HARBOR BOULEVARD MIXED USE TRANSIT CORRIDOR

DRAINAGE STUDY

DRAFT

MARCH 18, 2013

IBI GROUP

DOCUMENT CONTROL

Client:	The Planning Center
Project Name:	Harbor Boulevard Mixed Use Transit Corridor
Report Title:	Drainage Study
IBI Reference:	29549
Version:	Version 1.0
Digital Master:	J:\29549_HarborSPEIR\10.0 Reports\Drainage Study.docx
Originator:	Chad Thomas
Reviewer:	Bill Delo
Authorization:	[Name]
Circulation List:	
History:	

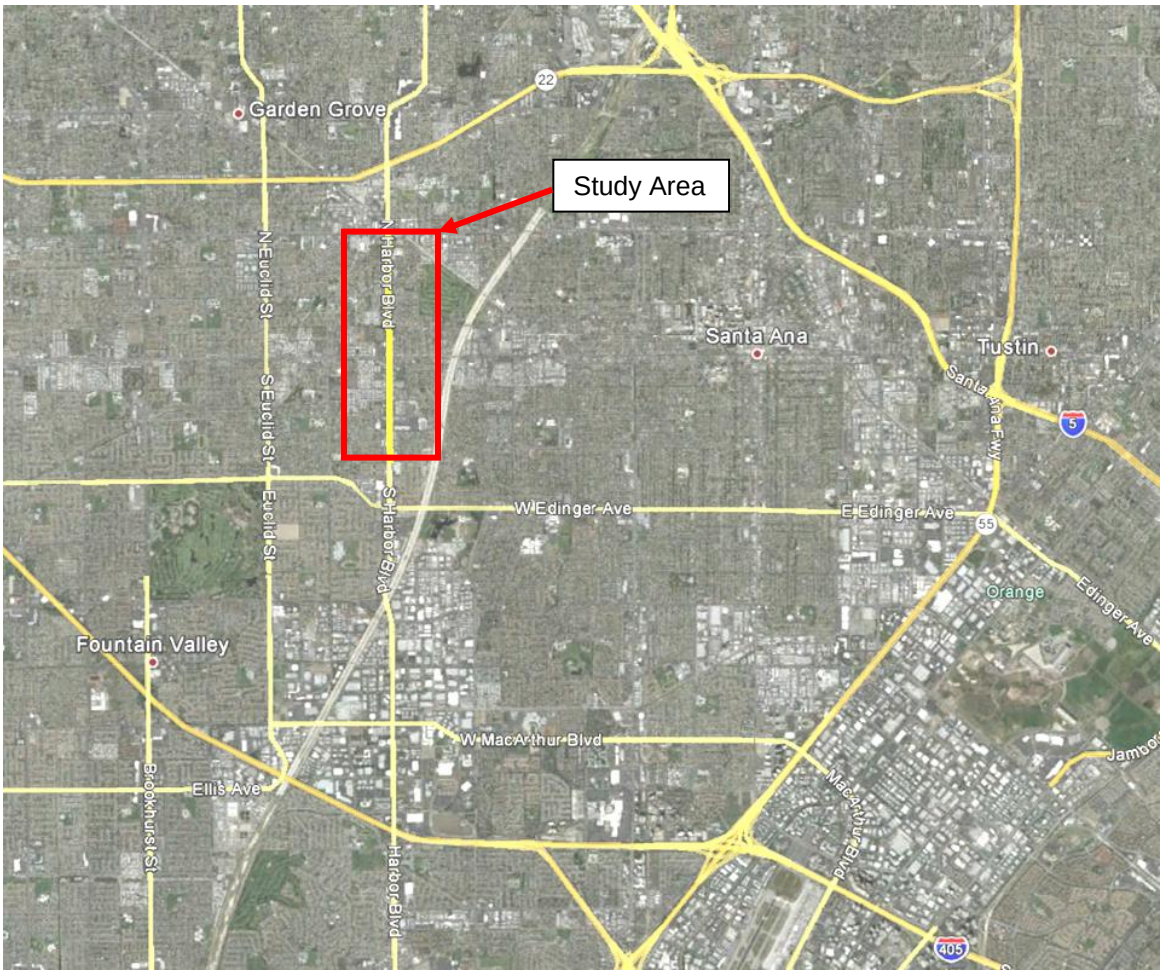
TABLE OF CONTENTS

Contents

1. INTRODUCTION

The Harbor Boulevard Mixed Use Transit Corridor project or Harbor Corridor Plan (HCP) will amend the North Harbor Specific Plan proposed by the city of Santa Ana in 1993. The project will consist of creating new residential housing with a mix of commercial and retail. The purpose of this report is to analyze the impacts that the new land uses will have on the storm drain infrastructure. Harbor Boulevard is a major north–south corridor that serves commercial and transportation purposes throughout Santa Ana and surrounding cities. The corridor study area is located on the west side of the City and is bounded on the north by Westminster Avenue and on the south by the City limits near Gloxinia Avenue.

