APPENDIX J – SEWER AREA STUDY

SEWER AREA STUDY

FOR

VESTING TENTATIVE TRACT No. 6061
BELTRAMO RANCH
11944 WEST LOS ANGELES AVE.
MOORPARK, CA 90604

Prepared for:

Warmington Residential
3090 Pullman Street
Costa Mesa, CA 92626

June, 2021

Prepared by:

United Civil Inc.
30141 Agoura Road, Suite 215
Agoura Hills, CA 91301
Tel: (818) 707-8648
Fax: (818) 707-8649

Table of Contents

I. INTRODUCTION

The following Sewer Area Study is to determine and show

a. The capacity of the existing sewer segments from proposed development to existing 8" sewer in Loretta Drive and 21" sewer in Maureen Lane.

b. The existing sewer facility will adequately service the proposed development.

II. SITE DESCRIPTION

The proposed 7.41 acres of Vesting Tentative Tract No. 6061 is located in the City of Moorpark, Ventura County, California as shown on the enclosed Vicinity Map in Appendix A. The site is located on Southside of Los Angeles Ave. and is bounded by the Arroyo Simi to the South, single family development to the West and East, and Los Angeles Avenue to the North.

III. PROJECT DESCRIPTION

Currently, the project site is a developed single family residence, Beltramo Ranch Road a private drive, and the Foursquare Church. The site is proposed for a total of 47 single family residential units with private drive and firelane access roads.

Reference attached Site Plan in Appendix B for detailed site layout.

IV. SEWER PIPE CAPACITY ANALYSIS

There is an existing 8" sewer main within Loretta Lane at the southern side of the proposed project from Ventura County Water Works District 1 As-Built Plan Drawing No. 46553 A, See Appendix D. The existing sewer system in Loretta Lane consists of 8" vitrified clay pipe with gravity flow at 1.25% slope, and connects to 21" vitrified clay sewer pipe located in Maureen Lane. The 21" sewer line in Maureen Lane is sloped at rates of 0.45% and 0.60%. There are 3 single family residences and 1 vacant single family lot served by Loretta Lane 8" sewer. For the purposes of this report we will be using the proposed 47 single family units of this project and the existing 4 units to total 51 single family residence to be served by existing 8" Loretta and 21" Maureen sewers. A flow test on the existing 21" Maureen

Lane sewer line has been performed by ADS Environmental Services in May of 2021 and the results are located in Appendix G. The flow test shows the existing flow rates within 21" sewer for a 7-day period. We will use the peak flow provided in the report of 0.6 million gallons per day (MGD) which is equivalent to 1.11 cfs for the purposes of this study.

The sewer system in this area is maintained by the Ventura County Water and Sanitation (VCWS). The Sewerage Manual by the County of Ventura Public Works Agency is used as a guideline for the sewer system analysis. The peak and average sewer discharge and pipe capacity is calculated based on section 2.1 Sewer Capacities. Referenced pages are attached in Appendix F.

The site and its vicinity tributary areas for this project is shown on Sewer Area Exhibit in Appendix C. The anticipated sewer discharge, Q average[cfs], is calculated based on section 2.121 Population Densities and 2.123 Average Flow Rate, per equation below:

$$Q\ average = (3.5\ person\ per\ unit) * (51\ single\ fam.units) * 0.00012$$

$$\underline{Q\ average = \ 0.021\ cfs}$$

The peak flow is calculated based on section 2.11 General, per equation below:

$$\underline{Q\ peak = (Q\ average) * (2.65) = 0.06\ cfs}$$

The pipe capacities are calculated using the Manning Equation with n=0.013 per section 2.141. The results verify that the existing 8" sewer within Loretta Lane will be at a depth of 0.10' with peak flow and the proposed 8" sewer sloped at 0.4% will be at depth 0.13', see Appendix E.

The results of the flow meter test within Maureen Lane 21" sewer main show that existing peak metered flow is 1.11 cfs. We conducted pipe hydraulic analysis using the peak metered flow plus the additional 0.06 cfs from our proposed project for a total combined peak flow of 1.17 cfs. The results verify that the existing 21" sewer, sloped at 0.45%, will be at a depth of 0.40' during peak flow, see Appendix E

V. CONCLUSION

The existing 8" sewer system being analyzed in this area study has the capacity to convey proposed peak flow with a depth of 0.10'. The existing 21" sewer within Maureen Lane has the capacity to convey the existing peak and proposed sewage at a depth of 0.40'. The proposed 8" sewer pipe sloped at the minimum allowable 0.4% will be at flow depth of 0.13'. All of these peak flow depths are below the 50% capacity of the pipes.

Based on the analysis, we conclude that the existing and proposed sewer system has adequate capacity to service the Tentative Tract 6061, 47 unit single family residence housing development.

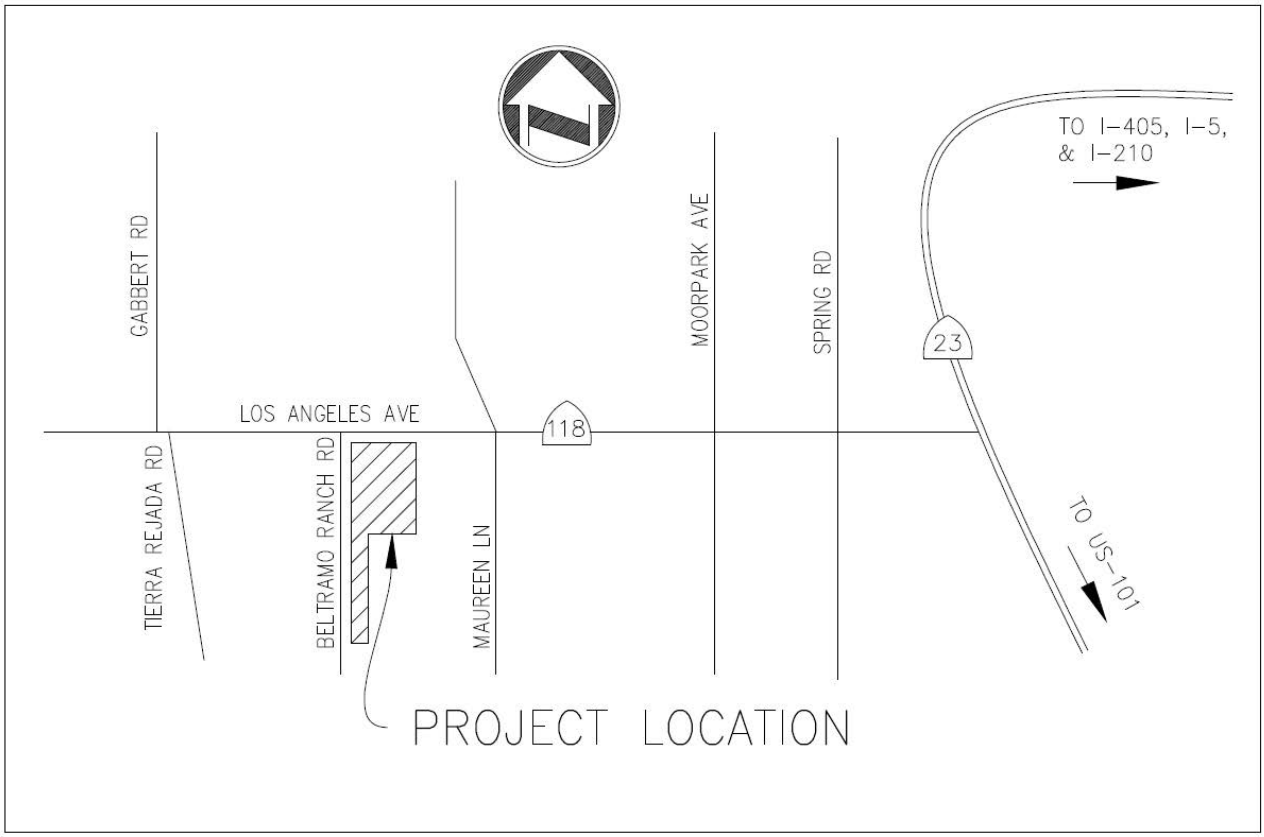
REFERENCES

i. "County of Ventura Public Works Agency Sewerage Manual", dated Revised 08/26/86, by Ventura County Public Works.

PREPARED BY:

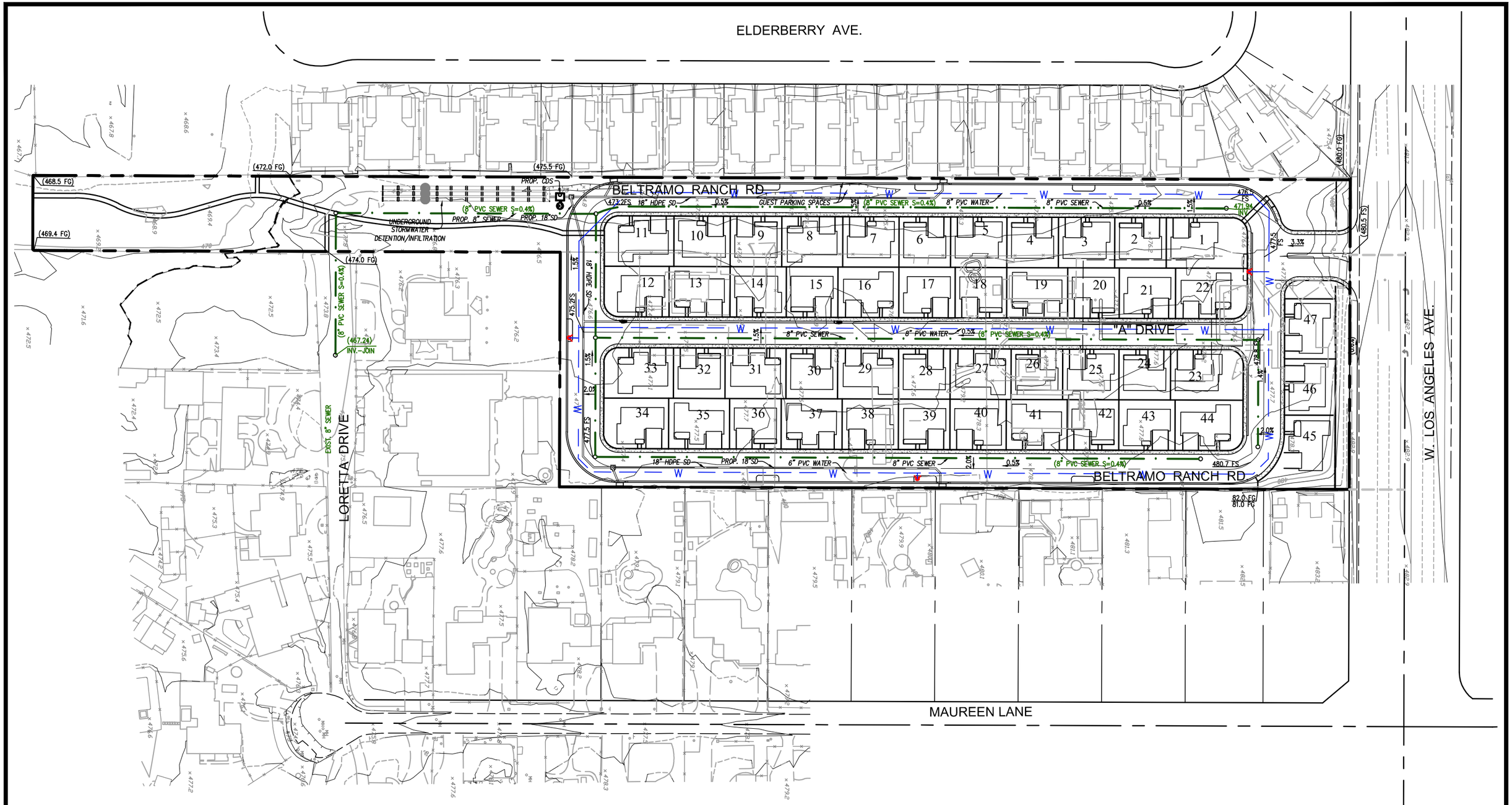
Matthew A. Sawyer

APPENDIX A – VICINITY MAP



VICINITY MAP
NTS

APPENDIX B − SITE PLAN



SCALE: 1" = 100'

0 100 200 300

SITE PLAN

BELTRAMO RANCH – TENT. TRACT 6061

MOORPARK, CA

UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8648
FAX: (818) 707-8649

5/22/21

APPENDIX C − SEWER AREA EXHIBIT

ELDERBERRY AVE.

BELTRAMO RANCH RD.

8" PVC SEWER S=0.4%

474.5 RIM
469.0 INV.

(8" PVC SEWER S=0.4%)

477.8 RIM
471.7 INV.

EXISTING UNDEVELOPED
SINGLE FAMILY RESIDENCE

EXISTING
SINGLE FAMILY RESIDENCE

8" PVC SEWER S=0.4%

(474.5 RIM)
(467.24 INV. - JOIN)
W/ CLEANOUT

475.5 RIM
469.5 INV.

PROPOSED 47 UNIT
SINGLE FAMILY RESIDENCE
BELTRAMO RANCH
TENTATIVE TRACT 6061

(8" PVC SEWER S=0.4%)

478.8 RIM
472.3 INV.

"A" DRIVE

EXISTING
SINGLE FAMILY RESIDENCE

EXISTING
SINGLE FAMILY RESIDENCE

477.5 RIM
470.0 INV.

480.5 RIM
472.5 INV.

480.7 RIM
472.7 INV.

BELTRAMO RANCH RD.

