

# Master Utilities Report

for

**Jamaso**

**Aurora, Colorado**

Prepared for:

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**Approved On This Date**

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AURORA WATER - UTILITIES DIVISION	DATE
_____	_____
FIRE DEPARTMENT	DATE

# Jamaso

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## Document history and status

Revision	Date	Description	By	Review	Approved

## Engineer's Statement

This "Master Utility Report for Jamaso" was prepared under my direct supervision in accordance with the provisions of the City of Aurora Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure. I understand that the City of Aurora does not and will not assume liability for facilities designed by others.

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## TABLE OF CONTENTS

I.	Introduction.....	5
	A. Site Location.....	5
	B. Description of Property.....	5
	C. Existing Infrastructure.....	6
II.	Water Distribution System.....	6
	A. Existing Water Infrastructure.....	6
	B. Water Design Criteria.....	6
	C. Proposed Water System.....	7
	D. Water System Analysis.....	8
III.	Sanitary Sewer System.....	9
	A. Existing Sanitary Sewer System.....	9
	B. Sanitary Design Criteria.....	9
	C. Proposed Sanitary Sewer System.....	10
	D. Future Sanitary Sewer Extension & Offsite Sanitary Basin.....	10
	E. Sanitary Sewer Analysis.....	11
IV.	Conclusion.....	12
V.	References.....	12

## APPENDICES

A.	Demand and Flow Calculations.....	14
B.	Water Hydraulic Computations.....	17
C.	Sanitary Hydraulic Computations.....	37
D.	Utility Maps.....	39
E.	Referenced Documents.....	42

# I. Introduction

## A. Site Location

The Jamaso project site is located in the northwest quarter of Section 4, Township 4 South, Range 65 West of the 6<sup>th</sup> Principal Meridian, City of Aurora, County of Arapahoe, State of Colorado. Below is Exhibit A for a vicinity map of the area.

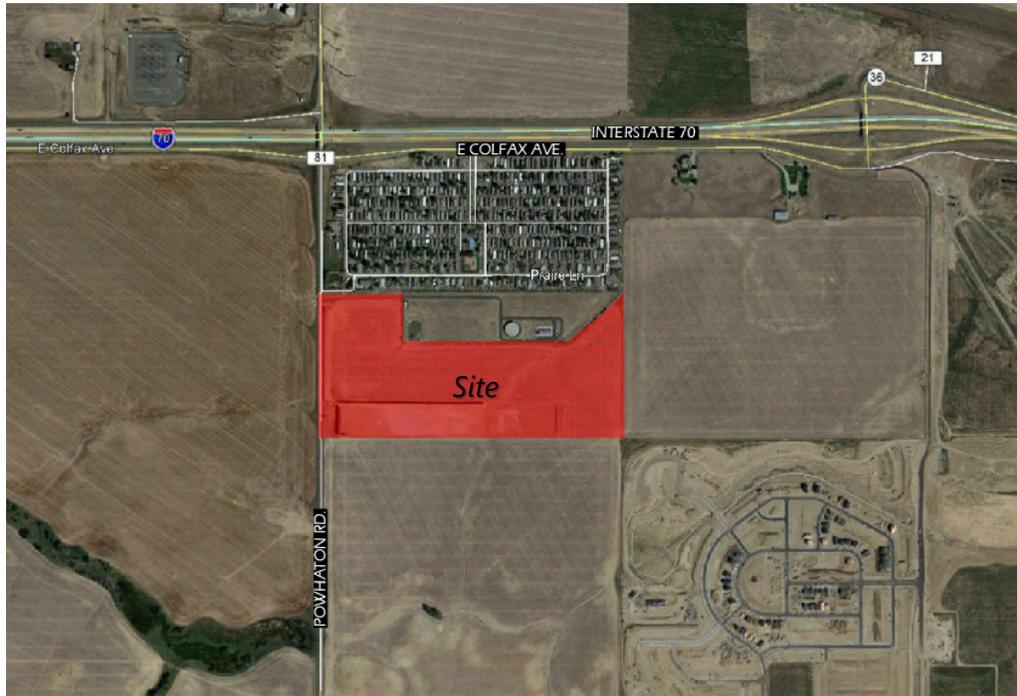


Exhibit A – Vicinity Map

## B. Description of Property

The site is approximately 56.9 acres of land which is bounded by N. Powhaton Road to the west; Foxridge Farm mobile home park, Sable Altura Fire Station #1, and Aurora Water Pumping Station #3 to the north; Sky Ranch Subdivision to the southeast; and undeveloped land to the east and south. The proposed site is divided into eleven (11) planning areas which account for 38.2 acres of commercial area (PA-2, PA-3, PA-5, and PA-6); 8.7 acres of existing oil & gas (PA-7); 2.2 acres for full-spectrum detention (PA-4); and 7.8 acres of open-space/landscape buffer (PA-1, PA-8, PA-9, PA-10, and PA-11). The 38.2 acreage of commercial planning area is comprised of 26.5 acres of outdoor self-storage (PA-5 and PA-6) and 11.7 acres of indoor self-storage and retail (PA-2 and PA-3). Detention ponds and emergency accesses for the project will be dedicated from the planning areas.

Currently, the project site is zoned for Mixed Use – Airport (MU-A). The following table provides the land use and total area of each planning area within the site. Refer to

Appendix C for the Water Distribution Map, which shows the locations of the planning areas.

<b>Planning Area</b>	<b>Area (Ac.)</b>	<b>Land Use</b>
PA-1	0.9	Open space/ Landscape buffer (MU-A)
PA-2	6.6	Commercial - Retail/ Indoor self-storage
PA-3	5.0	Commercial - Retail/ Indoor self-storage
PA-4	2.2	Detention
PA-5	23.8	Commercial - Outdoor self-storage
PA-6	2.7	Commercial - Outdoor self-storage
PA-7	8.7	Existing Oil & Gas
PA-8	2.7	Open space/ Landscape buffer (MU-A)
PA-9	1.8	Open space/ Landscape buffer (MU-A)
PA-10	2.0	Open space/ Landscape buffer (MU-A)
PA-11	0.4	Open space/ Landscape buffer (MU-A)
<b>Total Area</b>	<b>56.9</b>	

### **C. Existing Infrastructure**

Currently, there are existing utilities in N. Powhatan Road, and any work within or in the vicinity of the Powhatan ROW will require Aurora Water’s Watch and Protect Team to be notified ten (10) days in advance. These utilities include a cable television line, a fiber optic line, a 16-in waterline, and a 60-in waterline. In addition to the in-ground utilities listed above, there are overhead electric lines to the west of N. Powhatan Road.

## **II. Water Distribution System**

### **A. Existing Water Infrastructure**

There are two waterlines that extend from Aurora Pumping Station #3 to N. Powhatan Road; an existing 16-in waterline that conveys potable water and an existing 60-in waterline that conveys raw water. There are two waterlines within N. Powhatan Road; a 16-in waterline and a 60-in waterline that extends along the entire eastern boundary of the Jamaso project site.

### **B. Water Design Criteria**

Per sheet 05Y of Fire Hydrants from Aurora Water, the site is located within Pressure Zone 4 of the City of Aurora’s Water Master Plan. The table below provides the Hydraulic Grade

Line (HGL) of Zone 4 and provides site elevations with their corresponding pressure range. Refer to Appendix D for sheet 05Y of Fire Hydrants.

Pressure Zone	Static HGL	Site Elev. Range	Static Pressure Range
Zone 4	5850	5615-5585	102-115

As previously mentioned, this site incorporates 11.7 acres of commercial retail and indoor self-storage planning areas and 26.5 gross acres of outdoor self-storage area. This site does not include any residential development due to the proximity to existing oil and gas on site.

Per the City of Aurora’s Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications, below is a list of the demand criteria that was used:

- Average Day Demand (ADD): Commercial Demand = 1500 gpd/acre
- Max Day Peaking Factor = 2.8x
- Max Hour Peaking Factor = 4.5x
- Maximum Day Demand (MDD): Commercial Demand = 4200 gpd/acre
- Peak Hour Demand (PHD): Commercial Demand = 6750 gpd/acre
- Fire Flow: Commercial Demand = 2500 gpm
- Maximum Velocity = 3 fps in 8-in and 12-in WL during the PHD scenario.
- Head Loss Not to Exceed 0.005 ft/ft during the PHD scenario.

### C. Proposed Water System

The proposed water system for Jamaso includes two waterline loops, and there is no phasing of water distribution infrastructure. Additionally, there is a proposed 30-in waterline (design by others, DBO) along the eastern boundary of the project site. Per conversations with the City of Aurora, the 30-in waterlines within the Jamaso project site are a necessary part of the future Zone 4 waterline that is being proposed by the City’s master plan for the ‘Eastern Utility Extension Zone 4 Waterline’. Refer to Appendix D for plan and profile views of the proposed 30-in waterline design by HDR, Inc., released for construction May 1, 2023, and reissued July 14, 2023.

The first 16-in waterline loop is proposed from the existing 16-in waterline in N. Powhaton Rd at the intersection with proposed E. 12<sup>th</sup> Avenue. The waterline loop will extend east along the southern boundary of PA-2 for approximately 650 feet in E. 12<sup>th</sup> Avenue. From there, the waterline loop extends south along the eastern edge of PA-3 approximately 350 feet to the northern boundary of PA-7. The waterline loop is completed by continuing west along the northern boundary of PA-7 where it reconnects with the existing 16-in waterline in N. Powhaton Road.

The second waterline loop is proposed as 12-in waterline that connects the first proposed waterline loop to the proposed DBO 30-in waterline in two (2) locations. The northern

branch of the second waterline loop starts at the 16-in waterline in E. 12<sup>th</sup> Avenue at the southwest corner of PA-2, where it will be reduced to a 12-in waterline. From there, the 12-in waterline extends west in E. 12<sup>th</sup> Avenue for approximately 1,900 feet and intersects with the DBO 30-in waterline near the southeast corner of PA-6. The southern branch of the second proposed waterline loop begins at the southwest corner of the proposed 16-in waterline loop (near the southwest corner of PA-3), where it will be reduced to a 12-in waterline. From there, the 12-in waterline extends approximately 1,125 feet west and south along the boundary of PA-7; from the southwest corner of PA-7, the proposed 12-in waterline extends approximately 1,025 feet west and intersects with the DBO 30-in waterline near the southeast corner of PA-5. The loop is completed by approximately 710 feet of DBO 30-in waterline between the proposed 12-in waterline connection points, near the southeast corner of PA-6 and near the southeast corner of PA-5, respectively.

A minimum cover of four and one-half feet (4.5-ft) shall be maintained over all water mains and service laterals. The waterline connection in N. Powhatan Road will require a minimum of five feet (5-ft) of vertical separation from the 60-in waterline. Refer to Appendix C for the Water Distribution Map which details the proposed water distribution system.

## **D. Water System Analysis**

On-site water demand calculations are provided in Appendix A. Per the City's criteria, the water system was analyzed under the following scenarios:

- Average Day Demand
- Peak Hour Demand
- Maximum Day Demand plus Fire Flow

The Maximum Day Demand plus Fire Flow scenario was analyzed twice; in the first scenario, the fire flow was modeled at the node of highest elevation; in the second scenario, the fire flow was modeled at the node of lowest elevation. These analyses were performed to confirm the water distribution system functions in compliance with Aurora standards for both residual pressure and maximum velocities.

### **Model Summary**

The water model was created using Bentley's WaterCAD. The highest pressure observed for each scenario occurs at Junction J-9, which is the junction with the lowest elevation. The lowest pressure of 102 psi reported for each scenario occurs at Junction J-4, which is the junction with the highest elevation. A maximum pressure of 115 psi is reported at Junction J-9 during the average day demand, peak hour demand, and maximum day demand plus commercial fire flow (at junction of highest elevation) scenarios. A maximum pressure of 114 psi is reported at Junction J-9 during the maximum day demand plus commercial fire flow (at junction of lowest elevation) scenario. During the peak hour demand scenario, flows meet City of Aurora criteria. Refer to Appendix B for the Nodal Diagram and Water Hydraulic Computations.

### III. Sanitary Sewer System

#### A. Existing Sanitary Sewer System

The Jamaso project site lies within the First Creek Sanitary Basin. Currently, the closest available existing sanitary sewer connection is a 12-in sanitary sewer approximately two miles away at Prologis Park 70. Prologis Park 70 is located at E-470 and E. 19<sup>th</sup> Avenue. The existing Prologis lift station which is located to the west of E-470 and south of Smith Road is planned to be removed and replaced by a 21-in sanitary sewer main which will gravity flow to the existing First Creek Interceptor that is located west of E-470 within Smith Road. Per the Master Utility Study and Sanitary Sewer Plans for Aurora Crossroads by Martin/Martin, dated November 25, 2020 and October 27, 2021, respectively, the sanitary sewer is to be extended east from the Aurora Crossroads development by others during the construction of future projects that are within the vicinity of the Aurora Crossroads development. Generally, the sanitary sewer extension from Aurora Crossroads is to follow the First Creek Drainageway. Refer to Appendix D for the Aurora Crossroads Sanitary Map from the Master Utility Study by Martin/Martin, Inc and the pertinent sheets from the Aurora Crossroads Offsite Sanitary Sewer Construction Plans which show the locations of the existing and proposed sanitary infrastructure.

