
APPENDIX M-1

PRELIMINARY SEWER STUDY

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PRELIMINARY SEWER STUDY

MAREA VILLAGE

1900 & 1950 N. Coast Highway 101
Encinitas, CA 92024
APN: 216-041-06, 20 and 21

PREPARED FOR

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TABLE OF CONTENTS

	<u>SECTION</u>
INTRODUCTION	1
PROJECT OVERVIEW.....	1.1
PROJECT DESCRIPTION	1.2
METHODOLOGY	2.0
PLANNING AND DESIGN CRITERIA.....	2.1
WASTEWATER FLOW GENERATION FACTORS.....	2.2
GRAVITY SEWERS.....	2.3
FLOW ANALYSIS	3.0
EXISTING SEWER FACILITIES.....	3.1
PROJECTED SEWAGE FLOWS.....	3.2
EXISTING AND PROJECTED FLOW ANALYSIS.....	3.3
RESULTS AND CONCLUSIONS	4.0

FIGURES

FIGURE 1-1: PROJECT SITE PLAN

TABLES

TABLE 1-2: LAND USAGE & EDU FACTORS

TABLE 2-2: SEWAGE GENERATION FACTORS

TABLE 3-2: PROJECTED SEWAGE FLOWS

TABLE 3-3: SUMMARY OF SEWER CAPACITY

APPENDICES

APPENDIX A: EXISTING SEWER FACILITIES MAP

APPENDIX B: PROPOSED ONSITE SEWER FACILITIES MAP

APPENDIX C: PROPOSED NORMAL DEPTH FLOW CALCULATIONS

1.0 INTRODUCTION

This report provides an overview of sewer service for the Marea Village development and recommends sewage facilities specific to the needs of the project. Marea Village is located in the City of Encinitas currently within the Leucadia Wastewater District (LWD) and LWD has existing facilities adjacent to the project site. This report will calculate sewage flows from the project, as well as recommend new onsite facilities and analyze whether existing offsite facilities have the capacity to accommodate project flows.

1.1 PROJECT OVERVIEW

Marea Village is located at 1900 & 1950 N. Highway 101 in the City of Encinitas. Elevations within the project range from 56 feet above mean sea level (AMSL) to 95 feet AMSL. The project is bordered to the south and west by Seabluff residential community, N. Highway 101 to the east, and the Encinitas Beach Hotel to the north. Access to Marea Village will be provided via private streets and one main road entrance off of N. Coast Highway 101 at the SE corner of the site as shown on Figure 1-1.

