APPENDIX K

SEWER CAPACITY ANALYSIS AND WATER CAPACITY STUDY

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DRAFT TECHNICAL MEMORANDUM

861 S. Village Oaks Drive, Suite 100 • Covina, California • 91724
TEL: (626) 967-6202 FAX: (626) 331-7065 e-mail: jeffh@stetsonengineers.com

TO:	Brad Merrell	DATE:	Jan. 18, 2018
FROM:	Stetson Engineers Inc.	JOB NO:	2630-009
RE:	Water Capacity Study for Proposed Hotel (Huntington and Myrtle)		

The City of Monrovia (City) is currently reviewing the feasibility of providing water service to a proposed hotel project (Project) located at the southwest corner of the intersection of Myrtle Avenue and Huntington Drive in the City (Figure 1). The City requested that Stetson Engineers Inc. (Stetson) conduct a water capacity study to evaluate if the City's existing infrastructure is adequate to provide water to the Project. The evaluation included three aspects: (1) whether the existing water distribution system can provide adequate water service to the Project; (2) whether the Project will impose any impacts to the existing water system; and (3) to develop the required water system improvements if there are deficiencies that prevent the water system from providing adequate water service to the Project.

The existing hydraulic model of the City's water distribution system, previously prepared by Stetson in 2014 using H2O Map software (from Innovyze), was used for the study. The conditions in the existing model (i.e. water demands, etc.) were used as baseline conditions. The water capacity study is described below.

1. Evaluation Criteria

Water distribution system evaluation criteria usually come from America Water Works Associate (AWWA) standards, State Fire Code, and local fire department standards. In this study, the standards listed in Table 1 were used to evaluate the City's water system capacity. While there may be areas in the existing water distribution system where not all these standards are met, the evaluations in this study focused on the system's ability to provide the needed water service and the added, or incremental, impacts that would be imposed by the proposed Project.

Table 1 Evaluation Criteria of Water Distribution System

Parameter	Demand	Criteria
Minimum Pressure[1]	Peak Hour Demand (PHD) [4]	35 psi
Maximum Pressure[1]		120 psi
Pipe Velocity[2]		< 7 feet per second
Maximum Head Loss[2]		10 feet per 1,000 feet (Single pipe maximum loss of 1 foot)
Fire Flow[3]	Maximum Day Demand (MDD) [4]	Depending on building types/sizes; 1,750 gpm (2hrs) for the Project; Evaluated at residual pressure of 20 psi

Notes:
gpm = gallons per minute
psi = pounds per square inch

[1] City standard
[2] AWWA Standard
[3] The 2016 California Fire Code and the Los Angeles County Fire Department standards
[4] The PHD demand and MDD demand are usually derived by a multiplying a factor to the Average Day Demand (ADD)

2. Hydraulic Analysis

2.1. Existing Conditions Model

The City's water system gets its water supply from the Main San Gabriel Basin beneath the San Gabriel Valley. The existing H2OMap hydraulic model covers all the City's water facilities that are needed for hydraulic modeling, including 5 active wells, 12 reservoirs, 18 booster pumps, and about 114 miles of pipe, distributed in 7 pressure zones.

The Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD) in the existing conditions model were based on a 2013 annual water use analysis and were directly used in this study. The values of each of these water demands for each pressure zone are presented in Table 2.

Table 2 Water Demand of Existing System

Pressure Zone ID	Pressure Zone Name	ADD (gpm)	MDD (gpm)	PHD (gpm)	Percentage
Z1	Mountain	497	771	1,987	10%
Z2	Cloverleaf	2,975	4,609	11,900	60%
Z3	Ridgeside	1,034	1,602	4,135	21%
Z4	Norumbega	173	268	692	3.5%
Z5	Upper Cloverleaf	148	230	593	3.0%
Z6	Emerson	114	176	455	2.3%
Z7	Canyon	5	8	20	0.1%
Total		4,945	7,664	19,781	100%

Note: MDD = 1.55*ADD; PHD = 4.0*ADD

2.2. Project Conditions Model

As shown in Figure 1, attached, the Project is located within Zone 1 (lower pressure zone) but very close to Zone 2 (higher pressure zone). Based on communications with City Engineer Brad Merrell the water capacity study assumes the Project will connect to Zone 2.

Based upon review of the Conceptual Grading and Utility Plans (R.A. Smith National, September 14, 2017) and the Parcel Map (R.A. Smith National, September 15, 2017) for the Project, a new Project model node located at a proposed new fire hydrant location was added to the model to represent both the Project's water demand location and the fire flow demand location for the Project (Figure 2). The node elevation was determined by checking Google Earth elevations and the nearby model node elevations.

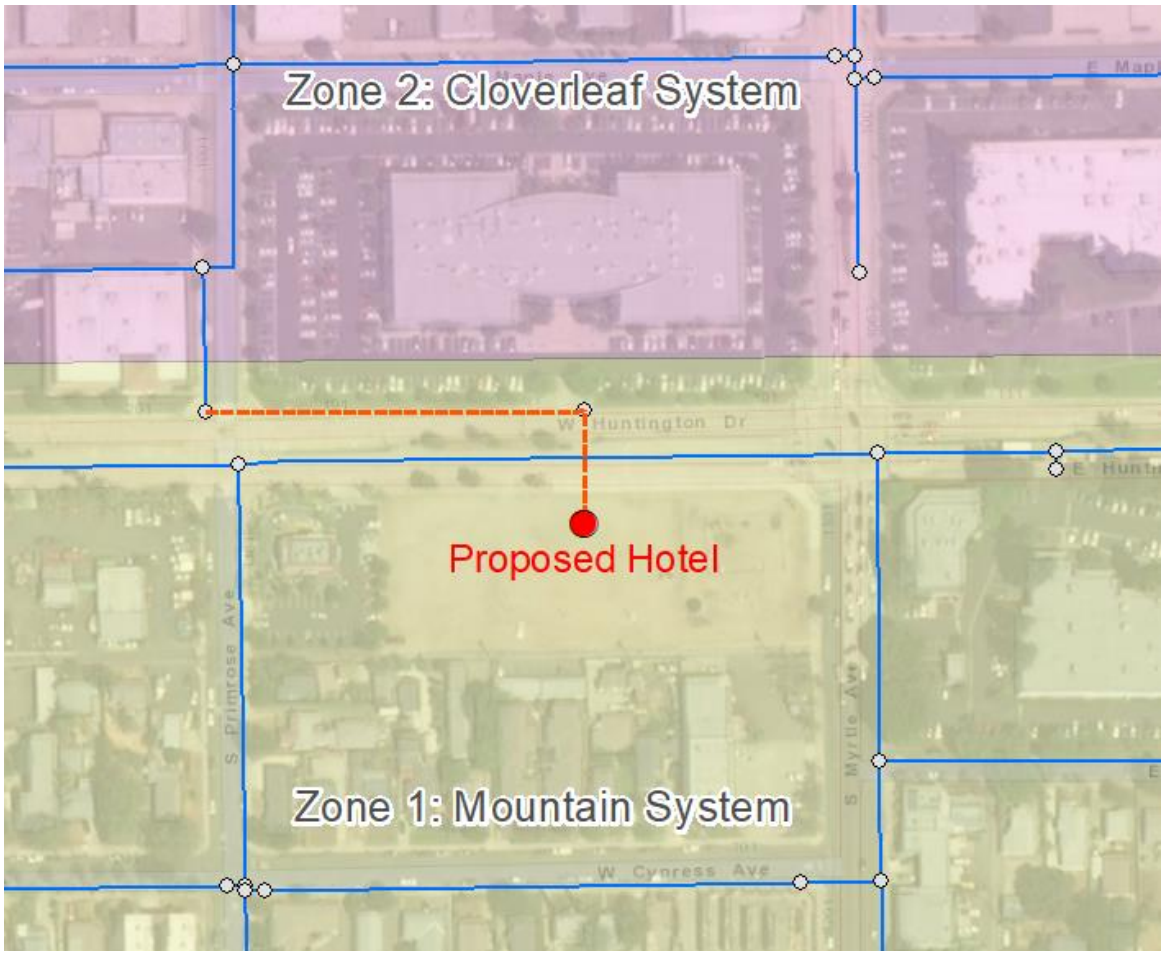


Figure 2 Project conditions model configuration

Examination of the Project model node and the existing pipe network suggested two convenient locations where the Project can be connected to Zone 2, one near the northwest corner of the block, and the other near the northeast corner of the block. The existing model node at the northwest corner of the intersection of West Huntington Drive and South Primrose Avenue was chosen as the Project connection point to the City's water system.

A proposed pipe alignment was then digitized to connect the Project node to the selected Zone 2 node, as shown by the red dashed line in Figure 2, above. The total pipe length of this connection is about 520 feet. An email from Sam Jacoby, dated Oct 17, 2017 7:11 PM, suggested that a 4-inch diameter pipe for the service lateral and a 6-inch diameter pipe for the fire lateral would be needed for the Project. A 6-inch diameter pipe was modeled to connect the Project to the existing 6-inch diameter pipe at the point of connection selected in Zone 2. It was assumed the pipe material is PVC, with a "C factor" of 140 (brand new PVC pipe is smoother and would have a C factor of 150).

Per the same Email from Sam Jacoby, dated Oct 17, 2017 7:11 PM, the Project has a domestic demand of 50 gallon per day per room and a total of 109 rooms. This corresponds to an ADD demand of 3.78 gallons per minute (gpm). Accordingly, the MDD and PHD demands created by the Project were estimated to be 5.86 gpm and 15.12 gpm, based on the conversion factors of 1.55 and 4.0. These demands were added to the Project node. The Project conditions system total water demand was the sum of the existing water demand in the area and the additional water demand created by the Project. Under the Project conditions, the water demand in Zone 2 was increased from 4,609 gpm to 4,615 gpm for MDD, and from 11,900 gpm to 11,915 gpm for PHD. Accordingly, the system total water demand was increased from 7,664 gpm to 7,670 gpm for MDD, and the from 19,781 gpm to 19,796 gpm for PHD.