#### B. Sanitary Design Criteria

Sanitary design criteria per the City of Aurora's Water, Sanitary Sewer & Storm Drainage Infrastructure Standards and Specifications is defined below.

- Average Residential Loading = 68 gpcd
- Average Day Loading (Commercial) = 1500 gpd/acre
- Equivalent Population per Acre (Commercial) = 22
- Population per Residence = 2.77 people/dwelling unit
- Peaking Factor (PF) =  $5 / p^{0.167}$ , where p = population (in thousands)
- Maximum Peaking Factor = 4.0
- Minimum Peaking Factor = 1.7
- Maximum Velocity = 10 ft/s
- Manning's: N=0.011 for PVC and N=0.013 for RCP or VCP.

Per Regulation No. O-17 from the Tri-County Health Department, septic storage sizing is defined below.

- For non-residential applications, a septic tank must be sized to permit detention of incoming wastewater design flows for a minimum of 48 hours.

Design criteria for the sanitary sewer system is based upon Section 5 of the Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications by Aurora Water. Per section 5.03.6 of the standards and specifications from the City of Aurora, the sanitary

sewer mains that are 12-in diameter and smaller are designed to carry the peak discharge with the pipe operating at no more than 75% of the maximum flow capacity; 80% for larger diameter pipes.

### C. Proposed Sanitary Sewer System

If the individual lots within the Jamaso project site are to be developed prior to the completion of the sanitary sewer extension from the Aurora Crossroads development, then those lots will be serviced via septic systems which may include sanitary vaults and/or septic tanks with an associated leach bed, as a temporary measure. Prior to construction of each lot, additional permitting will be required.

Permitting of Septic Systems is managed by the Arapahoe County Health Department and shall be completed prior to the construction of each lot. Designs of the individual lots shall include the locations of all proposed buildings and septic systems. Septic systems shall be designed and constructed per the requirements of the County Health Department. Septic systems within the Jamaso project site will be independently owned and maintained by the owner of the lots in which they reside.

The following table shows the three planning areas that will require sanitary accommodations. The table provides the average sanitary load, peak sanitary load, and the minimum septic storage volume required for a septic storage system to serve each planning area based on 48 hours of average sanitary loading. Refer to Appendix A for detailed flow calculations.

Sanitary Loading Calculations					
Planning Area	PA-2	PA-3	PA_5	PA-6	Offsite
Average Sanitary Load	9,900 gpd	7,500 gpd	35,700 gpd	4,050 gpd	85,952 gpd
Peak Sanitary Load + I/I	40,590 gpd	30,750 gpd	146,370 gpd	16,605 gpd	352,403 gpd
	0.063 cfs	0.048 cfs	0.226 cfs	0.026 cfs	0.545 cfs
Minimum Septic Storage	81,180 Gal	61,500 Gal	292,740 Gal	33,210 Gal	N/A

### D. Future Sanitary Sewer Extension & Offsite Sanitary Basin

Once the First Creek Interceptor Sanitary Sewer has been extended justifiably close to the Jamaso project site, a sewer main shall be constructed within E. 12<sup>th</sup> Avenue. At that time an amendment to this Master Utility Study will be provided to confirm that capacity requirements are met if master planning has been altered in such a way as to affect utilities. The proposed Jamaso design is in conformance with the Master Utility Study Addendum Letter (EDN: 221029), prepared by Martin & Martin Consulting Engineers and dated February 22, 2022. Refer to Section III.E of this report for detailed discussion of conformance the MUS Addendum Letter. Refer to Appendix E for excerpted material from the Master Utility Study Addendum Letter (EDN: 221029).

The sanitary sewer within E. 12<sup>th</sup> Avenue shall extend from N. Powhatan Road to the eastern site boundary and will be connected and outfall to the sanitary extension. The sanitary extension in N. Powhatan Road to the First Creek Interceptor will also require capacity for the property directly south of and adjacent to Jamaso which is currently zoned for Medium Density Residential development. For detailed information on the future sanitary sewer interceptor, refer to the excerpted material from the Master Utility Study Addendum Letter (EDN: 221029) included in Appendix E.

The offsite sanitary basin is bordered by the southern property boundary of Jamaso, N. Powhatan Road, First Creek, and Riverwood Tributary. Riverwood Tributary is a natural division for the sanitary sewer system of the property directly south of Jamaso and flows will need be diverted around the tributary. Offsite contributions to the flows in the future sanitary extension within N. Powhatan Road are provided in the table below. Refer to Appendix D for the sanitary sewer system map and refer to Appendix A for detailed sanitary flow calculations.

Planning Area	Offsite	
Average Sanitary Load	85,952	gpd
Peak Sanitary Load + I/I	352,403	gpd
	0.545	cfs

## E. Sanitary Sewer Analysis

There are four (4) commercial planning areas and one offsite residential area which will produce sanitary flows that need to be considered in this report. Assuming future full development of Planning Areas PA-5 and PA-6, the onsite sanitary basin generates a total peak flow of 0.363 cfs (0.234 MGD); the offsite sanitary basin generates a total peak flow of 0.545 cfs (0.352 MGD); and the total flow rate in the future sanitary sewer extension in N. Powhatan Road is 0.908 cfs (0.587 MGD).

A 12-in PVC pipe at a minimum slope of 0.40% conveying 0.908 cfs will flow at 40.0% capacity, measured as normal depth divided by diameter (d/D). Therefore, a 12-in PVC sanitary sewer pipe is sufficient to support Jamaso and the offsite sanitary basin to the south of the site. Refer to Appendix C for detailed hydraulic computations.

The Aurora Crossroads Filing No. 1 Master Utility Study Addendum Letter (EDN: 221029), prepared by Martin & Martin Consulting Engineers and dated February 22, 2022, anticipates an average daily flow of 0.070 MGD from the Jamaso project site (denoted OS7 in the MUS Addendum Letter). At maximum development, Jamaso would produce an average daily flow of 0.057 MGD. The formula for the peaking factor used in the Aurora Crossroads MUS Addendum Letter is in conformance with City of Aurora Standards, Section 5.03 (presented in Section III.B of this report). Therefore, the proposed

development of Jamaso is in conformance with the Master Utility Study and the design intent of the future sanitary sewer interceptor.

The Aurora Crossroads Filing No. 1 MUS Addendum Letter also anticipates an average daily flow of 0.1316 MGD from the future residential area immediately adjacent to the southern boundary of the Jamaso project site (denoted OS8 in the MUS Addendum Letter). OS8 encompasses an area of 127 acres which includes portions of Riverwood Tributary and the First Creek Tributary. Ultimately, the entirety of OS8 is collected by the 30-in interceptor along the First Creek Tributary. Additionally, OS8 includes portions of the Jamaso project site totaling approximately 10.5 acres; this overlap includes the existing oil & gas site in PA-7. Based on the existing topography, approximately 38 acres of OS8 would be able to contribute to the 12-in sanitary line in N. Powhaton Rd. This offsite 38.0-acre future residential area anticipates an average daily flow of 0.086 MGD and is comprised of the northwestern portion of OS8 delineated by N. Powhaton Road; the southern boundary of the Jamaso project site; Riverwood Tributary; and First Creek. Currently with this development, the 12-in sanitary line within N. Powhaton Rd is approximately 40.3 % full with a depth of 4.8 inches, resulting in a d/D of 0.4. Further analysis of OS8 is not the scope of this study and the pipe has additional capacity to provide options for the development of the OS8 basin. Therefore, the anticipated offsite development discussed in this report is in conformance with the Master Utility Study and the design intent of the future sanitary sewer interceptor.

Refer to Appendix A for detailed loading and demand calculations. Refer to Appendix E for loading and demand calculations and annotated maps excerpted from the Aurora Crossroads Filing No. 1 MUS Addendum Letter (EDN: 221029).

## IV. Conclusion

The proposed water systems conform to the Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications from Aurora Water. Septic systems are an acceptable temporary measure until such time as sanitary sewer mains are extended closer to service the project.

## V. References

1. ***Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications***, Aurora Water, January 2022.
2. ***Fire Hydrants***, Aurora Water, plot date February 2, 2020.

3. ***Aurora Prairie Waters Project Conveyance System Pumping Station 3 Civil Utility Extension – Water CSP excerpt***, plot date September 18, 2007 and prepared by MWH (2007-6046-00).
4. ***Jamaso Multi-well Pad Civil Plans***, approved November 13, 2018 and prepared by Lamp Rynearson & Associates (218185).
5. ***Regulation No. O-17 On-Site Wastewater Treatment Systems***, effective October 1, 2017 and prepared by Tri-County Health Department.
6. ***Aurora Crossroads – Master Utility Study***, dated November 25, 2020 and prepared by Martin/Martin, Inc (221029).
7. ***Aurora Crossroads Offsite Sanitary Sewer Construction Plans***, approved June 21, 2021 and prepared by Martin/Martin, Inc (221191).
8. ***Eastern Utility Extension Zone 4 Waterline Construction Plans***, revised July 14, 2023 and prepared by HDR, Inc.
9. ***Master Utility Study Addendum Letter***, dated February 22, 2022 and prepared by Martin/Martin, Inc (221029)

# APPENDIX A

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## Demand and Flow Calculations

<b>Jamaso Water Demand Calculations</b>							
					Average Day Demand (gpd / acre)	Maximum Day Demand (gpd / acre)	Peak Hour Demand (gpd / acre)
Commercial/Self Storage					1500	4200	6750
Parks & Landscaping					1800	5040	N/A
Industrial					1200	3360	5400
Junction	Planning Area	PA Usage	Total Area	Contributing Area (acre)	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Peak Hour Demand (gpm)
J-2	PA-1	Landscape	0.9	0.4	0.53	1.49	N/A
J-1	PA-2	Commercial	6.6	5.6	5.86	16.40	26.36
J-1	PA-3	Commercial	5.0	4.5	4.68	13.11	21.07
J-9	PA-4	Detention	2.2	0.6	0.70	1.96	N/A
J-7	PA-5	Commercial	23.8	21.5	22.39	62.68	100.73
J-3	PA-6	Commercial	2.7	2.3	2.42	6.78	10.90
J-8	PA-7	Industrial	8.7	8.7	7.25	20.30	32.63
J-6	PA-8	Landscape	2.7	2.6	3.29	9.21	N/A
J-2	PA-9	Landscape	1.8	0.4	0.44	1.24	N/A
J-5	PA-10	Landscape	2.0	1.2	1.53	4.30	N/A
J-2	PA-11	Landscape	0.4	0.4	0.50	1.41	N/A
Total =					49.60	138.88	191.68

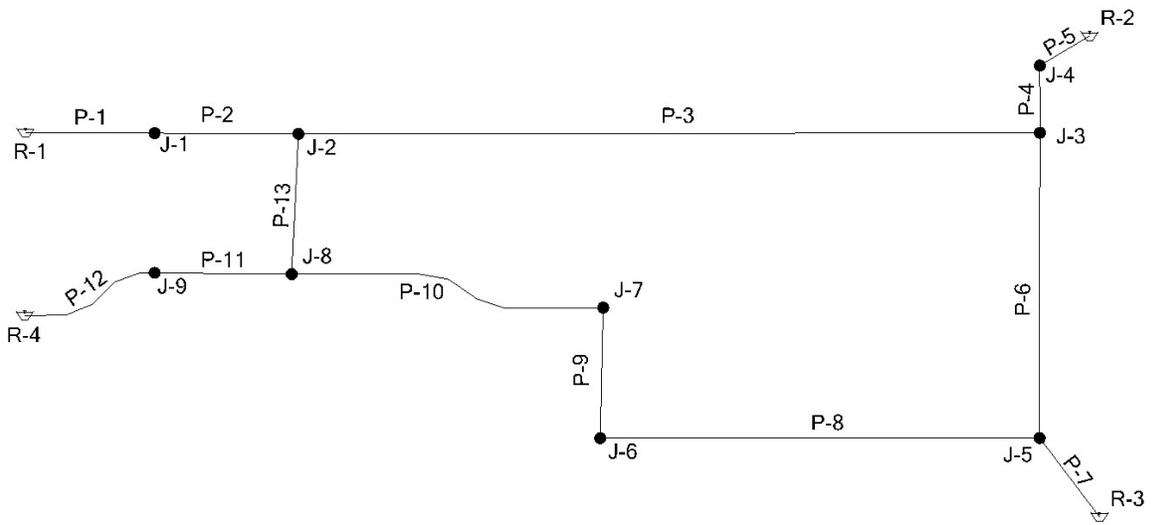
<b>Sanitary Loading Calculations</b>					
Planning Area	PA-2	PA-3	PA_5	PA-6	Offsite
Contributing Area	6.6 Acres Commercial (Retail)	5.0 Acres Commercial (Retail)	23.8 Acres Commercial (Self Storage)	2.7 Acres Commercial (Self Storage)	38.0 Acres Medium Density Residential
Maximum Dwelling Density	N/A	N/A	N/A	N/A	12 units/ acre
Equivalent # of Residents	146	110	524	60	1264
Peak Factor (PF)	4.00	4.00	4.00	4.00	4.00
Average Sanitary Load	9,900 gpd	7,500 gpd	35,700 gpd	4,050 gpd	85,952 gpd
Infiltration & Inflow (I/I)	990 gpd	750 gpd	3,570 gpd	405 gpd	8,595 gpd
Peak Sanitary Load + I/I	40,590 gpd	30,750 gpd	146,370 gpd	16,605 gpd	352,403 gpd
	0.063 cfs	0.048 cfs	0.226 cfs	0.026 cfs	0.545 cfs
Minimum Septic Storage	81,180 Gal	61,500 Gal	292,740 Gal	33,210 Gal	N/A

