# 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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CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING

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# 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 Seabluffe 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.

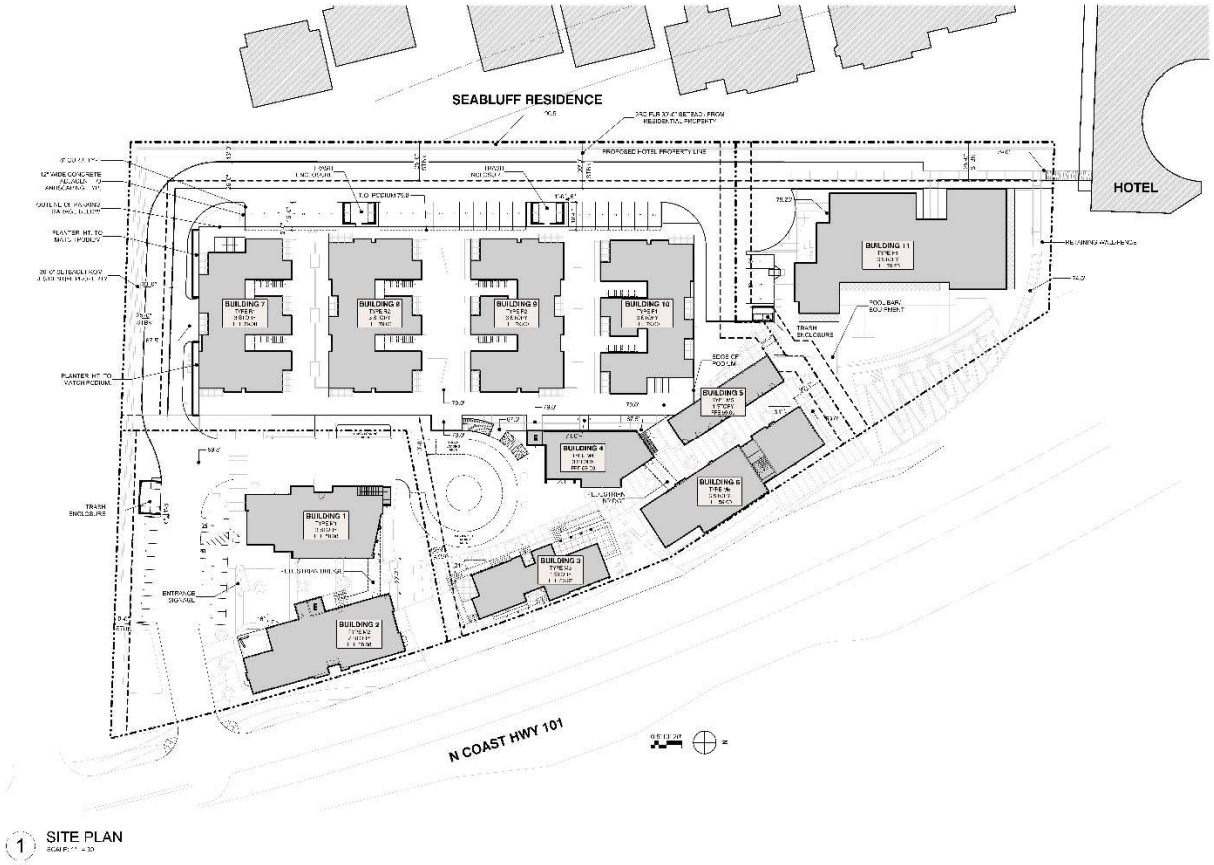


**FIGURE 1-1: PROJECT SITE PLAN**

## 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)<br>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)<br>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 Procesures 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 hall 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