Another email from Sam Jacoby (dated October 16, 2017 5:06 PM) indicated that, based on the building's 1st floor square footage of 14,000 square feet and an assumed construction type III-A, per current CFC, the required fire flow for the Project is 1,750 gpm for 2 hours at a residual pressure of 20 psi.

2.3. Model Results

A total of 4 model runs were performed: (1) existing conditions with PHD demand; (2) existing conditions with MDD demand plus Fire Flow; (3) Project conditions with PHD demand; and (4) Project conditions with MDD demand plus Fire Flow.

The Project conditions model runs show that (1) at PHD conditions, the Project will get the design flow rate of 15.12 gpm with a residual node pressure of 95 psi, well within the normal pressure range of 35 psi – 120 psi; and (2) at MDD plus Fire Flow conditions, the Project will get a fire flow rate of 2,113 gpm at a residual pressure of 20 psi.

The Project conditions model results were then compared with existing conditions model results for node pressure, pipe flow velocity, pipe head loss, and available fire flow (Figures 3-6, attached). The comparison shows that (1) the maximum pressure drop caused by the Project to the existing system is only 0.03 psi; (2) the maximum pipe

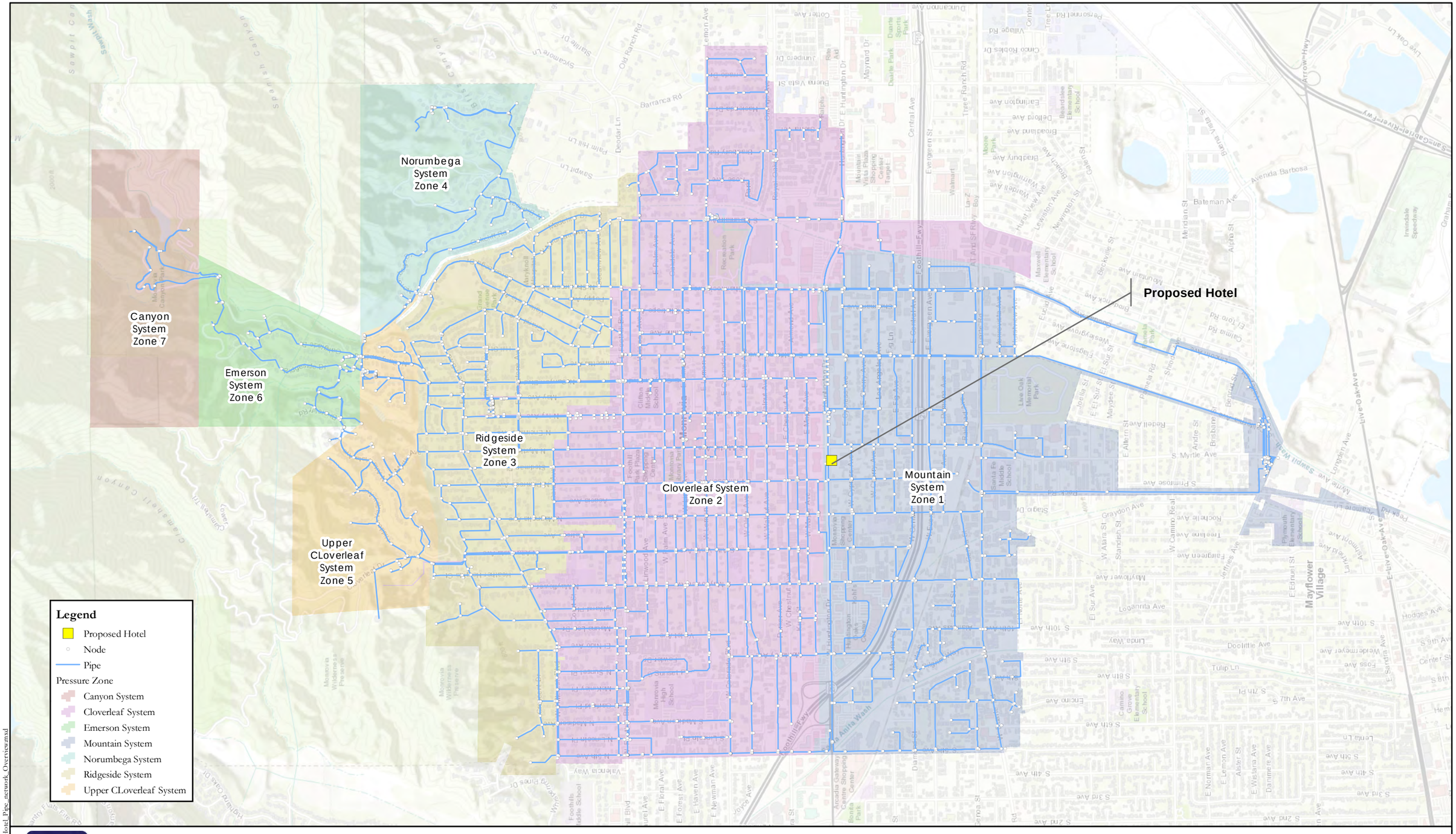
flow velocity increase caused by the Project is only 0.02 fps; (3) the maximum head loss increase caused by the Project is 1.03 ft per 1000 feet; and (4) the maximum reduction in available fire flow caused by the Project is 0.13 gpm.

The exception to the above summary is that the velocity in the 6-inch diameter pipe that was added to the model to connect the Project to Zone 2 and the existing 6-inch diameter pipe in Primrose Avenue between Huntington Drive and Maple Street the modeled pipe was connected to had a velocity of almost 25 feet per second at MDD plus Fire Flow conditions.

3. Conclusion

The modeling results indicate the City's water system, when the Project is connected to high pressure Zone 2, will have adequate capacity to provide service water to the Project and meet the fire flow requirement of the Project. The Project is not anticipated to cause any noticeable impact to the existing system due to its small water demand.

It is recommended that the Project connect to a minimum 8-inch diameter pipe in Zone 2 and that the size of pipe to connect the Project to Zone 2 be adequately sized for required flows. There is no need to develop water system improvements for the impacts to the water system from the Project.



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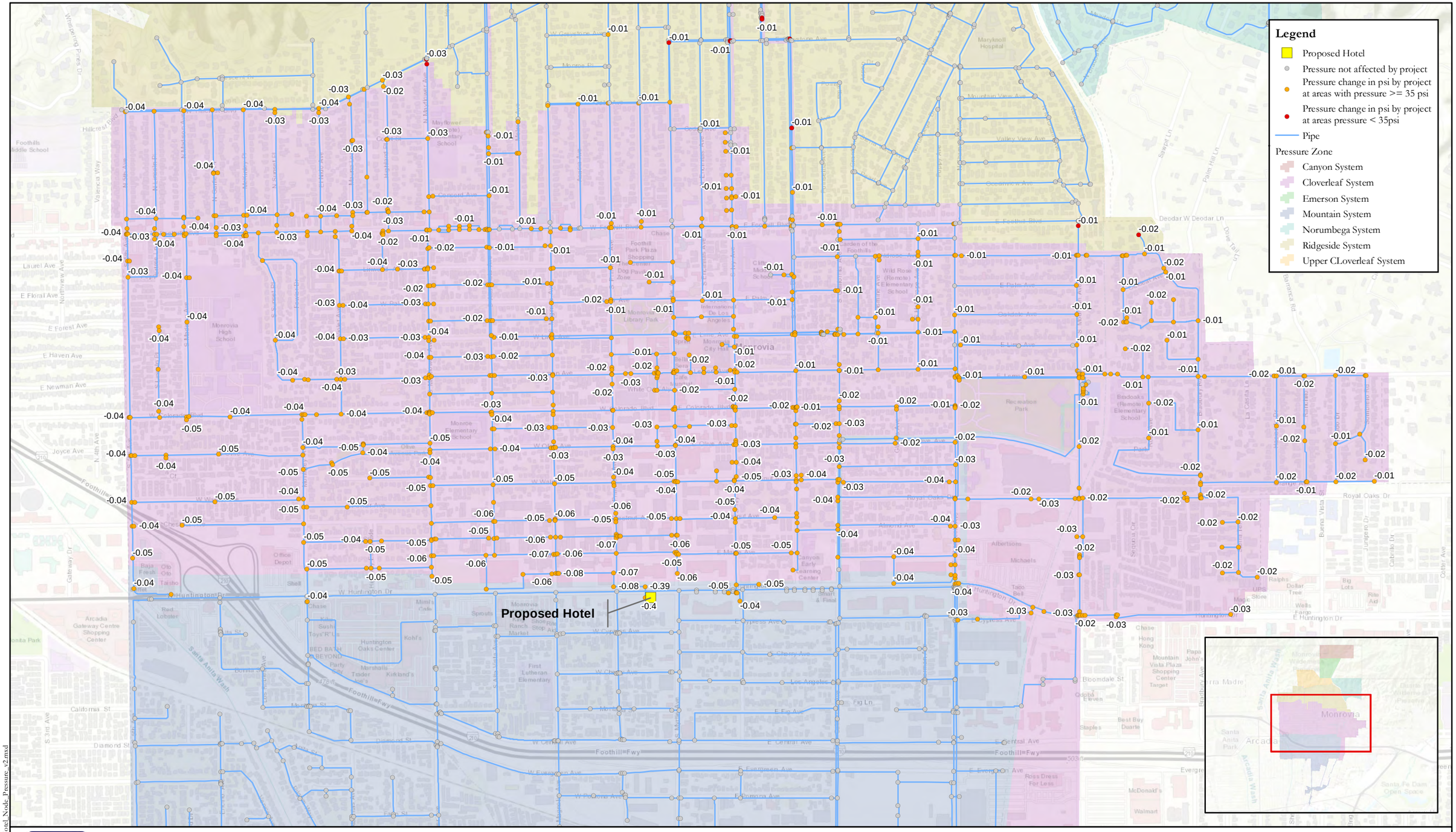
STETSON ENGINEERS INC.