(8" PVC SEWER S=0.4%)

(EXIST. 8" SEWER S=1.25%)

LORETTA DRIVE

W. LOS ANGELES AVE.

EX GAS

EX WTR

EX SWR

(EXIST. 21" SEWER S=0.60%)

(EXIST. 21" SEWER S=0.45%)

MAUREEN LANE

FLOW METER TEST LOCATION
AT MANHOLE IN MAUREEN AVE.

LEGEND

- EXIST. SINGLE FAM. RESID. TRIBUTARY AREA
- BELTRAMO RANCH TT. 6061 TRIBUTARY AREA
- DIRECTION OF SEWAGE FLOW
- EXISTING SEWER PIPE
- PROPOSE SEWER PIPE

SCALE: 1" = 100'

0 100 200

SEWER AREA EXHIBIT

BELTRAMO RANCH – TENT. TRACT 6061

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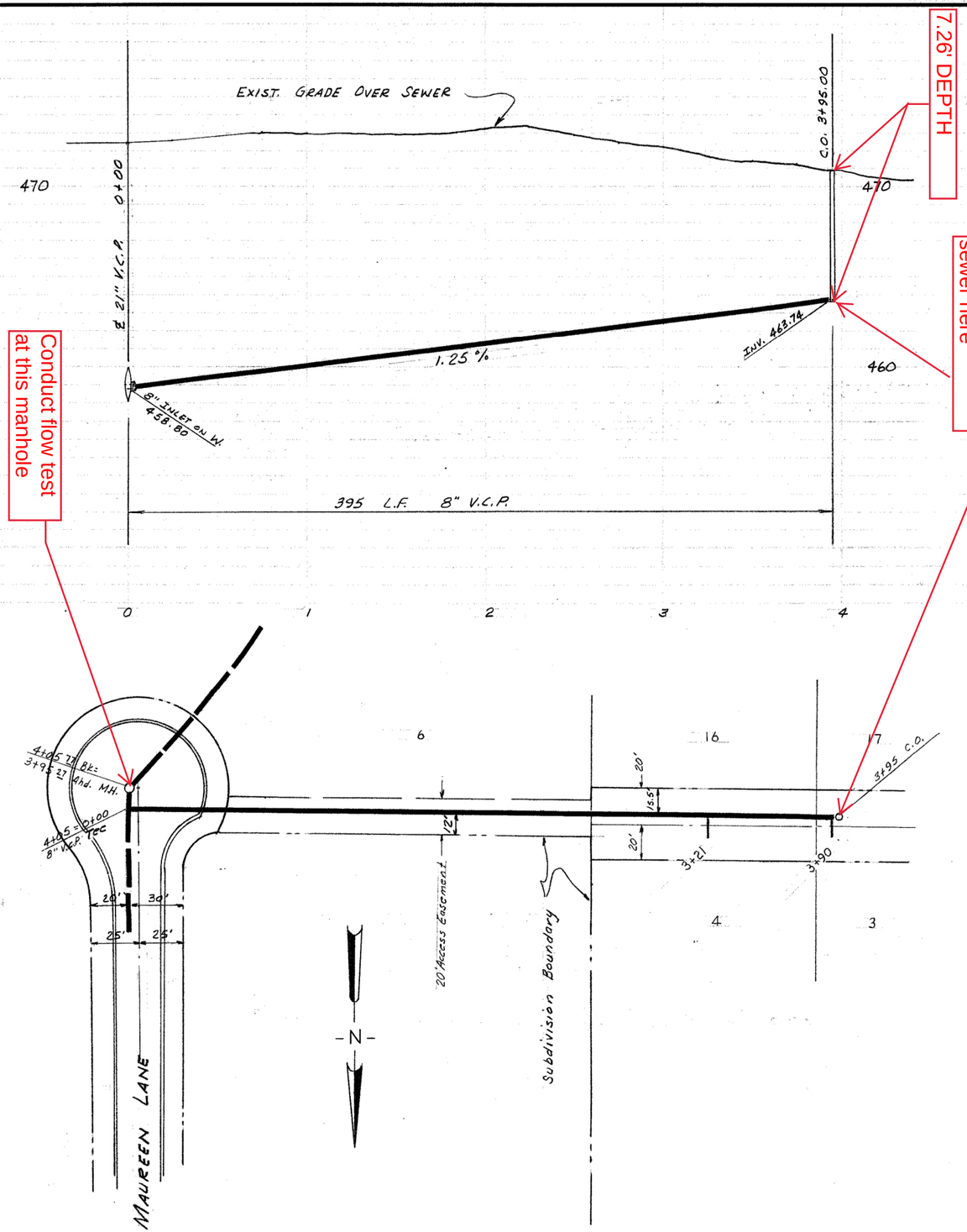
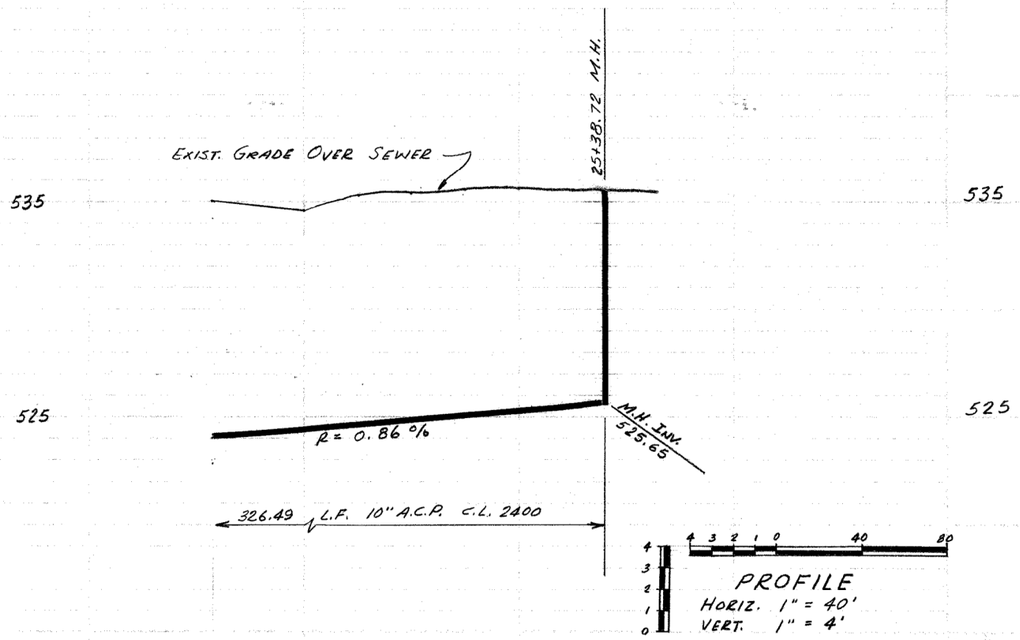
FAX: (818) 707-8649

5/22/21

APPENDIX D − AS-BUILT SEWER PLANS

8-773

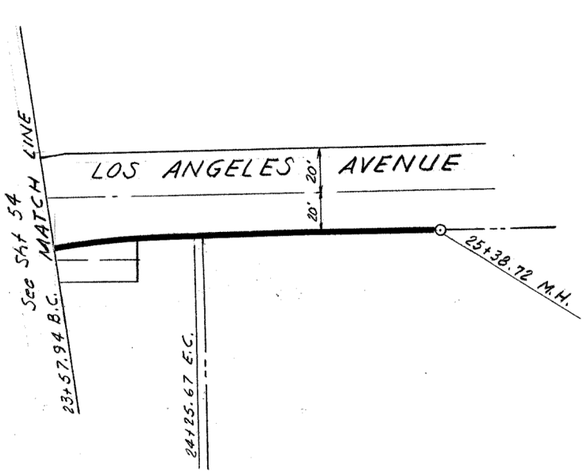




PLAN

4 3 2 1 0 40 80

SCALE : 1" = 40'



℄ SEWER CURVE DATA
Δ = 4°51'00"
R = 800'
L = 67.72

"AS-BUILT"
10-7-68

D				Designed L.B.
C				Drawn J.S.
B				Checked R.T.
A				Spec. No.
△	Revisions	By	Date	Datum
Approved	By	Chief Engr.		Field Books
Approved	By	Engr. Mgr.		
Scale	Date			

VENTURA COUNTY WATER WORKS DISTRICT NO. 1
MOORPARK SEWER COLLECTION SYSTEM

PREPARED BY:
POMEROY – MADERA
(A JOINT VENTURE)
FOR

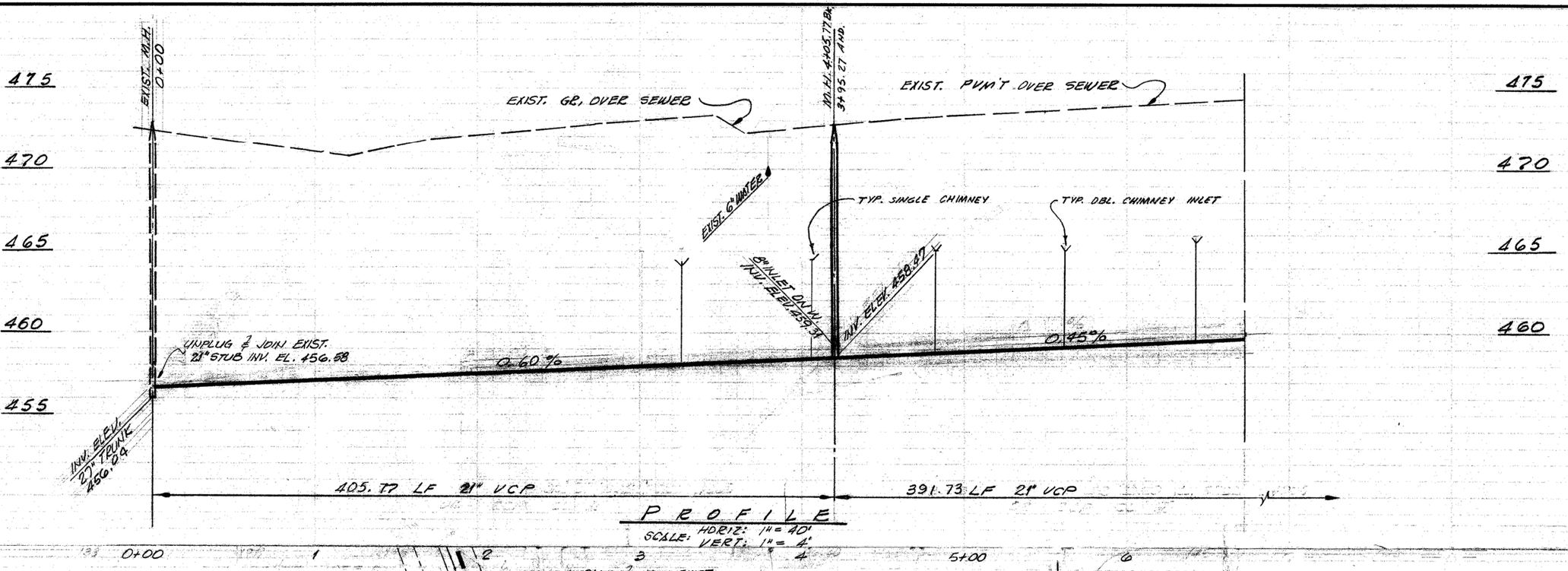
COUNTY OF VENTURA
DEPARTMENT OF PUBLIC WORKS

ALLEY at South End of MAUREEN LANE
LOS ANGELES AVENUE
23+57.94 B.C. to 25+38.72 End

Sheet 54A of 88 Sheets | Drawing No. 46553 A

281-17224/17335-5

8741



UTILITY FACILITIES ARE SHOWN AS BELIEVED TO EXIST AT TIME OF SURVEY. FACILITIES MAY HAVE BEEN OMITTED, MISPLACED AND/OR RELOCATED. CONTRACTORS SHALL PROTECT ALL UTILITIES WHETHER SHOWN ON PLANS OR NOT.

William L. Jensen 7-3-67
RCE 10276 DATE

D				Designed A.P.J.
C				Drawn J.G.G.
B				Checked C.B.J.
A				Spec. No. W.W. 68-3
△	Revisions	By	Date	Datum
Approved 9-21-67	By H.P. Pulmeier	Dep. Dir.		Field Books
Approved	By	Engr. Mgr.		Proj. No. 3180
Scale GRAPHIC		Date JULY 21, 1967		

COUNTY WATER WORKS DISTRICT NO. 1
PARK SEWER COLLECTION SYSTEM

PREPARED BY:
POMEROY — MADERA
(A JOINT VENTURE)
FOR

COUNTY OF VENTURA
DEPARTMENT OF PUBLIC WORKS

MAUREEN LANE
0+00 TO 6+73

Sheet 3 of 88 Sheets | Drawing No. 46502

APPENDIX E – CALCULATIONS

Average Flow @ 8" Sewer Main in Loretta Lane

Calculation	Description	Total Units	·	[1]Population Density Coefficient	=	Total Population	[2]Avg. Flow Rate Per Person (CFS)	Total Average Flow Rate (CFS)
Average Flow Rate	*47 Proposed + 4 Existing Single Family Residence*	*51*	·	*3.5*	=	*179 people*	*0.00012*	*0.021*

[3]Peak Flow @ 8" Sewer Main in Loretta Lane

(0.021 CFS) x 2.65 = 0.6 CFS

[1] The Population Density coefficient is aquired from Section 2.12 of the Sewerage Manual for Single family units at 3.5 persons per unit.

