HYDROLOGY STUDY

For

Century Aero Club

Psomas Project No.: 1MUR010500
May 7, 2008

Prepared for:

Castle & Cooke
7415 Hayvenhurst Place
Van Nuys, CA 91406
Telephone: (818) 988-8385

Prepared by:

PSOMAS
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Andrew Nickerson, P.E. R.C.E. No. C56808 Date **05-07-08**

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1.0 PROJECT SUMMARY

1.1 PROJECT PURPOSE AND SCOPE

The purpose of this study is to demonstrate that the proposed project site can be designed to provide adequate flood protection for on-site improvements without adversely impacting existing off-site drainage facilities or adjacent properties.

Psomas has been retained by Castle & Cooke to prepare a hydrology report for the proposed Century Aero Club Project. The 1.97-acre project site is located at the Van Nuys Airport in the City of Van Nuys. The study area is bordered by Hayvenhurst Avenue and Hayvenhurst Place to the south and west of the airport. To the south are existing airport facilities such as an airport tower and a parking lot area. To the north of the site are two metal hangers. The scope of this project is to remove the existing metal hangers, shed and one-story building and replace them with asphalt-concrete pavement and landscaping.

1.2 HYDROLOGIC ANALYSIS

In order to determine the appropriate design flows to be utilized to study the adequacy of the existing drainage facilities, the existing onsite area was divided into three sub-areas. Proposed grading of the site was designed to match the existing conditions by dividing the site into the same 3 sub-areas.

The hydrologic methods used in this study were based on procedures described in the Los Angeles County Department of Public Works Hydrology Manual. The methods used are the "Rational Method" (for sub-area time of concentration computation) and the "Modified Rational Method" (for flow routing through the drainage watershed and runoff computation using sub-area times of concentration computed by the Rational Method).

The *LACDPW TC (TC_calc_depth.xls, July 2004)* program was used to calculate the time of concentration and peak runoff flow rate for the existing and proposed conditions. Tc calculations are provided in Section 2.

The Century Aero Club project is located in County of Los Angeles and in the Van Nuys quadrant of Isohyetal Map figure LACDPW 1-H1.27, in Appendix 1. The 50-year 24-hour rainfall Isohyet nearest the project area is 7.3.

The soil of the watershed is classified as Type 018, as shown on figure LACDPW 1-H1.27, in Appendix 1. The project area to be disturbed is 1.97 acres in size. The total tributary watershed area to be studied is 2.56 acres in size.

1.3 EXISTING AND PROPOSED DRAINAGE CONDITIONS

EXISTING DRAINAGE CONDITIONS

The exising site is located in a predominantly impervious area. Located on-site are two corrugated metal hangars measuring approxiamely 14,000 square-feet and 1,800 square-feet. Other structures located are three one-story buildings and a metal shed. On the east side of the 14,000 square-feet metal hangar exist a 3,400 square-feet strip of grass. Other pervious area such as plants and trees are planted next to the existing buildings. The remainder of the site is impervious open space. The open space is occupied by parking spaces for both automobiles and small airplanes. Located to the east and north is an offsite area, the 0.59 acre tributary area is the airport's taxiway, the east half of a hangar and a parking area . This areas will contribute potential offsite flow onto the project site.

There are no major existing storm drain structures located on the project site. One structure, an inlet basin, is located northwest to the 14,000 square-feet hangar. Water tributary to this basin is collected and discharged into Hayvenhurst Avenue. To the west, water will sheet flow southerly and discharge into an offsite catch basin connected to a 57" storm drain located adjacent to Hayvenhurst Avenue and Hayvenhurst Place. Storm water from the off-site area will flow off the taxiway and onto the project site where it joins into an impervious swale.

The watershed of the existing condition divides into three sub-basins as identified in the Existing Hydrology Map located in Appendix A. Existing condition hydrology results for the 50-year storm events are summarized in Table 1 below.

Table 1: Existing Condition Hydrology Summary

% Impervious	Sub area	Area (ac)	50-Year Storm Events Q_{50} (cfs)
92	5A	1.03	3.26
95	10A	0.07	0.27
95	15A	0.52	1.81
85	5B	0.60	2.20
95	5C	0.34	1.29
	Total	2.56	8.83

PROPOSED DRAINAGE CONDITIONS

Future site development will consist of a parking area paved to match the existing overall flow charactersitics. Designated throughout the perimeter of the site will consist of landscaping and parking areas. The landscaping areas will be used to clean and detain storm water coming off the site.

Proposed condition hydrology results for the 50-year storm events are summarized in Table 2 below.

