Appendix K

Sewer Capacity Study

Sewer Capacity Study
For
South Coast Plaza Village
Santa Ana, CA 92704

April 9, 2025

David Sloan, P.E.
Registered Civil Engineer No. 82595
Exp.: 9/30/26

Prepared for:

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TAIT JOB # **SP4831D**

Table of Contents

Section 1 Study Purpose

The purpose of this study is to provide a site-specific sewer capacity study to assess the amount of wastewater generated by the proposed development of the South Coast Plaza Village in Santa Ana, CA. This sewer study will analyze and compare the existing and proposed sewage generation rate from the project area by land use in accordance with the City of Santa Ana Design Guidelines for Water and Sewer Facilities.

Section 2 Existing Site Location & Information

The proposed project site comprised of 17.23-acres, located in the City of Santa Ana, Orange County, California. The site is at the North-East corner Sunflower Avenue and Bear Street with Plaza Drive separating the 2 project areas, see Figure 1 for Vicinity Map. Area 1 west of Plaza Drive is 14.04 acres and Area 2 east of Plaza Drive is 3.19 acres. The current land use is Commercial with restaurants, offices, and stores in Area 1 and a movie theater in Area 2.

Figure 1. Vicinity Map

Section 3 Proposed Site Description

The proposed project is comprised of 8 podium style blocks of buildings with subterranean parking levels. The project will be mixed use, with commercial spaces or parking garage uses at the ground level and residential apartments or towers above. See Figure 2 below for general site configuration and the associated use of each of the blocks.

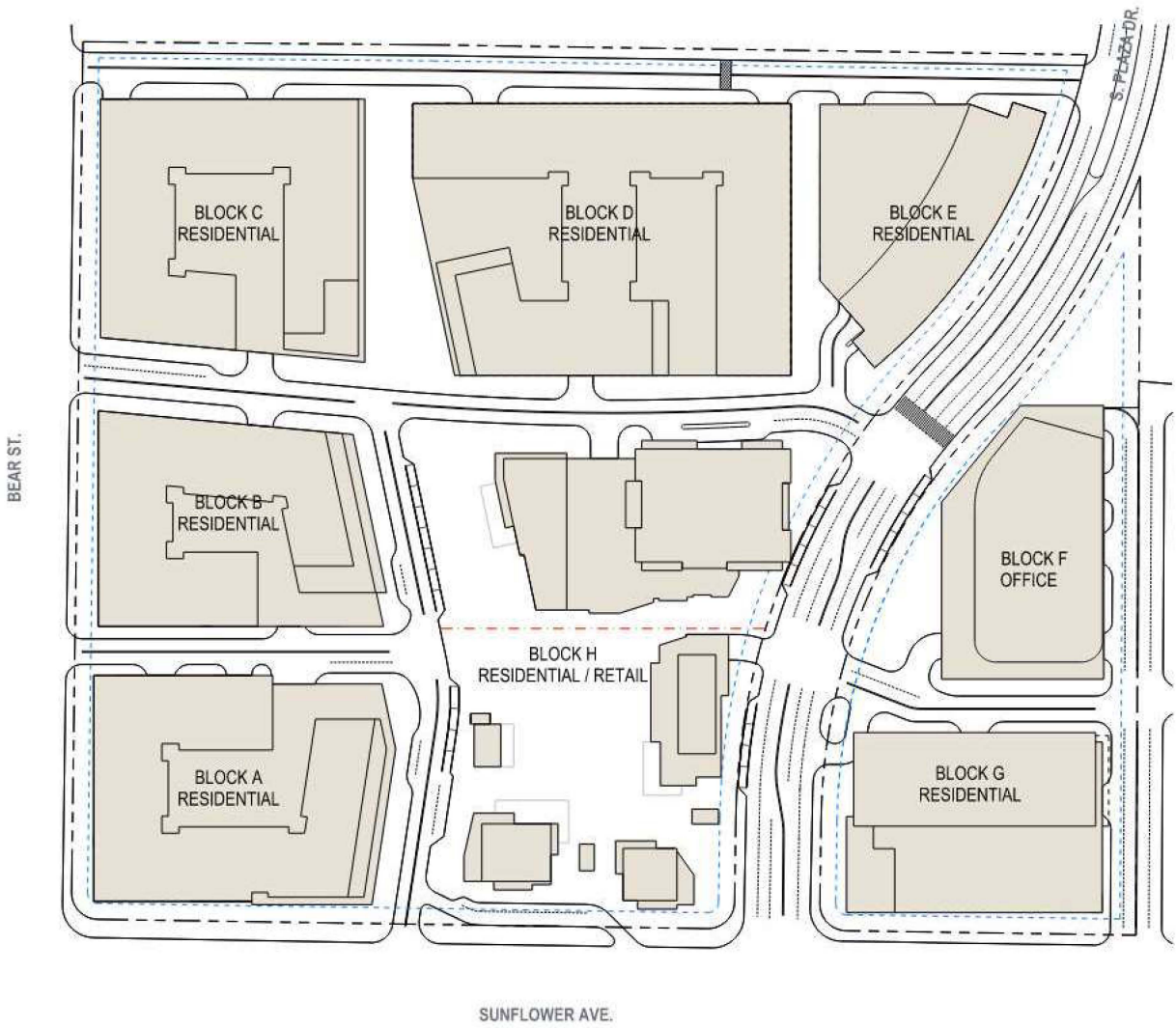


Figure 2. Proposed Site Conditions at the Project Site

Section 4 Sewer System Layout

4.1 Existing Sewer System

For report tracking purposes, the existing sewer system has been sub-divided in to the following three tributary networks:

Plaza Drive Tributary (OC San): The central buildings within project area 1 flow through an 8" lateral to a 15" VCP sewer main owned by Orange County Sanitation District (OC San) within Plaza Drive, see Figure 2 for a graphic representation of the existing sewer system servicing the project site and Appendix B for the full-size exhibit. The 15" main flows south to a 78" RCP sewer trunk line owned by OC San on the south side of Sunflower Avenue.

Sunflower Avenue Tributary (City of Santa Ana): A City of Santa 8" VCP sewer main currently exists on the north side of Sunflower which originates at the southwest corner of the project site. The existing commercial development to the east is tributary to this sewer main, however, based on currently submitted development plans it is understood that the existing sewer connection from the adjacent development will be abandoned. As a baseline condition, this report assumes the adjacent connection will be abandoned, however, alternative solutions have also been provided in the case that the connection is not abandoned. In addition to the adjacent commercial development's flows, a 6" sewer lateral was constructed for Area 2 of the proposed development and a restaurant in the southern portion or Area 1 boarding Sunflower Avenue has a 6" PVC lateral connected to the main. Finally, a 4" sewer lateral was constructed for the southwestern portion of Area 1 prior to the 8" sewer main connecting to a 10" VCP sewer main owned by OC San within Bear Street.

Bear Street Tributary (OC San): The 10" VCP OC San sewer main originates 772' north of the intersection of Bear Street and Sunflower Avenue which receives the City of Santa Ana's sewer flows from the north and also provides a single 4" lateral to the project site. No records currently exist indicating active connections to this lateral, however, connections may be present that are unknown. The sewer main continues south to intercept the aforementioned 8" City of Santa Ana Sunflower Avenue Tributary line at which point, the sewer flows continue south and southwest in a 10" Sewer main to connect to 78" RCP OC San trunk line. See Appendix E for record drawing information.