[2] The Average flow rate per person is acquired from Section 2.123 of the Sewerage Manual at 0.00012 cfs times the number of persons to be served.

[3] The Peak flow rate per person is acquired from Section 2.11 of the Sewerage Manual at (Total Average Flow Rate) x 2.65.

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, May 22 2021

<Name> Exist. 8" sewer in Loretta Lane 1.25% slope, Qpeak=0.06cfs

Circular

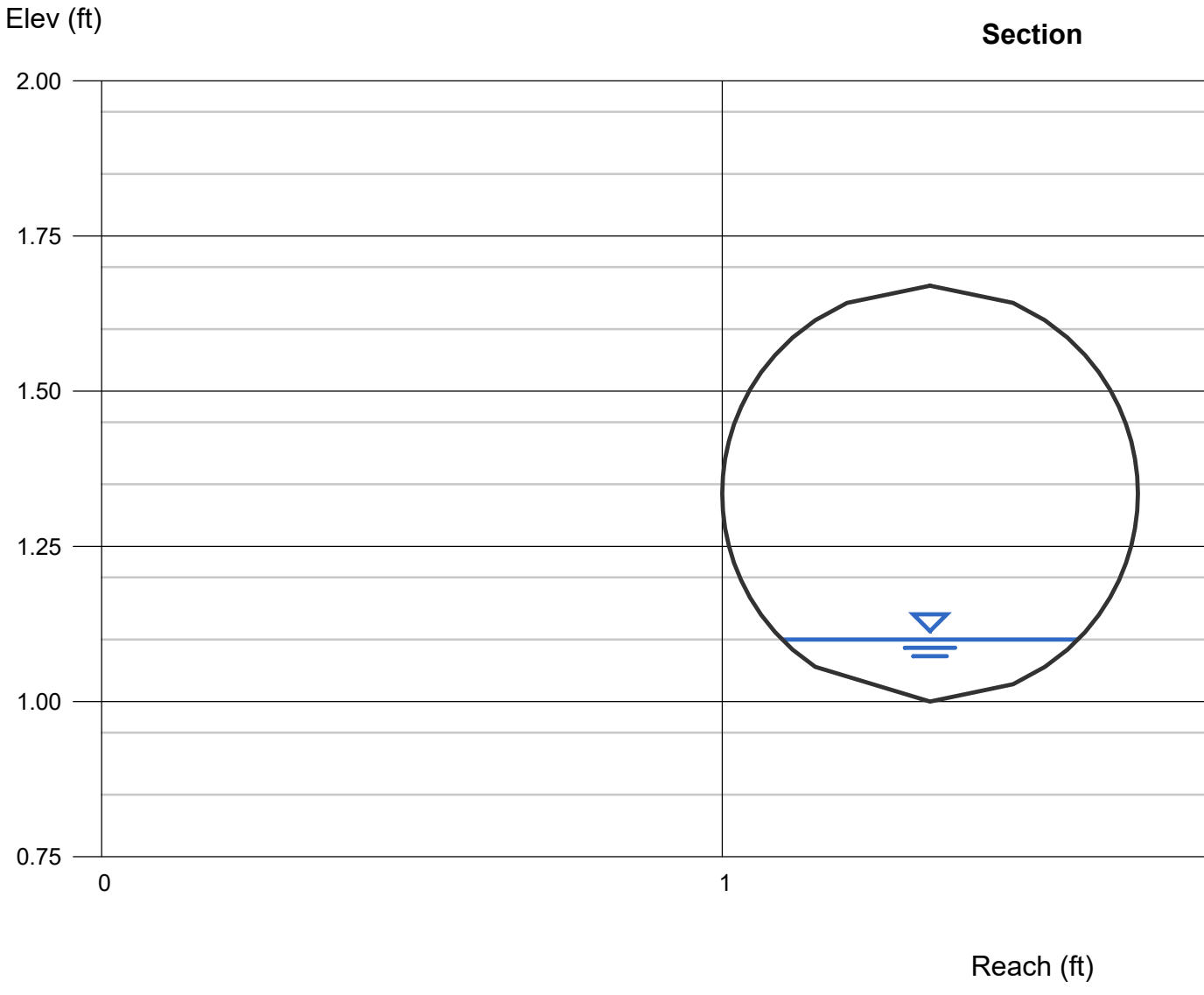
Diameter (ft)	= 0.67
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.06

Highlighted

Depth (ft)	= 0.10
Q (cfs)	= 0.060
Area (sqft)	= 0.03
Velocity (ft/s)	= 1.81
Wetted Perim (ft)	= 0.53
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 0.48
EGL (ft)	= 0.15



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, May 22 2021

<Name> Proposed 8" sewer for Beltramo Ranch 0.40% slope Qpeak=0.06 cfs

Circular

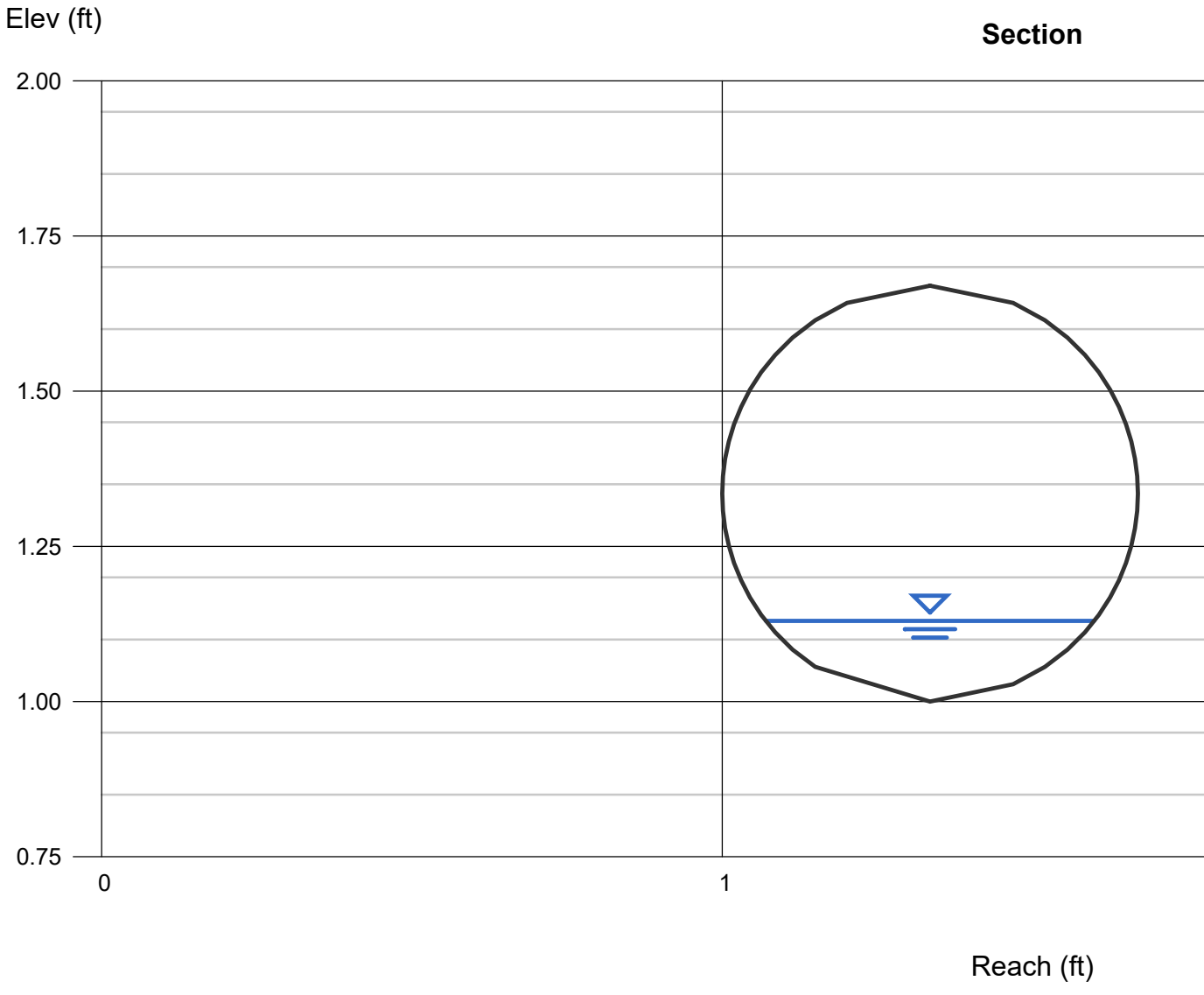
Diameter (ft)	= 0.67
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.06

Highlighted

Depth (ft)	= 0.13
Q (cfs)	= 0.060
Area (sqft)	= 0.05
Velocity (ft/s)	= 1.24
Wetted Perim (ft)	= 0.61
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 0.53
EGL (ft)	= 0.15



Channel Report

<Name> Exist. 21" sewer in Maureen Lane 0.45% slope Qpeak=1.17cfs

Circular

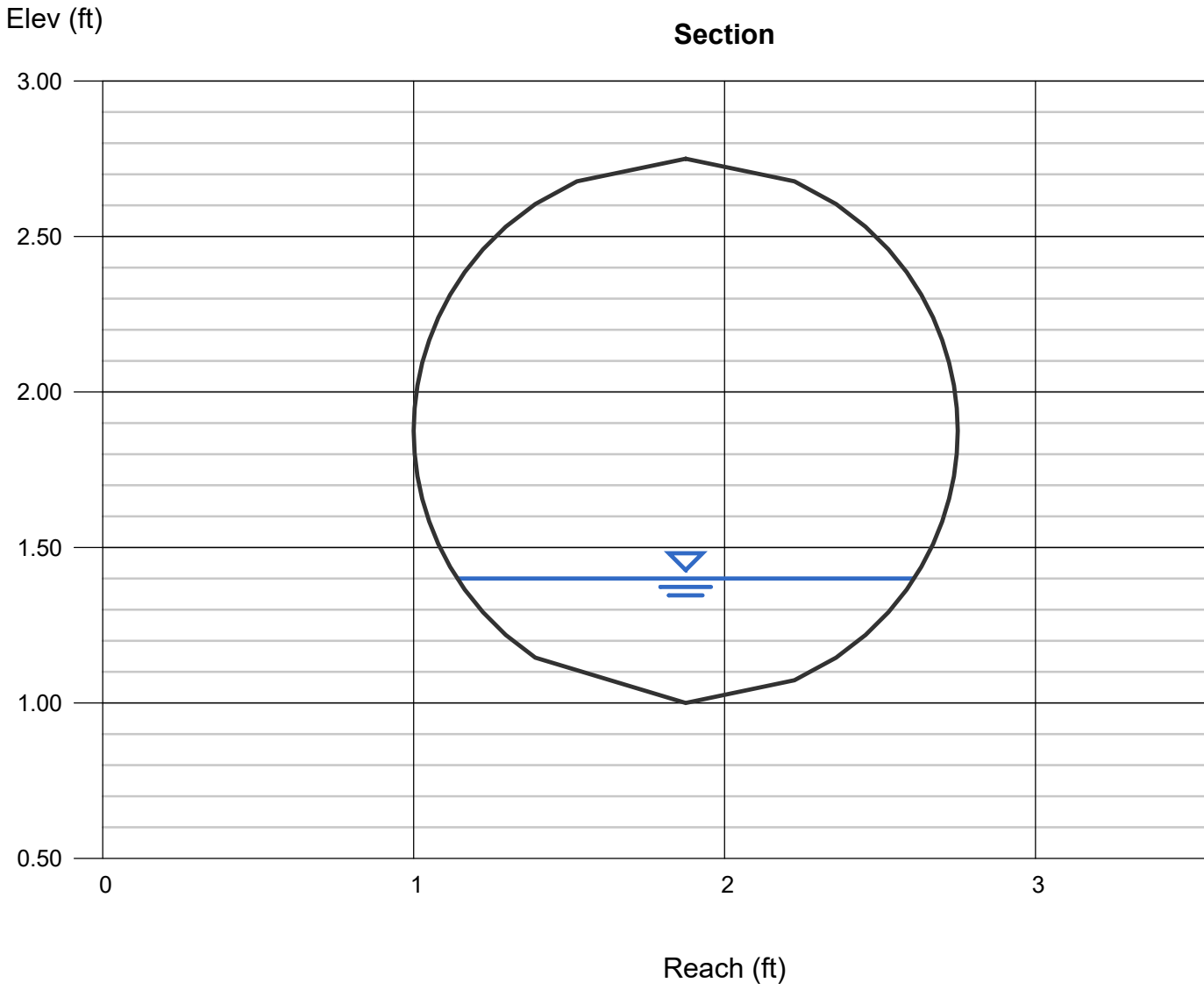
Diameter (ft)	= 1.75
Invert Elev (ft)	= 1.00
Slope (%)	= 0.45
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.17

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 1.170
Area (sqft)	= 0.42
Velocity (ft/s)	= 2.80
Wetted Perim (ft)	= 1.75
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 1.47
EGL (ft)	= 0.52



APPENDIX F – VENTURA COUNTY PUBLIC WORKS AGENCY SEWERAGE MANUAL

COUNTY OF VENTURA

PUBLIC WORKS AGENCY

SEWERAGE MANUAL

APPROVED BY THE BOARD OF SUPERVISORS
(Dates as shown on Revision Sheets)

2.0 DESIGN CRITERIA

2.1 SEWER CAPACITIES

2.11 General

Sewers shall be designed to carry the peak flow rates from all areas tributary to them. Sewers shall be designed for both size and depth to accommodate developments in upstream tributary areas which would logically be served by them. The peak flow rate at any point shall be the average flow of all tributary areas times the factor

$$(2.65 * (\text{AVE CFS})^{-0.1}).$$

Zoning shown in this section is that in effect in March 1986 as shown in the Ventura County Ordinance Code. Changes in zoning regulations shall be taken into consideration in computing flows.