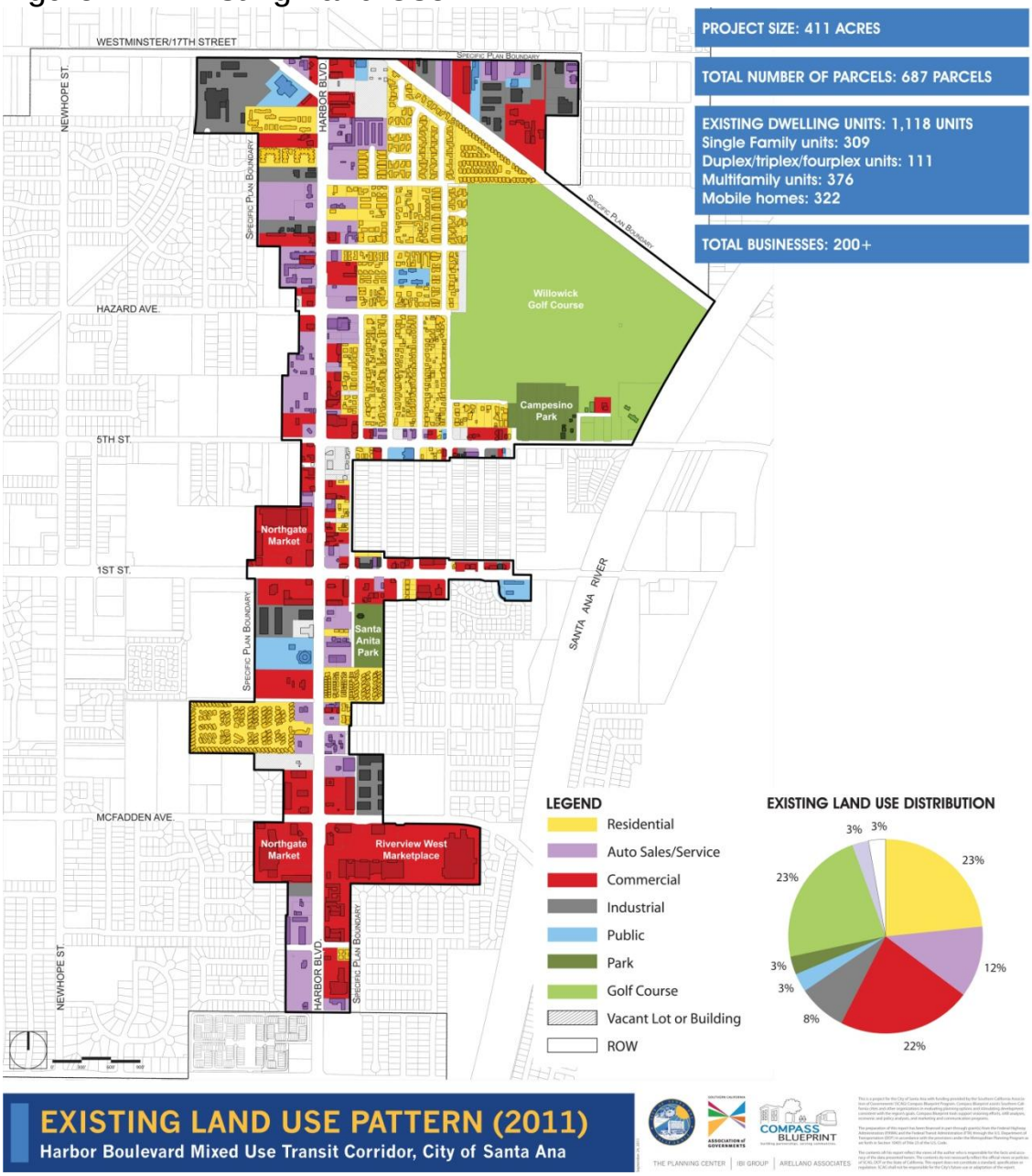
Figure 1: Vicinity Map



2. EXISTING CONDITIONS

The majority of the existing Harbor Boulevard Corridor is developed with only a few vacant lots. The existing land uses (see Figure 2.1) consist of auto sales/service, commercial, industrial and residential areas. The existing HCP consists of predominantly impervious areas with a few back lots that are unpaved where cars are stored. The existing runoff coefficient for the HCP was calculated to be approximately 0.70. It is assumed that the lots surface-drain to Harbor Boulevard and other side streets and the runoff is captured and conveyed in the storm drain systems. Run-off is managed by a combination of closed and open drainage channels. A 90-inch culvert crosses Harbor Boulevard at Washington Street. A second large closed drainage system is located midway between First and Fifth Streets. All drainage ultimately discharges into the Orange County Flood Control Channel.