## APPENDIX B

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### Water Hydraulic Computations

# Jamaso Nodal Diagram



**Static**  
**Pipe Table - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	0.00	0.00	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	0.00	0.00	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	0.00	0.00	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	0.01	0.00	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	-0.01	0.00	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	0.01	0.00	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	0.01	0.00	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	0.00	0.00	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	0.00	0.00	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	0.00	0.00	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	0.00	0.00	0.000
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	0.00	0.00	0.000
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	0.00	0.00	0.000

**Static**

**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	0.00	5,850.00	114
J-2	5,599.00	0.00	5,850.00	109
J-3	5,610.50	0.00	5,850.00	104
J-4	5,614.70	0.00	5,850.00	102
J-5	5,604.10	0.00	5,850.00	106
J-6	5,589.30	0.00	5,850.00	113
J-7	5,590.70	0.00	5,850.00	112
J-8	5,586.71	0.00	5,850.00	114
J-9	5,585.00	0.00	5,850.00	115

**Static**

**Reservoir Table - Time: 0.00 hours**

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	0.00	5,850.00
R-2	5,850.00	-0.01	5,850.00
R-3	5,850.00	0.01	5,850.00
R-4	5,850.00	0.00	5,850.00

**Average Day Demand (ADD)**  
**Pipe Table - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	15.38	0.02	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	4.84	0.01	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	3.58	0.01	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	-5.66	0.00	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	5.66	0.00	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	0.34	0.00	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	14.08	0.01	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	-12.21	0.03	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	-8.92	0.03	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	13.47	0.04	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	13.78	0.02	0.000
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	14.48	0.02	0.000
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	6.94	0.01	0.000

## Average Day Demand (ADD)

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	10.54	5,850.00	114
J-2	5,599.00	1.48	5,850.00	109
J-3	5,610.50	2.42	5,850.00	104
J-4	5,614.70	0.00	5,850.00	102
J-5	5,604.10	1.53	5,850.00	106
J-6	5,589.30	3.29	5,850.00	113
J-7	5,590.70	22.39	5,850.00	112
J-8	5,586.71	7.25	5,850.00	114
J-9	5,585.00	0.70	5,850.00	115

### Average Day Demand (ADD)

Reservoir Table - Time: 0.00 hours

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	15.38	5,850.00
R-2	5,850.00	5.66	5,850.00
R-3	5,850.00	14.08	5,850.00
R-4	5,850.00	14.48	5,850.00

## Maximum Day Demand (MDD)

### Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	43.07	0.07	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	13.56	0.02	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	10.02	0.03	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	-15.84	0.01	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	15.84	0.01	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	0.96	0.00	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	39.43	0.02	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	-34.17	0.10	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	-24.96	0.07	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	37.72	0.11	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	38.58	0.06	0.000
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	40.54	0.06	0.000
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	19.44	0.03	0.000

## Maximum Day Demand (MDD)

### Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	29.51	5,850.00	114
J-2	5,599.00	4.14	5,850.00	109
J-3	5,610.50	6.78	5,850.00	104
J-4	5,614.70	0.00	5,850.00	102
J-5	5,604.10	4.30	5,850.00	106
J-6	5,589.30	9.21	5,849.99	113
J-7	5,590.70	62.68	5,849.99	112
J-8	5,586.71	20.30	5,850.00	114
J-9	5,585.00	1.96	5,850.00	115

## Maximum Day Demand (MDD)

Reservoir Table - Time: 0.00 hours

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	43.07	5,850.00
R-2	5,850.00	15.84	5,850.00
R-3	5,850.00	39.43	5,850.00
R-4	5,850.00	40.54	5,850.00

**Max. Day Demand + Fire Flow at Highest Elevation (MDD+FF High)**

**Pipe Table - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	59.48	0.09	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	29.97	0.05	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	-20.66	0.06	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	425.36	0.19	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	2,074.64	0.94	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	411.49	0.19	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	450.40	0.20	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	-34.61	0.10	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	-25.40	0.07	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	37.28	0.11	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	52.40	0.08	0.000
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	54.36	0.09	0.000
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	5.18	0.01	0.000

**Max. Day Demand + Fire Flow at Highest Elevation (MDD+FF High)**  
**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	29.51	5,850.00	114
J-2	5,599.00	4.14	5,850.00	109
J-3	5,610.50	6.78	5,849.99	104
J-4	5,614.70	2,500.00	5,849.99	102
J-5	5,604.10	4.30	5,850.00	106
J-6	5,589.30	9.21	5,849.99	113
J-7	5,590.70	62.68	5,849.99	112
J-8	5,586.71	20.30	5,850.00	114
J-9	5,585.00	1.96	5,850.00	115

### Max. Day Demand + Fire Flow at Highest Elevation (MDD+FF High)

Reservoir Table - Time: 0.00 hours

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	59.48	5,850.00
R-2	5,850.00	2,074.64	5,850.00
R-3	5,850.00	450.40	5,850.00
R-4	5,850.00	54.36	5,850.00

**Max. Day Demand + Fire Flow at Lowest Elevation (MDD+FF Low)**

**Pipe Table - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	608.83	0.97	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	579.32	0.92	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	176.24	0.50	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	-136.52	0.06	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	136.52	0.06	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	46.50	0.02	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	291.00	0.13	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	-240.20	0.68	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	-230.99	0.66	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	-168.31	0.48	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	-899.43	1.44	0.001
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	1,602.53	2.56	0.001
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	751.41	1.20	0.000

**Max. Day Demand + Fire Flow at Lowest Elevation (MDD+FF Low)**  
**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	29.51	5,849.88	114
J-2	5,599.00	4.14	5,849.81	109
J-3	5,610.50	6.78	5,850.00	104
J-4	5,614.70	0.00	5,850.00	102
J-5	5,604.10	4.30	5,850.00	106
J-6	5,589.30	9.21	5,849.81	113
J-7	5,590.70	62.68	5,849.76	112
J-8	5,586.71	20.30	5,849.68	114
J-9	5,585.00	2,501.96	5,849.49	114

**Max. Day Demand + Fire Flow at Lowest Elevation (MDD+FF Low)**

**Reservoir Table - Time: 0.00 hours**

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	608.83	5,850.00
R-2	5,850.00	136.52	5,850.00
R-3	5,850.00	291.00	5,850.00
R-4	5,850.00	1,602.53	5,850.00

**Peak Hourly Demand**  
**Pipe Table - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Material	Length (User Defined) (ft)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	R-1	J-1	16.0	PVC	480	130.0	0.000	62.68	0.10	0.000
P-2	J-1	J-2	16.0	PVC	320	130.0	0.000	15.26	0.02	0.000
P-3	J-3	J-2	12.0	PVC	1,885	130.0	0.000	14.37	0.04	0.000
P-4	J-3	J-4	30.0	PVC	395	130.0	0.000	-21.23	0.01	0.000
P-5	R-2	J-4	30.0	PVC	70	130.0	0.000	21.23	0.01	0.000
P-6	J-5	J-3	30.0	PVC	880	130.0	0.000	4.04	0.00	0.000
P-7	R-3	J-5	30.0	PVC	85	130.0	0.000	50.58	0.02	0.000
P-8	J-6	J-5	12.0	PVC	1,070	130.0	0.000	-46.54	0.13	0.000
P-9	J-7	J-6	12.0	PVC	300	130.0	0.000	-46.54	0.13	0.000
P-10	J-8	J-7	12.0	PVC	843	130.0	0.000	54.19	0.15	0.000
P-11	J-9	J-8	16.0	PVC	362	130.0	0.000	57.19	0.09	0.000
P-12	R-4	J-9	16.0	PVC	340	130.0	0.000	57.19	0.09	0.000
P-13	J-2	J-8	16.0	PVC	355	130.0	0.000	29.64	0.05	0.000

## Peak Hourly Demand

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,587.40	47.42	5,850.00	114
J-2	5,599.00	0.00	5,850.00	109
J-3	5,610.50	10.90	5,850.00	104
J-4	5,614.70	0.00	5,850.00	102
J-5	5,604.10	0.00	5,850.00	106
J-6	5,589.30	0.00	5,849.99	113
J-7	5,590.70	100.73	5,849.99	112
J-8	5,586.71	32.63	5,850.00	114
J-9	5,585.00	0.00	5,850.00	115

## Peak Hourly Demand

Reservoir Table - Time: 0.00 hours

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,850.00	62.68	5,850.00
R-2	5,850.00	21.23	5,850.00
R-3	5,850.00	50.58	5,850.00
R-4	5,850.00	57.19	5,850.00

## APPENDIX C

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### Sanitary Hydraulic Computations

## Worksheet for 12" PVC Capacity - Jamaso (Max.) + Offsite Contributions

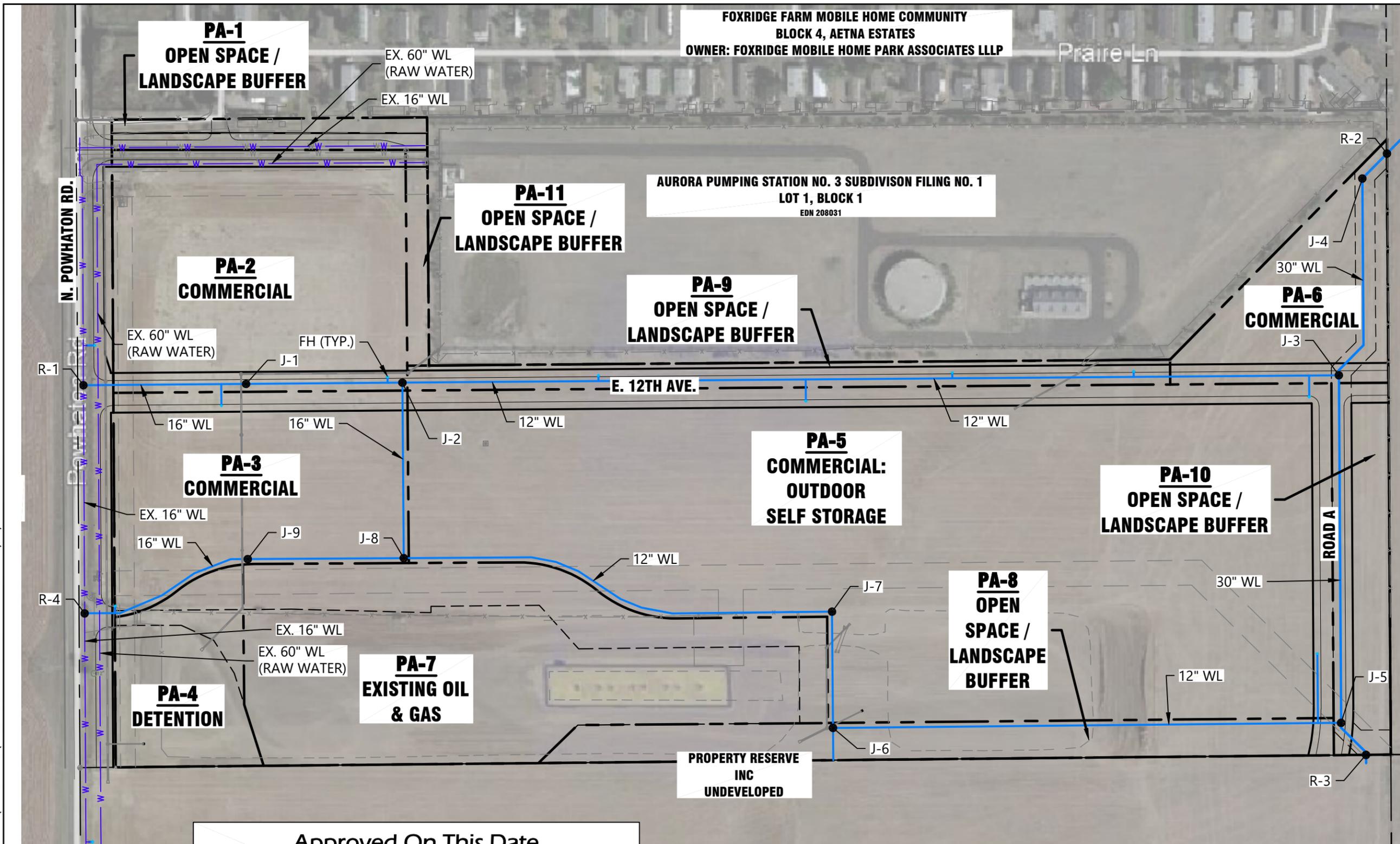
Project Description	
Friction Method	Manning
Solve For	Formula Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.400 %
Diameter	12.0 in
Discharge	0.908 cfs
Results	
Normal Depth	4.8 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.6 in
Top Width	0.98 ft
Critical Depth	4.8 in
Percent Full	40.3 %
Critical Slope	0.411 %
Velocity	3.07 ft/s
Velocity Head	0.15 ft
Specific Energy	0.55 ft
Froude Number	0.984
Maximum Discharge	2.864 cfs
Discharge Full	2.663 cfs
Slope Full	0.047 %
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	4.8 in
Critical Depth	4.8 in
Channel Slope	0.400 %
Critical Slope	0.411 %