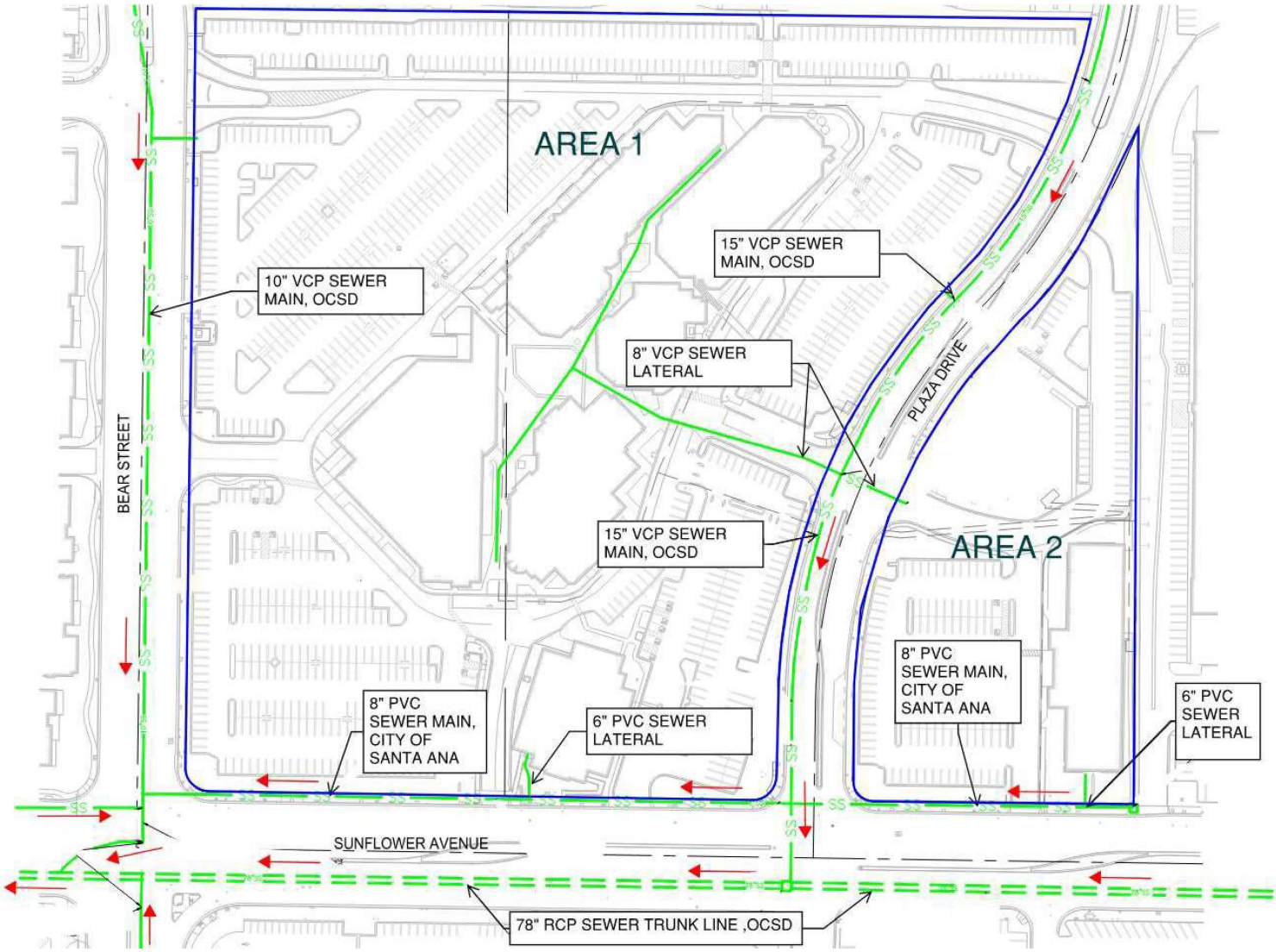


Figure 3. Existing Sewer System at the Project Site

4.2 Proposed Sewer System

Changes to the public sewer system are proposed as part of this project, see figure 3 below for the proposed sewer system schematic, Appendix B for the full-size exhibit, and section 5 for the pre and post construction sewer hydraulic calculations which were used in justifying the proposed sewer network.

Plaza Drive Tributary (OC San):

Block F is proposed to connect to the existing 8" sewer lateral to a 15" VCP sewer main owned by OC San in Plaza Drive to match existing sewer capacities being generated by the previous developments.

Sunflower Avenue Tributary (City of Santa Ana):

Block G & H(south) are proposed to connect to the existing 8" City owned sewer main line within Sunflower Avenue via proposed 8" sewer laterals. Under the assumed conditions stated in Section 4.1, the generated flows from these blocks have been designed to match the existing sewer capacity of the existing 8" sewer line.

Bear Street Tributary (OC San):

Block A, B, C, D, E, and H(north) will all be connected to a proposed 12" PVC, on-site, private sewer system which flows southwest towards the intersection of Bear Street & Sunflower Avenue. At which the proposed onsite line and the existing 8" main line in sunflower converges at a proposed Sewer Manhole (SMH). From which a proposed 18" RCP sewer line will tap into the existing 10" Sewer main SMH within Bear Street. An 18" RCP sewer line upgrade is proposed from the above-mentioned Manhole to the 78" RCP Sewer trunk line in Sunflower Avenue. The proposed 18" RCP upgrade will provide enough capacity to the existing OC San sewer lines to accommodate the existing flows and the generated flows form Block A,B,C,D,E, and H(south).

Figure 4. Proposed Sewer System Schematic Plan

Section 5 Design Criteria

5.1 Sewer Design Criteria

Design criteria utilized in this report are based on the City of Santa Ana Design Guidelines for Water and Sewer Facilities (November 2020) as well as OC San Engineering design Guidelines Chapter 12- Sanitary Sewer- Design and Construction Requirements (March 2022). The focus of this study is to calculate the generation rates for the existing and proposed development based on land use generation rates to calculate the projected ratio of flow depth versus pipe diameter (d/D).

d/D Requirements: Based on the City's and OC-San Design Guidelines, existing sewer pipes are considered deficient if this ratio is greater than 0.5 at peak flow.

Manning's Friction Factor: Per the City's and OC-San Design Guidelines requirements a Manning's friction factor of 0.013 has been utilized on all flow calculations.

Flow Generation Rates: Flows are based on the estimated sewerage generation rate by land use Per City's Design Guidelines, (see below and Appendix C). Existing land use is best represented as Commercial. The proposed site will be mixed use with a currently estimated maximum dwelling unit count of 1,583 units for an average of 92 du/ac across the 17.23 acre site. As a conservative estimate, Mixed Use Corridor (130 du/ac max) was selected from the City's Design Guidelines for estimating proposed flows.

Land Use Classification	Average Sewage Flow Coefficient
Low Density Residential (8 du/ac max)	0.0032 cfs/acre
Medium Density Residential (15 du/ac max)	0.0045 cfs/acre
Med/High Density Residential (35 du/ac max)	0.0105 cfs/acre
Med. Urban Center Residential (60 du/ac max)	0.0180 cfs/acre
Urban Center Residential (90 du/ac max)	0.0270 cfs/acre
Mixed Use Corridor (130 du/ac max)	0.0400 cfs/acre
Commercial	0.0050 cfs/acre
Industrial	0.0060 cfs/acre
Schools	25 gals/day per student
Medical Center	0.0250 cfs/acre
Hospital	1,000 gals/day per bed

Peaking Factor: Per City's Design Guidelines, peak flow is assumed to be 3.0 times the average sewage flow.

5.2 Existing Flow Rates

Existing daily flow rates were calculated based on total tributary acreage and commercial land use. Flows from Area 1 have two discharge locations, the 15" main in Plaza Drive and the 8" main on Sunflower Ave. Area 2 has 1 discharge location, the 8" main on Sunflower Ave. Record drawings for Plaza drive show that our site contributes 0.20 cfs to the 15" main. Based on the above Area 1 is assumed to split sewage flow 95% to the Plaza Drive sewer main and 5% to Sunflower Ave. sewer main. See Appendix E for record drawing information.

Existing Project Estimated Sewerage Generation			
Sub area (ac)		**Average Sewage flow (cfs)** 0.0050 cfs/ac	**Peak Sewage flow (cfs)** Average x 3.0
Plaza Drive			
Area 1 (north)	13.33	0.0667	0.2000
Sunflower			
Area 2	3.19	0.0160	0.0479
Area 1 (south)	0.71	0.0036	0.0107
Bear Street			
Total site	**17.23**	**0.0863**	**0.2586**

5.3 Existing Sewer Capacity

Sewer Pipe capacity is based on the City's Design Guidelines maximum depth to diameter ratio (d/D) of 0.5. Flow rates were calculated with the Hydraflow Express Extension for Autodesk at a d/D of 0.5, see Appendix D.

	Existing Sewer Pipe Capacity	
	Existing Pipe slope %	Flow rate @ d/D = 0.5
Plaza Drive (15" VCP)	0. 12	1.126 cfs
Sunflower Avenue (8" VCP)	0.44	0.405 cfs
Bear Street (10" VCP)	0.28	0.577 cfs

5.4 Proposed Flow Rates

Proposed daily flow rates were calculated based on total tributary acreage and the Mixed Use Corridor land use. See section 5.4 for pipe capacity at various slopes.