Figure 2.1: Existing Land Use



Boyle Engineering prepared a Drainage Engineering report in 1993 for the entire City of Santa Ana. The City storm drain system was modeled using AES software and the findings of this report showed significant deficiencies in the storm drain system. The results of this report for the HCP area are summarized in Table 2.1. See Appendix for corresponding maps.

Figure 2.2: Existing Drainage System Map

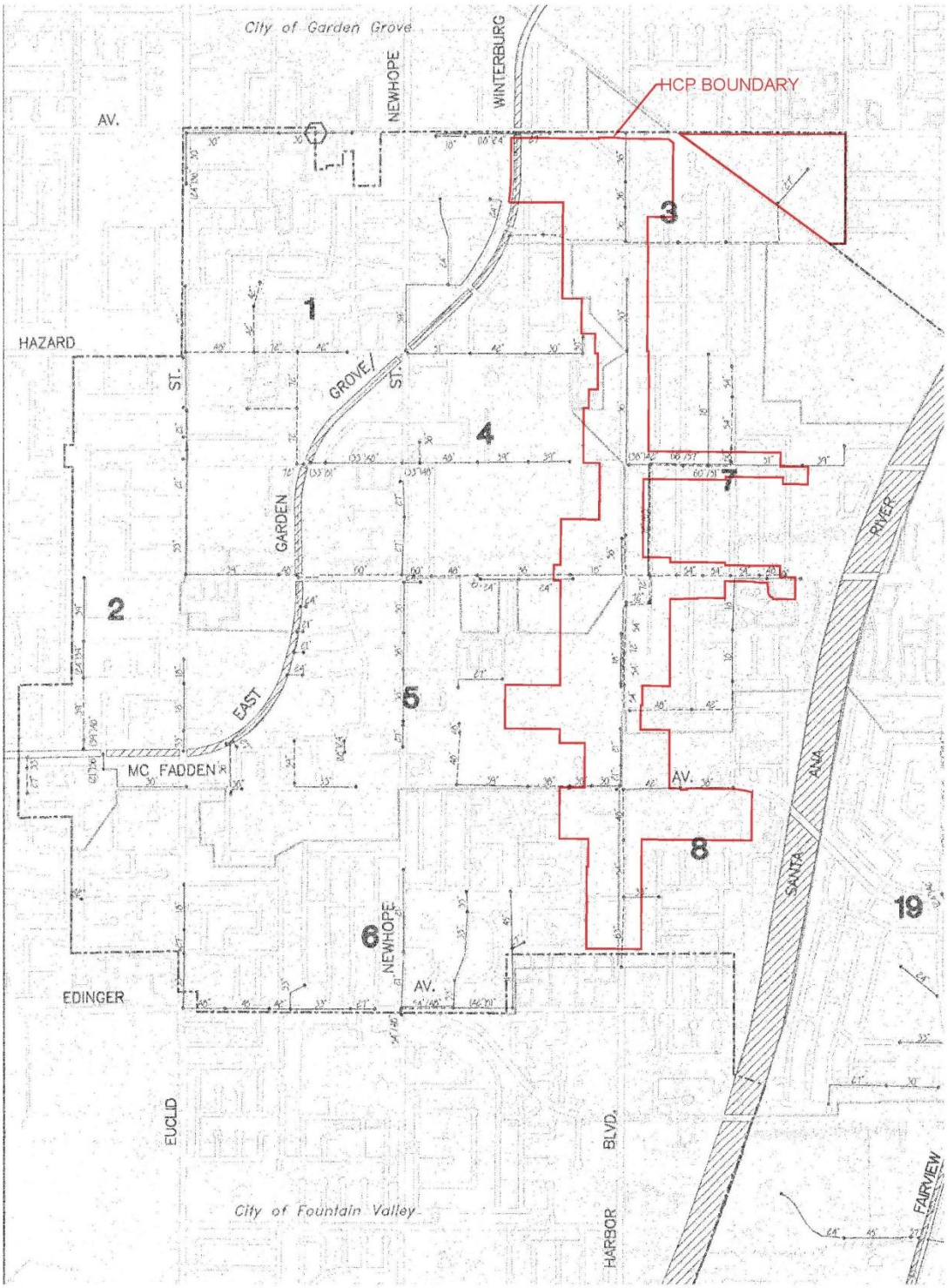


Table 2.1: Existing Pipe Deficiency

Map	Existing Pipe				Capacity				Existing
Area	Pipe ID node to node	Ex Diam. (inches)	Ex Slope (ft/ft)	Ex Runoff (cfs)	Roadway (cfs)	'93 Pipe (cfs)	'96 Pipe (cfs)	Total (cfs)	Deficiency (cfs)
3	0302-0303	-	-	13.3	0	0		0.0	-13.3
3	0325-0326	-	-	26.4	2.3	0	39.6	41.9	0.0
3	0326-0327	-	-	26.4	29.2	0	39.6	68.8	0.0
3	0327-0328	-	-	26.4	29.2	0	39.6	68.8	0.0
3	0330-0377	-	-	17.5	6.6	0		6.6	-10.9
4	0406-0407	-	-	15.2	12.5	0		12.5	-2.7
4	0407-0408	36	0.00102	15.2	12.5	21.3		33.8	0.0
4	0426-0427	-	-	20.7	12.5	0		12.5	-8.2
4	0427-0428	-	-	20.7	12.5	0		12.5	-8.2
4	0428-0408	-	-	28.2	12.5	0		12.5	-15.7
4	0408-0409	48	0.00370	54.0	12.5	87.6		100.1	0.0
5	0581-0582	-	-	15.6	12.5	0		12.5	-3.1
5	0582-0586	7'x8'	-	309.2	0	1128.3		1128.3	0.0
5	0571-0572	-	-	18.3	12.5	0		12.5	-5.8
5	0572-0573	-	-	18.3	12.5	0		12.5	-5.8
5	0573-0574	-	-	18.3	1.6	0		1.6	-16.7
5	0574-0575	36	0.002	19.6	1.6	29.9		31.5	0.0
6	0651-0652	-	-	21.2	25.3	0		25.3	0.0
6	0652-0653	-	-	21.2	25.3	0		25.3	0.0
6	0661-0662	-	-	13.1	25.3	0		25.3	0.0
6	0662-0663	-	-	13.1	25.3	0		25.3	0.0
7	0717-0718	-	-	38.7	3.1	0		3.1	-35.6
7	0718-0715	-	-	68.7	3.1	0		3.1	-65.6
7	0715-0723	60	0.0008	86.0	3.1	73.8		76.9	-9.1
7	0723-0724	66	0.0008	120.7	3.1	95.2		98.3	-22.4