## APPENDIX D

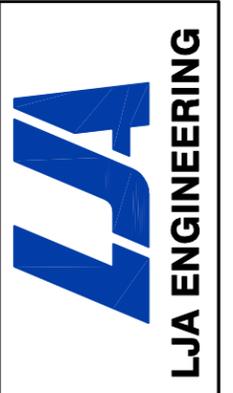
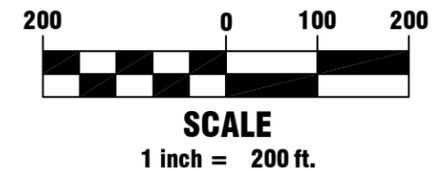
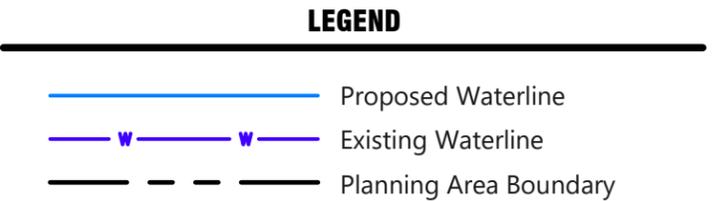
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Utility Maps  
Water Distribution Map  
Sanitary Sewer System Map

I:\JOB FOLDERS\1022\1022-02\EXHIBITS\MASTER UTIL\WATER DISTRIBUTION MAP PRINTED ON: 9/28/2023 6:02 PM



Approved On This Date	
_____	_____
AURORA WATER - UTILITIES DIVISION	DATE
_____	_____
FIRE DEPARTMENT	DATE



1765 W. 121st Avenue  
Suite 300  
Westminster, CO 80234  
303-421-4224 · www.lja.com

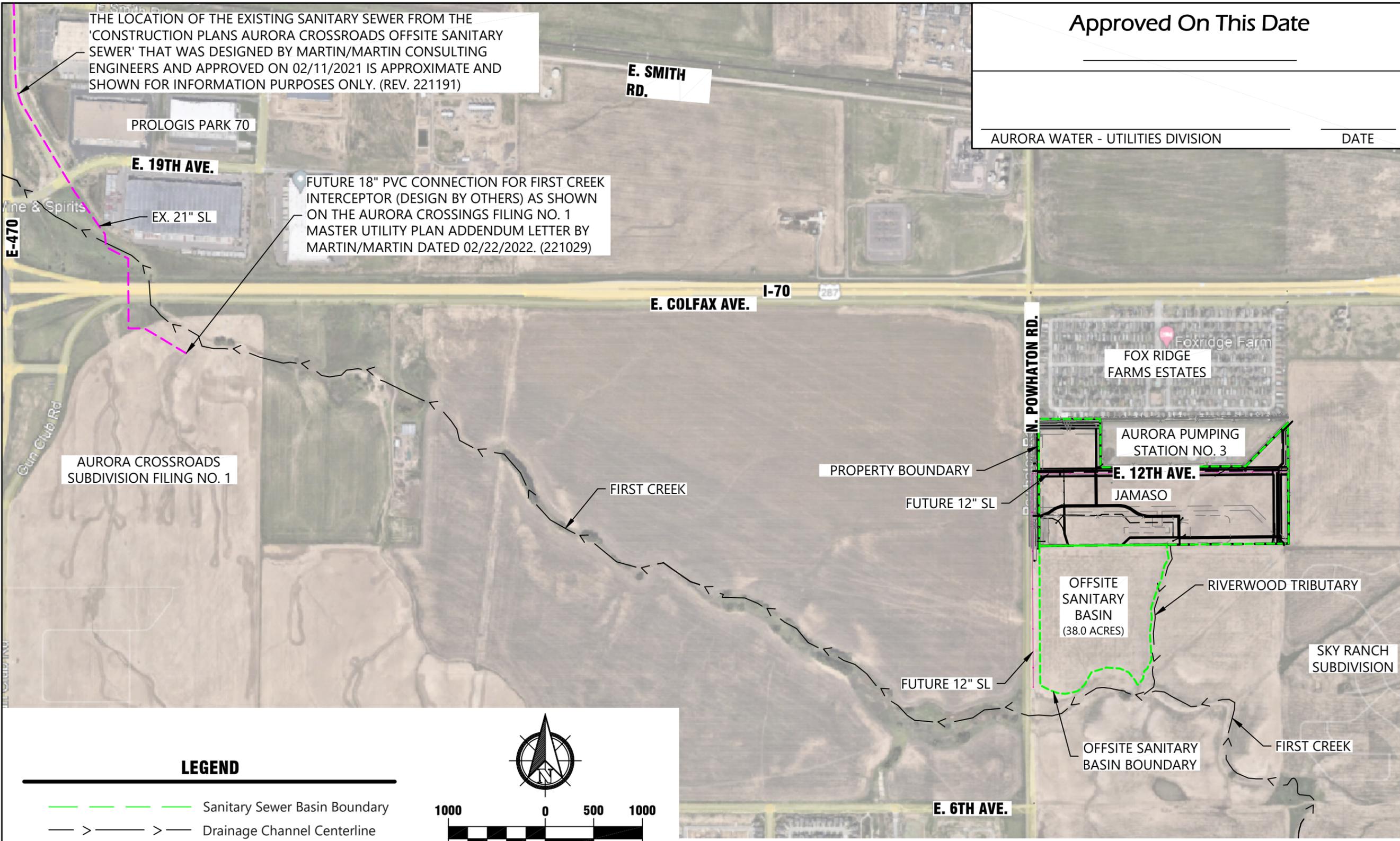
Proj. Name:	Jamaso
Location:	Aurora, Colorado
Plan Set:	Water Distribution Map
Sheet Name:	

Date:	Sept 29, 2023
Job No.:	1022-02
Scale H:	1" = 200'
Scale V:	N/A
Prepared:	CWS
Approved:	AKM



No.	1
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I:\JOB FOLDERS\1022-02\EXHIBITS\MASTER UTIL\SANITARY ROUTING MAP PRINTED ON: 9/28/2023 6:00 PM

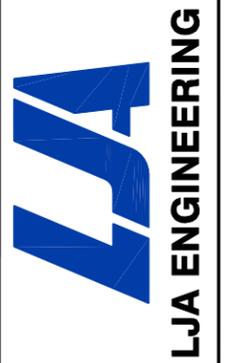


THE LOCATION OF THE EXISTING SANITARY SEWER FROM THE 'CONSTRUCTION PLANS AURORA CROSSROADS OFFSITE SANITARY SEWER' THAT WAS DESIGNED BY MARTIN/MARTIN CONSULTING ENGINEERS AND APPROVED ON 02/11/2021 IS APPROXIMATE AND SHOWN FOR INFORMATION PURPOSES ONLY. (REV. 221191)

FUTURE 18" PVC CONNECTION FOR FIRST CREEK INTERCEPTOR (DESIGN BY OTHERS) AS SHOWN ON THE AURORA CROSSINGS FILING NO. 1 MASTER UTILITY PLAN ADDENDUM LETTER BY MARTIN/MARTIN DATED 02/22/2022. (221029)

Approved On This Date

AURORA WATER - UTILITIES DIVISION \_\_\_\_\_ DATE \_\_\_\_\_



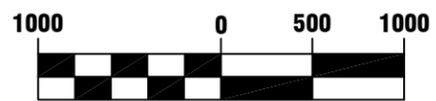
1765 W. 121st Avenue  
Suite 300  
Westminster, CO 80234  
303-421-4224 · www.lja.com

Proj. Name: Jamaso  
Location: Aurora, Colorado  
Plan Set: Sanitary Sewer System Map  
Sheet Name: Sanitary Sewer System Map

Date: Sept 29, 2023  
Job No.: 1022-02  
Scale H: 1" = 1000'  
Scale V: N/A  
Prepared: CWS  
Approved: AKM

**LEGEND**

- Sanitary Sewer Basin Boundary
- >->- Drainage Channel Centerline
- Future Sanitary Sewer
- Existing Sanitary Sewer



**SCALE**  
1 inch = 1000 ft.

**NOTES:**

1. REFER TO THE WATER DISTRIBUTION PLAN FOR A DETAILED VIEW OF JAMASO WHICH PROVIDES THE LAND USE TYPE FOR EACH PLANNING AREA.
2. THE OFFSITE SANITARY BASIN IS ZONED FOR MEDIUM DENSITY RESIDENTIAL.

Proposed Sanitary Design			
Contributing Basin	Jamaso (Max.)	Offsite	Total
Average Sanitary Load	0.057 MGD	0.086 MGD	0.143 MGD
Peak Sanitary Load + I/I	0.234 MGD	0.352 MGD	0.587 MGD
	0.363 cfs	0.545 cfs	0.908 cfs



Know what's below.  
Call before you dig.

No. 1

## APPENDIX E

---

### Referenced Documents

# **Fire Hydrants**

**by  
Aurora Water**



LEGEND:

- Fire\_Hydrants
- Proposed\_Fire\_Hydrants
- Water\_Valves**
- UNIT\_TYPE
  - JRV
  - Ball
  - Butterfly
  - BFZV
  - BO
  - CK
  - △ FLAPGATE
  - GV
  - ▲ PRV
  - Plug
  - ZV
  - Proposed\_Water\_Valves
- Water\_Fittings**
- UNITTYPE
  - Bunting
  - Cap
  - Cross
  - Encase End
  - Hydrant Tee
  - Main Tee
  - Meter Tee
  - Other
  - Outlet
  - Plug
  - Reducer
  - Service Tee
  - Wet Tap
  - Proposed\_Water\_Fittings
  - Water\_Station
  - Irrigation\_Meters\_Big\_Meters
  - Water\_Manhole
  - Proposed\_Water\_Manholes
  - Water\_Storage
  - Water\_Wells
- CCV, Denver, ECCV
- OWNER, WATER\_TYPE**
  - Aurora, Potable
  - Private, Potable
- Water\_Mains**
- CCV, Denver, ECCV
- OWNER, WATER\_TYPE**
  - Aurora, Potable
  - Private, Potable
- Proposed\_Water\_Laterals
- Proposed\_Water\_Mains
- Abandoned\_Point**
  - -all other valves-
- POINTTYPE**
  - Fitting
  - Hydrant
  - Manhole
  - Meter
  - Valve
  - Abandoned\_Mains
  - Pressure\_Zones
  - Water\_Facilities\_Security Area
  - Address Points
  - Easement Line
  - Parcels
  - Street Name Geocoded Line
  - CITY LIMITS

**FUTURE UTILITIES CORRIDOR**

THIS IS THE PROPOSED LOCATION FOR A 66" WATER LINE WITH FOUR ALTERNATE ROUTES. IF YOU HAVE ANY QUESTIONS REGARDING ANY CONSTRUCTION WITHIN THIS CORRIDOR PLEASE CONTACT THE CITY OF AURORA, CAPITAL PROJECTS DIVISION (720)-859-4300

**\* RESTRICTED AREA \***

**AURORA WATER SECURITY AREA**  
THIS INFORMATION HAS BEEN BLOCKED FOR SECURITY PURPOSES. CONTACT AURORA WATER, ENGINEERING DIVISION FOR DETAILS AT (303)-739-7376

**NOTES:**

THE CITY OF AURORA, WATER DEPARTMENT ASSUMES NO RESPONSIBILITY OR LIABILITY OF ANY KIND TO ANY USER OF THIS MAP.

