HYDROLOGY AND HYDRAULIC CALCULATIONS

FOR

TENTATIVE PARCEL MAP 67341
2740 LOMITA BOULEVARD
TORRANCE , CALIFORNIA 90505

PREPARED FOR:

ROCKEFELLER GROUP PROFFESSIONAL CENTER
13120 TELFAIR AVENUE
SYLMAR, CALIFORNIA 91342

July 16, 2008
Revised September 9, 2008
Revised September 18, 2008
Revised December 9, 2008

JOB NO. 2746

PREPARED BY:

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HYDROLOGY AND HYDRAULIC CALCULATIONS

FOR

TENTATIVE PARCEL MAP 67341

PREPARED BY BRIAN WEIL
UNDER THE SUPERVISION OF

REGISTERED PROFESSIONAL ENGINEER
HAIDOOK I. AGHAIAN
No. 043293
Exp: 3/31/10
CIVIL
STATE OF CALIFORNIA

Haidook Aghaian 2/19/09

HAIDOOK I. AGHAIAN DATE:
R.C.E. 43293
EXP. 03/31/08

INTRODUCTION

A: PROJECT LOCATION

The project site is located at the south-east of intersection Lomita Boulevard and Garnier Street in the City of Torrance. Please see Figure 1 for Vicinity Map.

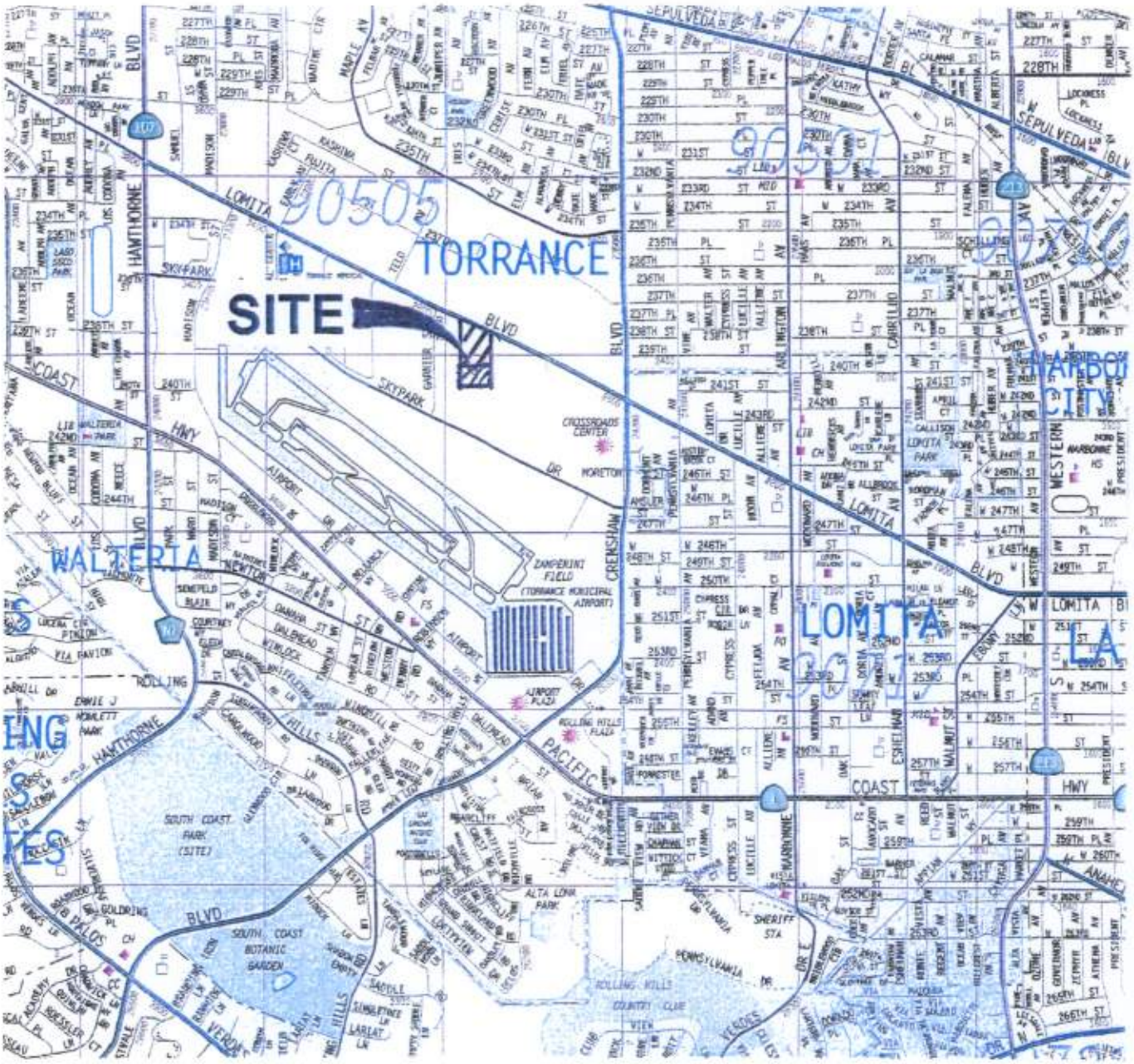
B: STUDY PURPOSE

The purpose of this study is to determine an approximate 50-year peak flow rate, and design storm drain system with on-site retention structures to meet with downstream requirements. Also included are calculations for the proposed realignment of an existing storm drain through the project site.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Brian Weil



VICINITY MAP

DISCUSSION

Project Description

The project site (T.P.M 67341-Parcel 1, 2 and 3) encompasses approximately 23.5 acres. Parcel 1 (Phase I) is located westerly and is bounded by the Costco site to the south, Parcel 2 and 3 (Phase II) to the east, and Lomita Blvd. to the north. Phase I will be constructed as a business park with eleven separate office buildings, covering approximately 234,300 square feet. Phase II is located easterly and is bounded by Costco site to the south, Lomita Blvd., to the north and Phase I to the west. Proposed improvements to the Phase II site consist of the construction of 6 industrial buildings, covering approximately 80,600 square feet. There will be landscaped areas adjacent to the street. The remainder of the site will be paved for vehicle parking. There is no proposed subterranean parking or garages for the project site.

Existing Conditions

The project site is currently vacant open space. The majority of the site generally drains east and south east, to existing field inlet openings that drains directly to an existing private 36" RCP. The existing 36" RCP drains south, crossing project property line, then continues south through the existing COSTCO site. Runoff from the Project Site and Costco Site ultimately drain to an existing 54" RCP located on Skypark Drive. The entire watershed area contributing discharges to the proposed and existing 36" RCP is 42.8 Ac. (see Fig. 2 in Appendix "A").

A previous study for the COSTCO site was prepared by Fuscoe Engineering and was approved in October of 1997. This study concluded that allowable discharge to the existing County storm drain in Skypark Drive would be 52.6 cfs for the tributary area of 42.8 acres (1.23 cfs/acre). This corresponds to a Q5 storm event. The Fuscoe study determined that 9,906 cubic feet of storage would be required to detain the difference in the Q50 and the allowable peak flow rate. This volume appears to be from a hydrograph that was calculated using the entire drainage area under existing conditions (assuming undeveloped conditions for the area north of COSTCO). Then, the peak flow rate in excess of 52.6 cfs was summed up to get the stated volume of 9,906 cubic feet. It is unclear from the Fuscoe report how much detention is required for the COSTCO site only or if the entire 9,906 cubic feet is detained on the COSTCO site or if additional detention is required on the offsite areas.

Please see Appendices "D", "E", & "F" for portions of the Approved COSTCO hydrology.

Proposed Condition and Hydrology

The current Site will be rough graded and prepared for construction of the new commercial buildings. The Site will generally maintain the existing drainage patterns. Original discharges allowed under proposed condition for Project Site were presented in approved Hydrology Study by Fuscoe Engineering dated October 15, 1997 (please see Appendix "D").

Currently Thienes Engineering Inc., is proposing to relocate the existing private 36" RCP on lots 2 and 3 TPM 67341 to be closer to property lines to maximize buildings space layout (please see Hydrology Map, Appendix "B"). It is necessary for Thienes Engineering Inc. to revise approved Hydrology Study by Fuscoe Engineering, due the fact that the original calculated subarea (north of the COSTCO site) is currently divided in to two phases, east (Parcel 1, TPM 67341), and west (Parcels 2 and 3, TPM 67341). Precise grading has been prepared for Phase I (west parcel), while Phase II (east parcels) is conceptual at this time.

The proposed condition exceeds L.A.C.D.P.W. allowable discharges. Thienes Engineering has calculated the required retention storage basins for Phase I and II as well as the COSTCO site. Proposed basins will reduce peak flows for each Parcel to meet allowable discharge rates.

Phase I consists approximately of 14.4 acres, and generates approximately 29.0 cfs, where Phase II consists of approximately 9.1 acres, and generates approximately 20.0 cfs. The runoff calculations are based on fully developed condition. The existing COSTCO site is located downstream of the Project site and is already built (Hydrology and hydraulic calculations have been approved). Thienes Engineering used Fuscoe Engineering, Hydrology study for analyzing the COSTCO site, and to determinate watershed boundary and responsibility of sharing discharges, for entire watershed area (total of 42.8 Ac). As previously mentioned, it is unclear how much detention was required for just the COSTCO site since an overall drainage area hydrograph was used. Thienes Engineering has added the COSTCO site with an allowable peak flow rate of 17.6 cfs (rounded to 18 cfs in calculations). Since the COSTCO site is already built, it is assumed that the necessary detention for the site was provided. The following assumptions also were used:

1) The existing Tank Farm (north of Lomita Blvd.) has been modeled as 1 acre of area with necessary detention from this 1 acre area and Lomita Boulevard (5 acres) to be detained within the project site. The remainder of the existing tank farm detains all storm water onsite.
2) Existing COSTCO site discharges 17.6 cfs to existing 36" RCP (as per approved Hydrology analysis done by Fuscoe Engineering.)
3) Maximum discharge from entire watershed area, to the existing 54" RCP located on the Skypark Drive, cannot exceed 52.6 cfs (42.8 ac x 1.23 cfs/ac).

Thienes Engineering performed calculations in this report taking into consideration all required restrictions, and the results are shown in the following Table:

T.P.M 67341 – PARCELS 1,2, & 3 (PHASE I & II)
SUMMARY TABLE (ULTIMATE CONDITION)

SUBAREA NUMBER	TRIBUTARY AREA (ACRES)	SUBAREA Q50 (CFS)	ALLOWABLE Q50 (CFS)	DETAINED Q50 (CFS)	DETAINED VOLUME (AC-FT.)
1A (Offsite)	1.0	1.8	1.4	0.4*	N/A*
2A (Lomita)	5.0	9.0	6.1	2.9*	N/A*
3A(Phase II)	9.1	20.0	11.2	8.8	0.19
8D(Phase I)	14.4	29.0	17.7	11.3	0.16
14F(COSTCO)	14.3	24.0	17.6	6.4	0.11

*To be detained within the Phase II site.

From the Table, the total discharge is 54.0 cfs (52.6 cfs + 1.4 cfs offsite). Note that the offsite area will be detained within the Phase II portion of the project site. Due to time of concentration and main line pipes confluence, the discharge from entire 42.8 acres comes to a total of 53.0 cfs (see hydrology calculations, area 18AF, in Appendix B), which will meet the County allowable discharges to the existing 54" RCP. The hydraulics is the restriction that ensures that no more than 52.6 cfs enters the County storm drain on Skypark Drive.

Final design will require water quality storage volume calculations, to treat initial run-off prior to discharging to storm drain system.

Please see Hydrology Map (Appendix "C") for the proposed storm drain location and details.

Hydraulics

Hydraulic calculations were computed for the entire storm drain system that traverses through the COSTCO site as well as the realignment through the Phase II portion of the project site. The controlling hydraulic grade line for the 36" storm drain connection at Skypark Drive is 71.68 (taken from the Fuscoe study). Stations and elevations used were based on available storm drain plans for the existing storm drain system (see copies of storm drain plan in Appendix "B"). Peak flow rates used are based on allowable flow from the project site as well as allowable flow from estimated tributary areas within the COSTCO site. Total allowable peak flow rate is 52.6 cfs.

The hydraulic model shows that the existing and proposed 36" storm drain can sufficiently carry allowable project flows. When storm flows reach the 5-year level, the hydraulic grade line will rise high enough to begin filling the surface detention areas. The hydraulic grade line at the downstream portion of the site is approximately at elevation 76.00. Most top of grates are set at elevation 76.50. Hydraulic calculations for the entire system have not been calculated at this time since the site is preliminary, however additional loses through the storm drain system would raise the water surface elevation above top of grates to allow for the necessary detention. The surface detention areas are graded so they do not fill deeper than 6" during a 50-year storm.

Please see Appendix "B" for hydraulic calculations.

Detention

To limit runoff from the project site, detention is required. Previous Fuscoe study analyzed the overall drainage area assuming undeveloped areas for the Phase I and Phase II portions of the project site. This study updates the required detention based on allowable discharge for Phase I, Phase II and COSTCO site. Each Phase was modeled as a separate subarea with the hydrograph split at the allowable peak flow rate for the respective subareas. For Phase II, the offsite areas (tank farm and Lomita Boulevard) were added prior to splitting off the allowable peak flow rate. The required storage for Phase I and II are 0.16 acre-feet and 0.19 acre-feet respectively. The volume required for the COSTSCO site is 0.11 acre-feet (4,790 cubic feet). While this is less than the Fuscoe calculated detention volume of 9,906 cubic feet, it is specific for COSTCO site, not the overall drainage area (see hydrograph in Appendix "D").

Underground storage has been provided for the Phase I and Phase II portions of the site. However, this volume is intended for water quality purposes. The underground storage has been sized to store and treat the first ¾" of runoff. The runoff is stored and slowly released to allow pollutants to settle in the separation chambers. Some infiltration occurs, but soil test show that the volume cannot infiltrate within 48 hours.

For conservative modeling, it is assumed that the underground storage is already full when the peak flows occur. The ponding area is located within the parking lots. The parking areas have been designed such that water can pond to a maximum depth of 0.5' before spilling over to another parking area. Ultimate secondary outlet is through driveways located at Lomita Boulevard at elevation 77.00.

Estimated volume of ponding provided in the Phase I portion of the site is approximately 0.56 acre-feet, while the volume provided in the Phase II portion is about 0.29 acre-feet. This is more than required volume. Runoff will be stored on the surface when the storm drain system reaches it's capacity and no more water will be allowed into the drain. The detention will empty as the hydraulic grade line lowers after the peak storm has passed and the surface detention will drain into the catch basins and into the 36" pipe.

See storm drain schematic that depicts how low flow enters the underground storage system from the mainline and ponding concept at the grate inlets.

Flood Routing

The proposed 36" storm drain and the existing 36" drain that traverses through the COSTCO site connects to the existing County drain in Skypark Drive. After a major storm event, the water stored from the storm in Walteria Lake sump located at the west side of Hawthorne Boulevard and south of Lomita Boulevard is also pumped into the County drain. The water is pumped at a rate of 55 cfs and results in a force main condition and a hydraulic grade line of about elevation

80.0 at the site, according to L.A.C.D.P.W. staff (see reference material). The existing COSTCO building floor elevation is set above elevation 80.0. However, existing land for the Phase I and II portion of the site is around elevation 75.0 The proposed building floor elevations will be raised several feet above existing ground however, they will not exceed elevation 80.0.

As previously mentioned, secondary outlet for the project site will be the driveways located at Lomita Boulevard. There is an existing sump condition in Lomita at the existing catch basins located north of the Phase II portion of the project site. Water would pond in Lomita to an elevation of about 77.50 if these catch basins were plugged or if the hydraulic grade line were at elevation 77.50 or higher prior to spilling easterly towards Crenshaw Boulevard. The proposed building finished floors are set at a minimum elevation of 78.70. Existing Lomita Boulevard elevations would not allow the hydraulic grade line to ever approach elevation 80.0 near the project site.

Methodology

The county of Los Angeles Rational Method and MORA software was used for the hydrology calculations. The soil type is "004" per the Los Angeles County Hydrology Manual. Detention volumes were determined by using the split flow feature of the MORA program. Hydraulic calculations for the entire storm drain system (including COSTCO site) were calculated using WSPG.

TRACT No. _____

Thienes Engineering, Inc.

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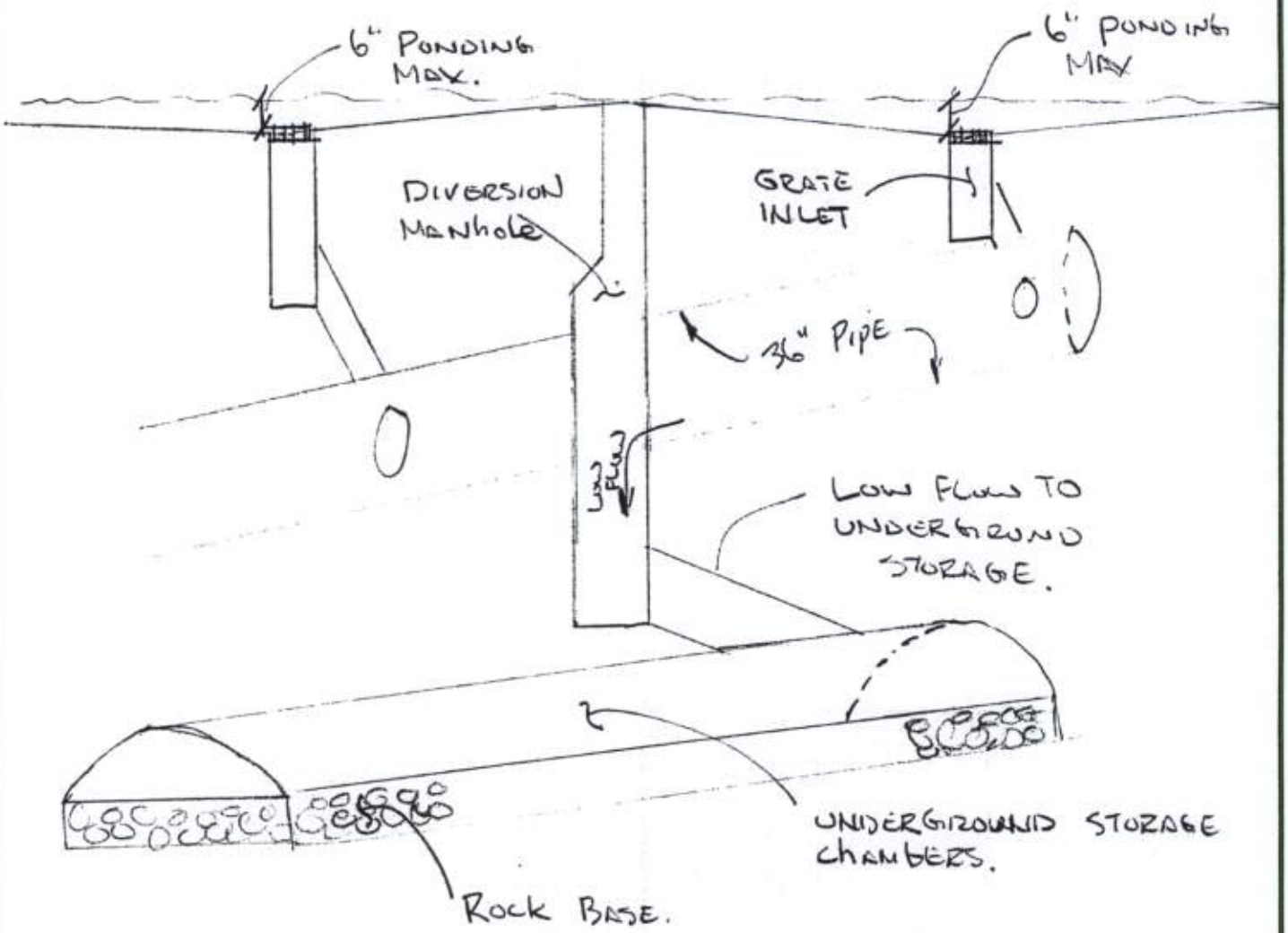

STORM DRAIN SCHEMATIC

14349 Firestone Blvd. • La Mirada, CA 90638 • Tel: (714) 521-4811 • Fax: (714) 521-4173

APPENDIX	DESCRIPTION
A	PROPOSED CONDITION HYDROLOGY CALCULATION
B	HYDRAULIC CALCULATION FOR RELOCATED STORM DRAIN LINE "A"
C	PROPOSED CONDITION HYDROLOGY MAP
D	PORTION OF APPROVED HYDROLOGY CALCULATION BY FUSCOE ENG. DATED OCTOBER 15, 1997
E	PORTION OF APPROVED HYDRAULIC CALCULATION BY FUSCOE ENG. DATED OCTOBER 15, 1997, AND PAGE 1 AND 2 FROM "PRIVATE STORM DRAIN" IMPROVEMENT PLAN (SD-475).
F	PROPOSED CONDITION HYDROLOGY MAP BY FUSCOE ENG. DATED OCTOBER 15, 1997

APPENDIX A

PROPOSED CONDITION HYDROLOGY CALCULATIONS

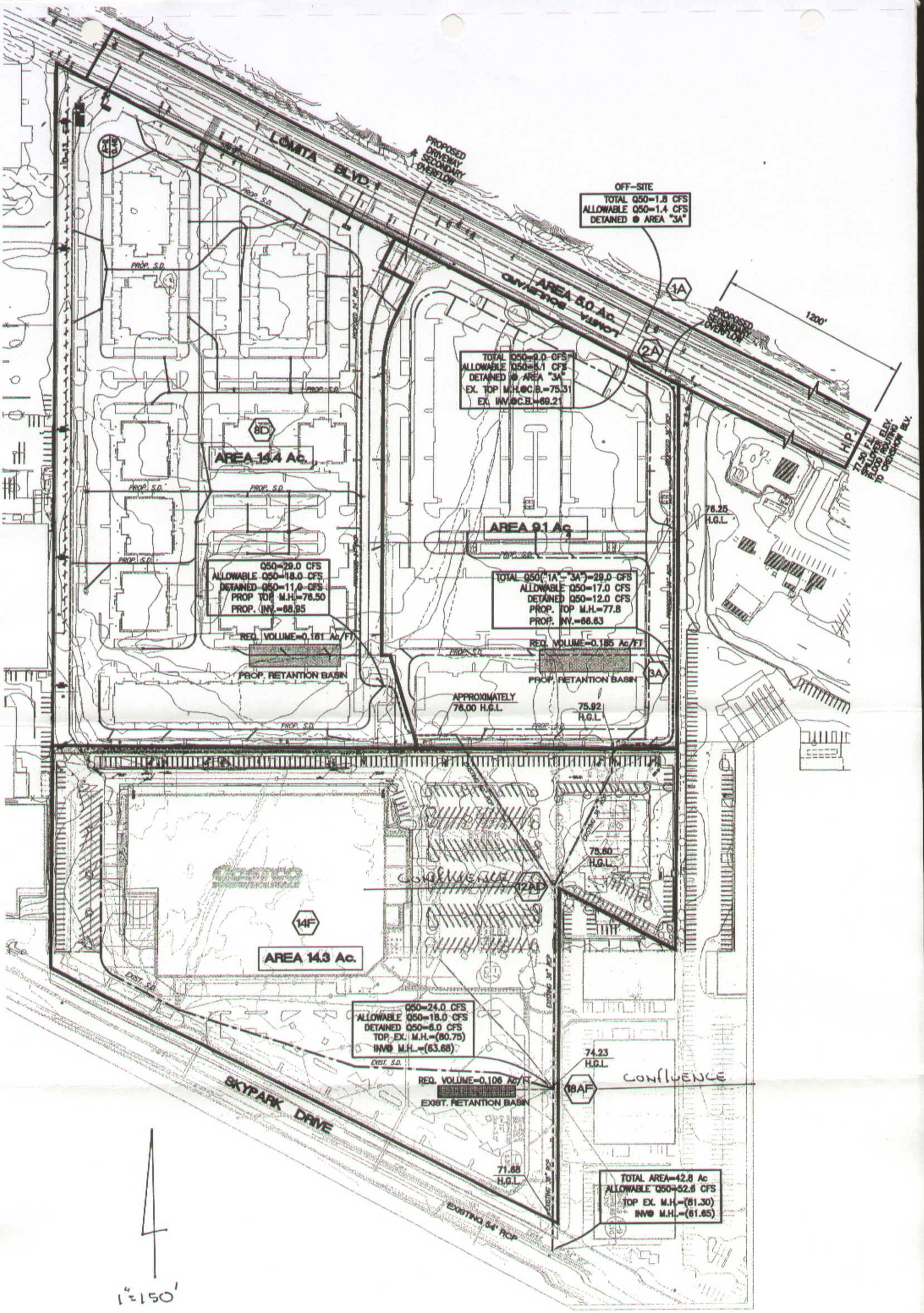
LOMITA BLVD.
PROPOSED DRIVEWAY SECONDARY OVERFLOW
OFF-SITE
TOTAL Q50=1.8 CFS
ALLOWABLE Q50=1.4 CFS
DETAINED @ AREA "3A"
AREA 5.0 Ac.
OVERFLOW
1A
2A
PROPOSED SECONDARY OVERFLOW
1200'
TOTAL Q50=9.0 CFS
ALLOWABLE Q50=5.1 CFS
DETAINED @ AREA "3A"
EX. TOP M.H.@C.B.=75.31
EX. INV.@C.B.=69.21
H.P.
77.50 F.L. BLOCK WALL BLDG. TO CROSSROW BLV.
8D
AREA 14.4 Ac.
AREA 9.1 Ac.
76.25 H.G.L.
Q50=29.0 CFS
ALLOWABLE Q50=18.0 CFS
DETAINED Q50=11.0 CFS
PROP TOP M.H.=76.50
PROP. INV.=68.95
REQ. VOLUME=0.181 Ac/FT
PROP. RETANTION BASIN
TOTAL Q50("1A"-"3A")=29.0 CFS
ALLOWABLE Q50=17.0 CFS
DETAINED Q50=12.0 CFS
PROP. TOP M.H.=77.8
PROP. INV.=66.63
REQ. VOLUME=0.185 Ac/FT
PROP. RETANTION BASIN
3A
APPROXIMATELY 76.00 H.G.L.
75.92 H.G.L.
75.60 H.G.L.
CONFLUENCE
12AD
14F
AREA 14.3 Ac.
Q50=24.0 CFS
ALLOWABLE Q50=18.0 CFS
DETAINED Q50=6.0 CFS
TOP EX. M.H.=(80.75)
INV@ M.H.=(63.68)
74.23 H.G.L.
REQ. VOLUME=0.106 Ac/FT
EXIST. RETANTION BASIN
18AF
CONFLUENCE
SKYPARK DRIVE
71.68 H.G.L.
TOTAL AREA=42.8 Ac
ALLOWABLE Q50=52.6 CFS
TOP EX. M.H.=(61.30)
INV@ M.H.=(61.65)
EXISTING 54" RCP
1"=150'

FIGURE 2

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

LOMITA BLVD TORRANCE - INDUSTRIAL BUILDING (FILE:2746M1)

STORM DAY 4

	LOCATION		SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	TC	RAIN ZONE	PCT IMPV
OFFSITE	2746	1A	1.	2.	1.	2.	4	200.	0.00500	2.00	0.00	0.	4	12	A29	0.95
LOMITA	2746	2A	5.	9.	6.	11.	4	826.	0.00400	2.00	0.00	0.	4	20	A29	0.95
PHASE II	2746	3A	9.	20.	15.	29.	0	0.	0.00000	0.00	0.00	0.	4	12	A29	0.90
SPLIT	2746	4AC	0.	12.	15.	17.	0	0.	0.00000	0.00	0.00	17.	4	0	A29	0.00
	2746	5A	0.	0.	15.	17.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00
	2746	6C	0.	0.	0.	12.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00
	2746	7A	0.	0.	15.	17.	4	260.	0.00400	2.25	0.00	0.	4	99	A29	0.00
PHASE I	2746	8D	14.	29.	14.	29.	0	0.	0.00000	0.00	0.00	0.	4	14	A29	0.90
SPLIT	2746	9DE	0.	11.	14.	18.	0	0.	0.00000	0.00	0.00	18.	4	0	A29	0.00
	2746	10D	0.	0.	14.	18.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00
HYDROGRAPH	2746	11E	0.	0.	0.	11.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00

****

CONFLUENCE Q'S

2746 12A TA 1157 QA 17. QAD 35. QD 18. 2746 12D TD 1149 QD 18. QDA 34. QA 16.