2.12 Residential

2.121 Population Densities

The following population densities shall be used in establishing sewage flow:

Population per Residential Unit

Type of Development	
Trailers and mobile homes on lots under 3000 S.F. in area	2.0
Multiple unit buildings with 5 or more residential units	2.2
Multiple unit buildings with 3 or 4 residential units	2.4
Multiple unit buildings with 2 residential units	2.8
Mobile homes on lots of 3000 to 6000 S.F. in area	2.8
Single family units and mobile homes on lots larger than 6000 S.F.	3.5

2.122 Building Density

Residential building density for undeveloped areas shall be taken from the following table.

Zoning	Dwelling Units per Acre
R-O	1.9
R-1	4.8
R-2	9.6
R-A	0.9
R-E	3.5
R-P-D	30

Densities given in this table may be reduced for areas where the average slope of the land exceeds 5% by multiplying the values in the table by (1 - 0.025 * Slope in %).

Existing developments or proposed developments with approved plans shall use the actual number of units.

2.123 Average Flow Rate

The average flow rate in cubic feet per second (CFS) shall be 0.00012 times the number of persons to be served.

2.13 Commercial and Manufacturing

Average flow rates for design shall be taken from the following table unless special conditions require additional capacity or an approved study indicates less capacity is required.

Zoning	Average Flow Rate CFS per Acre
C-O	0.005
C-I	0.003
C-P-D	0.006
M-I	0.009
M-2	0.009
M-3	0.012
PC	0.008

2.14 Hydraulic Design

2.141 Pipe size, flow quantity and hydraulic slope relationships shall be computed using the Manning Formula with n=0.013 or Hazen-Williams Formula with C=100 for pipes running full with adjustment of results for partially filled pipe based on ASCE Manual No. 37 (See Section 1.12) curves for Discharge and velocity when varies with depth.

2.142 To use full flow pipe formulas to determine pipe diameter or slope, multiply design flow or Manning's "n" by Factor A from the table below.

To use full flow pipe formulas to determine flow for a given pipe diameter and slope with n=0.013, divide the resultant flow by Factor A from the table below.

Pipe Diameter	Maximum Depth at Design Peak Flow	Factor A for use with full pipe formula
Less than 12"	2/3 Pipe Diam.	1.54
12" & greater	3/4 Pipe Diam.	1.25

2.15 Minimum Size

Minimum street sewer size shall be 8", except that 6" pipe may be used where all of the following conditions are met:

a. The minimum slope is at least 0.8%.

b. The length does not exceed 200 feet with no possibility of extension.

c. Not more than 10 house laterals contribute to the 6" portion.

2.2 Minimum Sewer Slopes

2.21 Purpose

Minimum slope requirements are necessary to assure self-cleansing and self-oxidizing velocities in order to avoid significant generation of hazardous, odorous, and corrosive sulfur compounds.

2.22 Minimum Slopes

Slopes of sewers shall equal or exceed those set forth in the following table:

Pipe Diameter	Corrosion Resistant Sewer Pipe Material (Sec. 3.41)	Other Sewer Pipe Material (Sec. 3.42)
6"	0.0080	0.0100
8"	0.0040	0.0088
10"	0.0028	0.0060
12"	0.0024	0.0056
14"	0.0020	0.0048
15"	0.0020	0.0044
16"	0.0016	0.0040
18"	0.0016	0.0036
20"	0.0012	0.0032
21"	0.0012	0.0028
24"	0.0012	0.0024
27"	0.0012	0.0020
30"	0.0012	0.0016
33"	0.0012	0.0016
36"	0.0012	0.0012

2.23 Substandard Slopes

Slopes below the minimum slopes may be used in order to avoid pumping only upon specific approval of the Engineer. Such approval should be solicited well in advance of completion of design.

2.24 Pipe for Substandard Slopes

Pipe, in substandard slope areas and pipe in all areas downstream from substandard slope areas to the point where the peak flow rate is four times that in the section with substandard slope, shall be corrosion-resistant sewer pipe in accordance with Section 3.41.

2.3 Sewer Location

2.31 Roads

The centerline of sewers constructed in County roads shall not be closer than 4 feet to the centerline of the road nor closer than 4 feet to the curb. On divided highways, a separate sewer shall be installed to serve each side of the highway. Exceptions to these location requirements may be made only on approval of the Engineer.

APPENDIX G − MAUREEN LANE FLOW TEST PERFORMED BY ADS ENVIRONMENTAL SERVICES

SEWER AREA STUDY

FOR

VESTING TENTATIVE TRACT No. 6061
BELTRAMO RANCH
11944 WEST LOS ANGELES AVE.
MOORPARK, CA 90604

Prepared for:

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3090 Pullman Street
Costa Mesa, CA 92626

September, 2021

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Currently, the project site is a developed single family residence, Beltramo Ranch Road a private drive, and the Foursquare Church. The site is proposed for a total of 47 single family residential units with private drive and firelane access roads.

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$$Q\ average = (3.5\ person\ per\ unit) * (51\ single\ fam.units) * 0.00012$$

$$\underline{Q\ average = \ 0.021\ cfs}$$

The peak flow is calculated based on section 2.11 General, per equation below:

$$\underline{Peak\ Factor = (Q\ average)\text{^}(-0.1) * (2.65) = 3.90}$$

$$\underline{Q\ peak = (Q\ average) * (Peak\ Factor) = 0.082\ cfs}$$

The pipe capacities are calculated using the Manning Equation with n=0.013 per section 2.141. The results verify that the existing 8" sewer within Loretta Lane will be at a depth of 0.11' with peak flow and the proposed 8" sewer sloped at 0.4% will be at depth 0.15', see Appendix E.

The results of the flow meter test within Maureen Lane 21" sewer main show that existing peak metered flow is 1.11 cfs. We conducted pipe hydraulic analysis using the peak metered flow plus the additional 0.082 cfs from our proposed project for a total combined peak flow of 1.192 cfs. The results verify that the existing 21" sewer, sloped at 0.45%, will be at a depth of 0.40' during peak flow, see Appendix E

V. CONCLUSION

The existing 8" sewer system being analyzed in this area study has the capacity to convey proposed peak flow with a depth of 0.11'. The existing 21" sewer within Maureen Lane has the capacity to convey the existing peak and proposed sewage at a depth of 0.40'. The proposed 8" sewer pipe sloped at the minimum allowable 0.4% will be at flow depth of 0.15'. All of these peak flow depths are below the 50% capacity of the pipes.

Based on the analysis, we conclude that the existing and proposed sewer system has adequate capacity to service the Tentative Tract 6061, 47 unit single family residence housing development.

REFERENCES

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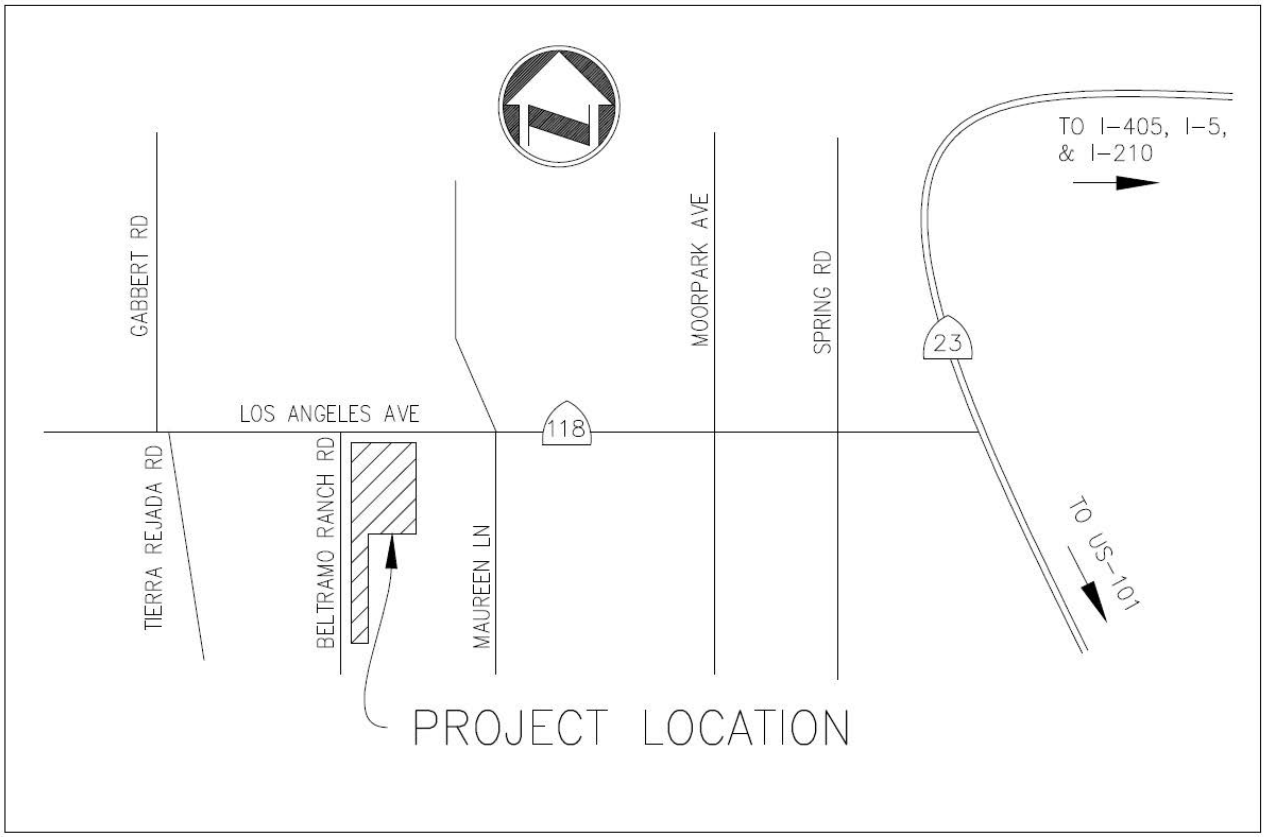
PREPARED BY:

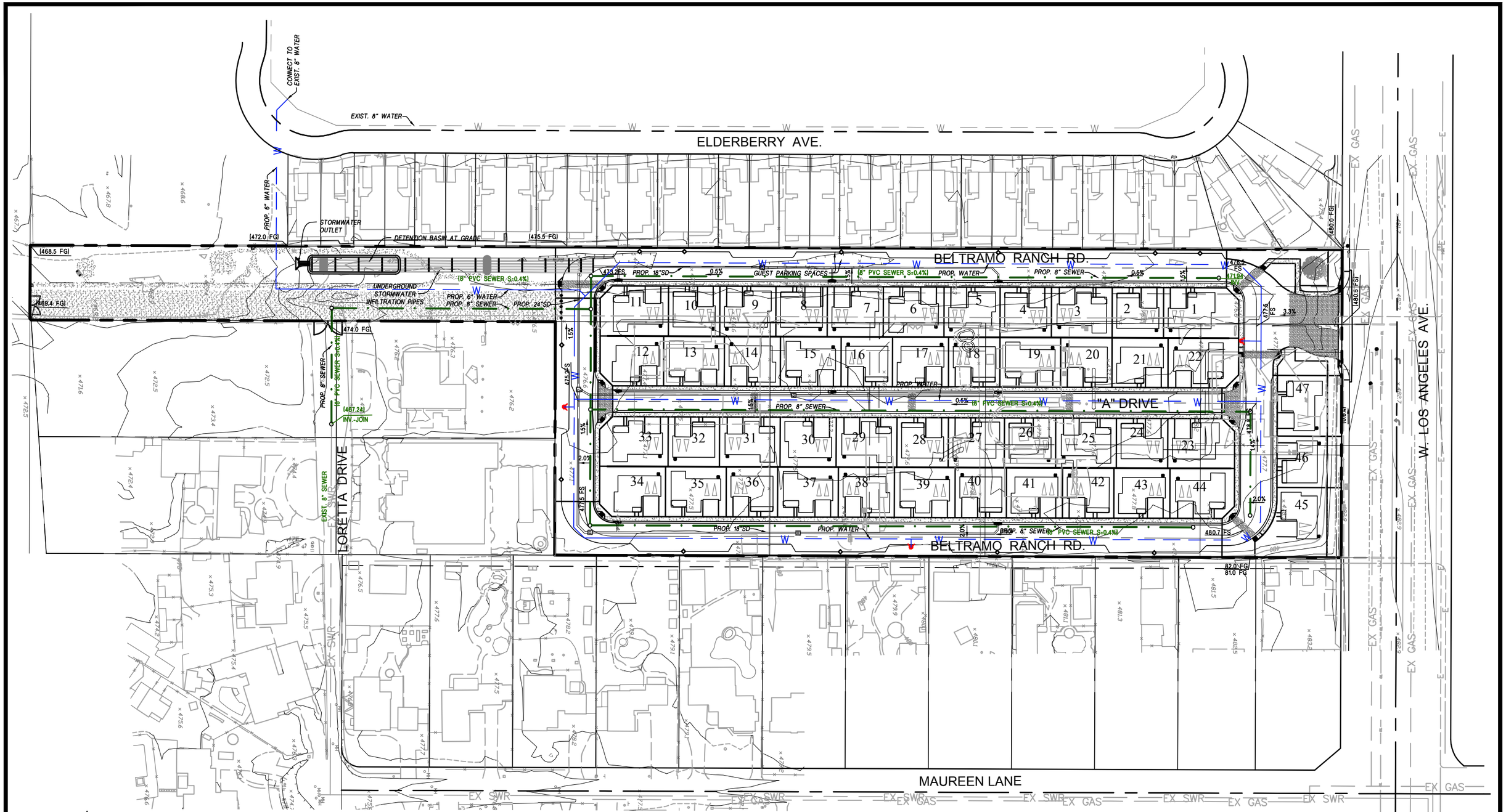
Matthew A. Sawyer

APPENDIX A – VICINITY MAP



VICINITY MAP
NTS

APPENDIX B − SITE PLAN



SCALE: 1" = 100'

