

May 20, 2025

Aurora Water  
Attn: Nina Khanzadeh  
15151 E. Alameda Pkwy.  
Aurora, CO 50012

RE: Green Valley Master Plan Amendment 3 Master Utility Report Conformance Letter

Dear Nina,

This letter is provided to Aurora Water to confirm that utility design for the Green Valley Master Plan Amendment 3, herein after called Site or the Project, conforms the to *Green Valley – Amendment 1 Master Utility Report* (EDN #218184). This narrative provides a description of the Project and a summary of the sanitary sewer and water infrastructure needed to serve the proposed uses and density with the Project.

The Project is located within Section 24 within Township 3 South, Range 66 West of the Sixth Principal Meridian, City of Aurora, County of Adams, and State of Colorado. The Site is bounded on the north by Windler properties, on the west by North Tibet Road, on the south by East 38<sup>th</sup> Avenue, and on the east by E-470. The Project comprises of a mix of proposed uses including residential and commercial with associated amenities, parks, and open spaces. The Project has been divided in to Planning Areas (PAs) to identify the areas and uses planned within the Site. A Vicinity Map has been provided as Figure 1 to depict the Project and the surrounding area. PA-8 and PA-9 are zoned as residential (RES.), AAC-1 is Admin Activity Center (A.A.C.), PA-44 is Multi-use Easement (M.U.E.), and PA-23, 24, 39, 41, and 69 are parks and open space (N.P., P.P., & O.S.). For the purposes of this report, AAC-1 has been assumed to consist of High Density Residential in order to provide a conservative estimate for the demands generated from this area. Civil infrastructure will be developed to support the Project in the form of roadways, water distribution system, sanitary sewer system and storm sewer system. The *Green Valley – Amendment 1 Master Utility Report* (EDN #218184) was referenced while reviewing for utility design conformance. The *Winder Master Utility Study* (EDN #222155), and *Aurora Highlands Utility Report Amendment 2* (EDN #219069), were used for reviewing offsite sanitary flows that are tributary to the First Creek Lift Station.

## Sanitary Sewer

The Site is located in two separate basins as previously identified within the Amendment 1 MUR. The west half of the Site, including PA-8 and AAC-1, are in Basin 7 while the east half of the Site, including PA-9, is in Basin 5. Both of these basins are conveyed to the First Creek Lift Station, located near the intersection of East 48th Avenue and Rome Street. As a portion of the Green Valley Ranch East development, two sanitary sewer connection points were planned to provide outfall locations for the Site. A 10-inch sanitary sewer stub was built at the northern edge of PA-8 in North Tibet Road (EDN # 221249) for Basin 7. Meanwhile an 8-inch sanitary sewer stub was built at the northern edge of PA-9 in North Tibet Road (EDN # 221298) for Basin 5.

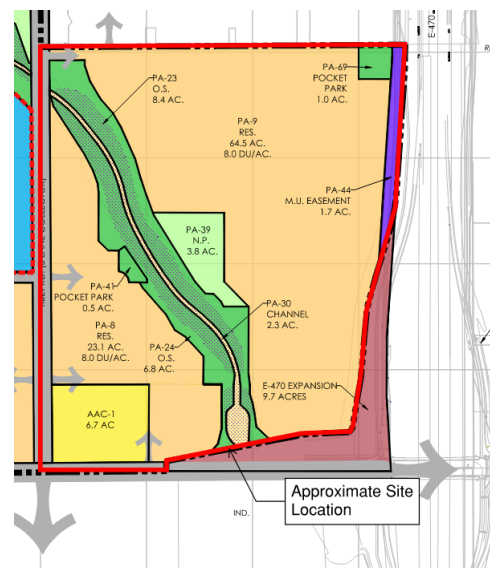


Figure 1-Vicinity Map

Average daily flows for the Site were calculated based on the recommended sewer loading rates in Section 5.03 of Aurora Water's 2024 Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications. A minimum peaking factor of 1.7, maximum peaking factor of 4.0, and

minimum slopes of 0.4% were used to confirm pipe capacity percentages remain below 75% for peak flows for pipe sizes 12-inches or smaller and 80% for pipe sizes larger than 12-inches.

This amendment includes revisions to land use, area, density, and off-Site flows of Basins 5, 7, and OS-12. PA-9 makes up the entire 64.5 acres of Basin 5 with a proposed land use of Residential (8 du/ac). Basin 7 is 52.45 acres which is comprised of a portion of Filing 7 (EDN #221285), PA-8 and AAC-1. For the purposes of this report, the A.A.C zoning for this Master Plan Amendment will be designed to the worst-case scenario land use permitted for utility purposes in this zoning. Therefore, AAC-1 has been assumed to consist of High Density Residential (20 du/ac) in order to provide a conservative estimate for the demands generated from this area. PA-8 is proposed as Residential (8 du/ac).

During the preparation of this letter, it was found that there appeared to be an area discrepancy for what the Green Valley - Amendment 1 Master Utility Report (EDN #218184) used for calculations for Basin 7 versus the area originally shown on the Master Utility Plan for Basin 7. The calculations for Basin 7 used 28.5 acres, meanwhile the actual area of Basin 7 in the utility map was closer to 60.5 acres. This means that the downstream sanitary sewer infrastructure was undersized even before the proposed changes implemented with this Amendment. However, based on email discussions with HR Green on 12/03/2024, flows from the Majestic Commerce Center (Basin OS-12) are anticipated to be 0.32 MGD rather than the 0.65 MGD per the *Green Valley – Amendment 1 Master Utility Report* (EDN #218184). The reduced flow provides relief in the pipe capacity proposed with the on-Site sanitary sewer system for PA-8. Additional information regarding the original MUR calculation discrepancy and COA direction is provided below and in the Appendix of this letter. With the updates to PA-8 with this Amendment and the design shown in the Green Valley Ranch East Subdivision Filing 7 Construction Documents (EDN #221285), the tributary area of Basin 7 is now anticipated to be 52.45 acres. Calculations showing Basin 7 with its updated area are also provided in the Appendix of this letter.

<b>TABLE 1: PEAK FLOW + I&amp;I COMPARISION – SCENARIO 1</b>			
<b>BASIN ID</b>	<b>AMENDMENT 1 (EDN #218184) (GPD)</b>	<b>PROPOSED (GPD)</b>	<b>DIFFERENCE (GPD)</b>
<b>Basin 5</b>	<b>342,720</b>	<b>398,494</b>	<b>55,774</b>
<b>Basin 7</b>	<b>138,240</b>	<b>352,776</b>	<b>214,536</b>
<b>Basin OS-12</b>	<b>649,440</b>	<b>319,800</b>	<b>-330,640</b>

As can be seen above in Table 1, overall peak flows generated from Basin 5 & Basin 7 have been increased from Green Valley - Amendment 1 Master Utility Report (EDN #218184) but the total flow routed through the on-Site sanitary sewer system within PA-8 is less due to Basin OS-12 flows being reduced per coordination with HR Green on 12/3/2024.

The proposed Site sanitary sewer infrastructure has been sized to service the proposed uses associated with Green Valley Master Plan Amendment 3 while also meeting the Aurora Water 2024 criteria. The proposed system will contain 8-inch and 10-inch gravity sewer mains which is consistent with the Green Valley - Amendment 1 Master Utility Report (EDN #218184) maps attached to this Report.

**TABLE 2: DESIGN POINT PIPE CAPACITY COMPARISON**

DESIGN POINT	AMENDMENT 1 (EDN #218184)	AMENDMENT 1 W/ CORRECTED PA-8 AREA	PROPOSED
DP-17	56%	56%	38%
DP-18	64%	71%	58%
DP-19	70%	77%	63%

Table 2 is provided to compare and confirm pipe capacity percentages between Amendment 1 and the proposed Site. The revised Amendment 1 calculations using the correct area assumption for PA-8 are shown above to detail that the downstream sanitary sewer infrastructure was undersized even before the proposed changes were implemented with this Amendment. However, since the flows from the Majestic Commerce Center (Basin OS-12) are anticipated to be lower than expected, depth of flow in the proposed or downstream sanitary sewer system does not exceed seventy-five percent (75%) capacity for pipes 12-inches or smaller.

#### **Water System:**

The Site was modeled for four scenarios: Average Day, Max Daily, Max Hour, and Fire Flow Analyses. PA-8 and PA-9 are proposed as Residential (8 du/ac). AAC-1, part of Basin 7, is being zoned as AAC with this master plan amendment. However, due to the uncertainty of the future use of this PA, calculations with this letter assume worst case scenario in order to provide flexibility for the developer in the future. Worst case scenario flows for AAC-1 were calculated using a high-density residential use of 20 du/ac. As a portion of the Green Valley Ranch East development and 38<sup>th</sup> Avenue Roadway Plans, four (4) water connection points were intended for the Site to meet future demands. A 16-inch water line was installed with *38<sup>th</sup> Avenue Roadway Improvement Plans and Storm Water Management Plan, Picadilly to Tibet Phase I* (EDN #224183) with one (1) future 8-inch PA-8 connection. A 12-inch water line was installed with *Green Valley Ranch East Tibet Road Phase 1* (EDN #220055) and *Green Valley Ranch East Tibet Road Phase 2* (EDN #221298) with four (4) future 8-inch PA-8 and PA-9 connections. PA-8 will tie into Junction J-4, J-7, J-100, and J-130 to provide a looped water system for the Planning Area as well as through AAC-1 to connect onto 38<sup>th</sup> Avenue at Junction J-5. PA-9 will tie into Junction J-132 located in Tibet Road Phase 1 as well as into Junction J-5 in PA-8.

The maximum (peak) hourly and maximum day demands are based on peaking factors of 4.5:1 for Max Hour: Average Day and 2.8:1 Max Day: Average Day as required per Section 5.02 of the 2024 Water, Sanitary Sewer & Storm Drainage Infrastructure Standards & Specifications. The system was analyzed by delineating major water mains on-Site to evaluate serviceability, fire flows and required minimum system pressures. The tables below present results and criteria used within the modeling analysis.

**TABLE 3: MODEL RESULTS SUMMARY**

Maximum Pressure	117 psi (Junction J-101, Max Hour)
Minimum Residual Pressure	104 psi (Junction J-1, Max Hour)
Peak Hour Maximum Pipe Velocity (8-12 inches)	2.04 fps, 1.1 ft/1000 ft Head loss, Pipe P-18

**TABLE 4: MAX VELOCITY AND HEAD LOSS REQUIREMENTS BASED ON PIPE DIAMETER**

PIPE DIAMETER (IN)	MAX VELOCITY (FPS)	HEAD LOSS NOT TO EXCEED (FT/1,000 FT)
6	2.5	5
8 to 12	3	5
16-24	4.5	5
Over 24	4.5	2

**TABLE 5: FIRE FLOW DEMAND BY LAND USE TYPE**

USE CLASSIFICATION	FIRE FLOW DEMAND
Residential	1500 gpm for 2 hours
Commercial/Multifamily	2500 gpm for 2 hours
Industrial	4000 gpm for 3 hours

We conclude that the proposed sanitary sewer and domestic water infrastructure for the Green Valley Amendment 3 Master Plan Amendment conforms to requirements determined by *The Green Valley – Amendment 1 Master Utility Report* (EDN #218184).

Sincerely,

Sue Sibel, PE

Senior Associate, Department Manager

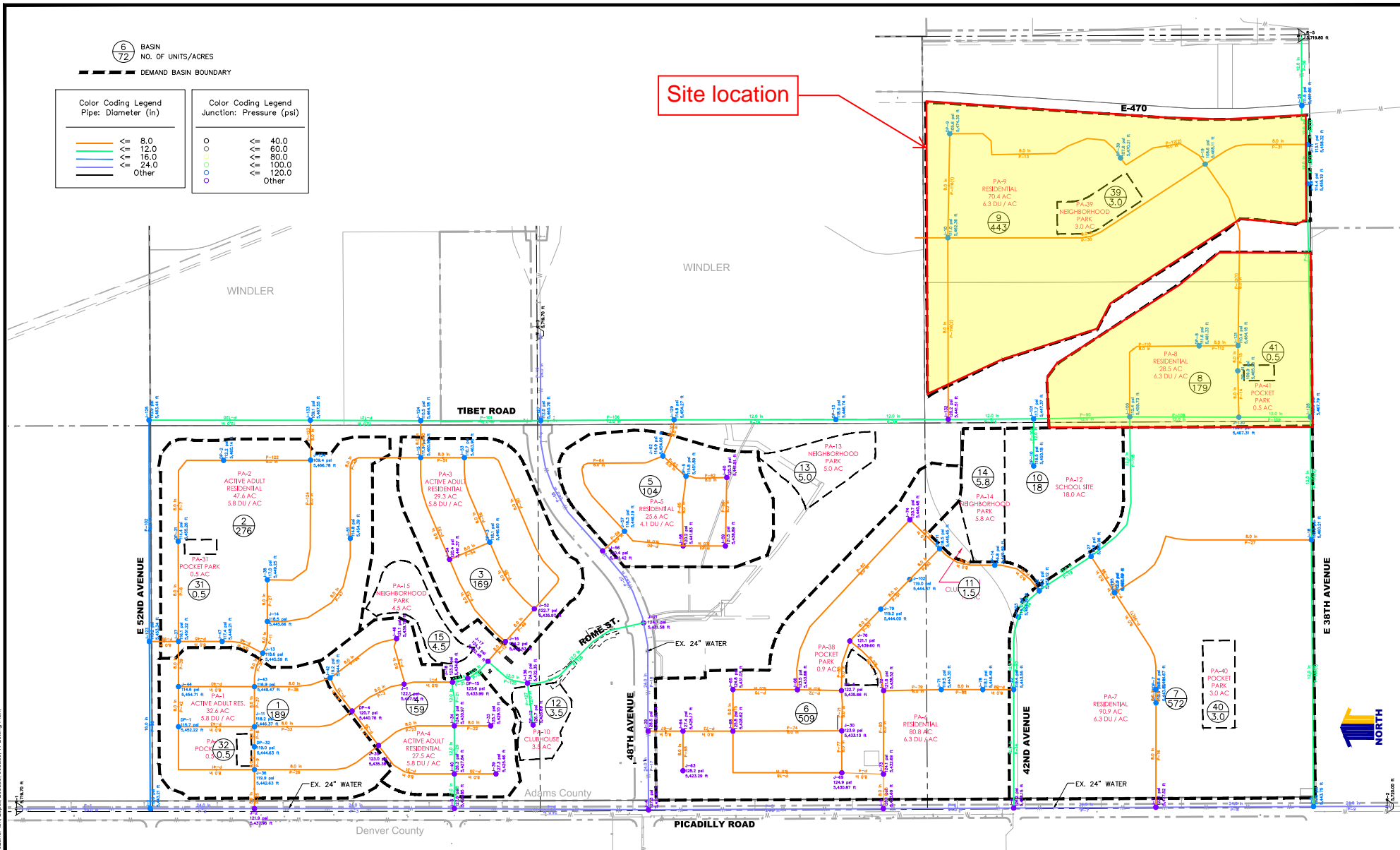
# APPENDIX

## FIGURES AND SUPPORTING DOCUMENTS

# Pages from Green Valley–Amendment 1 Master Utility Report

**EDN #218184**

PATH: P:\AURORA\GVRE\CD\UTILITY\WATER\GVRE WATER MODEL.DWG  
PLOT BY: MICHAEL LOPEZ, PLOT DATE: 8/22/2018 9:00 AM  
XREFS: "Aurora\GVRE\CD\UTILITY\WATER\GVRE Water Model.dwg" W.Landing Plan.