7	0724-0705	66	0.0008	121.8	3.1	95.2		98.3	-23.5
7	0702-0703	-	-	29.2	12.5	0	20.6	33.1	0.0
7	0703-0704	-	-	39.6	12.5	0	33.4	45.9	0.0
7	0704-0705	36	0.0032	50.7	0	37.8	37.8	75.6	0.0
7	0705-0734	72	0.0008	177.1	25.3	120.0		145.3	-31.8
7	0734-0736	72	0.0008	180.8	25.3	120.0		145.3	-35.5
7	0736-0737	72	0.0008	180.8	0	120.0		120.0	-60.8
7	0737-0735	72	0.0008	180.8	12.5	120.0		132.5	-48.3
7	0743-0744	48	0.004	28.5	12.5	91.1		103.6	0.0
7	0744-0745	54	0.002	36.7	12.5	88.2		100.7	0.0
7	0745-0746	54	0.0068	45.3	12.5	162.5		175.0	0.0
7	0746-0747	54	0.004	54.3	12.5	124.7		137.2	0.0
7	0747-0748	54	0.004	62	0	124.7		124.7	0.0
7	0748-0735	54	0.004	62	12.5	124.7		137.2	0.0
8	0804-0805	-	-	28.7	4.6	0.0		4.6	-24.1
8	0805-0806	-	-	45.3	4.6	0.0		4.6	-40.7
8	0806-0807	48	0.002	58.2	29.2	64.4		93.6	0.0
8	0807-0808	54	0.002	62.1	29.2	88.2		117.4	0.0
8	0808-0819	63	0.002	103.1	29.2	133		162.2	0.0

*See Appendix for corresponding maps.

In summary, the Boyle report shows that the existing conditions of the storm water system exhibit significant under sizing. Hydraulic grade line elevations exceed grate and curb elevations creating potential flooding conditions along most of Harbor Boulevard. A storm drain project was completed along Harbor Boulevard in 1996. Many of the deficiencies shown in the 1993 Boyle Report were remedied with the 1996 project.

3. PROPOSED CONDITIONS

The Harbor Boulevard Mixed Use Transit Corridor will develop all vacant land in the corridor and replace much of the existing commercial areas with commercial, retail and residential developments. A conceptual vision plan of the HCP is shown in Figure 3.1. It is assumed that the HCP will have a new runoff coefficient of approximately 0.80. This is a 15% percent increase from existing conditions.

