expected to yield little or inconsequential drainage other than nuisance waters from cars entering from the street. It is anticipated that a drainage device will be provided within the garage floor for this drainage and or any potential ceiling mounted piping malfunctions. This drain will be routed to a sump pump or "Duplex System" with back power device to accommodate these events. The garage drainage, other than the driveway leading to the garage was not used in quantifying storm related waters in this report.

Additionally, planned landscaping, planters, permeable pavers and any commonly used permeable *softscape* surfaces to reduce the pervious vs. impervious site ratios were not considered at the time of writing this report. Although this site is located within a hillside area, and with no soils report to relay on, the potential for site infiltration was not considered either. These concepts which are decorative but helpful in reducing the impervious areas, regardless, studied whether the type of soils, ground water and potential for seepage to surrounding foundations, basement garages and adjacent properties but could yield in reduction of overall "runoff coefficient".

REGISTERED PROFESSIONAL ENGINEER
PHILLIP M. BERGER
No. 13128
Exp. 3-31-23
CIVIL
STATE OF CALIFORNIA

One assumption maybe considered in later studies would be the Low Impact development component of the site. These drainage cleansing devices such as "Bio-Filtration" flow-thru planters help to cleanse the low developed storm events of particulate generated from roof mounted equipment and or parking structures, but add to the routing even under overflow conditions. Although these devices were not considered at the time of this report, this Time of Concentration could be considered conservative.

In conclusion, it is the opinion of this office, with the limited information provides, this site can be developed to provide site drainage and adequately exit the site with no additional adverse impacts to surrounding residential and commercial developments.

