



ALLARD ENGINEERING

civil engineering land surveying land planning

**Walnut & South Highland Ave, Residential Tract
Fontana, California
APN: 0243-142-01**

Preliminary Sewer Study

June 10, 2024

Prepared For:

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Discussion

The purpose of this study is to analyze the expected sewer flow from the proposed 30 Acre development off of Walnut Avenue, west of Almeria Avenue, and analyze the sewer the project is joining from a capacity standpoint. The site is tributary to an existing 8" sewer in Walnut Avenue that drains to the west and then turns south down a 15" sewer in Beech Avenue. There is also an existing 7 acres in the northeast corner of the site, not a part of this proposed development, which has two homes and is on septic, of which a proposed sewer lateral will stubbed for future tie in.

Tributary to the Walnut Sewer is an existing 12 Acre park, 98 Acres of existing single family detached residential, the proposed 30 acre site, and the 17 Acres to the north & northeast of the site, for a total of 157 Acres. Sizing analysis, taken from San Bernardino County sewer criteria, dictates that the sewer needs to handle the peak flow when less than 75% full.

According to our sewer capacity analysis (Refer to Table-1 Proposed Sewer Capacity and Velocity Calculation) the segment between MH-A to MH-C in Walnut Avenue from the projects tie in point, to Beechcraft Avenue, the existing 8" sewer main has the capacity for the tributary area of 92 acres which achieved 112% of the half-full capacity (56% full) of the 8" sewer main.

The segment between MH-C and MH-D in Walnut Avenue, between Beech Avenue to Beechcraft Avenue (Approximately 960 feet) an upsizing of the existing 8" existing sewer main is required per the sewer capacity analysis (Refer to Table-1 Proposed Sewer Capacity and Velocity Calculation). During this segment the sewer is flowing 87% full after the proposed site is taken into account. A 10" Sewer Main will have the capacity to carry a total wastewater flow of 1.24 CFS (0.80 MGD) from the entire tributary area of 157 acres at its 98% of half full capacity (49% full).

Therefore, the proposed upgrade of 8" sewer main into a 10" sewer main will be required for approximately 960 feet from Beach Avenue to Beechcraft Avenue in Walnut Avenue. The proposed 10" sewer main with a flow of 1.24 CFS (0.80 MGD) will be at 98% of its half full capacity (Refer to Table-1 Propose Sewer Capacity and Velocity Calculation) and will be safe to carry wastewater from the proposed tract.

References:

Table-1 : Proposed Sewer Capacity/Velocity Calculation

In-tract and Sewer Tributary Area Exhibit: Provides all in tract sewer area, and the area tributary to the sewer main.