2746 12AD TAD 1157 QAD 35. QA 17. QD 18.

****

	LOCATION		SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	TC	RAIN ZONE	PCT IMPV
	2746	12AD	14.	18.	29.	35.	0	0.	0.00000	0.00	0.00	0.	4	0	A29	0.00
	2746	13A	0.	0.	29.	35.	4	640.	0.00400	2.75	0.00	0.	4	99	A29	0.00
COSTCO	2746	14F	14.	24.	14.	24.	0	0.	0.00000	0.00	0.00	0.	4	21	A29	0.90
SPLIT	2746	15FC	0.	6.	14.	18.	0	0.	0.00000	0.00	0.00	18.	4	0	A29	0.00
	2746	16F	0.	0.	14.	18.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00
HYDROGRAPH	2746	17C	0.	0.	0.	6.	0	0.	0.00000	0.00	0.00	0.	4	99	A29	0.00

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CONFLUENCE Q'S

2746 18A TA 1165 QA 35. QAF 53. QF 18. 2746 18F TF 1151 QF 18. QFA 50. QA 32.

2746 18AF TAF 1165 QAF 53. QA 35. QF 18.

****

	LOCATION		SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	TC	RAIN ZONE	PCT IMPV
CONFLUENCE	2746	18AF	14.	18.	43.	53.	0	0.	0.00000	0.00	0.00	0.	4	0	A29	0.00

PROG FO601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 5B

HYDROGRAPH AT 2746 5A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	2.	200	2.	300	2.	400	2.
500	2.	600	3.	700	3.	800	3.	900	4.
1000	4.	1050	5.	1100	6.	1110	7.	1120	9.
1130	10.	1131	10.	1132	10.	1133	11.	1134	11.
1135	11.	1136	11.	1137	11.	1138	12.	1139	12.
1140	12.	1141	13.	1142	13.	1143	13.	1144	14.
1145	14.	1146	15.	1147	16.	1148	16.	1149	17.
1150	17.	1151	17.	1152	17.	1153	17.	1154	17.
1155	17.	1156	17.	1157	17.	1158	17.	1159	17.
1160	17.	1161	17.	1162	17.	1163	17.	1164	17.
1165	17.	1166	17.	1167	16.	1168	15.	1169	14.
1170	14.	1171	13.	1172	12.	1173	12.	1174	11.
1175	10.	1176	9.	1177	9.	1178	8.	1179	8.
1180	7.	1181	7.	1182	7.	1183	6.	1184	6.
1185	6.	1186	6.	1187	6.	1188	6.	1189	6.
1190	6.	1191	5.	1192	5.	1193	5.	1194	5.
1195	5.	1196	5.	1197	5.	1198	5.	1199	5.
1200	5.	1201	5.	1202	5.	1203	5.	1204	5.
1205	4.	1206	4.	1207	4.	1208	4.	1209	4.
1210	4.	1211	4.	1212	4.	1213	4.	1214	4.
1215	4.	1216	4.	1217	4.	1218	4.	1219	4.
1220	4.	1221	4.	1222	4.	1223	4.	1224	4.
1225	4.	1226	4.	1227	4.	1228	4.	1229	4.
1230	4.	1231	4.	1232	4.	1233	4.	1234	4.
1235	4.	1236	4.	1237	4.	1238	3.	1239	3.
1240	3.	1241	3.	1242	3.	1243	3.	1244	3.
1245	3.	1246	3.	1247	3.	1248	3.	1249	3.
1250	3.	1251	3.	1252	3.	1253	3.	1254	3.
1255	3.	1256	3.	1257	3.	1258	3.	1259	3.
1260	3.	1261	3.	1262	3.	1263	3.	1264	3.
1265	3.	1266	3.	1267	3.	1268	3.	1269	3.
1270	3.	1271	3.	1272	3.	1273	3.	1274	3.
1275	3.	1276	3.	1277	3.	1278	3.	1279	3.
1280	3.	1281	3.	1282	3.	1283	3.	1284	3.
1285	3.	1286	3.	1287	3.	1288	3.	1289	3.
1290	3.	1291	3.	1292	3.	1293	3.	1294	3.
1295	3.	1296	3.	1297	3.	1298	3.	1299	3.
1300	3.	1310	3.	1320	3.	1330	3.	1340	2.
1350	2.	1360	2.	1370	2.	1380	2.	1390	2.
1400	2.	1420	2.	1440	2.	1460	1.	1500	1.

Total Runoff = 6.571 Acre-Ft.
Peak Q = 17 CFS
Time to Peak Q = 1149 Minutes

17 cfs Flowby (TANK FARM + Lomita + Pat 2) 14.1 AC 1.23 cfs/AC = 1

PROG FO601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 6C

HYDROGRAPH AT 2746 6C STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	0.	200	0.	300	0.	400	0.
500	0.	600	0.	700	0.	800	0.	900	0.
1000	0.	1050	0.	1100	0.	1110	0.	1120	0.
1130	0.	1131	0.	1132	0.	1133	0.	1134	0.
1135	0.	1136	0.	1137	0.	1138	0.	1139	0.
1140	0.	1141	0.	1142	0.	1143	0.	1144	0.
1145	0.	1146	0.	1147	0.	1148	0.	1149	1.
1150	3.	1151	5.	1152	8.	1153	10.	1154	11.
1155	12.	1156	12.	1157	12.	1158	12.	1159	12.
1160	11.	1161	9.	1162	7.	1163	5.	1164	3.
1165	1.	1166	0.	1167	0.	1168	0.	1169	0.
1170	0.	1171	0.	1172	0.	1173	0.	1174	0.
1175	0.	1176	0.	1177	0.	1178	0.	1179	0.
1180	0.	1181	0.	1182	0.	1183	0.	1184	0.
1185	0.	1186	0.	1187	0.	1188	0.	1189	0.
1190	0.	1191	0.	1192	0.	1193	0.	1194	0.
1195	0.	1196	0.	1197	0.	1198	0.	1199	0.
1200	0.	1201	0.	1202	0.	1203	0.	1204	0.
1205	0.	1206	0.	1207	0.	1208	0.	1209	0.
1210	0.	1211	0.	1212	0.	1213	0.	1214	0.
1215	0.	1216	0.	1217	0.	1218	0.	1219	0.
1220	0.	1221	0.	1222	0.	1223	0.	1224	0.

1225	0.	1226	0.	1227	0.	1228	0.	1229	0.
1230	0.	1231	0.	1232	0.	1233	0.	1234	0.
1235	0.	1236	0.	1237	0.	1238	0.	1239	0.
1240	0.	1241	0.	1242	0.	1243	0.	1244	0.
1245	0.	1246	0.	1247	0.	1248	0.	1249	0.
1250	0.	1251	0.	1252	0.	1253	0.	1254	0.
1255	0.	1256	0.	1257	0.	1258	0.	1259	0.
1260	0.	1261	0.	1262	0.	1263	0.	1264	0.
1265	0.	1266	0.	1267	0.	1268	0.	1269	0.
1270	0.	1271	0.	1272	0.	1273	0.	1274	0.
1275	0.	1276	0.	1277	0.	1278	0.	1279	0.
1280	0.	1281	0.	1282	0.	1283	0.	1284	0.
1285	0.	1286	0.	1287	0.	1288	0.	1289	0.
1290	0.	1291	0.	1292	0.	1293	0.	1294	0.
1295	0.	1296	0.	1297	0.	1298	0.	1299	0.
1300	0.	1310	0.	1320	0.	1330	0.	1340	0.
1350	0.	1360	0.	1370	0.	1380	0.	1390	0.
1400	0.	1420	0.	1440	0.	1460	0.	1500	0.

Total Runoff = 0.185 Acre-Ft. — VOLUME REQ'D.
Peak Q = 12 CFS — DETAIN 12 cfs. (FOR PARCEL
Time to Peak Q = 1155 Minutes

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PROG FO601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 11D
HYDROGRAPH AT 2746 10D STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	2.	200	2.	300	2.	400	2.
500	2.	600	2.	700	2.	800	3.	900	3.
1000	4.	1050	5.	1100	6.	1110	7.	1120	8.
1130	10.	1131	10.	1132	10.	1133	10.	1134	10.
1135	11.	1136	11.	1137	11.	1138	11.	1139	11.
1140	12.	1141	12.	1142	13.	1143	13.	1144	13.
1145	14.	1146	15.	1147	15.	1148	16.	1149	18.
1150	18.	1151	18.	1152	18.	1153	18.	1154	18.
1155	18.	1156	18.	1157	18.	1158	18.	1159	18.
1160	18.	1161	18.	1162	18.	1163	18.	1164	18.
1165	16.	1166	13.	1167	10.	1168	9.	1169	9.
1170	8.	1171	8.	1172	7.	1173	7.	1174	7.
1175	7.	1176	6.	1177	6.	1178	6.	1179	6.
1180	6.	1181	6.	1182	5.	1183	5.	1184	5.
1185	5.	1186	5.	1187	5.	1188	5.	1189	5.
1190	5.	1191	5.	1192	5.	1193	4.	1194	4.
1195	4.	1196	4.	1197	4.	1198	4.	1199	4.
1200	4.	1201	4.	1202	4.	1203	4.	1204	4.
1205	4.	1206	4.	1207	4.	1208	4.	1209	4.
1210	4.	1211	4.	1212	4.	1213	4.	1214	4.
1215	3.	1216	3.	1217	3.	1218	3.	1219	3.
1220	3.	1221	3.	1222	3.	1223	3.	1224	3.
1225	3.	1226	3.	1227	3.	1228	3.	1229	3.
1230	3.	1231	3.	1232	3.	1233	3.	1234	3.
1235	3.	1236	3.	1237	3.	1238	3.	1239	3.
1240	3.	1241	3.	1242	3.	1243	3.	1244	3.
1245	3.	1246	3.	1247	3.	1248	3.	1249	3.
1250	3.	1251	3.	1252	3.	1253	3.	1254	3.
1255	3.	1256	3.	1257	3.	1258	3.	1259	3.
1260	3.	1261	3.	1262	3.	1263	3.	1264	3.
1265	3.	1266	3.	1267	3.	1268	3.	1269	3.
1270	3.	1271	3.	1272	3.	1273	3.	1274	3.
1275	3.	1276	3.	1277	2.	1278	2.	1279	3.
1280	2.	1281	2.	1282	2.	1283	2.	1284	2.
1285	2.	1286	2.	1287	2.	1288	2.	1289	2.
1290	2.	1291	2.	1292	2.	1293	2.	1294	2.
1295	2.	1296	2.	1297	2.	1298	2.	1299	2.
1300	2.	1310	2.	1320	2.	1330	2.	1340	2.
1350	2.	1360	2.	1370	2.	1380	2.	1390	2.
1400	2.	1420	2.	1440	2.	1460	0.	1500	0.

PARCEL 1 14.4 AC x 1.23 = 17.7 cfs.

Total Runoff = 5.861 Acre-Ft.
Peak Q = 18 CFS — LET 18 cfs flowby.
Time to Peak Q = 1149 Minutes

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PROG FO601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 12E
HYDROGRAPH AT 2746 11E STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q

0	0.	100	0.	200	0.	300	0.	400	0.
500	0.	600	0.	700	0.	800	0.	900	0.
1000	0.	1050	0.	1100	0.	1110	0.	1120	0.
1130	0.	1131	0.	1132	0.	1133	0.	1134	0.
1135	0.	1136	0.	1137	0.	1138	0.	1139	0.
1140	0.	1141	0.	1142	0.	1143	0.	1144	0.
1145	0.	1146	0.	1147	0.	1148	0.	1149	1.
1150	3.	1151	5.	1152	8.	1153	10.	1154	11.
1155	11.	1156	11.	1157	10.	1158	10.	1159	9.
1160	8.	1161	8.	1162	7.	1163	4.	1164	1.
1165	0.	1166	0.	1167	0.	1168	0.	1169	0.
1170	0.	1171	0.	1172	0.	1173	0.	1174	0.
1175	0.	1176	0.	1177	0.	1178	0.	1179	0.
1180	0.	1181	0.	1182	0.	1183	0.	1184	0.
1185	0.	1186	0.	1187	0.	1188	0.	1189	0.
1190	0.	1191	0.	1192	0.	1193	0.	1194	0.
1195	0.	1196	0.	1197	0.	1198	0.	1199	0.
1200	0.	1201	0.	1202	0.	1203	0.	1204	0.
1205	0.	1206	0.	1207	0.	1208	0.	1209	0.
1210	0.	1211	0.	1212	0.	1213	0.	1214	0.
1215	0.	1216	0.	1217	0.	1218	0.	1219	0.
1220	0.	1221	0.	1222	0.	1223	0.	1224	0.
1225	0.	1226	0.	1227	0.	1228	0.	1229	0.
1230	0.	1231	0.	1232	0.	1233	0.	1234	0.
1235	0.	1236	0.	1237	0.	1238	0.	1239	0.
1240	0.	1241	0.	1242	0.	1243	0.	1244	0.
1245	0.	1246	0.	1247	0.	1248	0.	1249	0.
1250	0.	1251	0.	1252	0.	1253	0.	1254	0.
1255	0.	1256	0.	1257	0.	1258	0.	1259	0.
1260	0.	1261	0.	1262	0.	1263	0.	1264	0.
1265	0.	1266	0.	1267	0.	1268	0.	1269	0.
1270	0.	1271	0.	1272	0.	1273	0.	1274	0.
1275	0.	1276	0.	1277	0.	1278	0.	1279	0.
1280	0.	1281	0.	1282	0.	1283	0.	1284	0.
1285	0.	1286	0.	1287	0.	1288	0.	1289	0.
1290	0.	1291	0.	1292	0.	1293	0.	1294	0.
1295	0.	1296	0.	1297	0.	1298	0.	1299	0.
1300	0.	1310	0.	1320	0.	1330	0.	1340	0.
1350	0.	1360	0.	1370	0.	1380	0.	1390	0.
1400	0.	1420	0.	1440	0.	1460	0.	1500	0.

Total Runoff = 0.161 Acre-Ft. — VOLUME REQ'D.
Peak Q = 11 CFS — DETAIN 11 cfs (PARCEL 1)
Time to Peak Q = 1154 Minutes

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PROG FO601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 17F
HYDROGRAPH AT 2746 16F STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	2.	200	2.	300	2.	400	2.
500	2.	600	2.	700	2.	800	3.	900	3.
1000	4.	1050	5.	1100	6.	1110	7.	1120	8.
1130	9.	1131	9.	1132	9.	1133	10.	1134	10.
1135	10.	1136	10.	1137	10.	1138	11.	1139	11.
1140	11.	1141	11.	1142	12.	1143	12.	1144	12.
1145	13.	1146	13.	1147	14.	1148	14.	1149	16.
1150	18.	1151	18.	1152	18.	1153	18.	1154	18.
1155	18.	1156	18.	1157	18.	1158	18.	1159	18.
1160	18.	1161	18.	1162	18.	1163	18.	1164	18.
1165	18.	1166	18.	1167	18.	1168	18.	1169	18.
1170	17.	1171	15.	1172	13.	1173	11.	1174	9.
1175	8.	1176	8.	1177	7.	1178	7.	1179	7.
1180	6.	1181	6.	1182	6.	1183	6.	1184	6.
1185	6.	1186	5.	1187	5.	1188	5.	1189	5.
1190	5.	1191	5.	1192	5.	1193	5.	1194	5.
1195	5.	1196	5.	1197	4.	1198	4.	1199	4.
1200	4.	1201	4.	1202	4.	1203	4.	1204	4.
1205	4.	1206	4.	1207	4.	1208	4.	1209	4.
1210	4.	1211	4.	1212	4.	1213	4.	1214	4.
1215	4.	1216	4.	1217	4.	1218	4.	1219	4.
1220	3.	1221	3.	1222	3.	1223	3.	1224	3.
1225	3.	1226	3.	1227	3.	1228	3.	1229	3.
1230	3.	1231	3.	1232	3.	1233	3.	1234	3.
1235	3.	1236	3.	1237	3.	1238	3.	1239	3.
1240	3.	1241	3.	1242	3.	1243	3.	1244	3.
1245	3.	1246	3.	1247	3.	1248	3.	1249	3.
1250	3.	1251	3.	1252	3.	1253	3.	1254	3.
1255	3.	1256	3.	1257	3.	1258	3.	1259	3.
1260	3.	1261	3.	1262	3.	1263	3.	1264	3.
1265	3.	1266	3.	1267	3.	1268	3.	1269	3.

1270	3.	1271	3.	1272	3.	1273	3.	1274	3.
1275	3.	1276	3.	1277	3.	1278	2.	1279	3.
1280	3.	1281	2.	1282	2.	1283	2.	1284	2.
1285	2.	1286	2.	1287	2.	1288	2.	1289	2.
1290	2.	1291	2.	1292	2.	1293	2.	1294	2.
1295	2.	1296	2.	1297	2.	1298	2.	1299	2.
1300	2.	1310	2.	1320	2.	1330	2.	1340	2.
1350	2.	1360	2.	1370	2.	1380	2.	1390	2.
1400	2.	1420	2.	1440	2.	1460	0.	1500	0.

Total Runoff = 5.941 Acre-Ft.
Peak Q = 18 CFS
Time to Peak Q = 1150 Minutes

Costco site 14.3 Ac x 1.23 cfs/ac = 17.6 cfs

LET 18 cfs Flow by

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PROG F0601A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 18C
HYDROGRAPH AT 2746 17C STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	0.	200	0.	300	0.	400	0.
500	0.	600	0.	700	0.	800	0.	900	0.
1000	0.	1050	0.	1100	0.	1110	0.	1120	0.
1130	0.	1131	0.	1132	0.	1133	0.	1134	0.
1135	0.	1136	0.	1137	0.	1138	0.	1139	0.
1140	0.	1141	0.	1142	0.	1143	0.	1144	0.
1145	0.	1146	0.	1147	0.	1148	0.	1149	0.
1150	0.	1151	2.	1152	3.	1153	5.	1154	5.
1155	6.	1156	6.	1157	6.	1158	6.	1159	5.
1160	5.	1161	5.	1162	5.	1163	4.	1164	4.
1165	3.	1166	3.	1167	2.	1168	1.	1169	1.
1170	0.	1171	0.	1172	0.	1173	0.	1174	0.
1175	0.	1176	0.	1177	0.	1178	0.	1179	0.
1180	0.	1181	0.	1182	0.	1183	0.	1184	0.
1185	0.	1186	0.	1187	0.	1188	0.	1189	0.
1190	0.	1191	0.	1192	0.	1193	0.	1194	0.
1195	0.	1196	0.	1197	0.	1198	0.	1199	0.
1200	0.	1201	0.	1202	0.	1203	0.	1204	0.
1205	0.	1206	0.	1207	0.	1208	0.	1209	0.
1210	0.	1211	0.	1212	0.	1213	0.	1214	0.
1215	0.	1216	0.	1217	0.	1218	0.	1219	0.
1220	0.	1221	0.	1222	0.	1223	0.	1224	0.
1225	0.	1226	0.	1227	0.	1228	0.	1229	0.
1230	0.	1231	0.	1232	0.	1233	0.	1234	0.
1235	0.	1236	0.	1237	0.	1238	0.	1239	0.
1240	0.	1241	0.	1242	0.	1243	0.	1244	0.
1245	0.	1246	0.	1247	0.	1248	0.	1249	0.
1250	0.	1251	0.	1252	0.	1253	0.	1254	0.
1255	0.	1256	0.	1257	0.	1258	0.	1259	0.
1260	0.	1261	0.	1262	0.	1263	0.	1264	0.
1265	0.	1266	0.	1267	0.	1268	0.	1269	0.
1270	0.	1271	0.	1272	0.	1273	0.	1274	0.
1275	0.	1276	0.	1277	0.	1278	0.	1279	0.
1280	0.	1281	0.	1282	0.	1283	0.	1284	0.
1285	0.	1286	0.	1287	0.	1288	0.	1289	0.
1290	0.	1291	0.	1292	0.	1293	0.	1294	0.
1295	0.	1296	0.	1297	0.	1298	0.	1299	0.
1300	0.	1310	0.	1320	0.	1330	0.	1340	0.
1350	0.	1360	0.	1370	0.	1380	0.	1390	0.
1400	0.	1420	0.	1440	0.	1460	0.	1500	0.