Thank you,

David LaFaille, Project Engineer

Phillip M Berger

Phillip M. Berger, RCE 13128

Los Angeles County Department of Public Works

HYDROLOGY MANUAL

Water Resources Division
January 2006

Donald L. Wolfe, Director

900 South Fremont Avenue
Alhambra, California 91803

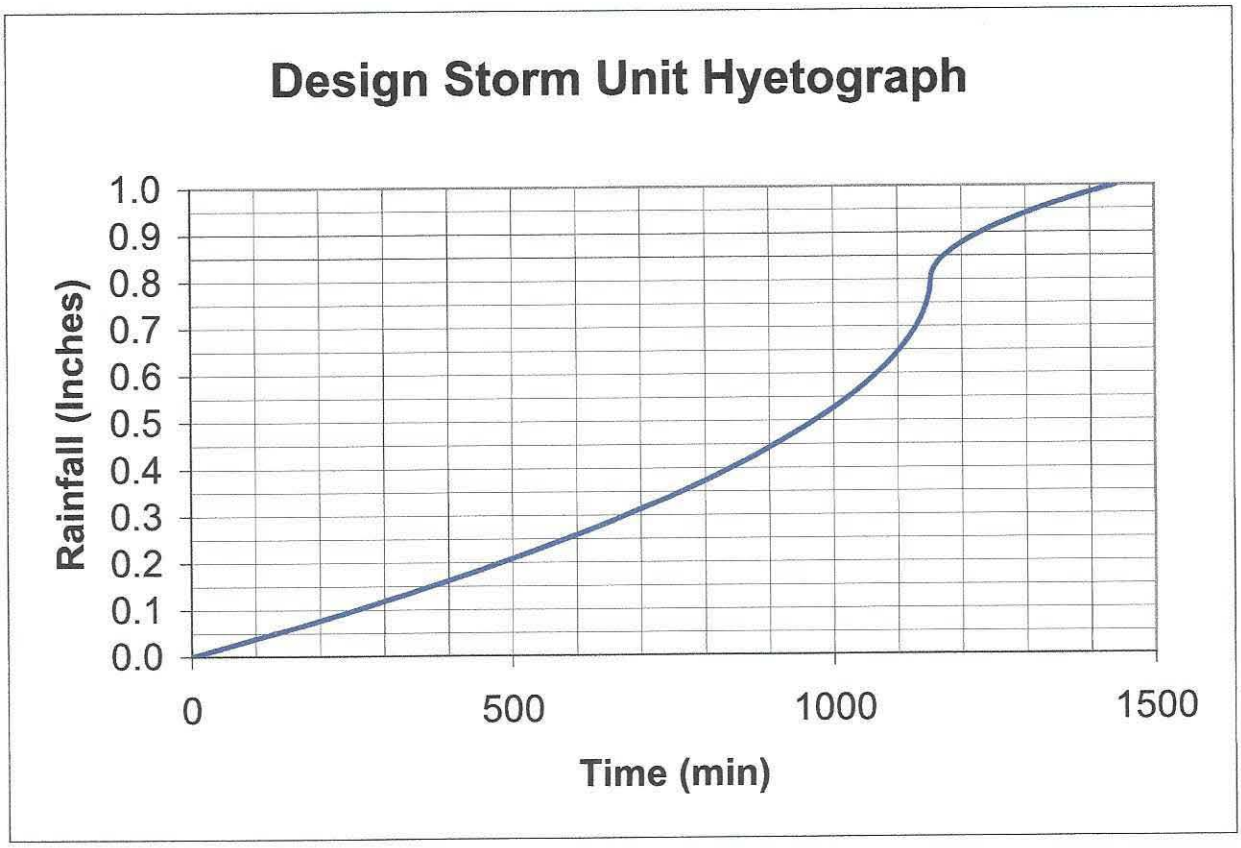
APPENDIX A

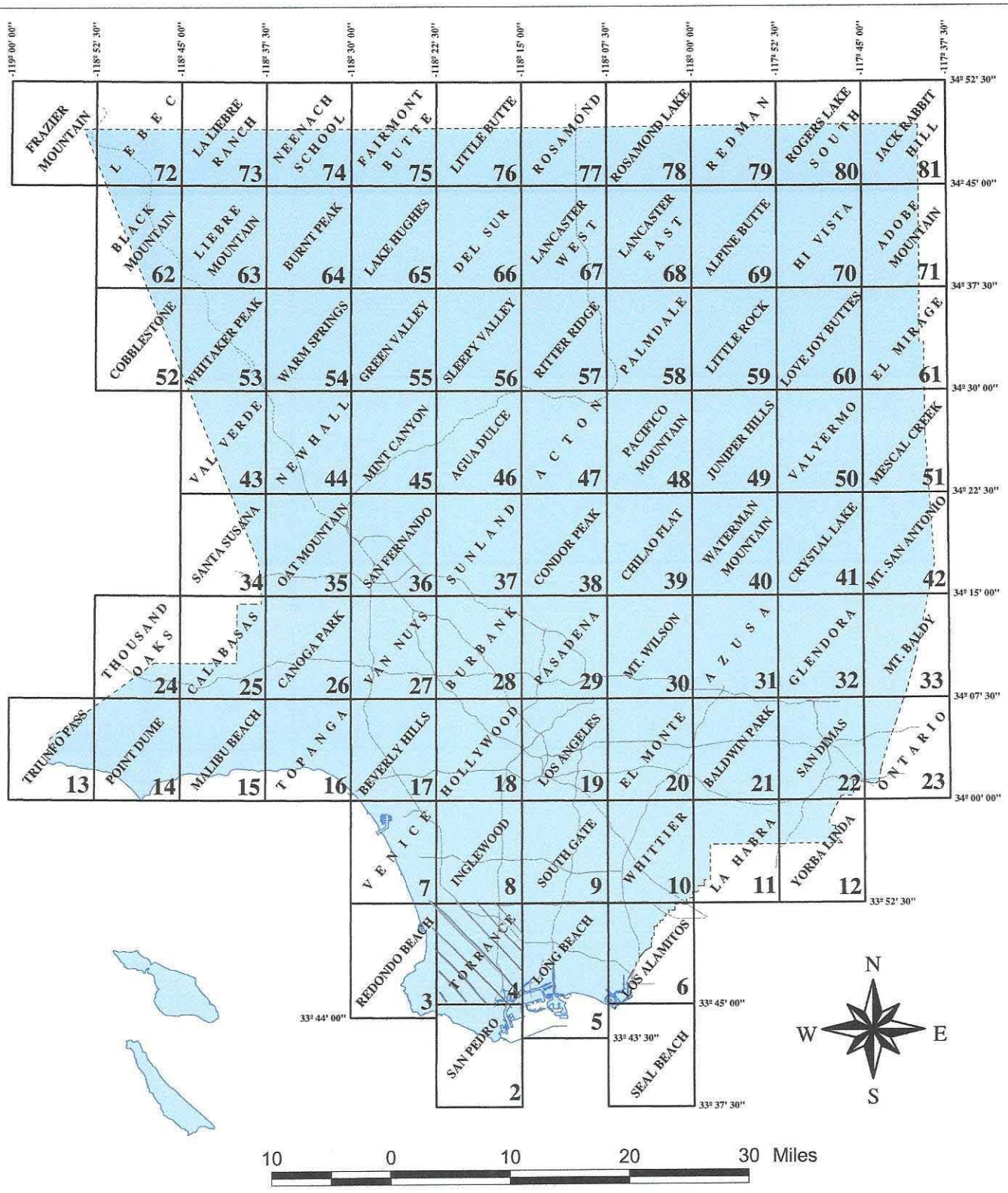
Design Storm Unit Hyetograph

Temporal Distribution of Unit Hyetograph

(Time in minutes, Depth in inches)