0 100 200 300

SITE PLAN

BELTRAMO RANCH - TENT. TRACT 6061
MOORPARK, CA

UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8648
FAX: (818) 707-8649

9/24/21

APPENDIX C − SEWER AREA EXHIBIT

ELDERBERRY AVE.

EXISTING UNDEVELOPED SINGLE FAMILY RESIDENCE

EXISTING SINGLE FAMILY RESIDENCE

EXISTING SINGLE FAMILY RESIDENCE

EXISTING SINGLE FAMILY RESIDENCE

8" PVC SEWER S=0.4%

8" PVC SEWER S=0.4%

(474.5 RIM)
467.24 INVI.-JOINT
A" CLEANOUT

8" PVC SEWER S=1.25%

LORETTA DRIVE

(EXIST. 8" SEWER)

EX. SWR

474.5 RIM
469.0 INV.

BELTRAMO RANCH RD.

(8" PVC SEWER S=0.4%)

PROPOSED 47-UNIT SINGLE FAMILY RESIDENCE

BELTRAMO RANCH TENTATIVE TRACT 6061

"A" DRIVE

477.5 RIM
474.7 INV.

476.1 RIM
469.5 INV.

478.6 RIM
472.3 INV.

477.5 RIM
469.0 INV.

480.7 RIM
472.7 INV.

480.1 RIM
472.6 INV.

BELTRAMO RANCH RD.

(8" PVC SEWER S=0.4%)

EX GAS

EX WTR

EX SWR

W. LOS ANGELES AVE.

(EXIST. 21" SEWER S=0.60%)

(EXIST. 21" SEWER S=0.45%)

MAUREEN LANE

FLOW METER TEST LOCATION AT MANHOLE IN MAUREEN AVE.

LEGEND

- -EXIST. SINGLE FAM. RESID. TRIBUTARY AREA
- -BELTRAMO RANCH TT. 6061 TRIBUTARY AREA
- -DIRECTION OF SEWAGE FLOW
- -EXISTING SEWER PIPE
- -PROPOSE SEWER PIPE

SCALE: 1" = 100'

0 100 200

SEWER AREA EXHIBIT

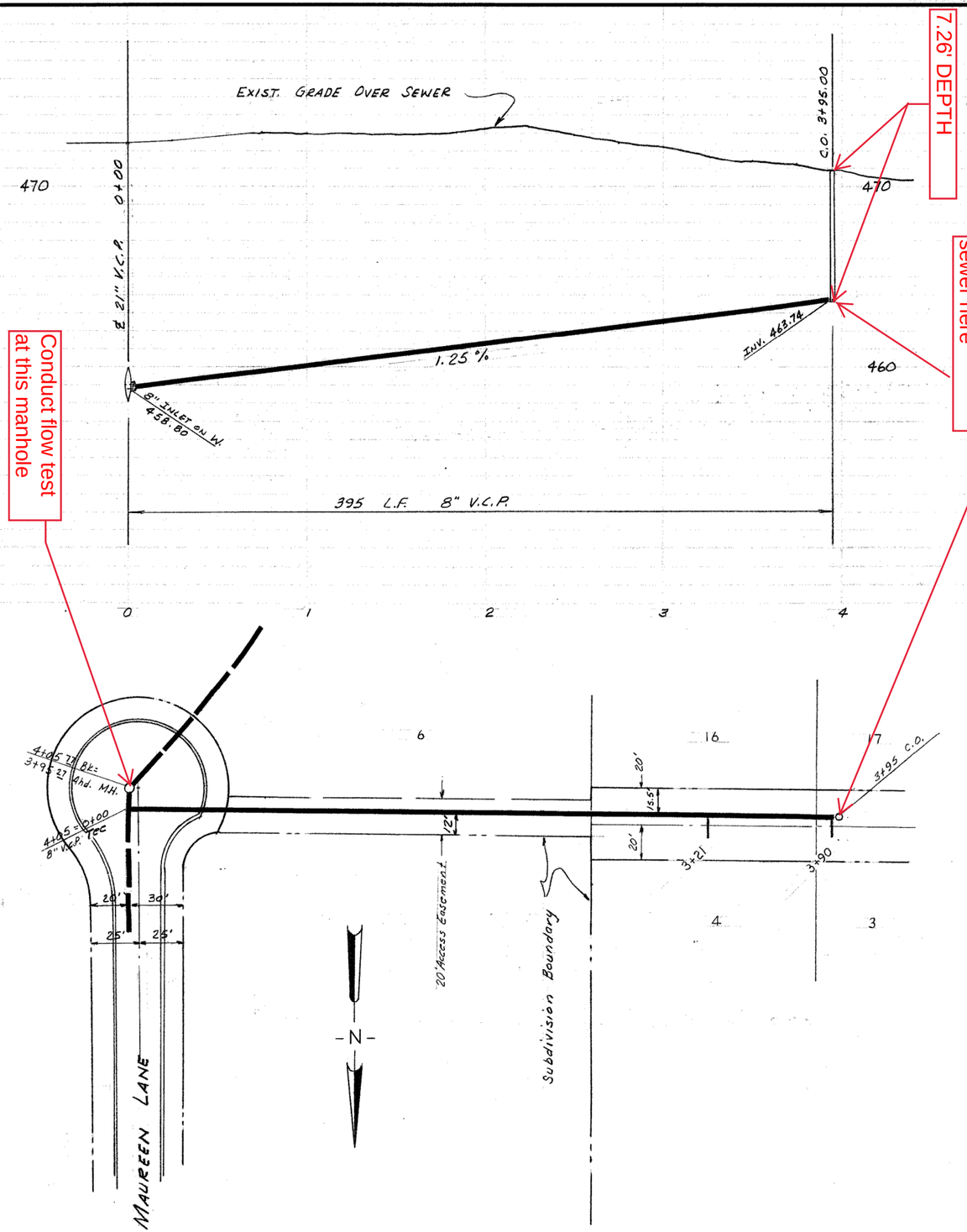
BELTRAMO RANCH - TENT. TRACT 6061
MOORPARK, CA

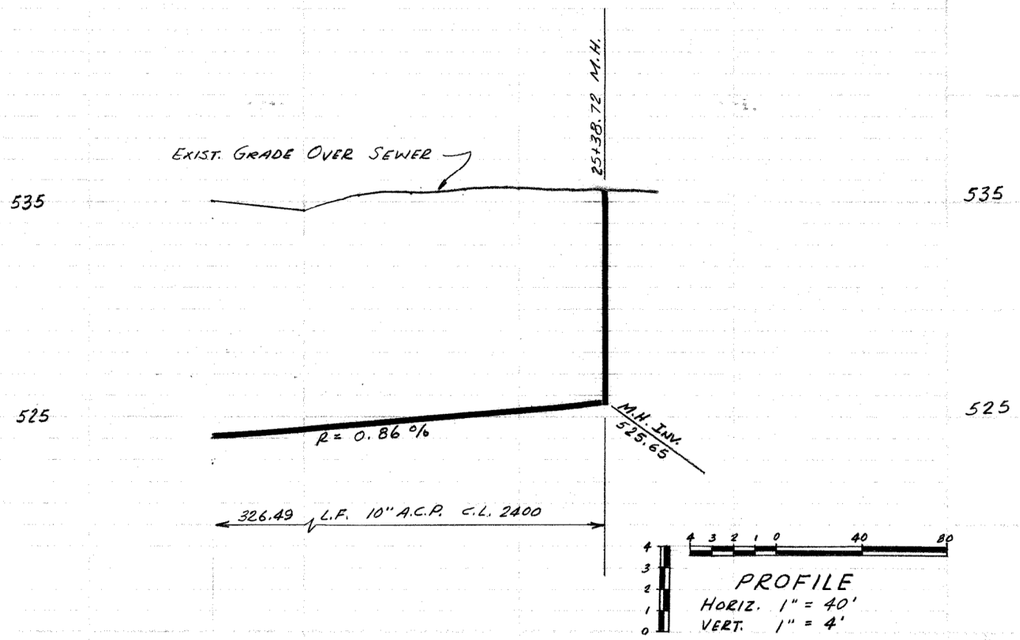
UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8648
FAX: (818) 707-8649

9/24/21

APPENDIX D − AS-BUILT SEWER PLANS

8-773

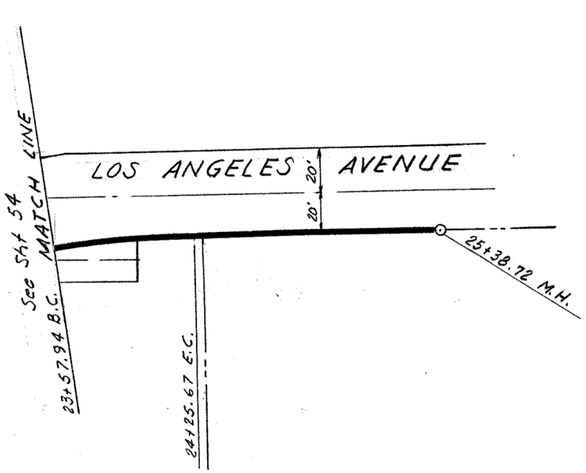




PLAN

4 3 2 1 0 40 80

SCALE : 1" = 40'



℄ SEWER CURVE DATA
Δ = 4°51'00"
R = 800'
L = 67.72

"AS-BUILT"
10-7-68

D				Designed L.B.
C				Drawn J.S.
B				Checked R.T.
A				Spec. No.
△	Revisions	By	Date	Datum
Approved	By	Chief Engr.		Field Books
Approved	By	Engr. Mgr.		
Scale	Date			

VENTURA COUNTY WATER WORKS DISTRICT NO. 1
MOORPARK SEWER COLLECTION SYSTEM

PREPARED BY:
POMEROY – MADERA
(A JOINT VENTURE)
FOR

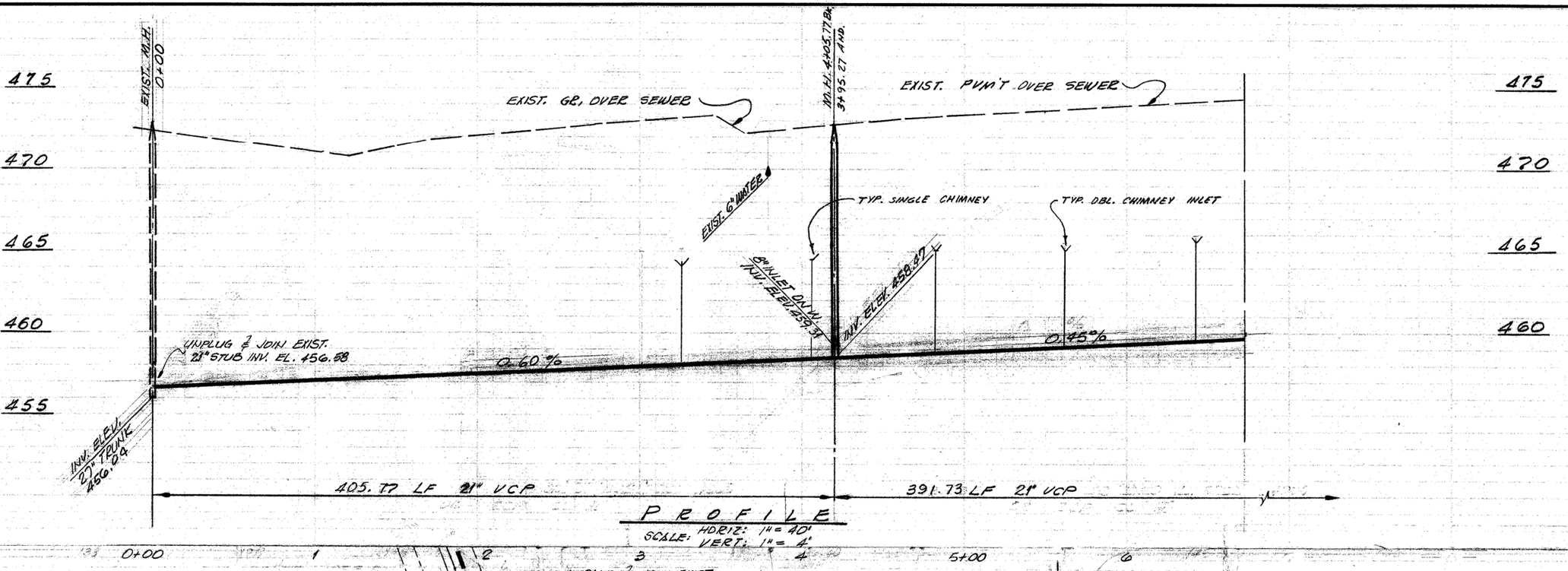
COUNTY OF VENTURA
DEPARTMENT OF PUBLIC WORKS

ALLEY at South End of MAUREEN LANE
LOS ANGELES AVENUE
23+57.94 B.C. to 25+38.72 End

Sheet 54A of 88 Sheets | Drawing No. 46553 A

281-17224/17335-5

8741



UTILITY FACILITIES ARE SHOWN AS BELIEVED TO EXIST AT TIME OF SURVEY. FACILITIES MAY HAVE BEEN OMITTED, MISPLACED AND/OR RELOCATED. CONTRACTORS SHALL PROTECT ALL UTILITIES WHETHER SHOWN ON PLANS OR NOT.