Table 2: Proposed Condition Hydrology Summary

% Impervious	Sub area	Area (ac)	50-Year Storm Events
			Q_{50} (cfs)
99	5A	0.98	3.24
95	10A	0.07	0.27
95	15A	0.52	1.81
92	5B	0.57	2.14
93	5C	0.42	1.57
	Total	2.56	9.03

Water Quality- Stormwater Treatment:

Structural or Treatment Control Best Management Practices (BMPs) are required for this project under the LA County Standard Urban Stormwater Mitigation Plan (SUSMP). Volume-based or flow-based design standards may be used separately or in combination. Volume-based criteria are used in the sizing of detention or infiltration structures while flow-based criteria are used on swales, catch basin devices or wetlands. The SUSMP requirements, approved by the Regional Water Quality Control Board, call for the treatment of the peak mitigation flow rate or volume of runoff produced by a 0.75" 24-hr rainfall event.
For this project, we propose to use infiltration to treat the runoff.

Water sheet flowing from the pavement, parking lots or pedestrian walk areas will flow southerly and discharge into the landscaping areas before leaving the site. The landscaped areas will be used as a primary means of cleaning the storm water. For the details of this system, a Water Quality Mitigation Plan will be used to comply with the water quality.

1.4 CONCLUSIONS

The hydrology calculations demonstrate that overall the Century Aero Club site will not need to detain runoff coming off the site. Only the sub-area designated as 5C will need to detain approximately 0.009 ac-ft. of water. This will be accomplished by a swale located east of Hayvenhurst Avenue. This additional flow is mainly due to the increase of surface area to basin 5C. Overall, the project will discharge 0.20 cfs of more storm water from the site when compared to the existing condition. The following table summarizes the calculated flow rates and allowable discharge rates:

Table 3 – Existing vs. Proposed Condition Hydrology Comparison Summary:

50-Year Storm Events						
Drainage Area	**Area (ac)**	**Area (ac)**	**Q_{50} (cfs)**	**Q_{50} (cfs)**	**Difference-50yr (cfs)**	**Required Detention-50yr (ac-ft)**
	Exist.	**Prop.**	**Exist.**	**Prop.**		
A Total	1.62	1.54	5.34	5.32	-0.02	0
5B	0.60	0.57	2.20	2.14	-0.06	0
5C	0.34	0.42	1.29	1.57	0.28	0.009
Total	2.56	2.56	8.83	9.03	0.20	--

1.5 LIMITATIONS

- This report was prepared to comply with the guidelines established by the Los Angeles County Department of Public Works and their representatives. Evaluation of the appropriateness of these guidelines and the accuracy of County data was beyond the scope of this work.

- Usage of this report is limited to address the purpose and scope previously defined by the project owner. Psomas shall not be held responsible for any unauthorized application of this report and the contents herein.

- The opinions presented in this report have been derived in accordance with current standards of civil engineering practice. No other warranty is expressed or implied.

Section 2.0

RATIONAL METHOD Tc CALCULATIONS

Century Aero Club
Existing 50-yr Storm

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
CAC	5A	1.03	0.92	50	18	580	0.0085	7.3	7	3.72	0.26	0.85	3.26
CAC	10A	0.07	0.95	50	18	40	0.0067	7.3	5	4.36	0.34	0.87	0.27
CAC	15A	0.52	0.95	50	18	490	0.008	7.3	6	4	0.3	0.87	1.81
CAC	5B	0.6	0.9	50	18	285	0.0128	7.3	5	4.36	0.34	0.84	2.2
CAC	5C	0.34	0.95	50	18	215	0.00756	7.3	5	4.36	0.34	0.87	1.29

Century Aero Club
Proposed 50-yr Storm

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
CAC	5A	0.98	0.98	50	18	590	0.0083	7.3	7	3.72	0.26	0.89	3.24
CAC	10A	0.07	0.95	50	18	40	0.0067	7.3	5	4.36	0.34	0.87	0.27
CAC	15A	0.52	0.95	50	18	490	0.008	7.3	6	4	0.3	0.87	1.81
CAC	5B	0.57	0.92	50	18	305	0.0133	7.3	5	4.36	0.34	0.86	2.14
CAC	5C	0.42	0.93	50	18	270	0.0085	7.3	5	4.36	0.34	0.86	1.57