Time	Depth	Time	Depth	Time	Depth	Time	Depth
0	0.000000	1110	0.661694	1185	0.863440	1232	0.901435
30	0.011110	1115	0.670680	1186	0.864452	1233	0.902105
60	0.022361	1120	0.680257	1187	0.865450	1234	0.902772
90	0.033758	1125	0.690568	1188	0.866434	1235	0.903434
120	0.045307	1130	0.701824	1189	0.867406	1240	0.906691
150	0.057015	1135	0.714364	1190	0.868366	1245	0.909862
180	0.068889	1136	0.717072	1191	0.869313	1250	0.912954
210	0.080937	1137	0.719860	1192	0.870250	1255	0.915973
240	0.093166	1138	0.722738	1193	0.871175	1260	0.918923
270	0.105586	1139	0.725713	1194	0.872090	1265	0.921810
300	0.118206	1140	0.728799	1195	0.872995	1270	0.924638
330	0.131037	1145	0.746492	1196	0.873889	1275	0.927409
360	0.144090	1150	0.772454	1197	0.874775	1280	0.930129
390	0.157377	1151	0.780923	1198	0.875651	1285	0.932799
420	0.170913	1152	0.800000	1199	0.876518	1290	0.935422
450	0.184711	1153	0.809944	1200	0.877377	1295	0.938000
480	0.198790	1154	0.814358	1201	0.878227	1300	0.940537
510	0.213168	1155	0.817800	1202	0.879069	1305	0.943034
540	0.227865	1156	0.820732	1203	0.879903	1310	0.945492
570	0.242905	1157	0.823335	1204	0.880730	1315	0.947915
600	0.258314	1158	0.825702	1205	0.881549	1320	0.950302
630	0.274121	1159	0.827890	1206	0.882361	1325	0.952657
660	0.290362	1160	0.829936	1207	0.883166	1330	0.954980
690	0.307075	1161	0.831864	1208	0.883964	1335	0.957272
720	0.324307	1162	0.833694	1209	0.884755	1340	0.959535
750	0.342111	1163	0.835440	1210	0.885540	1345	0.961770
780	0.360552	1164	0.837112	1211	0.886318	1350	0.963978
810	0.379705	1165	0.838721	1212	0.887091	1355	0.966159
840	0.399666	1166	0.840272	1213	0.887857	1360	0.968316
870	0.420552	1167	0.841772	1214	0.888618	1365	0.970448
900	0.442511	1168	0.843225	1215	0.889372	1370	0.972558
930	0.465738	1169	0.844636	1216	0.890121	1375	0.974644
960	0.490493	1170	0.846009	1217	0.890865	1380	0.976709
970	0.499144	1171	0.847347	1218	0.891603	1385	0.978752
980	0.508022	1172	0.848652	1219	0.892336	1390	0.980775
990	0.517145	1173	0.849926	1220	0.893064	1395	0.982778
1000	0.526538	1174	0.851172	1221	0.893787	1400	0.984761
1010	0.536225	1175	0.852392	1222	0.894505	1405	0.986726
1020	0.546239	1176	0.853588	1223	0.895218	1410	0.988673
1030	0.556617	1177	0.854760	1224	0.895926	1415	0.990602
1040	0.567402	1178	0.855910	1225	0.896630	1420	0.992514
1050	0.578651	1179	0.857039	1226	0.897330	1425	0.994410
1060	0.590431	1180	0.858149	1227	0.898024	1430	0.996289
1070	0.602830	1181	0.859241	1228	0.898715	1435	0.998152
1080	0.615962	1182	0.860315	1229	0.899401	1440	1.000000
1090	0.629985	1183	0.861372	1230	0.900083		
1100	0.645118	1184	0.862414	1231	0.900761		


Design Storm Unit Hyetograph
Rainfall (Inches)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
500
1000
1500
Time (min)