Proposed Project Estimated Sewerage Generation			
Sub area (ac)		**Average Sewage flow (cfs)** 0.0400 cfs/ac	**Peak Sewage flow (cfs)** Average x 3.0
Open Space	0.07	NA	NA
Plaza Drive			
Blocks F	1.67	0.0667	0.2000
Sunflower Avenue			
Blocks G	1.45	0.0580	0.1740
Block H (south)	1.63	0.0652	0.1956
Bear Street			
Blocks A and B	3.65	0.1460	0.4380
Blocks C and D	5.22	0.2088	0.6264
Block E	1.46	0.0584	0.1752
Block H (north)	2.08	0.0832	0.2496
Total site	**17.23**	**0.6864**	**2.0592**

Section 6 Results and Conclusion

Based on the above noted calculations, data, and the City's design guidelines, the proposed development will increase the total sewage generation of the subject site by changing from commercial use to a mixed-use corridor. We can conclude that the proposed generated flows will be accommodated for each of the following three tributary areas:

Plaza Drive Tributary (OC San): .

By only connecting Block F, the generated 0.200 cfs matches the allowed 0.200 cfs which has been generated to this tributary and no capacity will be required.

Sunflower Avenue Tributary (City of Santa Ana):

Bases on our baseline assumptions the existing sewer connection from the adjacent development being abandoned and adding generated flows from Block G & H(south) the proposed generated flow rate of 0.3696 cfs will be sufficient for the Ex. 8" VCP Sewer line.

Should the adjacent property not abandon their connection, it has been assumed the existing 8" line is running at its capacity of 0.405 cfs. In order for our sites generated 0.3696 cfs flows to be captured the cities line will need to be upgraded to a 12" line which will provide a capacity of 1.190 cfs which is greater than the sum of the flows contributing to the sewer line.

Bear Street Tributary (OC San):

The 1.4892 cfs generated by Blocks A,B,C,D,E and H(north) & 0.3696 cfs from the upstream 8" VCP in Sunflower Avenue will be contained by upgrading the 10" VCP sewer line in Bear Street to an 18" RCP as described in section 4.2.

The above tributary areas all eventually flow into the OC San 78" Trunk line, which has sufficient capacity for the sites generated flows. See Appendix D for existing and proposed sewer flow calculations. See Appendix E for existing Records.

A summary table of the site sewage generation is provided below.

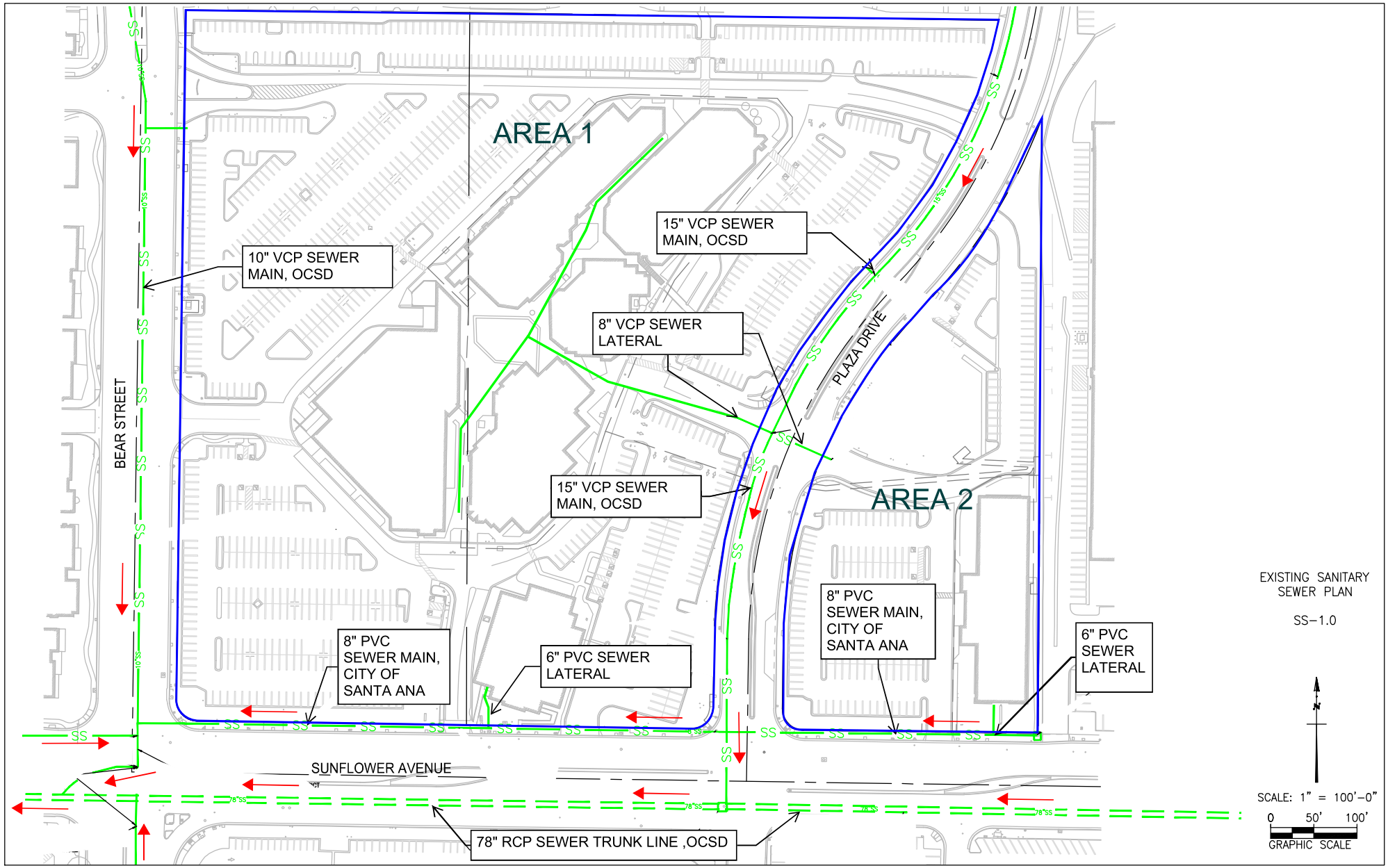
On-site Sewage Summary Table			
Tributary Public Sewer Main	Existing Peak Flow (cfs)	Proposed Peak Flow (cfs)	Difference (cfs)
Plaza Drive 15" VCP @ 0.12%	0.2000	0.2000	-0.0000
Sunflower Ave. 8" PVC @ 0.44%	0.0586	0.3696	+0.311
Bear Street 10" VCP @ 0.28%	0	1.4892	+1.4892
Total	**0.2586**	**2.0588**	**+1.8002**