William L. Jensen 7-3-67
RCE 10276 DATE

D				Designed A.P.J.
C				Drawn J.G.G.
B				Checked C.B.J.
A				Spec. No. W.W. 68-3
△	Revisions	By	Date	Datum
Approved 9-21-67	By H.P. Pulmeier	Dep. Dir.		Field Books
Approved	By	Engr. Mgr.		Proj. No. 3180
Scale GRAPHIC		Date JULY 21, 1967		

COUNTY WATER WORKS DISTRICT NO. 1
PARK SEWER COLLECTION SYSTEM

PREPARED BY:
POMEROY — MADERA
(A JOINT VENTURE)
FOR

COUNTY OF VENTURA
DEPARTMENT OF PUBLIC WORKS

MAUREEN LANE
0+00 TO 6+73

Sheet 3 of 88 Sheets | Drawing No. 46502

APPENDIX E − CALCULATIONS

Average Flow @ 8" Sewer Main in Loretta Lane

Calculation	Description	Total Units	·	[1]Population Density Coefficient	=	Total Population	[2]Avg. Flow Rate Per Person (CFS)	Total Average Flow Rate (CFS)
Average Flow Rate	*47 Proposed + 4 Existing Single Family Residence*	*51*	·	*3.5*	=	*179 people*	*0.00012*	*0.021*

[3]Peak Flow @ 8" Sewer Main in Loretta Lane

(0.021 CFS) x 3.90 = 0.082 CFS

[1] The Population Density coefficient is acquired from Section 2.12 of the Sewerage Manual for Single family units at 3.5 persons per unit.

[2] The Average flow rate per person is acquired from Section 2.123 of the Sewerage Manual at 0.00012 cfs times the number of persons to be served.

[3] The Peak flow rate per person is acquired from Section 2.11 of the Sewerage Manual at (Total Average Flow Rate) x 2.65.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 24 2021

<Name> Exist. 8" sewer in Loretta Lane 1.25% slope, Qpeak=0.082 cfs

Circular

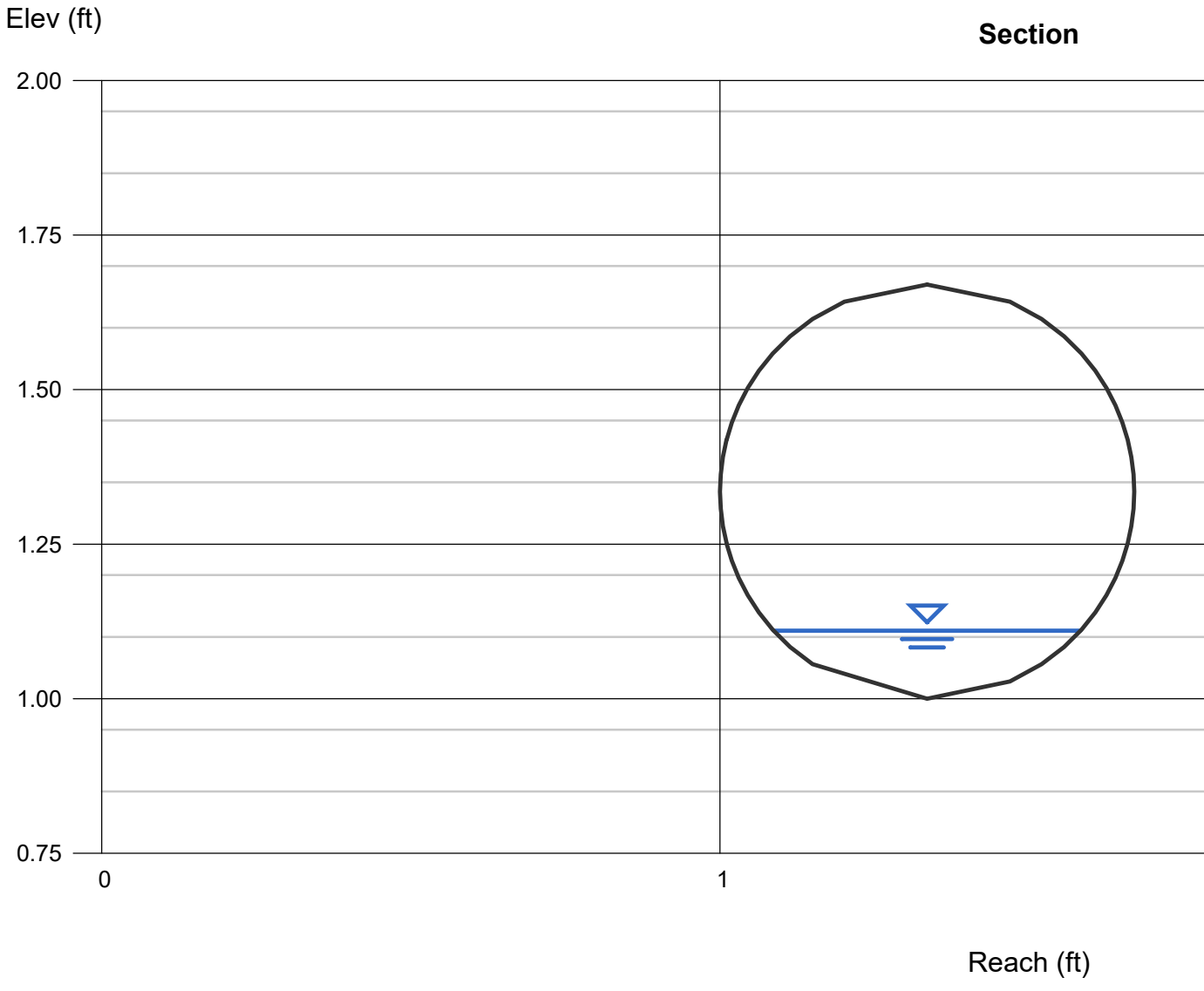
Diameter (ft)	= 0.67
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.08

Highlighted

Depth (ft)	= 0.11
Q (cfs)	= 0.082
Area (sqft)	= 0.04
Velocity (ft/s)	= 2.11
Wetted Perim (ft)	= 0.56
Crit Depth, Yc (ft)	= 0.13
Top Width (ft)	= 0.50
EGL (ft)	= 0.18



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Sep 24 2021

<Name> Proposed 8" sewer for Beltramo Ranch 0.40% slope Qpeak=0.82 cfs

Circular

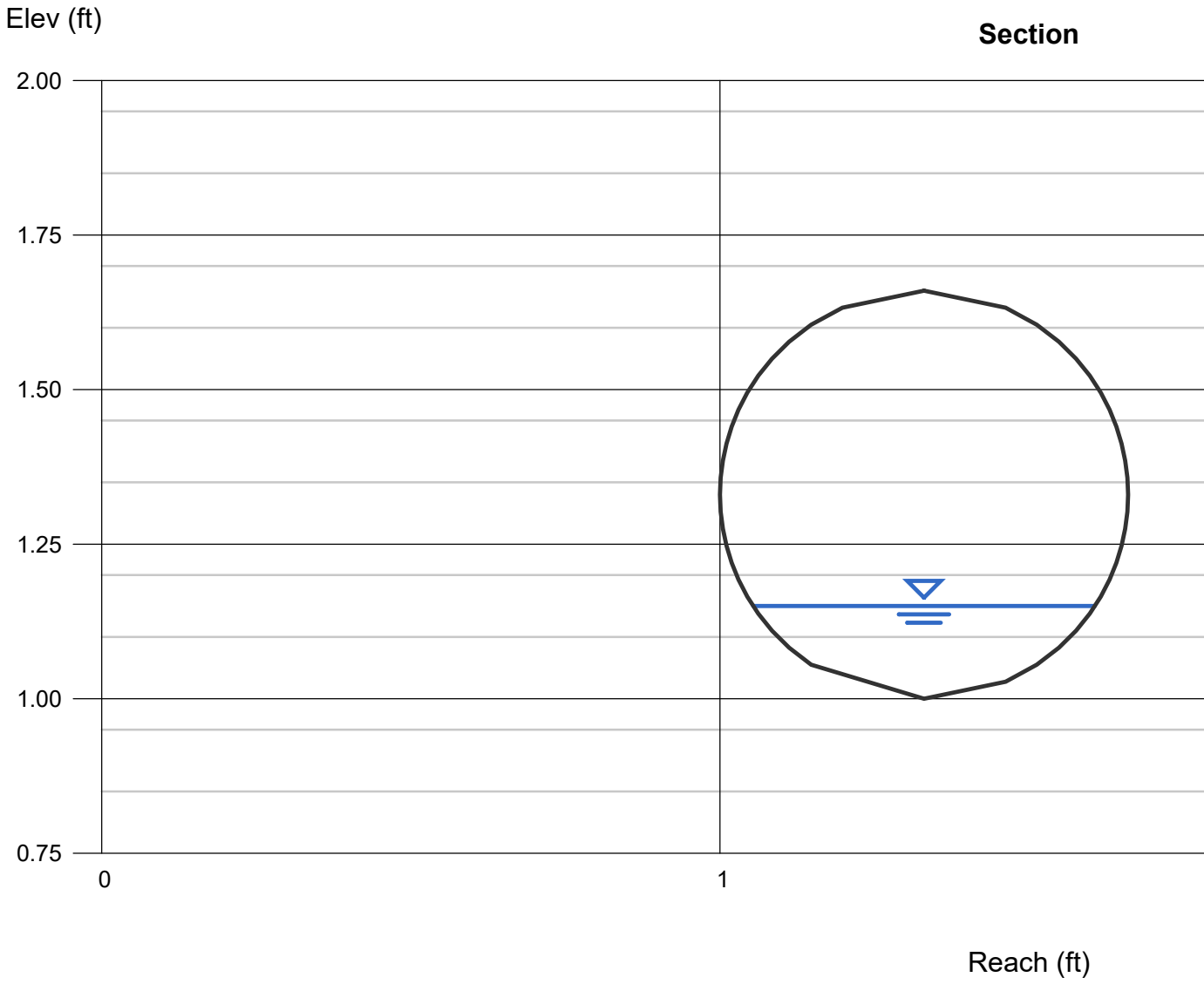
Diameter (ft)	= 0.66
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.08

Highlighted

Depth (ft)	= 0.15
Q (cfs)	= 0.082
Area (sqft)	= 0.06
Velocity (ft/s)	= 1.40
Wetted Perim (ft)	= 0.66
Crit Depth, Yc (ft)	= 0.14
Top Width (ft)	= 0.55
EGL (ft)	= 0.18