Section 3.0

MODIFIED RATIONAL METHOD CALCULATIONS

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\civild\lar_soilx_71.dat

CENTURY AERO CLUB SUBAREA A PROPOSED 50-YEAR HYDROLOGY STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.4	1.48	.4	1.48	2	270.	.00850	.00	.00	0.	18	5	A36	.93
1	2AF	.0	.18	.4	1.00	0	0.	.00000	.00	.00	1.	18	0	A36	.00
1	3F	.0	.00	.0	.18	0	0.	.00000	.00	.00	0.	18	99	A36	.00
1	4A	.0	.00	.4	1.00	0	0.	.00000	.00	.00	0.	18	99	A36	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:

DETENTION BASIN HYDROGRAPH

HYDROGRAPH AT 1 3F STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.00	200	.00	300	.00	400	.00
500	.00	600	.00	700	.00	800	.00	900	.00
1000	.00	1050	.00	1100	.00	1110	.00	1120	.00
1130	.00	1131	.00	1132	.00	1133	.00	1134	.00
1135	.00	1136	.00	1137	.00	1138	.00	1139	.00
1140	.00	1141	.00	1142	.00	1143	.00	1144	.00
1145	.00	1146	.00	1147	.00	1148	.00	1149	.00
1150	.00	1151	.00	1152	.00	1153	.00	1154	.00
1155	.05	1156	.16	1157	.18	1158	.13	1159	.04
1160	.00	1161	.00	1162	.00	1163	.00	1164	.00
1165	.00	1166	.00	1167	.00	1168	.00	1169	.00
1170	.00	1171	.00	1172	.00	1173	.00	1174	.00
1175	.00	1176	.00	1177	.00	1178	.00	1179	.00
1180	.00	1181	.00	1182	.00	1183	.00	1184	.00
1185	.00	1186	.00	1187	.00	1188	.00	1189	.00
1190	.00	1191	.00	1192	.00	1193	.00	1194	.00
1195	.00	1196	.00	1197	.00	1198	.00	1199	.00
1200	.00	1201	.00	1202	.00	1203	.00	1204	.00
1205	.00	1206	.00	1207	.00	1208	.00	1209	.00
1210	.00	1211	.00	1212	.00	1213	.00	1214	.00
1215	.00	1216	.00	1217	.00	1218	.00	1219	.00
1220	.00	1221	.00	1222	.00	1223	.00	1224	.00
1225	.00	1226	.00	1227	.00	1228	.00	1229	.00
1230	.00	1231	.00	1232	.00	1233	.00	1234	.00
1235	.00	1236	.00	1237	.00	1238	.00	1239	.00
1240	.00	1241	.00	1242	.00	1243	.00	1244	.00
1245	.00	1246	.00	1247	.00	1248	.00	1249	.00
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1265	.00	1266	.00	1267	.00	1268	.00	1269	.00
1270	.00	1271	.00	1272	.00	1273	.00	1274	.00
1275	.00	1276	.00	1277	.00	1278	.00	1279	.00
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1350	.00	1360	.00	1370	.00	1380	.00	1390	.00
1400	.00	1420	.00	1440	.00	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .00(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:

OUTLET HYDROGRAPH

HYDROGRAPH AT 1 4A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.00	200	.00	300	.00	400	.00
500	.00	600	.00	700	.00	800	.00	900	.10
1000	.12	1050	.15	1100	.19	1110	.21	1120	.25
1130	.29	1131	.29	1132	.30	1133	.30	1134	.31
1135	.31	1136	.32	1137	.33	1138	.34	1139	.35
1140	.36	1141	.37	1142	.38	1143	.39	1144	.40
1145	.42	1146	.43	1147	.45	1148	.47	1149	.50
1150	.52	1151	.57	1152	.65	1153	.76	1154	.90
1155	1.00	1156	1.00	1157	1.00	1158	1.00	1159	1.00
1160	.92	1161	.78	1162	.67	1163	.58	1164	.51
1165	.45	1166	.41	1167	.37	1168	.34	1169	.32
1170	.30	1171	.28	1172	.26	1173	.25	1174	.24
1175	.23	1176	.22	1177	.21	1178	.21	1179	.20
1180	.20	1181	.19	1182	.19	1183	.18	1184	.18
1185	.18	1186	.17	1187	.17	1188	.17	1189	.16
1190	.16	1191	.16	1192	.15	1193	.15	1194	.15
1195	.15	1196	.15	1197	.14	1198	.14	1199	.14
1200	.14	1201	.14	1202	.14	1203	.13	1204	.13
1205	.13	1206	.13	1207	.13	1208	.13	1209	.12
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1225	.11	1226	.11	1227	.11	1228	.11	1229	.11
1230	.11	1231	.11	1232	.10	1233	.10	1234	.10
1235	.10	1236	.10	1237	.10	1238	.10	1239	.10
1240	.10	1241	.10	1242	.10	1243	.10	1244	.10
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1250	.10	1251	.10	1252	.10	1253	.10	1254	.10
1255	.10	1256	.10	1257	.10	1258	.10	1259	.10
1260	.10	1261	.10	1262	.10	1263	.10	1264	.10
1265	.10	1266	.10	1267	.10	1268	.10	1269	.10
1270	.10	1271	.00	1272	.00	1273	.00	1274	.00
1275	.00	1276	.00	1277	.00	1278	.00	1279	.00
1280	.00	1281	.00	1282	.00	1283	.00	1284	.00
1285	.00	1286	.00	1287	.00	1288	.00	1289	.00
1290	.00	1291	.00	1292	.00	1293	.00	1294	.00
1295	.00	1296	.00	1297	.00	1298	.00	1299	.00
1300	.00	1310	.00	1320	.00	1330	.00	1340	.00
1350	.00	1360	.00	1370	.00	1380	.00	1390	.00
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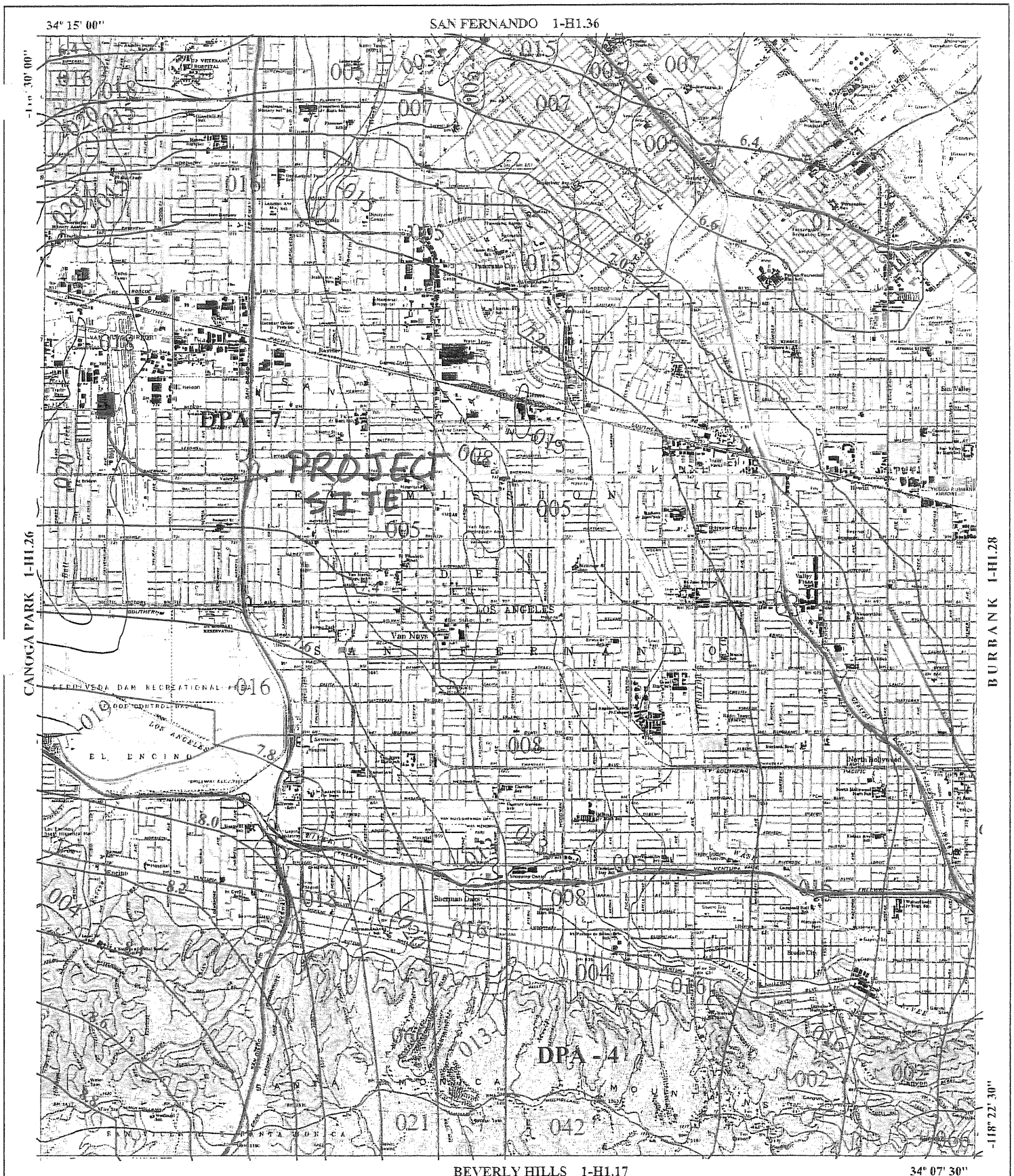
Section 4.0