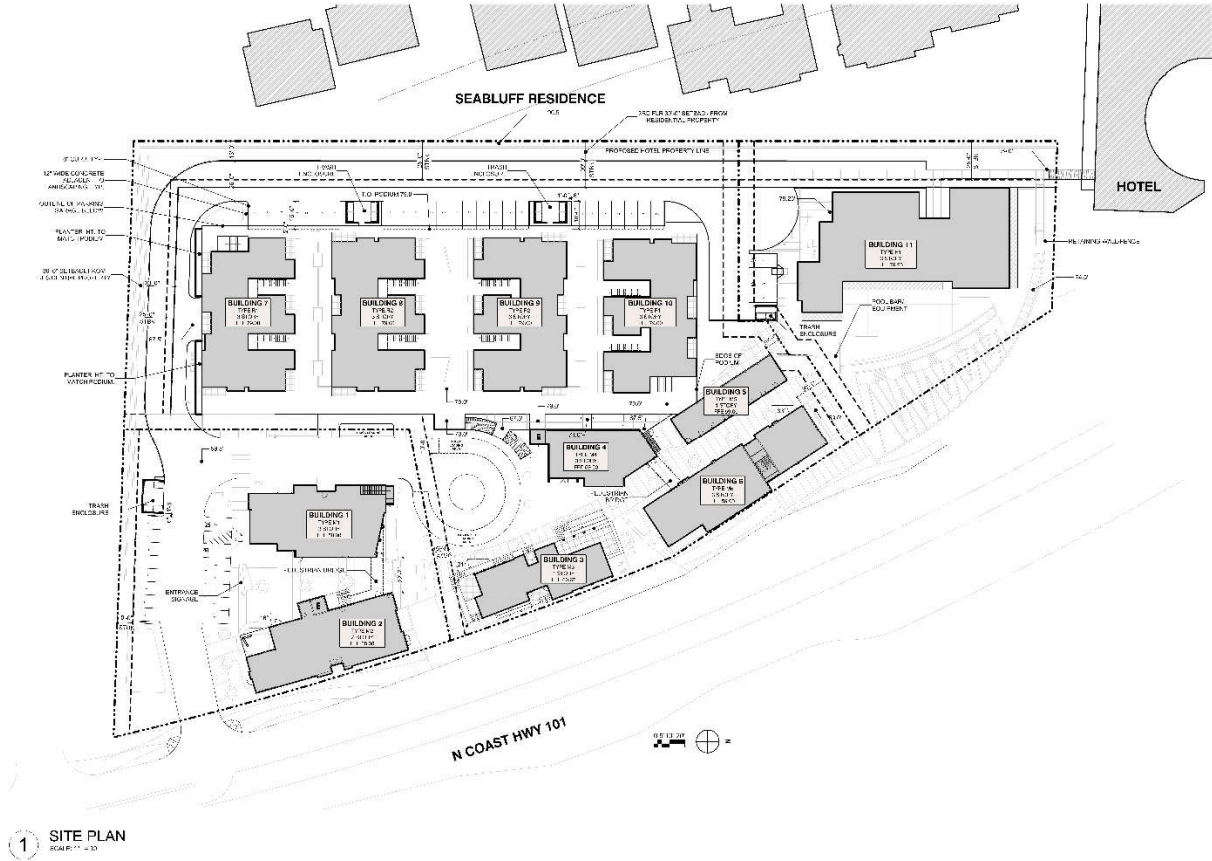


FIGURE 1-1: PROJECT SITE PLAN

1.2 PROJECT DESCRIPTION

Marea Village is a mixed-use project located on a 3.79-acre site and will consist of 94 rental apartment units, 30 hotel rooms and approximately 18,262 square feet of commercial uses.

The project's proposed land uses and their Equivalent Dwelling Unit values (according to Ordinance No. 141 from the Board of Directors of the Leucadia Wastewater District) are provided in Table 1-2.

The proposed on-site sewer improvements for the development will be private. See Appendix B for Proposed Onsite Sewer Facilities Map with the following references to existing sewer manhole (SMH) numbers and segment numbers.

Only sewage flows generated from Buildings 3, 4, 5 and 6 will flow through Segment 1. The sewage flows generated from the remainder of the project site will join those from Segment 1 at Ex. SMH #02-0500 and create a combined sewage flow through Segment 2 until reaching Ex. SMH #02-0490.

TABLE 1-2: LAND USAGE & EDU FACTORS			
Land Usage	EDU FACTORS	Prop. Units/Area/Seats	Total Prop. EDUs
Segment 1			
Bldg #3, Commercial	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	1,129 sf	1.6
Bldg #3, Restaurant	3.0 (45 seats max)	45 seats (estimate)	3
Bldg #4, Residential	1.0 (per living unit)	4 units	4
Bldg #4, Retail	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	1,898 sf	1.6
Bldg #4, Restaurant	3.0 (45 seats max)	45 seats (estimate)	3
Bldg #5, Commercial	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	1,544 sf	1.6
Bldg #6, Residential	1.0 (per living unit)	8 units	8
Bldg #6, Retail	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	2,490 sf	2.2
Bldg #6, Restaurant	3.0 (45 seats max) 1.0 (additional 15 seats)	60 seats (estimate)	4
Segment 1 EDUs			29.0
Segment 2			
Multiple Dwelling	1.0 (per living unit)	82 units	82
Hotel	0.55 (per unit w/ kitchen)	30 units	16.5
Bldg #1, Residential	1.0 (per living unit)	6 units	6
Bldg #1, Retail	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	2,652 sf	2.2
Bldg #1, Restaurant	3.0 (45 seats max)	41 seats (estimate)	3
Bldg #2, Residential	1.0 (per living unit)	4 units	4
Bldg #2, Commercial	1.0 (up to 1,000 sf), 0.6 (per 1,000 sf up to 5000 sf), 0.4 (per 1,000 sf over 5,000 sf)	2,509 sf	2.2
Bldg #2, Restaurant	3.0 (45 seats max) 1.0 (additional 15 seats)	53 seats (estimate)	4
Segment 2 (without Segment 1) EDUs			119.9
Segment 1 & 2 Combined EDUs			148.9

2.0 METHODOLOGY

2.1 PLANNING AND DESIGN CRITERIA

Leucadia Wastewater District has developed design standards and criteria that shall be used for the planning, design and construction of its sewer collection and transmission system within its service area. Sewer facility sizing for this study shall be based on the Leucadia Wastewater District Standard Specifications and Procedures for Wastewater Facility Projects dated May 2019.