DRAFT

PROPOSED HOTEL
(HUNTINGTON AND MYRTLE)
PROJECT LOCATION

0 1,000 2,000 Feet

FIGURE 3



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PROJECT IMPACT
TO EXISTING WATER DELIVERY SYSTEM AT MDD DEMAND
NODE PRESSURE

STETSON ENGINEERS INC.

N

0 375 750 1,125 Feet

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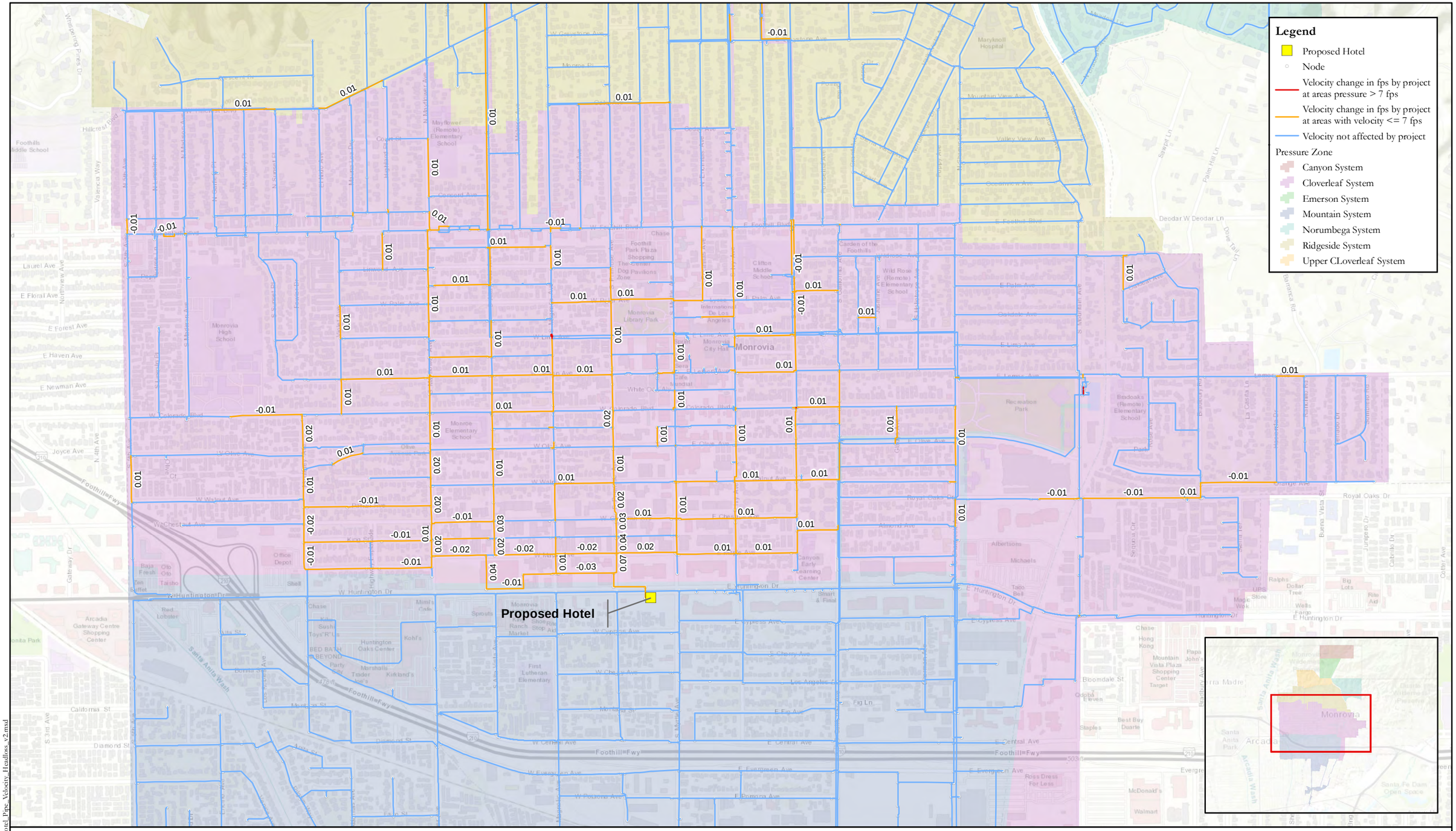

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PROJECT IMPACT
TO EXISTING WATER DELIVERY SYSTEM AT MDD DEMAND
PIPE VELOCITY

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STETSON ENGINEERS INC.

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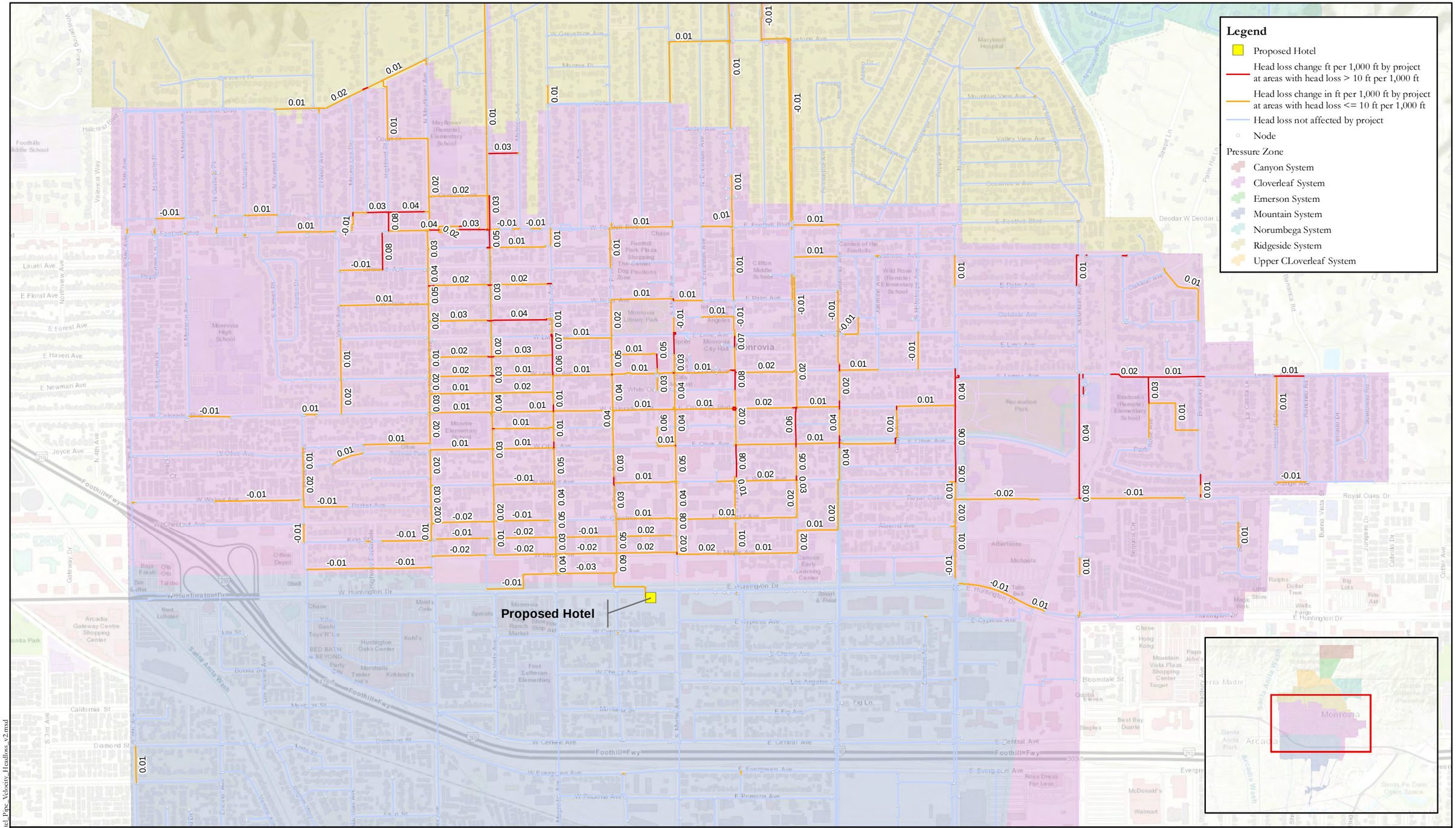

DRAFT

PROJECT IMPACT
TO EXISTING WATER DELIVERY SYSTEM AT MDD DEMAND
PIPE HEAD LOSS

STETSON ENGINEERS INC.

