# **Appendix N-5**EMWD Sewer Capacity Study

## **SEWER CAPACITY STUDY**

**EMWD** 

FOR

## **CARGO GATEWAY D1 PARCEL**

Riverside, CA

Prepared for:

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#### **SECTION 1.0 NARRATIVE**

#### 1.1 Introduction

The purpose of this report is to determine the capacity of the proposed sewer main conveying wastewater to the existing 8" EMWD sewer line and proposed manhole (Node 202) along Heacock Street. This report will analyze the capacity of the proposed 8" sewer main extending from the 8" EMWD existing sewer line and the proposed 8" sewer main going into the Node 202 manhole. The study will focus on the proposed sewer flows generated by the Cargo Gateway D1 Parcel and the existing Amazon building to the south of the private drive.

#### 1.2 Site Description

The area of this study includes one proposed development with one ~180,000 sf building and one existing development with one ~225,000 sf building. The uses are summarized as follows (See Ultimate Tributary Area Land Use map in Section 3):

- o Proposed D-1 Building
  - Light Industrial 10.54 tributary acres
- Existing Amazon Building
  - Light Industrial 14.85 tributary acres

#### 1.3 Proposed Sewer Systems

The proposed sewer system consists of two 8" services joining at a point (Node 201) and discharging to the existing 8" EMWD sewer line (Node 202). The initial 8" sewer line services the proposed D-1 building and cargo plane lavatory discharge line. Existing sewer studies performed on other sites with airport land use indicated that the lavatory discharge adds negligible flow to the peak sewer capacity requirement and no sewer flow is accounted for from this lateral (node 101). The second 8" sewer line services the existing Amazon building to the south of the private drive by intercepting the existing 4.5" sewer force main and conveying the discharge to the 8" main in the private drive. The laterals are 8" PVC pipe. The proposed D-1 building site includes 10.54 tributary acres of sewer service and the remaining portion of the site is composed of airport ramps. The existing Amazon building accounts for 14.85 tributary acres.

Based on EMWD standards for design, utilizing a manning's value of 0.013, the maximum allowable percentage full of sewage flow is 50% for 8" pipes.

#### 1.4 Wastewater Generation

The wastewater generation is estimated by land use and the generation factors from Eastern Municipal Water District 2015 Wastewater Collection System Master Plan Table 1 (See Table 1 in Section 4).

The proposed D-1 building and Amazon building are best described under the business park/light industrial land use with an EDU/ACRE of 5 and have a sewer generation rate of 1,175 GPD/ACRE per EMWD Sewer Design Guidelines. After the base daily flow is determined, EMWD requires a peaking factor to be applied to determine the peak design flow rate. The peaking factor is based upon the daily flow rate per the Peaking Factor Comparison chart from 3A2.2 of the 2015 Wastewater Collection System Master Plan. For the studied mains, the peaking factor used was 2.87.

The flow conditions in existing and proposed sewers were calculated in accordance with EMWD Sewer Design Guidelines. Manning's Equation is used to calculate the sewage flow condition in each pipe segment by using a roughness coefficient (n) of 0.015, the minimum pipe slope is per the record drawings and the minimum flow velocity is 2 fps. The flow rate from each tributary area is equal to the area acreage multiplied by the generation rate factor multiplied by the peaking factor:

PDWF (Q) = Acreage (A) x Generation Rate (Z) x Peaking Factor

The following table summarizes the average dry weather flow (ADWF) and peak dry weather flow (PDWF).



Table 3-1 Peak Flow Summary Table

Peak Flow Summary								
LAND USE CATEGORY	DISCHARGE LOCATION	ACREAGE (A)	DEVELOPMENT DENSITY (EDU/ACRE)	WASTEWATER GENERATION FACTOR (Z)	PEAKING FACTOR	ADWF (CFS)	PDWF (CFS)	
Business Park/Light	D-1	10.54	5	1,175 GPD/ACRE	2.87	0.0192	0.0550	
Industrial	Amazon	14.85	5	1,175 GPD/ACRE	2.87	0.0270	0.0775	
Total		25.39	5	1,175 GPD/ACRE	2.87	0.0462	0.1325	

#### 1.5 Sewer Capacity Analysis

Figure 3.1 shows the proposed sewer system with the corresponding tributary flow relationships of each lot. The figure also shows the land use and corresponding acreages for each proposed development. Using this map, the areas tributary to the EMWD sewer lines were tabularized. See Sewer Generation Tables on the Sewer Map in Section 3.

Max flow from the Cargo Gateway D-1 Parcel (North) – 0.0550 CFS at a water depth of 0.125' (19.0%).

Max flow from the combined D-1 Parcel and Amazon building (South) -0.1325 CFS at a water depth of 0.117' (23.1%).