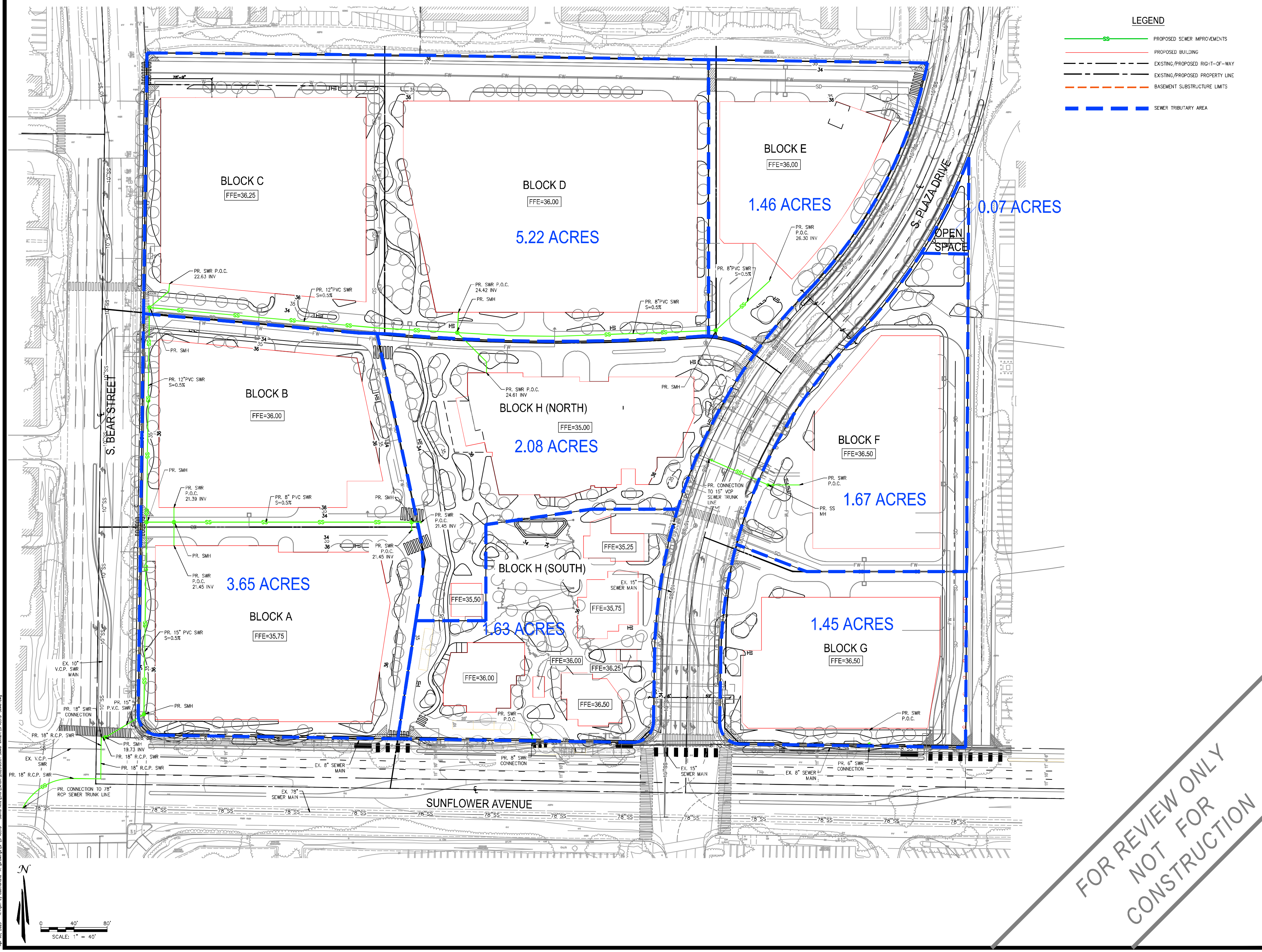
Appendix A – Vicinity Map

Vicinity Map

NTC

Appendix B – Sewer System Exhibits


AREA 1
AREA 2
10" VCP SEWER MAIN, OCSD
15" VCP SEWER MAIN, OCSD
8" VCP SEWER LATERAL
15" VCP SEWER MAIN, OCSD
8" PVC SEWER MAIN, CITY OF SANTA ANA
6" PVC SEWER LATERAL
8" PVC SEWER MAIN, CITY OF SANTA ANA
6" PVC SEWER LATERAL
78" RCP SEWER TRUNK LINE ,OCSD
BEAR STREET
PLAZA DRIVE
SUNFLOWER AVENUE
EXISTING SANITARY SEWER PLAN
SS-1.0
SCALE: 1" = 100'-0"
0 50' 100'
GRAPHIC SCALE



SCHEMATIC SEWER PLAN

SOUTH COAST VILLAGE
C.J. SEGERSTROM & SONS
3315 FAIRVIEW RD
COSTA MESA CA 92626

TAIT & ASSOCIATES

FOR REVIEW ONLY - NOT FOR CONSTRUCTION

Appendix C – Unit Flow Coefficients

400.4 FLOW DESIGN CRITERIA

400.4.1 Sewerage Flows

All design flows shall be based on the Applicant's (developer/builder) estimated sewerage generation rates for the proposed use, application, establishment, commercial, industry or development or re-development project. The following average sewage flow coefficients can be used as a guide to estimate the sewerage generation for some of the more common land uses:

Land Use Classification	Average Sewage Flow Coefficient
Low Density Residential (8 du/ac max)	0.0032 cfs/acre
Medium Density Residential (15 du/ac max)	0.0045 cfs/acre
Med/High Density Residential (35 du/ac max)	0.0105 cfs/acre
Med. Urban Center Residential (60 du/ac max)	0.0180 cfs/acre
Urban Center Residential (90 du/ac max)	0.0270 cfs/acre
Mixed Use Corridor (130 du/ac max)	0.0400 cfs/acre
Commercial	0.0050 cfs/acre
Industrial	0.0060 cfs/acre
Schools	25 gals/day per student
Medical Center	0.0250 cfs/acre
Hospital	1,000 gals/day per bed

400.4.2 Peak Flows

The peak flow is assumed to be 3.0 times the average sewage flow.

400.4.3 Design Criteria

Design peak flows in pipelines 12 inches in diameter and smaller are to be limited to approximately d/D = 0.5 (½ of full depth). Pipes over 12 inches in diameter are to be limited to approximately d/D = 0.75 (3/4 of full depth) at design peak flows.

400.5 TYPE OF PIPE

The minimum size of any sewer main shall be 8 inches in diameter. Sewer mains, 12-inches in diameter and smaller, shall be vitrified clay pipe (VCP) or PVC SDR-26 pipe. For pipe sizes greater than 12-inches in diameter, the sewer main shall be VCP only, PVC pipe is not acceptable for these sizes. All other pipe materials require special review and approval from the Water Resources Division. Sewer pipe material shall remain constant (continuous) between manholes. Transitioning between pipe material types (such as VCP to PVC), and size changes, may only be done at manholes.

All sewer laterals shall be either extra strength VCP or SDR-26 PVC pipe. The material used for construction of sewer laterals shall match the materials of construction for the adjacent sewer main to which they are connected.

2. Average dry weather flow (ADWF) shall be calculated using either of the following:

a. Divide the cumulative daily flow for the pipe by the desired time step.

b. Average the calculated flow rates for the pipe over a 24-hour period of time.

J. Criteria for Wet Weather Flow Calculations are as follows:

1. The Design Engineer shall use the hydraulic model to determine the peak wet weather flow (PWWF) generated by a 10-year storm event.

K. Velocity

1. The design velocity when flowing full shall be 3 ft/sec as calculated with Manning's formula, using a Manning's coefficient of 0.013.

L. Slope

1. Slope shall be designed to accommodate a velocity of 3 ft/sec when flowing full and allow maximum velocity of 8 ft/sec, unless otherwise approved by the Engineer. Changes in slope shall be such that no hydraulic jumps result under design flow conditions. The slope shall not exceed 10 percent.

M. Requirements for Depth of Flow (D) versus diameter of pipe (d) in sewer pipe.

Diameter of Pipe (d)	Max D/d
8 inches – 18 inches	0.50
21 inches and over	0.75

N. Depth of Cover

1. Minimum depth of cover over mainline sewers shall be 7 feet. Unless otherwise approved.

2. If 7 feet of cover cannot be achieved, the Design Engineer shall use pipe materials, or reinforcement techniques which will warrant the integrity of the pipeline at the shallower depth.