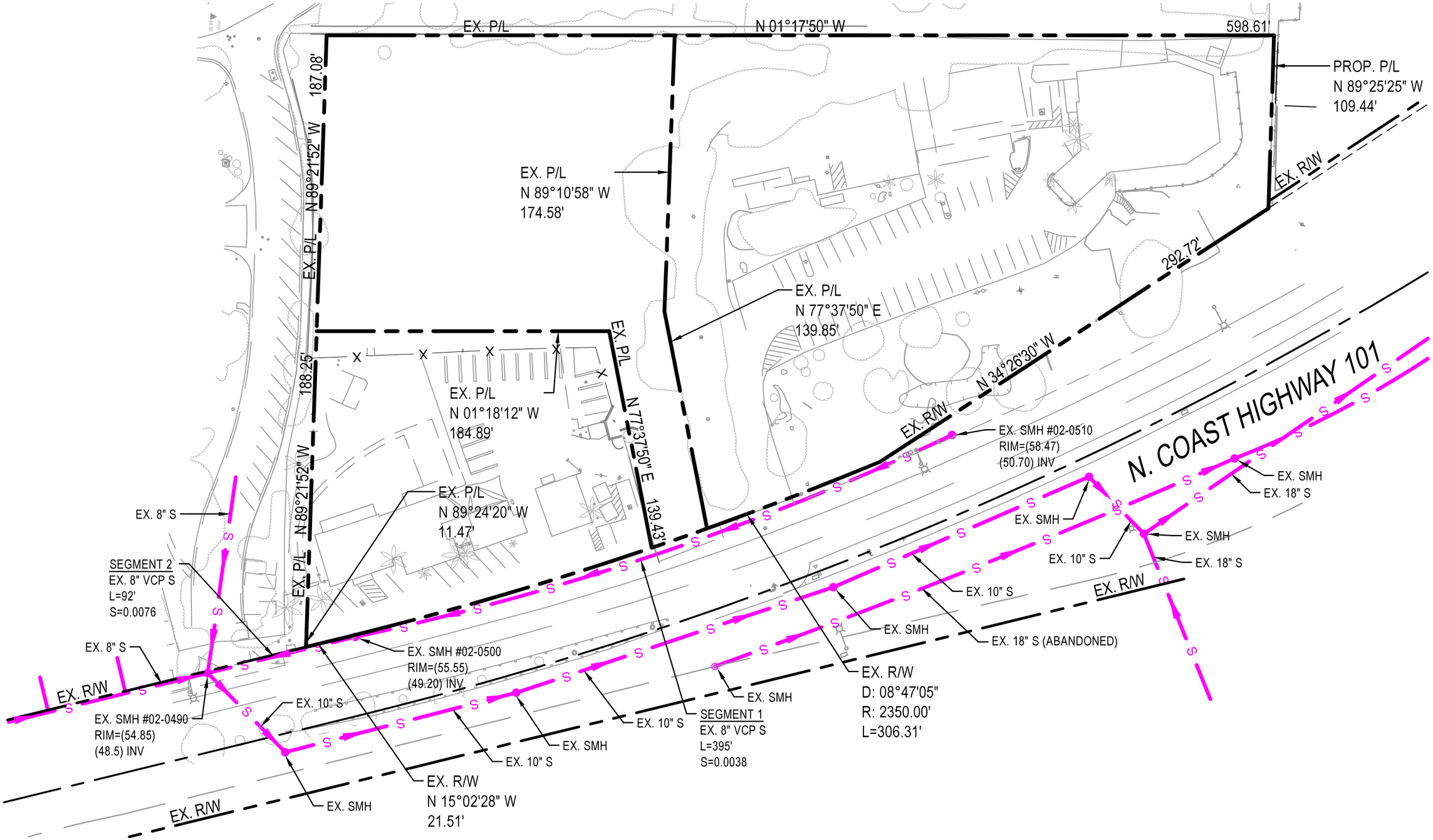


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EXHIBIT

SCALE = 1" = 60'