Channel Report

<Name> Exist. 21" in Maureen Lane 0.45% slope, Qpeak=1.192 cfs

Circular

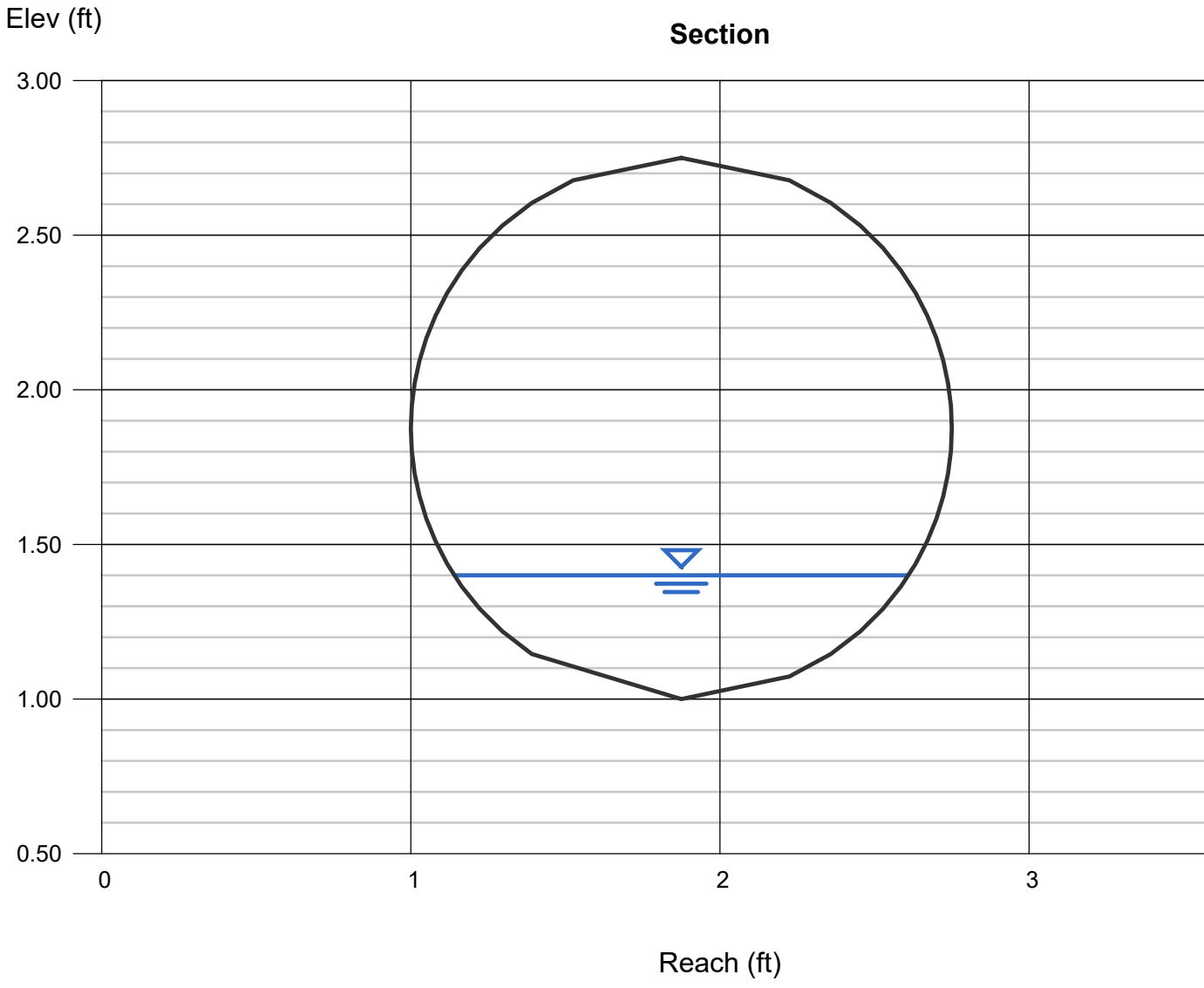
Diameter (ft)	= 1.75
Invert Elev (ft)	= 1.00
Slope (%)	= 0.45
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.19

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 1.192
Area (sqft)	= 0.42
Velocity (ft/s)	= 2.85
Wetted Perim (ft)	= 1.75
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 1.47
EGL (ft)	= 0.53



APPENDIX F – VENTURA COUNTY PUBLIC WORKS AGENCY SEWERAGE MANUAL

COUNTY OF VENTURA

PUBLIC WORKS AGENCY

SEWERAGE MANUAL

APPROVED BY THE BOARD OF SUPERVISORS
(Dates as shown on Revision Sheets)

2.0 DESIGN CRITERIA

2.1 SEWER CAPACITIES

2.11 General

Sewers shall be designed to carry the peak flow rates from all areas tributary to them. Sewers shall be designed for both size and depth to accommodate developments in upstream tributary areas which would logically be served by them. The peak flow rate at any point shall be the average flow of all tributary areas times the factor

$$(2.65 * (\text{AVE CFS})^{-0.1}).$$

Zoning shown in this section is that in effect in March 1986 as shown in the Ventura County Ordinance Code. Changes in zoning regulations shall be taken into consideration in computing flows.

2.12 Residential

2.121 Population Densities

The following population densities shall be used in establishing sewage flow:

Population per Residential Unit

Type of Development	
Trailers and mobile homes on lots under 3000 S.F. in area	2.0
Multiple unit buildings with 5 or more residential units	2.2
Multiple unit buildings with 3 or 4 residential units	2.4
Multiple unit buildings with 2 residential units	2.8
Mobile homes on lots of 3000 to 6000 S.F. in area	2.8
Single family units and mobile homes on lots larger than 6000 S.F.	3.5

2.122 Building Density

Residential building density for undeveloped areas shall be taken from the following table.

Zoning	Dwelling Units per Acre
R-O	1.9
R-1	4.8
R-2	9.6
R-A	0.9
R-E	3.5
R-P-D	30

Densities given in this table may be reduced for areas where the average slope of the land exceeds 5% by multiplying the values in the table by (1 - 0.025 * Slope in %).

Existing developments or proposed developments with approved plans shall use the actual number of units.

2.123 Average Flow Rate

The average flow rate in cubic feet per second (CFS) shall be 0.00012 times the number of persons to be served.

2.13 Commercial and Manufacturing

Average flow rates for design shall be taken from the following table unless special conditions require additional capacity or an approved study indicates less capacity is required.

Zoning	Average Flow Rate CFS per Acre
C-O	0.005
C-I	0.003
C-P-D	0.006
M-I	0.009
M-2	0.009
M-3	0.012
PC	0.008

2.14 Hydraulic Design

2.141 Pipe size, flow quantity and hydraulic slope relationships shall be computed using the Manning Formula with n=0.013 or Hazen-Williams Formula with C=100 for pipes running full with adjustment of results for partially filled pipe based on ASCE Manual No. 37 (See Section 1.12) curves for Discharge and velocity when varies with depth.

2.142 To use full flow pipe formulas to determine pipe diameter or slope, multiply design flow or Manning's "n" by Factor A from the table below.

To use full flow pipe formulas to determine flow for a given pipe diameter and slope with n=0.013, divide the resultant flow by Factor A from the table below.

Pipe Diameter	Maximum Depth at Design Peak Flow	Factor A for use with full pipe formula
Less than 12"	2/3 Pipe Diam.	1.54
12" & greater	3/4 Pipe Diam.	1.25

2.15 Minimum Size

Minimum street sewer size shall be 8", except that 6" pipe may be used where all of the following conditions are met:

a. The minimum slope is at least 0.8%.

b. The length does not exceed 200 feet with no possibility of extension.

c. Not more than 10 house laterals contribute to the 6" portion.

2.2 Minimum Sewer Slopes

2.21 Purpose

Minimum slope requirements are necessary to assure self-cleansing and self-oxidizing velocities in order to avoid significant generation of hazardous, odorous, and corrosive sulfur compounds.

2.22 Minimum Slopes

Slopes of sewers shall equal or exceed those set forth in the following table:

Pipe Diameter	Corrosion Resistant Sewer Pipe Material (Sec. 3.41)	Other Sewer Pipe Material (Sec. 3.42)
6"	0.0080	0.0100
8"	0.0040	0.0088
10"	0.0028	0.0060
12"	0.0024	0.0056
14"	0.0020	0.0048
15"	0.0020	0.0044
16"	0.0016	0.0040
18"	0.0016	0.0036
20"	0.0012	0.0032
21"	0.0012	0.0028
24"	0.0012	0.0024
27"	0.0012	0.0020
30"	0.0012	0.0016
33"	0.0012	0.0016
36"	0.0012	0.0012

2.23 Substandard Slopes

Slopes below the minimum slopes may be used in order to avoid pumping only upon specific approval of the Engineer. Such approval should be solicited well in advance of completion of design.

2.24 Pipe for Substandard Slopes

Pipe, in substandard slope areas and pipe in all areas downstream from substandard slope areas to the point where the peak flow rate is four times that in the section with substandard slope, shall be corrosion-resistant sewer pipe in accordance with Section 3.41.

2.3 Sewer Location

2.31 Roads

The centerline of sewers constructed in County roads shall not be closer than 4 feet to the centerline of the road nor closer than 4 feet to the curb. On divided highways, a separate sewer shall be installed to serve each side of the highway. Exceptions to these location requirements may be made only on approval of the Engineer.

APPENDIX G − MAUREEN LANE FLOW TEST PERFORMED BY ADS ENVIRONMENTAL SERVICES

Maureen Lane Sewer Flow Monitoring 2021, Moorpark CA
May 20, 2021 – May 26, 2021

Final Report Submitted to **UNITED CIVIL INC**
June 8, 2021

ADS ENVIRONMENTAL SERVICES

15201 Springdale Street
Huntington Beach, CA 92649

800-633-7246
www.adsenv.com

June 8, 2021

Matthew Sawyer, PE, QSD/QSP
UNITED CIVIL INC
30141 Agoura Road, Suite 215
Agoura Hills, CA 91301
O: (818) 707-8648 ext. 12
F: (818) 707-8649

SUBJECT: Maureen Lane Sewer Flow Monitoring 2021, Moorpark CA

Dear Matthew,

ADS is pleased to submit the final report for the Maureen Lane Sewer Flow Monitoring 2021, Moorpark CA Study completed on behalf of UNITED CIVIL INC. The metering was conducted at one (1) location. The study was conducted during the period of Thursday, May 20, 2021 to Wednesday, May 26, 2021.

The report contains depth, velocity, and quantity hydrographs as well as daily long tables for the metering period. An Excel file containing depth, quantity, and velocity entities for the monitoring location in 5-minute format is also provided.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Paul Mitchell at 714.379.9778.

It has been our pleasure to be of service to you in the performance of this project. Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,
ADS ENVIRONMENTAL SERVICES

Jackie Crutcher
Data Manager, West Coast

Maureen Lane Sewer Flow Monitoring 2021, Moorpark CA

Prepared For:

Matthew Sawyer, PE, QSD/QSP
UNITED CIVIL INC
30141 Agoura Road, Suite 215
Agoura Hills, CA 91301
O: (818) 707-8648 ext. 12
F: (818) 707-8649

Prepared By:

ADS, LLC
15201 Springdale Street
Huntington Beach, CA 92649

Table of Contents

Scope and Methodology

Introduction

United Civil Inc entered into an agreement with ADS Environmental Services to conduct flow monitoring at (1) one location in the Moorpark, CA Sanitary Collection System. The study was scheduled for a period of (7) seven calendar days. Once in place, the flow monitoring equipment was be used to measure depth, velocity, and to quantify flows. The objective of this study was to confirm sanitary sewer flows in the monitored locations for planning purposes.

Project Scope

The scope of this study involved using a flow monitor to quantify wastewater flow at the designated location for the 7- day time period. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring site for adequate hydraulic conditions
- Flow monitor installation
- Flow monitor confirmations and data collections
- Flow data analysis

Equipment installation was completed on May 19, 2021. The monitoring period began on May 20, 2021 and was completed on May 26, 2021. Upon completion of the study, equipment was removed from the system.

Flow Monitoring Equipment

The ***ADS FlowShark Triton*** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS FlowShark Triton monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The FS Triton monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The FS Triton monitor can support two (2) sets of sensors. The sensor option used for this project was:

The Peak Combo Sensor installed at the bottom of the pipe includes three types of data acquisition technologies.

The ***up looking ultrasonic depth*** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by sensor to calculate depth.

The ***pressure depth*** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a desiccant filled breather tube.

To obtain ***peak velocity*****,** the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors were mounted on expandable stainless-steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.

Data Collection, Confirmation, and Quality Assurance

Data collects were done remotely via wireless connect on a weekly basis. As needed, during the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare the meter readings to confirm that they agreed. The site met the criteria for confirmation for depth and velocity unless noted otherwise in the site commentary section. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the ***Continuity Equation*** and the ***Manning Equation.*** The Continuity Equation, which is considered the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

Q = A * V

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt levels present at each site visit are reviewed and representative silt levels established.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows (~< 1") that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. Hydrographs are based on 5-minute averaging. Tables are provided in daily average format. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the flow data table and hydrograph.

DEPTH - Final calculated depth measurement (in inches)

QUANTITY - Final calculated flow rate (in MGD)

VELOCITY - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

Maureen1

Site Commentary

SITE INFORMATION

Pipe	Elliptical (21.13 in H x 21 in W)
Silt	0.00 (in)

OBSERVATIONS

Average flow depth, velocity, and quantity data observed during **Thursday, May 20, 2021 to Wednesday, May 26, 2021**, along with observed minimum and maximum data, are provided in the following table.

Review of the scattergraph shows that flow remained free flowing and no surcharge conditions were experienced.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	4.68	1.39	0.376
Minimum	2.97	0.76	0.109
Maximum	5.99	1.84	0.644
Min Time	05/23/2021 05:00:00	05/21/2021 03:50:00	05/21/2021 03:50:00
Max Time	05/24/2021 21:50:00	05/22/2021 11:05:00	05/24/2021 21:50:00

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the five minute average.