O. Manhole Criteria

1. Manhole locations:

a. At changes of slope

b. At changes of direction

c. At junction of laterals

d. At changes of pipe size

e. At termination of sewers

f. At special locations as designated by the Engineer

Appendix D – Flow Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 20 2024

<Name>

Circular

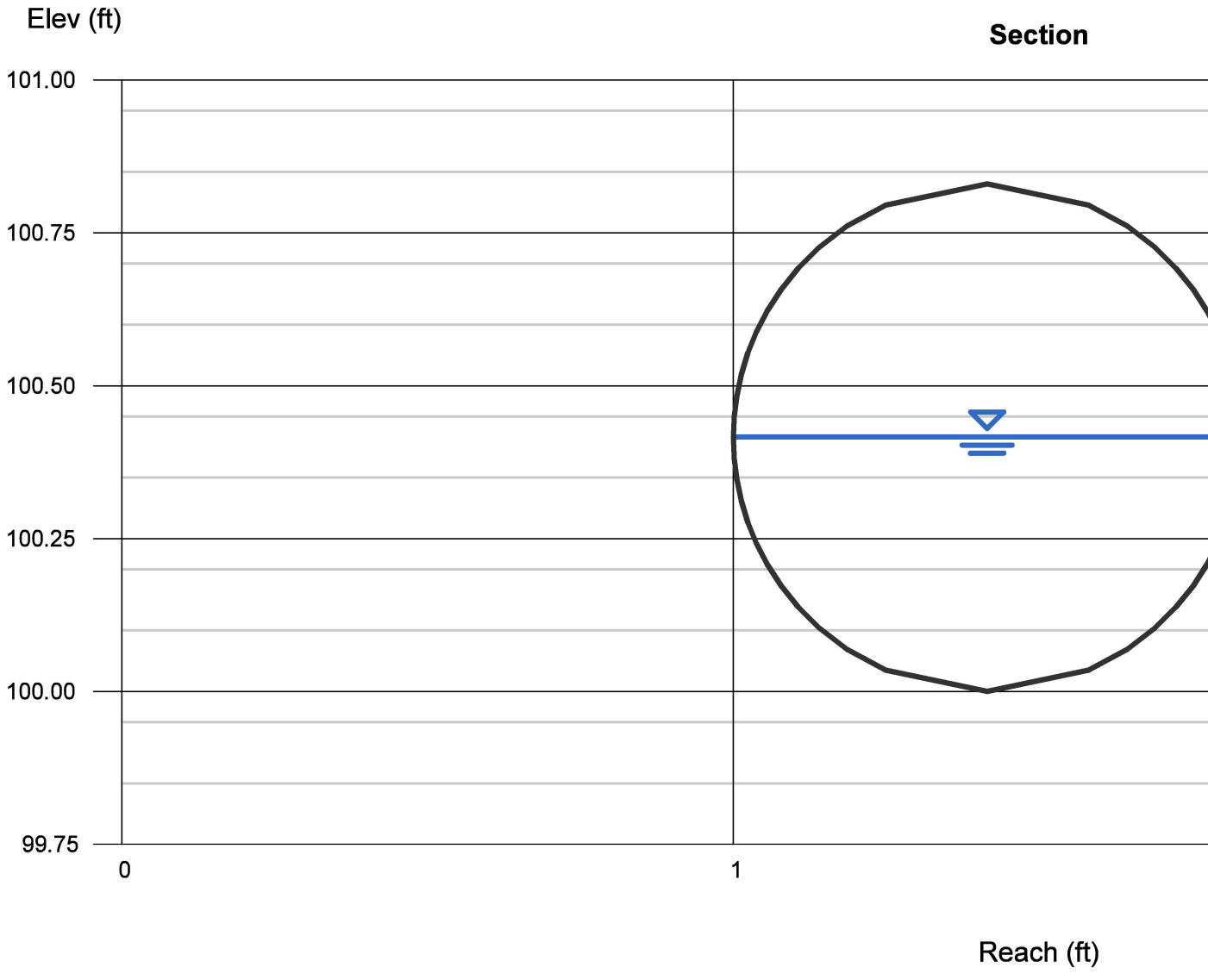
Diameter (ft)	= 0.83
Invert Elev (ft)	= 100.00
Slope (%)	= 0.28
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.42

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 0.577
Area (sqft)	= 0.27
Velocity (ft/s)	= 2.12
Wetted Perim (ft)	= 1.31
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 0.83
EGL (ft)	= 0.49



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 20 2024

<Name>

Circular

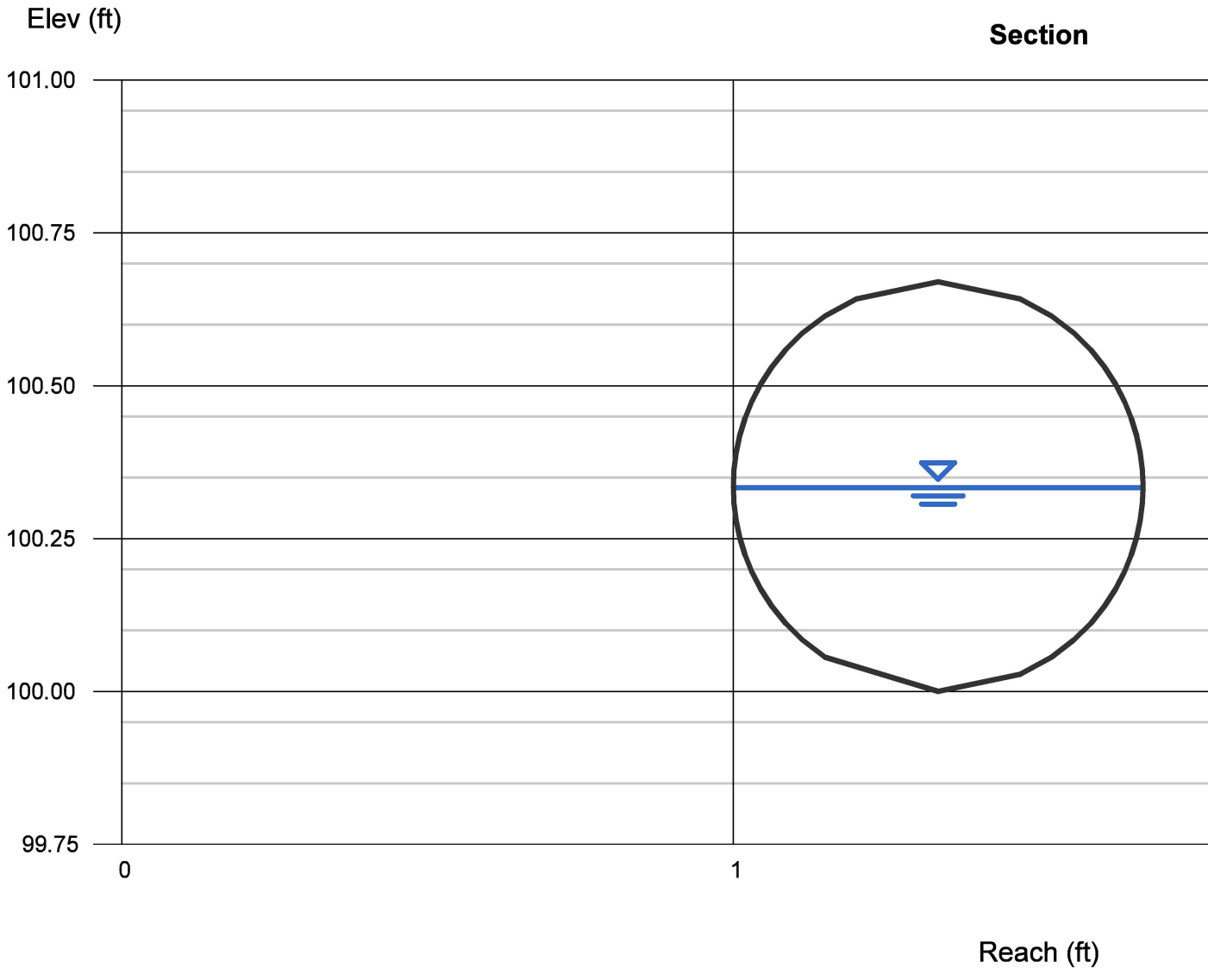
Diameter (ft)	= 0.67
Invert Elev (ft)	= 100.00
Slope (%)	= 0.44
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.33

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 0.405
Area (sqft)	= 0.18
Velocity (ft/s)	= 2.30
Wetted Perim (ft)	= 1.05
Crit Depth, Yc (ft)	= 0.30
Top Width (ft)	= 0.67
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 21 2024