Drawing Name: GVRE Water Model.dwg		1 inch = 300 ft. Horizontal		<b>Calibre</b> Calibre Engineering, Inc. 9090 South Ridgeline Boulevard, Suite 105 Highlands Ranch, CO 80129 (303) 730-0434 www.calibre-engineering.com		<b>GREEN VALLEY - AMENDMENT 1</b> <b>MASTER UTILITY REPORT</b> <b>WATER EXHIBIT</b>		Sheet <b>WT1</b> 1 of 2	
Job Number: Oakwood GVRE FDP F1&2		Designer: LMA		Checker: TAJ		Construction Management Civil Engineering Surveying		Date: AUGUST 2018	
Prepared For: CITY OF AURORA									
DATE		REVISION DESCRIPTION							





# GREEN VALLEY - AMENDMENT 1 SANITARY SEWER GENERATION

RESIDENTIAL		
Single-Family Population Density	2.77	People per Unit
Age Restricted Population Density	2.50	People per Unit
Average Flow Generation	68	gpcpd

MIXED USE	
Unit density of 10 units/acre was assumed and equivalent population was calculated with the Single-Family residential population density of 2.77	

COMMERCIAL		
Average Flow Generation	1,500	gpd/acre
Density	0.0023	cfs/acre
Equivalent Population	22	capita/acre

PEAKING FACTOR			
Where p = Population in thousands			
PF = 5/(p^0.167)			
Min. PF =	1.7	Max. PF =	4.0

SCHOOLS / INDUSTRIAL		
Average Flow Generation	1,200	gpd/acre
Density	0.0019	cfs/acre
Equivalent Population	18	capita/acre

PIPE CAPACITY (cfs) n = 0.011				
PIPE SIZE (IN)		0.4% SLOPE	0.25% SLOPE	
75 % FULL	8	0.82	0.65	
	10	1.49	1.18	
	12	2.43	1.92	
	15	4.72	3.73	
80 % FULL	18	7.67	6.07	
	24	16.53	13.07	
	30	29.97	23.69	
	36	48.73	38.52	
	42	73.50	58.11	

DESIGN POINT	BASIN	LAND USE	TOTAL ACRES	DENSITY (UNITS/AC)	NO. OF LOTS	EQUIVALENT POPULATION	AVG. DAY FLOW (CFS)	AVG. DAY FLOW (GPD)	AVG. DAY FLOW (GPM)	INFILTRATION @ 10% (GPM)	PEAKING FACTOR	PEAK FLOW (GPM)	PEAK FLOW + INFILTRATION (GPM)	PEAK FLOW + INFILTRATION (CFS)	Estimated Size at 0.4% (IN)	Pipe Percent Full at 0.4% (%)	Existing Pipe Size (IN)	COMMENTS
1	Offsite Basin 310-1	Mixed Use	142.4		-	3,227	0.246	158,994	110	11.0	4.0	442	453	1.01	10	57		Offsite Basin 310-1
2	Offsite Basin 310-2	SF Residential	57.9	5.0	290	802	0.084	54,530	38	3.8	4.0	151	155	0.35	8	43		Offsite Basin 310-2
3	Offsite Basin 310-3	SF Residential	70.4	5.0	352	975	0.103	66,303	46	4.6	4.0	184	189	0.42	8	48		Offsite Basin 310-3
3a	Design Point Total (Option 2 w/ 310-2)					1,777	0.187	120,833	84	8.4	4.0	336	344	0.77	8	71		Offsite Basin 310-2 + 310-3 (see Notes 1 and 4)
4	Basin 1	SF Resid. (Age Restricted)	47.6	5.8	276	690	0.073	46,920	33	3.3	4.0	130	134	0.30	8	40		Basin 1
	Design Point Total					690	0.073	46,920	33	3.3	4.0	130	134	0.30	8	40		
5	Basin 2	SF Resid. (Age Restricted)	32.6	5.8	189	473	0.050	32,130	22	2.2	4.0	89	91	0.20	8	32		Basin 1 + 2
	Design Point Total					1,163	0.122	79,050	55	5.5	4.0	220	225	0.50	8	53		
6	Offsite Basin 4 (GVR D-6)	Mixed Use	106.5		-	2,785	0.345	222,979	155	15.5	4.0	619	635	1.41	10	72		Offsite Basin 4 (GVR D-6)
	Design Point Total (Option 2 w/ 310-1)					6,012	0.591	381,973	265	26.5	3.7	983	1,010	2.25	12	71		Offsite Basin 4 + 310-1 (see Note 2)
7	Basin 3	SF Resid. (Age Restricted)	29.3	5.8	169	423	0.044	28,730	20	2.0	4.0	80	82	0.18	8	30		Offsite Basin 4 + Basin 1 + 2 + 3
	Design Point Total					3,208	0.337	218,110	151	15.1	4.0	606	621	1.38	10	70		
7a	Design Point Total (Option 2 w/ 310-1)					6,435	0.677	437,546	304	30.4	3.7	1,113	1,144	2.55	15	52		Offsite Basin 4 + Basin 1 + 2 + 3
	Design Point Total					4,370	0.512	330,759	230	23.0	3.9	898	921	2.05	12	66		
8	Design Point Total (Option 2 w/ 310-1)					7,597	0.758	489,753	340	34.0	3.6	1,212	1,246	2.78	15	54		Offsite Basin 4 + Basin 1 + 2 + 3
	Basin 4	SF Resid. (Age Restricted)	27.5	5.8	159	398	0.042	27,030	19	1.9	4.0	75	77	0.17	8	29		Offsite Basin 310-3 + Basin 4 (see Note 4)
	Design Point Total					1,373	0.144	93,333	65	6.5	4.0	259	266	0.59	8	59		Offsite Basin 310-2 + 310-3 + Basin 4 (see Notes 1 and 4)
	Design Point Total (Option 2 w/ 310-2)					2,174	0.229	147,863	103	10.3	4.0	411	421	0.94	10	54		
9	Design Point Total					6,905	0.778	503,142	349	34.9	3.6	1,265	1,300	2.90	15	56		Design Point 5 + Design Point 7 + Design Point 8 (see Note 4)
	Design Point Total (Option 2 w/ 310-2)					7,707	0.965	623,975	433	43.3	3.6	1,541	1,584	3.53	15	64		(see Notes 1 and 4)
	Design Point Total (Option 2 w/ 310-1 & 310-2)					10,934	1.211	782,969	544	54.4	3.4	1,823	1,878	4.18	15	72		(see Notes 1, 2 and 4)
10	Offsite Basin 310-4	Commercial	18.5			407	0.043	27,676	19	1.9	4.0	77	79	0.18	8	30		Offsite Basin 310-4
11	TAH (DP 18)	Mixed Use	2,109.0			104,435	7.425	4,798,903	3333	333.3	2.3	7,667	8,000	17.82	30	55		From The Aurora Highlands (TAH) Master Utility Report
12	Offsite Basin 5 (GVR D-7)	Mixed Use	62.8			1,423	0.187	120,861	84	8.4	4.0	336	344	0.77	8	71		From Lund Green Valley Report (GVR D-7)
	Design Point Total					2,190.3	7.655	4,947,440	3436	343.6	2.3	7,881	8,225	18.32	30	56		TAH (see Note 3)
13	Basin 5	SF Residential	70.4	6.3	443	1,227	0.129	83,443	58	5.8	4.0	232	238	0.53	8	55		Basin 5
14	Offsite Basin 6 (GVR C-30)	Mixed Use	64.0			1,408	0.174	112,459	78	7.8	4.0	312	320	0.71	8	67		From Lund Green Valley Report (GVR C-30)
	Design Point Total					134.4	0.303	195,903	136	13.6	4.0	544	558	1.24	10	65		Offsite Basin 6 + Basin 5
15	Design Point Total					2,324.7	7.958	5,143,343	3572	357.2	2.3	8,160	8,517	18.88	30	57	36"	TAH + Offsite Basin 5 + 6 + Basin 5 (see Note 3)
16	Basin 6	SF Residential	25.6	4.1	104	288	0.030	19,589	14	1.4	4.0	54	56	0.12	8	25		Basin 6
	Design Point Total					2,350.3	7.988	5,162,932	3585	358.5	2.3	8,187	8,546	19.04	30	57	42"	TAH + Offsite Basin 5 + 6 + Basin 5 + 6 (see Note 3)
17	Offsite Basin 12 (GV OFS-12)	Mixed Use	87.4		-	1,981	0.245	158,348	110	11.0	4.0	440	451	1.00	10	56		Offsite Basin 12 (GV OFS-12)
18	Basin 7	SF Residential	28.5	6.3	179	496	0.052	33,716	23	2.3	4.0	94	96	0.21	8	33		Basin 7
	Design Point Total					115.9	0.297	192,064	133	13.3	4.0	534	547	1.22	10	64		Basin 7 + Offsite Basin 12
19	Basin 8	School	18.0	-	-	324	0.033	21,600	15	1.5	4.0	60	62	0.14	8	27		Basin 8
	Design Point Total					133.9	0.331	213,664	148	14.8	4.0	594	608	1.36	10	70		Basins 7+8 + Offsite Basin 12
20	Offsite Basin 13	Mixed Use		-	-							5,157	11.49	24	61	30" @ 0.15%		Offsite Basin 13
21	Basin 9	SF Residential	90.9	6.3	572	1,584	0.167	107,742	75	7.5	4.0	299	307	0.68	8	65		Basin 9
	Design Point Total											5,464	12.17	24	63	30" @ 0.15%		Basin 9 + Offsite Basin 13
21.1	Basin 9.1	SF Residential	33.6	6.3	212	587	0.062	39,932	28	2.8	4.0	111	114	0.25	8	36		Basin 9.1
	Design Point Total					125						5,577	12.43	24	64	30" @ 0.15%		
22	Basin 10	SF Residential	47.2	6.3	297	823	0.087	55,943	39	3.9	4.0	155	159	0.35	8	43		Basin 10
	Design Point Total					297.0	0.714	246,399	171	17.1	4.0	684	702	1.56	12	55		Basins 7+8+9+10 and Offsite Basin 12
22.1	Design Point Total											6,279	13.99	24	69	30" @ 0.15%		Basins 7+8+9+10 + Offsite Basins 12+13
LS	Design Point Total											16,702	37.21	42	64			All Basins
SITE TOTALS	SF Resid. (Age Restricted)		137.0		793	1,983	0.209	134,810	94	9.4	4.0	374	384	0.86				
	SF Residential		296.3		1807	5,005	0.465	340,367	236	23.6	3.8	903	927	2.06				
	School		18.0		-	324	0.033	21600	15	1.5	4.0	60	62	0.14				

NOTE 1: For analysis purposes, Option 2 requires a lift station to convey flows from Basin 310-2 along Piccadilly Rd to Design Point 3a  
NOTE 2: For analysis purposes, Option 2 requires a lift station to convey flows from Basin 310-1 along Tibet Rd to Design Point 6  
NOTE 3: There is an existing 36" or 42" sanitary sewer main in this area  
NOTE 4: Sanitary Sewer Pipe runs at 0.25% slope near and along Rome St (Design Points 7a, 8 and 9)

AVERAGE DAY FLOW for Offsite Basin 310-1 and TRIBUTARY AREA for Offsite Basins 310-2 and 310-3 taken from 310 West Master Utility Report by Calibre Engineering  
AVERAGE DAY FLOW for Offsite Basins 4, 5, 6 and 12 taken from Master Utility Report for Green Valley by The Lund Partnership, Inc. (2006)  
PEAK FLOW + INFILTRATION for Offsite Basin 13 taken from HDR First Creek Interceptor Technical Memorandum 3 provided by COA (Parcels 26 and Parcels 32-38) with peaking factor of 2.25  
AVERAGE DAY FLOW for Offsite Basin TAH taken from Master Utility Report for The Aurora Highlands by Calibre Engineering (2018)  
SITE TOTALS are flows from Green Valley - Amendment 1 only

# Pages from Master Utility Report for Green Valley Master Plan Amendment 2

**DA-1662-25**

TABLE 1: SANITARY SEWER DEMANDS										
BASIN CHARACTERISTICS			RESIDENTIAL <sup>1</sup>					NON-RESIDENTIAL		TOTAL
BASIN	LAND USE	AREA (ACRES)	MAXIMUM NO. UNITS	DENSITY (unit/acre)	POPULATION	AVERAGE DAILY FLOW PER UNIT (gpd)	AVERAGE FLOW (gpd)	AVERAGE DAILY FLOW PER ACRE	AVERAGE FLOW (gpd)	TOTAL AVERAGE SEWAGE FLOW (gpd)
PA-45	RESIDENTIAL	27.8	222	8	617	188.36	41891.26			
	<b>TOTAL</b>						41891.26	0.00		41891.26
PA-46	RESIDENTIAL	38.1	305	8	845	188.36	57412.13	0		
	<b>TOTAL</b>						57412.13	0.00		57412.13
PA-47	MIXED USE	5	90	18	250	188.36	16952.40	1500	7500	
	<b>TOTAL</b>						16952.40	7500.00		24452.40
PA-48	MIXED USE	13.2	290	22	805	188.36	54699.74	1500	19800	
	<b>TOTAL</b>						54699.74	19800.00		74499.74
PA-49	MIXED USE	21.8	218	10	604	188.36	41062.48	1500	32700	
	<b>TOTAL</b>						41062.48	32700.00		73762.48
PA-50	MIXED USE	51.7	517	10	1433	188.36	97382.12	1500	77550	
	<b>TOTAL</b>						97382.12	77550.00		174932.12
PA-51	MIXED USE	15.3	77	5	212	188.36	14409.54	1500	22950	
	<b>TOTAL</b>						14409.54	22950.00		37359.54
PA-52	MIXED USE	9.6	48	5	133	188.36	9041.28	1500	14400	
	<b>TOTAL</b>						9041.28	14400.00		23441.28
PA-53	COMMERCIAL	17.5					0.00	1500	26250	
	<b>TOTAL</b>						0.00	26250.00		26250.00
PA-54	COMMERCIAL	27.3					0.00	1500	40950	
	<b>TOTAL</b>						0.00	40950.00		40950.00
Brandenburg Parcel										
PA-55 <sup>3</sup>	MIXED USE	17.2	258	15	715	188.36	48596.88	1500	25800	
	<b>TOTAL</b>						48596.88	25800.00		74396.88

