



Lincoln Colony Apartments Project

Appendix L

Sewer Study, December 2020

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TECHNICAL MEMORANDUM

To: Keith Linker
 From: Mike Swan
 Date: December 2, 2020
 Subject: Sewer Study – 848-914 W. Lincoln Ave.
 City Project Tracking No.: OTH2020-01311



The purpose of this memorandum is to document a sewer study prepared for the Lincoln Colony Apartment building project which includes 44 dwelling units (du) and 485 square foot (sf) of office space. The project is proposed to be constructed on Assessor Parcel No. (APN) 036-112-03 and 036-112-32, approximately 0.74 acres, currently a vacant lot. The site is bounded on the north by Lincoln Avenue and on the east by Ohio Street as shown on Figure 1.

Currently, APN 036-112-32 is zoned as commercial. According to the Central Anaheim Area Master Plan of Sanitary Sewers (CAMPSS) dated December 2017 and the updated modeling from the South Central Anaheim Sewer Study (SCASS) dated May 2020, sewer generation from the site and adjacent parcels to the west and south in the Existing and Buildout System computer model scenarios were loaded as commercial use based on acreage to the existing 12” VCP sewer in the alley located to the south of the project site. This existing 12” sewer serving the project site flows in a westerly direction down the alley just south of and parallel Lincoln Avenue.

Sewage from the project site is proposed to discharge to the existing 12” sewer in the alley between manholes SW063204 and SW063203. For this sewer study the entire project flow will be loaded to the upstream manhole, SW063204 to be conservative. Based on the SCASS computer model, each of the existing commercial parcels was loaded to a different one of these two manholes, SW063204 and SW063203, in the alley south of the project site. The larger, 0.55-acre vacant lot used to be a service station and the model has an existing commercial load of 0.91 gpm, or about 1,311 gpd. This load will be removed from manhole SW063204. The existing commercial load of 0.22 gpm, or about 321 gpd, from the smaller, 0.19-acre parcel was previously loaded to, but will be removed from, manhole SW063203. The proposed development generates a load from the 44-unit apartment building of 6.42 gpm or 9,240 gpd and from the 485 sf of office space of 0.02 gpm or 29 gpd. These two loads, a total of 6.44 gpm or 9,269 gpd will be added to manhole SW063204. The existing and proposed manhole loading with flow generation is summarized in Table 1. Flow factors in Table 1 are in gallons per day (gpd)/acre, gpd/du, and gpd/thousand square feet (ksf). The existing downstream sewer collection system and the location of the proposed project site are shown on Figure 2.

Based on the SCASS, the Existing System Scenario included the flows shown in Table 1, with this table also showing the average flow increases due to the proposed project. The adjusted calibration flow factor for apartments from the SCASS and CAMPSS was 210 gpd/du. This flow factor was used in this detailed sewer study. The proposed apartment building is planned to have 485 sf of office space. The flow factor used for this ancillary use was 60 gpd/ksf. As shown in

Table 1, the total net additional average daily flow increase to the sewer collection system is 7,635 gpd with the new apartment building and office space.

Table 1 – Existing and Proposed Manhole Flow Loading

Manhole Number	Existing/ Proposed	Units			Flow Factor (gpd/unit)	Existing Flow Rate (gpd)	Proposed Flow Rate (gpd)
		Acres	DU	ksf			
Existing Manhole Flow Loading							
SW063204							
Commercial	Existing	0.55			2,375	1,311	-
Total Flow to SW063204						1,311	-
SW063203							
Commercial	Existing	1.30			1,700	2,210	-
Total Flow to SW063203						2,210	-
Total Existing Flow						3,521	
Proposed Manhole Flow Loading							
SW063204							
Apartments	Proposed		44		210	-	9,240
Office Space	Proposed			0.49	60	-	29
Total Flow to SW063204						-	9,269
SW063203							
Commercial - Retail	To Remain	1.11			1,700	-	1,887
Total Flow to SW063203						-	1,887
Total Proposed Flow							11,156
Average Flow Increase							7,635

The Existing Condition Scenario plus the net additional peak project flow over a 24-hour simulation period and the maximum depth-to-Diameter (d/D) ratios for the sewer collection system from the latest hydraulic model are shown in Table 2. The sewer system manholes are shown in detail in the immediate vicinity of the project on Figure 1 with manhole numbers corresponding to the Upstream and Downstream IDs in Table 2. The entire downstream sewer collection system is shown graphically on Figure 2 with manhole numbers at key locations shown.