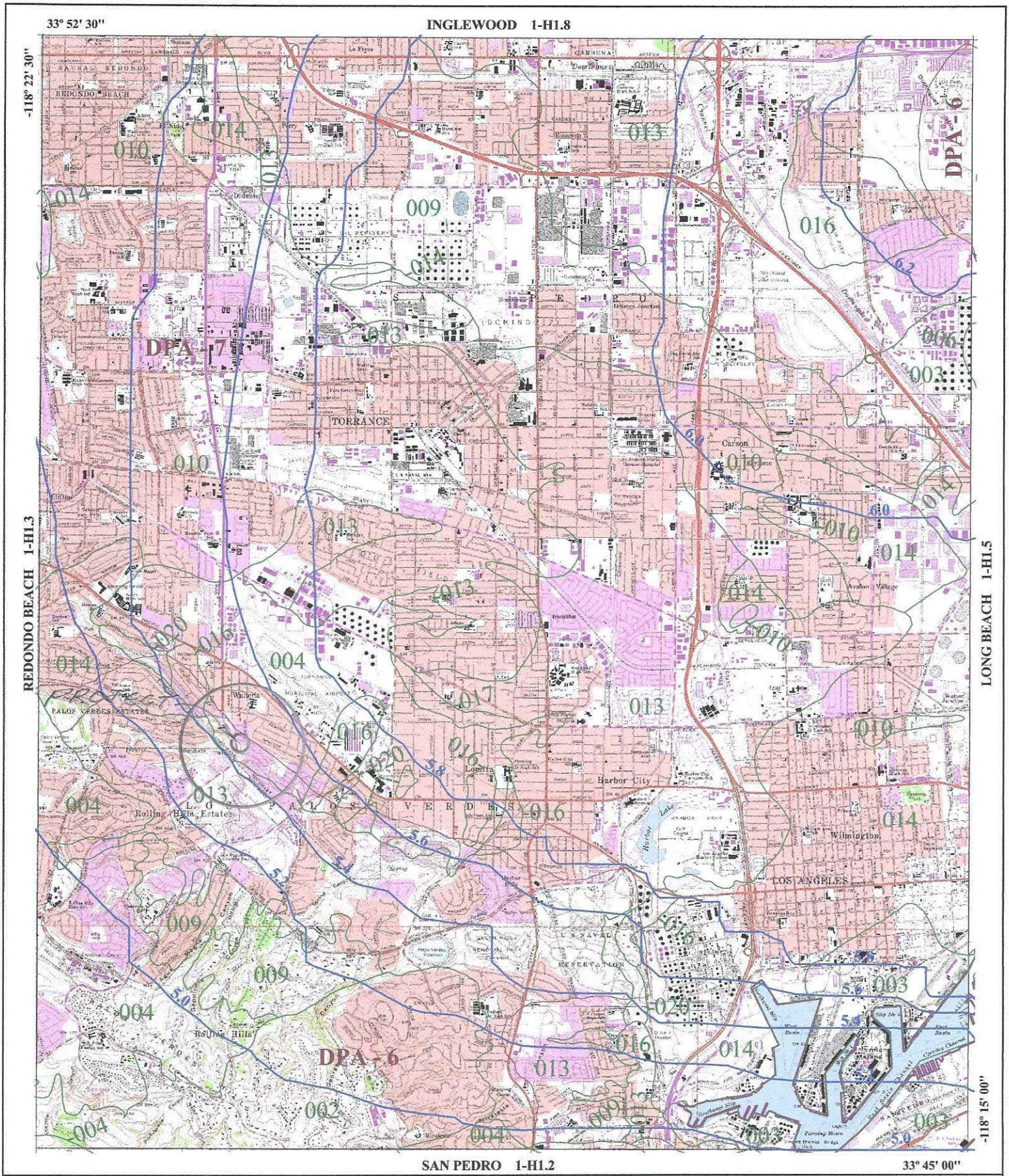


INDEX ISOHYETAL MAP

50-YEAR 24-HOUR ISOHYET

BASED ON USGS QUADRANGLE

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works


33° 52' 30"
INGLEWOOD 1-H1.8
-118° 22' 30"
REDONDO BEACH 1-H1.3
LONG BEACH 1-H1.5
-118° 15' 00"
SAN PEDRO 1-H1.2
33° 45' 00"
DPA - 6
DPA - 7
TORRANCE
Carson
Avalon Village
Harbor City
Lomita
Rolling Hills Estates
PALOS VERDES ESTATES
L O S P A L O S V E R D E S
Wilmington
LOS ANGELES
Rolling Hills
PROTECT
016
SOIL CLASSIFICATION AREA
7.2
INCHES OF RAINFALL
DPA - 6
DEBRIS POTENTIAL AREA
N
W
E
S
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
TORRANCE
50-YEAR 24-HOUR ISOHYET
1-H1.4
LOS ANGELES COUNTY
PUBLIC WORKS
Public Service That Works