LACDPW ISOHYET/SOILS MAPS



N
W E
S

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

1 0 1 2 Miles

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

VAN NUYS
50-YEAR 24-HOUR ISOHYET

1-H1.27

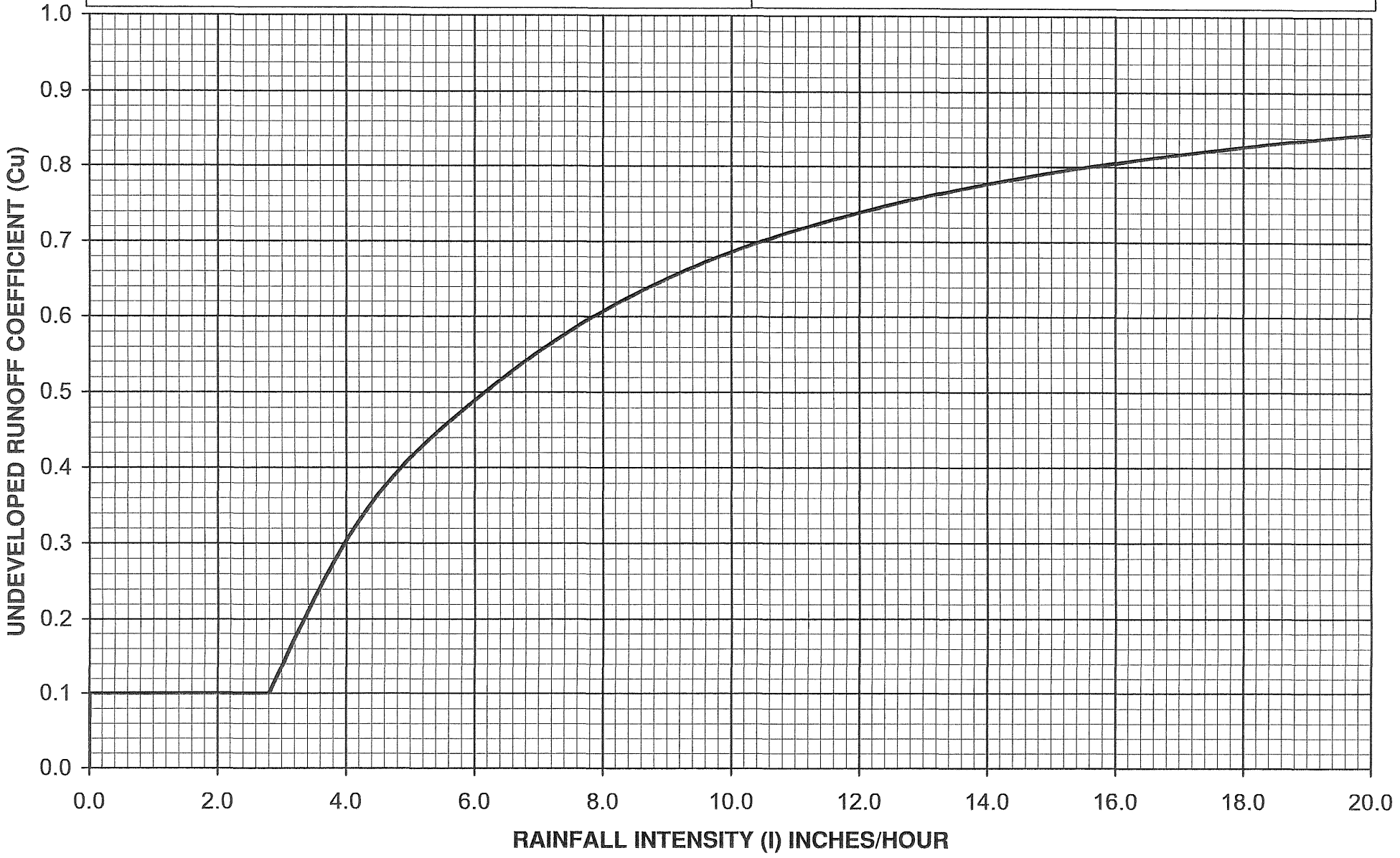
LOS ANGELES COUNTY PUBLIC WORKS
Public Service That Works