1. Residential based on 68 gallons per capita per day, 2.77 people per residence

2. Windler Homestead Sanitary not tributary to Aurora 310 per Windler Master Utility Report, Revised June 22, by Olsson

3. Basin accounted for within the Green Valley Ranch East Amendment 1 Master Utility Report as Basin 310-4. That Study estimated the gpd at 27,676

Updated flow used  
for Basin 310-4

# Pages from The Aurora Highlands Master Utility Report – Amendment 2

**EDN #219069**

Windler does not use DP 14 to recieve flows from TAH only DP 22

Aurora Highland Final Outfall to First Creek

Site Location

DESIGN POINT	PEAK FLOW (MGD)	ESTIMATED PIPE SLOPE (%)	ESTIMATED PIPE SIZE (IN)	PIPE NAME	ESTIMATED VELOCITY (FPS)	% FULL FLOW
1	1.97	0.40%	15	SS-1	4.1	56.9%
2.1	2.12	0.40%	15	SS-2	4.2	60.4%
2.2	0.66	0.40%	10	SS-3	3.2	57.2%
3.1	0.89	0.40%	10	SS-4	3.4	70.2%
3.2	0.20	0.40%	8	SS-5	2.3	40.4%
4	3.36	0.40%	18	SS-6	4.8	59.4%
5.1	1.01	0.40%	12	SS-7	3.5	55.1%
5.2	0.24	0.40%	8	SS-8	2.5	44.6%
6	1.30	0.40%	12	SS-9	3.7	64.9%
7	1.70	0.40%	15	SS-10	4.0	52.6%
8	4.79	0.40%	18	SS-11	5.1	77.6%
9.1	0.31	0.40%	8	SS-12	2.6	51.8%
9.2	0.37	0.40%	8	SS-13	2.7	57.8%
10	0.56	0.40%	10	SS-14	3.0	51.7%
11.1	0.15	0.40%	8	SS-15	2.2	34.6%
11.2	0.71	0.40%	10	SS-16	3.2	59.9%
12	5.59	0.40%	24	SS-17	5.4	50.7%
13	0.10	0.40%	8	SS-18	1.9	28.0%
14	0.49	0.40%	8	SS-19	2.9	70.1%
15	5.95	0.40%	24	SS-20	5.5	52.6%
16	3.27	0.25%	18	SS-21	3.9	68.6%
17	0.23	0.40%	8	SS-22	2.4	43.6%
18	0.38	0.40%	8	SS-23	2.8	58.8%
19	0.20	0.40%	8	SS-24	2.3	40.4%
20	0.81	0.40%	10	SS-25	3.3	65.5%
21	0.98	0.40%	12	SS-26	3.5	54.0%
22	4.27	0.25%	24	SS-27	4.2	49.7%
23	0.41	0.40%	8	SS-28	2.6	61.3%
24	6.06	0.25%	24	SS-29	4.6	61.7%
25	10.92	0.25%	30	SS-30	5.3	61.5%
26	10.95	0.25%	30	SS-31	5.3	61.6%
27	11.15	0.25%	30	SS-32	5.4	62.3%
28	0.05	0.40%	8	SS-33	2.8	35.1%
29	0.38	0.40%	8	SS-34	2.8	58.8%
30	0.85	0.40%	10	SS-35	3.3	67.8%
31	1.27	0.40%	12	SS-36	3.7	63.9%
32	0.09	0.50%	8	SS-37	2.0	25.1%
33	1.42	0.40%	12	SS-38	3.8	69.2%
34	1.69	0.40%	12	SS-39	3.7	15.6%
35	0.37	0.40%	8	SS-40	2.7	57.8%
36	0.46	0.40%	8	SS-41	2.9	66.9%
37	0.62	0.40%	8	SS-42	4.2	19.3%
38	13.16	0.40%	36	SS-43	6.6	44.5%
39	0.69	0.40%	12	SS-44	3.2	36.3%
40	1.19	0.40%	12	SS-45	3.7	61.1%
41	3.41	0.40%	18	SS-46	4.8	60.0%
42	1.73	0.40%	15	SS-47	4.0	53.2%
43	3.87	0.40%	18	SS-48	4.9	65.4%
44	1.66	0.40%	15	SS-49	4.0	51.9%
45	2.58	0.40%	15	SS-50	4.4	69.3%

DRAWN BY: KLH JOB DATE: 11/2022  
APPROVED: RWL JOB NUMBER: 181211.47  
CAD DATE: 11/22/2022 1:21:34 PM  
CAD FILE: J:\2018\181211.47\CAD\Drawings\Exhibits\X-SS2\_AM2.dwg

BAR IS ONE INCH ON OFFICIAL DRAWINGS.  
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION
1	10/2019	KH	REMOVED SEC. 21 & 28 FROM PROJECT
2	11/2022	KH	REVISED AREA AND LAND USE IN PA-55

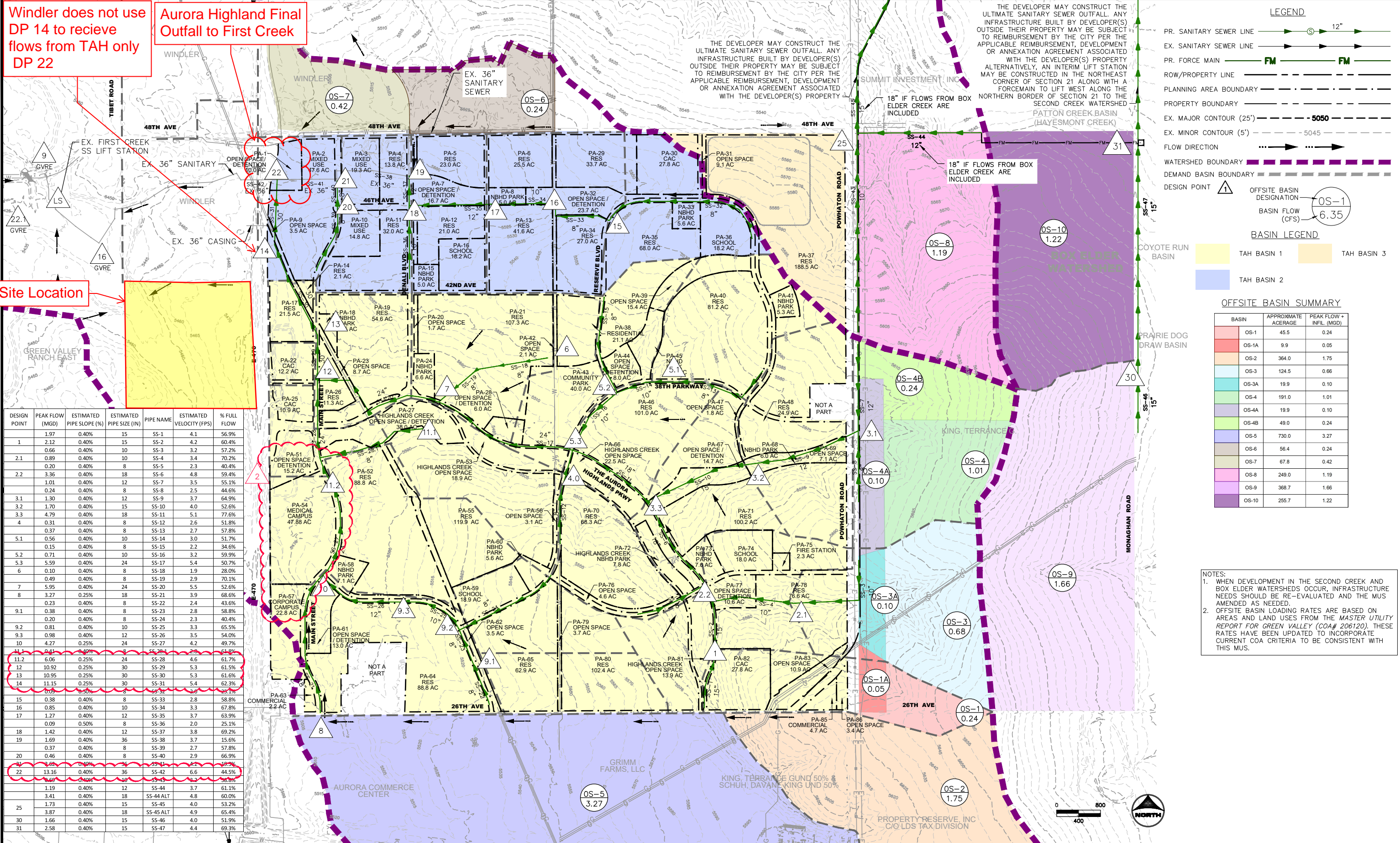


THE AURORA HIGHLANDS  
AURORA HIGHLANDS, LLC  
AURORA, COLORADO

THE AURORA HIGHLANDS

MASTER UTILITY REPORT - AMENDMENT 2  
SANITARY SEWER PLAN

SHEET NO.  
SS2



NOTES:  
1. WHEN DEVELOPMENT IN THE SECOND CREEK AND BOX ELDER WATERSHEDS OCCUR, INFRASTRUCTURE NEEDS SHOULD BE RE-EVALUATED AND THE MUS AMENDED AS NEEDED.  
2. OFFSITE BASIN LOADING RATES ARE BASED ON AREAS AND LAND USES FROM THE MASTER UTILITY REPORT FOR GREEN VALLEY (COA# 206120). THESE RATES HAVE BEEN UPDATED TO INCORPORATE CURRENT COA CRITERIA TO BE CONSISTENT WITH THIS MUS.



SANITARY SEWER DEMAND CALCULATIONS

Project #: 181211.47  
Project: The Aurora Highlands

Location: Aurora, CO  
Plan Date: 11/2022

By K House  
Checked R Littleton

Date 11/20/2022  
Date 11/20/2022

POPULATION DENSITY		
Multi-Family	2.77	People per Unit
Single-Family	2.77	People per Unit
Age Restricted	2.77	People per Unit
Average Flow Generation	68	gpcpd

COMMERCIAL / SCHOOLS / INDUSTRIAL			
	Commercial	Schools / Industrial	
Average Flow Generation	1,500	1,200	gpd/acre
Equivalent Population	0.0023	0.0019	cfs/acre
	22	18	capita

PEAKING FACTOR			
PF = 5/(p^0.167)		Where p = Population in thousands	
Min. PF =	1.7	Max. PF =	4.0

75 % FULL	PIPIE CAPACITY (mgd) (n=.011)		
	PIPE SIZE (IN)	0.4% SLOPE	0.25% SLOPE
	8	0.53	0.42
	10	0.97	0.76
12	1.57	1.24	

80 % FULL	PIPIE CAPACITY (mgd) (n=.011)		
	PIPE SIZE (IN)	0.4% SLOPE	0.25% SLOPE
	15	3.05	2.41
	18	4.96	3.92
	24	10.68	8.44
	30	19.37	15.31
36	31.49	24.90	