<Name>

Circular

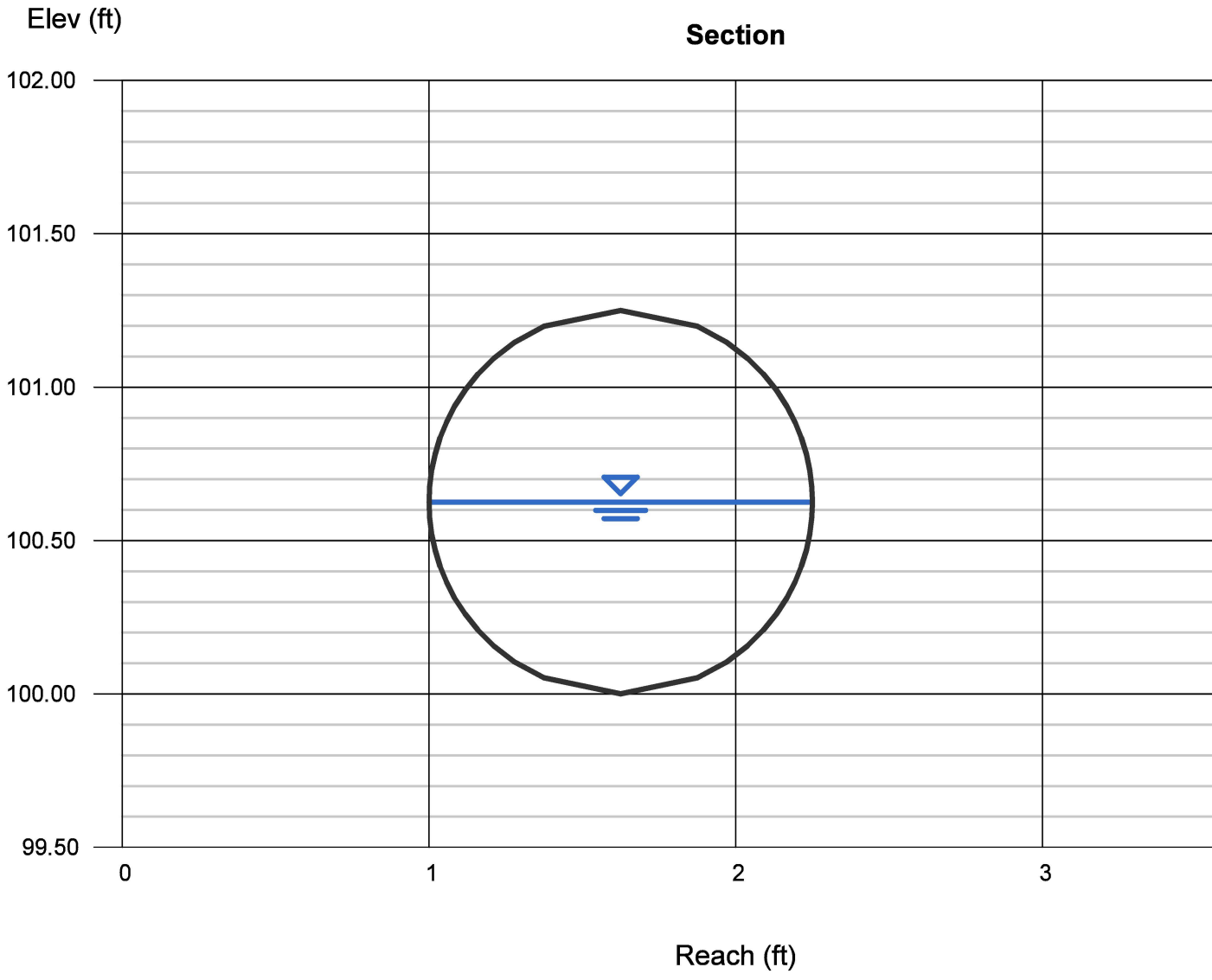
Diameter (ft)	= 1.25
Invert Elev (ft)	= 100.00
Slope (%)	= 0.12
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.63

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 1.126
Area (sqft)	= 0.62
Velocity (ft/s)	= 1.83
Wetted Perim (ft)	= 1.97
Crit Depth, Yc (ft)	= 0.42
Top Width (ft)	= 1.25
EGL (ft)	= 0.68



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Feb 22 2024

<Name>

Circular

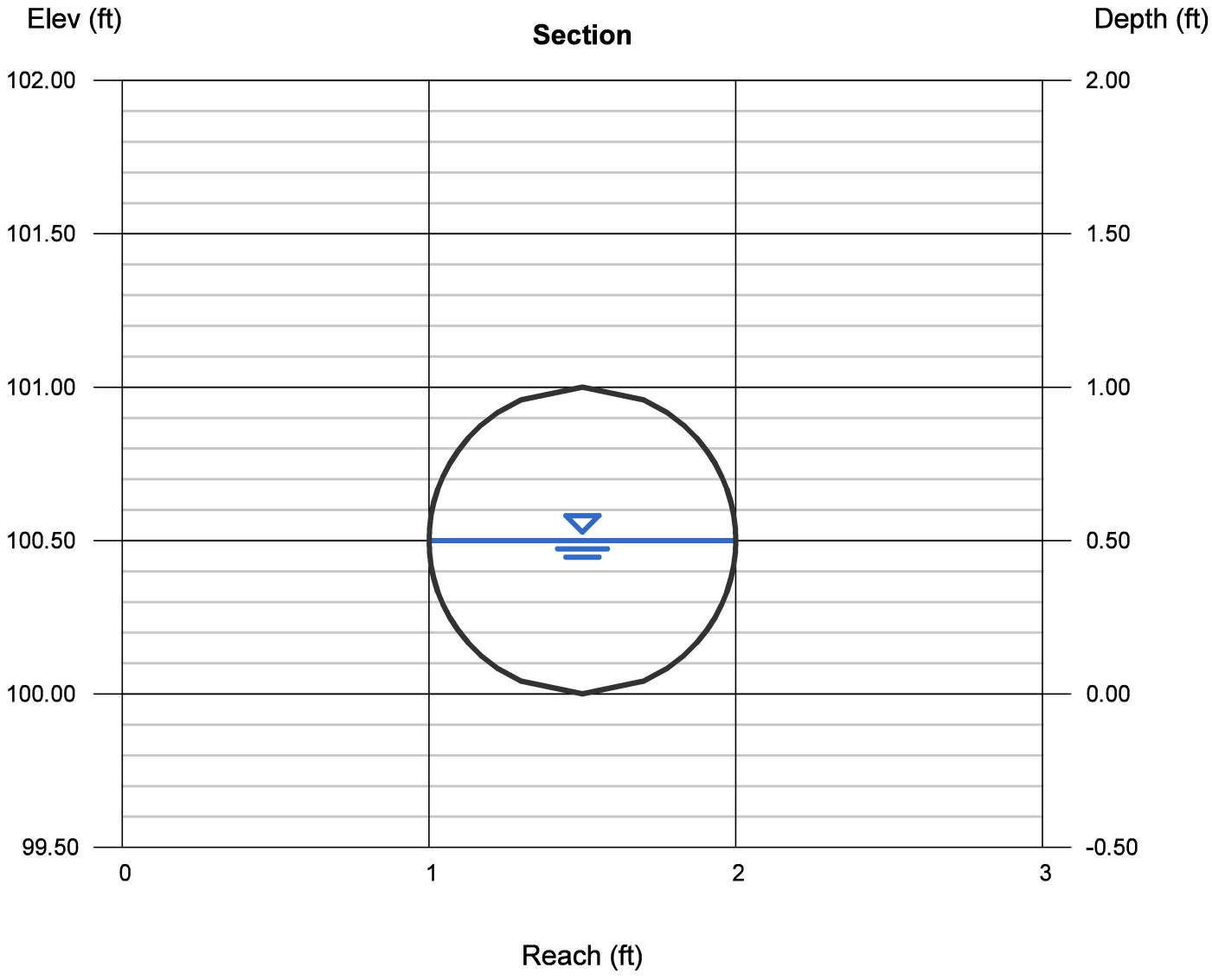
Diameter (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.44
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.50

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 1.190
Area (sqft)	= 0.39
Velocity (ft/s)	= 3.01
Wetted Perim (ft)	= 1.57
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 1.00
EGL (ft)	= 0.64



Appendix E – Existing Records

ORANGE COUNTY SANITATION DISTRICT
10844 Ellis Avenue
Fountain Valley, CA 92708
714.962.2411
www.ocsan.gov

ORANGE COUNTY SANITATION DISTRICT

Serving:
Anaheim
Brea
Buena Park
Cypress
Fountain Valley
Fullerton
Garden Grove
Huntington Beach
Irvine
La Habra
La Palma
Los Alamitos
Newport Beach
Orange
Placentia
Santa Ana
Seal Beach
Stanton
Tustin
Villa Park
County of Orange
Costa Mesa Sanitary District
Midway City Sanitary District
Irvine Ranch Water District
Yorba Linda Water District

Date: April 21, 2023

Subject: RE: Sewer Capacity Study for South Coast Plaza Village

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Thank you very much for providing the Sewer Capacity Study for South Coast Plaza Village (Study) and it was a pleasure meeting with you and the team last month. After review of the study, I can confirm the thoughts and comments about the existing capacity of the Orange County Sanitation District (OC San) sewers.

These comments included

1) The respective capacities of the 10" OC San sewer on Bear St and 15" OC San sewer on Plaza Dr would approach critical levels of capacity from this proposed project, but
2) There is sufficient capacity at the downstream 78-inch OC San trunk on Sunflower Ave.