Total Runoff = 0.106 Acre-Ft. — VOLUME REQ'D.
Peak Q = 6 CFS — TO BE DETAINED
Time to Peak Q = 1155 Minutes

(Costco)

Tc Calculator

Subarea No.	Area (acres)	Imp. %	Frequency	Soil Type	Length	Slope	Isohyet
1A	1	0.95	50	4	890	0.005	5.8

Equation, given parameters above:
Developed subarea coeff. (.68<%imp<1):

bo=	-0.507	
b1=	-0.519	Tc=(10)^-0.507*(Ix)^-0.519*(L)^0.483*(S)^-0.135
b2=	0.483	
b3=	-0.135	
0	0	

Undeveloped subarea coeff. (%imp=0):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Undeveloped subarea coeff. (0<%imp<.21):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.21<%imp<.68):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Equations for Tc: Tc=(10)^bo*(Ix)^b1*(L)^b2*(S)^b3

I1440=Isohyet/24hrs: 0.242
It=I1440*Ix/I1440: 2.293417

Iterations **RESET** Tc estimate: 12.00 Tc calc: 11.68 Diff: 0.32 **RUN** Cu 0.69 Cd 0.89 Ix=Cd*I 2.040 It 2.29 Flowrate (cfs): Q=Cd*Ix*Area 2.04

Interpolated value for I: Tc high 12.00 Tc low 12.00 It/I1440 low 9.488885 It/I1440 high 9.48889 Interpolated It/I1440 9.490

Tolerance (min) 0.5

Use Tc value: 12.00 minutes

SUBAREA "1A"

parameters

Tc Calculator

Subarea No.	Area (acres)	Imp. %	Frequency	Soil Type	Length	Slope	Isohyet
2A	5	0.95	50	4	2590	0.004	5.8

Equation, given parameters above:
Developed subarea coeff. (.68<%imp<1):

bo= -0.507
b1= -0.519
b2= 0.483
b3= -0.135
0 0

Tc=(10)^-0.507*(lx)^-0.519*(L)^0.483*(S)^-0.135

Undeveloped subarea coeff. (%imp=0)
bo= -0.507
b1= -0.519
b2= 0.483
b3= -0.135

Undeveloped subarea coeff. (0<%imp<.21):
bo= -0.507
b1= -0.519
b2= 0.483
b3= -0.135

Developed subarea coeff. (.21<%imp<.68):
bo= -0.507
b1= -0.519
b2= 0.483
b3= -0.135

Developed subarea coeff. (.68<%imp<1):
bo= -0.507
b1= -0.519
b2= 0.483
b3= -0.135

Equations for Tc: Tc=(10)^bo*(lx)^b1*(L)^b2*(S)^b3

I1440=Isohyet/24hrs: 0.242
Ix=I1440*lx/I1440: 2.293417

Iterations RESET Tc estimate: 12.00 Tc calc: 20.17 Diff. 8.17 RUN Cu 0.69 Cd 0.89 Ix=Cd*I 2.040 Ix 2.29 Flowrate (cfs): Q=Cd*Ix*Area 10.19

Interpolated value for I: Tc high 12.00 Tc low 12.00 Ix/I1440 low 9.488885 Ix/I1440 high 9.48889 Interpolated Ix/I1440 9.490

Tolerance (min) 0.5

Use Tc value: 20.00 minutes

SUBAREA "2A"

parameters

Tc Calculator

Subarea No.	Area (acres)	Imp. %	Frequency	Soil Type	Length	Slope	Ischyet
3A	9	0.9	50	4	860	0.005	5.8

Equation, given parameters above:
Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135
0	0

Tc=(10)^-0.507*(tx)^-0.519*(L)^0.483*(S)^-0.135

Undeveloped subarea coeff. (%imp=0):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Undeveloped subarea coeff. (0<%imp<.21):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.21<%imp<.68):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Equations for Tc: Tc=(10)^bo*(tx)^b1*(L)^b2*(S)^b3

I1440=Ischyet/24hrs: 0.242
It=I1440*tx/I1440: 2.293417

Iterations RESET Tc estimate: 12.00 Tc calc: 11.55 Diff: 0.45 RUN Cu 0.69 Cd 0.88 tx=Cd*I 2.020 It 2.29 Flowrate (cfs): Q=Cd*tx*Area 18.14

Tolerance (min) 0.5

Interpolated value for t: Tc high 12.00 Tc low 12.00 It/I1440 low 9.488885 It/I1440 high 9.48889 Interpolated It/I1440 9.490

Use Tc value: 12.00 minutes

SUBAREA "3A"

parameters

Tc Calculator

Subarea No.	Area (acres)	Imp. %	Frequency	Soil Type	Length	Slope	Isohyet
8D	14	0.9	50	4	1220	0.005	5.8

Equation, given parameters above:
Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135
0	0

Tc=(10)^-0.507*(lx)^-0.519*(L)^0.483*(S)^-0.135

Undeveloped subarea coeff. (%imp=0):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Undeveloped subarea coeff. (0<%imp<.21):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.21<%imp<.68):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Equations for Tc: Tc=(10)^bo*(lx)^b1*(L)^b2*(S)^b3

I1440=Isohyet/24hrs: 0.242
It=I1440*lx/I1440: 2.293417

Iterations RESET Tc estimate: 12.00 Tc calc: 13.67 Diff: 1.67 RUN Cu 0.69 Cd 0.88 Ix=Cd*I 2.020 It 2.29 Flowrate (cfs): Q=Cd*Ix*Area 28.21

Interpolated value for I: Tc high 12.00 Tc low 12.00 It/I1440 low 9.488885 It/I1440 high 9.48889 Interpolated It/I1440 9.490

Tolerance (min) 0.5

Use Tc value: 14.00 minutes

SUBAREA "8D"

Tc Calculator

Subarea No.	Area (acres)	Imp. %	Frequency	Soil Type	Length	Slope	Isohyet
14F	14	0.9	50	4	2250	0.002	5.8

Equation, given parameters above:
Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135
0	0

Tc=(10)^-0.507*(Ix)^-0.519*(L)^0.483*(S)^-0.135

Undeveloped subarea coeff. (%imp=0):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Undeveloped subarea coeff. (0<%imp<.21):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.21<%imp<.68):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Developed subarea coeff. (.68<%imp<1):

bo=	-0.507
b1=	-0.519
b2=	0.483
b3=	-0.135

Equations for Tc: Tc=(10)^bo*(Ix)^b1*(L)^b2*(S)^b3

I1440=Isohyet/24hrs: 0.242
It=I1440*Ix/I1440: 2.293417

Iterations RESET

Tc estimate:	Tc calc:	Diff:
12.00	20.80	8.80

RUN

Cu	Cd	Ix=Cd*I	It	Flowrate (cfs): Q=Cd*Ix*Area
0.69	0.88	2.020	2.29	28.21

Tolerance (min)
0.5

Interpolated value for t:

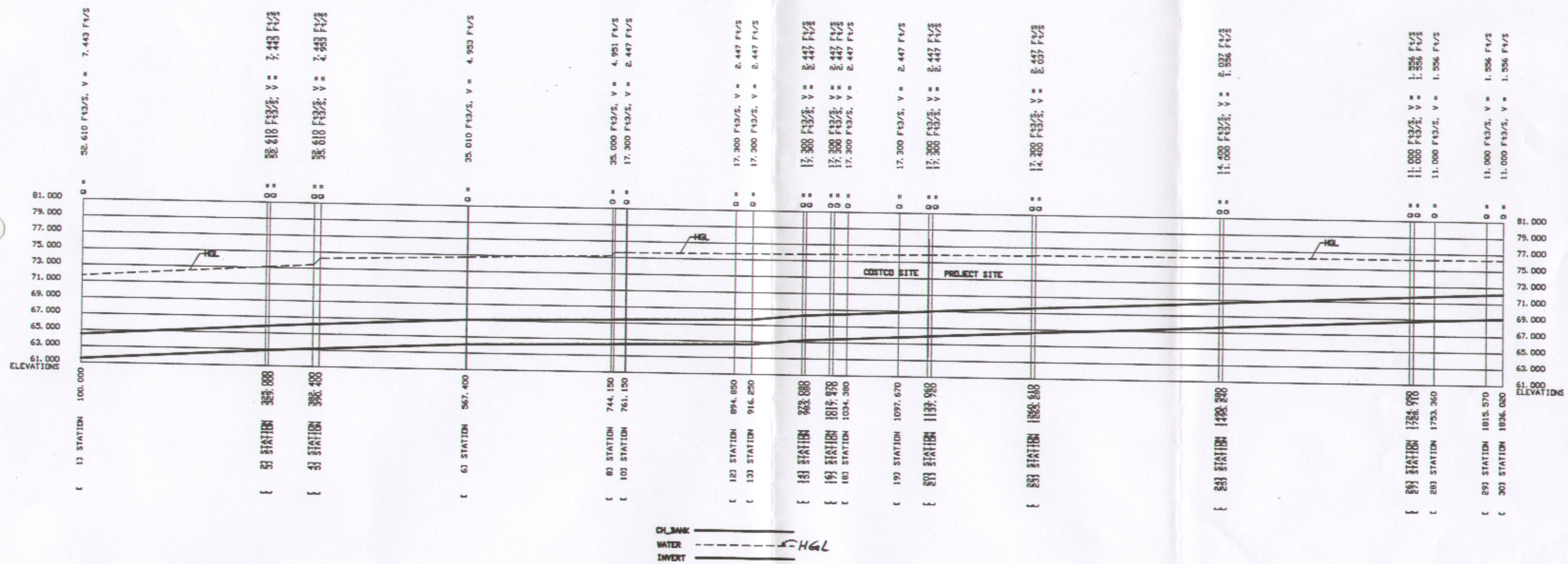
Tc high	Tc low	It/I1440 low	It/I1440 high	Interpolated It/I1440
12.00	12.00	9.488885	9.48889	9.490

Use Tc value: 21.00 minutes

APPENDIX B

HYDRAULIC CALCULATION

WATER SURFACE PRESSURE GRADIENT ANALYSIS (PROFILE)



```
T1 CITY OF TORRANCE                                                                                  0
T2 PRIVATE STORM DRAIN - LOMITA BLVD.
T3 Q50 (INCLUDING COSTCO SITE) 12-09-2008
SO    100.000  61.500  1                                    71.680
R     325.000  62.870  1      .013                                      .000     .000 0
JX    329.000  62.890  2      .013                                      .000     .000 0
R     382.400  63.170  2      .013                                       45.0          .000
JX    390.400  63.210  4  3   .013   17.600                63.720       .000     .000 0
R     567.400  64.070  4      .013                                       45.0          .000
JX    568.400  64.080  6  5   .013     .010                64.440       .000     .000 0
R     744.150  64.390  6      .013                                       45.0          .000
JX    747.150  64.400  8  7   .013   17.700                64.450     50.214     .000 0
R     761.150  64.440  8      .013
JX    762.150  64.450  9      .013                                    -31.022     .000 0
R     894.850  64.660  9      .013                                       .000     .000 0
R     916.250  64.680  9      .013                                       .000     .000 0
R     979.080  65.270  9      .013
JX    983.080  65.290  9      .013                                     45.000     .000 0
R    1012.870  65.430  9      .013                                       .000     .000 0
R    1017.470  65.450  9      .013                                     43.010     .000 0
R    1034.380  65.520  9      .013                                       .000     .000 0
R    1097.670  65.820  9      .013                                    -90.120     .000 0
R    1133.060  65.980  9      .013
JX   1137.720  66.030  9      .013                                       .000     .000 0
R    1260.610  66.580  9      .013                                       45.0          .000
JX   1265.280  66.630  9  3   .013     2.900                67.130       .000     .000 0
R    1490.580  67.620  9      .013                                       45.0          .000
JX   1495.240  67.670  9  3   .013     3.400                67.920       .000     .000 0
R    1724.050  68.700  9      .013
JX   1728.710  68.721  9      .013                                    -62.771     .000 1
R    1753.360  68.850  9      .013                                       .000     .000 0
R    1815.570  69.090  9      .013                                     67.838     .000 1
R    1836.020  69.180  9      .013
WE   1836.020  69.180  10     .300                                 69.180
SH   1836.020  69.180  10
CD   1  4   1    .000   3.000    .000  .000  .000   .00
CD   2  4   1    .000   3.000    .000  .000  .000   .00
CD   3  4   1    .000   2.500    .000  .000  .000   .00
CD   4  4   1    .000   3.000    .000  .000  .000   .00
CD   5  4   1    .000   2.500    .000  .000  .000   .00
CD   6  4   1    .000   3.000    .000  .000  .000   .00
CD   7  4   1    .000   2.500    .000  .000  .000   .00
CD   8  4   1    .000   3.000    .000  .000  .000   .00
CD   9  4   1    .000   3.000    .000  .000  .000   .00
CD  10  3   0    .000   4.600   3.000  .000  .000   .00
Q            11.000    .0
```

WATER SURFACE PROFILE LISTING

CITY OF TORRANCE
PRIVATE STORM DRAIN - LOMITA BLVD.
Q50 (INCLUDING COSTCO SITE) 10-27-2008

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT or I.D.	Base Wt "N"	ZL	No Wth Prs/Pip
L/Elem Ch Slope						SF Ave	HF	SE	Dpth Froude N	Norm Dp		X-Fall	ZR	Type Ch
100.000	61.500	10.180	71.680	52.61	7.44	.86	72.54	.00	2.36	.00	3.000	.000	.00	1
225.000	.0061					.0062	1.40	10.18	.00	2.49	.013	.00	.00	.0 PIPE
325.000	62.870	10.210	73.080	52.61	7.44	.86	73.94	.00	2.36	.00	3.000	.000	.00	1
329.000	.0050					.0062	.02	10.21	.00		.013	.00	.00	.0 JUNCT STR PIPE
382.400	62.890	10.215	73.105	52.61	7.44	.86	73.96	.00	2.36	.00	3.000	.000	.00	1
53.400	.0052					.0062	.33	10.21	.00	3.00	.013	.00	.00	.0 PIPE
390.400	63.170	10.267	73.437	52.61	7.44	.86	74.30	.00	2.36	.00	3.000	.000	.00	1
177.000	.0050					.0045	.04	10.27	.00		.013	.00	.00	.0 JUNCT STR PIPE
567.400	63.210	11.025	74.235	35.01	4.95	.38	74.62	.00	1.92	.00	3.000	.000	.00	1
568.400	.0049					.0028	.49	11.03	.00	1.94	.013	.00	.00	.0 PIPE
175.750	64.070	10.653	74.723	35.01	4.95	.38	75.10	.00	1.92	.00	3.000	.000	.00	1
744.150	.0100					.0028	.00	10.65	.00		.013	.00	.00	.0 JUNCT STR PIPE
747.150	64.080	10.646	74.726	35.00	4.95	.38	75.11	.00	1.92	.00	3.000	.000	.00	1
14.000	.0018					.0028	.48	10.65	.00	3.00	.013	.00	.00	.0 PIPE
	64.390	10.820	75.210	35.00	4.95	.38	75.59	.00	1.92	.00	3.000	.000	.00	1
	.0033					.0017	.01	.00	.00		.013	.00	.00	.0 JUNCT STR PIPE
	64.400	11.192	75.592	17.30	2.45	.09	75.69	.00	1.33	.00	3.000	.000	.00	1
	.0029					.0007	.01	.00	.00	1.47	.013	.00	.00	.0 PIPE

Program Package Serial Number: 3021
WATER SURFACE PROFILE LISTING Date:12- 9-2008 Time: 3:0:22

CITY OF TORRANCE
PRIVATE STORM DRAIN - LOMITA BLVD.
Q50 (INCLUDING COSTCO SITE) 10-27-2008

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT or I.D.	Base Wt "N"	ZL	ZR	No Wth Prs/Pip	L/Elem	Ch Slope	SF Ave	HF	SE	Dpth	Froude N	Norm Dp	X-Fall	Type Ch
761.150	64.440	11.176	75.616	17.30	2.45	.09	75.71	.00	1.33	.00	3.000	.000	.00	1.0											
															JUNCT STR	.0100		.0007	.00	.00	.00		.013	.00	.00	PIPE
762.150	64.450	11.166	75.616	17.30	2.45	.09	75.71	.00	1.33	.00	3.000	.000	.00	1.0											
															132.700	.0016		.0007	.09	.00	.00	1.77	.013	.00	.00	PIPE
894.850	64.660	11.057	75.717	17.30	2.45	.09	75.81	.00	1.33	.00	3.000	.000	.00	1.0											
															21.400	.0009		.0007	.01	11.06	.00	2.12	.013	.00	.00	PIPE
916.250	64.680	11.051	75.731	17.30	2.45	.09	75.82	.00	1.33	.00	3.000	.000	.00	1.0											
															62.830	.0094		.0007	.04	11.05	.00	1.06	.013	.00	.00	PIPE
979.080	65.270	10.503	75.773	17.30	2.45	.09	75.87	.00	1.33	.00	3.000	.000	.00	1.0											
															JUNCT STR	.0050		.0007	.00	.00	.00		.013	.00	.00	PIPE
983.080	65.290	10.486	75.776	17.30	2.45	.09	75.87	.00	1.33	.00	3.000	.000	.00	1.0											
															29.790	.0047		.0007	.02	.00	.00	1.28	.013	.00	.00	PIPE
1012.870	65.430	10.379	75.809	17.30	2.45	.09	75.90	.00	1.33	.00	3.000	.000	.00	1.0											
															4.600	.0043		.0007	.00	10.38	.00	1.31	.013	.00	.00	PIPE
1017.470	65.450	10.362	75.812	17.30	2.45	.09	75.91	.00	1.33	.00	3.000	.000	.00	1.0											
															16.910	.0041		.0007	.01	.00	.00	1.33	.013	.00	.00	PIPE
1034.380	65.520	10.316	75.836	17.30	2.45	.09	75.93	.00	1.33	.00	3.000	.000	.00	1.0											
															63.290	.0047		.0007	.04	10.32	.00	1.28	.013	.00	.00	PIPE

Program Package Serial Number: 3021
WATER SURFACE PROFILE LISTING

Date:12- 9-2008 Time: 3:0:22

CITY OF TORRANCE
PRIVATE STORM DRAIN - LOMITA BLVD.
Q50 (INCLUDING COSTCO SITE) 10-27-2008

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT or I.D.	Base Wt ZL	No Wth Prs/Pip	L/Elem Ch Slope	SF Ave	HF	SE	Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1097.670	65.820	10.059	75.879	17.30	2.45	.09	75.97	.00	1.33	.00	3.000	.000	.00	1	.0	35.390	.0045	.0007	.02	.00	.00	1.29	.013	.00	.00	PIPE
1133.060	65.980	9.941	75.921	17.30	2.45	.09	76.01	.00	1.33	.00	3.000	.000	.00	1	.0	JUNCT STR	.0107	.0007	.00	9.94	.00		.013	.00	.00	PIPE
1137.720	66.030	9.895	75.925	17.30	2.45	.09	76.02	.00	1.33	.00	3.000	.000	.00	1	.0	122.890	.0045	.0007	.08	9.89	.00	1.30	.013	.00	.00	PIPE
1260.610	66.580	9.427	76.007	17.30	2.45	.09	76.10	.00	1.33	.00	3.000	.000	.00	1	.0	JUNCT STR	.0107	.0006	.00	9.43	.00		.013	.00	.00	PIPE
1265.280	66.630	9.432	76.062	14.40	2.04	.06	76.13	.00	1.21	.00	3.000	.000	.00	1	.0	225.300	.0044	.0005	.11	9.43	.00	1.18	.013	.00	.00	PIPE
1490.580	67.620	8.547	76.167	14.40	2.04	.06	76.23	.00	1.21	.00	3.000	.000	.00	1	.0	JUNCT STR	.0107	.0004	.00	8.55	.00		.013	.00	.00	PIPE
1495.240	67.670	8.545	76.215	11.00	1.56	.04	76.25	.00	1.05	.00	3.000	.000	.00	1	.0	228.810	.0045	.0003	.06	8.54	.00	1.01	.013	.00	.00	PIPE
1724.050	68.700	7.577	76.277	11.00	1.56	.04	76.31	.00	1.05	.00	3.000	.000	.00	1	.0	JUNCT STR	.0045	.0003	.00	.00	.00		.013	.00	.00	PIPE
1728.710	68.721	7.557	76.278	11.00	1.56	.04	76.32	.00	1.05	.00	3.000	.000	.00	1	.0	24.650	.0052	.0003	.01	.00	.00	.97	.013	.00	.00	PIPE

CITY OF TORRANCE
PRIVATE STORM DRAIN - LOMITA BLVD.
Q50 (INCLUDING COSTCO SITE) 10-27-2008

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT or I.D.	Base Wt ZL	No Wth Prs/Pip	L/Elem	Ch Slope	SF Ave	HF	SE	Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1753.360	68.850	7.443	76.293	11.00	1.56	.04	76.33	.00	1.05	.00	3.000	.000	.00	1	.0	62.210	.0039	.0003	.02	7.44	.00	1.06	.013	.00	.00	PIPE
1815.570	69.090	7.220	76.310	11.00	1.56	.04	76.35	.00	1.05	.00	3.000	.000	.00	1	.0	20.450	.0044	.0003	.01	.00	.00	1.02	.013	.00	.00	PIPE
1836.020	69.180	7.144	76.324	11.00	1.56	.04	76.36	.00	1.05	.00	3.000	.000	.00	0	.0	WALL ENTRANCE									

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		3.000														
CD	2	4	1		3.000														
CD	3	4	1		2.500														
CD	4	4	1		3.000														
CD	5	4	1		2.500														
CD	6	4	1		3.000														
CD	7	4	1		2.500														
CD	8	4	1		3.000														
CD	9	4	1		3.000														
CD	10	3	0	.000	4.600	3.000	.000	.000	.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS - CITY OF TORRANCE

HEADING LINE NO 2 IS - PRIVATE STORM DRAIN - LOMITA BLVD.

HEADING LINE NO 3 IS - Q50 (INCLUDING COSTCO SITE) 10-27-2008

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	U/S DATA	STATION	INVERT	SECT	W S ELEV
		100.000	61.500	1	71.680

ELEMENT NO 2 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		325.000	62.870	1	.013	.000	.000	.000

0

ELEMENT NO 3 IS A JUNCTION

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		329.000	62.890	2	0	0	.013	.000	.000	.000	.000	.000	

.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		382.400	63.170	2	.013	.000	.000	.000

0

ELEMENT NO 5 IS A JUNCTION

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		390.400	63.210	4	3	0	.013	17.600	.000	63.720	.000	45.000	

.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 6 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		567.400	64.070	4	.013	.000	.000	.000

0

ELEMENT NO 7 IS A JUNCTION

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		568.400	64.080	6	5	0	.013	.010	.000	64.440	.000	45.000	

.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 8 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		744.150	64.390	6	.013	.000	.000	.000

0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 9 IS A JUNCTION

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		747.150	64.400	8	7	0	.013	17.700	.000	64.450	.000	45.000	

.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 10 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		761.150	64.440	8	.013	15.974	50.214	.000

0

ELEMENT NO 11 IS A JUNCTION

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		762.150	64.450	9	0	0	.013	.000	.000	.000	.000	.000	

.000

RADIUS	ANGLE
.000	.000

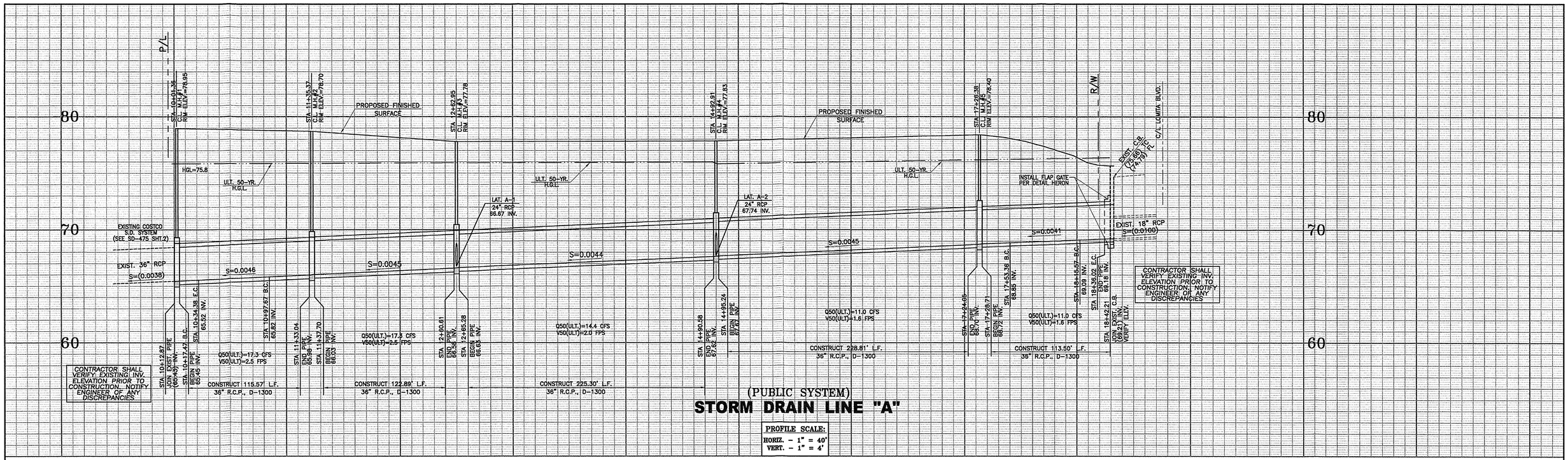
ELEMENT NO 12 IS A REACH

	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT
MAN H		894.850	64.660	9	.013	245.089	-31.022	.000