2.2 WASTEWATER FLOW GENERATION FACTORS

The sewage generation factors used to project average flows from the project are summarized in Table 2-2. According to LWD Standard Specifications and Procedures for Wastewater Facility Projects, a flow factor of 215 gpd/EDU shall be used to calculate average sewage flows.

TABLE 2-2: SEWAGE GENERATION FACTORS

Land Usage	Average Flow Factor
Multiple Dwelling	215 gpd/EDU
Hotel	215 gpd/EDU
Commercial	215 gpd/EDU

2.3 GRAVITY SEWERS

All existing and proposed gravity sewers will be designed to convey peak dry weather flow in accordance with Leucadia Wastewater District Asset Management Plan (dated May 25, 2018). For pipes with a diameter smaller than 15-inches, the sewers will be designed to flow half full at peak flow. Manning's equation with $n=0.013$ will be used to size gravity sewers and all new sewers will be designed to maintain a minimum velocity of two feet per second at design capacity to prevent deposition of solids.

Manning's formula for open channel flow shall be used for hydraulic calculations:

$$V = \frac{1.486}{N} \times R^{\frac{2}{3}} \times S^{\frac{1}{2}} \quad \text{and} \quad Q=AV$$

V=Velocity (ft/s)

N=Manning coefficient of roughness = 0.013

R=Hydraulic radius (ft)=Area/Wetted Perimeter at specified depth of flow

S=Slope (ft/ft)

Q=Flow (cf/s)

A=Cross sectional open area of the pipe (sf)

3.0 FLOW ANALYSIS

3.1 EXISTING SEWER FACILITIES

This section analyzes the existing 8-inch LWD sewer system (Segments 1 and 2 on Appendix A) from the point of connection where flows from Marea Village enters (Ex. SMH #02-0510 and #02-0500 on Appendix A) and up until reaching existing SMH #02-0490 (see Appendix A) where the flows confluence with two other 8-inch inlets and outlet one 10-inch pipe flowing easterly across N. Coast Highway 101.

Description of Existing Facilities

LWD has several existing sewer facilities in the vicinity of the Marea Village project within N. Coast Highway 101. The closest available sewer facility to connect to from the project is an 8-inch diameter gravity sewer pipe adjacent to the project's right-of-way line. The sewer line flows north to south parallel to the right-of-way line and begins at a terminal manhole (Ex. SMH #02-0510) located at the midpoint of the project's right-of-way. From the terminal manhole, sewage flows travel south approximately 395 feet to a second existing manhole at the SE corner of the project site (Ex. SMH #02-0500). Flows then continue to travel to the south approximately 92 feet to a third existing manhole (Ex. SMH #02-0490) where additional flow from two other 8-inch diameter pipes combine and outlet into a 10-inch diameter pipe towards the east and into N. Coast Highway 101. See Appendix A for Existing Sewer Facilities Map.

Existing facilities downstream of SMH #02-0490 were not evaluated because they are trunk sewer lines whose necessary upgrades will be completed by LWD.

Existing Flows

Existing flows from the existing commercial area on the project site flow into the 8-inch sewer line. However, these commercial areas will be demolished and removed prior to the construction of Marea Village. In the proposed condition, only sewage flows from the

proposed development will enter and flow through the existing 8-inch pipe located along the project’s right-of-way.

3.2 PROJECTED SEWAGE FLOWS

Based on the sewage generation factors presented in Section 2.2 and the proposed development for Marea Village in Section 1.2, Table 3-2 provides the projected wastewater flows for the project.

Sewer pipelines must be designed and sized using peak flow conditions determined by multiplying average flows by a peaking factor. A peaking factor of 3.50 was applied for this project, according to LWD’s Standard Specifications’s Table 1-2-1 for populations less than 5,000. Total peak flow for Marea Village is also provided in Table 3-2.