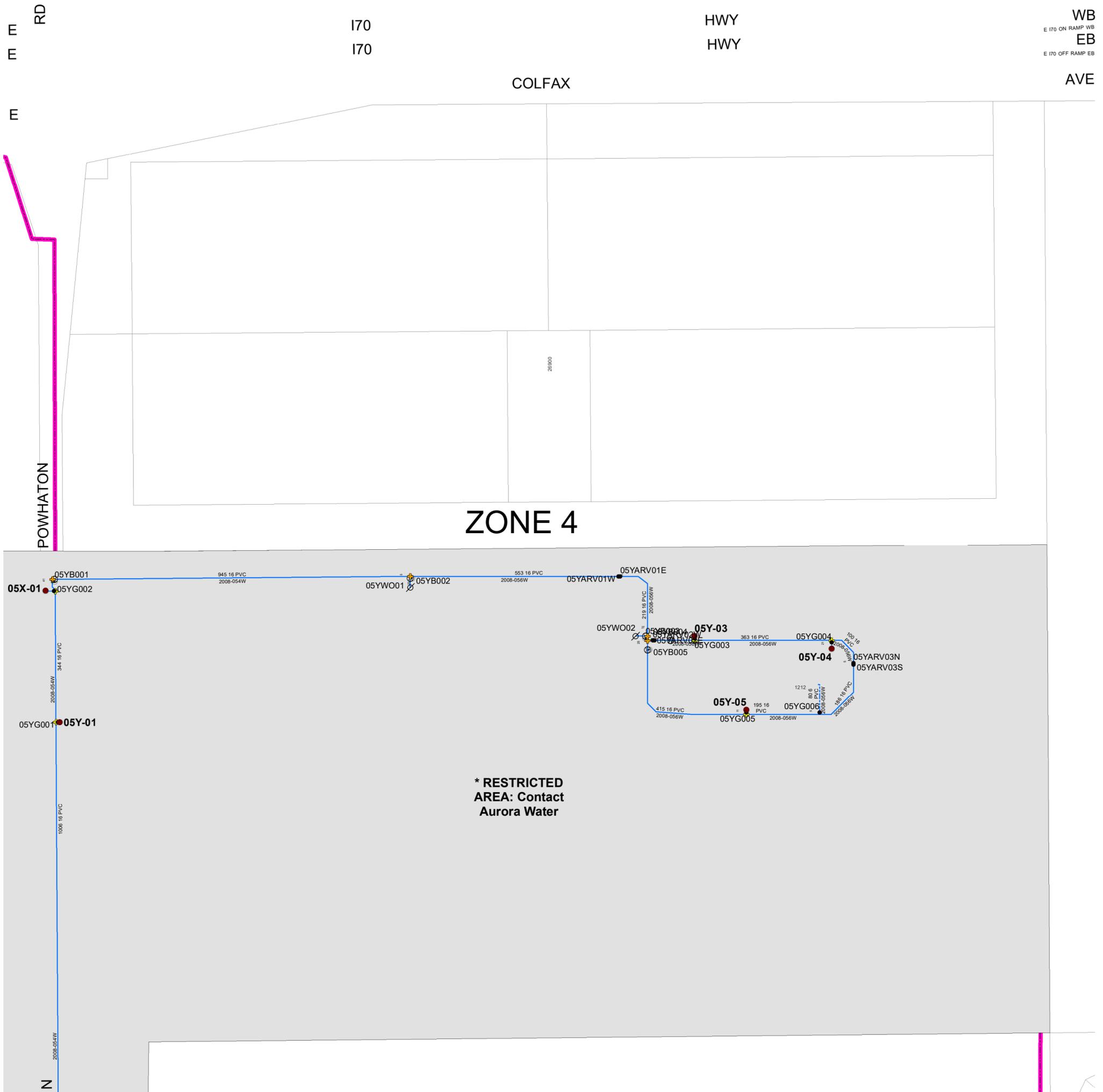
LOCATIONS ON THIS MAP ARE APPROXIMATE AND ARE INTENDED TO SERVE AS AN AID IN GRAPHIC REPRESENTATION ONLY.

BEFORE EXCAVATION CALL THE CITY OF AURORA WATER OPERATIONS AT (303)-326-8645 TO SCHEDULE FIELD LOCATIONS OF WATER, STORM AND SANITARY LINES.

PLEASE REPORT ANY ERRORS OR OMISSIONS ON THIS MAP TO THE CITY OF AURORA, AURORA WATER, ENGINEERING DIVISION, GIS SECTION.

PLOT DATE:  
February 2, 2020

SEE PAGE - 04Y



SEE PAGE - 05X

SEE PAGE - 05Z

2020

City of Aurora, Colorado - Aurora Water  
15151 East Alameda Parkway, Aurora, Colorado 80012  
website: www.auroragov.org phone: 303.739.7370 fax: 303.739.7491

TRS: NW1/4 SEC04 T4S R65W

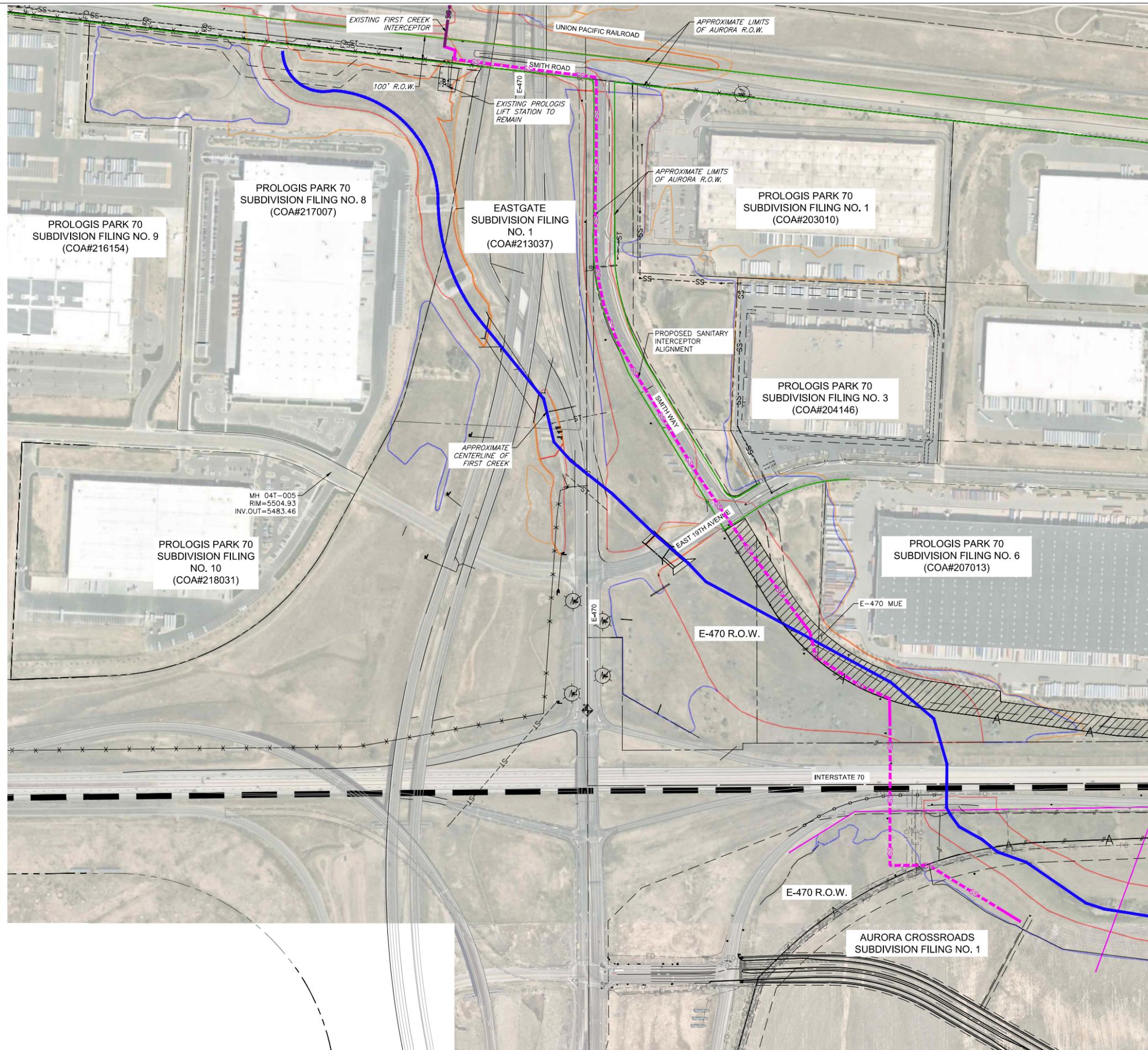


FIRE HYDRANTS

05Y

44 SEE PAGE - 06Y

**Excerpted Selections**  
**from**  
**Construction Plans**  
**for**  
**Aurora Crossroads Offsite Sanitary Sewer**  
**EDN: 221191**  
**by**  
**Martin & Martin Consulting Engineers**



**LEGEND**

	APPROXIMATE FIRST CREEK CENTERLINE
	E-470 MUE
	CITY OF AURORA R.O.W.
	OFF-SITE SANITARY SEWER ALIGNMENT
	EXISTING SANITARY SEWER
	REGULATORY FLOODWAY
	100-YEAR FLOODPLAIN
	500-YEAR FLOODPLAIN

**NOTES:**

1. A FLOODPLAIN DEVELOPMENT PERMIT IS REQUIRED PRIOR TO ANY WORK WITHIN THE FLOODPLAIN. NO FILL, NO STOCKPILING OF MATERIAL, OR STORAGE OF EQUIPMENT WILL BE PERMITTED IN THE FLOODWAY.
2. 100-YEAR FLOODPLAIN, 500-YEAR FLOODPLAIN, REGULATORY FLOODWAY, CHANNEL SECTIONS, AND BASE FLOOD ELEVATIONS NORTH OF I-70 OBTAINED PER FEMA FLOOD INSURANCE RATE MAP (FIRM) FOR ARAPAHOE/ADAMS COUNTY, COLORADO, MAP NUMBERS 08005C0202L AND 08005C0201L, MAPS REVISED: FEBRUARY 17, 2017. 100-YEAR FLOODPLAIN, REGULATORY FLOODWAY, CHANNEL SECTIONS, AND BASE FLOOD ELEVATIONS SOUTH OF I-70 OBTAINED PER APPROVED CITY OF AURORA FLOODPLAIN DEVELOPMENT PERMIT 2021-002, PREPARED BY MARTIN/MARTIN INC., AND DATED DECEMBER 3, 2020.