Figure 3.1: Harbor Corridor Vision Plan

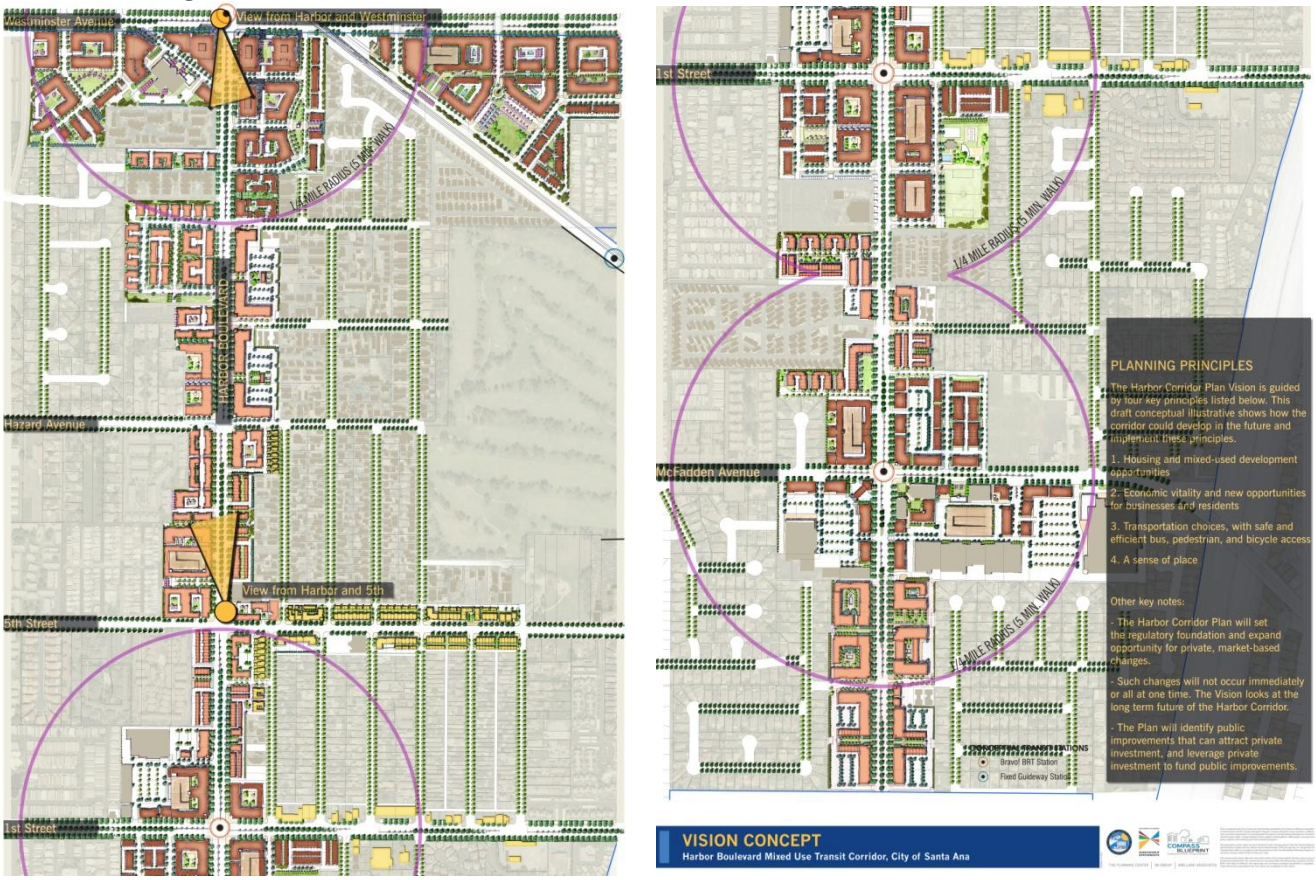


Table 3.1: Future Pipe Capacities

Map Area	Pipe ID	Ex Runoff (cfs)	Exist. Capacity (cfs)	Future Capacity			Total Capacity (cfs)	15% Fut. Flow (cfs)	Future Deficiency (cfs)
				Prop. Pipe (inches)	Prop. Slope (ft/ft)	Capacity (cfs)			
3	0302-0303	13.3	0.00	27	0.003	17.0	17.0	15.3	0.0
3	0325-0326	26.4	41.87				41.9	30.4	0.0
3	0326-0327	26.4	68.77				68.8	30.4	0.0
3	0327-0328	26.4	68.77				68.8	30.4	0.0
3	0330-0377	17.5	6.60	27	0.003	17.0	23.6	20.1	0.0
4	0406-0407	15.2	12.50	18	0.003	5.8	18.3	17.5	0.0
4	0407-0408	15.2	33.80				33.8	17.5	0.0
4	0426-0427	20.7	12.50	24	0.003	12.4	24.9	23.8	0.0
4	0427-0428	20.7	12.50	24	0.003	12.4	24.9	23.8	0.0
4	0428-0408	28.2	12.50	30	0.003	22.5	35.0	32.4	0.0
4	0408-0409	54	100.10				100.1	62.1	0.0
5	0581-0582	15.6	12.50	18	0.003	5.8	18.3	17.9	0.0
5	0582-0586	309.2	1128.30				1128.3	355.6	0.0
5	0571-0572	18.3	12.50	21	0.003	8.7	21.2	21.0	0.0
5	0572-0573	18.3	12.50	21	0.003	8.7	21.2	21.0	0.0
5	0573-0574	18.3	1.60	30	0.003	22.5	24.1	21.0	0.0
5	0574-0575	19.6	31.50				31.5	22.5	0.0
6	0651-0652	21.2	25.30				25.3	24.4	0.0
6	0652-0653	21.2	25.30				25.3	24.4	0.0
6	0661-0662	13.1	25.30				25.3	15.1	0.0
6	0662-0663	13.1	25.30				25.3	15.1	0.0
7	0717-0718	38.7	3.10	39	0.003	45.3	48.4	44.5	0.0
7	0718-0715	68.7	3.10	51	0.003	92.7	95.8	79.0	0.0
7	0715-0723	86	76.90	51	0.003	92.7	169.6	98.9	0.0
7	0723-0724	120.7	98.30	57	0.003	124.7	223.0	138.8	0.0