APPENDIX C

Soil Type & Runoff Coefficient Data

Soil Identification Table

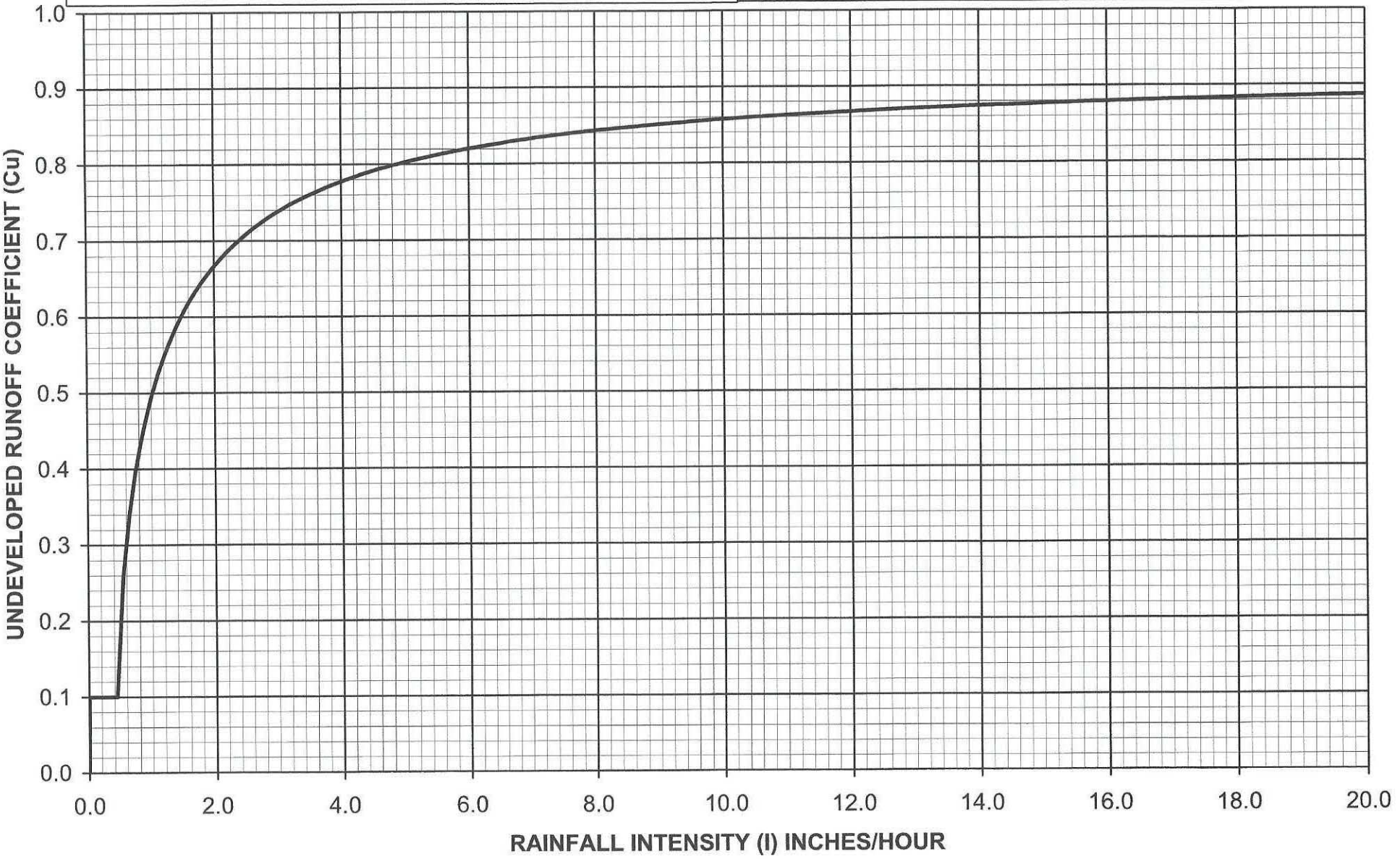
Number	Name	Original Name
2	ALTAMONT CLAY LOAM	A
3	CHINO SILT LOAM	CS-1
4	DIABLO CLAY LOAM	DY
5	HANFORD FINE SANDY LOAM	HF
6	HANFORD FINE SANDY LOAM	HF-1
7	HANFORD GRAVELLY SANDY LOAM	HG
8	HANFORD SILT LOAM	HN
9	MONTEZUMA CLAY ADOBE	M
10	OAKLEY FINE SAND	OS
11	PLACENTIA LOAM	PL
12	RAMONA CLAY LOAM	RC- 1
13	RAMONA LOAM	RO
14	RAMONA SANDY LOAM	RS
15	TUJUNGA FINE SANDY LOAM	TF
16	YOLO LOAM	Y
17	YOLO CLAY LOAM	YC
18	YOLO FINE SANDY LOAM	YF
19	YOLO GRAVELLY SANDY LOAM	YG
20	YOLO SANDY LOAM	YS
21	SANTA MONICA MOUNTAINS	SMM-1
22	SANTA MONICA MOUNTAINS	SMM-2
23	SANTA MONICA MOUNTAINS	SMM-3
24	SANTA MONICA MOUNTAINS	SMM-4
25	SANTA MONICA MOUNTAINS	SMM-5
26	SANTA MONICA MOUNTAINS	SMM-6
27	SANTA MONICA MOUNTAINS	SMM-7
28	SANTA MONICA MOUNTAINS	SMM-8
29	SANTA MONICA MOUNTAINS	SMM-9
30	SANTA MONICA MOUNTAINS	SMM-10
31	SANTA MONICA MOUNTAINS	SMM- 11
32	SANTA MONICA MOUNTAINS	SMM-12
33	SANTA MONICA MOUNTAINS	SMM-13
34	SANTA MONICA MOUNTAINS	SMM-14
35	SANTA MONICA MOUNTAINS	SMM-15
36	SANTA MONICA MOUNTAINS	SMM-16
37	SANTA MONICA MOUNTAINS	SMM- 17
38	SANTA MONICA MOUNTAINS	SMM- 18