Design Point	Planning Area	Flow Split	RESIDENTIAL SINGLE FAMILY							Average Day Flow (gpm)	RESIDENTIAL MULTI FAMILY							Land Use	COMMERCIAL / SCHOOLS / INDUSTRIAL					Average Day Flow (gpm)	CUMMULATIVE TOTALS							Peak Flow + Infil. (gpm)	PIPE PARAMETERS				
			Total Acres	Development Density (DU/acre)	No. of Units	Population Density (people/unit)	Equivalent Population	Average Flow Generation (gpcpd)	Average Day Flow (mgd)		Total Acres	Development Density (DU/acre)	No. of Units	Population Density (people/unit)	Equivalent Population	Average Flow Generation (gpcpd)	Average Day Flow (mgd)		Total Acres	Population Density	Equivalent Population	Average Flow Generation (gpd/acre)	Average Day Flow (mgd)		Total Acres	Infil. @ 10% (mgd)	Cumulative Population	Peak Factor	Peak Flow (mgd)	Peak Flow + Infil. (mgd)	Estimated Pipe Slope (%)		Estimated Size at Given Slope	Pipe Name	Velocity (ft/sec)	Percent Full at Given Slope	
9.2	PA-59	100%	0.0		0			0.00	0.0		0			0	0.00	School	18.9	18	340	1,200	0.023		18.90	0.002	340	4.0	0.09	0.09		0.40%	8						
	PA-65	50%	31.5	5.9	185	2.77	511	68	0.035											31.45	0.003	511	4.0	0.14	0.14		0.40%	8									
	PA-80	50%	43.6	5.9	256	2.77	709	68	0.048											43.60	0.005	709	4.0	0.19	0.20		0.40%	8	SS-24	2.3	40.4%						
	Design Point Total	DP9.1 - 9.2	106.5	5.9	625		1,731		0.118	15.2	20.0	304		842	0.057	18.9		340	0.023	140.60	0.020	2,914	4.0	0.79	0.81		0.40%	10	SS-25	3.3	65.5%						
9.3	PA-64	50%	37.3	5.9	219	2.77	607	68	0.041											37.25	0.004	607	4.0	0.17	0.17		0.25%	8									
	Design Point Total	DP9.1 - 9.3	143.8	5.9	844		2,338		0.159	15.2	20.0	304		842	0.057	18.9		340	0.023	177.85	0.024	3,520	4.0	0.96	0.98		0.40%	12	SS-26	3.5	54.0%						
10	PA-63	100%								14.3		286	2.77	792	68	0.054	Com.	2.2	22	48	1,500	0.003		2.20	0.000	48	4.0	0.01	0.01		0.25%	8					
	PA-64	50%	37.3	5.9	219	2.77	607	68	0.041		20.0									51.55	0.010	1,399	4.0	0.38	0.39		0.25%	8									
	PA-57	100%														Com.	22.8	22	501	1,500	0.034		22.77	0.003	501	4.0	0.14	0.14		0.25%	8						
	On-Site Total	DP8 - DP10	181.0		1,063		2,945		0.200	29.5		590		1,634	0.111	43.9		890	0.060	254.37	0.037	5,468	3.8	1.40	1.44		0.25%	15									
11.1	Design Point Total		400.0	5.7	2,268		6,281		0.427	29.5	20.0	590		1,634	0.111	554.9		12,132	0.827	984.37	0.136	20,047	3.0	4.14	4.27		0.25%	24	SS-27	4.2	49.7%						
	PA-55	75%	89.9	5.9	528.0	2.8	1,462.6	68.0	0.1											89.9	0.0	1,462.6	4.0	0.4	0.41		0.40%	8									
11.2	Design Point Total	DP11.1	89.9	5.9	528		1,463		0.099	0.0		0		0	0.000	0.0		0	0.000	89.93	0.010	1,463	4.0	0.40	0.41		0.40%	8	SS-28.1	2.8	61.8%						
	PA-52	100%	88.8	5.9	521	2.77	1,443	68	0.098											88.80	0.010	1,443	4.0	0.39	0.40		0.25%	8									
	PA-54	100%	0.0		0				0.00			0		0	0.00	Hospital	47.9	22	1,053	8,443	0.404		47.88	0.040	1,053	4.0	1.62	1.66	1,151	0.25%	15						
	PA-55	25%	30.0	5.9	176	2.77	488	68	0.033											29.98	0.003	488	4.0	0.13	0.14		0.25%	8									
12	On-Site Total	DP8 - DP11.2	389.7		2,288		6,338		0.431	29.5		590		1,634	0.111	91.8		1,943	0.464	510.95	0.101	9,915	3.4	3.43	3.53		0.25%	18									
	Design Point Total		608.7	5.7	3,493		9,674		0.658	29.5	20.0	590		1,634	0.111	602.8		13,185	1.231	1,240.95	0.200	24,493	2.9	5.86	6.06		0.25%	24	SS-28	4.6	61.7%						
	PA-19	100%	54.6	5.9	321	2.77	889	68	0.060											54.60	0.006	889	4.0	0.24	0.25		0.25%	8									
	PA-25	100%	0.0		0				0.00							Civic	10.9	18	196	1,200	0.013		10.90	0.001	196	4.0	0.05	0.05		0.25%	8						
13	PA-26	100%	11.3	5.8	66	2.77	183	68	0.012											11.30	0.001	183	4.0	0.05	0.05		0.25%	8									
	On-Site Total	DP1 - DP12	1,181.9		6,939		19,220		1.307	45.8		1,079		2,989	0.203	244.2		4,818	0.657	1,471.89	0.217	27,026	2.9	6.25	6.47		0.25%	24									
	Design Point Total		1,723.0	5.8	9,915		27,464		1.868	45.8	23.6	1,079		2,989	0.203	1,167.9		25,099	2.040	2,936.74	0.411	55,552	2.6	10.51	10.92		0.25%	30	SS-29	5.3	61.5%						
	PA-22	100%	0.0		0				0.00			0		0	0.00	Civic	12.2	18	220	1,200	0.015		12.20	0.001	220	4.0	0.06	0.06		0.25%	8						
14	On-Site Total	DP1 - DP13	1,181.9		6,939		19,220		1.307	45.8		1,079		2,989	0.203	256.4		5,037	0.672	1,484.09	0.218	27,246	2.9	6.28	6.50		0.25%	24									
	Design Point Total		1,723.0	5.8	9,915		27,464		1.868	45.8	23.6	1,079		2,989	0.203	1,180.1		25,319	2.054	2,948.94	0.413	55,772	2.6	10.54	10.95		0.25%	30	SS-30	5.3	61.6%						
	PA-14	100%	2.1	5.7	12	2.77	33	68	0.00	0.0										2.10	0.000	33	4.0	0.00	0.00		0.25%	8									
	PA-17	100%	5.0	5.8	29	2.77	80	68	0.00	16.5	30.0	495	2.77	1,371	68	0.093				21.50	0.009	1,451	4.0	0.37	0.38		0.25%	8									
15	On-Site Total	DP1 - DP13	1,189.0		6,980		19,333		1.307	62.3		1,574		4,360	0.296	256.4		5,037	0.672	1,507.69	0.228	28,730	2.9	6.49	6.72		0.25%	24									
	Design Point Total		1,730.1	5.8	9,956		27,578		1.868	62.3	25.3	1,574		4,360	0.296	1,180.1		25,319	2.054	2,972.54	0.422	57,256	2.5	10.73	11.15	7,744	0.25%	30	SS-31	5.4	62.3%						
	PA-30	100%	0.0		0				0.00	0.0						Com.	27.8	18	500	1,200	0.033		27.80	0.003	500	4.0	0.13	0.14		0.40%	8						
	PA-35	50%	34.0	5.9	200	2.77	553	68	0.038											34.00	0.004	553	4.0	0.15	0.15		0.40%	8									
16	PA-36	100%	0.0		0				0.00							School	18.2	18	328	1,200	0.022		18.20	0.002	328	4.0	0.09	0.09		0.50%	8	SS-32	2.0	25.1%			
	Design Point Total	DP15	34.0	5.9	200		553		0.038	0.0		0		0	0.000	46.0		828	0.055	80.00	0.009	1,381	4.0	0.37	0.38	264	0.40%	8	SS-33	2.8	58.8%						
	PA-29	100%	16.2	5.9	95	2.77	263	68	0.018	17.5	20.0	350	2.77	970	68	0.066				33.70	0.008	1,233	4.0	0.34	0.34		0.40%	8									
	PA-34	100%	27.0	5.9	159	2.77	440	68	0.030	0.0										27.00	0.003	440	4.0	0.12	0.12		0.40%	8									
17	Design Point Total	DP15 + DP16	77.2	5.9	454		1,256		0.085	17.5	20.0	350		970	0.066	46.0		828	0.055	140.70	0.021	3,054	4.0	0.83	0.85	588	0.40%	10	SS-34	3.3	67.8%						
	PA-6	100%	10.4	5.9	61	2.77	169	68	0.011	15.1	20.0	302	2.77	837	68	0.057				25.50	0.007	1,006	4.0	0.27	0.28		0.40%	8									
	PA-13	100%	41.6	5.9	244	2.77	676	68	0.046	0.0										41.60	0.005	676	4.0	0.18	0.19		0.40%	8									
	Design Point Total	DP15 - DP17	129.2	5.9	759		2,101		0.143	32.6	20.0	652		1,806	0.123	46.0		828	0.055	207.80	0.032	4,735	3.9	1.24	1.27	882	0.40%	12	SS-35	3.7	63.9%						
18</																																					

# Pages from Windler Master Utility Study

**EDN #222155**

		From Node	To Node	MAP AREA CODE	Peak Flow + Infiltration (CFS)	Avg Day + Infiltration (CFS)	Pipe Size (in)	Pipe Percent Full (Peak Flow)	Avg Day Velocity (FT/S)
FIRST CREEK	LINE C	C.4	C.3	PA-14	0.42	0.11	8	29%	2.4
		C.3	C.2	PA-21	0.80	0.21	8	56%	2.9
		C.2	C.1	PA-22	1.24	0.33	8	53%	4.8
	LINE D	D.1	EX 36"	PA-13, PK-2	0.52	0.14	8	18%	4.2
	LINE E	E.1	EX 36"	PA-12	0.28	0.07	8	10%	3.5
		F.3	F.1	PA-29A, GVRE 310-1	1.20	0.32	10	66%	2.5
		F.4	F.2	PA-28	0.34	0.09	8	28%	2.0
	LINE F	F.2	F.1	PA-27, PA-28	0.41	0.11	8	26%	2.6
		F.1	GVRE 12"	PA-27, PA-28, PA-29A, PA-29B, GVRE 310-1	1.76	0.50	12	59%	2.8
		LINE G	G.1	EX 36"	PA-26	0.27	0.07	8	19%
	LINE H	H.1	EX 36"	PA-24	0.14	0.04	8	8%	2.0
	LINE I	I.1	EX 36"	PA-23, PA-25, PK-4	0.67	0.18	8	47%	2.8

Suite 400  
Denver, CO 80204  
TEL 303.237.2072 [www.dlsson.com](http://www.dlsson.com)

Water Department	Date
------------------	------

SS — SS — EXISTING SANITARY SEWER  
 — PROPOSED SANITARY SEWER  
 - - - SANITARY SEWER BOUNDARY LINE  
 △ X,X DESIGN NODE  
 — BOUNDARY AREA  
 E BASIN  
 XXXX  
 XX  
 OFFSITE BASIN DESIGNATION  
 BASIN FLOW (CFS)

**36-inch Interceptor**  
**Peak Flow Analysis to TAH DP 22 (GVR DP 11)**

Development	Basin	Avg Day Flow (mgd)	Avg Day Flow (gpm)	Infiltration (10%)	Cumulative Population	Peak Factor	Peak Flow + Infl (mgd)	Peak Flow + Infl (gpm)	Peak Flow + Infl (MGD)
<b>Re: The Aurora Highlands Master Utility Report - Amendment 1 (#219069MU2)</b> Windler PA-12 and PA-13 comprise TAH basin OS-6									
TAH	OS-6	0.059	41		874				
Windler	PA-12	0.044	30		641				
	PA-13	0.082	57		1,058				
Windler total		0.125	87		1,700				
Windler average day flow and population from PA-12 and PA-13 greater than that assumed in TAH MUR									
		0.066	46		826				
Windler PA-14, PA-21 and PA-22 comprise TAH basin OS-7									
TAH	OS-7	0.102	71		1,492				
Windler	PA-14	0.065	45		963				
	PA-21	0.060	42		886				
	PA-22	0.070	49		1,029				
Windler total		0.196	136		2,878				
Windler average day flow and population from PA-14, PA-21 and PA-22 greater than that assumed in TAH MUR									
		0.094	65		1,386				
TAH DP 22 (peak flow + infiltration at DP22 is 550 gpm higher than that assumed in the GVR MUR)									
		4.822	3,349	335	71,041	2.5		8,550	12.31
Windler average day flow and population from PA-12, PA-13, PA-14, PA-21 and PA-22 greater than that assumed in TAH MUR									
		0.160	111	11	2,211				
TAH DP 22 with Windler		4.982	3,460	346	73,252	2.4		8,791	12.66
Peak flow + infiltration greater than that from TAH MUR									
								241	0.35

**36-inch Interceptor  
Peak Flow Analysis to GVR DP 15**

Development	Basin	Avg Day Flow (mgd)	Avg Day Flow (gpm)	Infiltration (10%)	Cumulative Population	Peak Factor	Peak Flow + Infl (mgd)	Peak Flow + Infl (gpm)	Peak Flow + Infl (MGD)
<b>Re: Green Valley - Amendment 1 Master Utility Report (#218184MU1)</b>									
Windler PA-23, PA-24, PA-25, PA-26 and PK-4 comprise GVR basins OS-5 and OS-6									
GVR	OS-5	0.121	84	8	1,423	4.00		344	0.50
GVR	OS-6	0.112	78	8	1,408	4.00		320	0.46
GVR total		0.233	162	16	2,831	4.00		664	0.96
Windler	PA-23	0.039	27		579				
	PA-24	0.022	15		327				
	PA-25	0.052	36		765				
	PA-26	0.043	30		640				
	PK-4	0.015	10						
<b>Windler total</b>		<b>0.171</b>	<b>119</b>	<b>12</b>	<b>2,310</b>	<b>4.00</b>		<b>488</b>	<b>0.70</b>
Net peak flow change for GVR basins OS-5 and OS-6 attributed to Windler		-0.062	-43					-176	(0.25)
GVR DP 13	5	0.083	58		1,227				
GVR DP 10	310-4	0.028	19		407				
GVR DP 12	Windler PA-23, PA-24, PA-25, PA-26 and PK-4	0.171	119		2,310				
TAH DP 22 with Windler (GVR DP 11)		4.982	3460		73,252				
Updated total at GVR DP 15		5.264	3,656	366	77,197	2.42		9,211	13.26
GVR DP 15 (peak flow +infiltration from GVR MUR		5.143	3,572	357	108,900	2.28		8,517	12.26
Peak flow + infiltration greater than that from GVR MUR								694.00	1.00

**Estimated Peak Flow Increase + Infiltration Atributed to Windler and TAH at GVR DP 15**

Total population at TAH DP 22	71,041
minus OS-6 population (Windler)	-874
minus OS-7 population (Windler)	-1,492
TAH population without Windler at TAH DP 22	68,675

Windler population at GVR DP 15	
PA-12	641
PA-13	1,058
PA-14	963
PA-21	886
PA-22	1,029
PA-23	579
PA-24	327
PA-25	765
PA-26	640
Total Windler population at GVR DP 15	6,888

Total population TAH and Windler at GVR DP 15 75,563

Estimated peak flow increase + infiltration attributed to Windler at GVR DP 15	63 gpm	0.09 MGD
Estimated peak flow increase + infiltration attributed to TAH at GVR DP 15	631 gpm	0.91 MGD
Peak flow + infiltration greater than that from GVR MUR at GVR DP 15	694 gpm	1.00 MGD

**Windler - Projected Sanitary Sewer Demands**

**Non-Residential Criteria**

		Equivalent
Land Use	Avg Day (gdp/ac)	Pop / Ac
Commercial	1,500	22
Industrial (schools)	1,200	18

**Residential Criteria**

People / unit	2.77
Avg day / capita (gpd)	68

**Peaking Factors**

MIN	1.7
MAX	4

**INFILTRATION**

AVG \* 10% of average, do not peak I&I

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

p= population in thousands

Based on Windler Land Use Summary - 03/24/2022

Map Area Code	Land Use	Total Acres	Proposed DUs	Population	Avg Daily Flow (GPD)	Peaking Factor	Peak Flow (GPD)	Infiltration (GPD)	Avg Day + Infiltration (GPD)	Avg Day + Infiltration (CFS)	Avg Day + Infiltration (GPM)	Peak Flow + Infiltration (GPD)	Peak Flow + Infiltration (CFS)	Peak Flow + Infiltration (GPM)
PA-1	MIXED COMM	31		684	46,605	4.0	186,420	4,661	51,266	0.079	36	191,081	0.296	133
PA-10	SFD/SFA FLEX	24	213	589	40,075	4.0	160,302	4,008	44,083	0.068	31	164,309	0.254	114
PA-11	SFD/SFA FLEX	30	271	752	51,128	4.0	204,514	5,113	56,241	0.087	39	209,627	0.324	146
PA-12	SFD/SFA FLEX	26	232	641	43,619	4.0	174,474	4,362	47,980	0.074	33	178,836	0.277	124
PA-13	SFD/SFA FLEX	21	183	507	34,470	4.0	137,880	3,447	37,917	0.059	26	141,327	0.219	98
PA-13	MF	7	195	540	36,730	4.0	146,921	3,673	40,403	0.063	28	150,594	0.233	105
PA-13	COMMERCIAL	1		11	750	4.0	3,000	75	825	0.001	1	3,075	0.005	2
PA-14	SFD/SFA	18	160	444	30,209	4.0	120,837	3,021	33,230	0.051	23	123,858	0.192	86
PA-14	MF	4	108	298	20,286	4.0	81,145	2,029	22,315	0.035	15	83,174	0.129	58
PA-14	COMMERCIAL	10		220	15,000	4.0	60,000	1,500	16,500	0.026	11	61,500	0.095	43
PA-15	SFD/SFA FLEX	35	313	867	58,960	4.0	235,842	5,896	64,856	0.100	45	241,738	0.374	168
PA-16	SFD/SFA FLEX	7	59	162	11,036	4.0	44,144	1,104	12,140	0.019	8	45,248	0.070	31
PA-17	SFD/SFA FLEX	17	152	421	28,633	4.0	114,530	2,863	31,496	0.049	22	117,394	0.182	82
PA-17	COMMERCIAL	1		22	1,500	4.0	6,000	150	1,650	0.003	1	6,150	0.010	4
PA-18	SFD/SFA FLEX	16	142	393	26,700	4.0	106,800	2,670	29,370	0.045	20	109,470	0.169	76
PA-19	SFA	18	161	446	30,311	4.0	121,244	3,031	33,342	0.052	23	124,275	0.192	86
PA-2	MF	24	711	1,969	133,924	4.0	535,696	13,392	147,316	0.228	102	549,088	0.850	381
PA-20	MIXED COMM	25		540	36,810	4.0	147,240	3,681	40,491	0.063	28	150,921	0.233	105
PA-21	MIXED COMM	4		90	6,156	4.0	24,624	616	6,772	0.010	5	25,240	0.039	18
PA-21	MF	10	287	796	54,112	4.0	216,448	5,411	59,523	0.092	41	221,859	0.343	154
PA-22	MF	11	334	924	62,854	4.0	251,415	6,285	69,139	0.107	48	257,701	0.399	179
PA-22	MIXED COMM	15		105	7,151	4.0	28,602	715	7,866	0.012	5	29,317	0.045	20
PA-23	SFD/SFA FLEX	21	209	579	39,367	4.0	157,469	3,937	43,304	0.067	30	161,406	0.250	112
PA-24	SFD/SFA FLEX	13	118	327	22,226	4.0	88,906	2,223	24,449	0.038	17	91,129	0.141	63
PA-25	SFD/SFA FLEX	33	276	765	51,987	4.0	207,949	5,199	57,186	0.088	40	213,148	0.330	148
PA-26	IND-3.3.5.Y	36		640	42,660	4.0	170,640	4,266	46,926	0.073	33	174,906	0.271	121
PA-26	IND-3.3.5.Z													