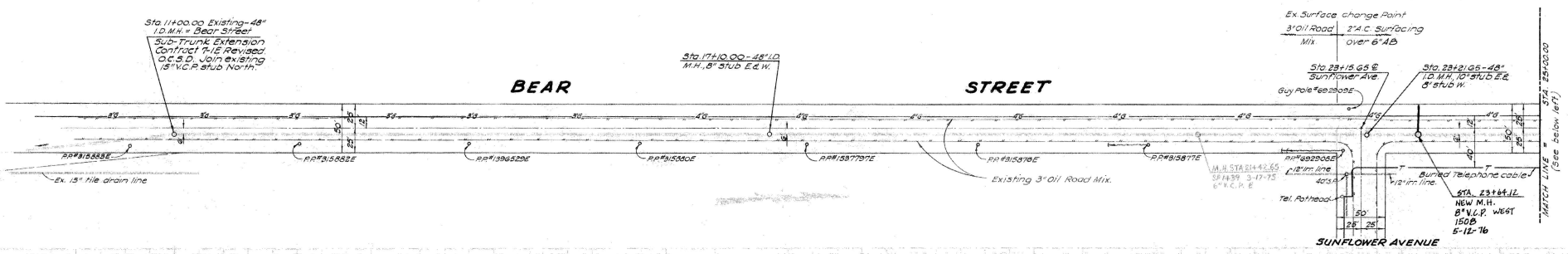
The Study proposed Blocks A&B discharge (0.24 MGD, gross peak) to the Bear St sewer, while Blocks C-H discharge (0.89 MGD, gross peak) to the Plaza Dr OC San sewer. Should the proposed routing of the sewers be maintained per the Study, OC San would at a minimum require a flow monitoring study that would compare and analyze the impacts to further validate and understand the hydraulics of the area.

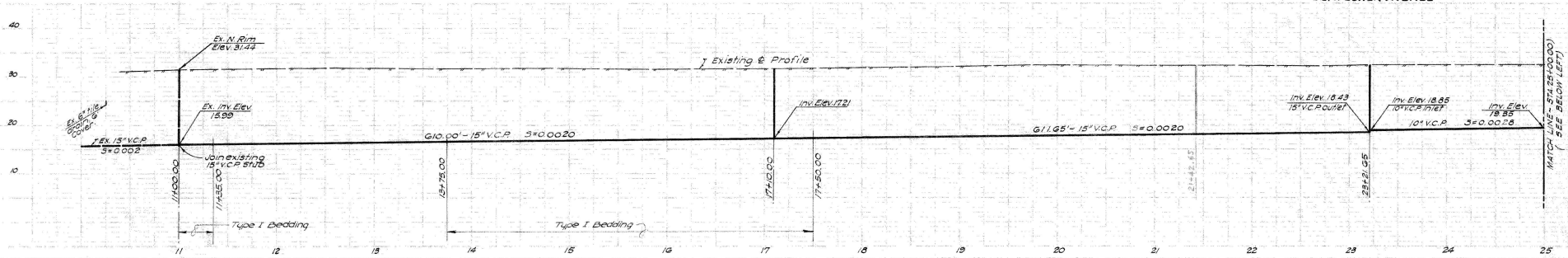
Additionally, the Study proposed up to a few sewer connections to the OC San sewers. Please be aware for your planning that any proposed new/modified connections will have to go through the Sewer Trunk Connection Permit application process. Please also be aware that OC San only allows new/modified connections at existing OC San sewers; no direct connections or new OC San manholes are permitted without a special variance.

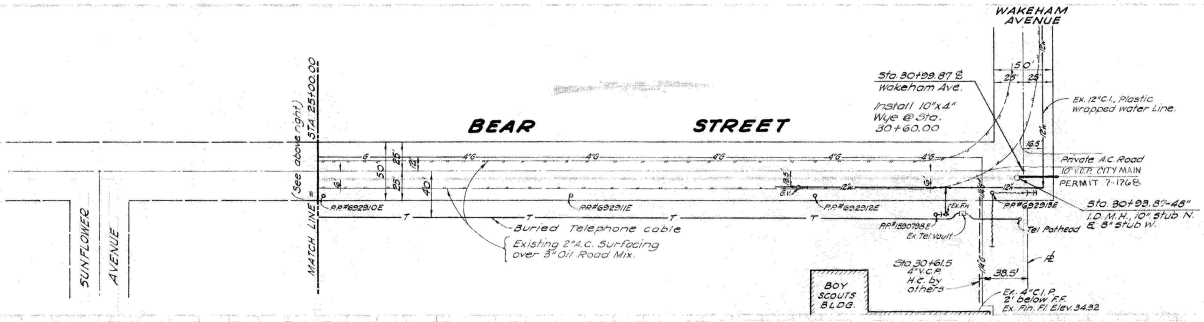
As discussed in the meeting, OC San suggests exploring consolidating the on-site sewers and discharging as close to the 78-inch trunk on Sunflower via local sewer. Please let me know if you have any questions or would like to discuss further.