TABLE 3-2: PROJECTED SEWAGE FLOWS

Quantity	Average Flow Factor	Total Average Sewage Flow
Segment 1		
29.0 EDUs	215 gpd/EDU	6,235 gpd
		.0062 mgd
		4.33 gpm
Segment 1 & 2 Combined		
148.9 EDUs	215 gpd/EDU	32,013.5 gpd
		.0320 mgd
		22.23 gpm
Total Average Sewage Flow	Peak Flow Factor	Peak Sewage Flow
Segment 1		
6,235 gpd/ 4.33 gpm	3.50	21,822.5 gpd/ 15.16 gpm
Segment 1 & 2 Combined		
32,013.5 gpd/ 22.23 gpm	3.50	112,047.25 gpd/ 77.81 gpm

3.3 EXISTING AND PROJECTED FLOW ANALYSIS

As previously stated, there will be no existing sewage that will continue to flow through the LWD 8-inch pipes in front of Marea Village’s right-of-way (Segments 1 and 2 on Appendix A). Only the project sewage flows from Section 3.2 will need to be analyzed.

Normal Depth Flow Calculations were completed using Advanced Engineering Software’s (AES) Hydraulic Elements program and can be found in Appendix C. Table 3-3 summarizes the flow analysis results for Segments 1 and 2 in the final proposed condition.

TABLE 3-3: SUMMARY OF SEWER CAPACITY

Segment No.	Pipe Diameter (D)	Existing Slope	Existing Peak Flow	Add'l Peak Flow	Total Prop. Peak Flow	Prop. d/D	Velocity
1	8"	0.38%	0	15.16 gpm/ 0.03 cfs	15.16 gpm/ 0.03 cfs	0.13	1.3 ft/s
2	8"	0.76%	0	77.81 gpm/ 0.17 cfs	77.81 gpm/ 0.17 cfs	0.28	2.2 ft/s

4.0 RESULTS AND CONCLUSIONS

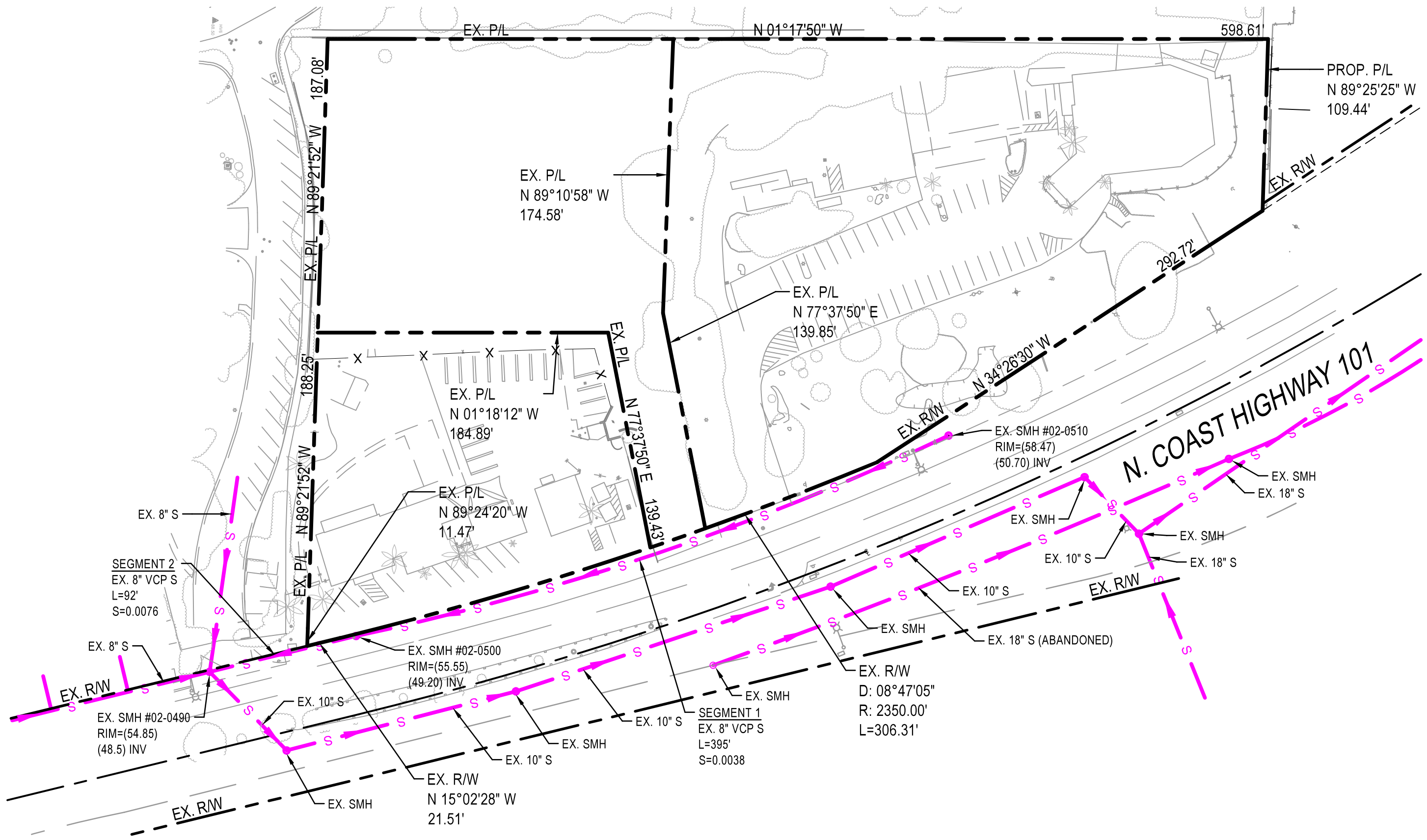
Based on the results from Appendix C and Table 3-3, the max d/D value within Segments 1 and 2 is 0.28. This is under the max value of 0.5 for 15 inch pipes or smaller, according to Leucadia Wastewater District Asset Management Plan (dated May 25, 2018). The existing pipes analyzed have enough capacity to carry the expected sewage flows of the proposed development.