7	0724-0705	121.8	98.30	57	0.003	124.7	223.0	140.1	0.0
7	0702-0703	29.2	33.06				33.1	33.6	-0.5
7	0703-0704	39.6	45.94				45.9	45.5	0.0
7	0704-0705	50.7	75.63				75.6	58.3	0.0
7	0705-0734	177.1	145.30	63	0.003	162.9	308.2	203.7	0.0
7	0734-0736	180.8	145.30	48	0.003	78.9	224.2	207.9	0.0
7	0736-0737	180.8	120.00	57	0.003	124.7	244.7	207.9	0.0
7	0737-0735	180.8	132.50	54	0.003	108.0	240.5	207.9	0.0
7	0743-0744	28.5	103.60				103.6	32.8	0.0
7	0744-0745	36.7	100.70				100.7	42.2	0.0
7	0745-0746	45.3	175.00				175.0	52.1	0.0
7	0746-0747	54.3	137.20				137.2	62.4	0.0
7	0747-0748	62	124.70				124.7	71.3	0.0
7	0748-0735	62	137.20				137.2	71.3	0.0
8	0804-0805	28.7	4.60	36	0.003	36.6	41.2	33.0	0.0
8	0805-0806	45.3	4.60	42	0.003	55.3	59.9	52.1	0.0
8	0806-0807	58.2	93.60				93.6	66.9	0.0
8	0807-0808	62.1	117.40				117.4	71.4	0.0
8	0808-0819	103.1	162.20				162.2	118.6	0.0

Table 3.1 reveals the pipe capacities and deficiencies if the Boyle recommendations were implemented and the existing flows were increased by 15% to account for the HCP redevelopment. The pipe segment from 0702 to 0703 is deficient by 0.5 cfs. All other capacities are sufficient to handle the HCP flows.

In order for the HCP to be developed and function properly the Boyle report recommendations will need to be implemented. A summary of the required upgrades to the storm drain infrastructure are shown in Table 3.2 and highlighted in the Boyle Engineering Report Storm Drain Maps (see Appendix).