DATA UPTIME

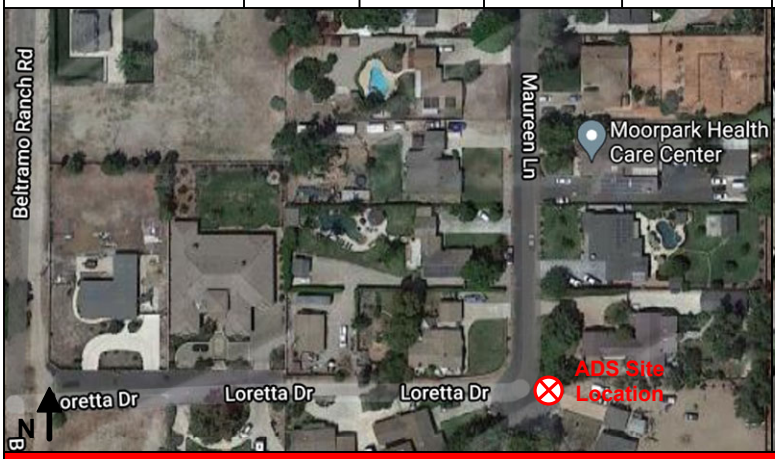
Data uptime observed during **Thursday, May 20, 2021 to Wednesday, May 26, 2021** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

ADS Site Report

Quality Form

Project Name: Moorpark United TFM 2021	**City:** Moorpark	**Agency:** Moorpark	**FM Initials:** SK
Site Name: Maureen1	**Install Date:** 5/19/21	**Monitor Type**	Peak Doppler
Address/Location: 4730 Maureen Ln		**Monitor Model**	Triton +
		Data Acquisition	Manual/Wireless Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	21.13 "
		Pipe Width:	21.00 "



Investigation Information:

Date/Time of Investigation:	5/19/21 @ 9:30 AM
Site Hydraulics:	Good curve through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not Investigated
Downstream Manhole:	Not investigated
Depth of Flow:	5.50 " +/- 0.25"
Range (Air DOF):	+/-
Peak Velocity:	1.77 fps
Silt:	0 Inches

Manhole Information:

Manhole Depth:	19'
Manhole Material / Condition	Precast/Good
Pipe Material / Condition:	VCP/Good

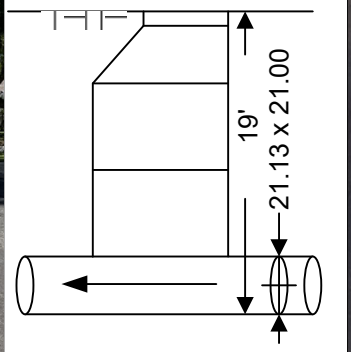
Land Use:	Residential	Commercial	Industrial	Other
	[X]	[ ]	[ ]	[ ]

Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

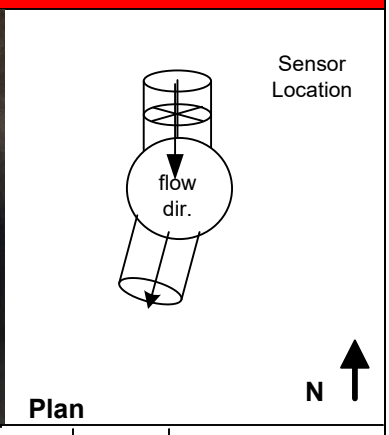
Safety Notes:

2 man crew required and one blower is to be operated at all times.

Other Information:



Cross Section



Plan

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultrasonic/Velocity/Pressure
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[x]	[ ]	
WWTP	[ ]	[x]	[ ]	
Other	[ ]	[x]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

Hydrograph Report

Maureen1

Flow Monitor

Maureen1

Pipe Height
21.13
in

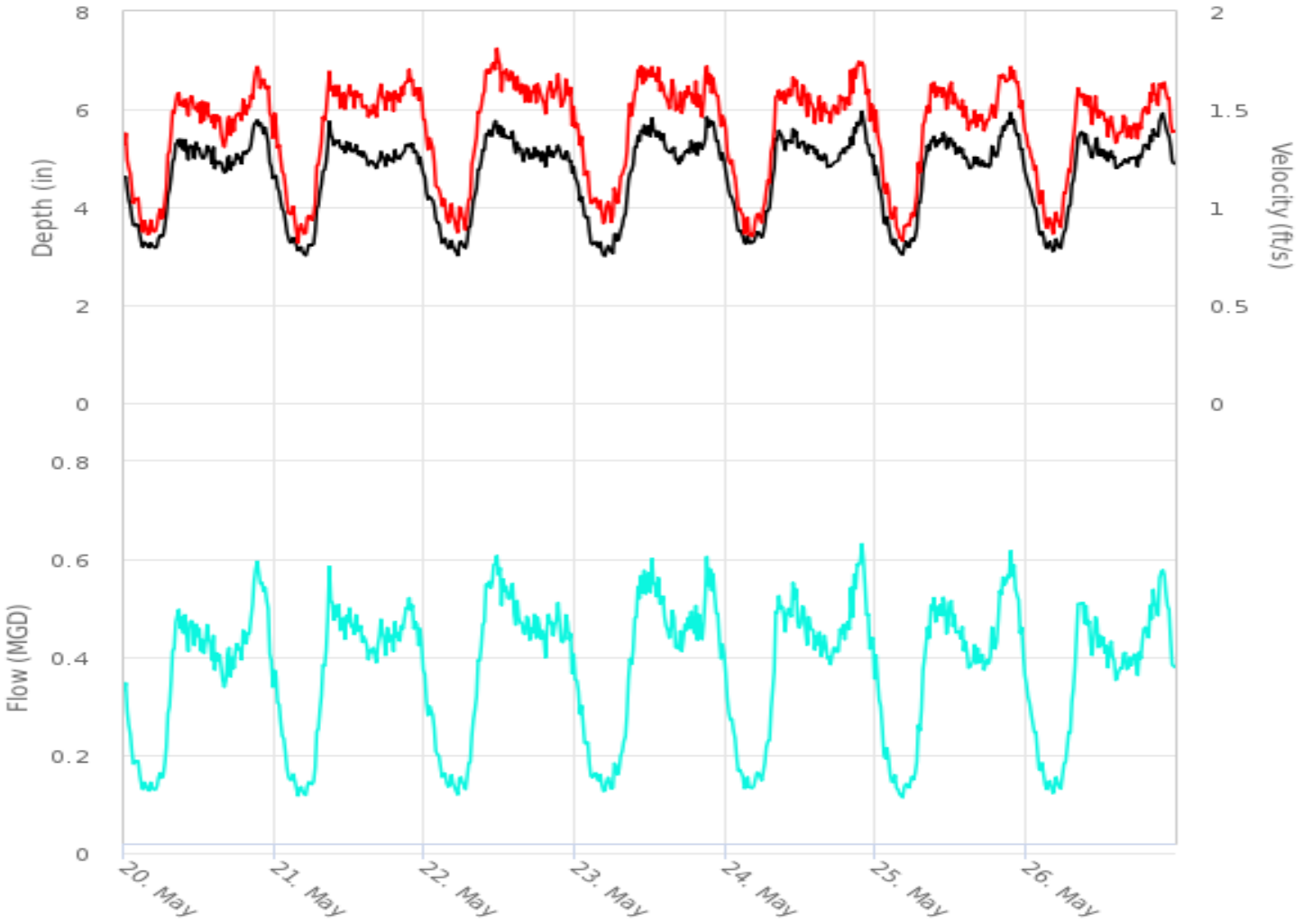
Report Period

05/20/2021
To
05/26/2021

Legend

- DFINAL
- VFINAL
- QFINAL

ADS ENVIRONMENTAL SERVICES

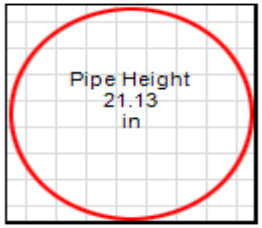


Scattergraph Report

Maureen1

Flow Monitor

Maureen1



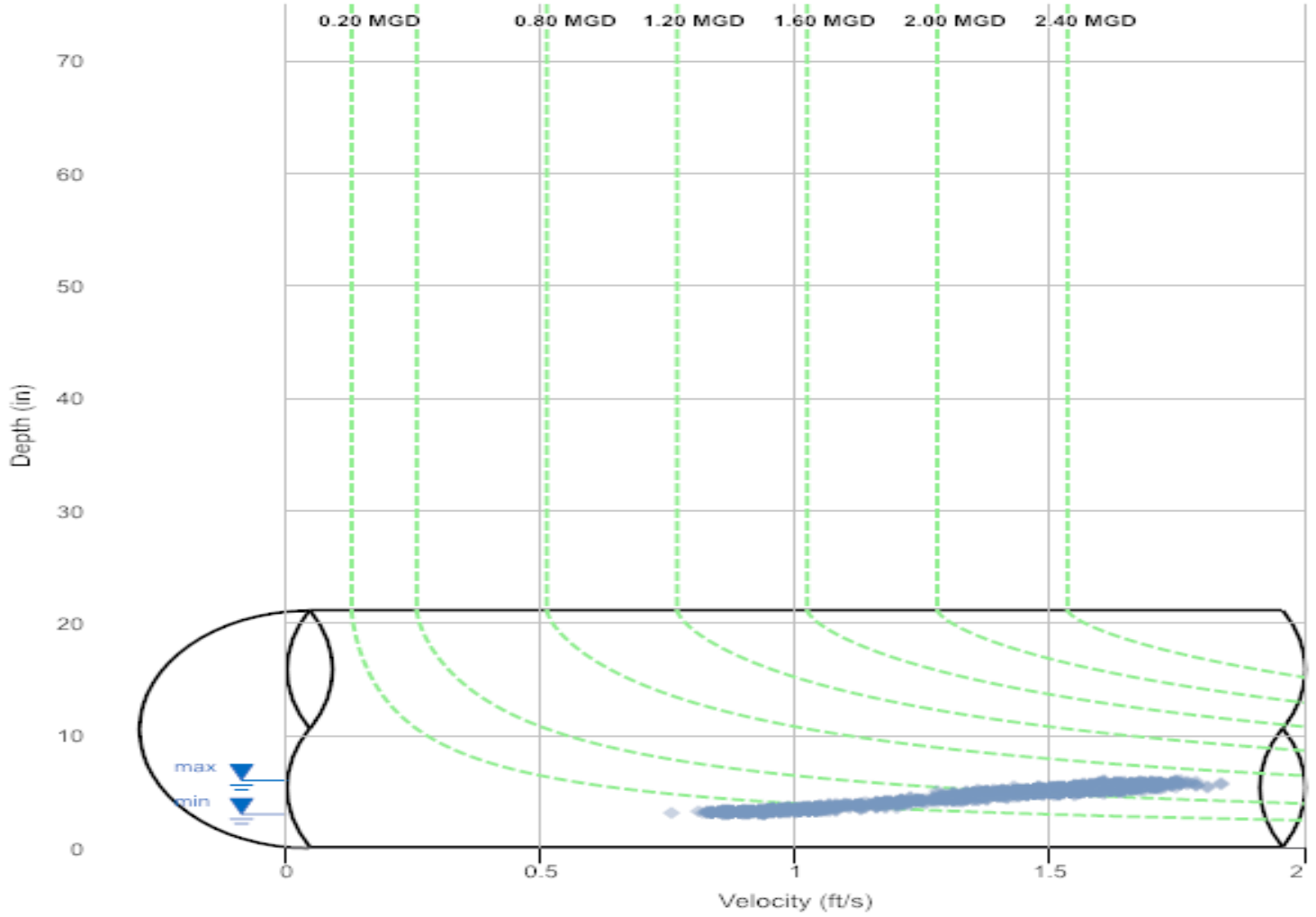
Report Period

05/20/2021
To
05/26/2021

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth

ADS ENVIRONMENTAL SERVICES



Daily Tabular Report

05/20/2021 00:00 - 05/26/2021 23:59
Maureen1Pipe: Elliptical (21.13 in H x 21 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/20/2021	05:15	3.12	21:20	5.81	4.66	04:00	0.84	21:20	1.73	1.35	04:05	0.122	21:20	0.603	0.364	0.364
05/21/2021	05:05	3.00	08:50	5.77	4.61	03:50	0.76	21:35	1.81	1.40	03:50	0.109	08:50	0.596	0.371	0.371
05/22/2021	05:20	3.00	11:25	5.82	4.63	06:45	0.83	11:05	1.84	1.43	05:15	0.117	11:05	0.626	0.383	0.383
05/23/2021	05:00	2.97	21:05	5.88	4.67	05:45	0.89	12:30	1.79	1.42	05:00	0.121	21:05	0.621	0.385	0.385
05/24/2021	03:15	3.21	21:50	5.99	4.75	04:25	0.81	21:25	1.77	1.39	03:15	0.125	21:50	0.644	0.385	0.385
05/25/2021	04:10	3.02	21:35	5.95	4.71	04:15	0.82	21:40	1.79	1.38	04:15	0.112	21:40	0.639	0.379	0.379
05/26/2021	04:20	3.09	21:55	5.97	4.70	05:40	0.83	21:25	1.70	1.35	04:20	0.121	21:25	0.609	0.366	0.365

05/20/2021 00:00 - 05/26/2021 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			2.632
Average	4.68	1.39	0.376