0

```
 ELEMENT NO  13 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         916.250    64.680    9                .013                                .000      .000      .000
0
 ELEMENT NO  14 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         979.080    65.270    9                .013                                .000      .000      .000
0
 ELEMENT NO  15 IS A JUNCTION              *          *      *      *        *                *                *                *
                   U/S DATA   STATION    INVERT   SECT LAT-1 LAT-2   N       Q3        Q4    INVERT-3 INVERT-4  PHI 3  PHI 4
                               983.080    65.290    9     0     0   .013     .000      .000     .000     .000     .000
.000                                                                                                   RADIUS    ANGLE
                                                                                                        .000      .000
 ELEMENT NO  16 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1012.870   65.430    9                .013                                37.930   45.000      .000
0                                                                W S P G W                                                   PAGE NO
4
                                   WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  17 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1017.470   65.450    9                .013                                .000      .000      .000
0
 ELEMENT NO  18 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1034.380   65.520    9                .013                                22.527   43.010      .000
0
 ELEMENT NO  19 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1097.670   65.820    9                .013                                .000      .000      .000
0
 ELEMENT NO  20 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1133.060   65.980    9                .013 *                              22.500  -90.120      .000
0
 ELEMENT NO  21 IS A JUNCTION              *          *      *      *        *                *                *                *
                   U/S DATA   STATION    INVERT   SECT LAT-1 LAT-2   N       Q3        Q4    INVERT-3 INVERT-4  PHI 3  PHI 4
                               1137.720   66.030    9     0     0   .013     .000      .000     .000     .000     .000
.000                                                                                                   RADIUS    ANGLE
                                                                                                        .000      .000
 ELEMENT NO  22 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1260.610   66.580    9                .013                                .000      .000      .000
0
 ELEMENT NO  23 IS A JUNCTION              *          *      *      *        *                *                *                *
                   U/S DATA   STATION    INVERT   SECT LAT-1 LAT-2   N       Q3        Q4    INVERT-3 INVERT-4  PHI 3  PHI 4
                               1265.280   66.630    9     3     0   .013    2.900      .000    67.130     .000   45.000
.000                                                                                                   RADIUS    ANGLE
                                                                                                        .000      .000
 ELEMENT NO  24 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1490.580   67.620    9                .013                                .000      .000      .000
0
 ELEMENT NO  25 IS A JUNCTION              *          *      *      *        *                *                *                *
                   U/S DATA   STATION    INVERT   SECT LAT-1 LAT-2   N       Q3        Q4    INVERT-3 INVERT-4  PHI 3  PHI 4
                               1495.240   67.670    9     3     0   .013    3.400      .000    67.920     .000   45.000
.000                                                                                                   RADIUS    ANGLE
                                                                                                        .000      .000
                                                                 W S P G W                                                   PAGE NO
5
                                   WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  26 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1724.050   68.700    9                .013                                .000      .000      .000
0
 ELEMENT NO  27 IS A JUNCTION              *          *      *      *        *                *                *                *
                   U/S DATA   STATION    INVERT   SECT LAT-1 LAT-2   N       Q3        Q4    INVERT-3 INVERT-4  PHI 3  PHI 4
                               1728.710   68.721    9     0     0   .013     .000      .000     .000     .000     .000
.000                                                                                                   RADIUS    ANGLE
                                                                                                        .000      .000
 ELEMENT NO  28 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1753.360   68.850    9                .013                                22.500  -62.771      .000
1
 ELEMENT NO  29 IS A REACH                 *          *      *                N                                RADIUS    ANGLE     ANG PT
                   U/S DATA   STATION    INVERT   SECT
MAN H                         1815.570   69.090    9                .013                                .000      .000      .000
0
```

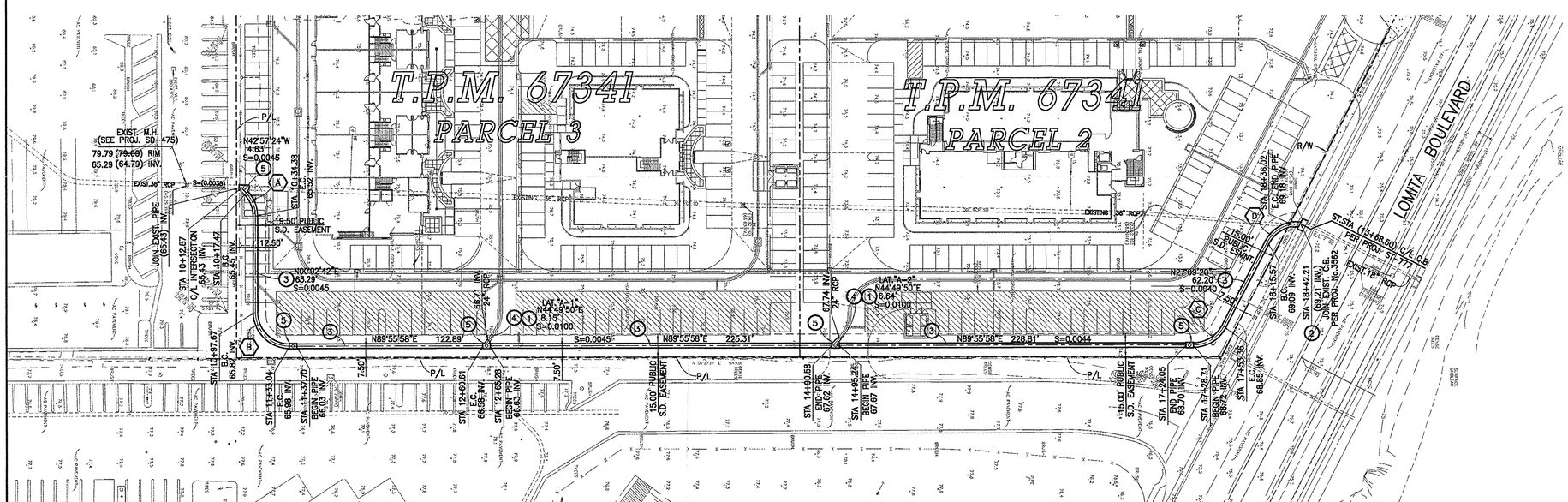
```
  ELEMENT NO  30 IS A REACH                 *          *      *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT
MAN H                           1836.020   69.180    9              .013                         17.272   67.838      .000
1
  ELEMENT NO  31 IS A  WALL  ENTRANCE                                 *
                     U/S DATA   STATION    INVERT  SECT              FP
                                1836.020   69.180    1              .300
  ELEMENT NO  32 IS A SYSTEM HEADWORKS                                *                  *
                     U/S DATA   STATION    INVERT  SECT                                          W S ELEV
                                1836.020   69.180    1                                            69.180
```



(PUBLIC SYSTEM)

STORM DRAIN LINE "A"

PROFILE SCALE:
HORIZ. - 1" = 40'
VERT. - 1" = 4'



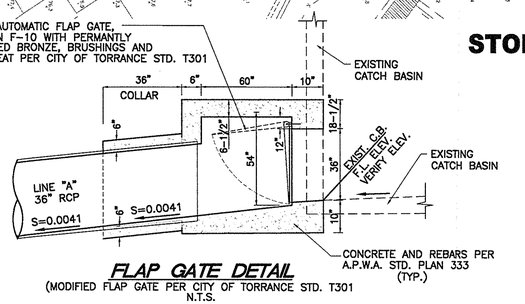
STORM DRAIN CONSTRUCTION NOTES:

1. CONSTRUCT 24" R.C.P. D-1250, BEDDING PER CITY OF TORRANCE STD. 302
2. CONSTRUCT MONOLITHIC CONNECTION AND FLAP GATE PER MODIFIED CITY OF TORRANCE STD. T301. SEE DETAIL ON SHT.3
3. CONSTRUCT 36" R.C.P. D-VALUE AS SHOWN ON PROFILE, BEDDING PER CITY OF TORRANCE STD. 302
4. BRICK AND MORTAR END OF PIPE
5. CONSTRUCT MANHOLE PER A.P.W.A. STD. PLAN NO. 322-1.

CURVE DATA				
⬡	△	R	T	L
A	43°00'05"	22.50'	8.86'	16.88'
B	90°06'44"	22.50'	22.54'	35.38'
C	62°46'38"	22.50'	13.73'	24.66'
D	52°04'00"	22.50'	10.99'	20.45'

0 20 40 80 120
SCALE:1"=40'

Last Update: 11/21/08
O:\2700-2799\2746\2746SD-REALIGN.dwg



FLAP GATE DETAIL

(MODIFIED FLAP GATE PER CITY OF TORRANCE STD. T301
N.T.S.

STORM DRAIN LINE "A"

(PUBLIC SYSTEM)

CALL BEFORE YOU DIG
Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REGISTERED PROFESSIONAL ENGINEER HAIDOOK I. AGHAIAN R.C.E. NO. 43293 Exp. 3-31-08 CIVIL STATE OF CALIFORNIA

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

PLANS PREPARED UNDER THE SUPERVISION OF

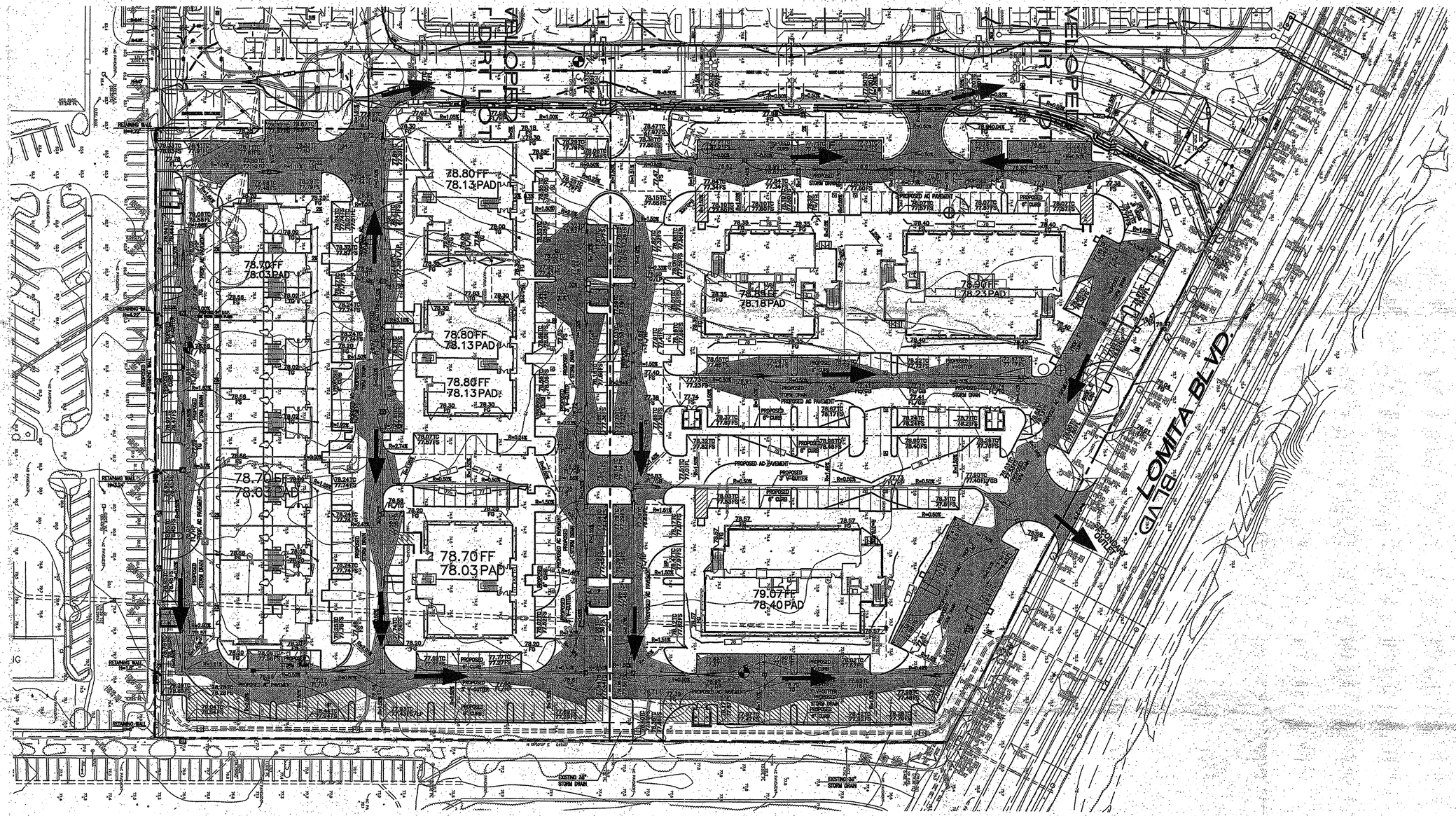
HAIDOOK I. AGHAIAN R.C.E. 43293 DATE

REV.	DATE	DESCRIPTION	BY	CHECKED

CITY OF TORRANCE
COMMUNITY DEVELOPMENT DEPARTMENT

DRAWN: PRIVATE ENGINEER
DESIGNED: PRIVATE ENGINEER
PROJECT ENGINEER:
APPROVED:
RECOMMENDED:
JEFFERY GIBSON DATE
COMMUNITY DEVELOPMENT DIRECTOR
TOUFIC J. SEMAAN
ENGINEERING DIVISION MANAGER
R.C.E. #59226 EXP: 6-30-2009
SCALE: AS SHOWN SHEET 2 OF 2
PLAN NO. **SD-498**

PHASE 1 SEE SHEET NO. 2



LEGEND:

APPROXIMATELY LIMITS OF PONDING

OVERFLOW DIRECTION

STREET VOLUME CALCULATION

TOTAL PONDING AREA = 77,470 SF/2 = 38,700 CF

APPROXIMATELY STREET SURFACE
PONDING VOLUME = 38,700 /3 = 12,900 CF = 0.29 Ac/Ft

0 20 40 80 120
SCALE:1"=40'

REGISTERED PROFESSIONAL ENGINEER
REINHARD STENZEL
R.C.E. NO. 56155
Exp. 12-31-08
CIVIL
STATE OF CALIFORNIA

Last Updated: 5/5/08
O:\2700-2799\2746\2746-PH2-SUMP.dwg

SOILS ENGINEER:
GSC
GEOSOILS CONSULTANTS INC.
6134 VALJEAN AVENUE
VAN NUYS, CA 91406
PHONE: (818) 785-2158
FAX: (818) 785-1548

BENCH MARK:
CITY OF TORRANCE: BENCH MARK NO. 928
CHIZ SQUARE ON SOUTH CURB OF SKYPARK DRIVE AT WEST END OF CATCH BASIN AT EAST BCR OF AIRPORT DRIVE WAY AT INTERSECTION OF GARNER STREET.
ELEVATION = 80.389'

PREPARED UNDER THE DIRECTION OF:

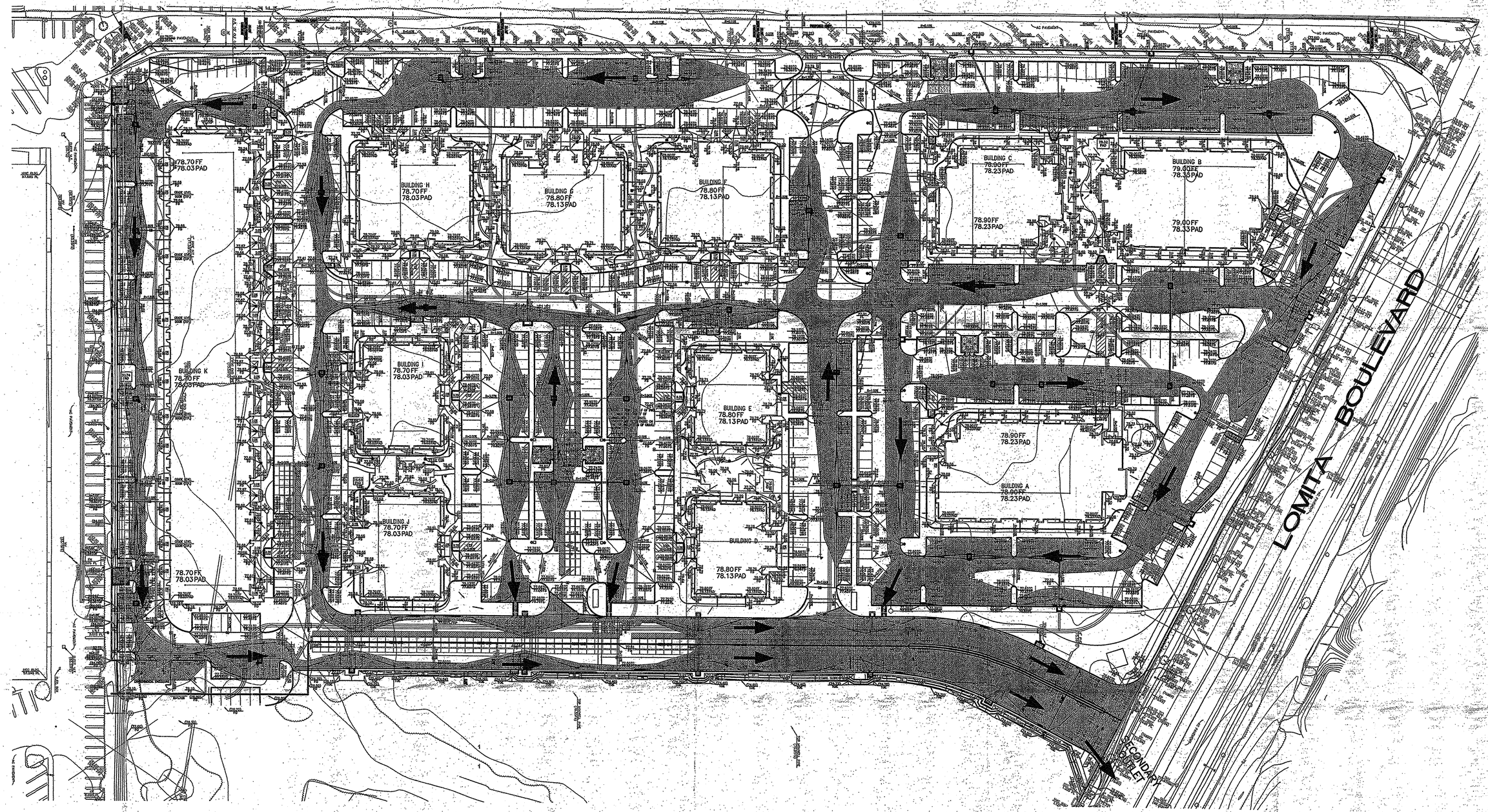
REINHARD STENZEL DATE
RCE NO. 56155

DEVELOPER:

ENGINEER:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

PRECISE GRADING PLAN (PHASE 1)
FOR
2740 LOMITA BOULEVARD
PONDING EXHIBIT

SHEET 1 OF 2



PHASE 2 SEE SHEET NO. 1

LEGEND:

APPROXIMATELY LIMITS OF PONDING

OVERFLOW DIRECTION

STREET VOLUME CALCULATION

TOTAL PONDING AREA = 148,360 SF/2 = 74,180 CF

APPROXIMATELY STREET SURFACE
PONDING VOLUME = 74,180 /3 = 24,730 CF = 0.56 Ac/Ft

0 20 40 80 120
SCALE:1"=40'

REGISTERED PROFESSIONAL ENGINEER
REINHARD STENZEL
R.C.E. NO. 56155
Exp. 12-31-08
CIVIL
STATE OF CALIFORNIA

Last Update: 9/3/08
O:\2700-2799\2746\2746-PH2-SUMP.dwg

SOILS ENGINEER:
GSC
GEOSOILS CONSULTANTS INC.
6834 VALJEAN AVENUE
VAN NUYS, CA 91406
PHONE: (818) 785-2158
FAX: (818) 785-1548

BENCH MARK:
CITY OF TORRANCE: BENCH MARK NO. 928
CHIZ SQUARE ON SOUTH CURB OF SKYPARK DRIVE AT WEST END OF CATCH BASIN AT EAST BCR OF AIRPORT DRIVE WAY AT INTERSECTION OF GARNIER STREET.
ELEVATION = 80.389'

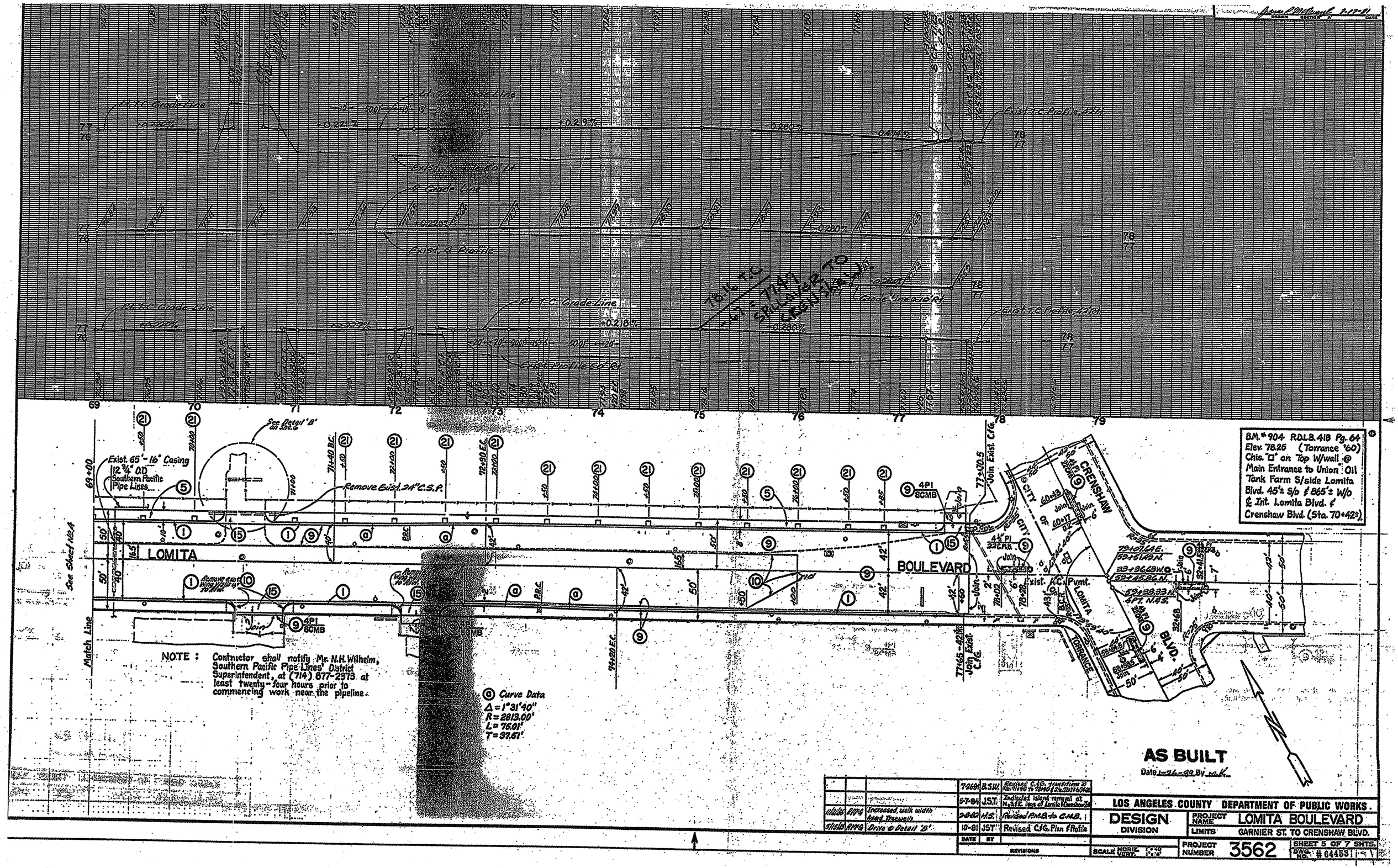
PREPARED UNDER THE DIRECTION OF:
REINHARD STENZEL DATE
RCE NO. 56155

DEVELOPER:

ENGINEER:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

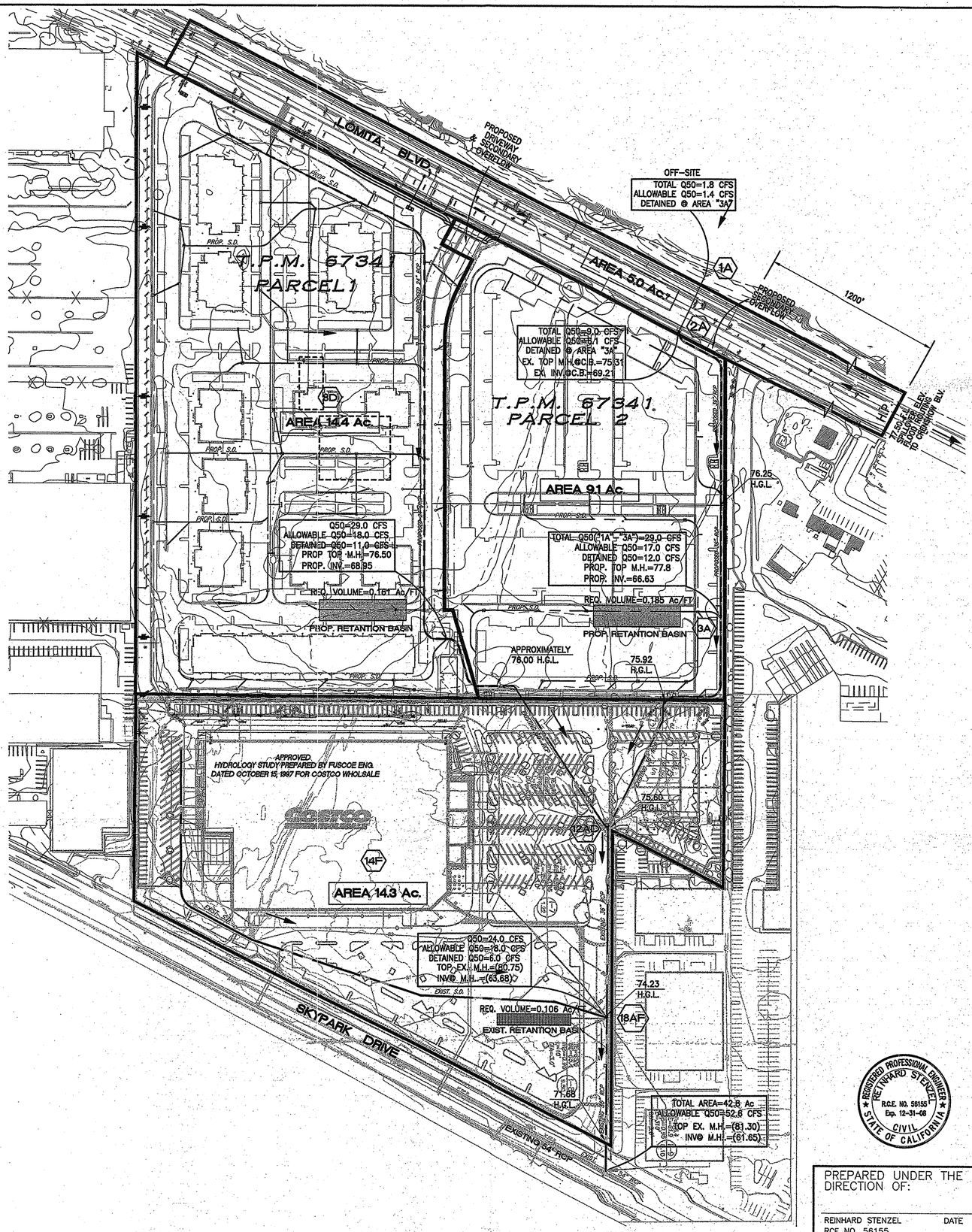
PRECISE GRADING PLAN (PHASE 1)
FOR
2740 LOMITA BOULEVARD
PONDING EXHIBIT

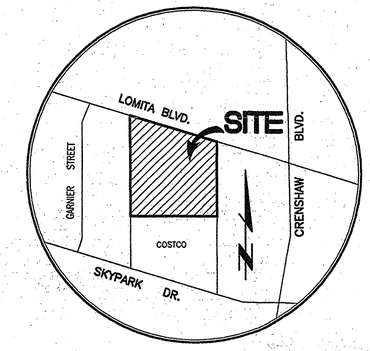
SHEET 2 OF 2


B.M. # 904 R.D.L.B. 418 Pg. 64
Elev. 78.25 (Torrance '60)
Chis. "□" on Top W/wall @
Main Entrance to Union Oil
Tank Farm S/side Lomita
Blvd. 45'± S/o ℄ 865'± W/o
℄ Int. Lomita Blvd. &
Crenshaw Blvd. (Sta. 70+42±).
Exist. 65'-16" Casing
12 ¾" OD
Southern Pacific
Pipe Lines
See Detail 'B' on Sht. 6
Remove Exist. 24" C.S.P.
See Sheet No. 4
Match Line
LOMITA
BOULEVARD
CRENSHAW
BLVD.
TORRANCE
CITY OF TORRANCE
Exist. A.C. Pvmt.
NOTE: Contractor shall notify Mr. N.H. Wilhelm, Southern Pacific Pipe Lines' District Superintendent, at (714) 877-2373 at least twenty-four hours prior to commencing work near the pipeline.
Curve Data
Δ = 1°31'40"
R = 2813.00'
L = 75.01'
T = 37.51'
AS BUILT
Date 1-26-82 By M.K.
7-26-81 B.S.W. Revised C.&G. Alignment & Sta. 70+90 to 72+90 & Sta. 78+00 to 79+00
5-7-84 J.S.T. Indicated island removal at N. & S/E ends of Lomita & Crenshaw
11/21/80 R.M.G. Increased walk width & added Trees wells
2-8-82 H.S. Revised F.M.B. to C.M.B.
5/15/80 R.M.G. Drive @ Detail 'B'
10-81 J.S.T. Revised C.&G. Plan & Profile
DATE BY REVISIONS
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
DESIGN DIVISION
PROJECT NAME LOMITA BOULEVARD
LIMITS GARNIER ST. TO CRENSHAW BLVD.
SCALE HORIZ. VERT.
PROJECT NUMBER 3562
SHEET 5 OF 7 SHTS.
DWG. NO. # 64453

APPENDIX C

PROPOSED CONDITION HYDROLOGY MAP





VICINITY MAP

N.T.S.

LEGEND

- WATERSHEAD BOUNDARY
- PROPOSED STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- 1.00 AC. — SUBAREA AREA
- 1A — NODE NUMBER
- FLOWPATH

N

0 50 100 200 300

SCALE:1"=100'

REGISTERED PROFESSIONAL ENGINEER REINHARD STENZEL R.C.E. NO. 56155 Exp. 12-31-08 CIVIL STATE OF CALIFORNIA

Last Update: 12/9/08
O:\2700-2799\2746\2746hyd-MS.dwg

PREPARED UNDER THE DIRECTION OF:	DEVELOPER:	ENGINEER:	MODIFICATION OFF APPROVED HYDROLOGY MAP FOR 2740 LOMITA BLVD CITY OF TORRANCE	SHEET 1 OF 1
REINHARD STENZEL DATE RCE NO. 56155	SHERIDAN-EBBERT DEVELOPMENT 13120 TELFAIR AVENUE SYLMAR, CA 91342 TEL: (818) 364-7505 FAX: (818) 364-7504	Thienes Engineering, Inc. CIVIL ENGINEERING • LAND SURVEYING 14349 FIRESTONE BLVD. LA MIRADA, CALIFORNIA 90638 PH.(714)521-4811 FAX(714)521-4173		T.E.JOB NO. 2746

APPENDIX D

PORTION OF APPROVED HYDROLOGY CALCULATION BY FUSCOE ENG.

FUSCOE ENGINEERING

SAN DIEGO

File Copy
2199.04A

5465 Morehouse Dr., Suite 165 ■ San Diego, CA 92121 ■ Phone (619) 554-1500 ■ Fax (619) 597-0335 ■ E-mail: http://www.fuscoe.com

HYDROLOGY REPORT

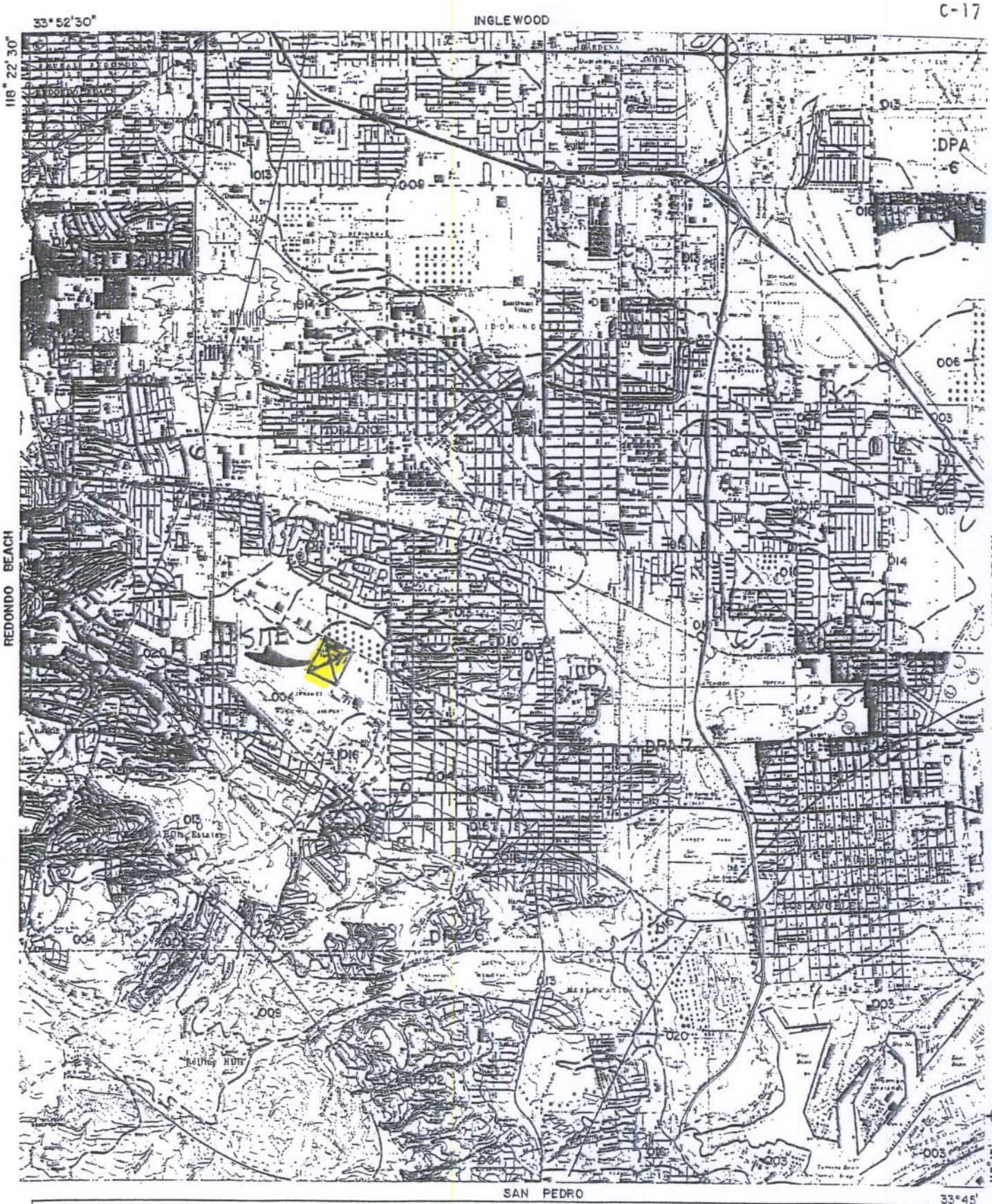
FOR

COSTCO WHOLESALE
TORRANCE, CA

OCTOBER 15, 1997

PREPARED FOR:

COSTCO WHOLESALE
Legal/Real Estate Department
999 Lake Drive
Issaquah, WA 98027



LEGEND

— — — SOIL CLASSIFICATION AREA

..... DEBRIS POTENTIAL AREA

(K) RAINFALL ZONE

—12— 50-YEAR ISOHYET (MAX. 24-HOUR AMOUNT)

LACFCD

hydrology manual

TORRANCE

1964

Revised (10/82)

hydrologic map

0 FEET 8000

Figure C1.4

DURATION IN MINUTES

STORM TIME IN MINUTES	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
912	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52	.52
950	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53
1000	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55	.55
1050	.58	.58	.58	.58	.58	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57
1075	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59
1100	.67	.67	.67	.67	.67	.66	.66	.66	.66	.66	.66	.65	.65	.65	.65	.65	.64	.64	.64	.64	.64
1105	.69	.69	.69	.69	.68	.68	.68	.68	.68	.68	.67	.67	.67	.67	.67	.66	.66	.66	.66	.66	.66
1110	.72	.72	.71	.70	.70	.71	.70	.70	.70	.70	.70	.69	.69	.69	.69	.69	.68	.68	.68	.68	.68
1115	.75	.75	.75	.74	.74	.74	.73	.73	.73	.73	.72	.72	.72	.71	.71	.71	.71	.71	.70	.70	.70
1120	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76	.75	.75	.75	.74	.74	.74	.73	.73	.73	.73
1121	.80	.79	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76	.75	.75	.75	.74	.74	.74	.73	.73
1122	.80	.80	.80	.79	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76	.75	.75	.75	.74	.74	.74
1123	.81	.81	.80	.80	.80	.79	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76	.75	.75	.75	.74
1124	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76	.75	.75
1125	.83	.83	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.78	.78	.78	.77	.77	.77	.76	.76	.76
1126	.84	.83	.83	.82	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.78	.78	.78	.77	.77	.77	.76
1127	.85	.84	.84	.83	.83	.83	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.79	.78	.78	.77	.77
1128	.85	.85	.85	.84	.84	.83	.83	.83	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.79	.78	.78
1129	.86	.86	.85	.85	.85	.84	.84	.83	.83	.83	.82	.82	.81	.81	.81	.80	.80	.80	.79	.79	.79
1130	.87	.87	.86	.86	.85	.85	.85	.84	.84	.83	.83	.83	.82	.82	.82	.81	.81	.80	.80	.80	.79
1131	.88	.88	.87	.87	.86	.86	.85	.85	.85	.84	.84	.83	.83	.83	.82	.82	.82	.81	.81	.80	.80
1132	.89	.89	.88	.88	.87	.87	.86	.86	.85	.85	.85	.84	.84	.84	.83	.83	.82	.82	.82	.81	.81
1133	.90	.90	.89	.89	.88	.88	.87	.87	.86	.86	.86	.85	.85	.84	.84	.84	.83	.83	.82	.82	.81
1134	.92	.91	.90	.90	.89	.89	.88	.88	.88	.87	.87	.86	.86	.85	.85	.85	.84	.84	.83	.83	.82
1135	.94	.93	.92	.91	.91	.90	.90	.89	.89	.88	.88	.87	.87	.86	.86	.86	.85	.85	.84	.84	.83
1136	.96	.95	.94	.93	.93	.92	.91	.91	.90	.90	.89	.89	.88	.88	.87	.87	.86	.86	.86	.85	.85
1137	.99	.98	.96	.95	.95	.94	.93	.93	.92	.91	.91	.90	.90	.89	.89	.88	.88	.87	.87	.86	.86
1138	1.02	1.01	.99	.98	.97	.96	.95	.95	.94	.93	.93	.92	.91	.91	.90	.90	.89	.89	.88	.88	.87
1139	1.06	1.04	1.03	1.01	1.00	.99	.98	.97	.96	.95	.95	.94	.93	.93	.92	.92	.91	.90	.90	.89	.89
1140	1.11	1.09	1.07	1.05	1.04	1.02	1.01	1.00	.99	.98	.97	.96	.96	.95	.94	.94	.93	.92	.92	.91	.91
1141	1.16	1.14	1.12	1.10	1.08	1.06	1.05	1.03	1.02	1.01	1.00	.99	.98	.97	.97	.96	.95	.95	.95	.93	.93
1142	1.22	1.20	1.17	1.15	1.12	1.10	1.09	1.07	1.06	1.04	1.03	1.02	1.01	1.00	.99	.99	.98	.97	.96	.96	.95
1143	1.29	1.26	1.23	1.20	1.18	1.16	1.14	1.12	1.10	1.09	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00	.99	.98	.98
1144	1.37	1.34	1.30	1.27	1.24	1.22	1.19	1.17	1.15	1.13	1.12	1.10	1.09	1.08	1.06	1.05	1.04	1.03	1.02	1.01	1.01
1145	1.46	1.42	1.38	1.35	1.31	1.28	1.26	1.23	1.21	1.19	1.17	1.15	1.13	1.11	1.11	1.09	1.08	1.07	1.06	1.05	1.04
1146	1.56	1.51	1.47	1.43	1.39	1.36	1.33	1.30	1.27	1.25	1.23	1.21	1.19	1.17	1.15	1.14	1.13	1.11	1.10	1.09	1.08
1147	1.67	1.62	1.57	1.52	1.48	1.44	1.41	1.38	1.35	1.32	1.29	1.27	1.25	1.23	1.21	1.19	1.18	1.16	1.15	1.13	1.12
1148	1.79	1.74	1.68	1.63	1.59	1.54	1.50	1.47	1.43	1.40	1.37	1.34	1.32	1.29	1.27	1.25	1.23	1.22	1.20	1.19	1.17
1149	1.97	1.90	1.83	1.78	1.72	1.67	1.62	1.58	1.53	1.50	1.47	1.44	1.41	1.38	1.35	1.33	1.31	1.29	1.27	1.25	1.24
1150	2.28	2.18	2.09	2.01	1.93	1.87	1.81	1.76	1.70	1.66	1.62	1.58	1.54	1.51	1.47	1.45	1.42	1.39	1.37	1.35	1.33
1151	2.93	2.73	2.58	2.45	2.34	2.24	2.16	2.08	2.01	1.94	1.88	1.83	1.78	1.73	1.69	1.65	1.62	1.58	1.55	1.52	1.50
1152	4.07	3.71	3.43	3.21	3.03	2.87	2.73	2.62	2.50	2.41	2.32	2.24	2.17	2.10	2.04	1.99	1.94	1.89	1.85	1.81	1.77
1153	4.62	4.19	3.87	3.61	3.39	3.20	3.05	2.91	2.78	2.67	2.57	2.48	2.39	2.32	2.25	2.18	2.12	2.07	2.02	1.97	1.93
1154	4.49	4.15	3.85	3.61	3.40	3.23	3.08	2.94	2.82	2.71	2.61	2.52	2.44	2.36	2.29	2.22	2.16	2.11	2.05	2.01	1.96
1155	4.10	3.95	3.73	3.53	3.35	3.19	3.05	2.92	2.81	2.71	2.62	2.52	2.44	2.37	2.30	2.24	2.18	2.12	2.07	2.02	1.98
1156	3.31	3.39	3.34	3.40	3.25	3.12	3.00	2.88	2.78	2.69	2.60	2.52	2.44	2.37	2.30	2.24	2.18	2.13	2.08	2.03	1.98
1157	1.98	2.92	3.22	3.22	3.13	3.03	2.92	2.83	2.74	2.65	2.57	2.50	2.43	2.36	2.30	2.24	2.18	2.13	2.08	2.03	1.99
1158	1.79	1.80	2.63	2.93	2.96	2.91	2.83	2.76	2.68	2.61	2.54	2.47	2.40	2.34	2.28	2.23	2.17	2.12	2.07	2.03	1.99
1159	1.01	1.14	1.66	2.41	2.70	2.75	2.72	2.67	2.61	2.55	2.49	2.43	2.37	2.32	2.27	2.21	2.16	2.11	2.07	2.03	1.98
1160	.92	.97	1.09	1.55	2.23	2.51	2.57	2.56	2.52	2.48	2.43	2.38	2.33	2.29	2.24	2.19	2.14	2.10	2.05	2.01	1.97
1161	.86	.89	.94	1.05	1.47	2.08	2.35	2.42	2.42	2.40	2.36	2.33	2.29	2.25	2.21	2.16	2.12	2.08	2.04	2.00	1.96
1162	.81	.84	.87	.92	1.01	1.39	1.96	2.22	2.29	2.30	2.29	2.26	2.23	2.20	2.17	2.13	2.09	2.06	2.02	1.99	1.95
1163	.78	.79	.82	.85	.89	.98	1.33	1.86	2.10	2.18	2.19	2.19	2.17	2.15	2.12	2.09	2.06	2.03	2.00	1.97	1.93
1164	.75	.76	.77	.80	.83	.87	.96	1.28	1.77	2.00	2.08	2.10	2.10	2.09	2.07	2.05	2.03	2.00	1.97	1.95	1.91
1165	.71	.73	.75	.76	.78	.81	.85	.93	1.23	1.69	1.91	1.99	2.01	2.02	2.01	2.00	1.98	1.96	1.94	1.92	1.90
1166	.68	.70	.72	.74	.75	.77	.80	.83	.91	1.19	1.62	1.83	1.91	1.94	1.95	1.94	1.94	1.92	1.91	1.89	1.87
1167	.66	.67	.69	.71	.72	.74	.76	.78	.82	.89	1.15	1.56	1.76	1.84	1.87	1.88	1.88	1.88	1.87	1.85	1.84
1168	.65	.66	.67	.68	.70	.71	.72	.75	.77	.80	.87	1.12	1.50	1.70	1.78	1.81	1.82	1.82	1.82	1.82	1.80
1169	.64	.64	.65	.66	.67	.69	.70	.72	.74	.76	.79	.85	1.09	1.45	1.64	1.72	1.75	1.77	1.77	1.77	1.77
1170	.63	.63	.64	.65	.66	.67	.68	.70	.71	.73	.75	.78	.84	1.06	1.41	1.51	1.66	1.70	1.72	1.72	1.73
1171	.62	.62	.63	.63	.64	.65	.66	.68	.69	.70	.72	.74	.77	.83	1.04	1.37	1.54	1.62	1.65	1.67	1.68
1172	.61	.62	.62	.62	.63	.64	.65	.66	.67	.68	.69	[illegible]	.73	.76	.82	1.02	1.33	1.50	1.57	1.61	1.63
1173	.61	.61	.62	.62	.62	.63	.63	.64	.65	.66	.68	.69	.71	.73	.75	.81	1.00	1.30	1.46	1.53	1.57
1174	.61	.61	.61	.61	.62	.62	.63	.63	.64	.65	.66	.67	.68	.70	.72	.75	.80	.96	1.27	1.42	1.49
1175	.60	.60	.61	.61	.61	.61	.62	.62	.63	.64	.64	.66	.67	.68	.69	.71	.74	.79	.96	1.24	1.39
1176	.60	.60	.60	.60	.61	.61	.61	.62	.62	.63	.63	.64	.65	.66	.67	.69	.71	.73	.78	.95	1.21
1177	.60	.60	.60	.60	.60	.60	.61	.61	.61	.62	.62	.63	.64	.65	.66	.67	.68	.70	.73	.77	.93
1178	.59	.60	.60	.60	.60	.60	.60	.61	.61	.61	.62	.62	.63	.64	.65	.66	.67	.68	.70	.72	.76
1179	.59	.59	.60	.60	.60	.60	.60	.60	.60	.61	.61	.61	.62	.63	.63	.64	.65	.66	.68	.69	.71
1180	.59	.59	.59	.59	.59	.60	.60	.60	.60	.60	.61	.61	.61	.62	.62	.63	.64	.65	.66	.67	.69
1185	.58	.58	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59	.60	.60	.60	.60	.61	.61	.61	.62
1190	.57	.57	.58	.58	.58	.58	.58	.58	.58	.58	.58	.58	.58	.59	.59	.59	.59	.59	.59	.59	.59
1195	.55	.56	.56	.56	.56	.56	.56	.57	.57	.57	.57	.57	.57	.57	.57	.58	.58	.58	.58	.58	.58
1200	.54	.54	.54	.54	.54	.55	.55	.55	.55	.55	.56	.56	.56	.56	.56	.56	.56	.56	.57	.57	.57
1205	.53	.53	.53	.53	.53	.53	.53	.54	.54	.54	.54	.54	.54	.55	.55	.55	.55	.55	.55	.55	.56
1210	.52	.52	.52	.52	.52	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.54	.54	.54	.54	.54	.54
1212	.52	.52	.52	.52	.52	.52	.52	.52	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.54	.54	.54

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AVERAGE RAINFALL INTENSITY TABLE

K ZONE

Figure C-4.2

Infiltration Rates in Inches per Hour

Soil Number	Soil Designation		Rainfall Intensities in Inches per Hour 0	0.5	1.0	1.5	2.0	2.5	3.0
002	Altamont Clay Loam	(A)	0	0.205	0.270	0.300	0.340	0.350	0.360
003	Chino Silt Loam	(CS-1)	0	0.500	0.910	1.185	1.360	1.525	1.650
004	Diablo Clay Loam	(DY)	0	0.390	0.500	0.600	0.660	0.725	0.810
005	Hanford Fine Sandy Loam	(HF)	0	0.440	0.590	0.660	0.660	0.650	0.630
006	Hanford Fine Sandy Loam	(HF-1)	0	0.325	0.420	0.480	0.520	0.525	0.510
007	Hanford Gravelly Sandy Loam	(HG)	0	0.500	0.720	0.840	0.920	0.975	1.020
008	Hanford Silt Loam	(HN)	0	0.170	0.200	0.210	0.220	0.225	0.210
009	Montezuma Clay Adobe	(M)	0	0.350	0.470	0.510	0.500	0.450	0.360
010	Oakley Fine Sand	(OS)	0	0.500	0.840	1.050	1.200	1.275	1.320
011	Placentia Loam	(PL)	0	0.325	0.420	0.480	0.520	0.550	0.600
012	Ramona Clay Loam	(RC-1)	0	0.130	0.160	0.160	0.140	0.125	0.120
013	Ramona Loam	(RO)	0	0.425	0.510	0.450	0.360	0.275	0.210
014	Ramona Sandy Loam	(RS)	0	0.500	0.740	0.720	0.760	0.800	0.780
015	Tujunga Fine Sandy Loam	(TF)	0	0.500	0.900	1.185	1.400	1.575	1.740
016	Yolo Loam	(Y)	0	0.380	0.460	0.480	0.480	0.475	0.450
017	Yolo Clay Loam	(YC)	0	0.280	0.320	0.315	0.300	0.275	0.270
018	Yolo Fine Sandy Loam	(YF)	0	0.500	1.000	1.500	2.000	2.500	2.580
019	Yolo Gravelly Sandy Loam	(YG)	0	0.500	0.900	1.185	1.420	1.575	1.680
020	Yolo Sandy Loam	(YS)	0	0.435	0.660	0.810	0.940	1.050	1.170

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INFILTRATION RATE TABLE
VALLEY SOILS

Figure C-6.1

TORRENCE COSTCO MAIN LINE HYDROLOGY
ULTIMATE CONDTION - FULLY DEVELOPED
SITE

Reach Data:

Reach No.	Conveyance (ft) Type	Depth	Width	Z Hor	Vert	Length (ft)	Effect. Slope	Area (ac.) at top	Q (cfs) at top
1- 1	1/2 St.	.37	80.0	.00	.00	1270.0	.0017	.3	2.1
1- 2	Pipe	1.50	.0	.00	.00	80.0	.0425	2.5	4.1
1- 3	Pipe	3.00	.0	.00	.00	100.0	.0040	5.0	8.3
1- 4	Pipe	3.00	.0	.00	.00	865.0	.0013	21.7	36.0
1- 5	Pipe	3.00	.0	.00	.00	10.0	.0100	23.3	38.7
1- 6	Pipe	3.00	.0	.00	.00	10.0	.0100	30.6	50.8
1- 7	Pipe	3.00	.0	.00	.00	355.0	.0048	32.0	53.1
1- 8	Pipe	3.00	.0	.00	.00	10.0	.0100	33.2	55.1
1- 9	Pipe	3.00	.0	.00	.00	310.0	.0113	42.7	70.9
Outlet								42.8	71.0

Street Cross-Section Data:

Section No.	Depth (feet) No.: 1	2	3	4	Curb Height	Horiz. Distance Curb-Prop. Line	Width (ft.)
1	.170	.500	.000	.200	.670	10.	80.