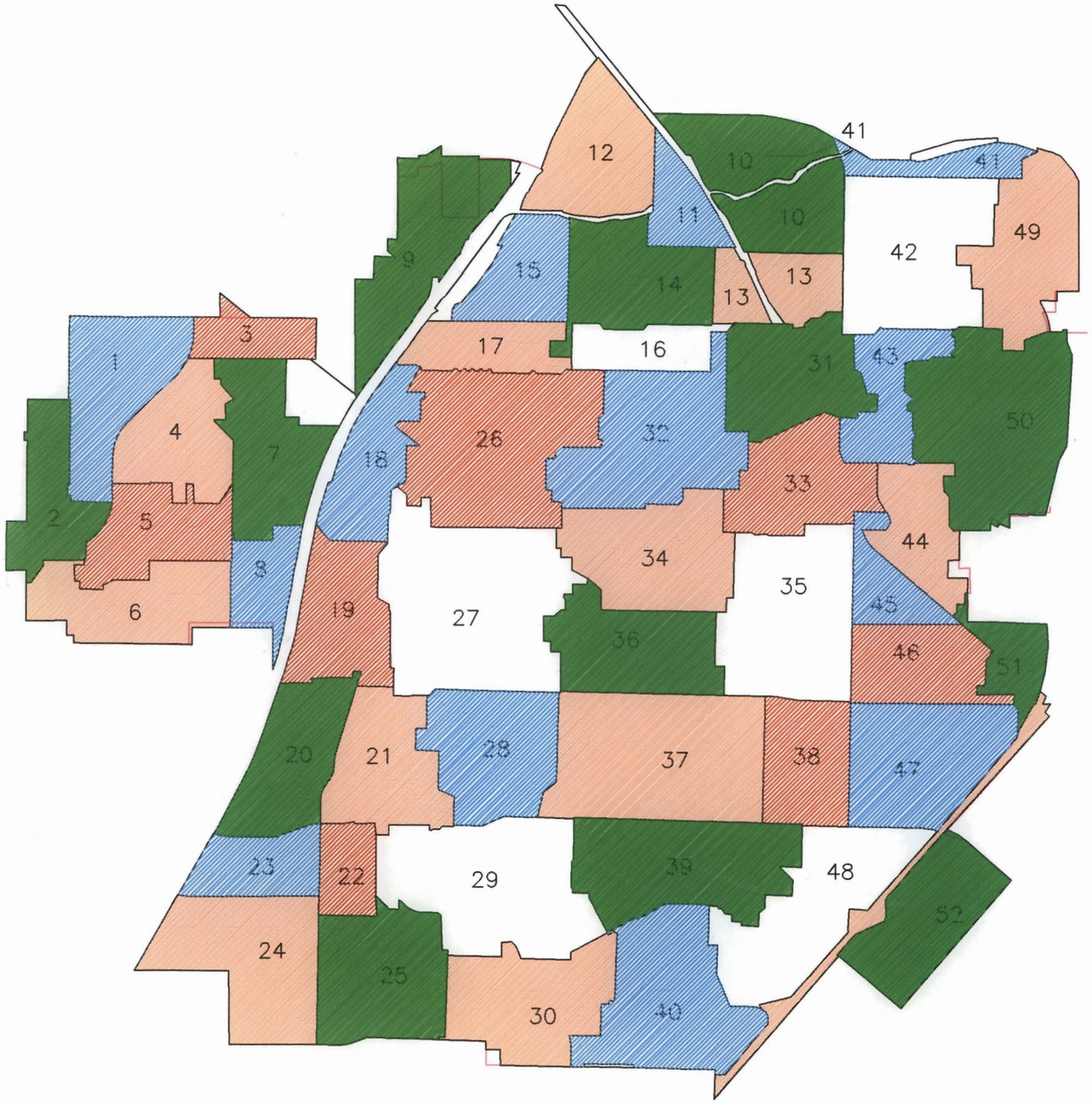
Table 3.2: Required Upgrades to Infrastructure

Map Area	Pipe ID	Recommded Upgrade	
		New Pipe (inches)	Parallel Pipe (inches)
3	0302-0303	27	
3	0330-0377	27	
4	0406-0407	18	
4	0426-0427		24
4	0427-0428		24
4	0428-0408		30
5	0581-0582		18
5	0571-0572	21	
5	0572-0573	21	
5	0573-0574	30	
7	0717-0718	39	
7	0718-0715	51	
7	0715-0723		51
7	0723-0724		57
7	0724-0705		57
7	0705-0734		63
7	0734-0736		48
7	0736-0737		57
7	0737-0735		54
8	0804-0805	36	
8	0805-0806	42	

4. CONCLUSIONS

The Habor Boulevard Mixed Use Transit Corridor project will be adding additional impervious area to the corridor. The majority of this will come from developing the vacant lots. The additional impervious area will add an additional 15% to existing flows. This is not a significant impact to the existing storm drain system. However, the Boyle Engineering Report completed in 1993 has shown that the existing system is deficient and unable to convey the current runoffs. The recommendations made in the Boyle Engineering Report would need to be implemented in order to convey existing runoff as well as future Harbor Corridor flows from the Harbor Boulevard Mixed Use Transit Corridor Project. These recommendations are highlighted in the appendix.