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

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

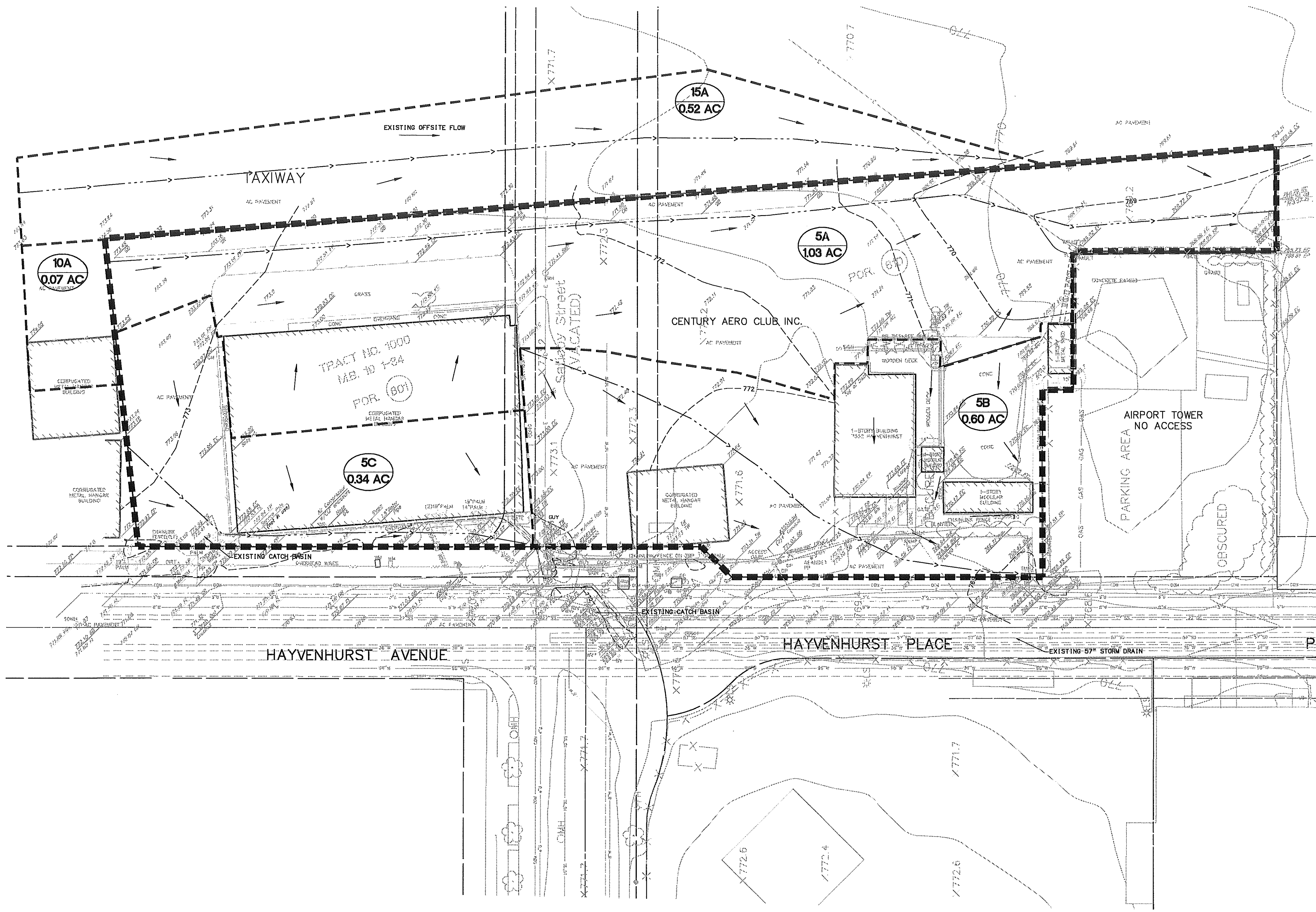
Los Angeles County Department of Public Works

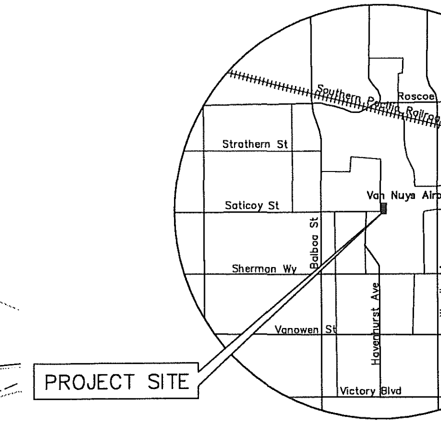
RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 018