Sewage from the project site discharges into a 12” sewer flowing westerly in the alley parallel to Lincoln Avenue. Where the sewer turns southerly it increases to 15” in diameter and increases to 24” at Santa Ana Street. The pipe continues flowing southerly and increases to 30” at Irving Place and then to 33” at Vermont Avenue where it crosses the I-5 Freeway. It continues west and becomes the southerly of two parallel lines in Ball Road at manhole SW075109. The southerly Ball Road line is 33” in diameter from Disneyland Drive to Euclid Street where it eventually discharges to the Orange County Sanitation District trunk sewer system.

As shown on Table 2, Existing Scenario plus Project, there are no deficiencies anywhere in the downstream tributary system. There is a maximum d/D of 0.41 in a couple of reaches along the I-5 Freeway just upstream of Santa Ana Street, well below the d/D criteria of 0.75 for lines 12” in diameter and larger. Based on this analysis, the system does not have any capacity deficiencies in the downstream collection system from the proposed project.

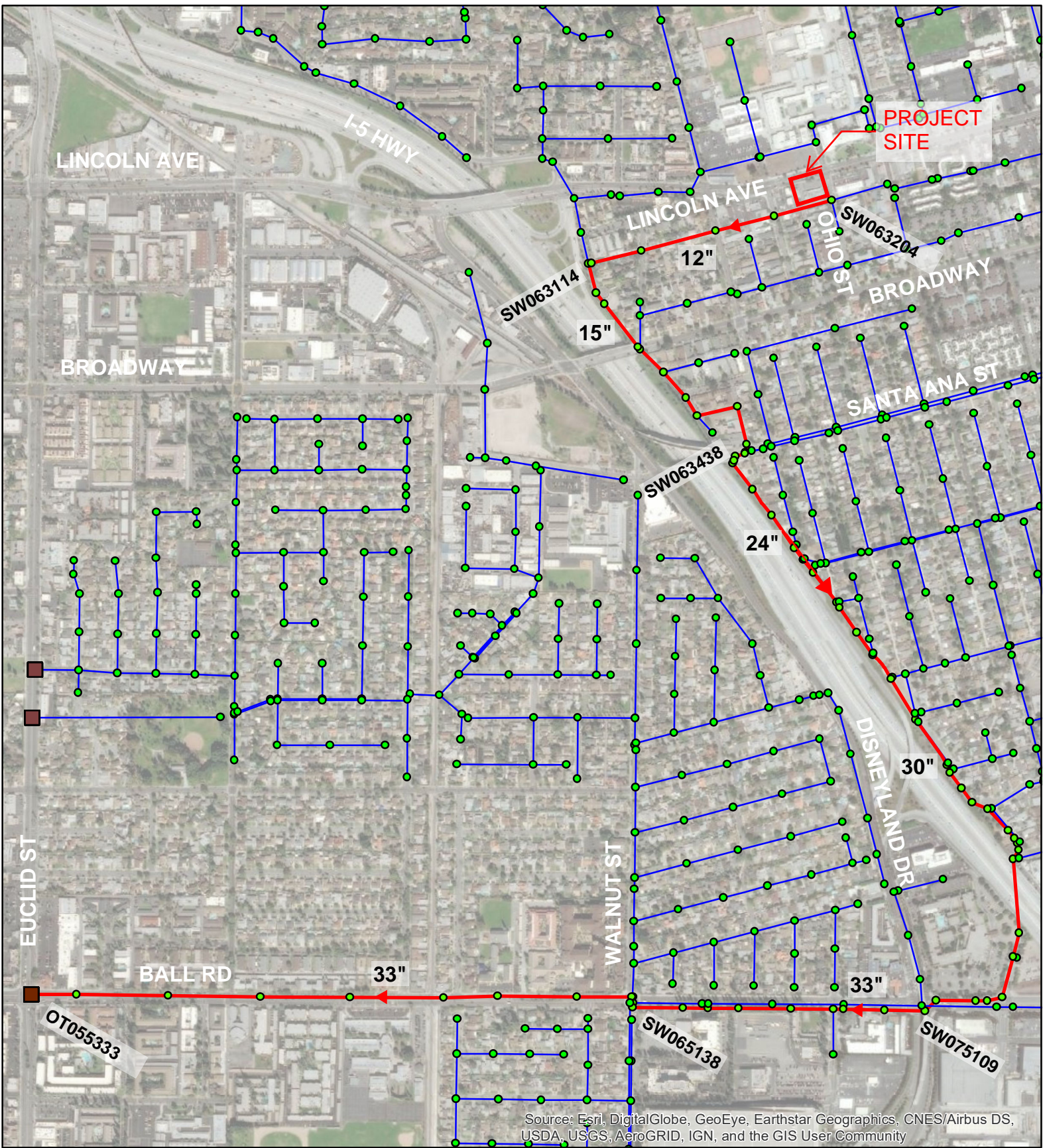
The Buildout Condition Scenario plus the Project and d/D ratios for the sewer collection system from the hydraulic model are shown in Table 3. As seen in Table 3, there are no deficiencies present in the tributary line. The same parallel system described above in the Existing Scenario applies to the Buildout Scenario as well. In the Buildout Scenario, the same two reaches described above increase to a d/D of 0.43, plus one reach on Ball Road increases to a d/D of 0.42, which is acceptable for that 33” diameter pipe.