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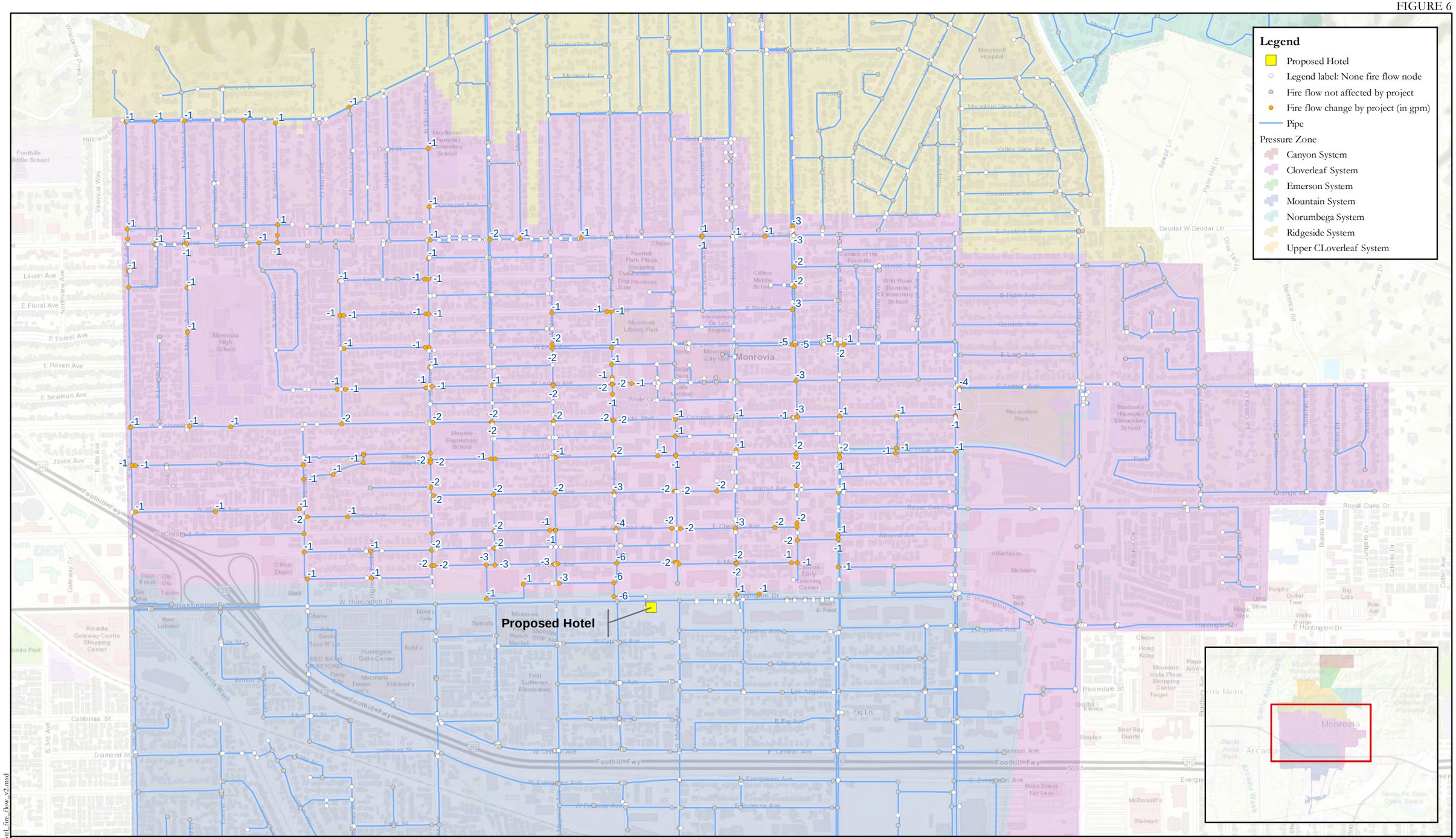

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STETSON ENGINEERS INC.

DRAFT

PROJECT IMPACT
TO EXISTING WATER DELIVERY SYSTEM AT MDD DEMAND
FIRE FLOW

N

0 375 750 1,125 Feet

DAVID EVANS
AND ASSOCIATES INC.

MEMORANDUM

DATE: January 8, 2018

TO: Brad Merrell, PE
City Engineer
Department of Pubhlic Works
City of Monrovia

FROM: David Stuetzel

SUBJECT: Sewer Capcity Analysis – Monrovia Hotel

PROJECT: Task order 03 – On Call Contract
150063.0000/MONR000-0001

CC: Alex Tachiki, City of Monrovia
Rob Bathke, DEA

As requested by the City of Monrovia, David Evans and Associates is tasked to evaluate the feasibility and potential impact of connecting the proposed Monrovia Hotel Project located at the southwest corner of East Huntington Drive and South Myrtle Avenue to the City's existing sanitary sewer collection system. Appendix A shows the proposed points of connect to the City sewer system. The proposed project is a 5-story, 109 room hotel with no defined retail space. The contributing sewer flows from the proposed development will connect to the existing 8-inch City sewer in Myrtle Avenue south of Huntington Drive through a new 6-inch sewer lateral.

The development will abandon the existing property sewer laterals connecting in the alley south of the property for lots 16 through 24 of Block 11 of M.R. 10/5. The existing laterals are connected to the City's sewer pipeline segment 153-029 to 153-030. The sewer flow removed from the City sewer system was calculated at 0.0009 mgd.

Appendix B shows the impacted downstream City sewer.

Appendix C lists the wastewater flow factors for various land use categories published by the Los Angeles County Sanitation Districts (LACSD). Table 1 summarizes the estimated average wastewater flows for the proposed development based on the proposed land use categories and respective LACSD Unit factors.

Table 1 – Estimated Wastewater Flows

POC Location	Land Use	Unit Factor (gdp/DU)	Number of Units	Floor Area	Average Flow (gpd)	Peaking Factor*	Peak Flow (mgd)
To 8" City sewer in Myrtle Ave	Hotel	125	109	0	13,625	1.61	0.0219

* Developed based on the flow measurements conducted as part of the 2015 Sewer Master Plan

The previously developed hydraulic model was used to evaluate the hydraulic capacity of the downstream City sewers. The variations of flow were captured in the hydraulic model using diurnal curve method with a peaking

DATE: January 8, 2018 **FROM:** David Stuetzel

TO: Brad Merrell, PE **SUBJECT:** Sewer Capcity Analysis – Monrovia Hotel

Factor of 1.61. The average flows in Table 1 and the previously developed diurnal curve were input at the point of connection (City pipe segment 143-017 to 153-006) for the proposed Hotel Development in the hydraulic model and the model was run for both existing and proposed flow conditions. Appendix D shows the model results. The following summarizes the major findings of the analysis:

- The City sewers receiving sewer flow from the proposed Hotel Development range in size from 8–inch to 24-inch in diameter. According to LACSD, for sewer mainlines less than 15-inch in diameter, the capacity if considered full when the when the ratio of depth of flow (d) over the pipe diameter (D) is equal to 0.5. Expressed as d/D=0.5. For 15-inch and larger sewers, the full capacity is set at a d/D of 0.75 by LACSD.
- Under the existing flow conditions, the existing d/D was predicted to be the highest at about 0.61 with a predicted flow of 0.288 mgd in an existing 8-inch sewer for pipe segment 173-029 to 172-010 located along Duarte Road east of Peck Road.
- Under the proposed conditions, overall the model shows little impact on the d/D ratios in all the impacted downstream sewers. The d/D ratio for pipe segment 173-029 to 172-010 increases the d/D ratio to 0.64 with a predicted peak flow of 0.310 mgd.

Based on these findings, it is recommended that the City monitor the sewer pipe segment 173-029 to 172-010, which is located along Duarte Road east of Peck Road. This sewer pipe segment has been calculated to flow at a flow ratio of 0.64 with the calculated peak flow, which exceeds the LACSD guidelines of 0.50 flow ratio for 8-inch pipelines. The remaining sewer pipelines in the study have sufficient capacity to convey the additional wastewater flows from the proposed project at the intersection of Huntington Drive and Myrtle Avenue.

Attachments:

Appendix A – Proposed Project Location Exhibit

Appendix B – Impacted City Sewer Locations

Appendix C – LACSD Flow Factors

Appendix D – Capacity Analysis Results

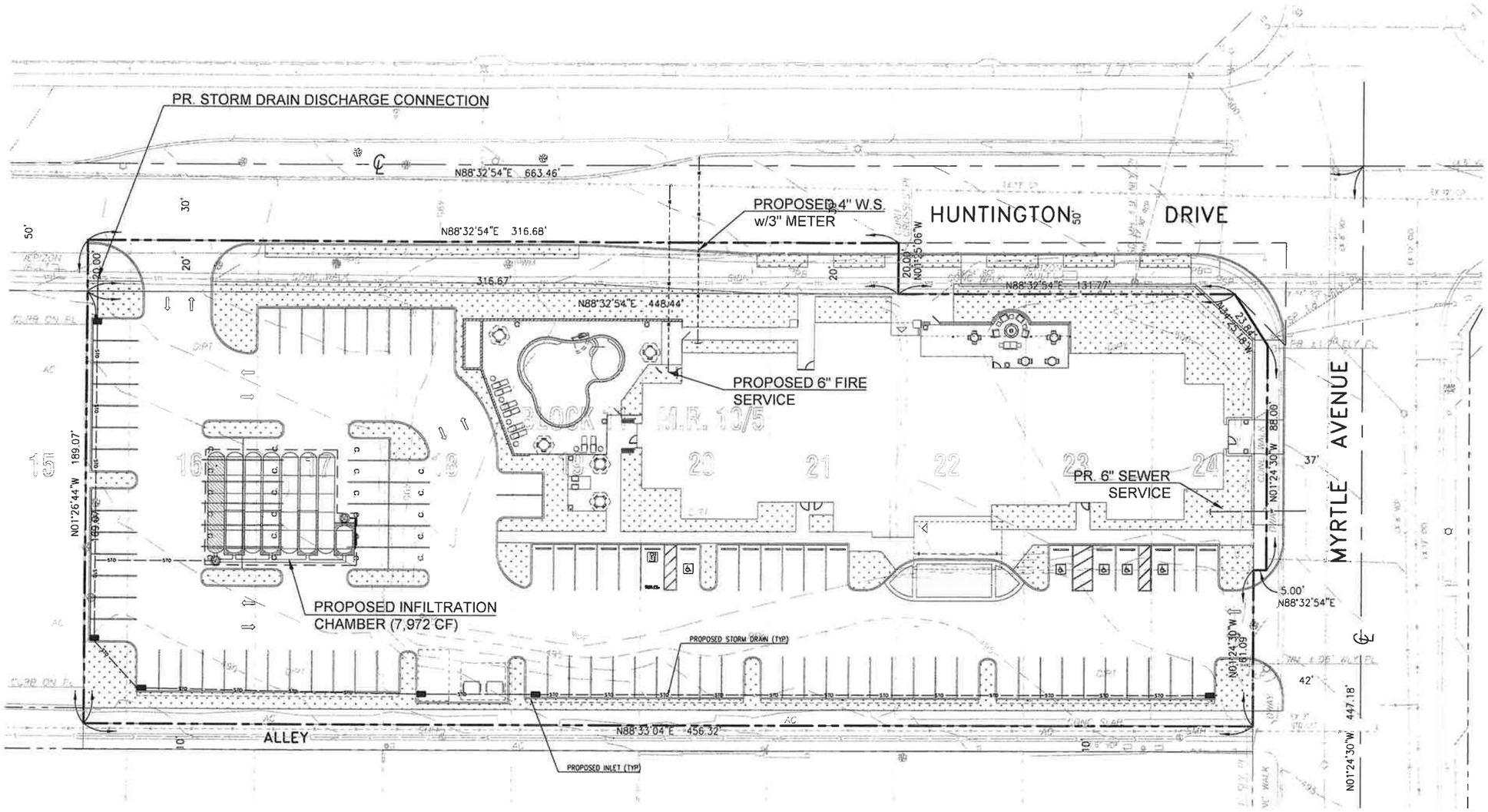
Attachments/Enclosures: List Items

File Path: Document1

Appendix A

Proposed Project Location and

Points of Connection



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THE LOCATIONS OF EXISTING UTILITY INSTALLATIONS AS SHOWN ON THIS PLAN ARE APPROXIMATE. THERE MAY BE OTHER UNDERGROUND UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN.

WDID NO.: PENDING

811 Know what's below. Call before you dig.

tharaldson hospitality

DATE	DESCRIPTION

R.A. Smith National
Beyond Surveying and Engineering
www.rasmithnational.com

MONROVIA HOTEL
E HUNTINGTON DRIVE & S MYRTLE AVENUE

CONCEPTUAL UTILITY PLAN

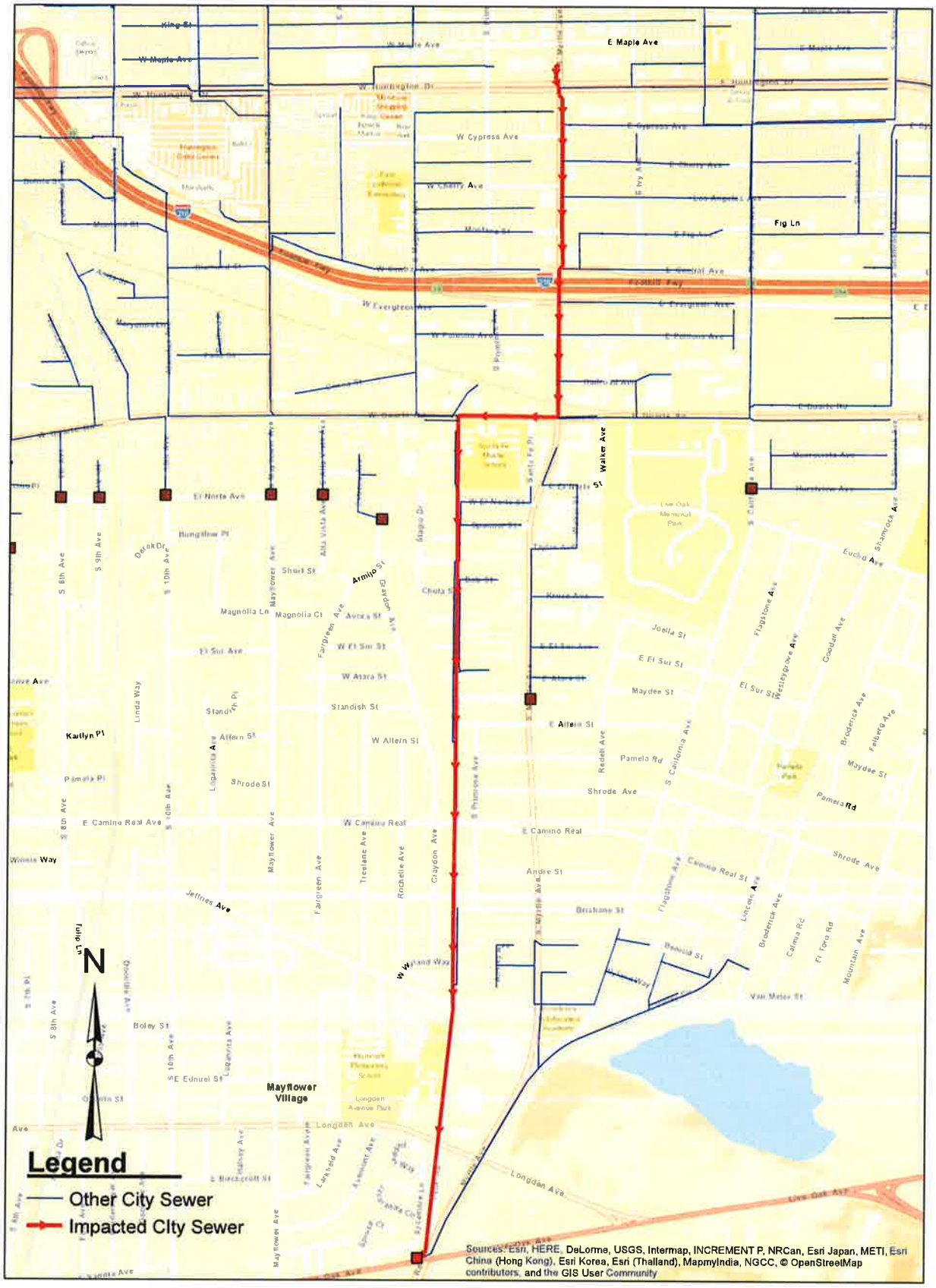
DATE: 08/14/17
SCALE: ########
JOB NO. 3160228
PROJECT MANAGER: SAMUEL JACOBY
DESIGNED BY: EAR
CHECKED BY: SJJ