The EMWD lateral will flow under their potential design capacity (50%) based on the minimum slopes seen in the laterals.

#### 1.6 Conclusion

In conclusion, the proposed 8" sewer lines and existing 8" EMWD sewer main have the capacity to handle flows from the proposed future developments.



## Section 2 Sewer Capacity Calculation

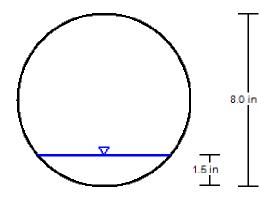


## Worksheet for 8" Pipe - D1 (Node 102)

Drain at Departure		<u> </u>	_
Project Description			
Friction Method	Manning		
	Formula		
Solve For	Normal Depth		
Innut Data			
Input Data			
Roughness Coefficient	0.013		
Channel Slope	0.0040 ft/ft		
Diameter	8.0 in		
Discharge	0.0550 cfs		
Results		_	
Normal Depth	1.5 in		
Flow Area	0.0 ft <sup>2</sup>		
Wetted Perimeter	0.6 ft		
Hydraulic Radius	0.9 in		
Top Width	0.51 ft		
Critical Depth	1.3 in		
Percent Full	18.2 %		
Critical Slope	0.0069 ft/ft		
Velocity	1.27 ft/s		
Velocity Head	0.03 ft		
Specific Energy	0.15 ft		
Froude Number	0.772		
Maximum Discharge	0.8221 cfs		
Discharge Full	0.7642 cfs		
Slope Full	0.0000 ft/ft		
Flow Type	Subcritical		
Tiow Type	Saberraear		
GVF Input Data			
Downstream Depth	0.0 in		
Length	0.0 ft		
Number Of Steps	0		
GVF Output Data			
Upstream Depth	0.0 in		
Profile Description	N/A		
Profile Headloss	0.00 ft		
Average End Depth Over Rise			
Normal Depth Over Rise	15.3 %		
Downstream Velocity	Infinity ft/s		
Upstream Velocity	Infinity ft/s		
Normal Depth	1.5 in		
Critical Depth	1.3 in		
Channel Slope	0.0040 ft/ft		
Critical Slope	0.0069 ft/ft		
Chical Slope	ייטטט וויונ		

## Cross Section for 8" Pipe - D1 (Node 102)

Project Description				
Friction Method	Manning Formula			
Solve For	Normal Depth			
Input Data				
Roughness Coefficient	0.013			
Channel Slope	0.0040 ft/ft			
Normal Depth	1.5 in			
Diameter	8.0 in			
Discharge	0.0550 cfs			

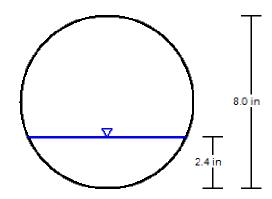


## Worksheet for 8" Pipe - D1 & Amazon (Node 202)

Project Description		
Friction Method	Manning	
	Formula	
Solve For	Normal Depth	
Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.0032 ft/ft	
Diameter	8.0 in	
Discharge	0.1325 cfs	
Results		
Normal Depth	2.4 in	
Flow Area	0.1 ft <sup>2</sup>	
Wetted Perimeter	0.8 ft	
Hydraulic Radius	1.4 in	
Top Width	0.61 ft	
Critical Depth	2.0 in	
Percent Full	29.9 %	
Critical Slope	0.0065 ft/ft	
Velocity	1.51 ft/s	
Velocity Head	0.04 ft	
Specific Energy	0.23 ft	
Froude Number	0.705	
Maximum Discharge	0.7353 cfs	
Discharge Full	0.6835 cfs	
Slope Full	0.0001 ft/ft	
Flow Type	Subcritical	
GVF Input Data		
Downstream Depth	0.0 in	
Length	0.0 ft	
Number Of Steps	0	
GVF Output Data		
Upstream Depth	0.0 in	
Profile Description	N/A	
Profile Headloss	0.00 ft	
Average End Depth Over Rise	0.0 %	
Normal Depth Over Rise	0.0 %	
Downstream Velocity	0.00 ft/s	
Upstream Velocity	0.00 ft/s	
Normal Depth	2.4 in	
Critical Depth	2.0 in	
Channel Slope	0.0032 ft/ft	
Critical Slope	0.0065 ft/ft	

## Cross Section for 8" Pipe - D1 & Amazon (Node 202)

Project Description		
Friction Method	Manning Formula	
Solve For	Normal Depth	
Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.0032 ft/ft	
Normal Depth	2.4 in	
Diameter	8.0 in	
Discharge	0.1325 cfs	