Conclusion

No sewer system improvements are required for the proposed Lincoln Colony Apartment building with 44 units and 485 sf of office space. Model results show sufficient capacity within the existing sewer collection pipelines for the increased sewer flow generated by the proposed project for both existing and buildout demand scenarios.

Attachments: Figures 1 & 2, Tables 2 & 3





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**FIGURE 2
TRIBUTARY BASIN MAP**

Table 2 - Existing Land Use Scenario Plus Project

Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
Ohio St	SW063204-SW063203	12	391	0.002	119.79	0.28
Illinois St	SW063203-SW063202	12	394	0.002	121.10	0.29
West St	SW063202-SW063109	12	504	0.002	128.30	0.29
Walnut St	SW063109-SW063115	12	338	0.003	139.24	0.29
	SW063115-SW063114	12	19	0.021	148.34	0.18
Cherry St	SW063114-SW063135	15	199	0.001	248.90	0.35
	SW063135-SW063136	15	91	0.002	251.29	0.31
	SW063136-SW063133	15	359	0.002	251.29	0.30
Broadway	SW063133-SW063215	15	18	0.008	251.84	0.23
	SW063215-SW063216	15	216	0.002	327.83	0.35
	SW063216-SW063223	15	222	0.001	343.56	0.41
	SW063223-SW063402	15	140	0.002	343.56	0.41
	SW063402-SW063437	24	269	0.001	347.53	0.28
	SW063437-SW063438	24	254	0.001	352.99	0.24
Santa Ana St	SW063438-SW063439	24	55	0.001	353.27	0.23
	SW063439-SW063441	24	8	0.006	410.23	0.17
	SW063441-SW063414	24	67	0.003	448.90	0.20
	SW063414-SW063435	24	28	0.003	448.90	0.20
	SW063435-SW063418	24	21	0.003	448.90	0.20
	SW063418-SW063421	24	213	0.003	448.90	0.20
	SW063421-SW063428	24	213	0.003	449.04	0.20
	SW063428-SW063432	24	259	0.003	449.04	0.20
	SW063432-SW063444	24	98	0.003	449.73	0.20
	SW063444-SW063433	24	106	0.004	853.39	0.27
	SW063433-SW063434	24	247	0.002	870.54	0.33
	SW063434-SW064232	24	41	0.002	870.54	0.32
	SW064232-SW074129	24	198	0.002	870.54	0.34
	SW074129-SW074131	24	180	0.002	870.54	0.34
	SW074131-SW074105	24	200	0.002	872.89	0.34
	SW074105-SW074134	24	309	0.002	1,009.25	0.33
Irving Pl	SW074134-SW074138	30	365	0.002	1,011.74	0.25
	SW074138-SW074141	30	53	0.002	1,012.29	0.26
	SW074141-SW074139	30	128	0.002	1,014.23	0.26
	SW074139-SW074140	30	115	0.001	1,014.51	0.28
	SW074140-SW074321	30	112	0.001	1,014.51	0.28
	SW074321-SW074322	30	194	0.001	1,014.51	0.30
	SW074322-SW074323	30	64	0.001	1,014.85	0.30
	SW074323-SW074324	30	38	0.001	1,015.02	0.30
	SW074324-SW074325	30	46	0.001	1,015.02	0.30
	SW074325-SW074314	30	68	0.001	1,015.02	0.28