**AURORA CROSSROADS**

**OFFSITE SANITARY SEWER**

**OVERALL PLAN AND OWNERSHIP MAP**

No.	Description of Revisions	Date	Name
1	MYLAR SUBMITTAL	05-25-21	JAW

Job Number	19.1522
Project Manager	J. WHITE
Design By	R. SCHALL
Drawn By	S. HUDGENS
Principal in Charge	P. HORN

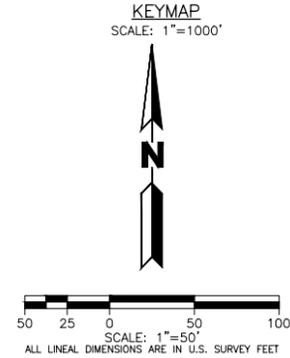
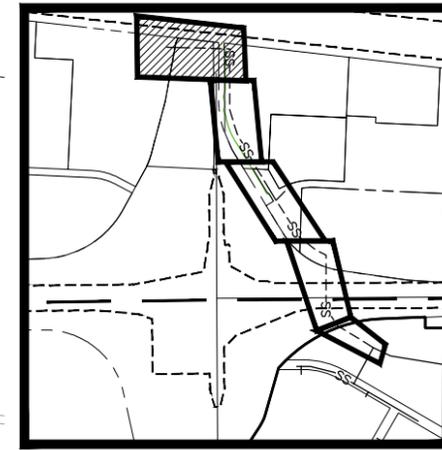
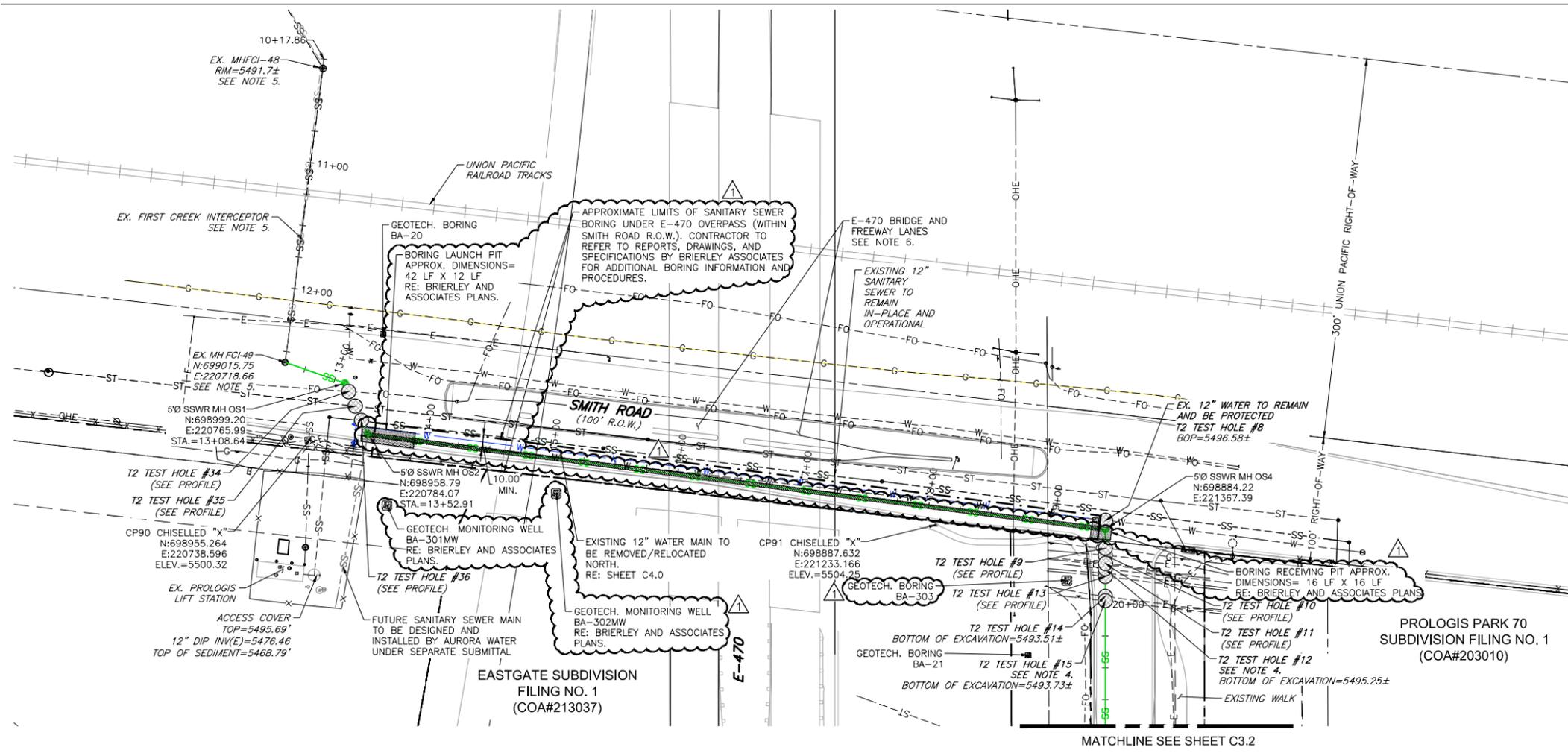
THE DESIGN, SPECIFICATIONS, CALCULATIONS, DRAWINGS, DIMENSIONS, REPRESENTATIONS AND NOTATIONS HEREON ARE ONLY FOR THE SPECIFIC PROJECT. ANY INFORMATION EXTRACTED FROM THIS SHEET AND USED FOR ANY OTHER PROJECT IS AT THE USER'S SOLE RISK OF THE USER AND NOT MARTIN/MARTIN, INC.

Sheet Number:  
**C1.2**  
3

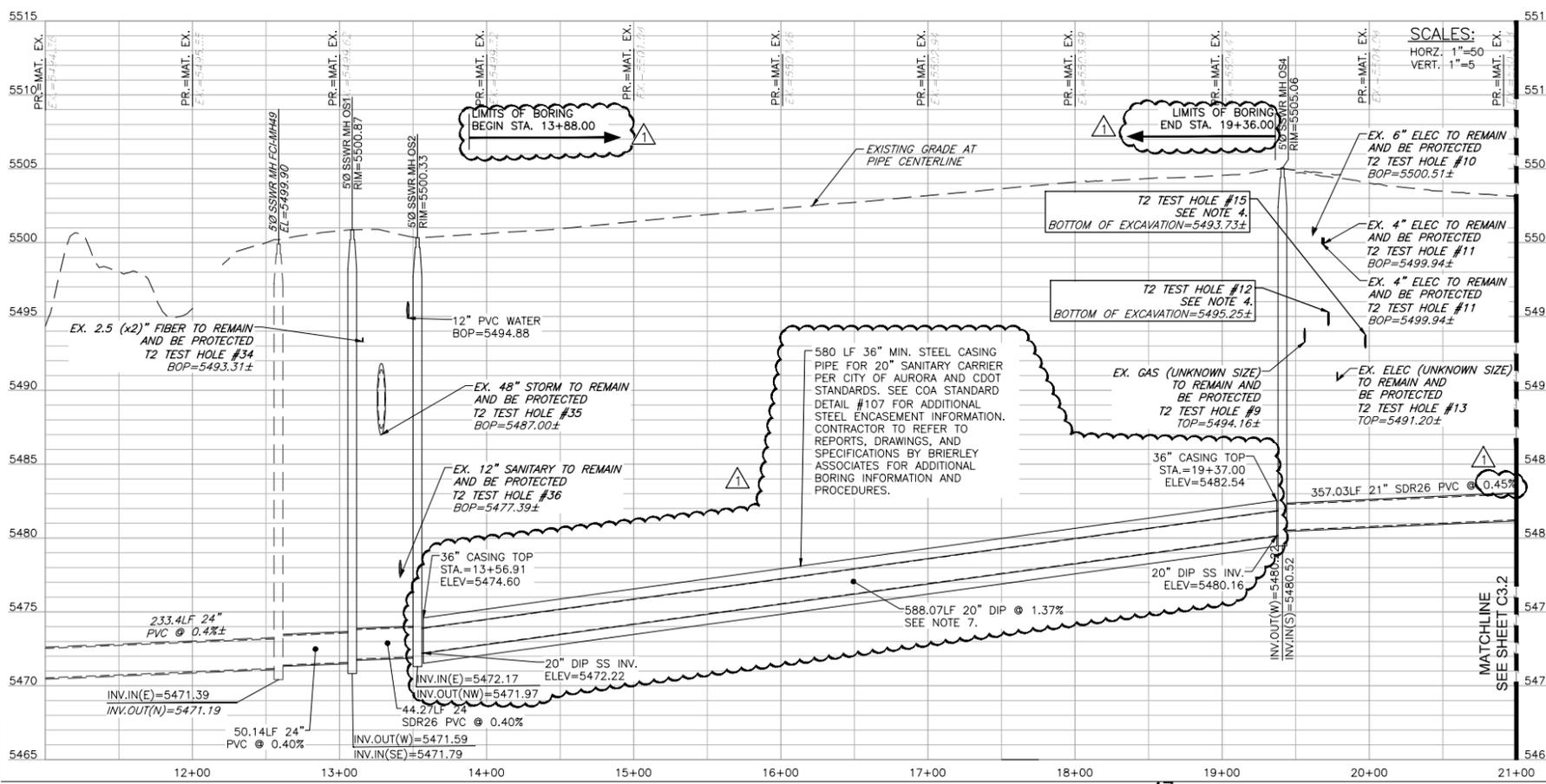
FACSIMILE  
THIS ELECTRONIC PLAN IS A FACSIMILE OF THE SIGNED AND SEALED PDF PLAN

*Jeffrey A. White* DATE 05/25/21  
(PE SIGNATURE)

**JEFFREY A. WHITE**  
(PRINTED NAME)



MARTIN/MARTIN ASSUMES NO RESPONSIBILITY FOR UTILITY LOCATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM INFORMATION PROVIDED BY THE PROJECT'S SUE CONSULTANT. THE ASCE (38) UTILITY QUALITY LEVEL IS AS INDICATED ON THE STAMPED/SIGNED SUE PLANS PREPARED BY THE PROJECT'S SUE CONSULTANT. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE SIZE, MATERIAL, HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES (DEPICTED OR NOT DEPICTED) PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.



**SCALES:**  
HORZ. 1"=50'  
VERT. 1"=5'

FACSIMILE  
THIS ELECTRONIC PLAN IS A FACSIMILE OF THE SIGNED AND SEALED PDF PLAN

*Jeffrey A. White* DATE 10/01/21  
(PRINTED NAME)  
**JEFFREY A. WHITE**  
(PRINTED NAME)

- NOTES:**
- ALL WATER AND SANITARY MAINS SHALL HAVE CLASS "B" ALTERNATE BEDDING. ALL TRENCHES SHALL USE THE GRANULAR BEDDING MATERIAL SPECIFIED IN SECTION 9.05 ("CLASSES OF BEDDING (METHODS)") OF THE CITY OF AURORA STANDARDS DATED SEPTEMBER 2019.
  - REFER TO COVER SHEET FOR LEGEND AND ADDITIONAL NOTES.
  - 100-YEAR FLOODPLAIN, 500-YEAR FLOODPLAIN, REGULATORY FLOODWAY, CHANNEL SECTIONS, AND BASE FLOOD ELEVATIONS OBTAINED PER FEMA FLOOD INSURANCE RATE MAP (FIRM) FOR ARAPAHOE COUNTY, COLORADO, MAP NUMBER 08005C0202L, MAP REVISED: FEBRUARY 17, 2017.
  - T2 UTILITY ENGINEERS UNABLE TO LOCATE EXISTING UTILITY LOCATION AND DEPTH PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
  - REFER TO FIRST CREEK INTERCEPTOR VOLUME 2 CONSTRUCTION DRAWINGS BY HDR AND DATED JULY 11, 2019 (COA#219046) FOR FUTURE INTERCEPTOR CONTINUATION.
  - E-470 BRIDGE AND SUPPORT STRUCTURES NOT TO BE DISTURBED. CONTRACTOR TO DETERMINE CONSTRUCTION MEANS AND METHODS OF SANITARY SEWER INSTALLATION TO AVOID AND PROTECT THE E-470 BRIDGE AT ALL TIMES. CONTRACTOR TO NOTIFY ENGINEER, CITY OF AURORA PUBLIC WORKS, AND E-470 AUTHORITIES OF ANY PLAN DISCREPANCIES AND FIELD CONSTRAINTS.
  - DUCTILE IRON PIPE TO BE LINED WITH PROTECTO 401 CERAMIC EPOXY LINING OR APPROVED EQUAL WITH JOINT RESTRAINTS PER PER COA CRITERIA.

**BENCHMARK:**  
BENCHMARK ID 4S6506NW001: ELEVATIONS ARE BASED ON THE CITY OF AURORA VERTICAL CONTROL NETWORK. ELEVATIONS ARE BASED ON THE CITY OF AURORA VERTICAL CONTROL NETWORK BM #G0-95 A FOUND STEEL PIPE WITH A 3" BRASS CAP IN CONCRETE ABOUT 1/2 A MILE EAST OF E-470 (GUN CLUB ROAD) ON THE SOUTHERLY RIGHT-OF-WAY OF I-70 FRONTAGE ROAD (EAST COLFAX AVENUE).

ELEVATION = 5515.52' (NAVD1988) DATUM.