5. APPENDIX – BOYLE ENGINEERING STORM DRAIN REPORT MAPS



City of Santa Ana

N

0 4000

Updated Master Plan of Drainage

May 1994

LEGEND

— 1 BASIN BOUNDARY

— CITY BOUNDARY

INDEX MAP

BOYLE ENGINEERING CORPORATION

City of Santa Ana

N

0 600

LEGEND

- 0369 — ANALYSIS NODE
- STORM FLOW PATH
- 36" — EXISTING STORM DRAIN
- 8X10 — EXISTING RCB STORM DRAIN
- 10'X5' — EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 — DRAINAGE AREA BOUNDARY
- 1 — BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" — NEW STORM DRAIN
- 24"/48" — PARALLEL STORM DRAIN
- (24") 48" — REPLACEMENT STORM DRAIN
- RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 3

BOYLE ENGINEERING CORPORATION

EAST GARDEN GROVE / WINTERBURG CHANNEL C05

City of Garden Grove

City of Santa Ana

1. MEADOWFALL LN.
2. SAGE RIVER LN.
3. FOUNTAIN PARK LN.
4. GARDENBROOK LN.
5. FOREST SPRING DR.

1. SPRING WATER CT.
2. MISTY WIND CT.

SANTA ANA RIVER E01

City of Santa Ana

N

0 600

LEGEND

- 0369 ANALYSIS NODE
- STORM FLOW PATH
- 36" EXISTING STORM DRAIN
- 8X10 EXISTING RCB STORM DRAIN
- 10'X5' EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 DRAINAGE AREA BOUNDARY
- 1 BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" NEW STORM DRAIN
- 24"/48" PARALLEL STORM DRAIN
- (24") 48" REPLACEMENT STORM DRAIN

RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 4

BOYLE ENGINEERING CORPORATION

1. MEADOWFALL LN.
2. SAGE RIVER LN.
3. FOUNTAIN PARK LN.
4. GARDENBROOK LN.
5. FOREST SPRING DR.

CHANNEL C05

WINTERBURG

GARDEN GROVE

EAST

R.F. HAZARD

NEW HOLIDAY MOBILE HOME

City of Santa Ana

0 600

LEGEND

- 0369 — ANALYSIS NODE
- STORM FLOW PATH
- 36" — EXISTING STORM DRAIN
- 8X10 — EXISTING RCB STORM DRAIN
- 10'X5' — EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 — DRAINAGE AREA BOUNDARY
- 1 — BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" — NEW STORM DRAIN
- 24"/48" — PARALLEL STORM DRAIN
- (24") 48" — REPLACEMENT STORM DRAIN

RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 5

BOYLE engineering corporation

City of Santa Ana

0 600

LEGEND

- 0369 ANALYSIS NODE
- STORM FLOW PATH
- 36" EXISTING STORM DRAIN
- 8X10 EXISTING RCB STORM DRAIN
- 10'X5' EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 DRAINAGE AREA BOUNDARY
- 1 BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" NEW STORM DRAIN
- 24"/48" PARALLEL STORM DRAIN
- (24") 48" REPLACEMENT STORM DRAIN

RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 6

BOYLE ENGINEERING CORPORATION

EAST GARDEN GROVE / WINTERBURG CHANNEL C05

City of Fountain Valley

1. MT. MUSALA CT.
2. MT. ROBERT CT.
3. MT MENNES CT.
4. MT. MARCEY CT.
5. DIAMOND CT
8. JADE CT.

City of Santa Ana

N

0 600

LEGEND

- 0369 — ANALYSIS NODE
- STORM FLOW PATH
- 36" — EXISTING STORM DRAIN
- 8X10 — EXISTING RCB STORM DRAIN
- 10'X5' — EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 — DRAINAGE AREA BOUNDARY
- 1 — BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" — NEW STORM DRAIN
- 24"/48" — PARALLEL STORM DRAIN
- (24") 48" — REPLACEMENT STORM DRAIN

RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 7

BOYLE ENGINEERING CORPORATION

1. MEADOWFALL LN.
2. SAGE RIVER LN.
3. FOUNTAIN PARK LN.
4. GARDENBROOK LN.
5. FOREST SPRING DR.

ALOHA ST.
BALI ST.
HILO ST.
KAWAII ST.
KONA AV.

City of Santa Ana

0 600

LEGEND

- 0369 ANALYSIS NODE
- STORM FLOW PATH
- 36" EXISTING STORM DRAIN
- 8X10 EXISTING RCB STORM DRAIN
- 10'X5' EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 DRAINAGE AREA BOUNDARY
- 1 BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" NEW STORM DRAIN
- 24"/48" PARALLEL STORM DRAIN
- (24") 48" REPLACEMENT STORM DRAIN

RECOMMENDED UPGRADES TO SERVICE THE HARBOR CORRIDOR MIXED USE TRANSIT CORRIDOR

DRAINAGE MAP AREA 8

BOYLE ENGINEERING CORPORATION

City of Santa Ana
City of Fountain Valley

1. MT. MUSALA CT.
2. MT. ROBERT CT.
3. MT NENNES CT.
4. MT. MARCEY CT.
5. DIAMOND CT
6. JADE CT.