SHEET NUMBER
2 OF 4

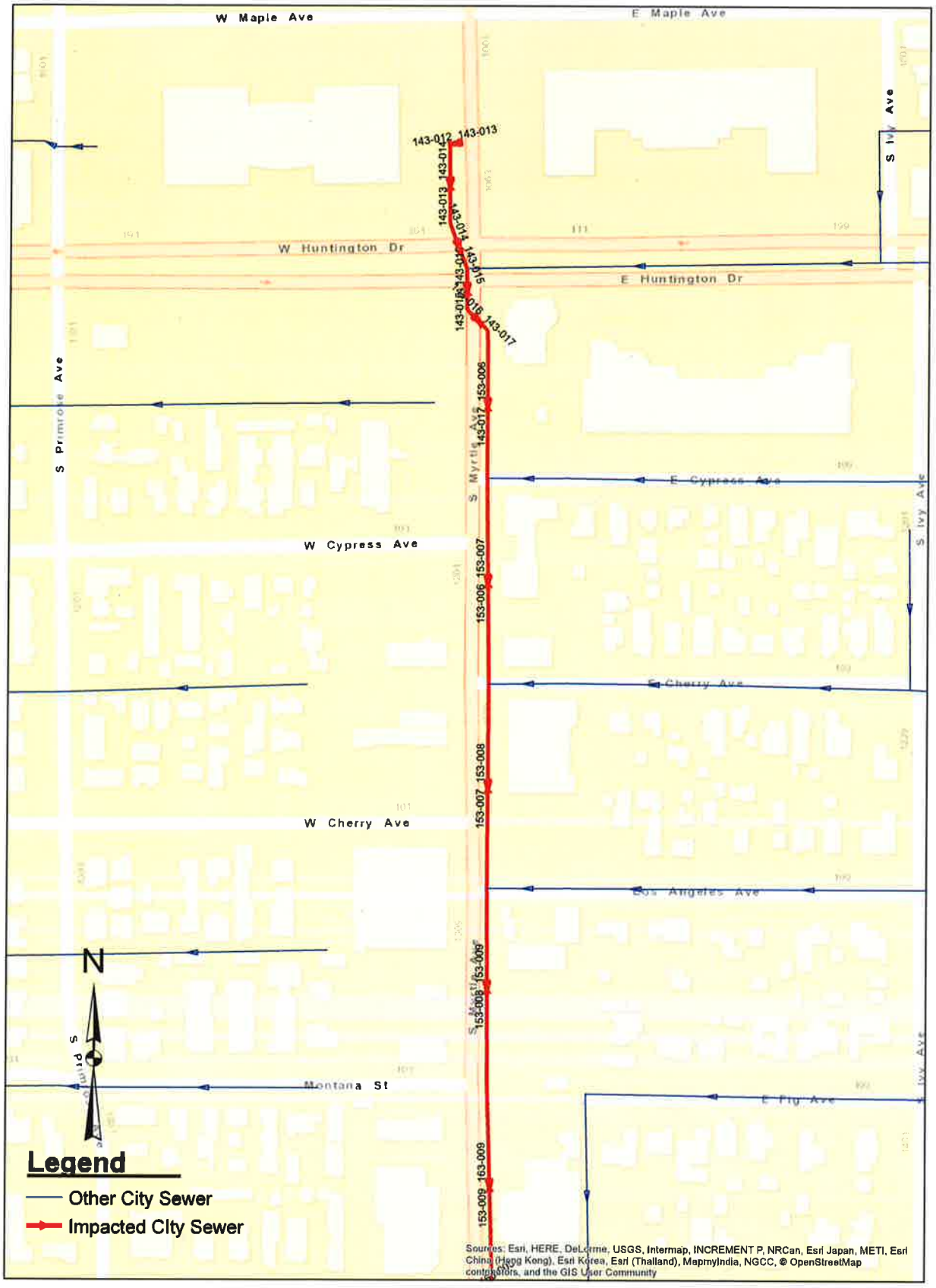
Appendix B

Impacted City Sewer Locations

Impacted City Sewers Monrovia Hotel



Impacted City Sewers



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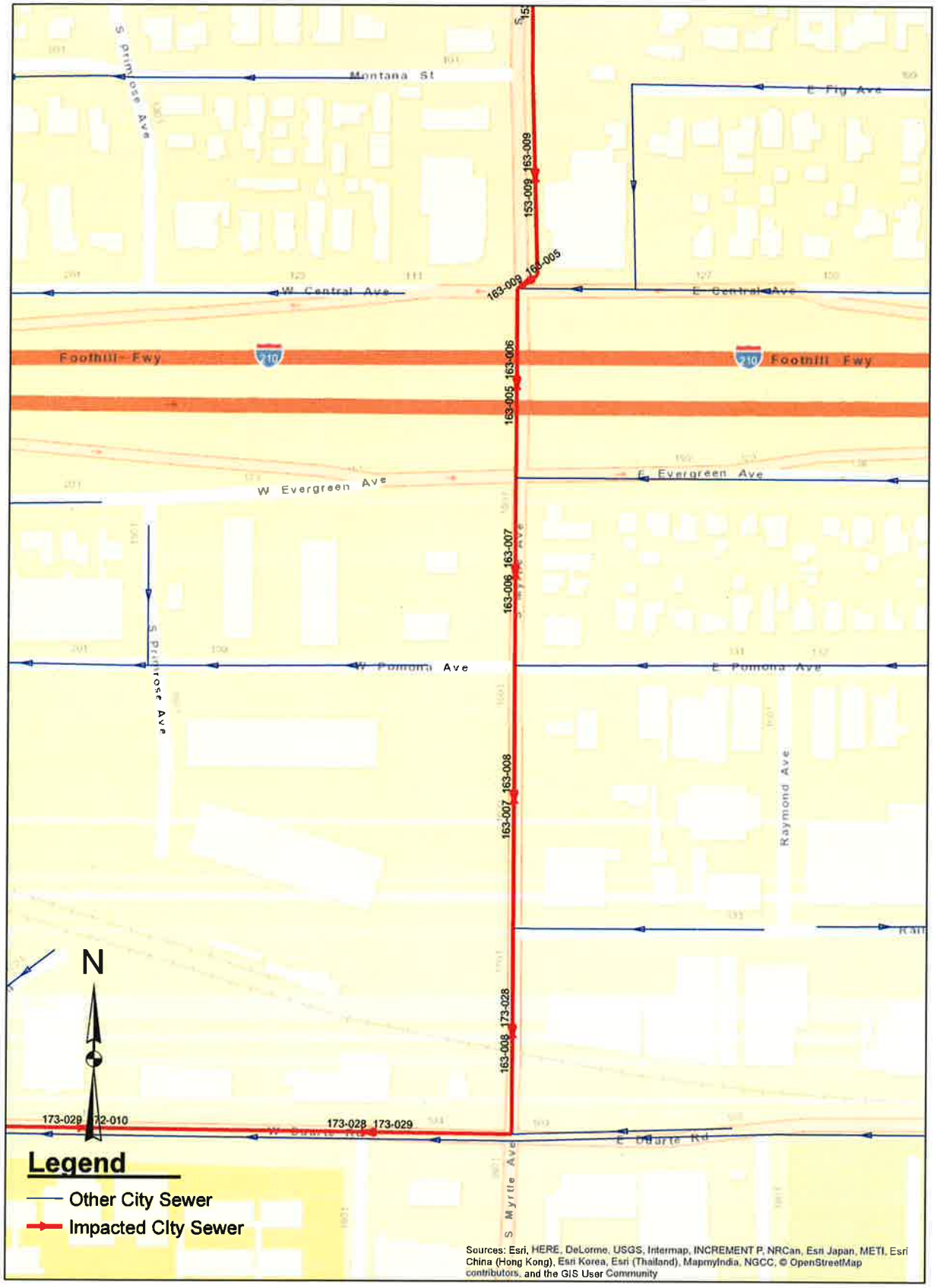

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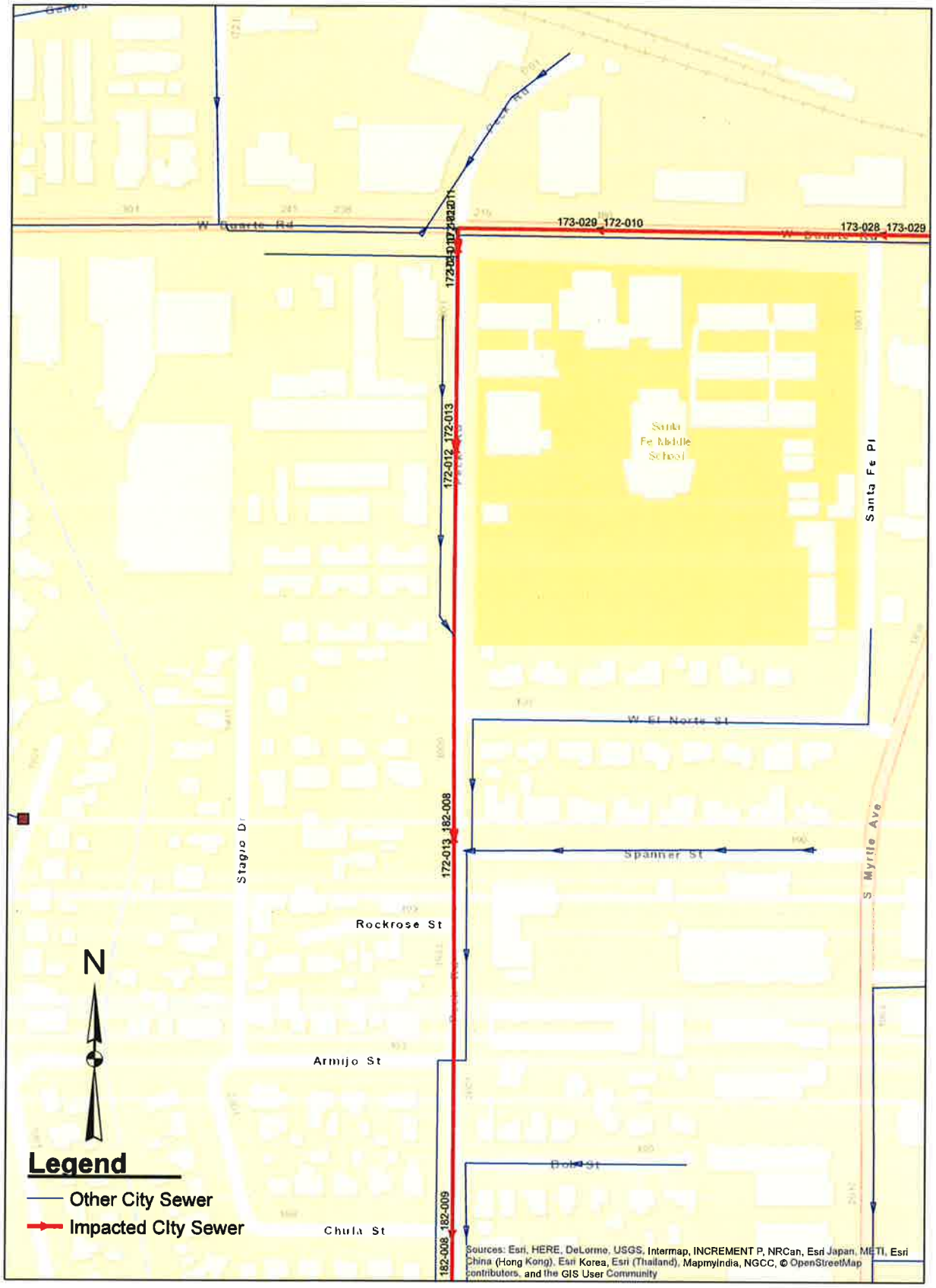