Appendix A

EXHIBITS (EXISTING & PROPOSED DRAINAGE MAPS





VICINITY MAP

JOB ADDRESS:

7552-7614 HAYVENHURST AVENUE
VAN NUYS, CA 91406

OWNER / DEVELOPER:

CASTLE & COOKE
7415 HAYVENHURST PLACE
VAN NUYS, CA 91406

ATTN: ROSS YOUNG

CIVIL ENGINEER:

PSOMAS
555 SOUTH FLOWER ST., STE. 4400
LOS ANGELES, CA 90071

TELEPHONE: 213/223-1400

LEGEND / HYDROLOGIC DATA

PROJECT BOUNDARY (LIMIT OF CONSTRUCTION)

DRAINAGE AREA BOUNDARY

DRAINAGE SUB-AREA BOUNDARY

5A 4.09 AC — SUB-AREA DESIGNATION AND ACREAGE

DRAINAGE FLOW PATH

STORM FREQUENCY: 50 YEAR

PREDOMINANT SOIL TYPE: 018

LAND USE: COMMERICIAL

RAINFALL: 7.3 INCHES

GRAPHIC SCALE
SCALE: 1" = 20'

SEAL: REGISTERED PROFESSIONAL ENGINEER ANDREW A. NICKERSON No. C056808 Exp. 06-30-09 CIVIL STATE OF CALIFORNIA

DESIGNED SK
DRAFTED SK
CHECKED AN

REV	DATE	DESCRIPTION	BY	APP'D

BENCHMARK CITY OF LOS ANGELES BENCHMARK 07-18550
WIRE SPK IN N CURB SATICOY ST;
11FT W OF BC CURB RETURN W OF HAVENHURST AVE;
6.5FT W OF CULV OUTLET
ELEV. 771.554 FEET ADJUSTMENT 1980 (NGVD29)
PATH/PLOT DATE

PSOMAS
555 South Flower Street, Suite 4400
Los Angeles, CA 90071
(213) 223-1400 (213) 223-1444 (FAX)

ANDREW NICKERSON RCE NO. C056808 DATE

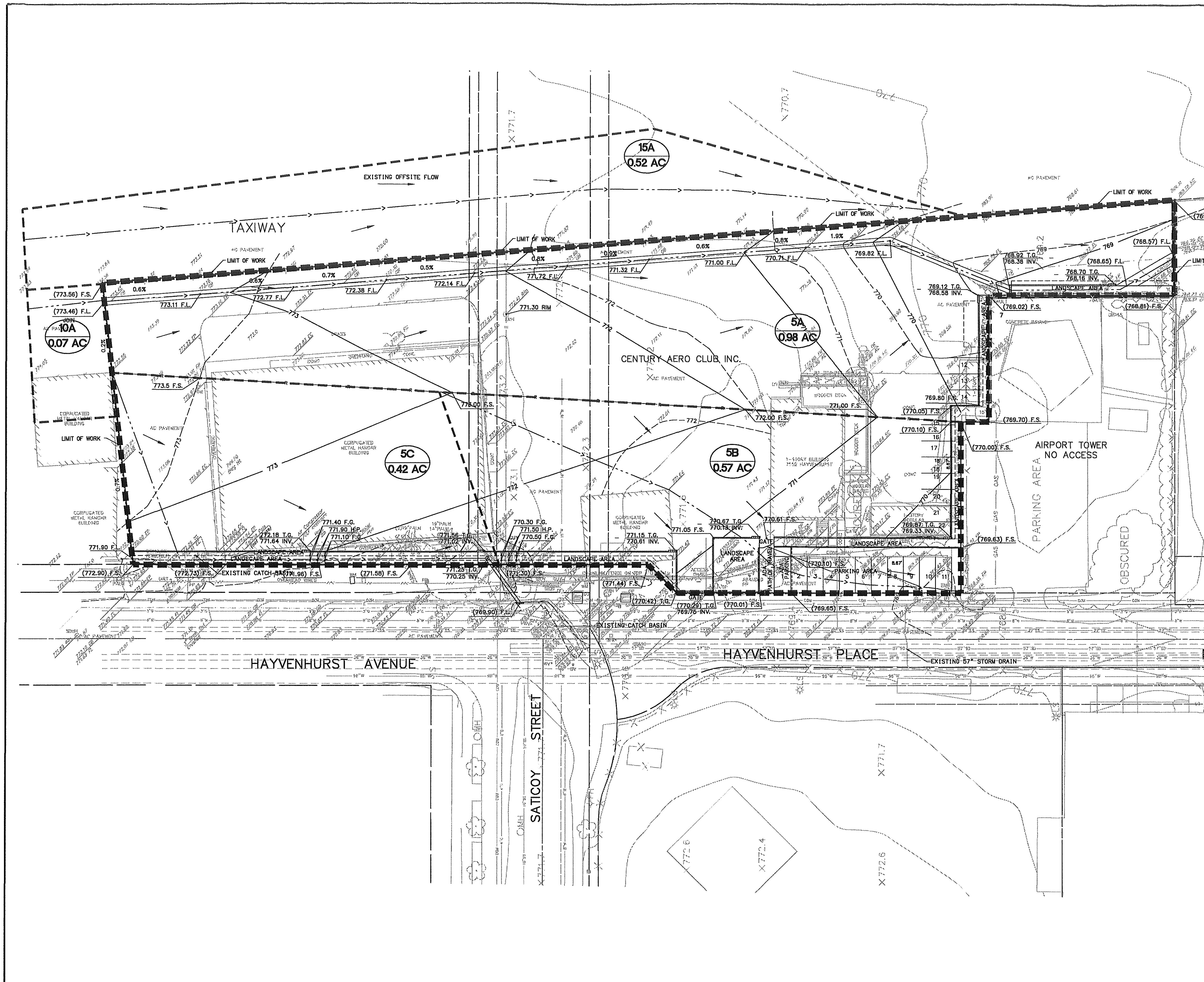
CASTLE & COOKE AVIATION SERVICES, INC.