Based on the results from Appendix C and Table 3-3, the velocity in segment 1 one does not meet the minimum 2 ft/s required per Leucadia Wastewater District. However, it should be noted that in the existing condition, velocity for Segment 1 also does not meet the minimum velocity requirement and that due to additional sewage flows in the proposed condition, the proposed project will help improve velocity.

Existing facilities downstream of Segments 1 and 2 were not evaluated because they are trunk sewer lines whose necessary upgrades will be completed by LWD. This proposed project will provide its share of contribution for any future upgrades by payment of their capacity fee.

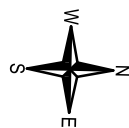
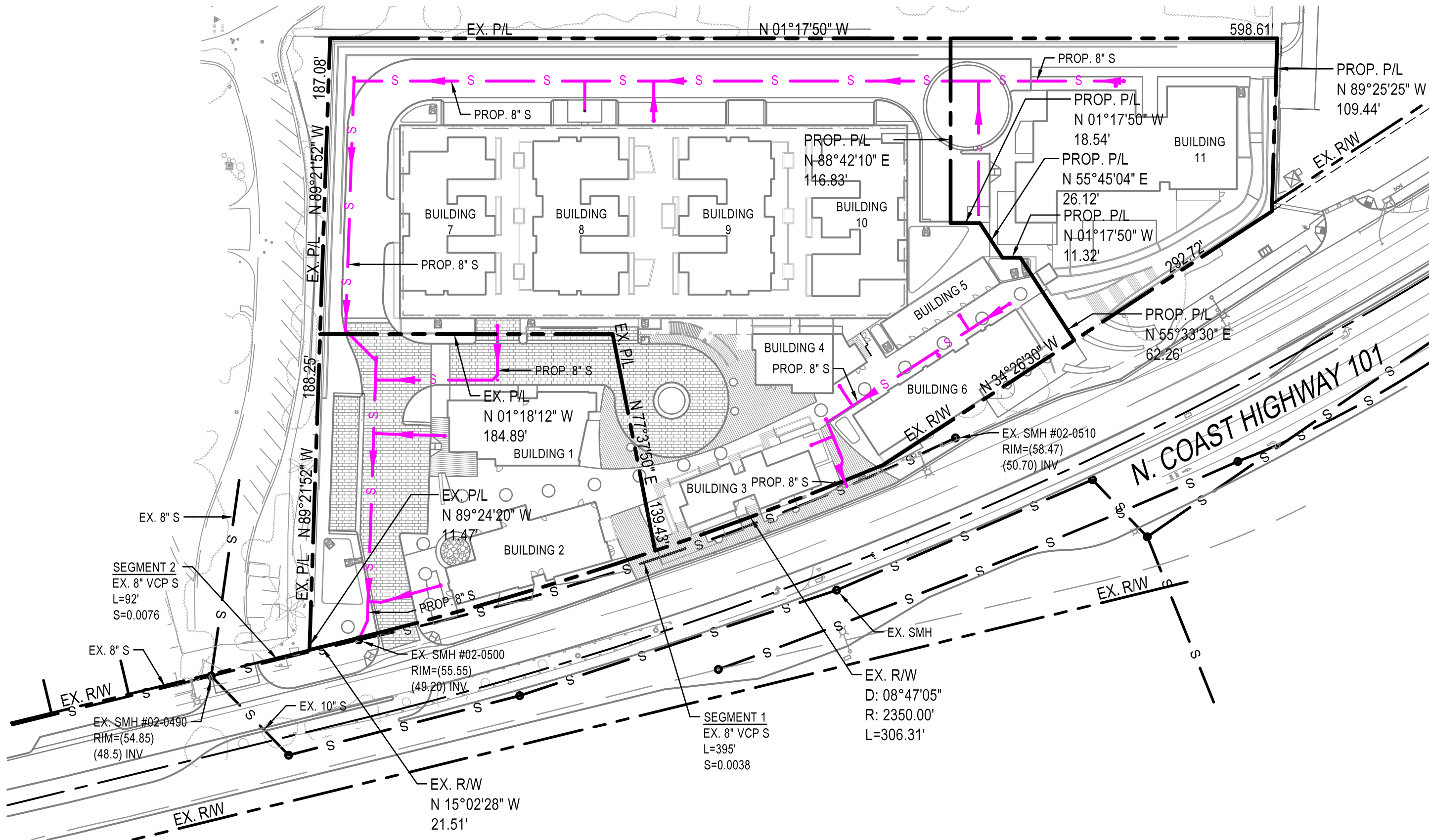
APPENDIX A