TABLE : 1

SEWER ANALYSIS, WALNUT AVENUE, FONTANA																					
Sewer Capacity/Velocity Calculations																					
Street Name	Segment		*Area (AC)	Land Cover	Average Flow/AC Qa (CFS)	Design Flow/AC Qd (CFS)	Design Flow (CFS)	Comm. Design Flow (CFS)	Slope (FT/FT)	Diameter (FT)	Diameter (FT)	n	A (SF)	R (FT)	AR^2/3	Velocity (FPS)	8" Pipe Capacity (1/2 Full Flow) CFS	% Full to 1/2 Capacity	10" Pipe Capacity	% Full to 1/2 Capacity	
	MH #	MH #																			
WALNUT AVE	A		30	12.9 DU/AC	0.0054	0.0148	0.4428														
WALNUT AVE	A		7	3.6 DU/AC	0.0015	0.0045	0.0318														
WALNUT AVE	A	B	37					0.4746	0.013		0.67	0.013	0.132354	0.1439	0.03640	3.58	0.70	68			
WALNUT AVE	B		45	4.7 DU/AC	0.002	0.0059	0.2663														
	B		10	3.6 DU/AC	0.0015	0.0045	0.0454														
WALNUT AVE	B	C	92					0.7863	0.013		0.67	0.013	0.192907	0.1750	0.06043	4.08	0.70	112			
WALNUT AVE	C		53	4.7 DU/AC	0.002	0.0059	0.3137														
WALNUT AVE	C	D	145					1.1000	0.013		0.67	0.013	0.251552	0.1955	0.08484	4.39	0.70	157	1.24	89	
WALNUT AVE	C	D	145					1.1000	0.013	0.83		0.013	0.248757	0.1988	0.08483	4.44			1.24	89	
WALNUT AVE	D		12	COMMUNITY	0.0034	0.0096	0.1157														
WALNUT AVE	D	15" SEWER	157					1.2158	0.013	0.83		0.013	0.266812	0.2061	0.09318	4.55	0.70	174	1.24	98	
Proposed tract density: 12.9 DU/AC Off-tract Area Density: 4.7 DU/AC n = 0.0013 VCP Unit Flow Factor: 270 GPD/DU (Avg Flow) 1 MGD = 1.55 CFS Qdesign = 1.8 * (Qavg)^0.92 12.9 DU/AC = 3,483 GPD/AC = 0.00348 MGD/AC = 0.0054 CFS/AC 4.7 DU/AC = 1,269 GPD/AC = 0.00127 MGD/AC = 0.002 CFS/AC Park Area: 2,200 GPD/AC = 0.0022 MGD/AC = 0.0034 CFS/AC 3.6 DU/AC = 972 GPD/AC = 0.00097 MGD/AC = 0.0015 CFS/AC								ALL MANHOLES ARE ARBITRARILY NUMBERED IN WALNUT AVE												Maximum Allowable Sewer Capacity: 150% of Half Full	



Street Improvements



Table 1
Unit Flow Factors

Land Use Category		Unit Flow Factor		
Use	Description	gpd/DU	gpd/AC	gpd/TSF
Residential				
→ SF	Single Family	→ 270	1242	-
→ MF	Multi-Family	270	3824	-
Commercial				
C1	Neighborhood	-	2200	253
→ C2	Community	-	2200	225
C3	Office (Town Center)	-	2200	144
C4	Regional	-	2200	189
C5	Retail (Town Center)	-	2200	174
C6	Retail (Business Park)	-	2200	253
Industrial				
IND	Light Manufacturing / Business Park	-	4700	308
Public				
P1	Community Facility	-	3500	250
P2	Government, Cultural	-	3500	250
P3	Schools	-	3500	-
P4	Parks	-	200	-
P5	Education Campus	-	3500	-
P6	Sports Complex	-	3500	-
Amenities				
A1	Lake	-	200	-
A2	Village Green	-	200	-
A3	Golf Course	-	200	-

Where specific plans propose more dense or different development than the uses covered in Table 1, average sewage flow shall be calculated based upon project specific information. Where the number of dwelling units are available, sewer flow calculations shall be based upon the per dwelling unit flow factor.

Peaking Factors

Wastewater unit flow factors contained in the previous section are used to generate average dry weather flows (ADWF) entering the collection system. However, the sewage collection system facilities are sized for the peak flows. The peak wet weather flow (PWWF) has two components: peak dry weather flow (PDWF) and rainfall dependent inflow/infiltration (I/I). At any individual point in the system, peak dry weather flow is estimated by converting the total average flow upstream of the point in question to peak flow by an empirical peak-to-average relationship.

The peaking formula commonly used in estimating the peak dry weather flows in sewerage studies is:

$$Q_{PDWF} = a Q_{ADWF}^b$$

where Q_{PDWF} = Peak Dry Weather Flow in MGD
 Q_{ADWF} = Average Dry Weather Flow in MGD
a, b = Peaking Formula Coefficients

The following formula shall be used for estimating peak dry weather flows:

$$\rightarrow Q_{PDWF} = 1.8 (Q_{ADWF})^{0.92}$$

A higher coefficient "a" may be required for small sewer-sheds or sewer-sheds of a single land use type.

