Appendix M
SEWER STUDY

DCA CIVIL ENGINEERING GROUP

CITY OF SANTA CLARITA
MASTER SEWER STUDY

HENRY MAYO NEWHALL MEMORIAL HOSPITAL

PREPARED FOR:

ROGER E. SEAVER
HENRY MAYO NEWHALL MEMORIAL HOSPITAL
23845 MCBEAN PARKWAY
VALENCIA, CA 91355-2083

PREPARED BY:

DCA CIVIL ENGINEERING GROUP
17625 CRENSHAW BLVD., STE. 300
TORRANCE, CA 90504

04/25/2008

DCA CIVIL ENGINEERING GROUP

HENRY MAYO NEWHALL MEMORIAL HOSPITAL SEWER STUDY

I. Introduction and Purpose

Henry Mayo Newhall Memorial Hospital, which is located at 23845 McBean Parkway in Santa Clarita, is proposing to expand their facilities and services. The proposed sewers from the site need to be drained to the existing sewer system . The purpose of this study is to show that there is adequate capacity in the existing sanitary sewer system to support the proposed facility expansion.

II. Site Description

There is an existing 12 inch diameter sewer main in said property along the project site's frontage, including several laterals to the subject property. A 10 inch diameter sewer main is connected at the upstream end, which begins approximately 9 feet northerly of the southwesterly corner of the property line, and drains the residential tracts to the west of the site (see attached Master Sewer Study Plan). The sewer flows northeast along the property line until the 12 inch sewer main then connects to a manhole located approximately 70' northwesterly of the intersection of McBean Parkway and Avenida Navarre. The manhole is the junction where the 12 inch sewer main connects to the Los Angeles County Trunk Sewer. The existing 24 inch diameter trunk sewer is located in the south bound half of McBean Parkway and flows from Orchard Village Road northerly along McBean Parkway to the manhole near Avenida Navarre. The manhole outlets and flows northerly in an existing 18 inch diameter County trunk sewer.

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III. Methodology

The capacity analysis of the existing sewer is done in accordance with the City of Santa Clarita sewer area study policy. The unit count method is used for the residential area, which consists of fully developed single family homes. Unit counts are verified by recorded tract maps. Meanwhile, Average Daily Sewage Flows supplied by the City of Santa Clarita Development Services Division are used to determine discharge from the project site, which is a commercial hospital. The capacity of the existing sewer is calculated from Kutter's formulae per Los Angeles County Department of Public Works Standard S-C4. The tabulated results and sample calculations are listed on the Sewer Study Plan.

IV. Conclusion

The calculations show that the existing sewer system has adequate capacity to accommodate the proposed improvements. All of the existing sanitary sewer mains between the upstream and the existing trunk sewer are well below the ¾ full capacity (including the added flow from the hospital site) which meets the County requirements. Please refer to the Master Sewer Study Plan for more information.

Respectfully submitted,

DCA Civil Engineering Group

Charles S. Cummins
Principal Engineer
R.C.E. No. 34526

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TABLE OF CONTENTS

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SECTION D

Master Sewer Study Plan

Reference Plans:

Attachment 1

I. Adjacent Tract Maps
   i. Tract Map 32888
   ii. Tract Map 43117
   iii. Tract Map 43149
   iv. Tact Map 32078
   v. Tract Map 44395

Attachment 2

II. Sewer Plans for adjacent Tracts
   i. Valencia Trunk Sewer 32-P-12
   ii. Sanitary Sewer PC 8865
   iii. Sanitary Sewer PC 9343
   iv. Sanitary Sewer PC 9077
   v. Sanitary Sewer PC 10302
   vi. Sanitary Sewer PC 10341
   vii. Sanitary Sewer PC 10540