Table 2 - Existing Land Use Scenario Plus Project

Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
Vermont Ave	SW074314-SW074327	33	487	0.001	1,894.28	0.39
	SW074327-SW074328	33	159	0.001	1,894.28	0.40
	SW074328-SW074329	33	275	0.001	1,894.28	0.40
Cast Pl	SW074329-SW074331	33	100	0.001	1,894.28	0.39
	SW074331-SW074334	33	75	0.001	1,894.28	0.39
	SW074334-SW074330	33	264	0.001	1,894.28	0.40
	SW074330-SW075109	33	100	0.001	1,894.28	0.41
Disneyland Dr	SW075109-SW075108	33	264	0.001	1,901.51	0.39
	SW075108-SW075107	33	269	0.001	1,902.02	0.40
	SW075107-SW065212	33	65	0.001	1,905.66	0.38
	SW065212-FIT-770	33	280	0.001	1,905.66	0.40
	SW065211-SW065210	33	340	0.001	1,908.69	0.40
	SW065210-SW065214	33	201	0.001	1,908.69	0.39
	SW065214-SW065209	33	163	0.001	1,910.83	0.39
	SW065209-SW065138	33	330	0.001	1,911.79	0.39
Walnut St	SW065138-SW065201	33	30	0.005	1,911.79	0.24
	SW065201-SW064427	33	39	0.003	3,234.58	0.38
	SW064427-SW064426	33	9	0.005	3,341.08	0.32
	SW064426-SW064317	33	357	0.005	3,341.08	0.32
	SW064317-SW064316	33	521	0.005	3,341.08	0.32
	SW064316-OT064315	33	353	0.005	3,341.08	0.32
	OT064315-OT055436	33	613	0.003	3,341.08	0.39
	OT055436-OT055435	33	586	0.003	3,341.08	0.39
	OT055435-OT055336	33	603	0.003	3,341.08	0.39
	OT055336-OT055334	33	599	0.003	3,341.08	0.39
Euclid St	OT055334-OT055333	33	296	0.003	3,341.08	0.39