EXISTING SEWER FACILITIES MAP



APPENDIX B

PROPOSED ONSITE SEWER FACILITIES MAP



APPENDIX C

PROPOSED NORMAL DEPTH FLOW CALCULATIONS

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE
(C) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1452

Analysis prepared by:

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TIME/DATE OF STUDY: 09:03 02/02/2021
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Problem Descriptions:
Segment 1 Analysis

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

PIPE DIAMETER(FEET) = 0.670
PIPE SLOPE(FEET/FEET) = 0.0038
PIPEFLOW(CFS) = 0.03
MANNINGS FRICTION FACTOR = 0.013000
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL DEPTH(FEET) = 0.08
CRITICAL FLOW AREA(SQUARE FEET) = 0.023
CRITICAL FLOW TOP-WIDTH(FEET) = 0.430
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 0.12
CRITICAL FLOW VELOCITY(FEET/SEC.) = 1.310
CRITICAL FLOW VELOCITY HEAD(FEET) = 0.03
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.05
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.10
=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 0.09
FLOW AREA(SQUARE FEET) = 0.03
FLOW TOP-WIDTH(FEET) = 0.459

FLOW PRESSURE + MOMENTUM(POUNDS) = 0.13
FLOW VELOCITY(FEET/SEC.) = 1.042
FLOW VELOCITY HEAD(FEET) = 0.017
HYDRAULIC DEPTH(FEET) = 0.06
FROUDE NUMBER = 0.734
SPECIFIC ENERGY(FEET) = 0.11

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TIME/DATE OF STUDY: 09:15 02/02/2021
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Problem Descriptions:
Segment 2 Analysis

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

PIPE DIAMETER(FEET) = 0.670
PIPE SLOPE(FEET/FEET) = 0.0076
PIPEFLOW(CFS) = 0.17
MANNINGS FRICTION FACTOR = 0.013000
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL DEPTH(FEET) = 0.19
CRITICAL FLOW AREA(SQUARE FEET) = 0.081
CRITICAL FLOW TOP-WIDTH(FEET) = 0.603
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 1.09
CRITICAL FLOW VELOCITY(FEET/SEC.) = 2.086
CRITICAL FLOW VELOCITY HEAD(FEET) = 0.07
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.14
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.26
=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 0.18
FLOW AREA(SQUARE FEET) = 0.08
FLOW TOP-WIDTH(FEET) = 0.595

FLOW PRESSURE + MOMENTUM(POUNDS) = 1.09
FLOW VELOCITY(FEET/SEC.) = 2.216
FLOW VELOCITY HEAD(FEET) = 0.076
HYDRAULIC DEPTH(FEET) = 0.13
FROUDE NUMBER = 1.087
SPECIFIC ENERGY(FEET) = 0.26