City of Santa Clarita
Development Services Division

SEWAGE FLOW COEFFICIENTS

ZONING	DESCRIPTION	COEFFICIENT (cfs/gross acreage)	COEFFICIENT (cfs/dwelling unit)
OS	Open Space	0.0002	-------
A	Agricultural - 1 single family home/ legal lot	0.0002	-------
RE	Residential Estate – large custom single family homes on uniquely configured lots	0.00075	-------
RVL	Residential Very Low Density - 1 DU/AC	0.001	0.001
RL	Residential Low Density – 2.2 DU/AC	0.0015	0.001
RS	Residential Suburban - 5 DU/AC	0.005	0.001
RM	Residential Moderate – 11 DU/AC	0.012	0.001
RMH	Residential Medium High – 20 DU/AC	0.015	0.001
RH	Residential High – 28 DU/AC	0.023	0.001
CTC	Commercial Town Center	0.015	-------
CC	Community Commercial	0.015	-------
CN	Commercial Neighborhood	0.015	-------
CO	Commercial Office	0.015	-------
VSR	Visitor Serving/Resort	0.021	-------
BP	Business Park	0.021	-------
IC	Industrial Commercial	0.021	-------
I	Industrial	0.021	-------

Notes:

- The coefficient to be used for any zoned area not listed in this table will be determined by the City Engineer based upon the intended development and use.
- Open space coefficient: this coefficient is to account for water infiltration into sewer pipe.
- Coefficients in cfs/gross acreage shall be used for areas that are not yet developed and not yet entitled.
- Coefficients in cfs/dwelling unit shall be used for developed areas and areas that are entitled.

Kutter's Formula

The standard form of Kutter's Formula is known as the Chézy Formula. Kutter's Formula is widely used in sanitary sewer design and analysis. The roughness component, *C*, is variable and is a function of *R*, *S*, and the channel material. Both *x* and *y* are equal to 1/2.

Equations for U.S. customary units and the S.I. system are shown below:

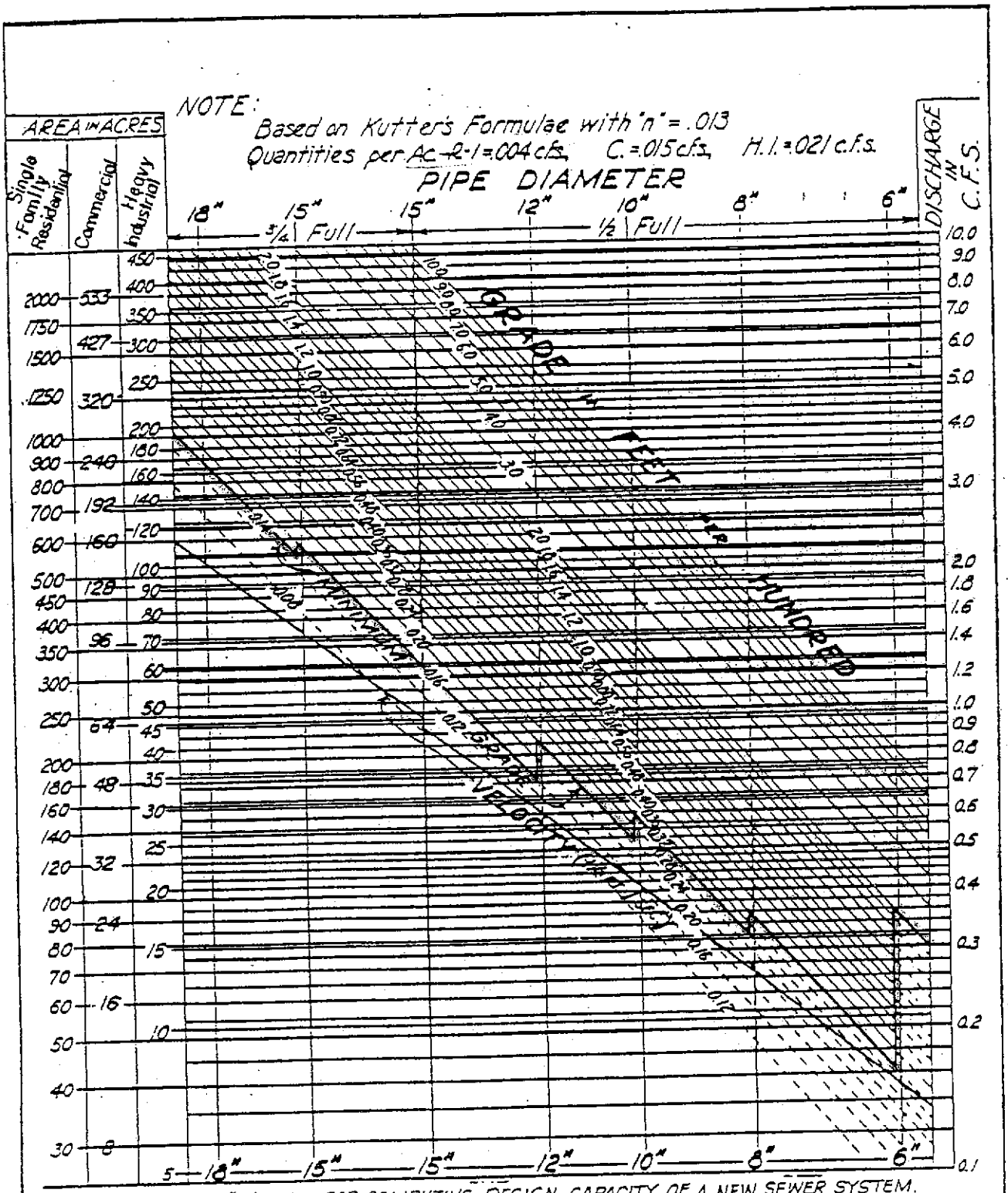
$$V = C\sqrt{RS} \tag{5.6}$$

The roughness coefficient *C* is related to Manning's *n* through Kutter's formula.

Note: Kutter's roughness coefficients are the same as Manning's roughness coefficients.

$$C = \frac{k_1 + \frac{k_2}{S} + \frac{k_3}{n}}{1 + \frac{n}{\sqrt{R}} \cdot \left(k_1 + \frac{k_2}{S}\right)} \tag{5.7}$$

Where	C	=	Chézy's roughness coefficient ($m^{1/2}$/sec., $ft^{1/2}$/sec.)
	S	=	Friction slope (m/m, ft/ft)
	R	=	Hydraulic roughness (unitless)
	n	=	Kutter's roughness (unitless)
	k_1	=	Constant (23.0 SI, 41.65 U.S. customary)
	k_2	=	Constant (0.00155 SI, 0.00281 U.S. customary)
	k_3	=	Constant (1.0 SI, 1.811 U.S. customary)