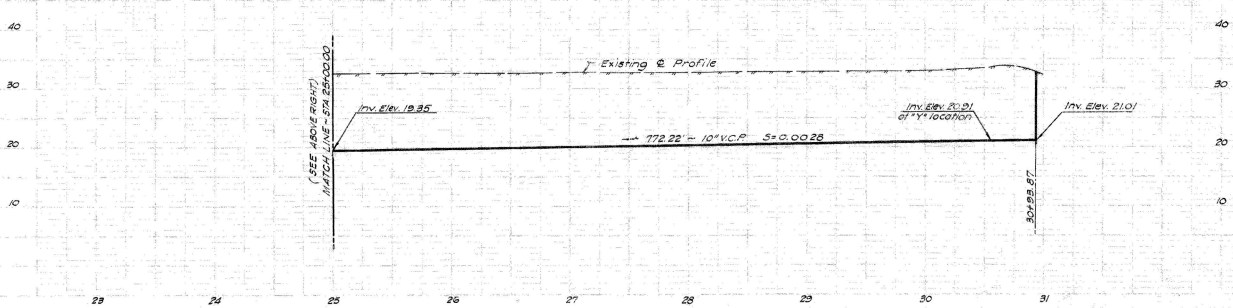
Thank you,

Daniel Lee, P.E.
Engineer
Orange County Sanitation District/Planning Division









AS BUILT

RA-16

BOY SCOUTS OF AMERICA

PLAN AND PROFILE

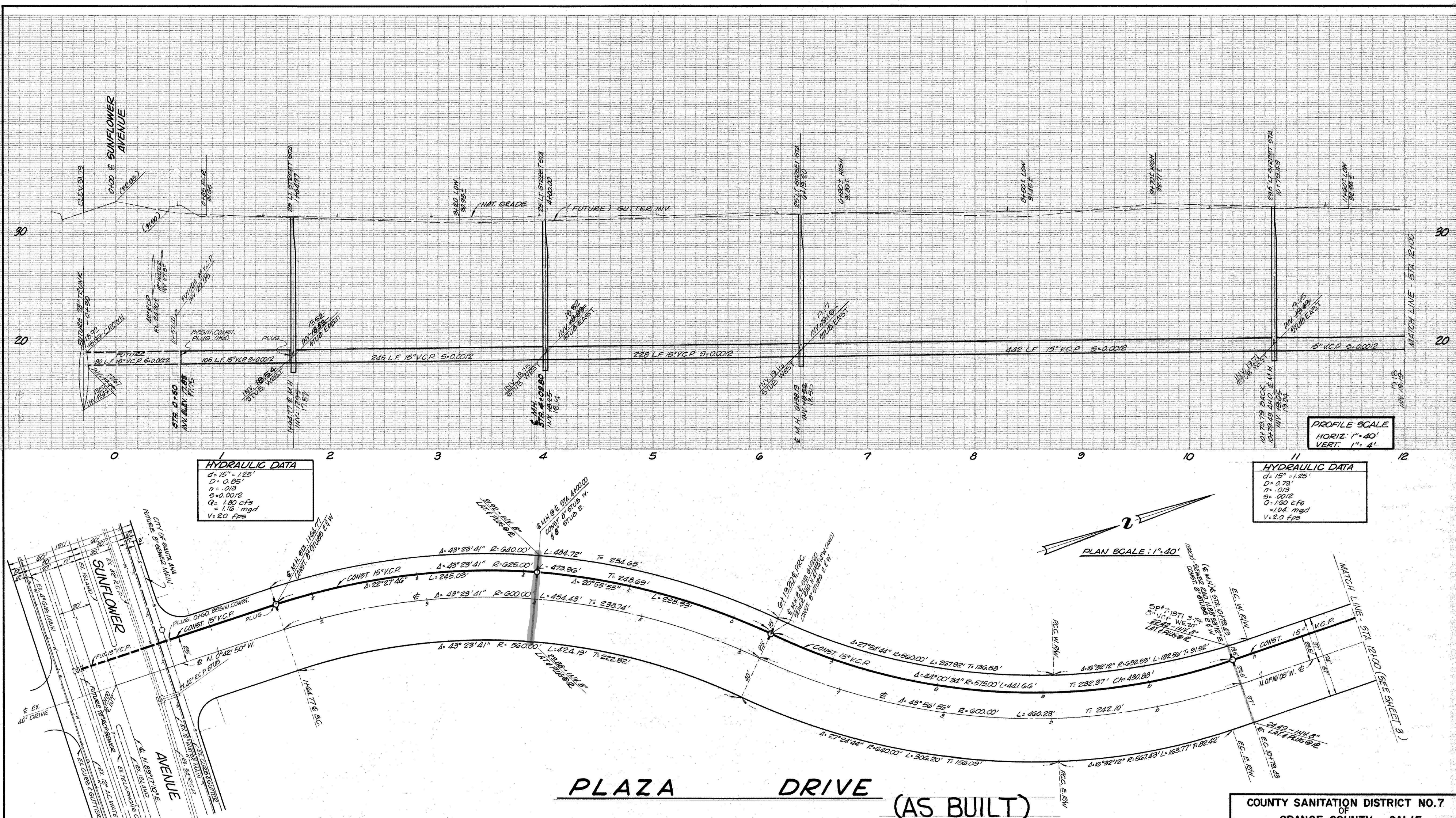
STA. 11+00.00 TO STA. 30+93.87

BEAR STREET SUB-TRUNK EXTENSION

S.L.L.	D.G.W.	APPROVED: Sidney L. Lowry	1
H.C.B.	Oct., 1964	SIDNEY L. LOWRY, R.C.E. 6210	2

O.C.S.D. F.B. #4, P.29-34

RA-16



(AS BUILT)

COUNTY SANITATION DISTRICT NO. 7 OF ORANGE COUNTY, CALIF.

TOUPS ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS
1801 N. COLLEGE AVE.
SANTA ANA CALIF. 541-4431

REVISIONS

NO.	DATE	ITEM	
2	10-27-71	"AS BUILT" INV. ELEV.	F.C.Z
1	9-15-71	"AS BUILT" - SHOW LATERALS	[initials]

DES. P.N.B. SCALE AS SHOWN DATE
DR. D.M. JOB NO.
CH. QM JWB F.B. NO. BT 2 PAGE 75-76

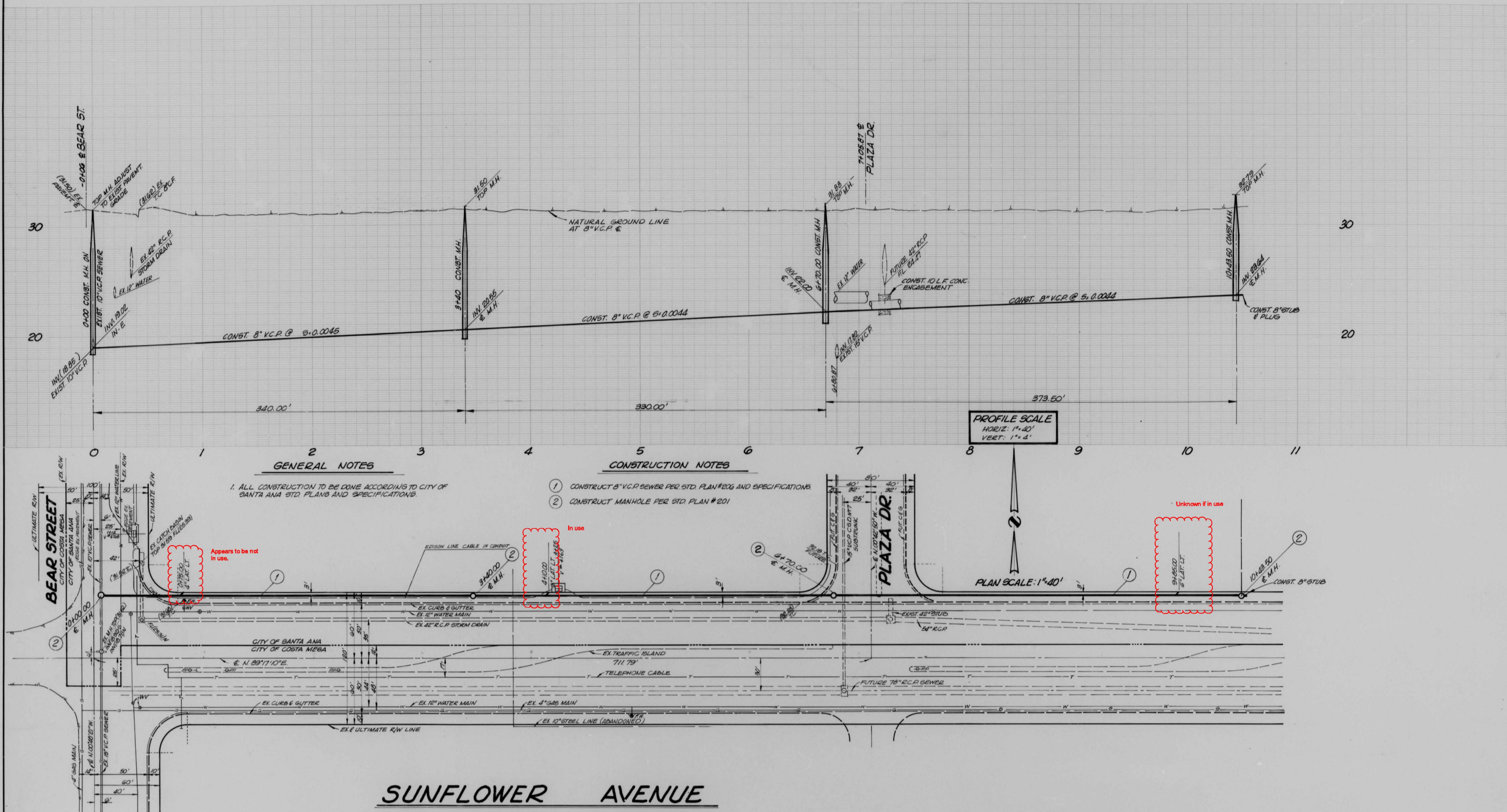
CLIENT SOUTH COAST PLAZA AND TOWN CENTER
PROJECT PLAZA DRIVE SUBTRUNK SEWER REACH 39
SHEET TITLE PLAN AND PROFILE FROM STA. 0+55 TO STA. 12+00

APPROVED Terrance K Barry R.C.E. 14010 FILE
SHEET NO. 2 OF 3 SHEETS REV.

7-6-2A

SUNFLOWER AVE: BEAR ST TO PLAZA DR. 1 OF 1
SS IMP. 4/71
VR: 71-4

HF: 29-43



REVISIONS				
NUMBER	DATE	INITIALS	DESCRIPTION	APP'V'D.
1	4-30-71		CORRECTED LOCATIONS OF SANTA ANA WATER MAINS	

REFERENCES

BENCH MARK: ELEV. 35.91
58-5A 29-6 MON. ON ℄-℄ ALTON & BRISTOL
(BELOW SURFACE IN CAPPED WELL)

TOUPS ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS - 1801 N. COLLEGE AVE., SANTA ANA CALIF. 714 541-4431

PREPARED UNDER THE SUPERVISION OF Terrance K. Barry 4-22-71
TERRANCE K. BARRY R.C.E. NO. 14010

DESIGNED	P.N.B.	4-15-71
DRAWN	D.M.	4-16-71
CHECKED	R.H.	
R/W APPROVED		
RECOMMENDED	Burk	4-71
APPROVED (ASSISTANT DIRECTOR OF PUBLIC WORKS R.C.E. 11026)		4-29-71

SANITARY SEWER
SUNFLOWER AVENUE
BEAR STREET TO PLAZA DRIVE

DEPARTMENT OF PUBLIC WORKS
CITY OF SANTA ANA
M/F 5MAR73
SHEET NO. 1 OF 1

VA 71-4

29-43