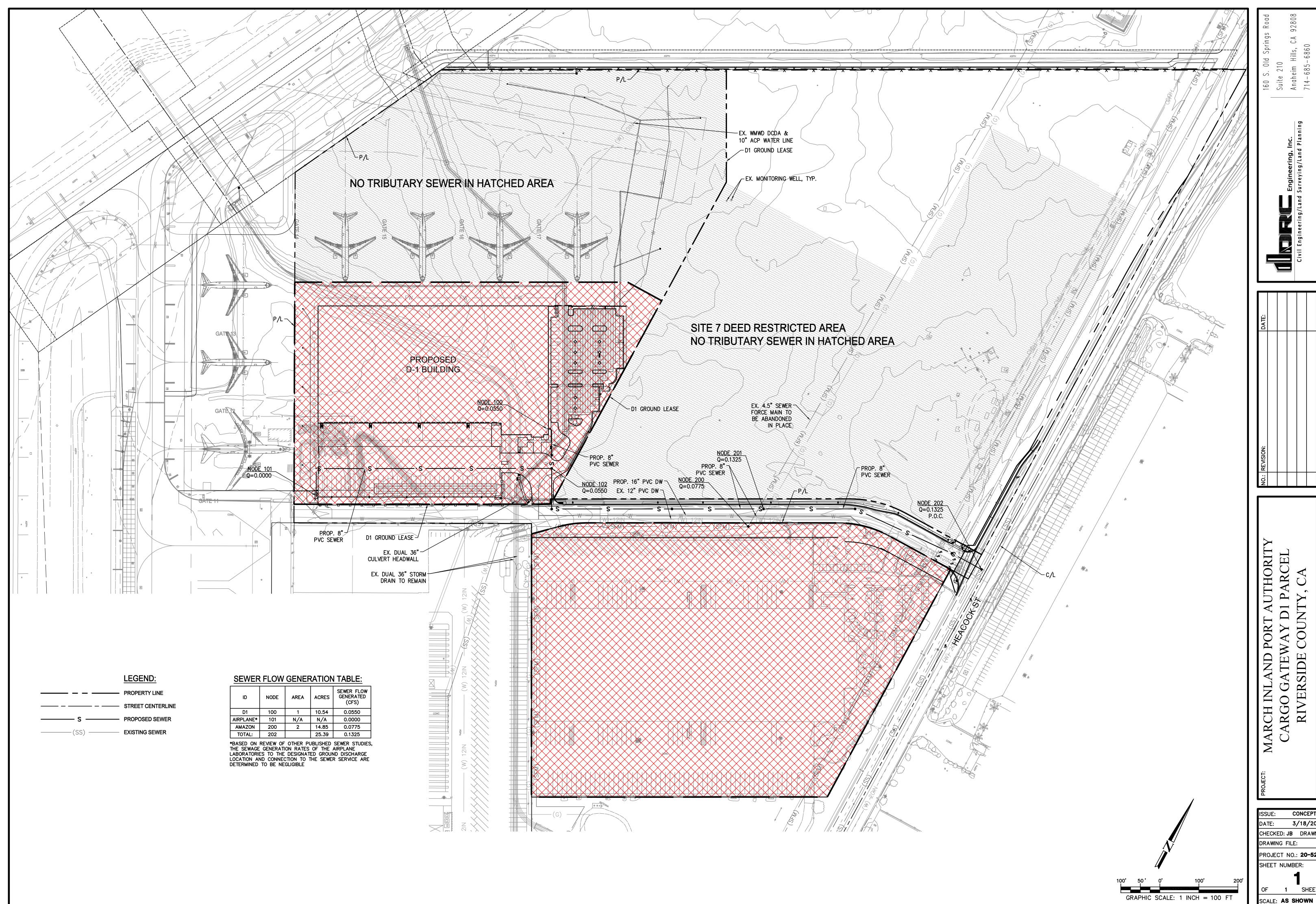


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# Section 3 Figures

Fig. 3.0 Location Map





RIVERSIDE COUNT SEWER MAP

CONCEPTUAL 3/18/2024 CHECKED: JB DRAWN: DG PROJECT NO.: **20-522** 

1 SHEETS

## Section 4 Reference Plans



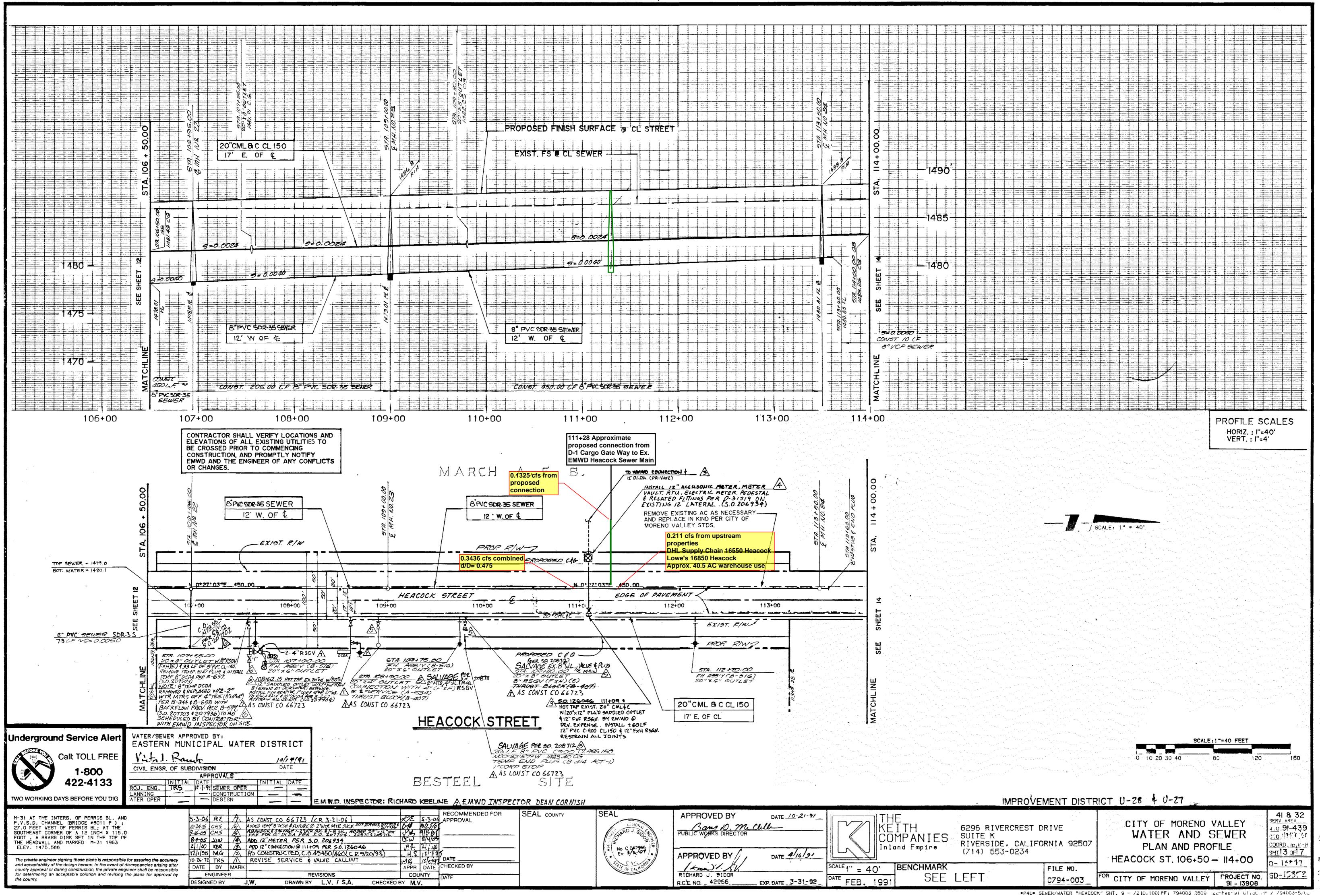
## F. Sewer Calculation Tables

Table 1 - EMWD - System Design and Loading Criteria **Average Daily Flow:** 

**Table 1: Development Densities** 

LAND USE CATEGORY	UNITS	AVERAGE RESIDENTIAL DENSITY (DU/ACRE)	RESIDENTIAL (EDU/DU)	DEVELOPMENT DENSITY (EDU/ACRE)
Residential Land Use				
Estate Density	DU	0.5	1.5	0.8
High Density	DU	12	0.7	8.4
Low Density	DU	2	1.3	2.6
Medium Density	DU	4.5	1	4.5
Medium High Density	DU	6	0.9	5.4
Mobile Home Park	DU	10	0.65	6.5
Rural Mountainous (1)	DU	0.1	3	0.3
Rural (1)	DU	0.2	3	0.6
Very High Density	DU	17	0.65	11.1
Very Low Density (1)	DU	1	1	1.5
Non-Residential Use				
Agriculture (1)	acre			0
Business Park/Light Industrial	acre			<u></u>
Business Park/Light Industrial/Warehouse	acre			1.25
Commercial Office	acre			5
Commercial Retail	acre			5
Heavy Industrial	acre			7.5
Hospital	acre			5
Mixed Use Policy Area	acre			5
Open Space (Conservation, Landscape, Recreation, Rural, or Water) (1)	acre			5
Public Facilities (Municipal or School)	acre		do not contribute (	5

(1) The following uses were assumed to be served by septic systems and do not contribute flow to the wastewater collection system: Rural Mountainous, Rural, Very Low Density, and Agriculture, and Open Space.



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