Sewer Design Criteria

Design criteria are established to ensure that the wastewater collection system can operate effectively under all flow conditions. Each pipe segment must be capable of carrying the peak wet weather flows in the hydraulically stable zone of the pipe. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

The design capacity of a gravity pipeline is the calculated capacity of the pipeline based on the Manning formula:

$$Q = 1.486 R^{2/3} S^{1/2} / n$$

where, Q = flow in cubic feet per second

R = hydraulic radius in feet = A / P

A = cross-sectional area of the pipe in square feet

P = wetted perimeter in feet

S = slope of pipe in feet of rise per foot of length

n = Manning's friction factor

Sewer system capacity is established using a Manning's friction factor of 0.013 for vitrified clay pipe.

The 1995 City Sewer System Master Plan established the hydraulic design criteria for sewer pipes by classifying 'over capacity' pipes as any with a depth to diameter (D/d) greater than 0.64. This D/d ratio was arrived at by taking 75 percent of a pipe's maximum stable flow capacity, which is at a D/d of 0.82. The area above a D/d of 0.82 is considered hydraulically unstable. This provides capacity for 35 percent of peak dry weather flow for inflow and infiltration.

The extra pipeline capacity allows for the possibility that actual wastewater flows may be slightly higher than anticipated, especially during the hours when instantaneous or intermittent peaks may occur. These peaks are generally observed between the hours of 6:00 a.m. and 9:00 a.m. and 7:00 p.m. and 9:00 p.m. during weekdays and somewhat later in the morning hours during weekends. They may also be observed during rainfall events due to inflow and infiltration. Additionally, the area above the water surface helps to keep the sewage aerated, reducing the possibility of septic conditions and odors.

The design and analysis of gravity sewer pipes is typically based upon the depth to diameter ratio (D/d). The following depth to diameter ratio assumptions apply:

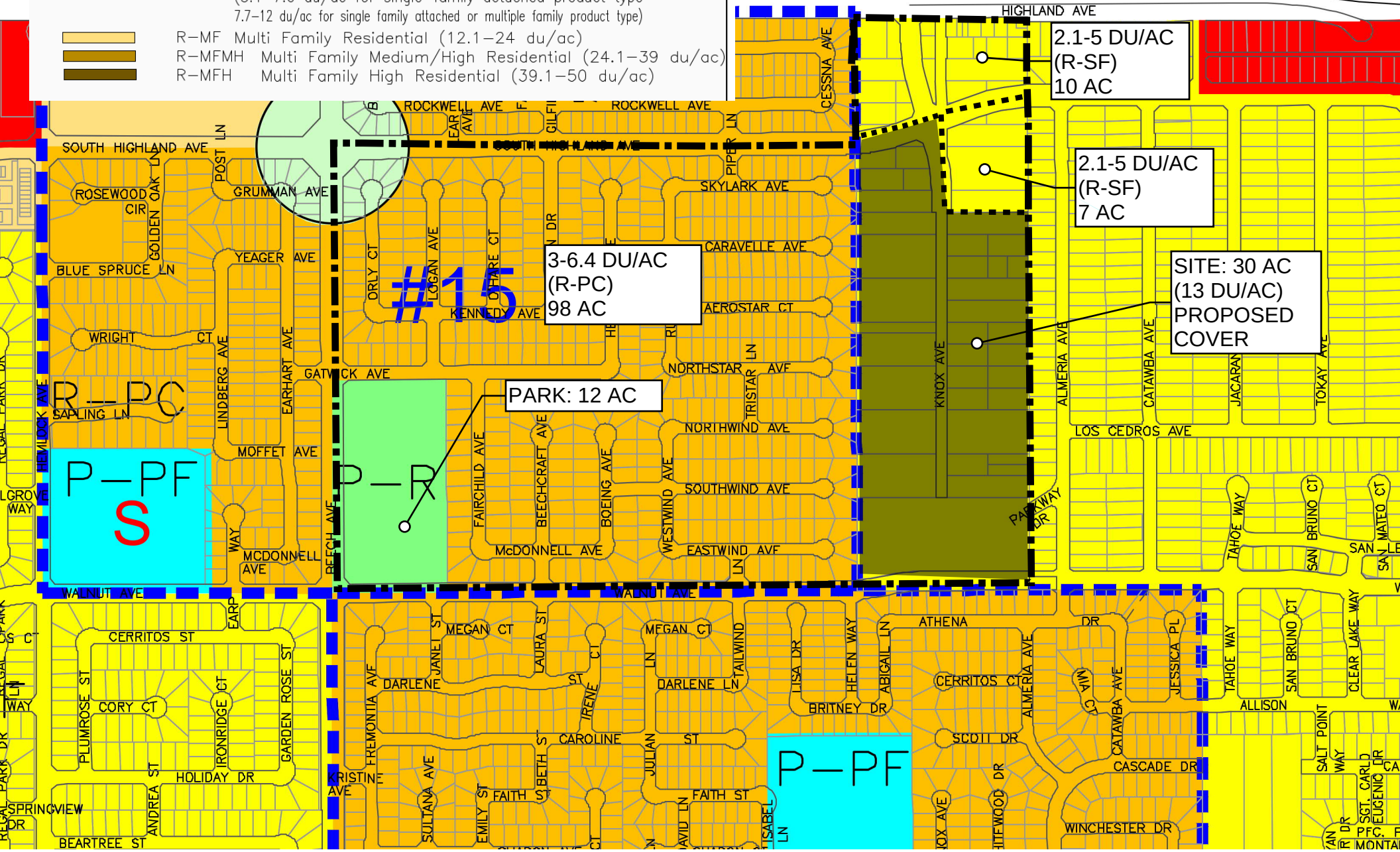
- Pipes **12-inches and smaller** in diameter shall be designed to flow at a maximum **D/d of 0.50** under peak dry weather flows
- Pipes **15-inches and greater** in diameter shall be designed to flow at a maximum **D/d of 0.64** under peak dry weather flows