Depth No. 1 = Gutter.
Depth No. 2 = Gutter to Crown.
Depth No. 3 = Crown to Curb.
Depth No. 4 = Curb to Property Line.

INTRODUCTION

This report has been prepared at the request of Costco Wholesale for the proposed warehouse site on Skypark Drive.

The purpose of the report is to estimate the runoff from the site before and after development, determine the capacity of the downstream storm drain system, and provide the technical basis for the design of the proposed on-site storm drain improvements.

Detailed hydrology calculations are limited to the area tributary to the existing 36" RCP. This area included a portion of Lomita Blvd., and all of the 38 acre site.

BACKGROUND

Although currently the site is vacant, the northern 25 acre portion was previously developed as a defense manufacturing plant. The existing private 36" storm drain has been in operation for nearly 40 years and drains to the existing 54" storm drain in Skypark Drive. The 54" storm drain, (LACFCD Proj. No. 245) has relatively little tributary area upstream of the site. However, after a major storm event, the water stored from the storm in Walteria Lake is pumped into the 54" pipe. The water is pumped at a rate of 55 CFS and results in a force main condition and a hydraulic grade line of about 80 feet at the site, according to LACFCD staff. An inquiry was made to Greg Evan at L.A.C.D.P.W. to confirm the operating policy for the pumping of Walteria Lake. He responded that "The pumps are turned on after the peak flow passes". Therefore, only the natural tributary area to the 54" pipe will be contributing runoff during the 50 year design storm.

In the early 1990's, a major shopping center developed just west of the Costco site: The Torrance Crossroads Center. As part of the supporting studies for this shopping center, two hydrology reports were prepared. The first report was prepared September 18, 1990, the second was prepared April 15, 1991 and revised May 28, 1991. Both reports were prepared by Dalcin Cummins Associates (DCA). These reports extensively define and evaluate the existing drainage system. This report utilizes the information and data in these reports by reference and includes some of the key exhibits in the appendix of the report.

A second storm drain system that runs parallel to the 54" pipe is a City owned drain that varies from 33" to 45". An earlier report prepared by Fuscoe Engineering stated that capacity was available in this system. However, careful review of the studies prepared for the Torrance Crossroads Center revealed that is system has a significant tributary area and shows that this pipe is inadequate. Flows that cannot enter this system during a 50 year storm will surface flow in Skypark Drive east until the hydraulic gradeline drops to below street level and flows can once again enter the system. According to the study prepared for the Torrance Crossroads Center, the hydraulic grade line exceeds the street grade in Skypark Drive about 1,200 feet upstream of Crenshaw Blvd.

This project has been conditioned to design a system with on-site retention structured to the satisfaction of the City engineer. The purpose of this design is to insure that the proposed development will not incrementally increase storm flows to any off-site storm drain facilities. And further, result in a net decrease in peak discharge during a 50 year storm. The F.E.I.R. prepared for the project presents a concept that achieves this goal with a two basin system, one above ground and one below ground. The above ground system was to be used when the Walteria Lake pump was operating and would discharge to the 42" storm drain in Skypark Drive. Since it is now understood that there is no capacity in the 42" storm drain and that the Walteria Lake pumps are not operated until after the peak flow passes, the second basin and connection to the 42" is not advisable nor necessary.

METHODOLOGY

The County of Los Angeles Rational Method was applied to the subareas defined for the proposed condition on-site. Figure 1 illustrates these subareas. The rational method utilizes the formula Q = CIA

Where:	Q =	Flow rate in cubic feet per second
	C =	Runoff coefficient
	I =	Rainfall intensity in inches per hour
	A =	Tributary area in acres

A computer program is used for the interative process to compute the peak flow rate and time of concentration for the subareas. Rainfall intensities for the 50 year storm design storm were used. Utilizing the results for the Rational Method Calculations, the Modified Rational Method was then used to compute a single area hydrograph for the fourth day design storm.

This hydrograph provided the time vs flow rate (Q) table needed to estimate the storage volumes needed to reduce peak discharge rates from the developed site.

The hydraulic analysis was performed utilizing software developed by Advanced Engineering Software (AES). This software uses LACFCD, LACRD, and OCEMA criteria. The hydraulic model was created by following closely the data from the DCA reports. As with the DCA reports, the downstream hydraulic grade line at the intersection of Pennsylvania Avenue and 248th Street was set at 67.11. The peak flow rates were taken from Figure 14 of the 9/18/90 DCA report and then modified based on changes from the 4/15/91 DCA report and from this report.

RESULTS

Rational Method Hydrology calculations can be found beginning on page 5. Four scenarios were tested and the results are as follows:

Undeveloped Site:	Q_{50} = 56.1 CFS
Costco Only Development:	Q_{50} = 60.9 CFS
Historic Defense Plant Development:	Q_{50} = 65.6 CFS
Ultimate Condition - Fully Developed:	Q_{50} = 71.0 CFS

As can be seen from these results, the Costco only scenario has a lower peak discharge that the historic condition but has a higher discharge than the current underdeveloped condition. To insure that this project will result in a net decrease, it was decided that peak discharge would be limited to a five year storm or Q_5. Per LACDPW, Q_5 is approximately equal to 1.23 CFS per acre (see appendix). For this site with 42.8 acres, Q_5=52.6 CFS. Discharge from the site is limited by storing flows that exceed Q_5 in underground pipes until peak flows have passed. Stored water is slowly discharged in a 6" pipe to the downstream storm drain.

Modified Rational Method Hydrology calculations can be found beginning on page 21. Utilizing the data from the Rational Method study, the program estimated a peak flow rate of 66 CFS at 1164 minutes. Based on this data, the storage volume needed is 9,906 cubic feet.

Hydraulic calculations can be found beginning on page 26. Off-site hydraulic calculations were performed in two steps. First the system from 248th Street to the junction at Crenshaw Blvd. was modeled. Then the 54" system in Skypark from Crenshaw to the Costco site was modeled.

The total system flow rate at the intersection of Pennsylvania and 248th per the 9/19/90 DCA report is 463 CFS. This flow rate assumed 67.5 CFS from the Costco site, 77.3 CFS from the Crossroads site, and 55.8 CFS from the imaginary tank site. Flow rates from the 9/19/90 DCA report were adjusted to reflect the restricted peak discharge rate of 60 CFS from the Crossroads site per the 4/15/91 DCA report. Flow rates were also adjusted to reflect the restricted peak discharge rate of 52.3 CFS from the Costco site. The following table details the flow rate adjustments:

Sub-area	Description	Q (Per 9/18/90 DCA Report)	Q (Adjusted per 4/15/90 DCA Report)	Q (Adjusted for Costco Detention)	Q (W/O Tank Farm)
1.		57.0	57.0	57.0	57.0
2.		81.5	81.5	81.5	81.5
3.		21.5	21.5	21.5	21.5
4.	Costco Site	67.5	67.5	**52.3**	**52.3**
5.		22.4	22.4	22.4	22.4
6.		37.5	37.5	37.5	37.5
7.		16.7	16.7	16.7	16.7
8.		10.4	10.4	10.4	10.4
9.		15.4	15.4	15.4	15.4
10.	Imaginary Tank Farm	55.8	55.8	55.8	**0**
Site.	Crossroads Site	77.3	**60.0**	**60.0**	**60.0**
	TOTALS	463 CFS	445.7 CFS	430.50 CFS	374.7 CFS

Based on the adjusted flow rates per the 4/15/95 DCA report, the hydraulic grade line in the 54" pipe in Skypark Drive where the 36" storm drain from the project site begins is 74.09. With the adjustment to the Costco site flow rate, the HGL drops to 72.72.

A third run without the imaginary tank farm resulted in a hydraulic grade line of 71.68. Since this HGL reflects the existing conditions downstream, it was used for design of the on-site system.

Based on the results of the off-site hydraulics, the on-site 36" main storm drain was analyzed. The backbone hydraulics were run using the prorated flow rates for the on-site 50 year design storm peak rate of 66 CFS. This proration was computed by dividing 66 CFS by 42.8 acres to arrive at 1.54 CFS/acre.

The hydraulics for the laterals, Lines A through Line E were run using the fully developed peak rate of 71 CFS since this represents a site that is 95% imperious and would better represent the maximum flow for each subarea. The proration factor is 71 CFS/42.8 acres = 1.66 CFS/acre.

Each inlet was designed assuming 50% clogging of the inlet area. The results of these calculations can be found in the Hydraulic Calculations section beginning on page 76.

10-21-1997 SITE LICENSEE: FUSCOE ENGINEERING PAGE 1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

TORRENCE COSTCO FULLY DEVELOPED SITE STORM DAY 4

SUBAREA LOCATION	SUBAREA AREA	SUBAREA Q	TOTAL AREA	TOTAL Q	CONV TYPE	CONV LNGTH	CONV SLOPE	CONV SIZE	CONV Z	CONTROL Q	SOIL NAME	RAIN TC	RAIN ZONE	PCT IMPV
199 1A	43.	66.	43.	66.	4	3010.	0.00420	3.00	0.00	0.	4 29	K50	0.47	
199 2A	0.	0.	43.	66.	0	0.	0.00000	0.00	0.00	0.	4 29	K50	0.47	

Average Imperviousness: 18.8 Acres @ 0.95%
24.0 Acres @ 0.10%

42.8 Acres @ 0.47%

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY
HYDROGRAPH AT OUTLET TO SKYPARK DRIVE
HYDROGRAPH AT 199 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	0.	100	1.	200	2.	300	3.	400	4.
500	5.	600	6.	700	7.	800	8.	900	9.
1000	13.	1050	14.	1100	16.	1110	17.	1120	18.
1130	20.	1131	21.	1132	21.	1133	21.	1134	21.
1135	22.	1136	22.	1137	22.	1138	22.	1139	23.
1140	23.	1141	23.	1142	23.	1143	24.	1144	24.
1145	25.	1146	25.	1147	26.	1148	27.	1149	27.
1150	28.	1151	29.	1152	30.	1153	31.	1154	32.
1155	33.	1156	34.	1157	35.	1158	37.	1159	39.
1160	43.	1161	46.	1162	50.	1163	64.	1164	66.
1165	65.	1166	66.	1167	65.	1168	65.	1169	64.
1170	64.	1171	63.	1172	63.	1173	62.	1174	61.
1175	60.	1176	59.	1177	58.	1178	57.	1179	56.
1180	55.	1181	53.	1182	52.	1183	51.	1184	49.
1185	48.	1186	48.	1187	46.	1188	43.	1189	40.
1190	38.	1191	35.	1192	32.	1193	30.	1194	28.
1195	27.	1196	25.	1197	24.	1198	23.	1199	22.
1200	21.	1201	20.	1202	20.	1203	19.	1204	19.
1205	18.	1206	18.	1207	17.	1208	17.	1209	17.
1210	17.	1211	16.	1212	16.	1213	16.	1214	16.
1215	15.	1216	15.	1217	15.	1218	15.	1219	15.
1220	15.	1221	14.	1222	14.	1223	14.	1224	14.
1225	14.	1226	13.	1227	13.	1228	13.	1229	13.
1230	13.	1231	12.	1232	12.	1233	12.	1234	12.
1235	12.	1236	12.	1237	11.	1238	11.	1239	11.
1240	11.	1241	11.	1242	11.	1243	10.	1244	10.
1245	10.	1246	10.	1247	10.	1248	10.	1249	10.
1250	10.	1251	9.	1252	9.	1253	9.	1254	9.
1255	9.	1256	9.	1257	9.	1258	9.	1259	9.
1260	9.	1261	9.	1262	9.	1263	9.	1264	9.
1265	9.	1266	9.	1267	8.	1268	8.	1269	8.
1270	8.	1271	8.	1272	8.	1273	8.	1274	8.
1275	8.	1276	8.	1277	8.	1278	8.	1279	8.
1280	8.	1281	8.	1282	8.	1283	8.	1284	8.
1285	8.	1286	8.	1287	8.	1288	8.	1289	8.
1290	8.	1291	8.	1292	8.	1293	8.	1294	8.
1295	8.	1296	8.	1297	8.	1298	8.	1299	8.
1300	8.	1310	7.	1320	7.	1330	6.	1340	6.
1350	5.	1360	5.	1370	5.	1380	4.	1390	4.
1400	3.	1420	3.	1440	2.	1460	2.	1500	1.

Total Runoff = 16.154 Acre-Ft.
Peak Q = 66 CFS
Time to Peak Q = 1164 Minutes

STORAGE VOLUME ESTIMATE

TIME (Minutes)	Q_{50} (CFS)	Ave. Q	Ave. Q in excess of 52.6 CFS
1162	50		
		57	4.4
1163	64		
		65	12.4
1164	66		
		65.5	12.9
1165	65		
		65.5	12.9
1166	66		
		65.5	12.9
1167	65		
		65	12.4
1168	65		
		64.5	11.9
1169	64		
		64	11.4
1170	64		
		63.5	10.9
1171	63		
		63	10.4
1172	63		
		62.5	9.9
1173	62		
		61.5	8.9
1174	61		
		60.5	7.9
1175	60		
		59.5	6.9
1176	59		
		58.5	5.9
1177	58		
		57.5	4.9
1178	57		
		56.5	3.9
1179	56		
		55.5	2.9
1180	55		
		54	1.4
1181	53		
		Total =	165.10 CFS/min

Volume = (165.10 CF/sec/min) (60 sec/min) = 9,906 CF

Notes:

1. Peak Q_{50} per Modified Rational Method is 66 CFS
2. Q_5 = (1.23 CFS/Acre) 42.8 Acres = 52.6 CFS

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San Diego, California 92121
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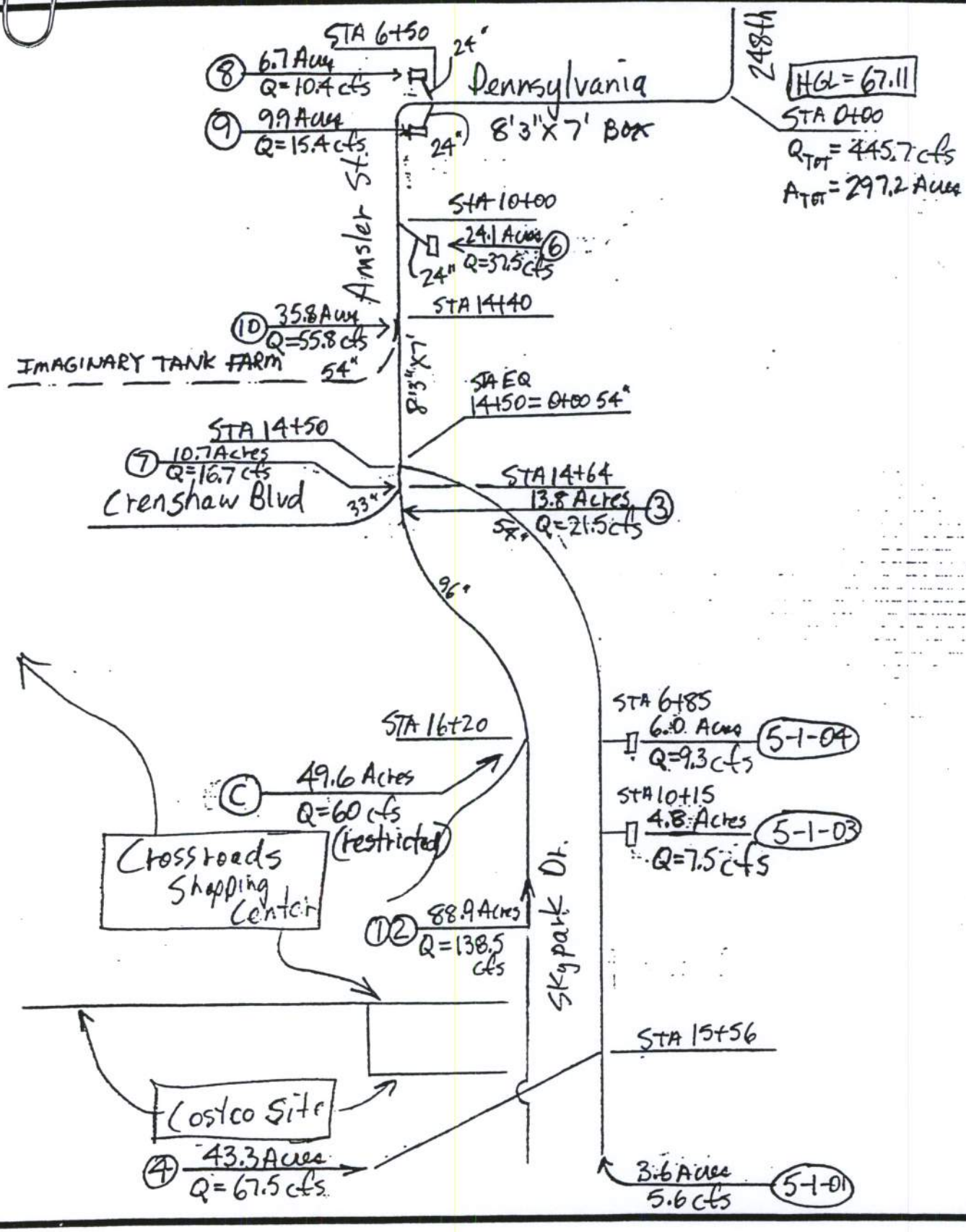
Fax (619) 597-0335

PROJECT:		PROJECT NO:	
BY: EKA	DATE: 10/13/97	CHECK:	DATE:

Run (A) Schematic

SHEET OF



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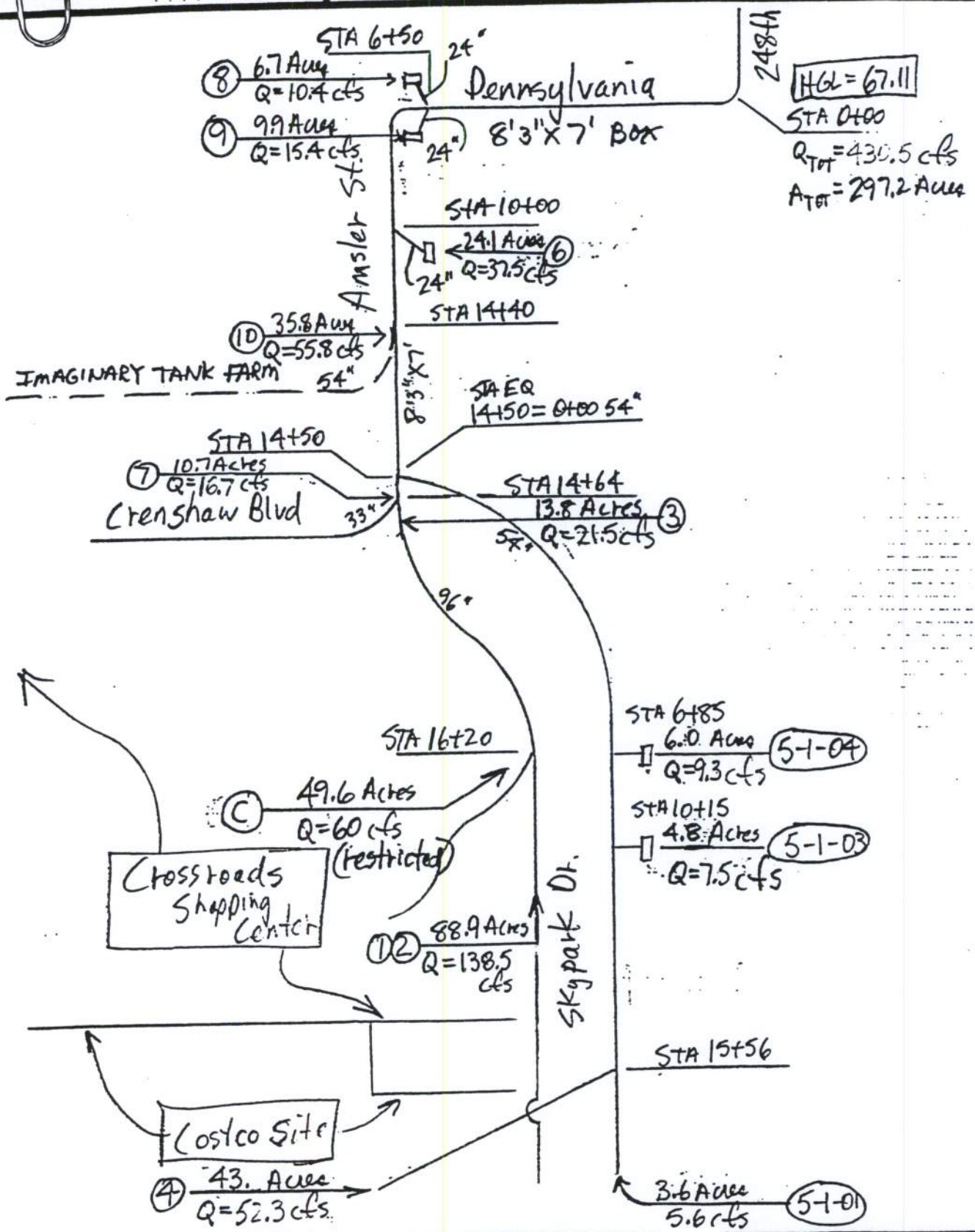
PROJECT:		PROJECT NO:	
BY: EKA	DATE: 10/20/97	CHECK:	DATE:

Run (B) Schematic

SHEET OF



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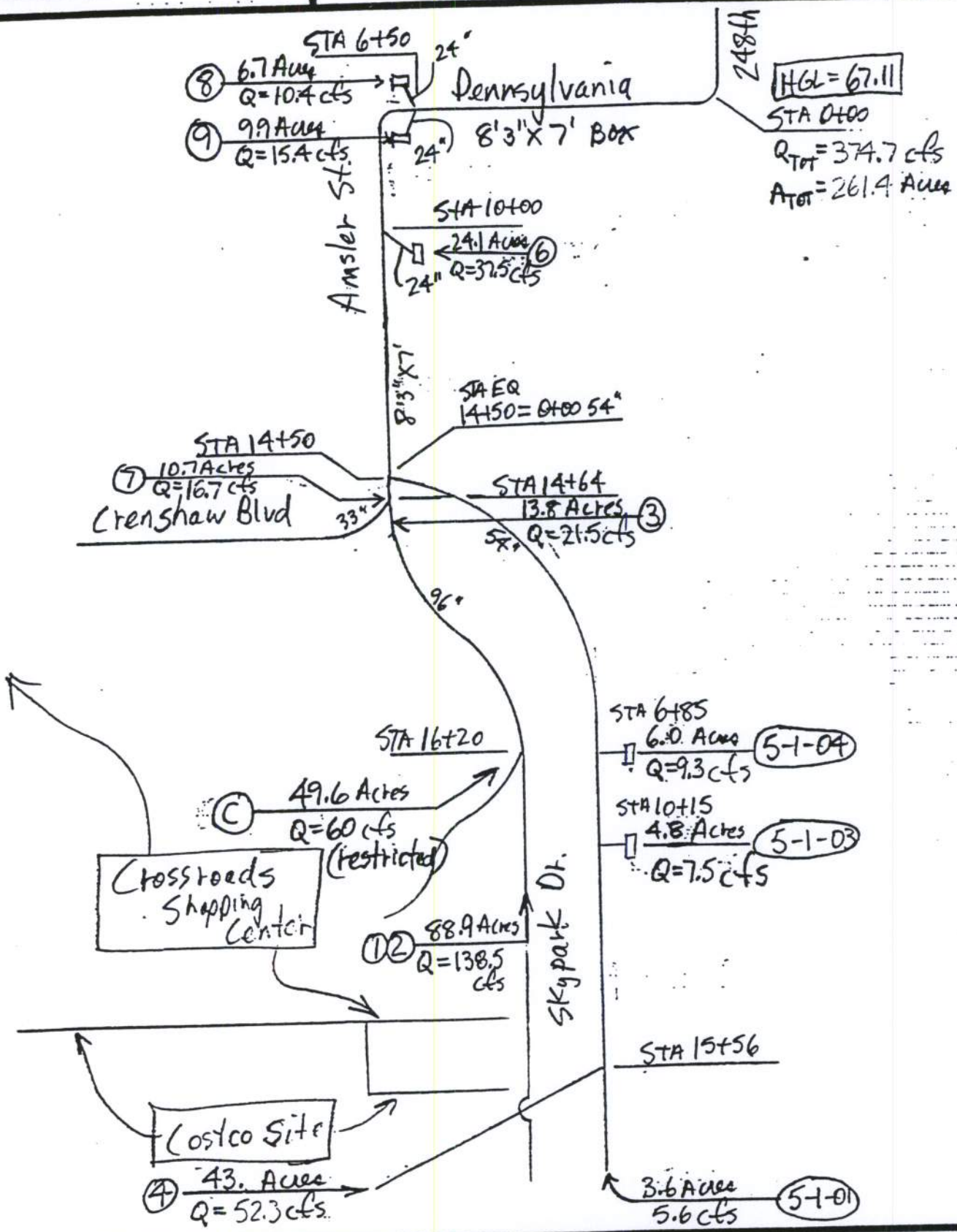
PROJECT:		PROJECT NO:	
BY: EKA	DATE: 10/20/97	CHECK:	DATE:

Run (C) Schematic

SHEET OF



COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (818) 458-5100

THOMAS A. TIDEMANSON, Director

PAGE 29
RECEIVED
DEC 20 1990
DALCIN CUMMINS ASSOC

ADDRESS ALL CORRESPONDENCE TO:
P.O.BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

December 17, 1990

IN REPLY PLEASE REFER TO FILE: D-3

Mr. Richard W. Burtt
City Engineer
City of Torrance
3031 Torrance Boulevard
Torrance, CA 90503

Dear Mr. Burtt:

HYDROLOGY STUDY (UNION OIL SITE)

This is in reference to your letter of October 26, 1990 requesting information on the status of design files for Project 2. The files were obtained by the consultant, Dalcin Cummins Associates earlier this year, but because of the numerous projects in the City of Torrance that were constructed after Project 2, the design files do not accurately describe the present condition.