**FLOODPLAIN DEVELOPMENT NOTE:**  
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**AURORA CROSSROADS**  
**OFFSITE SANITARY SEWER**  
SANITARY PLAN AND PROFILE

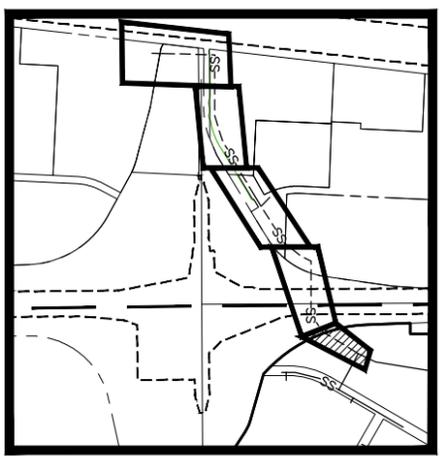
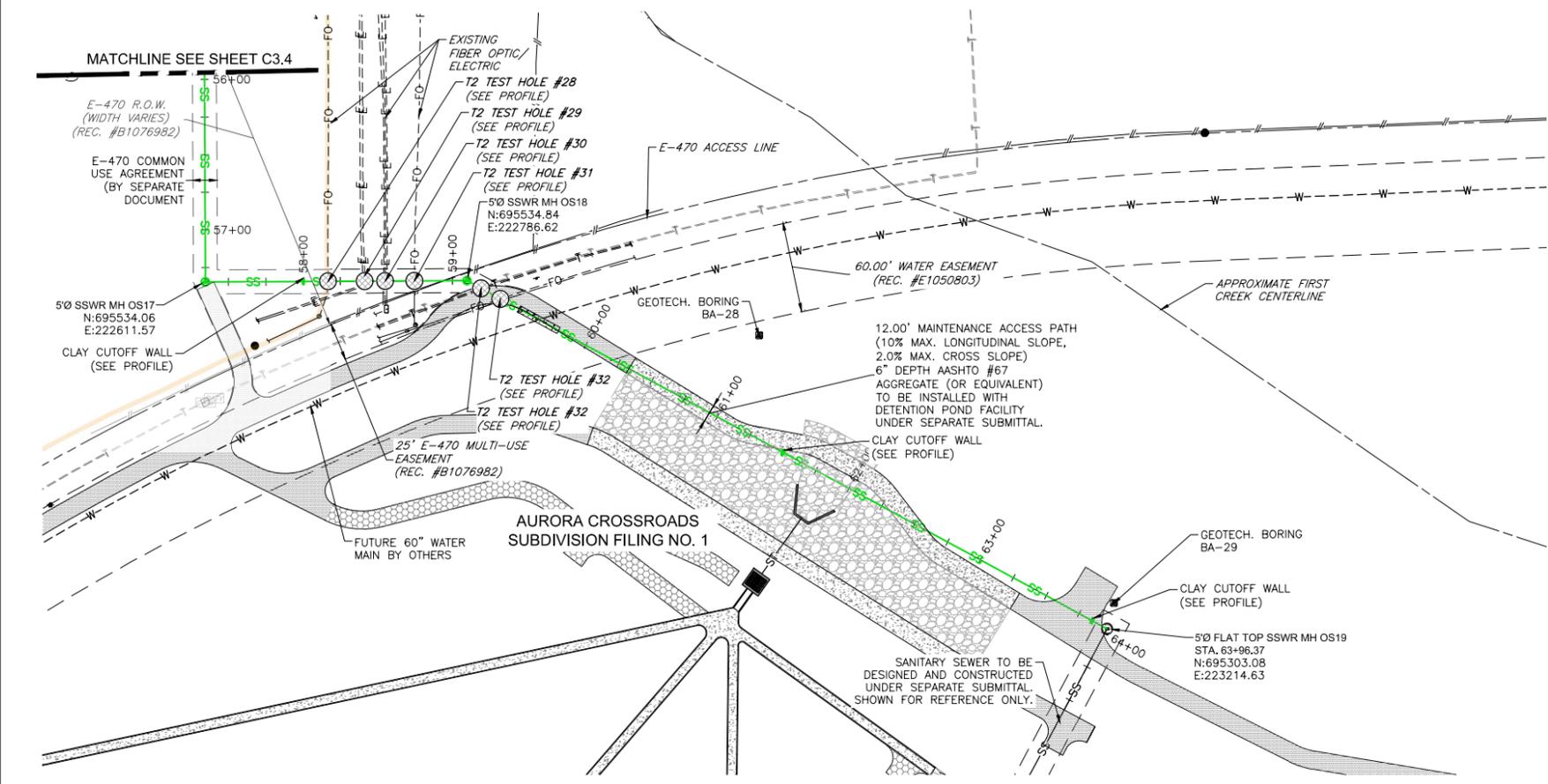
No.	Description of Revisions	Date	Name
1	MYCAR SUBMITTAL	05-25-21	JAW
2	MYCAR REVISION	10-01-21	JAW

Job Number 19.1522  
Project Manager J. WHITE  
Design By R. SCHALL  
Drawn By S. HUDGENS  
Principal in Charge P. HORN

Sheet Number:  
**C3.1**  
11

**MARTIN/MARTIN**  
CONSULTING ENGINEERS  
12495 WEST COLFAX AVENUE, LAKEWOOD, COLORADO 80225  
303.931.6100  
MARTINMARTIN.COM

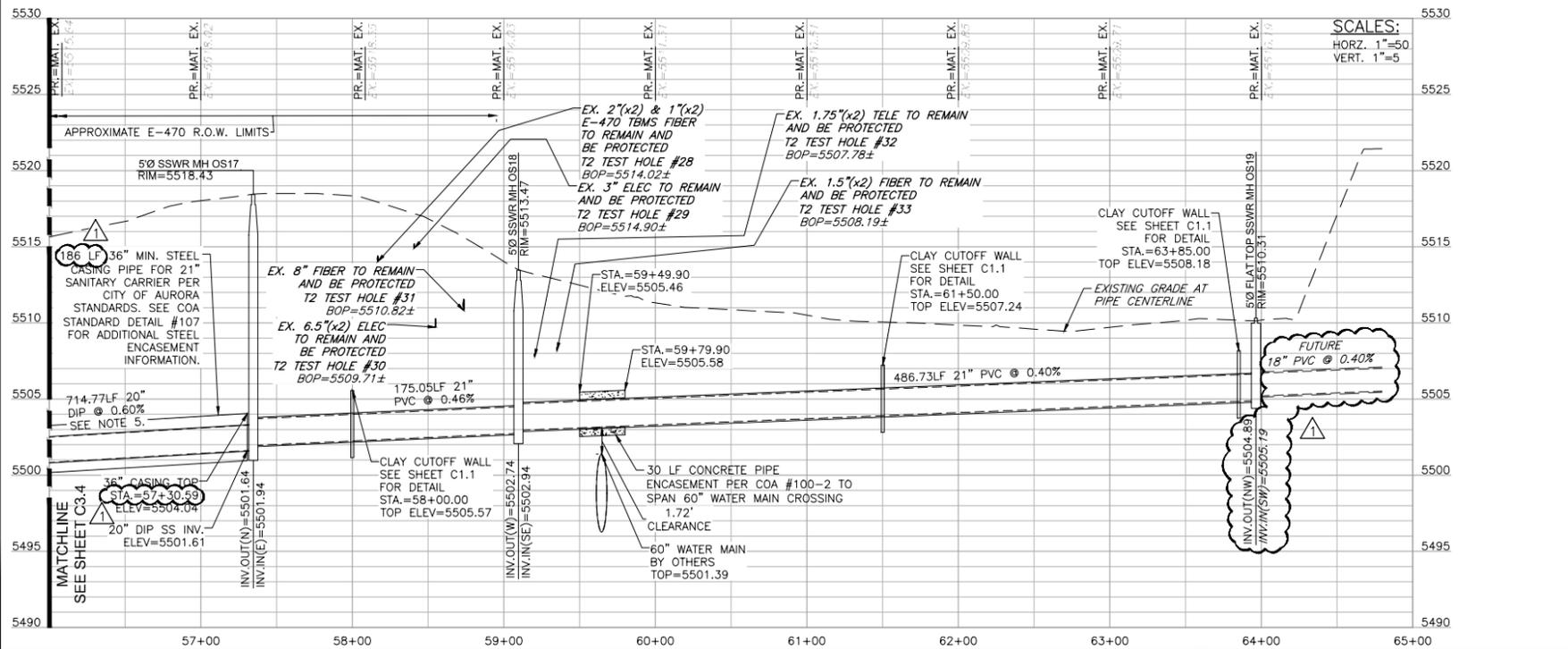
PLOT DATE: Thursday, September 30, 2021 2:12 PM LAST SAVED BY: SHUDDENS  
DRAWING LOCATION: G:\HORNA\19.1522-Aurora Crossroads - FDP\PLANS\OFF-SITE SANITARY CDS\SANITARY PLAN AND PROFILE.dwg



**KEYMAP**  
SCALE: 1"=1000'

50 25 0 50 100  
SCALE: 1"=50'  
ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

MARTIN/MARTIN ASSUMES NO RESPONSIBILITY FOR UTILITY LOCATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM INFORMATION PROVIDED BY THE PROJECT'S SUE CONSULTANT. THE ASCE (38) UTILITY QUALITY LEVEL IS AS INDICATED ON THE STAMPED/SIGNED SUE PLANS PREPARED BY THE PROJECT'S SUE CONSULTANT. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE SIZE, MATERIAL, HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES (DEPICTED OR NOT DEPICTED) PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.



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*Jeffrey A. White* DATE 10/01/21  
(PRINTED NAME)  
**JEFFREY A. WHITE**  
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**AURORA CROSSROADS**  
**OFFSITE SANITARY SEWER**  
SANITARY PLAN AND PROFILE

No.	Description of Revisions	Date	Name
1	MYLAR SUBMITTAL	05-25-21	JAW
2	MYLAR REVISION	10-01-21	JAW

Job Number 19.1522  
Project Manager J. WHITE  
Design By R. SCHALL  
Drawn By S. HUDGENS  
Principal in Charge P. HORN

THE USER SHALL BE RESPONSIBLE FOR VERIFYING THE ACCURACY OF THE INFORMATION SHOWN ON THIS SHEET. MARTIN/MARTIN ASSUMES NO LIABILITY FOR ANY ERRORS OR OMISSIONS THAT MAY OCCUR DUE TO THE USER'S MISUSE OF THE SOFTWARE OR THE USER'S FAILURE TO VERIFY THE INFORMATION SHOWN ON THIS SHEET.