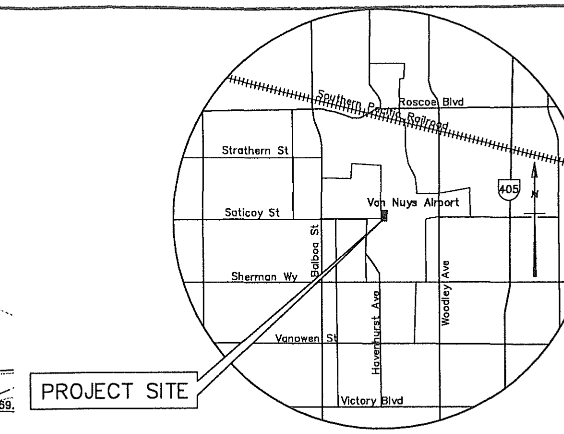
CENTURY AERO CLUB SITE - VAN NUYS AIRPORT

EXISTING HYDROLOGY

IN THE CITY OF LOS ANGELES COUNTY OF LOS ANGELES STATE OF CALIFORNIA

DATE: MAY 2, 2008
SCALE: 1" = 20'
PROJECT NUMBER: 1MUR0105
SHEET 1 OF 2





VICINITY MAP

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7552-7614 HAYVENHURST AVENUE
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VAN NUYS, CA 91406

ATTN: ROSS YOUNG

CIVIL ENGINEER:
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LOS ANGELES, CA 90071

TELEPHONE: 213/223-1400

LEGEND / HYDROLOGIC DATA

- PROJECT BOUNDARY (LIMIT OF CONSTRUCTION)
- DRAINAGE AREA BOUNDARY
- DRAINAGE SUB-AREA BOUNDARY
- 5A 4.09 AC — SUB-AREA DESIGNATION AND ACREAGE
- DRAINAGE FLOW PATH

STORM FREQUENCY: 50 YEAR
PREDOMINANT SOIL TYPE: 018
LAND USE: COMMERICIAL
RAINFALL: 7.3 INCHES

GRAPHIC SCALE
SCALE: 1" = 20'

REGISTERED PROFESSIONAL ENGINEER ANDREW K. NICKERSON No. C056808 Exp. 06-30-09 CIVIL STATE OF CALIFORNIA

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DRAFTED SK
CHECKED AN

BENCHMARK CITY OF LOS ANGELES BENCHMARK 07-18550
WIRE SPK IN N CURB SATICOY ST;
11FT W OF BC CURB RETURN W OF HAVENHURST AVE;
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ANDREW NICKERSON RCE NO. C056808 DATE

CASTLE & COOKE AVIATION SERVICES, INC.
CENTURY AERO CLUB SITE - VAN NUYS AIRPORT
PROPOSED HYDROLOGY
IN THE CITY OF LOS ANGELES COUNTY OF LOS ANGELES STATE OF CALIFORNIA

DATE MAY 2, 2008
SCALE 1" = 20'
PROJECT NUMBER 1MUR0105
SHEET 2 OF 2