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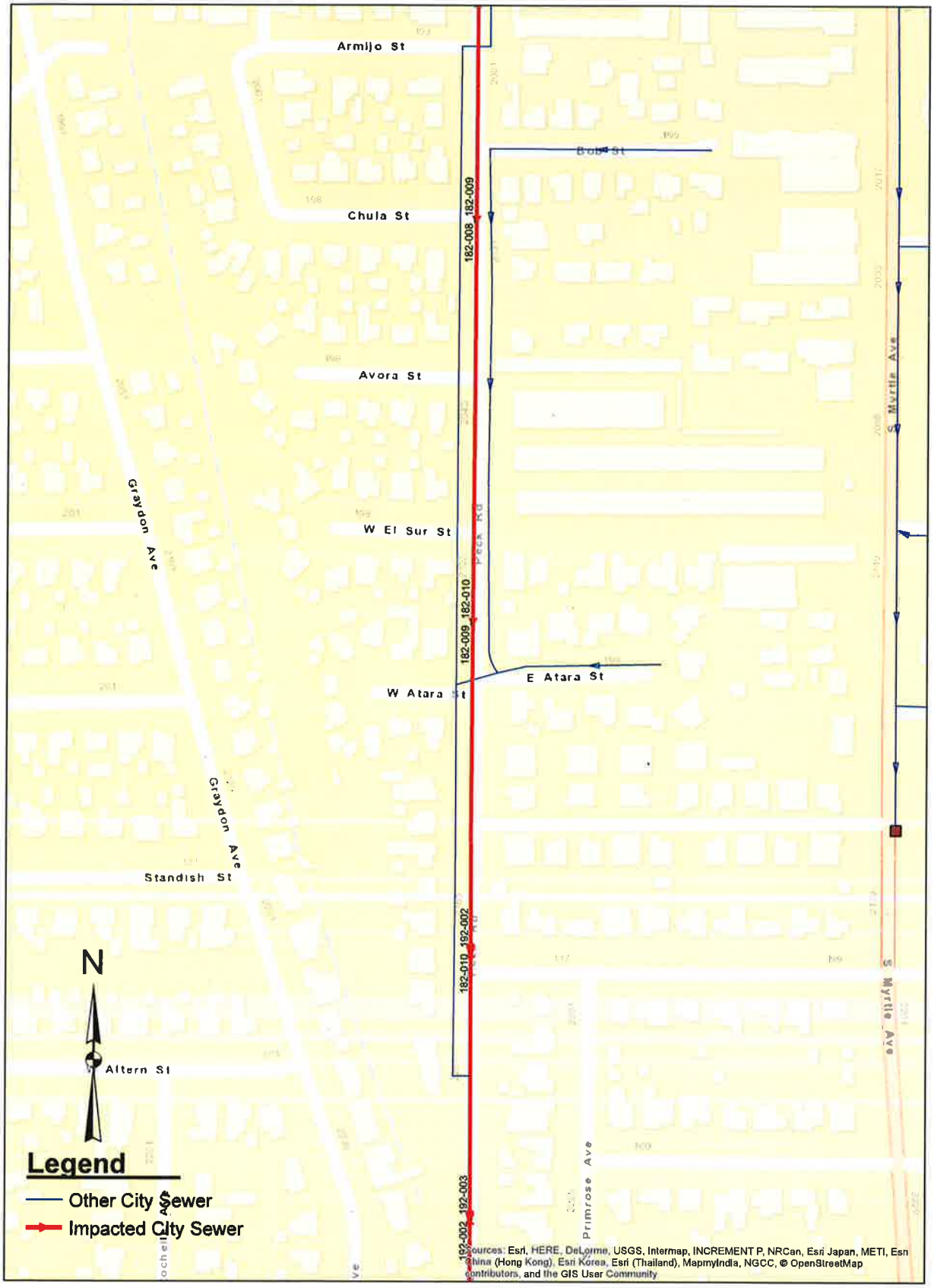

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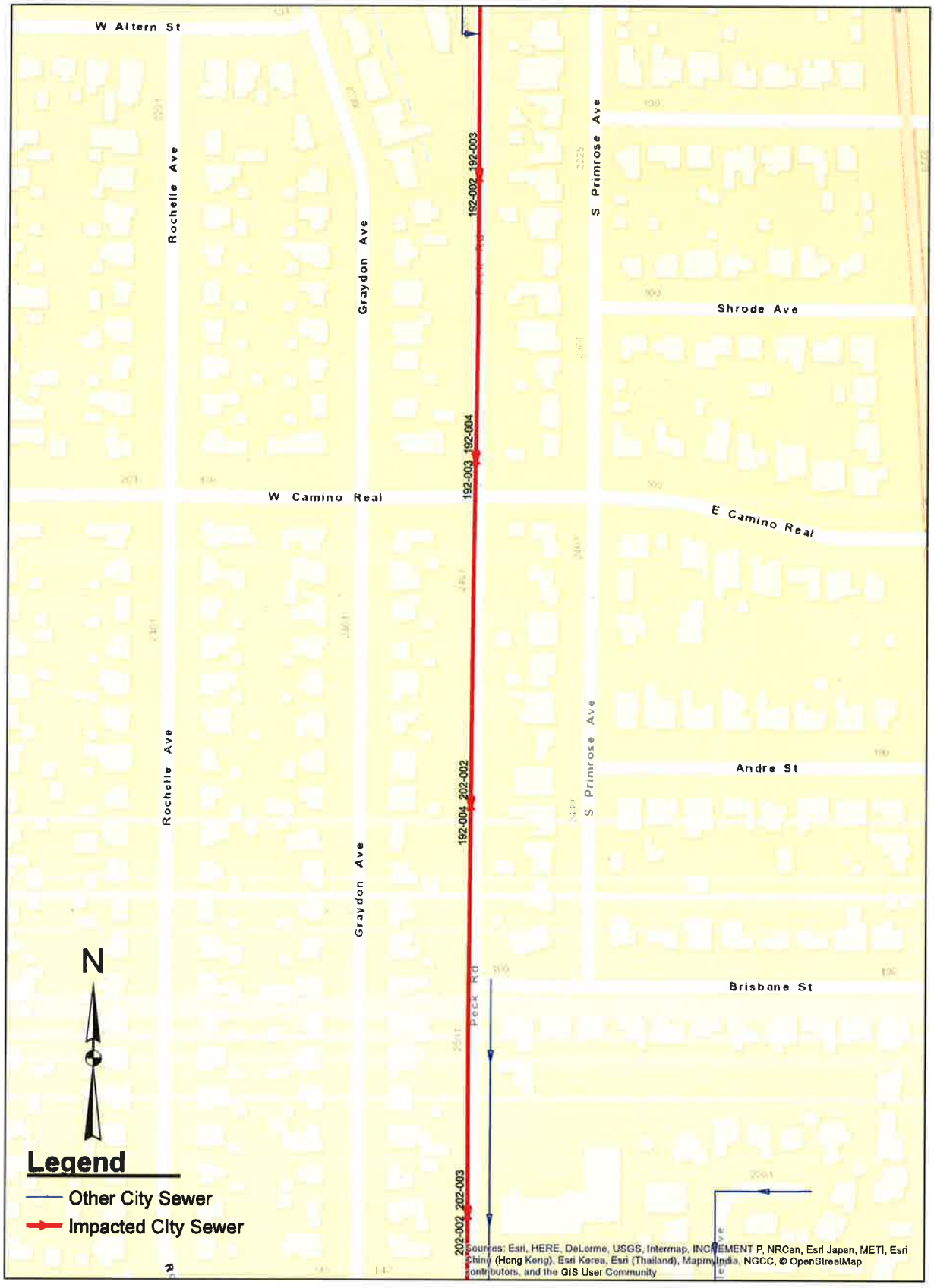

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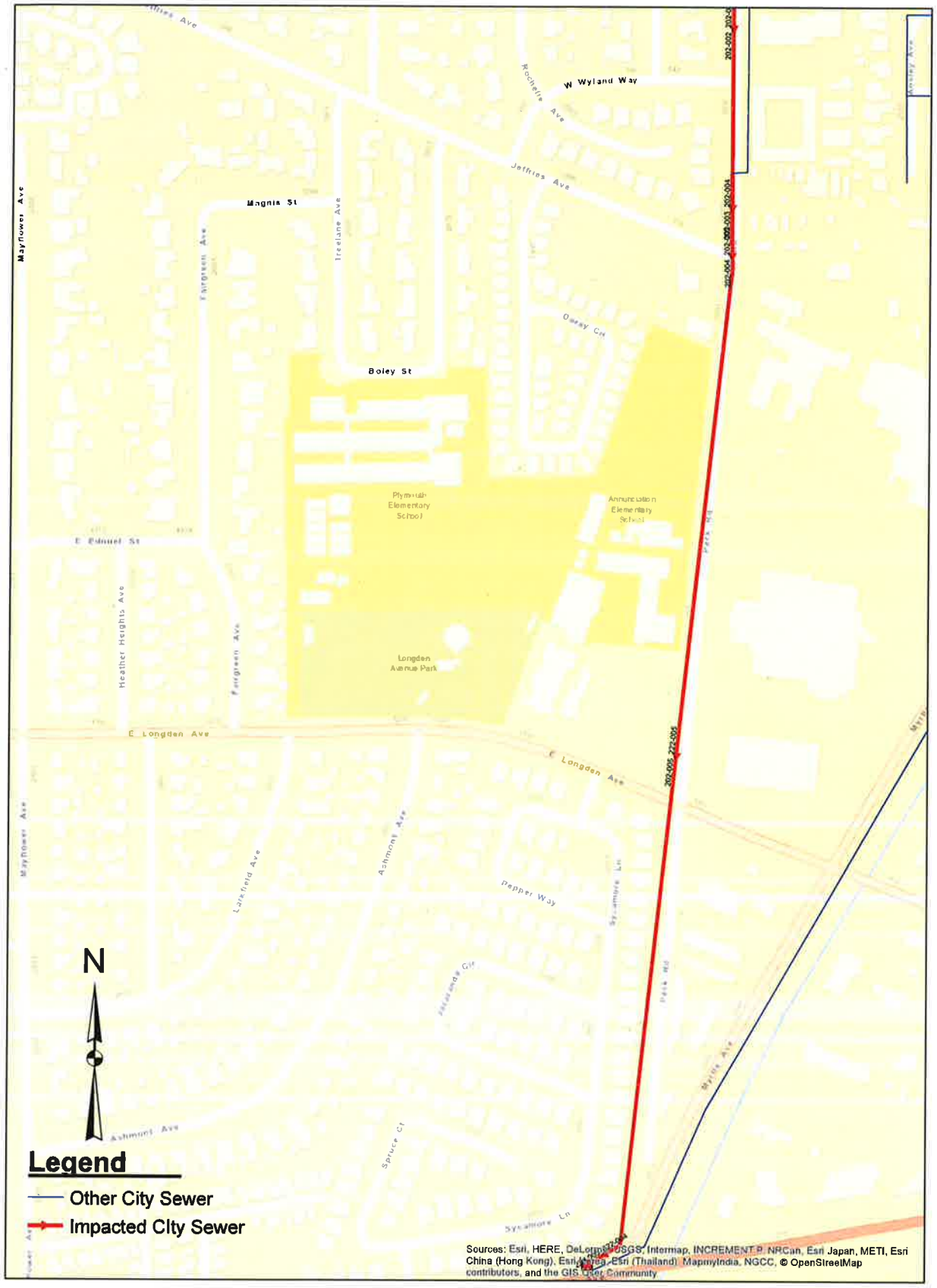