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

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. 004



APPENDIX D

Proportion Impervious Data

Proportion Impervious Data

Code	Land Use Description	% Impervious
1111	High-Density Single Family Residential	42
1112	Low-Density Single Family Residential	21
1121	Mixed Multi-Family Residential	74
1122	Duplexes, Triplexes and 2-or 3-Unit Condominiums and Townhouses	55
1123	Low-Rise Apartments, Condominiums, and Townhouses	86
1124	Medium-Rise Apartments and Condominiums	86
1125	High-Rise Apartments and Condominiums	90
1131	Trailer Parks and Mobile Home Courts, High-Density	91
1132	Mobile Home Courts and Subdivisions, Low-Density	42
1140	Mixed Residential	59
1151	Rural Residential, High-Density	15
1152	Rural Residential, Low-Density	10
1211	Low- and Medium-Rise Major Office Use	91
1212	High-Rise Major Office Use	91
1213	Skyscrapers	91
1221	Regional Shopping Center	95
1222	Retail Centers (Non-Strip With Contiguous Interconnected Off-Street	96
1223	Modern Strip Development	96
1224	Older Strip Development	97
1231	Commercial Storage	90
1232	Commercial Recreation	90
1233	Hotels and Motels	96
1234	Attended Pay Public Parking Facilities	91
1241	Government Offices	91
1242	Police and Sheriff Stations	91
1243	Fire Stations	91
1244	Major Medical Health Care Facilities	74
1245	Religious Facilities	82
1246	Other Public Facilities	91
1247	Non-Attended Public Parking Facilities	91
1251	Correctional Facilities	91
1252	Special Care Facilities	74
1253	Other Special Use Facilities	86
1261	Pre-Schools/Day Care Centers	68
1262	Elementary Schools	82
1263	Junior or Intermediate High Schools	82
1264	Senior High Schools	82
1265	Colleges and Universities	47
1266	Trade Schools and Professional Training Facilities	91
1271	Base (Built-up Area)	65
1271.01	Base High-Density Single Family Residential	42
1271.02	Base Duplexes, Triplexes and 2-or 3-Unit Condominiums and T	55

Peak Flow Hydrologic Analysis

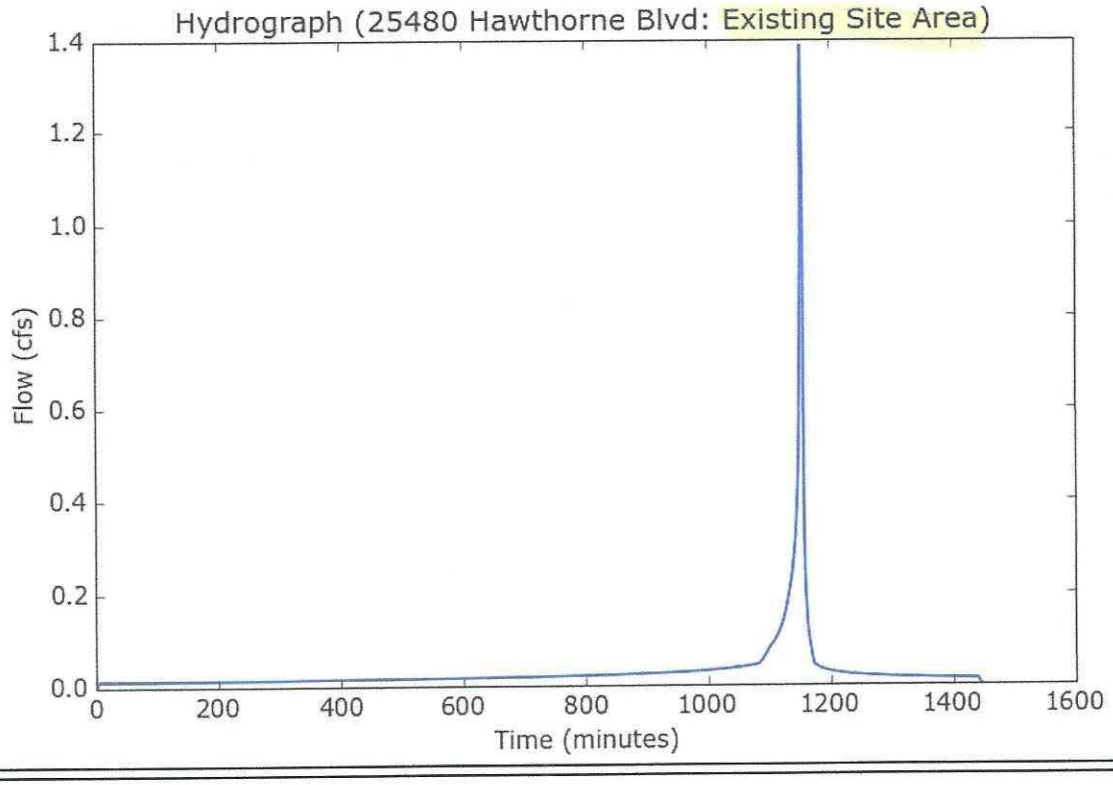
File location: D:/WCTConsultants/Projects/Walteria Townhomes/Hydrology Map/25480 Hawthorne Blvd - Existing Site Area.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	25480 Hawthorne Blvd
Subarea ID	Existing Site Area
Area (ac)	0.566
Flow Path Length (ft)	300.0
Flow Path Slope (vft/hft)	0.04
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.1
Soil Type	4
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	3.2218
Undeveloped Runoff Coefficient (Cu)	0.7455
Developed Runoff Coefficient (Cd)	0.7609
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.3876
Burned Peak Flow Rate (cfs)	1.3876
24-Hr Clear Runoff Volume (ac-ft)	0.0632
24-Hr Clear Runoff Volume (cu-ft)	2754.8335