RESIDENTIAL DESIGNATIONS

- | | |
|---|--|
|  | R-E Residential Estates (2 du/ac) |
|  | R-PC Residential Planned Community (3.0–6.4 du/ac) |
|  | R-SF Single Family Residential (2.1–5 du/ac) |
|  | R-M Medium Density Residential
(5.1–7.6 du/ac for single-family detached product type
7.7–12 du/ac for single family attached or multiple family product type) |
|  | R-MF Multi Family Residential (12.1–24 du/ac) |
|  | R-MFMH Multi Family Medium/High Residential (24.1–39 du/ac) |
|  | R-MFH Multi Family High Residential (39.1–50 du/ac) |

157 AC

TRIBUTARY AREA DRAIN
TO SEWER MAIN



HYDRAULIC ELEMENTS - I PROGRAM PACKAGE
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Analysis prepared by:

TIME/DATE OF STUDY: 00:14 05/23/2024
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Problem Descriptions:
8" Dia Sewer Capacity Calc (Half Full)

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 0.670
FLOWDEPTH(FEET) = 0.335
PIPE SLOPE(FEET/FEET) = 0.0130
MANNINGS FRICTION FACTOR = 0.013000
>>>> NORMAL DEPTH FLOW(CFS) = 0.70

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NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 0.34
FLOW AREA(SQUARE FEET) = 0.18
FLOW TOP-WIDTH(FEET) = 0.670
FLOW PRESSURE + MOMENTUM(POUNDS) = 6.92
FLOW VELOCITY(FEET/SEC.) = 3.960
FLOW VELOCITY HEAD(FEET) = 0.244
HYDRAULIC DEPTH(FEET) = 0.26
FROUDE NUMBER = 1.361
SPECIFIC ENERGY(FEET) = 0.58

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Problem Descriptions:
10" Dia Sewer Capacity Calc (Half Full)

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 0.830
FLOWDEPTH(FEET) = 0.415
PIPE SLOPE(FEET/FEET) = 0.0130
MANNINGS FRICTION FACTOR = 0.013000
>>>> NORMAL DEPTH FLOW(CFS) = 1.24

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NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 0.41
FLOW AREA(SQUARE FEET) = 0.27
FLOW TOP-WIDTH(FEET) = 0.830
FLOW PRESSURE + MOMENTUM(POUNDS) = 13.91
FLOW VELOCITY(FEET/SEC.) = 4.568
FLOW VELOCITY HEAD(FEET) = 0.324
HYDRAULIC DEPTH(FEET) = 0.33
FROUDE NUMBER = 1.410
SPECIFIC ENERGY(FEET) = 0.74

Untitled Map

Write a description for your map.