Areas used for OS-5

**Windler - Projected Sanitary Sewer Demands**

**Non-Residential Criteria**

	Avg Day (gdp/ac)	Equivalent Pop / Ac
Commercial	1,500	22
Industrial (schools)	1,200	18

**Residential Criteria**

People / unit	2.77
Avg day / capita (gpd)	68

**Peaking Factors**

MIN	1.7
MAX	4
Peaking Factor = $5 \div p^{0.167}$	
p= population in thousands	

**INFILTRATION**

AVG \* 10% of average, do not peak I&I

**Based on Windler Land Use Summary - 03/24/2022**

Map Area Code	Land Use	Total Acres	Proposed DUs	Population	Avg Daily Flow (GPD)	Peaking Factor	Peak Flow (GPD)	Infiltration (GPD)	Avg Day + Infiltration (GPD)	Avg Day + Infiltration (CFS)	Avg Day + Infiltration (GPM)	Peak Flow + Infiltration (GPD)	Peak Flow + Infiltration (CFS)	Peak Flow + Infiltration (GPM)
PA-27	IND-3.3.5.Y, IND-3.3.5.Z	10		174	11,592	4.0	46,368	1,159	12,751	0.020	9	47,527	0.074	33
PA-28	IND-3.3.5.Y, IND-3.3.5.Z	45		803	53,532	4.0	214,128	5,353	58,885	0.091	41	219,481	0.340	152
PA-29	IND-3.3.5.Y, IND-3.3.5.Z													
PA-29A		26		464	30,900	4.00	123,600	3,090	33,990	0.053	24	126,690	0.196	88
PA-29B		31		555	37,032	4.00	148,128	3,703	40,735	0.063	28	151,831	0.235	105
PA-3	SFA	7	76	212	14,400	4.0	57,600	1,440	15,840	0.025	11	59,041	0.091	41
PA-3	COMMERCIAL	1		22	1,500	4.0	6,000	150	1,650	0.003	1	6,150	0.010	4
PA-4	SFD/SFA-FLEX	33	316	874	59,462	4.0	237,850	5,946	65,409	0.101	45	243,796	0.377	169
PA-5	MF	10.61	228	632	43,003	4.0	172,010	4,300	47,303	0.073	33	176,311	0.273	122
PA-6	MF	16.22	322	891	60,577	4.0	242,306	6,058	66,634	0.103	46	248,364	0.384	172
PA-7	SFD/SFA-FLEX	29.87	269	745	50,637	4.0	202,547	5,064	55,701	0.086	39	207,611	0.321	144
PA-7	COMMERCIAL	0.50		11	750	4.0	3,000	75	825	0.001	1	3,075	0.005	2
PA-8	SFD/SFA-FLEX	17.76	160	443	30,107	4.0	120,430	3,011	33,118	0.051	23	123,441	0.191	86
PA-9	SCHOOL	15.50		279	18,600	4.0	74,400	1,860	20,460	0.032	14	76,260	0.118	53
PK-2	Event Center	6.50		143	9,750	4.0	39,000	975	10,725	0.017	7	39,975	0.062	28
PK-4	NEIGHBORHOOD PARK	14.77			15,000	4.0	60,000	1,500	16,500	0.026	11	61,500	0.095	43
***Assume 15,000 gpd in PK-4 to account for planned restaurant and education venues.														

Area used for OS-5

	707	5,494	19,980	1,370,102		137,010	1,507,113		1,047					
Residential	446	5,494	15,218	1,034,815		103,481	1,138,296							
Commercial	99	-	1,848	140,972		14,097	155,069							
Industrial (School)	162		2,915	194,316		19,432	213,748							
	707	5,494	19,980	1,370,102		137,010	1,507,113							
Second Creek	358	3,392	10,954	744,719	3.35	2,496,635	74,472	819,191		569	2,571,107	3.98	1,785	
First Creek	349	2,102	9,026	625,384	3.46	2,165,438	62,538	687,922		478	2,227,976	3.45	1,547	
	707	5,494	19,980	1,370,102		4,662,072	137,010	1,507,113		1047	4,799,083	7.42	3,333	
											4,799,083		3,333	

## Email Correspondence with HR Green

**From:** Littleton, Ryan <rlittleton@hrgreen.com>  
**Sent:** Tuesday, December 3, 2024 7:13 AM  
**To:** Menah, Julie  
**Cc:** White, Ben; Sibel, Sue; 'Philip Dunham'; 'Mike Weiher'; 'Carro, Dave'; 'Wyszynski, Brandon'  
**Subject:** RE: 38th Ave - ARTA coordination  
**Attachments:** [38th Avenue Corridor Study April 2020.pdf](#)

Hi Julie,

Attached is the Corridor Study for 38<sup>th</sup> Ave. The intersection you're inquiring about is noted as Intersection 8.

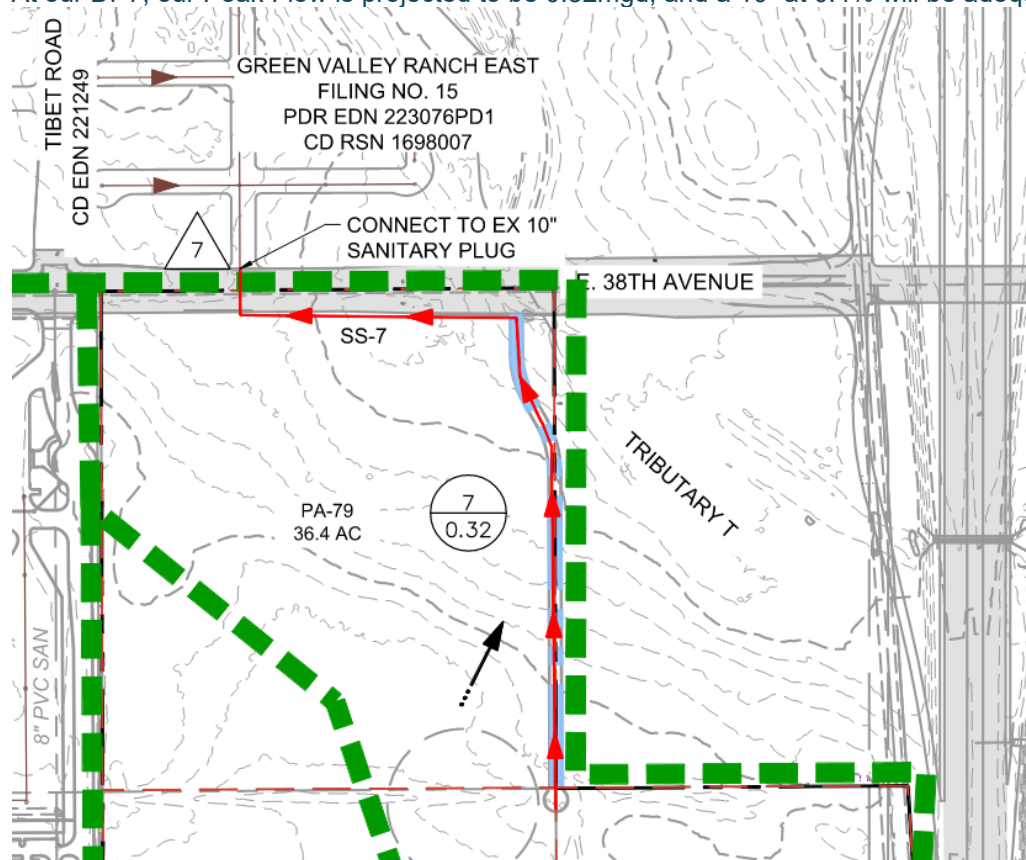
As I understand, and Ben can correct me if I misstate anything, COA would not approve the Civils for this stretch of 38<sup>th</sup> Ave showing additional LTL without the signal, which isn't warranted yet. Once it's warranted, Civil Plans can be prepared for the signal and convert the intersection to a full movement.

Regarding moving the Ukraine intersection – if COA approves this relocation, will you be preparing the plans for the redesign or are you asking ARTA to do that?

Sanitary Sewer:

If Ukraine shifts, we can work with shifting the main to the Ukraine alignment. MCC-II is still at the Master Plan stage, so we don't have any detailed design. We're gearing up for a MP Amendment submittal, so we do have sewer generations to share.

At our DP7, our Peak Flow is projected to be 0.32mgd, and a 10" at 0.4% will be adequate.



## Ryan Littleton, PE

Regional Director – Land Development

Direct 303.468.0386 | Cell 303.941.8913

HR Green® | Building Communities. Improving Lives.

The contents of this transmission and any attachments are confidential and intended for the use of the individual or entity to which it is addressed. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is prohibited.

---

**From:** Menah, Julie

**Sent:** Friday, November 22, 2024 4:05 PM

**To:** Littleton, Ryan

**Cc:** White, Ben ; Sibel, Sue ; Philip Dunham ; Mike Weiher ; Carro, Dave ; Wyszynski, Brandon

**Subject:** FW: 38th Ave - ARTA coordination

**This email came from outside the HR Green organization. Please use caution when clicking on hyperlinks and opening attachments**

---

Hi Ryan-

Good afternoon! We have been in contact with Ben White regarding the 38<sup>th</sup> Avenue project and he gave us your name to discuss some questions we had regarding the Majestic property. As you may know, our client – Oakwood Homes, has been doing some reimagining of the GVRE Filing 15 development located at the NE corner of Tibet Road and 38<sup>th</sup> Avenue. The major change to this development includes the shifting of N. Ukraine Street to meet the required spacing off Tibet in order to accommodate a traffic signal. We have started to look into the modifications required to the 38th Ave plans in order to accommodate this shift in Ukraine – please see the pdf exhibit attached.

I've provided some design questions in a bulleted list below – hoping you can provide some insight and feedback so we can adjust our design as needed:

- It's our understanding there is a future traffic signal also proposed to the east of the 38<sup>th</sup> Avenue EURV pond and directly west of the Tributary T box culverts.
  - o Do you have any information on this signal or the final striping of this intersection? I believe the current 38<sup>th</sup> Ave striping only considers a WB left- is this the final striping condition?
  - o We are also looking for a copy of the TIS that warranted this signal.
- Sanitary Sewer Connection @ 38<sup>th</sup> Avenue
  - o Future Majestic demands – is there any up to date information available on the proposed demands entering into the southern sewer system before crossing 38<sup>th</sup> Avenue north? If not – we are assuming Majestic is conforming to Calibre's Master Utility Report.
  - o Sizing updates – the Master Utility Report reflects a 10-inch sanitary sewer line. We'd like to confirm this is what is being constructed. 38<sup>th</sup> Avenue plans call out a 12-inch.
  - o Can this stub move – both horizontally and vertically?
    - 3 Options are attached for revisions to this sewer connection. We have run preliminary profiles on what each would require the invert to be at the newly proposed connection point. Please see the 2<sup>nd</sup> PDF attached for additional information.

- In previous conversations with Ben – Option #1, where the sewer connection remains in the original location but invert needs to be raised by ~8”, could be accommodated as a field change with 38<sup>th</sup> Avenue construction.
  - Our preferred option is Option #2 (New Location East) – where we realign this sewer connection to the updated alignment of Ukraine St. The sewer depth here is considerably shallower- will this work for the future design of Majestic? What is the sanitary depth required to serve this development?
  - If sewer depth is of concern – Option #3 (New Location West) realigns this connection closer to Tibet Road, to better split the future Filing 15 Commercial parcel and provide additional depth for Majestic’s future sewer connection.
  - Please note that each option above assumes the sanitary sewer pipe is a 10-inch.
- Attached is a preliminary grading plan for the N. Ukraine shift for your information and comment, if any.