FLOW DIAGRAM FOR THE DESIGN OF CIRCULAR SANITARY SEWERS

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS

ASSISTANT DEPUTY

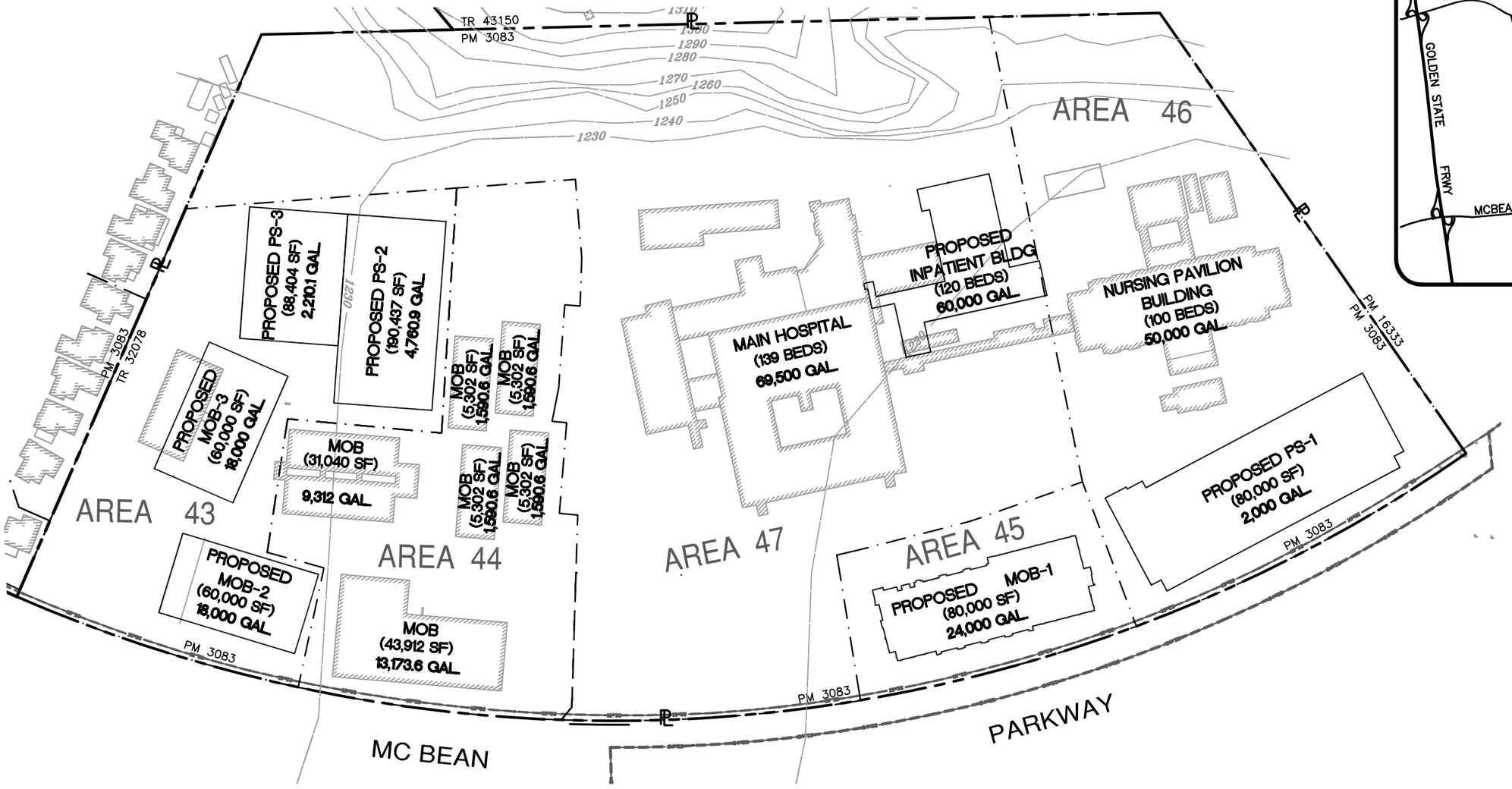
COUNTY ENGINEER

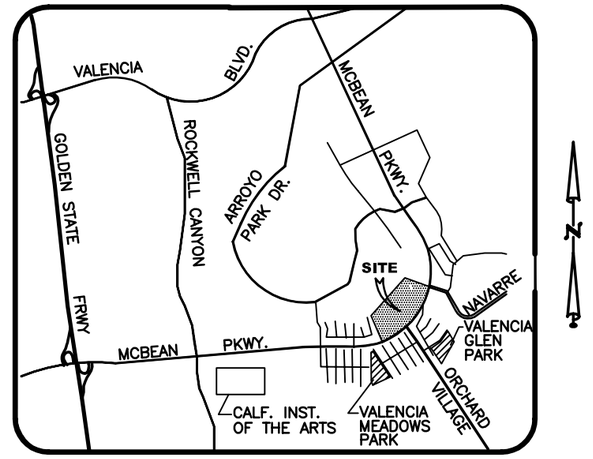
COUNTY ENGINEER STANDARD **S-C4**

DATE: 3/80

DESIGN RCE 10423

AVERAGE DAILY FLOWS EXHIBIT





VICINITY MAP

NOT TO SCALE

N

GRAPHIC SCALE

0' 150' 300'

SCALE: 1" = 150'

NOTE:

– ESTIMATED AVERAGE DAILY SEWAGE FLOWS ARE:
- 500gal/bed FOR HOSPITALS
- 300gal/1000sf FOR MEDICAL BUILDINGS
- 25gal/1000sf FOR PARKING STRUCTURES

LEGEND

GAL = GALLONS
MOB = MEDICAL OFFICE BUILDING
PS = PARKING STRUCTURE
℄ = PROPERTY LINE
SF = SQUARE FEET

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HENRY MAYO NEWHALL MEMORIAL HOSPITAL
AVERAGE DAILY FLOWS EXHIBIT

SCALE: 1"= 150'	DATE: 04/25/08
BY: MSM/KG	JOB NO.: 07-1373-1864.000-895

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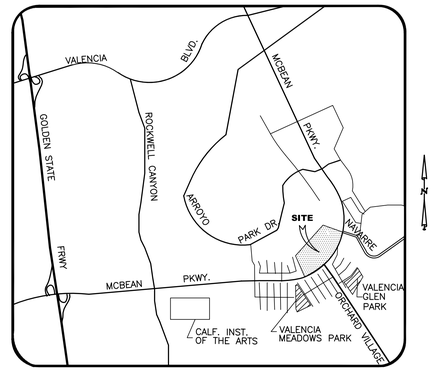
MASTER SEWER STUDY PLAN