Appendix C

LACSD Unit Factors by

Occupancies and Land Use Factors

Estimated Average Daily Sewage Flows for Various Occupancies

Occupancy	Abbreviation	*Average daily flow	
Apartment Buildings:			
Bachelor or Single dwelling units	Apt	100	gal/D.U.
1 bedroom dwelling units	Apt	150	gal/D.U.
2 bedroom dwelling units	Apt	200	gal/D.U.
3 bedroom or more dwelling units	Apt	250	gal/D.U.
Auditoriums, churches, etc.	Aud	5	gal/seat
Automobile parking	P	25	gal/1000 sq ft gross floor area
Bars, cocktails lounges, etc.	Bar	20	gal/seat
Commercial Shops & Stores	CS	100	gal/1000 sq ft gross floor area
Hospitals (surgical)	HS	500	gal/bed
Hospitals (convalescent)	HC	85	gal/bed
Hotels	H	150	gal/room
Medical Buildings	MB	300	gal/1000 sq ft gross floor area
Motels	M	150	gal/unit
Office Buildings	Off	200	gal/1000 sq ft gross floor area
Restaurants, cafeterias, etc.	R	50	gal/seat
Schools:			
Elementary or Jr. High	S	10	gal/student
High Schools	HS	15	gal/student
Universities or Colleges	U	20	gal/student
College Dormitories	CD	85	gal/student

*Multiply the average daily flow by 2.5 to obtain the peak flow

Zoning Coefficients

Zone	Coefficient (cfs/Acre)
Agriculture	**0.001**
Residential+:	
R-1	**0.004**
R-2	**0.008**
R-3	**0.012**
R-4	**0.016***
Commercial:	
C-1 through C-4	**0.015***
Heavy Industrial:	
M1 through M-4	**0.021***

***Individual building, commercial or industrial plant capacities shall be the determining factor when they exceed the coefficients shown**

+ Use 0.001 (cfs/unit) for condominiums only

TABLE 1

LOADINGS FOR EACH CLASS OF LAND USE

DESCRIPTION	UNIT OF MEASURE	FLOW (Gallons Per Day)	COD (Pounds Per Day)	SUSPENDED SOLIDS (Pounds Per Day)
RESIDENTIAL				
Single Family Home	Parcel	260	1.22	0.59
Duplex	Parcel	312	1.46	0.70
Triplex	Parcel	468	2.19	1.05
Fourplex	Parcel	624	2.92	1.40
Condominiums	Parcel	195	0.92	0.44
Single Family Home (reduced rate)	Parcel	156	0.73	0.35
Five Units or More	No. of Dwlg. Units	156	0.73	0.35
Mobile Home Parks	No. of Spaces	156	0.73	0.35
COMMERCIAL				
Hotel/Motel/Rooming House	Room	125	0.54	0.28
Store	1000 ft^2	100	0.43	0.23
Supermarket	1000 ft^2	150	2.00	1.00
Shopping Center	1000 ft^2	325	3.00	1.17
Regional Mall	1000 ft^2	150	2.10	0.77
Office Building	1000 ft^2	200	0.86	0.45
Professional Building	1000 ft^2	300	1.29	0.68
Restaurant	1000 ft^2	1,000	16.68	5.00
Indoor Theatre	1000 ft^2	125	0.54	0.28
Car Wash				
Tunnel - No Recycling	1000 ft^2	3,700	15.86	8.33
Tunnel - Recycling	1000 ft^2	2,700	11.74	6.16
Wand	1000 ft^2	700	3.00	1.58
Financial Institution	1000 ft^2	100	0.43	0.23
Service Shop	1000 ft^2	100	0.43	0.23
Animal Kennels	1000 ft^2	100	0.43	0.23
Service Station	1000 ft^2	100	0.43	0.23
Auto Sales/Repair	1000 ft^2	100	0.43	0.23
Wholesale Outlet	1000 ft^2	100	0.43	0.23
Nursery/Greenhouse	1000 ft^2	25	0.11	0.06
Manufacturing	1000 ft^2	200	1.86	0.70
Dry Manufacturing	1000 ft^2	25	0.23	0.09
Lumber Yard	1000 ft^2	25	0.23	0.09
Warehousing	1000 ft^2	25	0.23	0.09
Open Storage	1000 ft^2	25	0.23	0.09
Drive-in Theatre	1000 ft^2	20	0.09	0.05

TABLE 1
(continued)
LOADINGS FOR EACH CLASS OF LAND USE

DESCRIPTION	UNIT OF MEASURE	FLOW (Gallons Per Day)	COD (Pounds Per Day)	SUSPENDED SOLIDS (Pounds Per Day)
COMMERCIAL				
Night Club	1000 ft^2	350	1.50	0.79
Bowling/Skating	1000 ft^2	150	1.76	0.55
Club	1000 ft^2	125	0.54	0.27
Auditorium, Amusement	1000 ft^2	350	1.50	0.79
Golf Course, Camp, and Park (Structures and Improvements	1000 ft^2	100	0.43	0.23
Recreational Vehicle Park	No. of Spaces	55	0.34	0.14
Convalescent Home	Bed	125	0.54	0.28
Laundry	1000 ft^2	3,825	16.40	8.61
Mortuary/Cemetery	1000 ft^2	100	1.33	0.67
Health Spa, Gymnasium				
With Showers	1000 ft^2	600	2.58	1.35
Without Showers	1000 ft^2	300	1.29	0.68
Convention Center, Fairground, Racetrack, Sports Stadium/Arena	Average Daily Attendance	10	0.04	0.02
INSTITUTIONAL				
College/University	Student	20	0.09	0.05
Private School	1000 ft^2	200	0.86	0.45
Church	1000 ft^2	50	0.21	0.11

Appendix D

Capacity Analysis Results

Pipe ID	U/S MH ID	D/S MH ID	Size (inch)	Length (ft)	Slope (ft/ft)	Existing Peak Flow in Model (mgd)	Existing Maximum d/D	Proposed Peak Flow in Model (mgd)	Proposed Maximum d/D	LACSD d/D Criteria	Remark
143-012_143-013	143-012	143-013	8	18	0.0911	0.004	0.03	0.004	0.03	0.5	PASS
143-013_143-014	143-013	143-014	6	126	0.0095	0.008	0.11	0.008	0.11	0.5	PASS
143-014_143-015	143-014	143-015	6	77	0.0099	0.009	0.12	0.009	0.12	0.5	PASS
143-015_143-016	143-015	143-016	8	66	0.0212	0.045	0.15	0.045	0.15	0.5	PASS
143-016_143-017	143-016	143-017	8	47	0.0968	0.046	0.10	0.046	0.10	0.5	PASS
143-017_153-006	143-017	153-006	8	236	0.0204	0.048	0.15	0.069	0.18	0.5	PASS
153-006_153-007	153-006	153-007	8	329	0.0203	0.068	0.18	0.089	0.21	0.5	PASS
153-007_153-008	153-007	153-008	8	327	0.0225	0.099	0.21	0.121	0.23	0.5	PASS
153-008_153-009	153-008	153-009	8	314	0.0217	0.125	0.24	0.147	0.26	0.5	PASS
153-009_163-009	153-009	163-009	8	319	0.0149	0.127	0.26	0.149	0.29	0.5	PASS
163-009_163-005	163-009	163-005	8	38	0.0184	0.128	0.25	0.150	0.27	0.5	PASS
163-005_163-006	163-005	163-006	8	302	0.0223	0.160	0.27	0.182	0.29	0.5	PASS
163-006_163-007	163-006	163-007	8	300	0.022	0.181	0.29	0.203	0.30	0.5	PASS
163-007_163-008	163-007	163-008	8	420	0.0227	0.250	0.34	0.271	0.35	0.5	PASS
163-008_173-028	163-008	173-028	8	327	0.0175	0.275	0.38	0.297	0.40	0.5	PASS
173-028_173-029	173-028	173-029	8	454	0.008	0.281	0.48	0.302	0.50	0.5	PASS
173-029_172-010	173-029	172-010	8	450	0.0039	0.288	0.61	0.310	0.64	0.5	MONITOR
172-010_172-011	172-010	172-011	24	11	0.0091	4.329	0.41	4.350	0.41	0.75	PASS
172-011_172-012	172-011	172-012	24	35	0.0043	6.320	0.65	6.341	0.65	0.75	PASS
172-012_172-013	172-012	172-013	24	605	0.0045	6.330	0.64	6.351	0.64	0.75	PASS
172-013_182-008	172-013	182-008	24	639	0.0168	6.358	0.43	6.379	0.43	0.75	PASS
182-008_182-009	182-008	182-009	24	632	0.0068	6.363	0.56	6.383	0.56	0.75	PASS
182-009_182-010	182-009	182-010	24	651	0.0115	6.366	0.48	6.386	0.48	0.75	PASS
182-010_192-002	182-010	192-002	24	398	0.0166	6.370	0.43	6.391	0.43	0.75	PASS
192-002_192-003	192-002	192-003	24	453	0.0074	6.480	0.55	6.501	0.55	0.75	PASS