Peak Flow Hydrologic Analysis

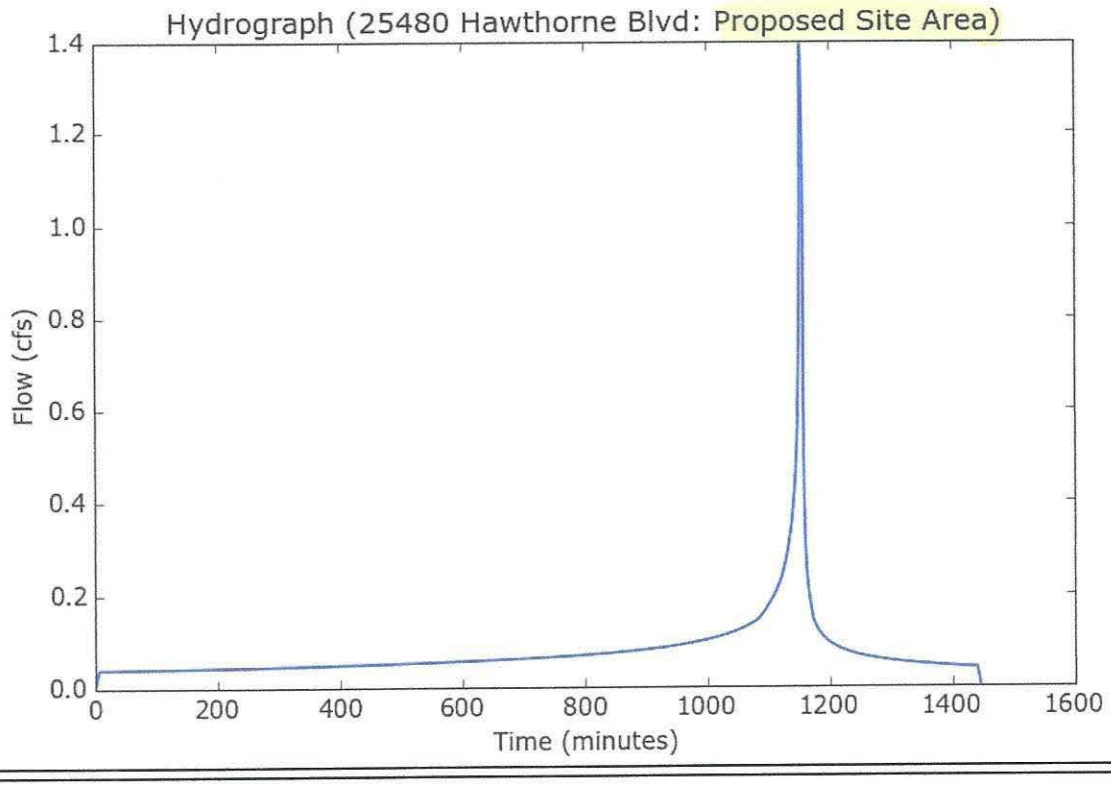
File location: D:/WCTConsultants/Projects/Walteria Townhnomes/Hydrology Map/25480 Hawthorne Blvd - Proposed Site Area.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	25480 Hawthorne Blvd
Subarea ID	Proposed Site Area
Area (ac)	0.566
Flow Path Length (ft)	300.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.6
Soil Type	4
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.9572
Undeveloped Runoff Coefficient (Cu)	0.7318
Developed Runoff Coefficient (Cd)	0.8327
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	1.3938
Burned Peak Flow Rate (cfs)	1.3938
24-Hr Clear Runoff Volume (ac-ft)	0.1544
24-Hr Clear Runoff Volume (cu-ft)	6725.3501



V Gutter Area A2

Project:

Walteria Townhomes
25480 Hawthorne Blvd
Torrance, Ca.