N
W E
S

# EXISTING SEWER FACILITIES MAP

SHEET 1 OF 1

# APPENDIX B

## PROPOSED ONSITE SEWER FACILITIES MAP

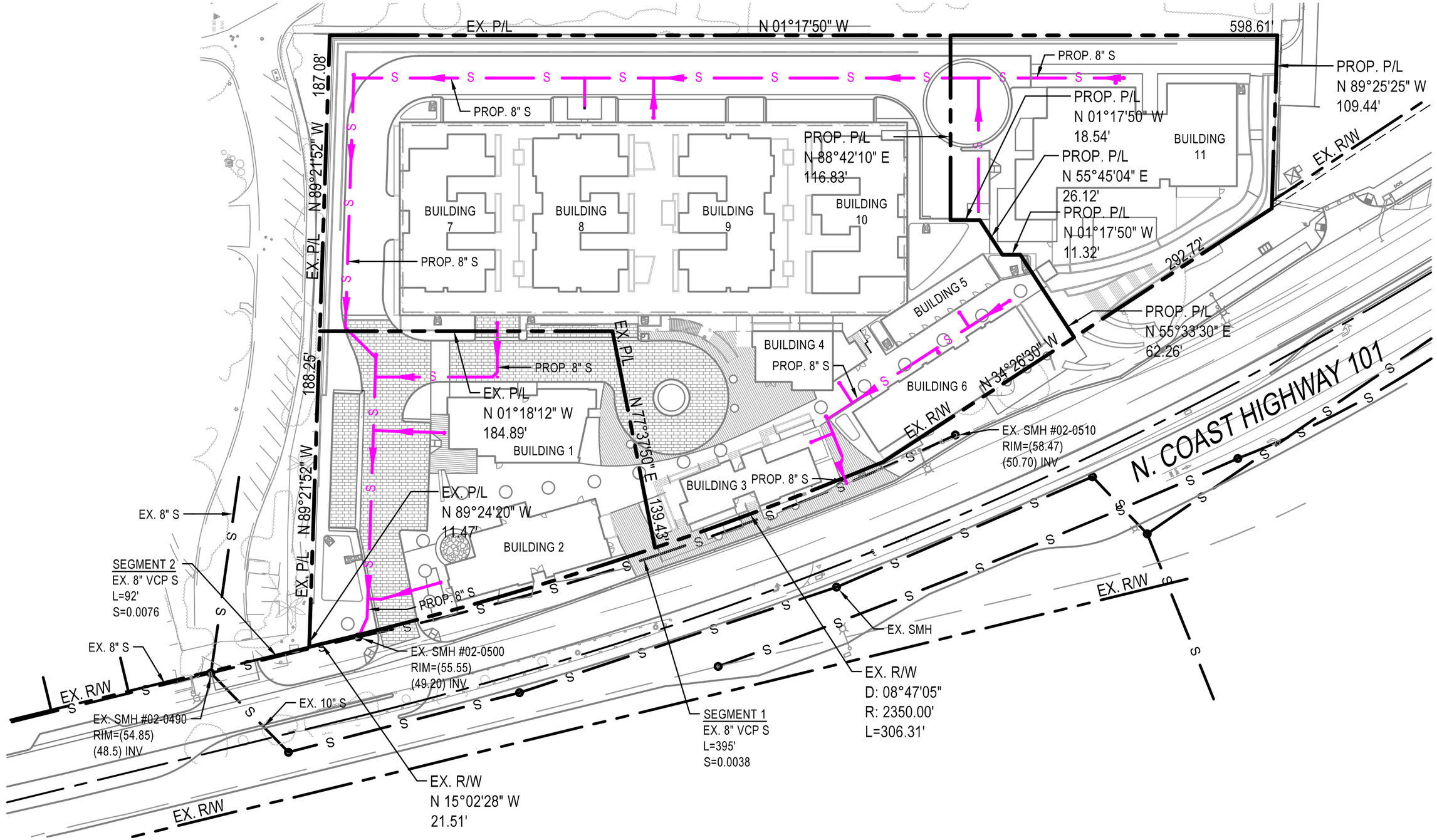


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EXHIBIT

SCALE = 1" = 60'

PROPOSED ONSITE SEWER FACILITIES MAP

SHEET 1 OF 1

# 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
========================================================================
 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
================================================================================
```

```
 ************************************************************************
                HYDRAULIC ELEMENTS - I  PROGRAM PACKAGE
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                           Analysis prepared by:

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 ------------------------------------------------------------------------
   TIME/DATE OF STUDY: 09:15 02/02/2021
 ========================================================================
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
================================================================================
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