Let us know if it’s easier to set up a call to discuss-

Thanks,

Julie Menah, EI

Staff Engineer  
D 321.354.9622  
[www.dewberry.com](http://www.dewberry.com)

---

**From:** White, Ben <[bwhite@hrgreen.com](mailto:bwhite@hrgreen.com)>  
**Sent:** Thursday, September 26, 2024 1:48 PM  
**To:** Sibel, Sue <[ssibel@Dewberry.com](mailto:ssibel@Dewberry.com)>  
**Cc:** DeVito, Tony <[anthony.devito@aecom.com](mailto:anthony.devito@aecom.com)>; Littleton, Ryan <[rlittleton@hrgreen.com](mailto:rlittleton@hrgreen.com)>  
**Subject:** RE: 38th Ave - ARTA coordination

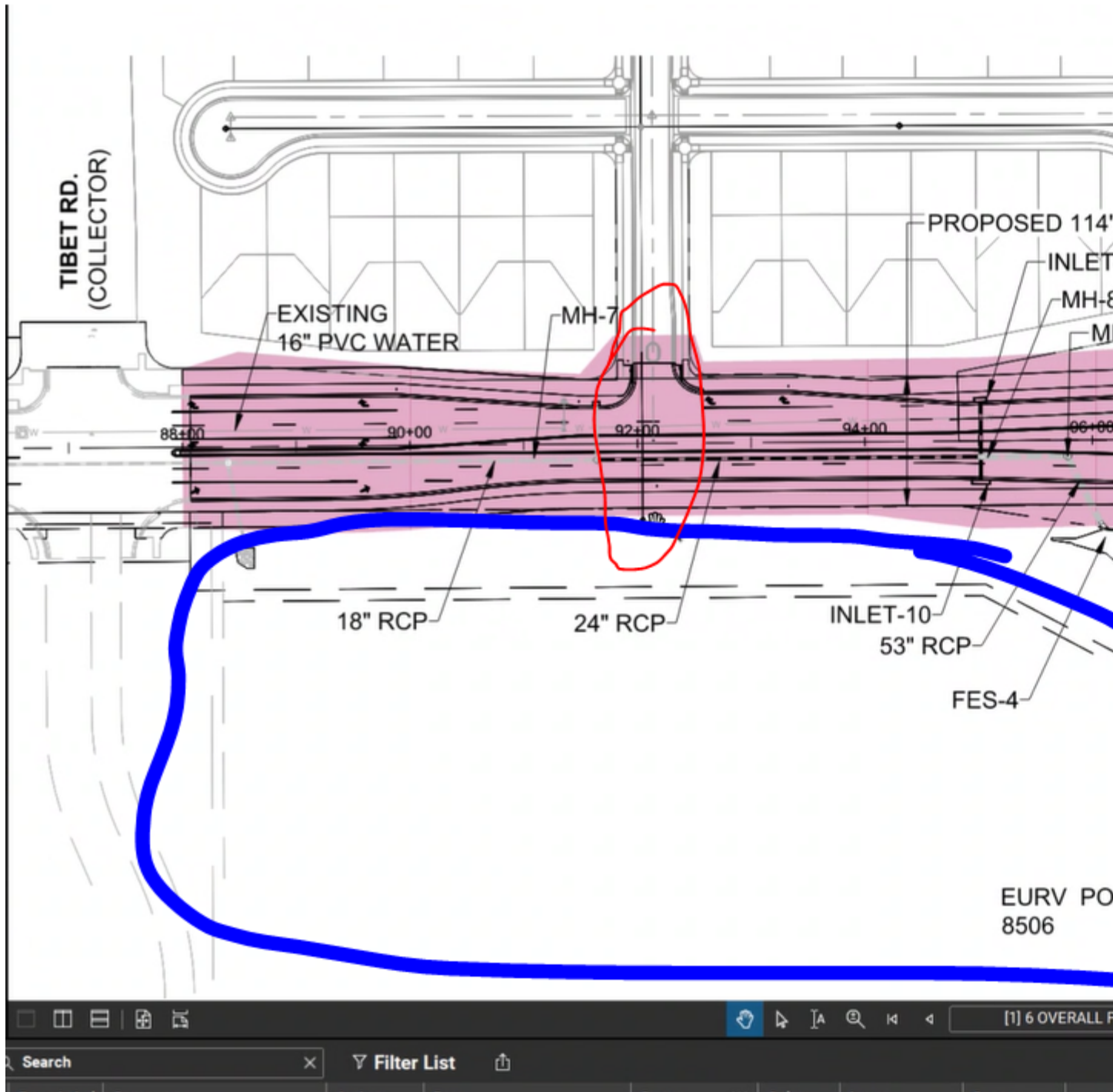
You don't often get email from [bwhite@hrgreen.com](mailto:bwhite@hrgreen.com). [Learn why this is important](#)

**[CAUTION]** External Email. DO NOT click links or open attachments unless expected. Please use the "Phish Alert" button to report all suspicious emails.

Hello Sue,

Nice to meet you today. It sounds like Ryan Littleton (copied on this email) is doing some preliminary work for the Majestic Property shown below. Feel free to reach out to him with any questions you have.

Thanks! Ben



**Ben White, PE, LS**

Senior Project Manager | Regional Director - Transportation  
HR Green® | Building Communities. Improving Lives.



431 N. Phillips Avenue | Suite 400 | Sioux Falls, SD 57104-5933  
**Direct** 605.221.2651 | **Cell** 605.400.4947 | [HRGREEN.COM](http://HRGREEN.COM)

The contents of this transmission and any attachments are confidential and intended for the use of the individual or entity to which it is addressed. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is prohibited.

**CONFIDENTIALITY NOTICE:** This e-mail message, including any attachments, is intended only for the use of the person(s) to whom it is addressed and may contain confidential and privileged information. Any unauthorized review, use, disclosure, copying, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply e-mail and destroy all copies of the original message.

# Supporting Calculations

# Sanitary Sewer Calculations

TABLE 1: SANITARY SEWER DEMANDS											
BASIN CHARACTERISTICS				RESIDENTIAL					NON-RESIDENTIAL		TOTAL
BASIN		LAND USE	AREA (ACRES)	MAXIMUM NO. UNITS	DENSITY (unit/acre)	POPULATION	AVERAGE DAILY FLOW PER UNIT (gpd)	AVERAGE FLOW (gpd)	AVERAGE DAILY FLOW PER ACRE	AVERAGE FLOW (gpd)	TOTAL AVERAGE SEWAGE FLOW (gpd)
Basin 5	PA-9	RESIDENTIAL	64.5	516	8	1430	188.36	97193.76			
TOTAL				97193.76							97193.76
Basin 6 (Filing 22)(PA-5) <sup>1</sup>		RESIDENTIAL	24.6	180	7.4	499	188.36	33904.80			
TOTAL				33904.80							33904.80
	Filing 7 (PA-7)	RESIDENTIAL	22.65	138	6.09	383	188.36	25993.68			
	PA-8	RESIDENTIAL	23.1	185	8	512	188.36	34808.93			
	AAC-1 <sup>2</sup>	RESIDENTIAL	6.7	134	20	372	188.36	25240.24			
Basin 7		TOTAL		86042.85							86042.85
Basin 310-4 <sup>3</sup>		MIXED USE	17.2	258	15	715	188.36	48596.88	1500	25800.00	
TOTAL				48596.88					25800.00		74396.88
Offsite flows per Windler MUR and Aurora Highlands MUR											
TAH <sup>4</sup>		MIXED USE	3494.24	14853	5.8	41142	188.36	2790000.00	2362000.00		
TOTAL				2790000.00					2362000.00		5152000.00
Windler <sup>5</sup>		RESIDENTIAL AND PARKS	117.77	139	2310	1981	188.36	156240.00	15000.00		
TOTAL				156240.00					15000.00		171240.00
Basin 8		SCHOOL	18.0						1200	21600.00	
									21600.00		21600.00
OS-12 (Majestic) <sup>6</sup>											
											78000.00

1: Basin 6 updated with Filing 22 Utility Letter. (RSN #1849820)

2. AAC-1, part of Basin 7, is being zoned as AAC with this Master Plan Amendment. However, due to the uncertainty of the future use of this PA, calculations with this letter assume worst case scenario in order to provide flexibility for the developer in the future. Worst case scenario flows for AAC-1 were calculated using a high-density residential use of 20 du/ac.

3. Basin 310-4 updated per the Green Valley Ranch Master Utility Report Amendment 2 (DA-1662-25)

4. Basin flow values from the Aurora Master Utility Report (EDN #219069)

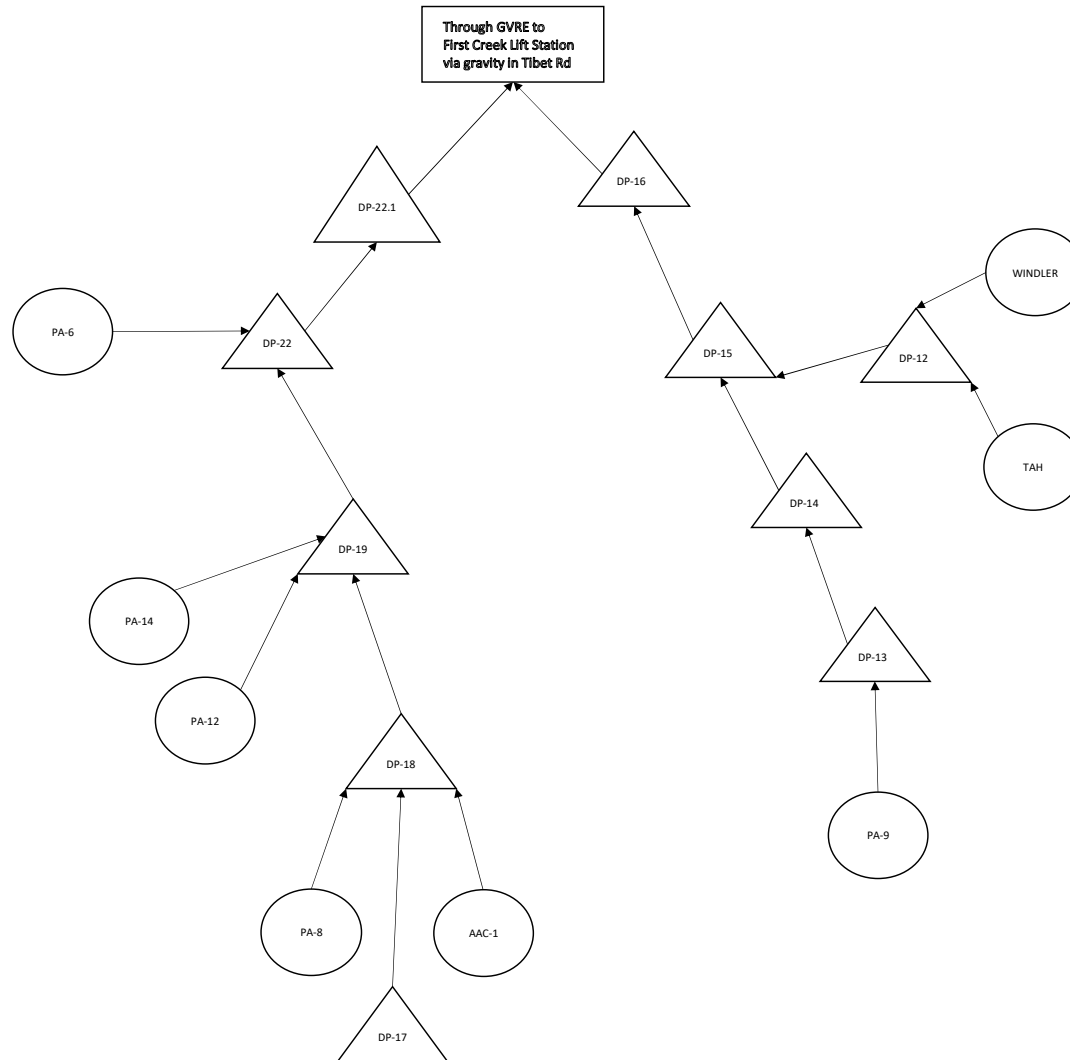
5. Basin flow values from the Windler Master Utility Report (EDN #222155)

6. Basin flow values from email correspondence with HR Green on 12/3/2024 regarding updated demands for Majestic Commerce Center

TABLE 2: SANITARY SEWER ROUTING														
Design Point	Basin(s)	Average Daily Flow (gpd)	Cumulative Equivalent Pop <sup>1</sup>	Peak Factor	Peak Flow (gpd)	Inflow and Infiltration (gpd)	Design Flow (gpd)	Design Flow (mgd)	Design Flow (cfs)	Req'd Pipe Diameter (in)	Req'd PipeSlope (Percent)	Velocity (ft/s)	Depth of Flow (in)	Depth of Ratio (Percent)
DP-17	OS-12 (Majestic Flows)	78000.00	1147.06											
Total		78000.00	1147.06	4.00	312000.00	7800.00	319800.00	0.32	0.49	10.00	0.4%	2.62	3.8	38%
DP-18	Basin 7	86042.85	1265.34											
	OS-12 (Majestic Flows)	78000.00	1147.06											
Total		164042.85	2412.39	4.00	656171.39	16404.28	672575.68	0.67	1.04	10.00	0.4%	3.18	5.8	58%
DP-19	Basin 7	86042.85	1265.34											
	Basin 8	21600.00	317.65											
	OS-12 (Majestic Flows)	78000.00	1147.06											
Total		185642.85	2730.04	4.00	742571.39	18564.28	761135.68	0.76	1.18	10.00	0.4%	3.27	6.3	63%
DP-13	Basin 5	97193.76												
Total		97193.76	1429.32	4.00	388775.04	9719.38	398494.42	0.40	0.62	8.00	0.4%	2.79	4.9	61%
DP-15	Basin 310-43	74396.88	1094.07											
	TAH4	5152000.00	75764.71											
	Windler5	171240.00	2518.24											
	Basin 6	33904.80	498.60											
	Basin 5	97193.76	1429.32											
Total		5528735.44	81304.93	2.40	13261916.57	552873.54	13814790.11	13.81	21.37	36.00	0.4%	6.78	16.5	46%

1. Cumulative Equivalent Population = Total Average Daily Flow at a design point ÷ 68 gallons per day

## Green Valley Master Plan Amendment 2 Routing Schematic



## Worksheet for DP-13

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.62 cfs
Results	
Normal Depth	4.9 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.2 ft
Hydraulic Radius	2.2 in
Top Width	0.65 ft
Critical Depth	4.4 in
Percent Full	60.9 %
Critical Slope	0.005 ft/ft
Velocity	2.79 ft/s
Velocity Head	0.12 ft
Specific Energy	0.53 ft
Froude Number	0.841
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.9 in
Critical Depth	4.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

## Worksheet for DP-15

<b>Project Description</b>	
Friction Method	Manning
	Formula
Solve For	Normal Depth
<b>Input Data</b>	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	36.0 in
Discharge	21.37 cfs
<b>Results</b>	
Normal Depth	16.5 in
Flow Area	3.2 ft <sup>2</sup>
Wetted Perimeter	4.5 ft
Hydraulic Radius	8.5 in
Top Width	2.99 ft
Critical Depth	17.8 in
Percent Full	45.7 %
Critical Slope	0.003 ft/ft
Velocity	6.78 ft/s
Velocity Head	0.71 ft
Specific Energy	2.09 ft
Froude Number	1.164
Maximum Discharge	53.62 cfs
Discharge Full	49.85 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical
<b>GVF Input Data</b>	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
<b>GVF Output Data</b>	
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	45.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	16.5 in
Critical Depth	17.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.003 ft/ft

## Worksheet for DP-17

<b>Project Description</b>	
Friction Method	Manning
	Formula
Solve For	Normal Depth
<b>Input Data</b>	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	10.0 in
Discharge	0.49 cfs
<b>Results</b>	
Normal Depth	3.8 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.81 ft
Critical Depth	3.7 in
Percent Full	37.5 %
Critical Slope	0.004 ft/ft
Velocity	2.62 ft/s
Velocity Head	0.11 ft
Specific Energy	0.42 ft
Froude Number	0.960
Maximum Discharge	1.76 cfs
Discharge Full	1.64 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical
<b>GVF Input Data</b>	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
<b>GVF Output Data</b>	
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	3.8 in
Critical Depth	3.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

## Worksheet for DP-18

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	10.0 in
Discharge	1.04 cfs
Results	
Normal Depth	5.8 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.7 in
Top Width	0.82 ft
Critical Depth	5.4 in
Percent Full	57.9 %
Critical Slope	0.005 ft/ft
Velocity	3.18 ft/s
Velocity Head	0.16 ft
Specific Energy	0.64 ft
Froude Number	0.889
Maximum Discharge	1.76 cfs
Discharge Full	1.64 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.8 in
Critical Depth	5.4 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