Prepared by:

West Coast Technical Consultants, Inc
1197 E. Los Angeles Ave., C115
Simi Valley, Ca. 93065

Drainage "A2" (Existing)
Existing Conc. Swale

Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	0.0800 cfs
Slope	0.0100 ft/ft
Manning's n	0.0130
Height	6.0000 ft
Bottom width	0.0000 ft
Left slope	0.3300 ft/ft (V/H)
Right slope	0.3300 ft/ft (V/H)

Computed Results:

Depth	0.1236 ft
Velocity	1.7267 fps
Full Flowrate	2505.9980 cfs
Flow area	0.0463 ft2
Flow perimeter	0.7891 ft
Hydraulic radius	0.0587 ft
Top width	0.7494 ft
Area	109.0909 ft2
Perimeter	38.2925 ft
Percent full	2.0608 %

Critical Information

Critical depth	0.1341 ft
Critical slope	0.0065 ft/ft
Critical velocity	1.4686 fps
Critical area	0.0545 ft2
Critical perimeter	0.8557 ft
Critical hydraulic radius	0.0637 ft
Critical top width	0.8126 ft
Specific energy	0.1700 ft
Minimum energy	0.2011 ft
Froude number	1.2243
Flow condition	Supercritical

4_Inch Area B1_Proposed

Project:

Walteria Townhomes
25480 Hawthorne Blvd
Torrance, Ca.

Prepared by:

West Coast Technical Consultants, Inc
1197 E. Los Angeles Ave., C115
Simi Valley, Ca. 93065

Drainage "B1" (Proposed)
4" Outlet to HHawthorne Blvd

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	0.3300 ft
Flowrate	0.1900 cfs
Slope	0.0200 ft/ft
Manning's n	0.0100

Computed Results:

Depth	0.1762 ft
Area	0.0855 ft2
Wetted Area	0.0464 ft2
Wetted Perimeter	0.5407 ft
Perimeter	1.0367 ft
Velocity	4.0912 fps
Hydraulic Radius	0.0859 ft
Percent Full	53.3789 %
Full flow Flowrate	0.3406 cfs
Full flow velocity	3.9826 fps

Critical Information

Critical depth	0.2530 ft
Critical slope	0.0065 ft/ft
Critical velocity	2.6459 fps
Critical area	0.0718 ft2
Critical perimeter	0.6944 ft
Critical hydraulic radius	0.1034 ft
Critical top width	0.3300 ft
Specific energy	0.4363 ft
Minimum energy	0.3795 ft
Froude number	1.9227
Flow condition	Supercritical

3x12 Box Area B2_Proposed

Project:

Walteria Townhomes
25480 Hawthorne Blvd
Torrance, Ca.

Prepared by:

West Coast Technical Consultants, Inc
1197 E. Los Angeles Ave., C115
Simi Valley, Ca. 93065

Drainage "B2" (Proposed)
3" x 12" Box Culvert outlets to Hawthorne Blvd.

Manning Pipe Calculator

Given Input Data:

Shape	Rectangular
Solving for	Depth of Flow
Height	0.2500 ft
Width	1.0000 ft
Flowrate	0.2600 cfs
Slope	0.0200 ft/ft
Manning's n	0.0100

Computed Results:

Depth	0.0759 ft
Area	0.2500 ft2
Wetted Area	0.0759 ft2
Wetted Perimeter	1.1517 ft
Perimeter	2.5000 ft
Velocity	3.4275 fps
Hydraulic Radius	0.0659 ft
Percent Full	30.3432 %
Full flow Flowrate	1.1319 cfs
Full flow velocity	4.5276 fps

Critical Information

Critical depth	0.1281 ft
Critical slope	0.0039 ft/ft
Critical velocity	2.0300 fps
Critical area	0.1281 ft2
Critical perimeter	1.2562 ft
Critical hydraulic radius	0.1020 ft
Critical top width	1.0000 ft
Specific energy	0.2584 ft
Minimum energy	0.1921 ft
Froude number	2.1939
Flow condition	Supercritical

3x12 Box Area B3_Proposed

Project:

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Drainage "B3" (Proposed)
3" x 12" Box Culvert outlets to Hawthorne Blvd.

Manning Pipe Calculator

Given Input Data:

Shape	Rectangular
Solving for	Depth of Flow
Height	0.2500 ft
Width	1.0000 ft
Flowrate	0.5600 cfs
Slope	0.0200 ft/ft
Manning's n	0.0100

Computed Results:

Depth	0.1241 ft
Area	0.2500 ft2
Wetted Area	0.1241 ft2
Wetted Perimeter	1.2483 ft
Perimeter	2.5000 ft
Velocity	4.5110 fps
Hydraulic Radius	0.0994 ft
Percent Full	49.6567 %
Full flow Flowrate	1.1319 cfs
Full flow velocity	4.5276 fps

Critical Information

Critical depth	0.2136 ft
Critical slope	0.0039 ft/ft
Critical velocity	2.6216 fps
Critical area	0.2136 ft2
Critical perimeter	1.4272 ft
Critical hydraulic radius	0.1497 ft
Critical top width	1.0000 ft
Specific energy	0.4404 ft
Minimum energy	0.3204 ft
Froude number	2.2571
Flow condition	Supercritical