Table 3 - Buildout Land Use Scenario Plus Project

Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
Ohio St	SW063204-SW063203	12	391	0.002	128.70	0.29
Illinois St	SW063203-SW063202	12	394	0.002	130.40	0.30
West St	SW063202-SW063109	12	504	0.002	138.01	0.31
Walnut St	SW063109-SW063115	12	338	0.003	149.49	0.30
	SW063115-SW063114	12	19	0.021	159.04	0.19
Cherry St	SW063114-SW063135	15	199	0.001	267.91	0.36
	SW063135-SW063136	15	91	0.002	270.42	0.32
	SW063136-SW063133	15	359	0.002	270.42	0.32
Broadway	SW063133-SW063215	15	18	0.008	271.00	0.24
	SW063215-SW063216	15	216	0.002	351.28	0.36
	SW063216-SW063223	15	222	0.001	367.80	0.43
	SW063223-SW063402	15	140	0.002	367.80	0.43
	SW063402-SW063437	24	269	0.001	371.97	0.29
	SW063437-SW063438	24	254	0.001	377.70	0.24
Santa Ana St	SW063438-SW063439	24	55	0.001	377.99	0.24
	SW063439-SW063441	24	8	0.006	441.39	0.18
	SW063441-SW063414	24	67	0.003	482.01	0.21
	SW063414-SW063435	24	28	0.003	482.01	0.21
	SW063435-SW063418	24	21	0.003	482.01	0.21
	SW063418-SW063421	24	213	0.003	482.01	0.21
	SW063421-SW063428	24	213	0.003	482.16	0.21
	SW063428-SW063432	24	259	0.003	482.16	0.21
	SW063432-SW063444	24	98	0.003	482.89	0.21
	SW063444-SW063433	24	106	0.004	909.32	0.28
	SW063433-SW063434	24	247	0.002	927.33	0.34
	SW063434-SW064232	24	41	0.002	927.33	0.33
	SW064232-SW074129	24	198	0.002	927.33	0.35
	SW074129-SW074131	24	180	0.002	927.33	0.35
	SW074131-SW074105	24	200	0.002	929.80	0.36
	SW074105-SW074134	24	309	0.002	1,075.54	0.35
Irving Pl	SW074134-SW074138	30	365	0.002	1,078.16	0.26
	SW074138-SW074141	30	53	0.002	1,078.74	0.27
	SW074141-SW074139	30	128	0.002	1,080.77	0.27
	SW074139-SW074140	30	115	0.001	1,081.06	0.29
	SW074140-SW074321	30	112	0.001	1,081.06	0.29
	SW074321-SW074322	30	194	0.001	1,081.06	0.31
	SW074322-SW074323	30	64	0.001	1,081.43	0.31
	SW074323-SW074324	30	38	0.001	1,081.61	0.31
	SW074324-SW074325	30	46	0.001	1,081.61	0.31
	SW074325-SW074314	30	68	0.001	1,081.61	0.29

Table 3 - Buildout Land Use Scenario Plus Project

Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
Vermont Ave	SW074314-SW074327	33	487	0.001	2,027.42	0.40
	SW074327-SW074328	33	159	0.001	2,027.42	0.41
	SW074328-SW074329	33	275	0.001	2,027.42	0.41
Cast Pl	SW074329-SW074331	33	100	0.001	2,027.42	0.41
	SW074331-SW074334	33	75	0.001	2,027.42	0.41
	SW074334-SW074330	33	264	0.001	2,027.42	0.41
	SW074330-SW075109	33	100	0.001	2,027.42	0.42
Disneyland Dr	SW075109-SW075108	33	264	0.001	2,034.66	0.41
	SW075108-SW075107	33	269	0.001	2,035.16	0.41
	SW075107-SW065212	33	65	0.001	2,038.81	0.39
	SW065212-FIT-770	33	280	0.001	2,049.75	0.41
	SW065211-SW065210	33	340	0.001	2,052.77	0.42
	SW065210-SW065214	33	201	0.001	2,052.77	0.40
	SW065214-SW065209	33	163	0.001	2,065.59	0.40
	SW065209-SW065138	33	330	0.001	2,066.56	0.40
Walnut St	SW065138-SW065201	33	30	0.005	2,066.56	0.25
	SW065201-SW064427	33	39	0.003	3,523.52	0.40
	SW064427-SW064426	33	9	0.005	3,640.92	0.34
	SW064426-SW064317	33	357	0.005	3,640.92	0.34
	SW064317-SW064316	33	521	0.005	3,640.92	0.34
	SW064316-OT064315	33	353	0.005	3,640.92	0.34
	OT064315-OT055436	33	613	0.003	3,640.92	0.41
	OT055436-OT055435	33	586	0.003	3,640.92	0.41
	OT055435-OT055336	33	603	0.003	3,640.92	0.41
	OT055336-OT055334	33	599	0.003	3,640.92	0.41
Euclid St	OT055334-OT055333	33	296	0.003	3,640.92	0.41