VICINITY MAP

NOT TO SCALE

LEGEND

CFS = CUBIC FEET PER SECOND
GAL = GALLONS
IN = INCHES
PC = PRIVATE CONTRACT
SF = SQUARE FEET
SFH = SINGLE FAMILY HOUSE
SMD = SEWER MAINTENANCE DISTRICT

NOTES:

1. Q IS CALCULATED PER CITY OF SANTA CLARITA SEWAGE FLOW COEFFICIENTS, 0.0015cfs/GROSS ACREAGE FOR AREAS THAT ARE NOT FULLY DEVELOPED AND, AND 0.001cfs/DWELLING UNIT FOR DEVELOPED AREAS AND AREAS THAT ARE ENTITLED.
2. $\sum Q = \sum_{i=1}^{n} Q_i$
3. Q_{cap} IS CALCULATED FROM KUTTER'S FORMULAE, $Q_{cap} = \frac{K' D^{8/3} S^{1/2}}{n}$

   WHERE K'=0.42235 FOR 3/4 FULL
   D=DIAMETER OF THE SEWER PIPE
   S=SLOPE OF THE SEWER PIPE
   n=0.013
4. %FULL= $\frac{\sum Q}{Q_{cap}} X100\%$

SANITARY SEWER PIPE DATA

SEGMENT #	SMD MH (W)	PC #	Ø SIZE (IN.)	SLOPE	Q (cfs)	Qcap. (cfs)	∑Q (cfs)	% FULL	SEGMENT #	SMD MH (W)	PC #	Ø SIZE (IN.)	SLOPE	Q (cfs)	Qcap. (cfs)	∑Q (cfs)	% FULL	SEGMENT #	SMD MH (W)	PC #	Ø SIZE (IN.)	SLOPE	Q (cfs)	Qcap. (cfs)	∑Q (cfs)	% FULL
(1)	577,578	PC 10341	8	0.0104	0.016	1.124	0.016	1.42	(19)	618,620	PC 10320	8	0.0280	0.019	1.844	0.019	1.03	(37)	10,11	PC 9343	8	0.0036	0.004	0.661	0.191	28.89
(2)	576,577	PC 10341	8	0.0080	0.005	0.986	0.021	2.13	(20)	380,618	PC 10320	8	0.0060	0.001	0.854	0.120	14.05	(38)	11,387	PC 9343	8	0.0024	0.012	0.540	0.012	2.22
(3)	575,576	PC 10341	8	0.0104	0.005	1.124	0.026	2.31	(21)	2,380	PC 10320	8	0.0040	0.008	0.697	0.128	18.36	(39)	11,12	PC 9343	8	0.0035	0.001	0.652	0.204	31.29
(4)	579,575	PC 10341	8	0.0160	0.015	1.394	0.015	1.08	(22)	1,2	PC 10320	8	0.0340	0.007	2.032	0.007	0.34	(40)	12,13	PC 9343	8	0.0062	0.004	0.868	0.208	23.96
(5)	574,575	PC 10341	8	0.0302	0.001	1.915	0.042	2.19	(23)	2,3	PC 10320	8	0.0040	0.002	0.697	0.135	19.37	(41)	13,388	PC 9343	8	0.0032	0.008	0.623	0.008	1.28
(6)	575,606	PC 10341	8	0.0184	0.001	1.495	0.043	2.88	(24)	3,4	PC 9343	8	0.1736	0	4.591	0.135	2.94	(42)	13,14	PC 9343	8	0.0276	0.004	1.831	0.220	12.01
(7)	606,607	PC 10341	8	0.0040	0.002	0.697	0.045	6.46	(25)	4,5	PC 9343	8	0.0118	0.003	1.197	0.138	11.53	(43)	14,390	PC 9343	8	0.0040	0.009	0.697	0.022	3.16
(8)	607,608	PC 10341	8	0.0180	0.001	1.478	0.046	3.11	(26)	5,382	PC 9343	8	0.0260	0.006	1.777	0.014	0.79	(44)	389,390	PC 9343	8	0.0040	0.013	0.697	0.013	1.87
(9)	608,609	PC 10320	8	0.0040	0	0.697	0.046	6.60	(27)	381,382	PC 9343	8	0.0040	0.008	0.697	0.008	1.15	(45)	–	–	10	0.0032	0.003	1.130	0.245	21.68
(10)	609,610	PC 10320	8	0.0040	0.002	0.697	0.048	6.89	(28)	5,29	PC 9343	8	0.0100	0.004	1.102	0.152	13.79	(46)	–	–	10	0.0032	0	1.130	0.245	21.68
(11)	610,612	PC 10320	8	0.1144	0.007	3.727	0.028	0.75	(29)	6,7	PC 9343	8	0.0436	0.001	2.301	0.153	6.65	(47)	–	–	12	0.0100	0.165	3.249	0.410	12.62
(12)	612,613	PC 10320	8	0.0176	0.009	1.462	0.021	1.44	(30)	7,384	PC 9343	8	0.0032	0.007	0.623	0.014	2.25	(48)	–	–	12	0.0100	0.110	3.249	0.520	16.00
(13)	613,614	PC 10320	8	0.0132	0.012	1.266	0.012	0.95	(31)	383,384	PC 9343	8	0.0032	0.007	0.623	0.007	1.12	(49)	–	–	12	0.0100	0.498	3.249	1.018	31.33
(14)	610,611	PC 10320	8	0.0200	0.003	1.558	0.079	5.07	(32)	7,8	PC 9343	8	0.0436; 0.1000	0.003	2.953	0.170	5.76	(50)	–	–	12	0.0380	0.092	6.333	1.110	17.53
(15)	611,615	PC 10320	8	0.0820	0.009	3.155	0.088	2.79	(33)	8,9	PC 9343	8	0.0036	0.001	0.661	0.171	25.86	(51)	–	–	12	0.0092	0.200	3.116	1.310	42.04
(16)	615,616	PC 10320	8	0.0040	0.004	0.697	0.092	13.20	(34)	9,10	PC 9343	8	0.0036	0.001	0.661	0.172	26.02	(52)	–	–	12	0.0092	0	3.116	1.310	42.04
(17)	616.617	PC 10320	8	0.3480	0.004	6.501	0.096	1.48	(35)	10,386	PC 9343	8	0.0032	0.003	0.623	0.015	2.41									
(18)	617,618	PC 10320	8	0.0604	0.004	2.708	0.100	3.69	(36)	385,386	PC 9343	8	0.0032	0.012	0.623	0.012	1.93									