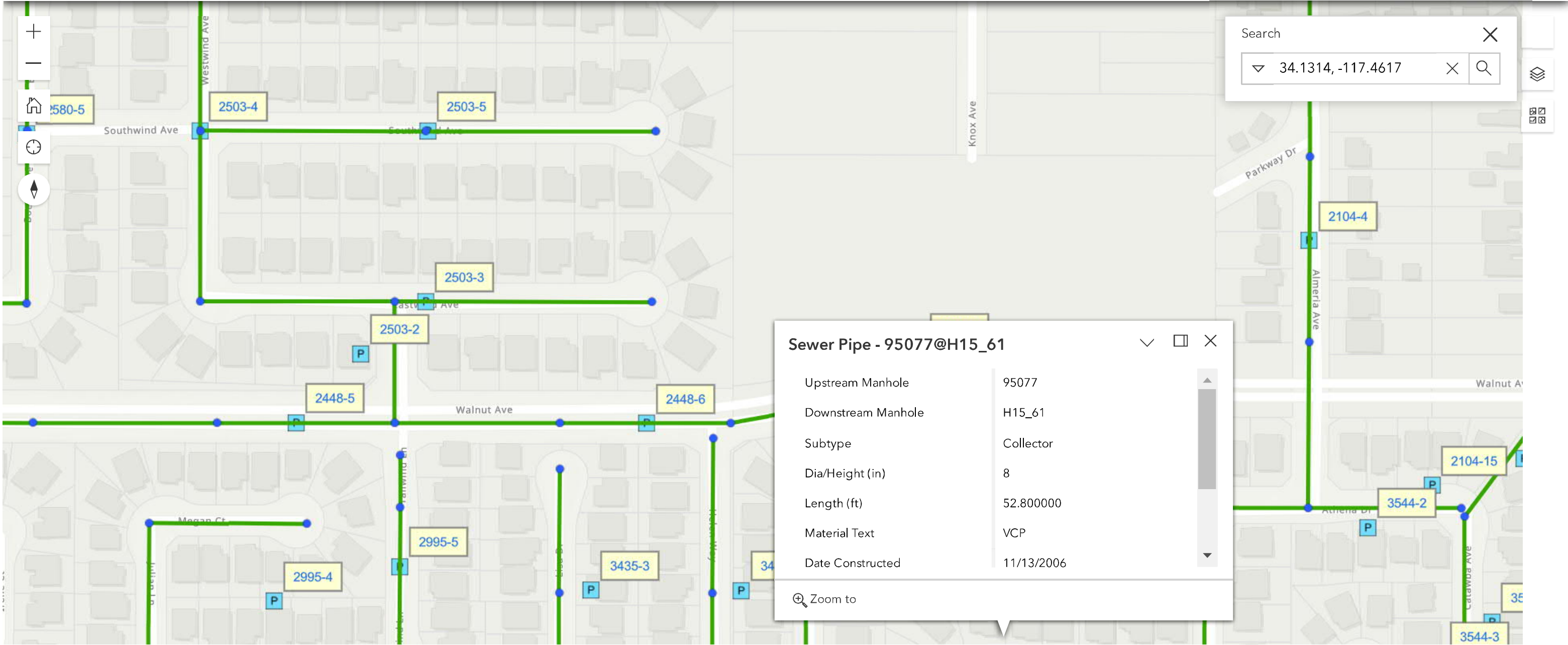


City of Fontana Improvement Plans

Sewer

Storm Drain

Street Improvements





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Sewer

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