## Worksheet for DP-19

<b>Project Description</b>	
Friction Method	Manning
	Formula
Solve For	Normal Depth
<b>Input Data</b>	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	10.0 in
Discharge	1.18 cfs
<b>Results</b>	
Normal Depth	6.3 in
Flow Area	0.4 ft <sup>2</sup>
Wetted Perimeter	1.5 ft
Hydraulic Radius	2.8 in
Top Width	0.81 ft
Critical Depth	5.8 in
Percent Full	62.9 %
Critical Slope	0.005 ft/ft
Velocity	3.27 ft/s
Velocity Head	0.17 ft
Specific Energy	0.69 ft
Froude Number	0.860
Maximum Discharge	1.76 cfs
Discharge Full	1.64 cfs
Slope Full	0.002 ft/ft
Flow Type	Subcritical
<b>GVF Input Data</b>	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
<b>GVF Output Data</b>	
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	6.3 in
Critical Depth	5.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

# Water Calculations

TABLE 1: ON-SITE WATER DEMANDS													
Planning Area	Max # of SFD/SFD Units	Residential People/Units	Total People	Non-Residential Acreage	Use	Demand (GPD/Acre)	Avg. Daily Demand (GPD)	Avg. Daily Demand (GPM)	Max. Daily Demand (GPD)	Max. Daily Demand (GPM)	Max. Hour Demand (GPD)	Max. Hour Demand (GPM)	Node(s)
PA-9							149434.00	103.77	418415.20	290.57	633573.00	439.98	J-1, J-2, J-3, J-8, J-132
	503	2.77	1394		Residential		140794.00	97.77	394223.20	273.77	633573.00	439.98	
				4.8	PA-39 & PA-69	1800	8640.00	6.00	24192.00	16.80	N/A	N/A	
PA-8							52612.00	36.54	147313.60	102.30	232704.00	161.60	J-4,J-5, J-6,J-7, J-100, J-130
	185	2.77	512		Residential		51712.00	35.91	144793.60	100.55	232704.00	161.60	
				0.5	PA-41	1800	900.00	0.63	2520.00	1.75	N/A	N/A	
AAC-1 <sup>1</sup>	134	2.77	372		MF Residential		37572.00	26.09	105201.60	73.06	169074.00	117.41	J-4, J-5, J-128, J-130
					Totals:		239618.00	166.40	670930.40	465.92	1035351.00	718.99	

1: AAC-1, part of Basin 7, is being zoned as AAC with this Master Plan Amendment. However, due to the uncertainty of the future use of this PA, calculations with this letter assume worst case scenario in order to provide flexibility for the developer in the future. Worst case scenario flows for AAC-1 were calculated using a high-density residential use of 20 du/ac

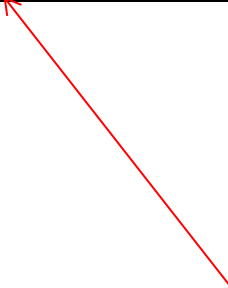
Green Valley Master Plan Amendment 3



## Average Daily

**Reservoir Table - Time: 0.00 hours**

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-5	5,719.80	166.5	5,719.80



Reservoir elevation referenced from  
R-5 within the Green Valley -  
Amendment 1 Master Utility Report  
(EDN #218184)

**Average Daily**  
**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Needed) (gpm)
J-1	5,474.30	<Collection: 1 item>	20.8	5,719.66	106	2,500.0
J-8	5,462.36	<Collection: 1 item>	20.8	5,719.67	111	2,500.0
J-2	5,470.21	<Collection: 1 item>	20.8	5,719.66	108	2,500.0
J-3	5,468.11	<Collection: 1 item>	20.8	5,719.67	109	2,500.0
J-4	5,455.19	<Collection: 2 items>	12.6	5,719.75	114	2,500.0
J-128	5,467.79	<Collection: 1 item>	6.5	5,719.74	109	2,500.0
J-130	5,467.31	<Collection: 2 items>	12.6	5,719.73	109	2,500.0
J-100	5,459.73	<Collection: 1 item>	6.1	5,719.72	112	2,500.0
J-7	5,447.37	<Collection: 1 item>	6.1	5,719.71	118	2,500.0
J-5	5,464.18	<Collection: 2 items>	12.6	5,719.72	111	2,500.0
J-132	5,441.51	<Collection: 1 item>	20.8	5,719.71	120	2,500.0
J-6	5,461.42	<Collection: 1 item>	6.1	5,719.72	112	2,500.0
J-101	5,445.16	<Collection: 0 items>	0.0	5,719.71	119	2,500.0

## Average Daily

### Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1	835	J-1	J-8	8.0	PVC	150.0	-20.4	0.13	0.010
P-2	1,081	J-8	J-132	8.0	PVC	150.0	-39.1	0.25	0.035
P-4	816	J-7	J-100	12.0	PVC	150.0	-52.9	0.15	0.008
P-5	396	J-100	J-130	12.0	PVC	150.0	-66.9	0.19	0.013
P-6	591	J-130	J-128	12.0	PVC	150.0	-97.4	0.28	0.026
P-7	669	J-128	J-4	16.0	PVC	150.0	-103.9	0.17	0.007
P-10	566	J-3	J-2	8.0	PVC	150.0	21.1	0.13	0.011
P-11	1,424	J-2	J-1	8.0	PVC	150.0	0.4	0.00	0.000
P-12	2,223	J-8	J-3	8.0	PVC	150.0	-2.1	0.01	0.000
P-13	1,036	J-3	J-5	8.0	PVC	150.0	-44.0	0.28	0.043
P-14	660	J-5	J-130	8.0	PVC	150.0	-17.9	0.11	0.008
P-17	592	J-5	J-4	8.0	PVC	150.0	-49.9	0.32	0.054
P-18	2,655	J-4	R-5	16.0	PVC	150.0	-166.5	0.27	0.017
P-15(1)	724	J-5	J-6	8.0	PVC	150.0	11.2	0.07	0.003
P-15(2)	332	J-6	J-100	8.0	PVC	150.0	-7.9	0.05	0.001
P-19	1,035	J-7	J-6	8.0	PVC	150.0	-13.1	0.08	0.005
P-3(1)	531	J-132	J-101	12.0	PVC	150.0	-59.8	0.17	0.011
P-3(2)	323	J-101	J-7	12.0	PVC	150.0	-59.8	0.17	0.011

**Max Daily**  
**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Needed) (gpm)
J-1	5,474.30	<Collection: 1 item>	58.1	5,717.76	105	2,500.0
J-8	5,462.36	<Collection: 1 item>	58.1	5,717.81	111	2,500.0
J-2	5,470.21	<Collection: 1 item>	58.1	5,717.76	107	2,500.0
J-3	5,468.11	<Collection: 1 item>	58.1	5,717.81	108	2,500.0
J-4	5,455.19	<Collection: 2 items>	28.6	5,718.54	114	2,500.0
J-128	5,467.79	<Collection: 1 item>	18.3	5,718.29	108	2,500.0
J-130	5,467.31	<Collection: 2 items>	34.6	5,718.22	109	2,500.0
J-100	5,459.73	<Collection: 1 item>	16.4	5,718.17	112	2,500.0
J-7	5,447.37	<Collection: 1 item>	16.4	5,718.13	117	2,500.0
J-5	5,464.18	<Collection: 2 items>	45.0	5,718.20	110	2,500.0
J-132	5,441.51	<Collection: 1 item>	58.1	5,718.09	120	2,500.0
J-6	5,461.42	<Collection: 1 item>	16.4	5,718.17	111	2,500.0
J-101	5,445.16	<Collection: 0 items>	0.0	5,718.12	118	2,500.0

## Max Daily

**Pipe Table - Time: 0.00 hours**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1	835	J-1	J-8	8.0	PVC	150.0	-56.9	0.36	0.069
P-2	1,081	J-8	J-132	8.0	PVC	150.0	-107.9	0.69	0.227
P-4	816	J-7	J-100	12.0	PVC	150.0	-144.4	0.41	0.054
P-5	396	J-100	J-130	12.0	PVC	150.0	-171.6	0.49	0.075
P-6	591	J-130	J-128	12.0	PVC	150.0	-239.6	0.68	0.138
P-7	669	J-128	J-4	16.0	PVC	150.0	-257.9	0.73	0.158
P-10	566	J-3	J-2	8.0	PVC	150.0	59.4	0.38	0.075
P-11	1,424	J-2	J-1	8.0	PVC	150.0	1.3	0.01	0.000
P-12	2,223	J-8	J-3	8.0	PVC	150.0	-7.0	0.04	0.002
P-13	1,036	J-3	J-5	8.0	PVC	150.0	-124.6	0.79	0.296
P-14	660	J-5	J-130	8.0	PVC	150.0	-33.4	0.21	0.026
P-17	592	J-5	J-4	8.0	PVC	150.0	-179.7	1.15	0.583
P-18	2,655	J-4	R-5	16.0	PVC	150.0	-466.2	1.32	0.473
P-15(1)	724	J-5	J-6	8.0	PVC	150.0	43.6	0.28	0.043
P-15(2)	332	J-6	J-100	8.0	PVC	150.0	-10.8	0.07	0.003
P-19	1,035	J-7	J-6	8.0	PVC	150.0	-38.0	0.24	0.033
P-3(1)	531	J-132	J-101	12.0	PVC	150.0	-166.0	0.47	0.070
P-3(2)	323	J-101	J-7	12.0	PVC	150.0	-166.0	0.47	0.069

**Max Hour**  
**Junction Table - Time: 0.00 hours**

Label	Elevation (ft)	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Needed) (gpm)
J-1	5,474.30	<Collection: 1 item>	88.0	5,715.28	104	2,500.0
J-8	5,462.36	<Collection: 1 item>	88.0	5,715.39	109	2,500.0
J-2	5,470.21	<Collection: 1 item>	88.0	5,715.28	106	2,500.0
J-3	5,468.11	<Collection: 1 item>	88.0	5,715.40	107	2,500.0
J-4	5,455.19	<Collection: 2 items>	45.9	5,716.99	113	2,500.0
J-128	5,467.79	<Collection: 1 item>	29.4	5,716.43	108	2,500.0
J-130	5,467.31	<Collection: 2 items>	55.1	5,716.28	108	2,500.0
J-100	5,459.73	<Collection: 1 item>	25.8	5,716.16	111	2,500.0
J-7	5,447.37	<Collection: 1 item>	25.8	5,716.09	116	2,500.0
J-5	5,464.18	<Collection: 2 items>	71.7	5,716.23	109	2,500.0
J-132	5,441.51	<Collection: 1 item>	88.0	5,716.00	119	2,500.0
J-6	5,461.42	<Collection: 1 item>	25.8	5,716.16	110	2,500.0
J-101	5,445.16	<Collection: 0 items>	0.0	5,716.05	117	2,500.0

## Max Hour

**Pipe Table - Time: 0.00 hours**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1	835	J-1	J-8	8.0	PVC	150.0	-86.1	0.55	0.150
P-2	1,081	J-8	J-132	8.0	PVC	150.0	-163.3	1.04	0.488
P-4	816	J-7	J-100	12.0	PVC	150.0	-219.3	0.62	0.117
P-5	396	J-100	J-130	12.0	PVC	150.0	-261.8	0.74	0.162
P-6	591	J-130	J-128	12.0	PVC	150.0	-367.8	1.04	0.305
P-7	669	J-128	J-4	16.0	PVC	150.0	-397.2	1.13	0.352
P-10	566	J-3	J-2	8.0	PVC	150.0	89.9	0.57	0.162
P-11	1,424	J-2	J-1	8.0	PVC	150.0	1.9	0.01	0.000
P-12	2,223	J-8	J-3	8.0	PVC	150.0	-10.7	0.07	0.003
P-13	1,036	J-3	J-5	8.0	PVC	150.0	-188.7	1.20	0.639
P-14	660	J-5	J-130	8.0	PVC	150.0	-50.8	0.32	0.056
P-17	592	J-5	J-4	8.0	PVC	150.0	-276.3	1.76	1.295
P-18	2,655	J-4	R-5	16.0	PVC	150.0	-719.4	2.04	1.057
P-15(1)	724	J-5	J-6	8.0	PVC	150.0	66.8	0.43	0.093
P-15(2)	332	J-6	J-100	8.0	PVC	150.0	-16.8	0.11	0.008
P-19	1,035	J-7	J-6	8.0	PVC	150.0	-57.7	0.37	0.071
P-3(1)	531	J-132	J-101	12.0	PVC	150.0	-251.3	0.71	0.152
P-3(2)	323	J-101	J-7	12.0	PVC	150.0	-251.3	0.71	0.150