NOTE:
– SEWAGE FLOW COEFFICIENT IS 0.001cfs/dwelling unit FOR SEGMENTS 1 THRU 46 EXCEPT FOR AREA 17b WHERE 0.0015cfs/gross acreage IS USED
– AVERAGE DAILY FLOWS FOR SEGMENTS 47 THRU 52 IS:
- 500gal/bed FOR HOSPITAL (0.00077cfs/bed)
- 300gal/1000sf FOR MEDICAL BUILDINGS (0.00046cfs/1000sf)
- 25gal/1000sf FOR PARKING STRUCTURE (0.000039cfs/1000sf)

TRIBUTARY AREA ACREAGE AND ZONING

AREA #	ACREAGE	ZONING	NUMBER OF SFH	Q (cfs)	SEWAGE FLOW COEFFICIENT	AREA #	ACREAGE	ZONING	NUMBER OF SFH	Q (cfs)	SEWAGE FLOW COEFFICIENT	AREA #	ACREAGE	# OF BEDS (HOSPITAL)/ SF (BUILDING/PARKING)		Q (cfs)	SEWAGE FLOW COEFFICIENT
1	3.221	RL	16	0.016	0.001	22	0.463	RL	3	0.003	0.001	43	4.915	MEDICAL OFFICE BUILDING	120000	0.138	0.00046
2	1.475	RL	5	0.005	0.001	23	1.048	RL	6	0.006	0.001			PARKING STRUCTURE	278841	0.027	0.000039
3	0.899	RL	5	0.005	0.001	24	1.760	RL	8	0.008	0.001	44	4.155	MEDICAL OFFICE BUILDING	96160	0.110	0.00046
4	2.778	RL	15	0.015	0.001	25	0.966	RL	4	0.004	0.001	45	1.123	MEDICAL OFFICE BUILDING	80000	0.092	0.00046
5	0.237	RL	1	0.001	0.001	26	0.268	RL	1	0.001	0.001	46	6.824	HOSPITAL	100	0.192	0.00077
6	0.381	RL	1	0.001	0.001	27	1.190	RL	7	0.007	0.001			PARKING STRUCTURE	80000	0.008	0.000039
7	2.093	RL	3	0.003	0.001	28	2.052	RL	7	0.007	0.001	47	13.363	HOSPITAL	259	0.498	0.00077
8	1.126	RL	2	0.002	0.001	29	0.662	RL	3	0.003	0.001						
9	1.896	RL	7	0.007	0.001	30	0.241	RL	1	0.001	0.001						
10	2.765	RL	9	0.009	0.001	31	0.226	RL	1	0.001	0.001						
11	3.334	RL	12	0.012	0.001	32	0.499	RL	3	0.003	0.001						
12	0.825	RL	3	0.003	0.001	33	2.575	RL	12	0.012	0.001						
13	3.057	RL	9	0.009	0.001	34	0.977	RL	4	0.004	0.001						
14	1.232	RL	4	0.004	0.001	35	2.751	RL	12	0.012	0.001						
15	0.44	RVL	–	0.0004	0.001	36	0.375	RL	1	0.001	0.001						
16	1.041	RL	4	0.004	0.001	37	0.864	RL	4	0.004	0.001						
17a	1.772	RL	6	0.006	0.001	38	1.647	RL	8	0.008	0.001						
17b	8.422	RL	–	0.013	0.0015	39	0.879	RL	4	0.004	0.001						
18	0.578	RL	1	0.001	0.001	40	1.407	RL	9	0.009	0.001						
19	2.048	RL	8	0.008	0.001	41	3.981	RL	13	0.013	0.001						
20	1.872	RL	7	0.007	0.001	42	0.665	RL	3	0.003	0.001						
21	0.716	RL	2	0.002	0.001												

ZONING NOTE:
– RL PER CITY OF SANTA CLARITA ZONING MAP
– RVL PER CITY OF SANTA CLARITA ZONING MAP

NOTE:
– IN ORDER TO OBTAIN PEAK FLOW FOR AREAS 43 THRU 48, AVERAGE DAILY FLOWS HAVE BEEN MULTIPLIED BY 2.5

Q AT SEWER INTERSECTION NODES

NODE #	Q(cfs)
1	Q=0.041cfs FROM AREAS 1+2+3+4
2	Q=0.076cfs FROM AREAS 1 THRU 13
3	Q=0.106cfs FROM AREAS 1 THRU 19
4	Q=0.122cfs FROM AREAS 1 THRU 22
5	Q=0.141cfs FROM AREAS 1 THRU 27
6	Q=0.160cfs FROM AREAS 1 THRU 31
7	Q=0.180cfs FROM AREAS 1 THRU 36
8	Q=0.196cfs FROM AREAS 1 THRU 38
9	Q=0.209cfs FROM AREAS 1 THRU 41
10	Q=0.235cfs FROM AREAS 1 THRU 44

SAMPLE CALCULATION OF ∑Q

SEGMENT #	Q (cfs)	CALCULATION
(3)	0.026	0.016+0.005+0.005=0.026(cfs)
(4)	0.015	
(5)	0.001	
∑Q @ (5)	0.042	0.026+0.015+0.001=0.0429(cfs)
(10)	0.048	0.042+0.001+0.002+0.001+0+0.002=0.048(cfs)
(11)	0.028	0.012+0.009+0.007=0.028(cfs)
(14)	0.003	
∑Q @ (14)	0.079	0.048+0.028+0.003=0.079(cfs)

N

GRAPHIC SCALE
0' 200' 400' 600'
SCALE: 1" = 200'

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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

NO.	DATE	REVISION

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Torrance, California 90504
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HENRY MAYO NEWHALL MEMORIAL HOSPITAL
23845 McBEAN PARKWAY
VALENCIA, CALIFORNIA 91355
MASTER SEWER STUDY PLAN

PROFESSIONAL STAMP
REGISTERED PROFESSIONAL ENGINEER
CHARLES S. CUMPIAN
NO. 34526
EXP. 9/30/09
CIVIL
STATE OF CALIFORNIA

DATE: 04/25/2008
SCALE:
DESIGNED: MSM DRAWN: KG
SHEET NO.
1.0
SHEET 1 OF 1
PROJECT NO.
07-1373-1864.000-895

4/25/2008 11:55 AM
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