Mr. Richard Niemeyer of Dalcin Cummins Associates has been in contact with the County regarding the deficiency in the design files. Mr. Niemeyer has been informed that he can outlet 1.23 cfs per acre into County storm drain MTD 249 Line "B", providing his site with an approximately 5-year frequency protection. The hydraulic grade line control for his proposed project is approximately two to three feet above the soffit of the pipe. He was also informed that he would have to apply for a connection permit from the Permits Section of Construction Division.

In a telephone conversation with Mr. Richard Perkins of the City, he expressed concerns about the correct method of calculating the required storage for excess flows. He was informed that all questions regarding hydrology should be referred to Mr. Chander Garg of Hydraulic Water Conservation Division. Mr. Niemeyer was also given this information. If you have any questions, please call Mr. James Daly at (818) 458-7836.

Very truly yours,

1.23 CFS/Acre ≅ Q_5

T. A. TIDEMANSON
Director of Public Works

Richard J. Smith

RICHARD J. SMITH
Assistant Deputy Director

JD:tkh
13/HYDRO

cc: Mr. Richard Niemeyer
Dalcin Cummins Associates

FUSCOE ENGINEERING

MEMORANDUM

TO: *Greg Even, L.A.C.D.P.W.*
FAX (626) 458-7827

FROM: *Eric Armstrong*

DATE: *September 25, 1997*

SUBJECT: *Walteria Sump Storm Drain*

Bruce Bornemann @ City of Torrance thought you might be able to help (or know who could help) with the following questions:

1. What is the maximum pumped discharge from the Walteria sump into Project 245? 55 cfs or 24,750 gpm
2. What is the operating policy for this pumping? THE PUMPS ARE TURNED ON AFTER THE PEAK FLOW PASSES.
3. Is there a telemetry system that limits pumping during high flow periods downstream? THE SYSTEM IS ENTIRELY MANUAL. NO TELEMETRY SYSTEM.

Please have the current person call me, or let me know who I can call.

Thanks for your help.

5465 Morehouse Dr., Suite 165 ■ San Diego, CA 92121 ■ Phone (619) 554-1500 ■ Fax (619) 597-0335 ■ E-mail: http://www.fuscoe.com

FUSCOE ENGINEERING
SAN DIEGO

MEMORANDUM

TO: *Bruce Borneman, City of Torrance*

FROM: *Eric Armstrong*

DATE: *January 7, 1998*

SUBJECT: *Costco Review of Hydrology Report*

The purpose of this memo is to respond to the comments received from the City on the Hydrology Report. To aid in responding to the comments, I have numbered the questions one through twelve and I am going to restate the questions and then respond in that order.

Question #1: Report states that HGL in County 54" line is at 80' when pump is on. How will those areas on your grading plan below 80' be protected?

Answer: Only a limited area of the site is below elevation 80'. There is a flap gate proposed in the most downstream cleanout that will prevent water from backing up into the site and causing those areas to flood if the hydraulic gradeline is above 80'.

Question #2: Can you guarantee in writing that pump will not be turned on when the second "third" peak hits?

Answer: The operating policy of the pump is set by the LA County Department of Public Works. They have stated that their policy is to operate the pumps only after the peak flow passes. Operation of the pump is manual therefore, it is up to the operator to determine what conditions would dictate stopping pumping operations in the event a second or third peak event occurs.

Question #3: Can you verify the HGL equal to 80' when the pumps are turned on?

Answer: The HGL of 80' was provided to us by the County. The only data I could find to corroborate that elevation was data provided by the City in the form of a hydraulic calculation table dated 3-26-64. In this table it appears that the hydraulic grade line for Project 245 was calculated assuming a downstream water surface elevation at the discharge point of 78 and a flow rate of 72 cfs. Reviewing the original plans for Project 245 I found that

5565 Morehouse Dr., Suite 165 ■ San Diego, CA 92121 ■ Phone (619) 554-1500 ■ Fax (619) 597-0335 ■ E-mail: http: www.fuscoe.co

this downstream water surface assumption is approximately the finish surface of the street. With that assumption and the flow rate assumption, the hydraulic grade line in Skypark adjacent to the proposed Costco site is about elevation 80'. Using the pumping capacity's peak discharge of 55 cfs would result in a hydraulic gradeline that would be at the soffit of the 54" pipe assuming no downstream constraints. Based on this information it appears that the assumption of elevation 80' is conservative.

Questions #4: Are adjacent properties also below elevation 80?

Answer: Yes.

Questions #5: Please provide cross sections around the perimeter of the subject property,

Answer: Cross sections will be added to the grading plan for the perimeter of the property.

Question #6: When County pump is on, will the system backup into the on-site retention system?

Answer: Flap gates will be installed on the north and west interior walls of the downstream junction structure on the existing 36" RCP to prevent water from backing up into the on-site retention system and to prevent water from flooding elevations below 80.

Question #7: Is there a flap gate?

Answer: Yes, two flap gates.

Question #8: There is a catch basin on Skypark just east of this site. It's elevation is 80'. If the street floods for any reason, will your parking lot under elevation 80' flood?

Answer: The entrance drive from Skypark Drive rises to elevation 82.5' before going back down to the lower areas on site. Therefore, flood waters within Skypark Drive will continue easterly towards Crenshaw Boulevard. The catch basin on Skypark just east of the site connects to the City owned 39" RCP.

Question #9: Will Sam's Club parking lot flood when your parking lot floods.

Answer: No.

Question #10: Is there is block wall.

Answer: Yes.

Question #11: The Q50 figures for this 43-acre site seem very low. We expect to see Q's of 2 to 3 cfs per acre using LA County methods. (FO601).

Answer: Peak Q from this site during a 50-year storm averages about 1.65 cfs per acre. This value is consistent with the results from the Dalcin Cummins report in the early 1990's. We believe the values are correct.

Question #12: Will the 6" low flow pipe be self cleaning or will the pipe silt up quickly?

Answer: Velocities in the 6" low flow pipe will be high enough to ensure that the pipe will not become clogged. It would be a good idea to install a 3" screen on the upstream inlet to the detention basin to ensure that no materials can enter the detention system that would be large enough to get caught in the 6" pipe. We will add this detail to our plans.

APPENDIX E

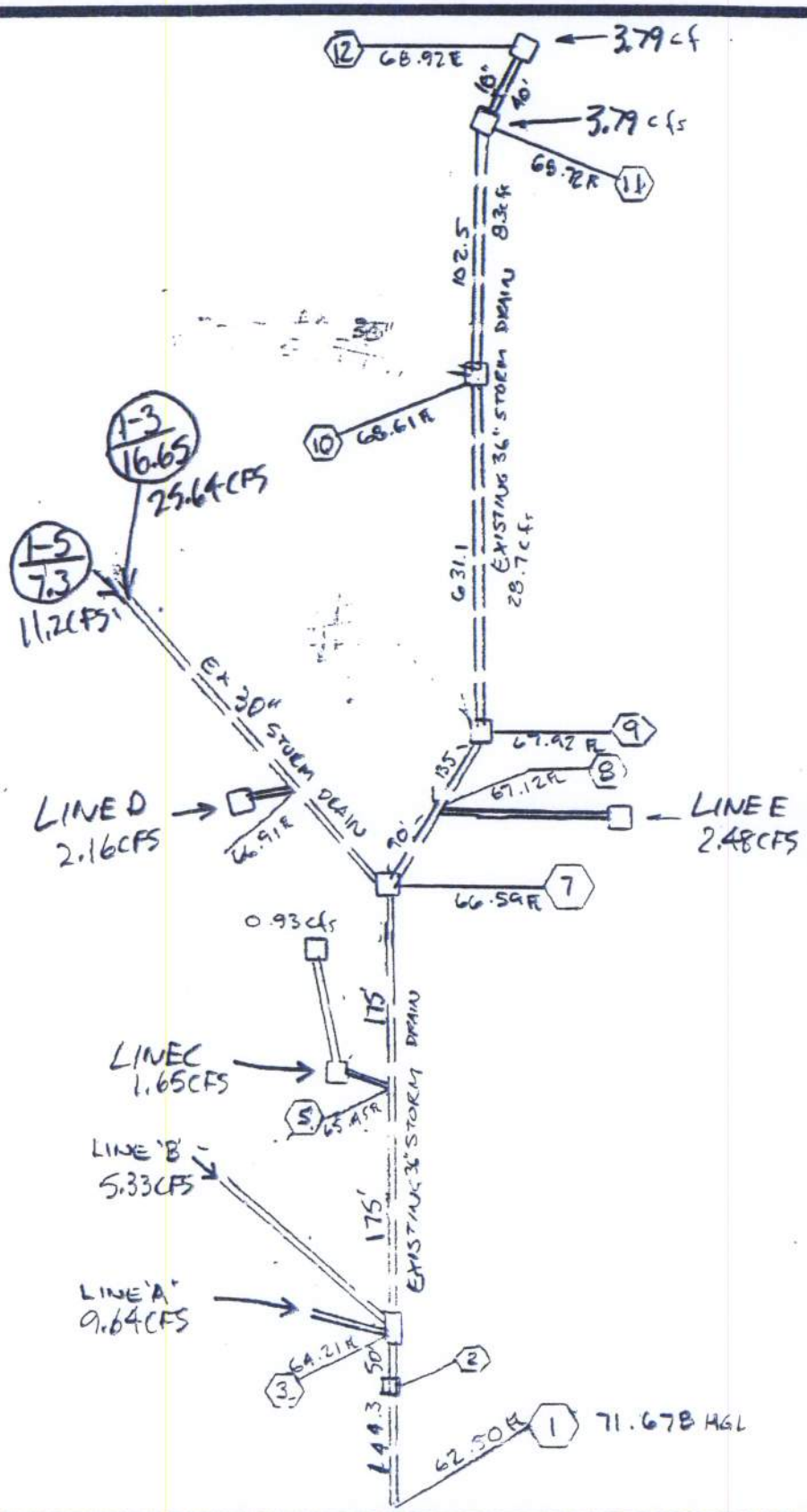
PORTION OF APPROVED HYDRAULIC CALCULATION BY FUSCOE ENG.

FUSCOE ENGINEERING
5465 Morehouse Drive #165
San Diego, California 92121
Phone (619) 554-1500
Fax (619) 597-0335

PROJECT:		PROJECT NO:	
BY: EKA	DATE:	CHECK:	DATE:

ONSITE MAINLINE HYDRAULICS

SHEET OF



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PRESSURE PIPE-FLOW HYDRAULICS COMPUTER PROGRAM PACKAGE
(Reference: LACFD,LACRD,& OCEMA HYDRAULICS CRITERION)

(c) Copyright 1982-96 Advanced Engineering Software (aes)
Ver. 6.1 Release Date: 01/01/96 License ID 1355

Analysis prepared by:

FUSCOE ENGINEERING SAN DIEGO INC.
5465 MOREHOUSE DRIVE, SUITE 165
SAN DIEGO, CA 92121
(619) 554-1500

```
************************** DESCRIPTION OF STUDY **************************
* ONSITE MAINLINE HYDRAULICS                                             *
*                                                                        *
*                                                                        *
****************************************************************************
```

FILE NAME: TORR-A.DAT
TIME/DATE OF STUDY: 21:23 10/27/1997

NOTE: STEADY FLOW HYDRAULIC HEAD-LOSS COMPUTATIONS BASED ON THE MOST CONSERVATIVE FORMULAE FROM THE CURRENT LACRD,LACFCD, AND OCEMA DESIGN MANUALS.

DOWNSTREAM PRESSURE PIPE FLOW CONTROL DATA:
NODE NUMBER = 1.00 FLOWLINE ELEVATION = 62.50
PIPE DIAMETER(INCH) = 36.00 PIPE FLOW(CFS) = 52.00
ASSUMED DOWNSTREAM CONTROL HGL = 71.678
L.A. THOMPSON'S EQUATION IS USED FOR JUNCTION ANALYSIS

NODE 1.00 : HGL= < 71.678>;EGL= < 72.518>;FLOWLINE= < 62.500>

PRESSURE FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 1
UPSTREAM NODE 2.00 ELEVATION = 63.50

CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW = 52.00 CFS PIPE DIAMETER = 36.00 INCHES
PIPE LENGTH = 144.30 FEET MANNINGS N = .01300
SF=(Q/K)**2 = ((52.00)/(666.983))**2 = .0060782
HF=L*SF = (144.30)*(.0060782) = .877
NODE 2.00 : HGL= < 72.555>;EGL= < 73.395>;FLOWLINE= < 63.500>

PRESSURE FLOW PROCESS FROM NODE 2.00 TO NODE 2.10 IS CODE = 5
UPSTREAM NODE 2.10 ELEVATION = 63.83

```
CALCULATE PRESSURE FLOW JUNCTION LOSSES:
 NO. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA    HV
  1    52.0    36.00    7.069   7.356    .000    .840
  2    52.0    36.00    7.069   7.356    --      .840
  3     .0     6.00     .196    .000   75.000    -
  4     .0     .00      .000    .000    .000     -
  5     .0===Q5 EQUALS BASIN INPUT===

LACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
 DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
   Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N = .01300
 DOWNSTREAM MANNINGS N = .01300
UPSTREAM FRICTION SLOPE = .00608
DOWNSTREAM FRICTION SLOPE = .00608
 AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS .00608
JUNCTION LENGTH(FEET) = 4.00    FRICTION LOSS = .024
ENTRANCE LOSSES = .000
 JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
 JUNCTION LOSSES = .000+ .840- .840+( .024)+( .000) = .024
NODE    2.10 : HGL= <  72.579>;EGL= <  73.420>;FLOWLINE= <  63.830>

==================================================================
PRESSURE FLOW PROCESS FROM NODE    2.10 TO NODE    3.00 IS CODE = 1
 DOWNSTREAM NODE    3.00    ELEVATION =   64.31
------------------------------------------------------------
CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW =     52.00 CFS    PIPE DIAMETER = 36.00 INCHES
 PIPE LENGTH =     50.00 FEET    MANNINGS N = .01300
SF=(Q/K)**2 = ((    52.00)/(  666.983))**2 = .0060782
HF=L*SF = (    50.00)*( .0060782) =     .304
 NODE    3.00 : HGL= <  72.883>;EGL= <  73.724>;FLOWLINE= <  64.310>

==================================================================
 PRESSURE FLOW PROCESS FROM NODE    3.00 TO NODE    3.10 IS CODE = 5
UPSTREAM NODE    3.10    ELEVATION =   64.21
------------------------------------------------------------
 CALCULATE PRESSURE FLOW JUNCTION LOSSES:
 NO. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA    HV
  1    50.7    36.00    7.069   7.174    .000    .799
  2    52.0    36.00    7.069   7.356    --      .840
  3     1.3    24.00    3.142    .411   75.000    -
  4     .0     .00      .000    .000    .000     -
  5     .0===Q5 EQUALS BASIN INPUT===

LACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
   Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N = .01300
DOWNSTREAM MANNINGS N = .01300
```

```
'STREAM FRICTION SLOPE = .00578
DOWNSTREAM FRICTION SLOPE = .00608
A'/ERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS .00593
NCTION LENGTH(FEET) = 6.00 FRICTION LOSS = .036
ENTRANCE LOSSES = .000
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
NCTION LOSSES = .082+ .799- .840+( .036)+( .000) = .076
ODE 3.10 : HGL= < 73.001>;EGL= < 73.800>;FLOWLINE= < 64.210>

==========================================================================
PRESSURE FLOW PROCESS FROM NODE 3.10 TO NODE 5.00 IS CODE = 1
UPSTREAM NODE 5.00 ELEVATION = 65.45
--------------------------------------------------------------------------
CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW = 50.71 CFS PIPE DIAMETER = 36.00 INCHES
PE LENGTH = 175.00 FEET MANNINGS N = .01300
=(Q/K)**2 = (( 50.71)/( 666.983))**2 = .0057804
HF=L*SF = ( 175.00)*( .0057804) = 1.012
ODE 5.00 : HGL= < 74.012>;EGL= < 74.811>;FLOWLINE= < 65.450>

==========================================================================
ESSURE FLOW PROCESS FROM NODE 5.00 TO NODE 5.10 IS CODE = 5
UPSTREAM NODE 5.10 ELEVATION = 65.47
--------------------------------------------------------------------------
ALCULATE PRESSURE FLOW JUNCTION LOSSES:
O. DISCHARGE DIAMETER AREA VELOCITY DELTA HV
1 49.1 36.00 7.069 6.941 .000 .748
2 50.7 36.00 7.069 7.174 -- .799
3 1.6 12.00 .785 2.101 75.000 -
4 .0 .00 .000 .000 .000 -
5 .0===Q5 EQUALS BASIN INPUT===

ACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N = .01300
DOWNSTREAM MANNINGS N = .01300
PSTREAM FRICTION SLOPE = .00541
OWNSTREAM FRICTION SLOPE = .00578
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS .00560
JNCTION LENGTH(FEET) = 1.00 FRICTION LOSS = .006
NTRANCE LOSSES = .000
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
JUNCTION LOSSES = .098+ .748- .799+( .006)+( .000) = .053
ODE 5.10 : HGL= < 74.116>;EGL= < 74.864>;FLOWLINE= < 65.470>

==========================================================================
RESSURE FLOW PROCESS FROM NODE 5.10 TO NODE 7.00 IS CODE = 1
UPSTREAM NODE 7.00 ELEVATION = 66.58
--------------------------------------------------------------------------
```

```
CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW =    49.06 CFS    PIPE DIAMETER = 36.00 INCHES
PIPE LENGTH =    175.00 FEET    MANNINGS N = .01300
SF=(Q/K)**2 = ((    49.06)/(  666.983))**2 =  .0054104
HF=L*SF = (   175.00)*(  .0054104) =     .947
NODE    7.00 : HGL= <  75.063>;EGL= <  75.811>;FLOWLINE= <  66.580>


==================================================================
PRESSURE FLOW PROCESS FROM NODE    7.00 TO NODE    7.10 IS CODE = 5
UPSTREAM NODE    7.10    ELEVATION =    66.61
------------------------------------------------------------------
CALCULATE PRESSURE FLOW JUNCTION LOSSES:
 NO. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA    HV
 1    10.1   36.00    7.069   1.423   35.000   .031
 2    49.1   36.00    7.069   6.941    --      .748
 3    39.0   30.00    4.909   7.945   35.000    -
 4     .0     .00     .000    .000     .000     -
 5     .0===Q5 EQUALS BASIN INPUT===

LACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
   Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N =  .01300
DOWNSTREAM MANNINGS N =  .01300
UPSTREAM FRICTION SLOPE =  .00023
DOWNSTREAM FRICTION SLOPE =  .00541
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS  .00282
JUNCTION LENGTH(FEET) =  4.00    FRICTION LOSS =   .011
ENTRANCE LOSSES =  .000
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
JUNCTION LOSSES =  .329+  .031-  .748+(  .011)+(  .000) =  -.376
** CAUTION: TOTAL ENERGY LOSS COMPUTED USING (PRESSURE+MOMENTUM) IS NEGATIVE.
**        COMPUTER CHOOSES ZERO ENERGY LOSS FOR TOTAL JUNCTION LOSS.
NODE    7.10 : HGL= <  75.780>;EGL= <  75.811>;FLOWLINE= <  66.610>


==================================================================
PRESSURE FLOW PROCESS FROM NODE    7.10 TO NODE    8.00 IS CODE = 1
UPSTREAM NODE    8.00    ELEVATION =    67.12
------------------------------------------------------------------
CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW =    10.06 CFS    PIPE DIAMETER = 36.00 INCHES
PIPE LENGTH =    90.00 FEET    MANNINGS N = .01300
SF=(Q/K)**2 = ((    10.06)/(  666.983))**2 =  .0002275
HF=L*SF = (   90.00)*(  .0002275) =     .020
NODE    8.00 : HGL= <  75.800>;EGL= <  75.831>;FLOWLINE= <  67.120>


==================================================================
PRESSURE FLOW PROCESS FROM NODE    8.00 TO NODE    8.10 IS CODE = 5
UPSTREAM NODE    8.10    ELEVATION =    67.14
------------------------------------------------------------------
```

```
ALCULATE PRESSURE FLOW JUNCTION LOSSES:
O. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA    HV
    7.6   36.00    7.069   1.072    .000    .018
   10.1   36.00    7.069   1.423    --      .031
    2.5   12.00     .785   3.158   75.000    -
     .0     .00     .000    .000    .000    -
     .0===Q5 EQUALS BASIN INPUT===

CFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
4*V4*COS(DELTA4))/((A1+A2)*16.1)

TREAM MANNINGS N =  .01300
VNSTREAM MANNINGS N =  .01300
PSTREAM FRICTION SLOPE =  .00013
WNSTREAM FRICTION SLOPE =  .00023
ERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS  .00018
UNCTION LENGTH(FEET) =   1.00    FRICTION LOSS =  .000
NTRANCE LOSSES =  .000
CTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
CTION LOSSES =  .018+ .018- .031+( .000)+( .000) =  .005
ODE    8.10 : HGL= <  75.818>;EGL= <  75.836>;FLOWLINE= <  67.140>

PESSURE FLOW PROCESS FROM NODE    8.10 TO NODE    9.00 IS CODE =  1
STREAM NODE    9.00    ELEVATION =   67.92

CALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
E FLOW =      7.58 CFS    PIPE DIAMETER =  36.00 INCHES
E LENGTH =    135.00 FEET    MANNINGS N =  .01300
SF=(Q/K)**2 = ((     7.58)/(  666.983))**2 =  .0001292
=L*SF = (   135.00)*( .0001292) =      .017
DE    9.00 : HGL= <  75.836>;EGL= <  75.854>;FLOWLINE= <  67.920>

ESSURE FLOW PROCESS FROM NODE    9.00 TO NODE    9.10 IS CODE =  5
UPSTREAM NODE    9.10    ELEVATION =   67.94

ALCULATE PRESSURE FLOW JUNCTION LOSSES:
NO. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA    HV
1    7.6   36.00    7.069   1.072   25.000    .018
     7.6   36.00    7.069   1.072    --      .018
3     .0     .00     .000    .000    .000    -
4     .0     .00     .000    .000    .000    -
5     .0===Q5 EQUALS BASIN INPUT===

LACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N =  .01300
DOWNSTREAM MANNINGS N =  .01300
```

```
 PSTREAM FRICTION SLOPE =  .00013
DOWNSTREAM FRICTION SLOPE =  .00013
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS  .00013
 JNCTION LENGTH(FEET) =  4.00    FRICTION LOSS =  .001
ENTRANCE LOSSES =  .000
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
 JNCTION LOSSES =  .003+ .018- .018+( .001)+( .000) =  .004
 ODE    9.10 : HGL= <  75.840>;EGL= <  75.858>;FLOWLINE= <  67.940>


PRESSURE FLOW PROCESS FROM NODE    9.10 TO NODE    10.00 IS CODE =  1
UPSTREAM NODE   10.00    ELEVATION =   68.60
 ALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW =      7.58 CFS    PIPE DIAMETER =  36.00 INCHES
 IPE LENGTH =    631.10 FEET    MANNINGS N =  .01300
 F=(Q/K)**2 = ((     7.58)/(  666.983))**2 =  .0001292
HF=L*SF = (   631.10)*( .0001292) =     .082
NODE   10.00 : HGL= <  75.921>;EGL= <  75.939>;FLOWLINE= <  68.600>


 RESSURE FLOW PROCESS FROM NODE    10.00 TO NODE    10.10 IS CODE =  5
 PSTREAM NODE   10.10    ELEVATION =   68.62
 ALCULATE PRESSURE FLOW JUNCTION LOSSES:
 O. DISCHARGE  DIAMETER   AREA   VELOCITY  DELTA     HV
 1     7.6   36.00     7.069   1.072     .000     .018
 2     7.6   36.00     7.069   1.072     --       .018
 3      .0     .00      .000    .000     .000      -
 4      .0     .00      .000    .000     .000      -
 5      .0===Q5 EQUALS BASIN INPUT===

 ACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
   Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

UPSTREAM MANNINGS N =  .01300
DOWNSTREAM MANNINGS N =  .01300
 PSTREAM FRICTION SLOPE =  .00013
 OWNSTREAM FRICTION SLOPE =  .00013
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS  .00013
 JNCTION LENGTH(FEET) =  4.00    FRICTION LOSS =  .001
 NTRANCE LOSSES =  .000
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
JUNCTION LOSSES =  .000+ .018- .018+( .001)+( .000) =  .001
 ODE   10.10 : HGL= <  75.922>;EGL= <  75.940>;FLOWLINE= <  68.620>


 RESSURE FLOW PROCESS FROM NODE    10.10 TO NODE    11.00 IS CODE =  1
UPSTREAM NODE   11.00    ELEVATION =   68.71
```

ALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
PIPE FLOW = 7.58 CFS PIPE DIAMETER = 36.00 INCHES
PE LENGTH = 102.50 FEET MANNINGS N = .01300
=(Q/K)**2 = ((7.58)/(666.983))**2 = .0001292
HF=L*SF = (102.50)*(.0001292) = .013
NODE 11.00 : HGL= < 75.935>;EGL= < 75.953>;FLOWLINE= < 68.710>

RESSURE FLOW PROCESS FROM NODE 11.00 TO NODE 11.10 IS CODE = 5
PSTREAM NODE 11.10 ELEVATION = 68.73

ALCULATE PRESSURE FLOW JUNCTION LOSSES:

NO.	DISCHARGE	DIAMETER	AREA	VELOCITY	DELTA	HV
1	3.8	18.00	1.767	2.145	25.000	.071
2	7.6	36.00	7.069	1.072	--	.018
3	.0	.00	.000	.000	.000	-
4	.0	.00	.000	.000	.000	-
5	3.8===Q5 EQUALS BASIN INPUT===					

ACFCD AND OCEMA PRESSURE FLOW JUNCTION FORMULAE USED:
DY=(Q2*V2-Q1*V1*COS(DELTA1)-Q3*V3*COS(DELTA3)-
Q4*V4*COS(DELTA4))/((A1+A2)*16.1)

PSTREAM MANNINGS N = .01300
DOWNSTREAM MANNINGS N = .01300
PSTREAM FRICTION SLOPE = .00130
OWNSTREAM FRICTION SLOPE = .00013
AVERAGED FRICTION SLOPE IN JUNCTION ASSUMED AS .00072
JUNCTION LENGTH(FEET) = 4.00 FRICTION LOSS = .003
NTRANCE LOSSES = .004
JUNCTION LOSSES = DY+HV1-HV2+(FRICTION LOSS)+(ENTRANCE LOSSES)
JUNCTION LOSSES = .005+ .071- .018+(.003)+(.004) = .065
ODE 11.10 : HGL= < 75.947>;EGL= < 76.018>;FLOWLINE= < 68.730>

RESSURE FLOW PROCESS FROM NODE 11.10 TO NODE 12.00 IS CODE = 1
UPSTREAM NODE 12.00 ELEVATION = 68.92

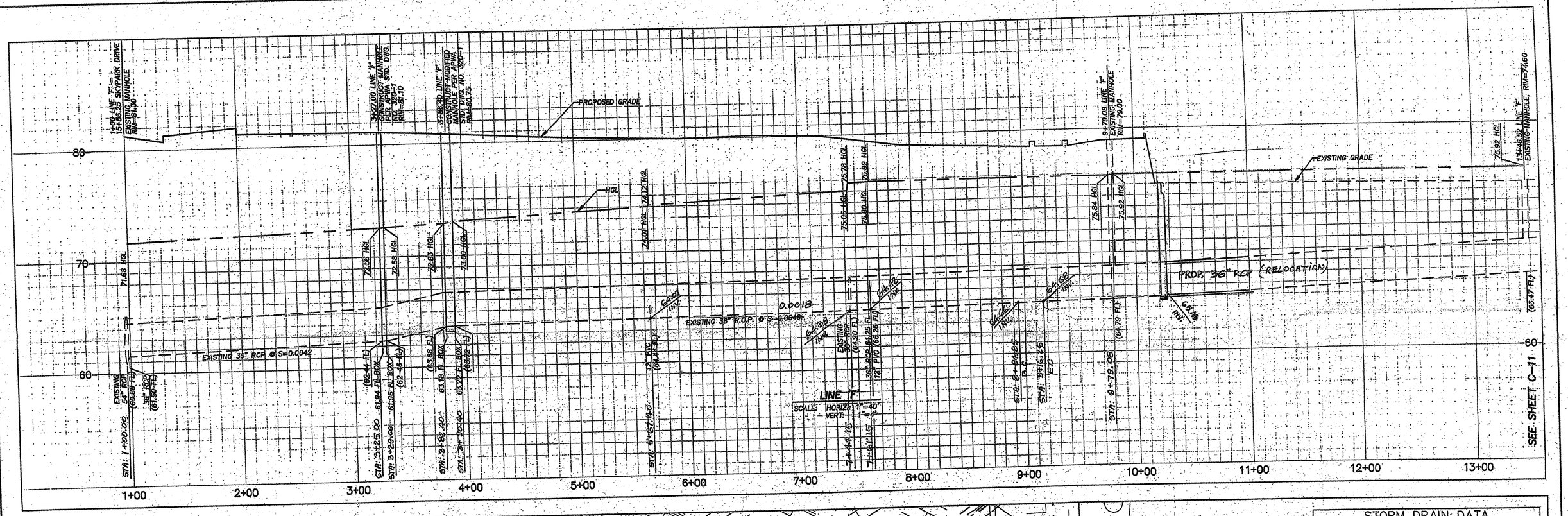
ALCULATE PRESSURE FLOW FRICTION LOSSES(LACFCD):
IPE FLOW = 3.79 CFS PIPE DIAMETER = 18.00 INCHES
PIPE LENGTH = 40.00 FEET MANNINGS N = .01300
F=(Q/K)**2 = ((3.79)/(105.043))**2 = .0013018
F=L*SF = (40.00)*(.0013018) = .052
NODE 12.00 : HGL= < 75.999>;EGL= < 76.070>;FLOWLINE= < 68.920>

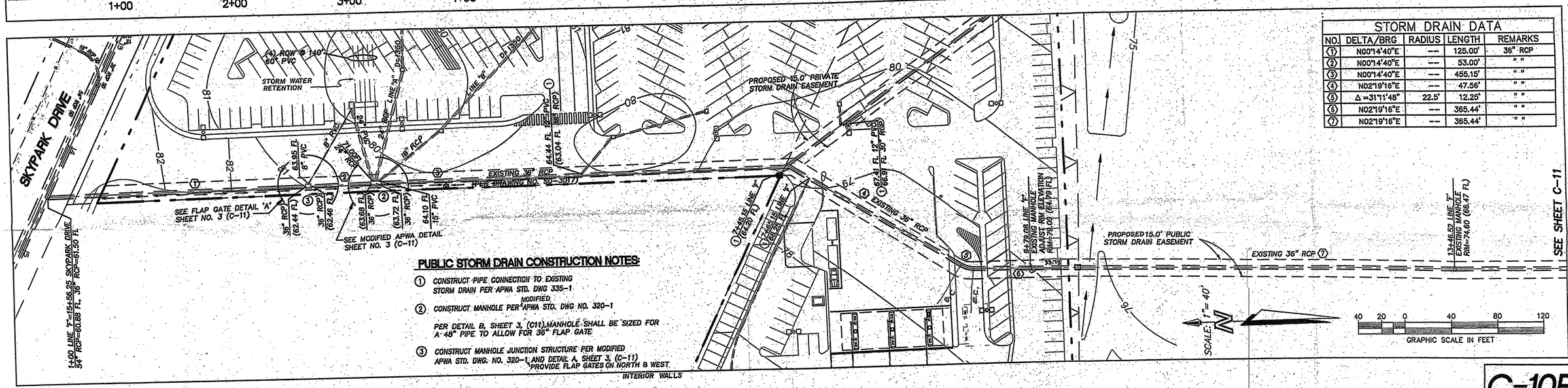
PRESSURE FLOW PROCESS FROM NODE 12.00 TO NODE 12.10 IS CODE = 8
PSTREAM NODE 12.10 ELEVATION = 68.93

CALCULATE PRESSURE FLOW CATCH BASIN ENTRANCE LOSSES(LACFCD):
PIPE FLOW(CFS) = 3.79 PIPE DIAMETER(INCH) = 18.00

ESSURE FLOW VELOCITY HEAD = .071
TCH BASIN ENERGY LOSS = .2*(VELOCITY HEAD) = .2*(.071) = .014
E 12.10 : HGL= < 76.085>;EGL= < 76.085>;FLOWLINE= < 68.930>

ND OF PRESSURE FLOW HYDRAULICS PIPE SYSTEM





STORM DRAIN DATA

NO.	DELTA/BRG	RADIUS	LENGTH	REMARKS
1	N00°14'40"E	---	125.00'	36" RCP
2	N00°14'40"E	---	53.00'	" "
3	N00°14'40"E	---	455.15'	" "
4	N02°19'16"E	---	47.56'	" "
5	Δ =31°11'48"	22.5'	12.25'	" "
6	N02°19'16"E	---	365.44'	" "
7	N02°19'16"E	---	365.44'	" "

PUBLIC STORM DRAIN CONSTRUCTION NOTES:

1. CONSTRUCT PIPE CONNECTION TO EXISTING STORM DRAIN PER APWA STD. DWG 335-1
2. CONSTRUCT MANHOLE PER MODIFIED APWA STD. DWG NO. 320-1

   PER DETAIL B, SHEET 3, (C11) MANHOLE SHALL BE SIZED FOR A 48" PIPE TO ALLOW FOR 36" FLAP GATE
3. CONSTRUCT MANHOLE JUNCTION STRUCTURE PER MODIFIED APWA STD. DWG. NO. 320-1 AND DETAIL A, SHEET 3, (C-11) PROVIDE FLAP GATES ON NORTH & WEST INTERIOR WALLS

C-10B

BENCHMARK:
BENCH MARK: 22-18A ELEV: 77.005
CRENSHAW BL. & LOMITA BL. SOUTHEAST CORNER, 55.50 FT. SOUTHWESTERLY FROM CL OF LOMITA BL 50.50 FT. EAST OF CL CRENSHAW BL. ABOUT THE MIDDLE OF THE CURB RETURN, 8.30 FT. BACK OF THE CURB, 8 INCHES BELOW SURFACE OF THE CONCRETE WALK UNDER CAST IRON COVER LETTERED "COUNTY ENGINEER MONUMENT WITH AN L.A. COUNTY ENGINEER BUTTON BRASS CAP STAMPED 10R. 2.11.55
F.B.3705-42 ADJ. 1970

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Civil Engineers • Land Surveyors
5465 Morehouse Dr., Suite 195
San Diego, California 92121
Phone (619) 554-1500
FAX (619) 597-0335

REGISTERED PROFESSIONAL ENGINEER
ROBERT A. CRANE
No. RCE 41903
EXP. 03-31-03
Civil
STATE OF CALIFORNIA

PUBLIC STORM DRAIN IMPROVEMENT PLAN
COSTCO WHOLESALE
DRAWN BY: CLC | DESIGN BY: RAC | CHECKED BY: RAC
CITY OF TORRANCE

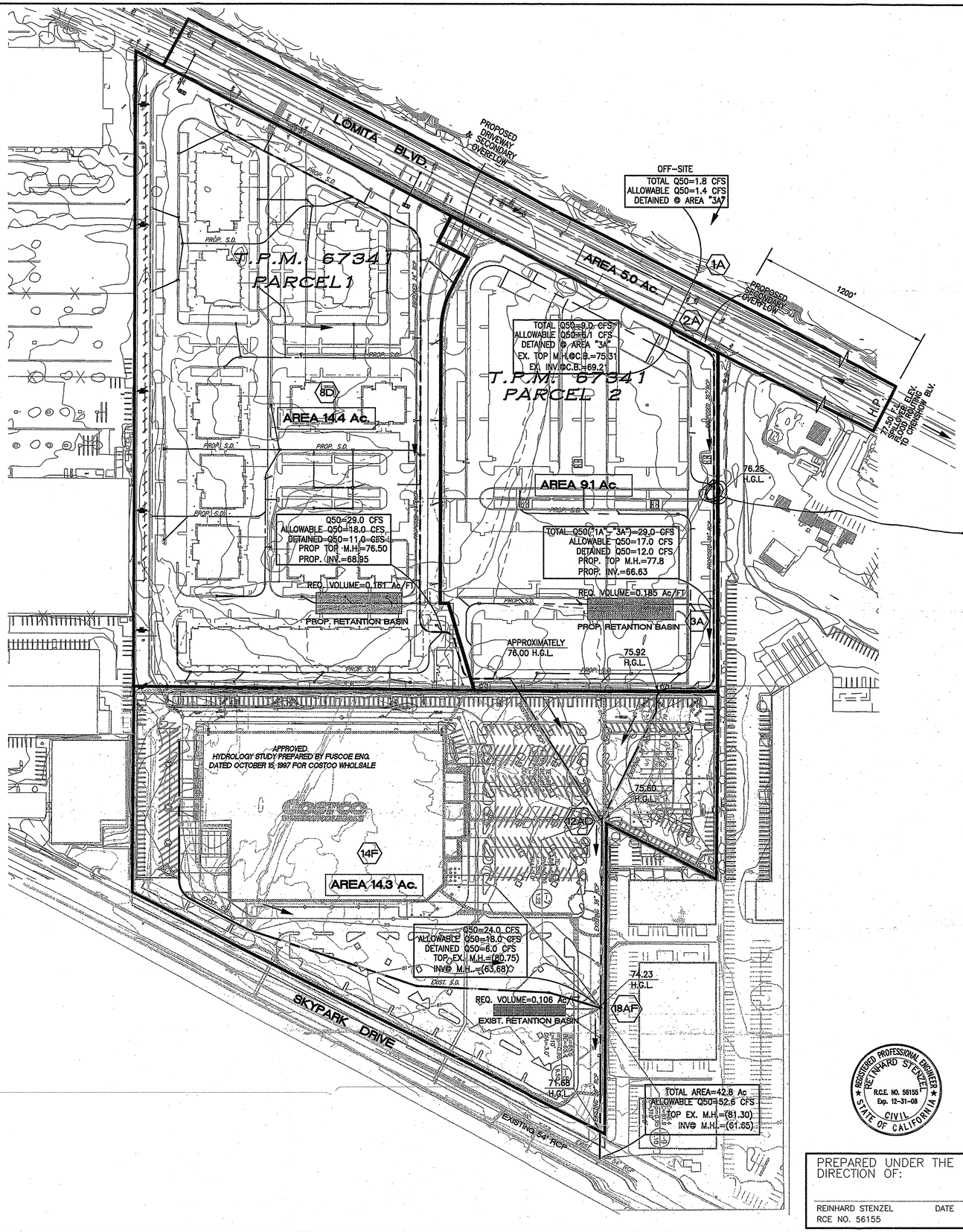
REV.#	DATE	DESCRIPTION	BY	CHECKED

CITY OF TORRANCE
ENGINEERING DEPARTMENT
DRAWN: PVT. ENGR.
DESIGNED: PVT. ENGR.
PROJECT ENGINEER:
DIVISION ENGINEER:
APPROVED:
RICHARD W. BURTT DATE
ENGINEERING DIRECTOR
R.C.E. NO. 32862 EXP. 6/30/02
SCALE: AS SHOWN | SHEET 2 OF 3
PLAN NO. SD-475

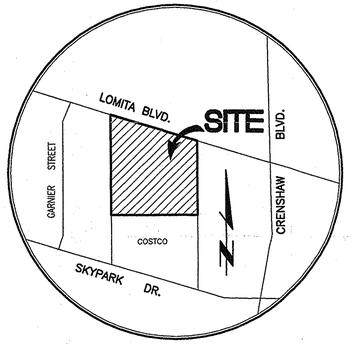
H:\PROJECTS\2199\04A\C-10B.DWG

APPENDIX F

PORTION OF HYDROLOGY MAP BY FUSCOE ENG.



ADDED
ALLOWABLE Q
for Parcel 2 Hydro
for Cons. Hydraulic
EST.



VICINITY MAP

N.T.S.

LEGEND

- WATERSHEAD BOUNDARY
- PROPOSED STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- 1.00 AC. — SUBAREA AREA
- 1A — NODE NUMBER
- FLOWPATH

N

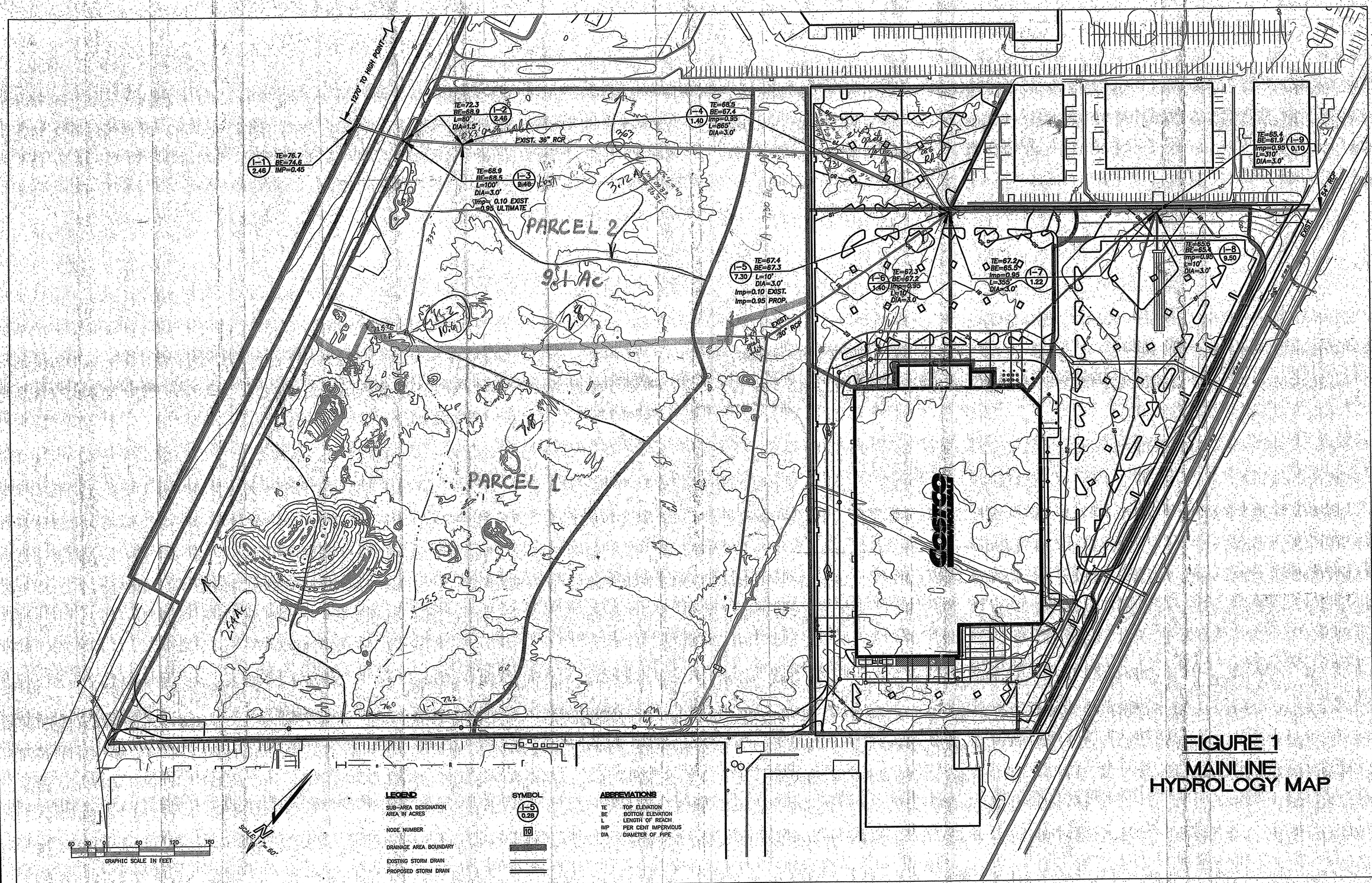
0 50 100 200 300

SCALE:1"=100'

REGISTERED PROFESSIONAL ENGINEER
REINHARD STENZEL
R.C.E. NO. 56155
Exp. 12-31-08
CIVIL
STATE OF CALIFORNIA

Last Update: 9/2/08
O:\2700-2799\2746\2746hyd-MS.dwg

PREPARED UNDER THE DIRECTION OF:	DEVELOPER:	ENGINEER:	MODIFICATION OFF APPROVED HYDROLOGY MAP	SHEET 1
REINHARD STENZEL DATE RCE NO. 56155	SHERIDAN-EBBERT DEVELOPMENT 13120 TELFAIR AVENUE SYLMAR, CA 91342 TEL: (818) 364-7505 FAX: (818) 364-7504	Thienes Engineering, Inc. CIVIL ENGINEERING • LAND SURVEYING 14349 FIRESTONE BLVD. LA MIRADA, CALIFORNIA 90638 PH.(714)521-4811 FAX(714)521-4173	FOR 2740 LOMITA BLVD CITY OF TORRANCE	OF 1 T.E.JOB NO. 2746



HYDROLOGY STUDY

FIGURE 1
MAINLINE HYDROLOGY MAP

BENCHMARK:
BENCH MARK 22-18A ELEV: 77.006
CRENSHAW BL. & LOMITA BL. SOUTHWEST CORNER, 55.50 FT. SOUTHWESTERLY FROM CL OF LOMITA BL. 50.50 FT. EAST OF CL CRENSHAW BL. ABOUT THE MIDDLE OF THE CURB RETURN, 8.30 FT. BACK OF THE CURB, 8 INCHES BELOW SURFACE OF THE CONCRETE WALK UNDER CAST IRON COVER LETTERED "COUNTY ENGINEER MONUMENT" WITH AN L.A. COUNTY ENGINEER BUTTON BRASS CAP STAMPED TOR. 2.11.55
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FAX (619) 597-0355

REGISTERED PROFESSIONAL ENGINEER ERICK ARMSTRONG No. RCE 36082 EXP. 6-30-00 CIVIL STATE OF CALIFORNIA

MAINLINE HYDROLOGY MAP FOR:
COSTCO WHOLESALE
DRAWN BY: C. CHERRY
DESIGN BY: E. ARMSTRONG
CHECKED BY: E. ARMSTRONG
CITY OF TORRANCE

REV.#	DATE	DESCRIPTION	BY	CHECKED

CITY OF TORRANCE
ENGINEERING DEPARTMENT

DRAWN: PVT. ENGINEER
DESIGNED: PVT. ENGINEER
PROJECT ENGINEER:
DIVISION ENGINEER:
APPROVED:
RICHARD W. BURTT DATE
CITY ENGINEER
R.C.E. NO. 32862 EXP. 6/30/98
SCALE: AS SHOWN
SHEET 1 OF 4
PLAN NO. GP-