Sheet Number:  
**C3.5**  
15

**Excerpted Selections**

**from  
Master Utility Study**

**for  
Aurora Crossroads**

**EDN: 221029**

**by  
Martin & Martin Consulting Engineers**



**Excerpted Selections**

**from**

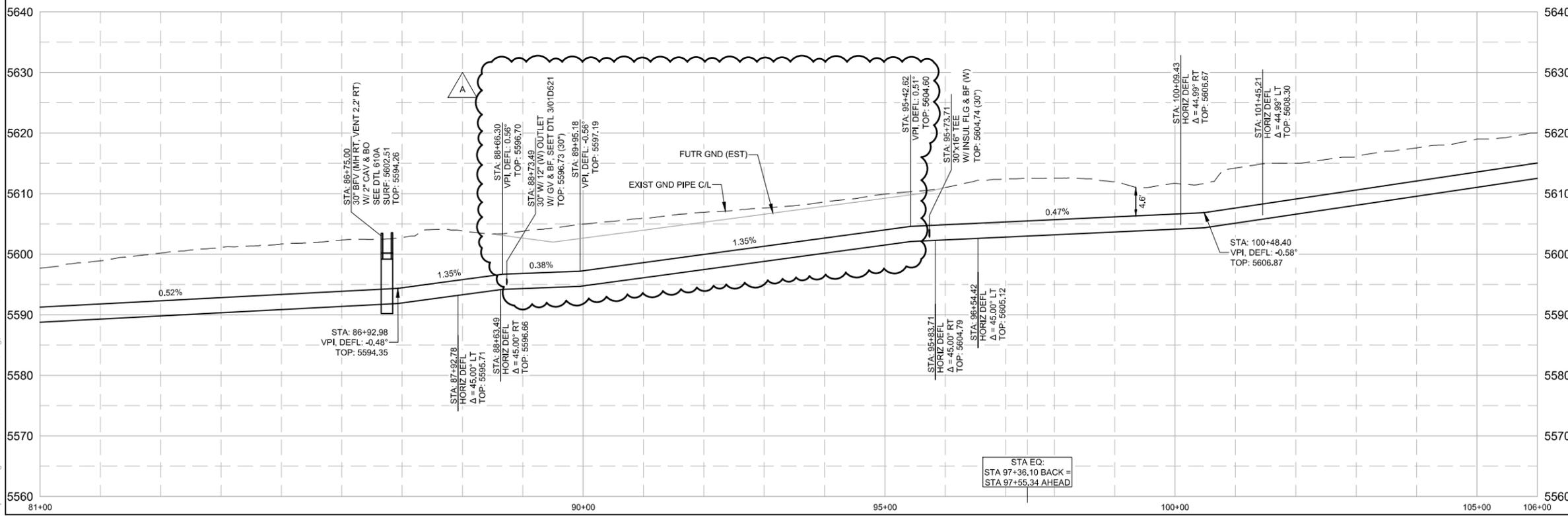
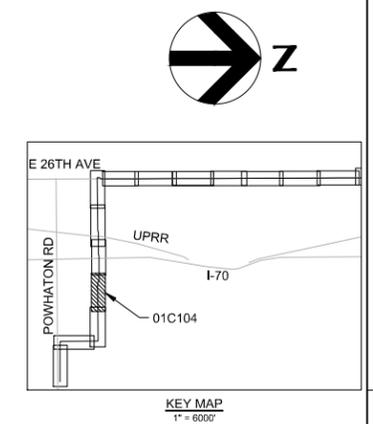
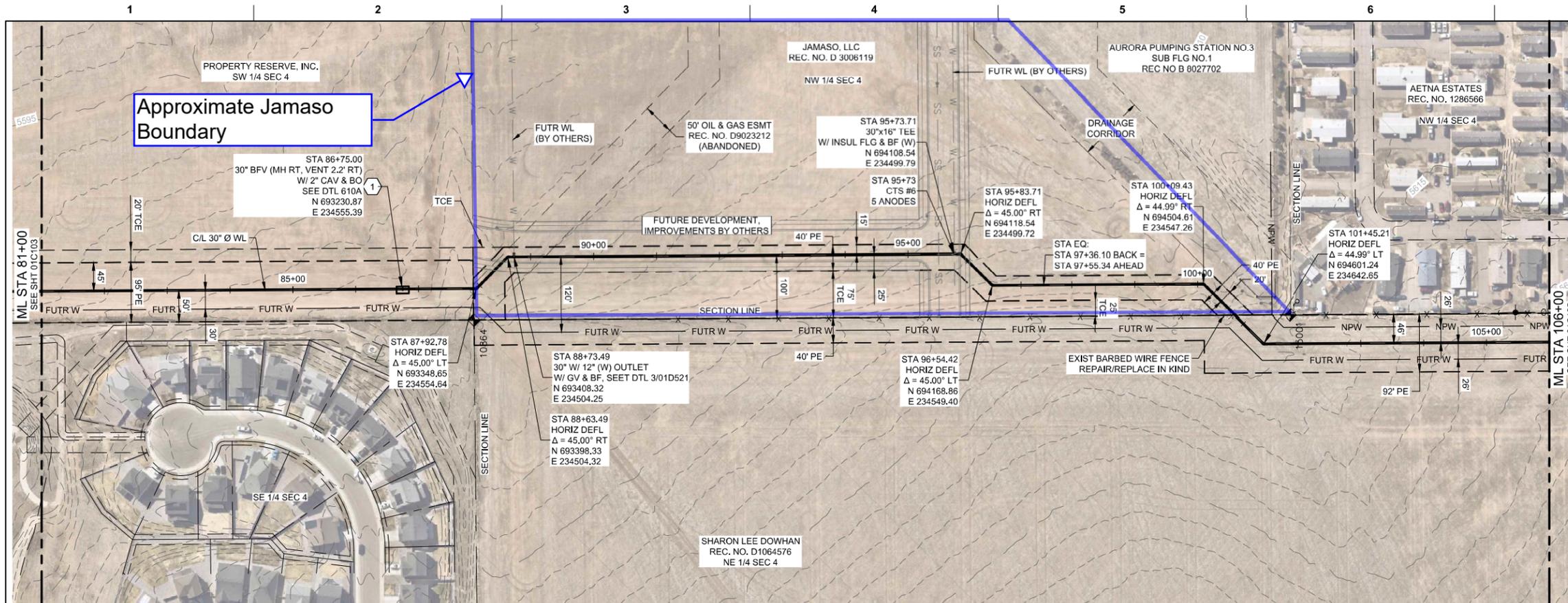
**Eastern Utility Extension Zone 4 Waterline Construction Plans**

**for**

**City of Aurora, Colorado**

**by**

**HDR**



**KEY NOTES:** (X)

- USE ALTERNATE VENT LOCATION PER DETAIL.

**NOTES:**

- 30-INCH PIPE MATERIAL TO BE STEEL, 0.150-IN (MIN) WALL THICKNESS. ALL STEEL PIPE JOINTS TO BE SINGLE LAP WELDED UNLESS NOTED OTHERWISE. PIPELINE APPURTENANCE PRESSURE RATING SHALL BE 150 PSI WORKING, 225 PSI TRANSIENT/TEST UNLESS NOTED OTHERWISE.
- SEE CATHODIC PROTECTION SCHEDULE AND DETAILS ON SHEET 01C526.

**BENCHMARKS**

9385 - 3S6533SW002: 3" DIAM. BRASS CAP AT THE S.W. COR. OF A CONC. BASE FOR POWER TOWER ON THE W SIDE OF POWHATON RD - ELEV. = 5617.704 NAVD88

9387 - 3S6534SE001: USGS BRASS CAP IN CONCRETE BASE MARKED "L-259 1938, U.S. COAST & GEODETIC SURVEY BENCH MARK" - ELEV. = 5596.629 NAVD88

9774 - 3S6432NW004: 3" DIAM. BRASS CAP ATOP A 30" LONG STL. PIPE IN CONC. & BEING 37' +/- EAST OF N.W. COR. SEC. 32, T3S, R64W - ELEV. = 5594.553 NAVD88

9920 - 4S6508SE001: 3" DIAM. BRASS CAP ATOP THE N.E. CONC. BASE FOR POWER TOWER ON THE W SIDE OF POWHATON RD - ELEV. = 5612.875 NAVD88

**SCALE IN FEET**

HORIZONTAL SCALE: 1" = 100' (22"x34")  
1" = 200' (11"x17")

VERTICAL SCALE: 1" = 10' (22"x34")  
1" = 20' (11"x17")

c:\pwworking\central\1\22398843\10\104.dwg, 7/14/2023 8:21 AM



ISSUE	DATE	DESCRIPTION
A	07/14/23	FO1-1 REISSUED DRAWING
1	05/01/23	FINAL FOR CONSTRUCTION

PROJECT MANAGER	K. BUSHDIECKER
PROJECT ENGINEER	R. KEATLEY
DRAWN BY	J. HILL
PROJECT NUMBER	10254264



**CITY OF AURORA, COLORADO**  
**EASTERN UTILITY EXTENSION**  
**ZONE 4 WATERLINE**

**WATERLINE**  
**PLAN & PROFILE**  
**STA 81+00 TO STA 106+00**



FILENAME | 01C104  
SCALE | 1" = 100'

SHEET | 17/01C104

**Excerpted Selections**  
**from**  
**Master Utility Study Addendum**  
**for**  
**Aurora Crossroads**

**EDN: 221029MU2-LETTER**

**by**  
**Martin & Martin Consulting Engineers**

February 22, 2022

City of Aurora  
Aurora Water  
15151 E. Alameda Parkway Ste. 3200  
Aurora, CO 80012

Re: Aurora Crossroads Filing No. 1  
Martin/Martin, Inc. Project No.: 19.1522

The purpose of the following utility report addendum is to analyze the off-site sanitary sewer tributary basins and size the offsite sanitary sewer infrastructure required to support the Aurora Crossroads development. As outlined in the approved "Aurora Crossroads-Master Utility Study," (MASTER UTILITY STUDY) by Martin/Martin, Inc., dated November 25, 2020 (COA#221029), a sanitary sewer interceptor will be required along First Creek and under I-70 to connect to the First Creek Interceptor that is under construction.

Through collaboration with Aurora Water, this addendum provides sizing for the interceptor from the Crossroads property, under I-70 and to the point of connection to the First Creek interceptor. Sizing for the future sanitary mains for the tributary basins east and west of the Crossroads development has been provided for information only and should be verified by others under a separate submittal. It is anticipated this off-site sewer alignment will parallel First Creek and will be submitted to the city for approval at time of development by others. The sewer systems will combine prior to crossing Interstate 70 as identified in the MASTER UTILITY STUDY.

### Sanitary Sewer Design Criteria

The latest City of Aurora criteria, dated September 2019, was used to determine the developed sanitary flows for future tributary basins.

Consistent with the MASTER UTILITY STUDY, analysis of the hydraulic capacity and characteristics of the pipe assumed open channel flow (not pressurized) and was completed using Manning's Equation. Bentley Flowmaster was utilized for computations. Based on Aurora Water's Requirements, a minimum slope of 0.40% was used for the basis of design and a Manning's n value of 0.011 was used for PVC pipe unless specified differently. The depth of flow in the pipes shall not exceed 75% of capacity for pipes 12 inches or smaller and 80% for pipes larger than 12 inches. Peak factors were calculated by using the equation:

$$\text{Peaking Factor} = 5 \div p^{0.167}$$

where p = population in thousands. A minimum peaking factor of 1.7 and a maximum peaking factor of 4 was used for the calculations. Infiltration and inflow were calculated at 10% of average day flows and added to the peaked flows.



### Sanitary Sewer Design Analysis

Per coordination with Aurora Water and consistent with the “Cross Creek Initial Phase Development Utility Report,” prepared by High Country Engineering, Inc. and revised October 21, 2002 (COA#202189), the First Creek sanitary sewer basin upstream of the proposed Interstate 70 crossing is bounded to the west by E-470, to the north by Interstate 70, to the east by N. Monaghan Road, and to the south by East 6<sup>th</sup> Avenue (the south 800’ of these planning areas are tributary to the E. 6<sup>th</sup> Avenue sanitary interceptor). The Aurora Crossroads development is located within this boundary, west of E-470 and south of First Creek. Sanitary sewer flows will be routed as outlined in the MASTER UTILITY STUDY. Refer to the attached Cross Creek Sanitary Regional Utility Exhibit and First Creek Offsite Sanitary Basin Map for more information.

Analysis of the proposed sanitary flows consists of using the acreage for each basin area and applying demands based on current zoning and anticipated zoning for future annexation areas (see attached zoning map). The land usage and associated size of each planning area was obtained by GIS and is shown in the attached First Creek Offsite Sanitary Basin Map. FlowMaster software was used to calculate the pipe velocities and pipe sizes for each segment of pipe between the design points. The calculated demands, updated routing diagram, peak flows, and pipe cross sections are enclosed.

### Conclusion

The proposed off-site sanitary sewer from the Aurora Crossroads development to the connection to the First Creek interceptor in Smith Road has been designed to accommodate the anticipated flows for the planning areas and assumptions outlined in this report and comply with the City of Aurora’s *Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications*.

Respectfully,

Jeff A. White, PE

Encl:

- Cross Creek Sanitary Regional Utility Exhibit
- First Creek Offsite Sanitary Map
- City of Aurora Zoning Map
- Sanitary Sewer Demand Calculations
- Sanitary Sewer Flowmaster Calculations

FACSIMILE	
THIS ELECTRONIC PLAN IS A FACSIMILE OF THE SIGNED AND SEALED PDF PLAN	
 (PE SIGNATURE)	DATE <u>02/23/22</u>
<b>JEFFREY A. WHITE</b> (PRINTED NAME)	



**AURORA CROSSROADS  
SANITARY SEWER AVERAGE FLOWS AND POPULATION**

**OFFSITE NON-RESIDENTIAL**

Basin	Area (Ac)	Type of Development	Avg. Daily Flow/Ac (gpd)	Avg. Daily Flow (MGD)	Equivalent Population /Ac	Population
BASIN 1-PA1	30.05	MIXED COMM	**	0.113	22	661.10
BASIN 1-PA4	11.49	MIXED COMM	1500	0.017	22	252.78
BASIN 1-PA5	67.41	MIXED COMM	1500	0.101	22	1483.02
OS1	36.30	COMMERCIAL	1500	0.054	22	798.60
OS3	168.40	COMMERCIAL	1500	0.253	22	3704.80
OS6	16.60	UTILITY	0	0.000	0	0.00
OS7	46.40	MIXED COMM	1500	0.070	22	1020.80

**JAMASO**

BASIN 1 PA1 FLOW CALCULATIONS PROVIDED IN AURORA CROSSROADS MASTER UTILITY STUDY DATED NOVEMBER 25, 2020

**OFF-SITE RESIDENTIAL**

Basin	Area (AC)	Type of Development	Dwelling Units (DU/AC)	CAP/DU	Population (CAP)	Avg. Daily Demand (gpd/CAP)	Avg. Daily Flow (MGD)
OS2	95.1	RESIDENTIAL	5.5	2.77	1448.8485	68	0.0985
OS4	130	RESIDENTIAL	5.5	2.77	1980.55	68	0.1347
OS5	384.4	RESIDENTIAL	5.5	2.77	5856.334	68	0.3982
OS8	127	RESIDENTIAL	5.5	2.77	1934.845	68	0.1316
OS9	224.1	RESIDENTIAL	5.5	2.77	3414.1635	68	0.2322
OS10	74.3	RESIDENTIAL	5.5	2.77	1131.9605	68	0.0770

**FUTURE OFFSITE  
SANITARY BASIN  
(38.0 ACRES)**