## Fire Flow

**Junction Table - Time: 0.00 hours**

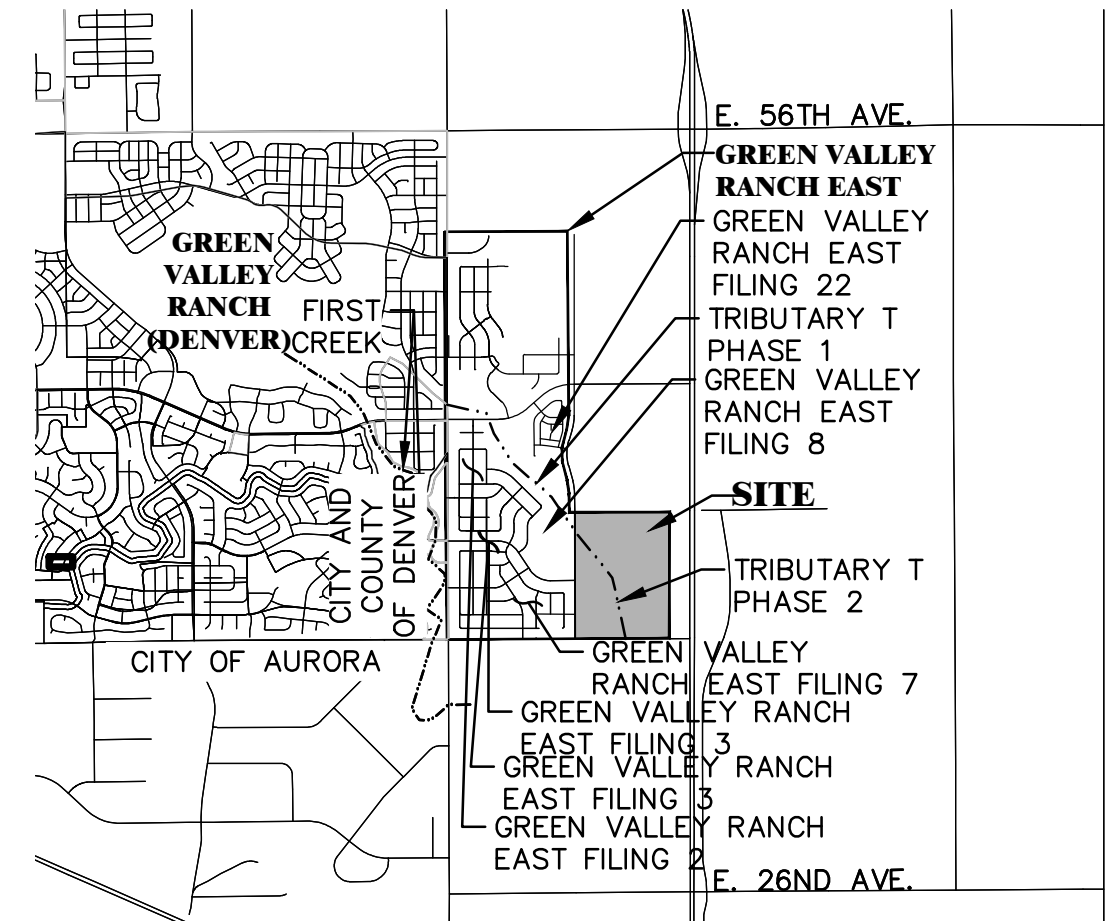
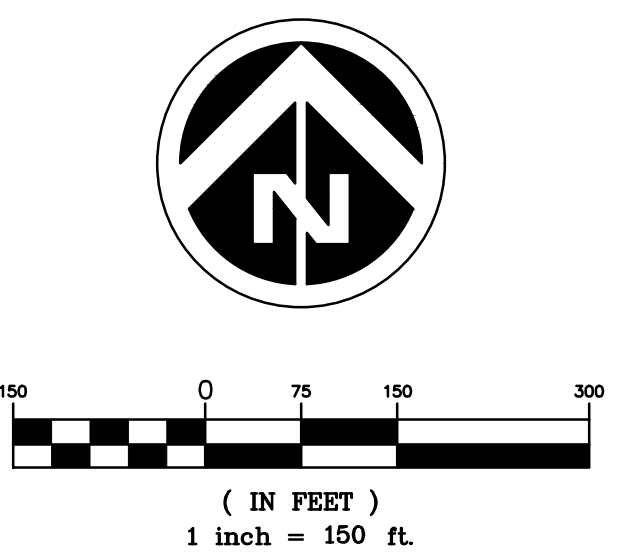
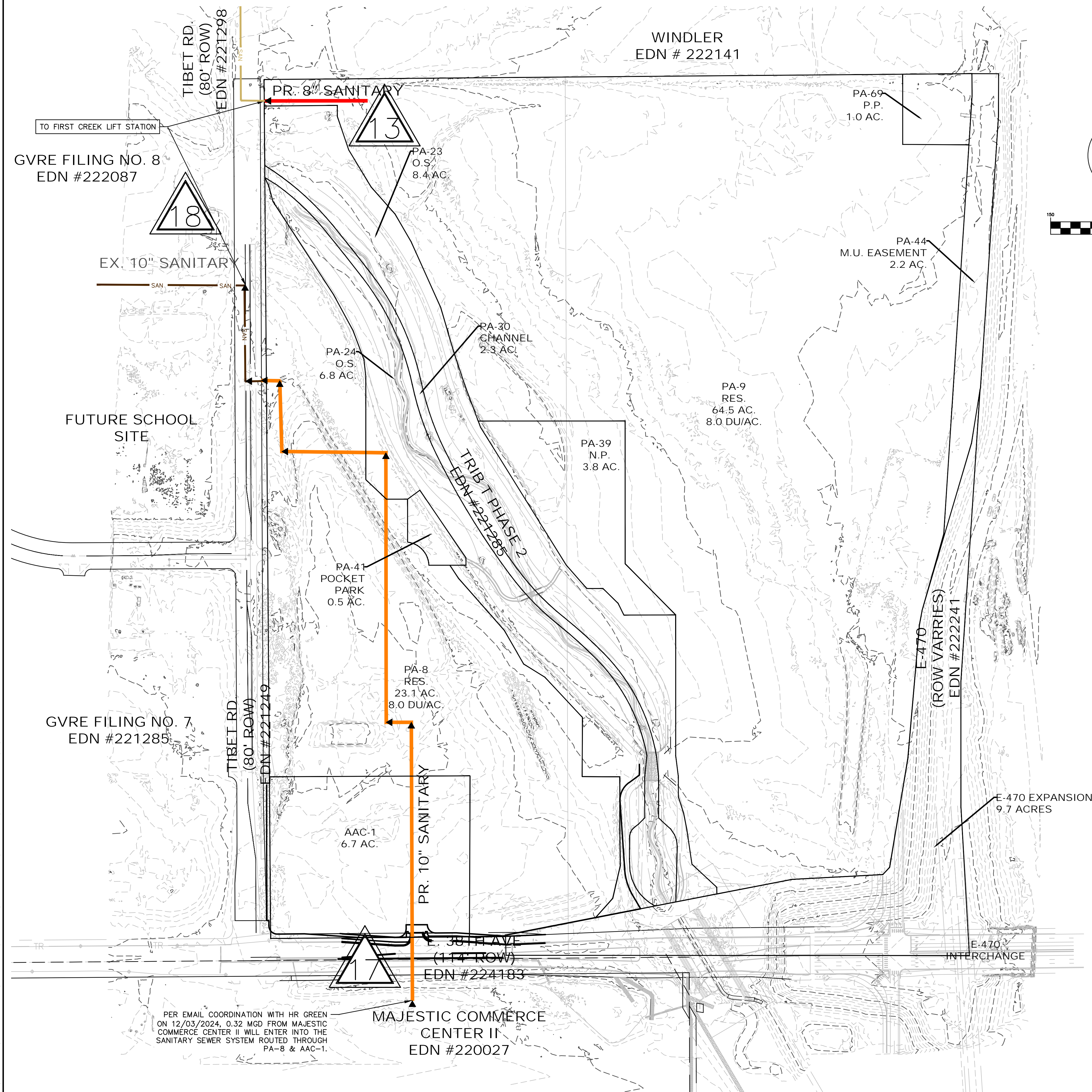
Label	Elevation (ft)	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Needed) (gpm)
J-1	5,474.30	<Collection: 1 item>	58.1	5,717.76	105	2,500.0
J-8	5,462.36	<Collection: 1 item>	58.1	5,717.81	111	2,500.0
J-2	5,470.21	<Collection: 1 item>	58.1	5,717.76	107	2,500.0
J-3	5,468.11	<Collection: 1 item>	58.1	5,717.81	108	2,500.0
J-4	5,455.19	<Collection: 2 items>	28.6	5,718.54	114	2,500.0
J-128	5,467.79	<Collection: 1 item>	18.3	5,718.29	108	2,500.0
J-130	5,467.31	<Collection: 2 items>	34.6	5,718.22	109	2,500.0
J-100	5,459.73	<Collection: 1 item>	16.4	5,718.17	112	2,500.0
J-7	5,447.37	<Collection: 1 item>	16.4	5,718.13	117	2,500.0
J-5	5,464.18	<Collection: 2 items>	45.0	5,718.20	110	2,500.0
J-132	5,441.51	<Collection: 1 item>	58.1	5,718.09	120	2,500.0
J-6	5,461.42	<Collection: 1 item>	16.4	5,718.17	111	2,500.0
J-101	5,445.16	<Collection: 0 items>	0.0	5,718.12	118	2,500.0

## Fire Flow

**Pipe Table - Time: 0.00 hours**

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
P-1	835	J-1	J-8	8.0	PVC	150.0	-56.9	0.36	0.069
P-2	1,081	J-8	J-132	8.0	PVC	150.0	-107.9	0.69	0.227
P-4	816	J-7	J-100	12.0	PVC	150.0	-144.4	0.41	0.054
P-5	396	J-100	J-130	12.0	PVC	150.0	-171.6	0.49	0.075
P-6	591	J-130	J-128	12.0	PVC	150.0	-239.6	0.68	0.138
P-7	669	J-128	J-4	16.0	PVC	150.0	-257.9	0.73	0.158
P-10	566	J-3	J-2	8.0	PVC	150.0	59.4	0.38	0.075
P-11	1,424	J-2	J-1	8.0	PVC	150.0	1.3	0.01	0.000
P-12	2,223	J-8	J-3	8.0	PVC	150.0	-7.0	0.04	0.002
P-13	1,036	J-3	J-5	8.0	PVC	150.0	-124.6	0.79	0.296
P-14	660	J-5	J-130	8.0	PVC	150.0	-33.4	0.21	0.026
P-17	592	J-5	J-4	8.0	PVC	150.0	-179.7	1.15	0.583
P-18	2,655	J-4	R-5	16.0	PVC	150.0	-466.2	1.32	0.473
P-15(1)	724	J-5	J-6	8.0	PVC	150.0	43.6	0.28	0.043
P-15(2)	332	J-6	J-100	8.0	PVC	150.0	-10.8	0.07	0.003
P-19	1,035	J-7	J-6	8.0	PVC	150.0	-38.0	0.24	0.033
P-3(1)	531	J-132	J-101	12.0	PVC	150.0	-166.0	0.47	0.070
P-3(2)	323	J-101	J-7	12.0	PVC	150.0	-166.0	0.47	0.069

GREEN VALLEY MASTER PLAN AMENDMENT 3



VICINITY MAP  
SCALE: 1"=4000'

**LEGEND**

8" SANITARY —

10" SANITARY —

EX. 8" SANITARY — SAN

EX. 10" SANITARY — SAN

SANITARY DESIGN POINT

**Dewberry**  
Dewberry Engineers Inc.  
2011 Cherry Street, Suite 206  
Louisville, CO 80027  
720.975.0177  
Contact: Kenneth S. Cecil, P.E., CFM  
Email: kcecil@dewberry.com

GREEN VALLEY MASTER PLAN AMENDMENT 3  
MASTER UTILITY STUDY  
SEWER MAIN MODELING EXHIBIT

Client Information  
OAKWOOD HOMES  
18655 GREEN VALLEY  
RANCH BLVD  
DENVER, CO 80249  
Tel: 303-486-8734  
Contact: DAVID CARRO

DOCUMENT AMENDMENTS	
No.	Description
1	2/14/2025 FIRST SUBMITTAL

PRELIMINARY  
NOT FOR  
CONSTRUCTION

Approved For One Year From This Date

City Engineer \_\_\_\_\_ Date \_\_\_\_\_

Water Department \_\_\_\_\_ Date \_\_\_\_\_

Parks, Recreation and Open Space \_\_\_\_\_ Date \_\_\_\_\_

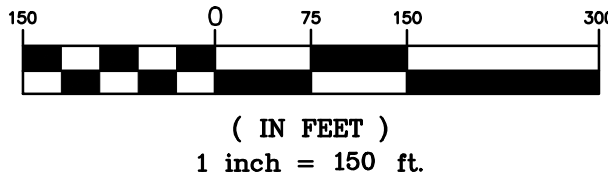
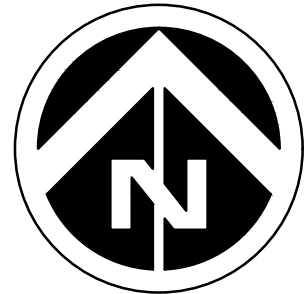
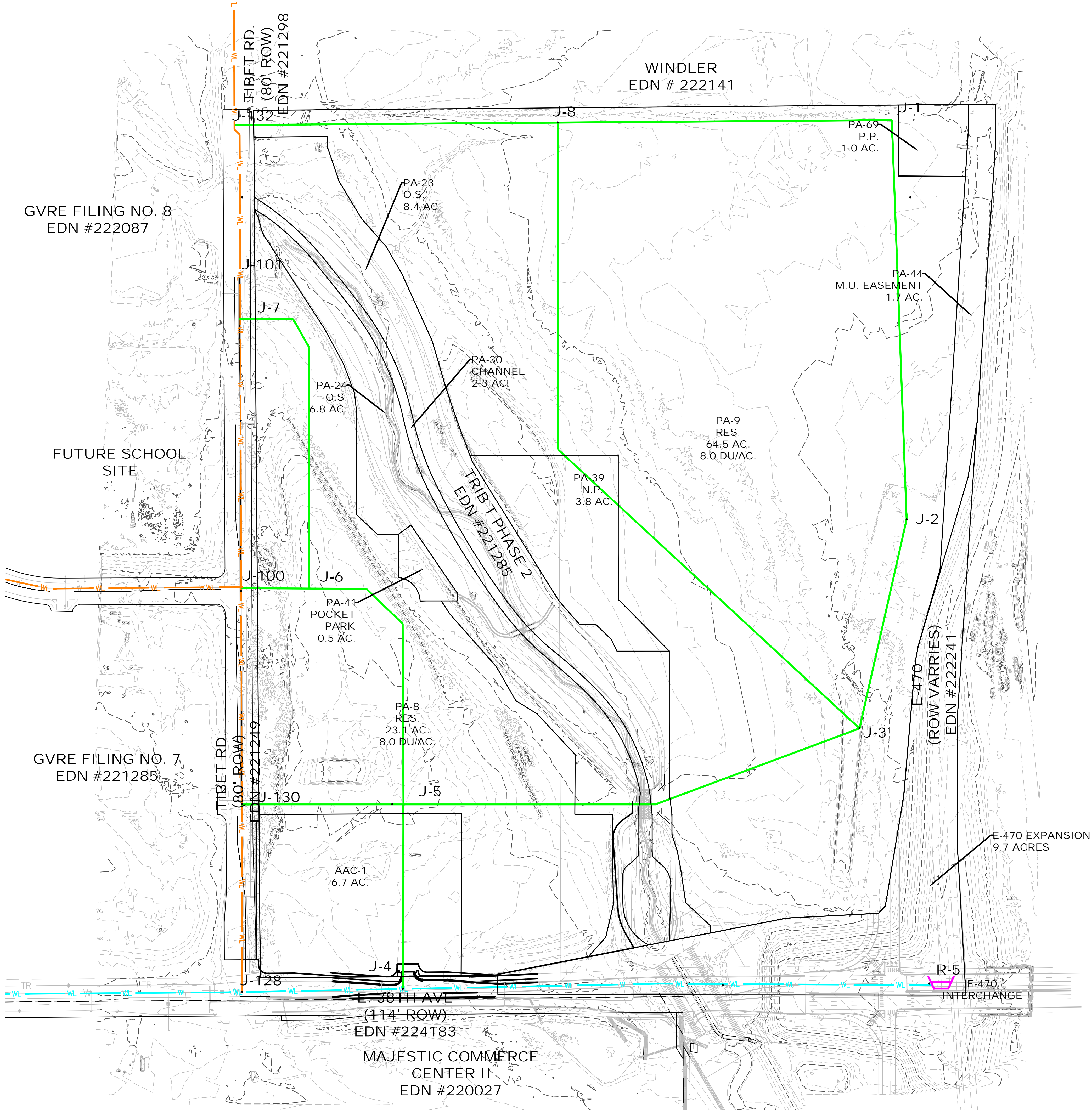
Fire Department \_\_\_\_\_ Date \_\_\_\_\_

Traffic Manager \_\_\_\_\_ Date \_\_\_\_\_

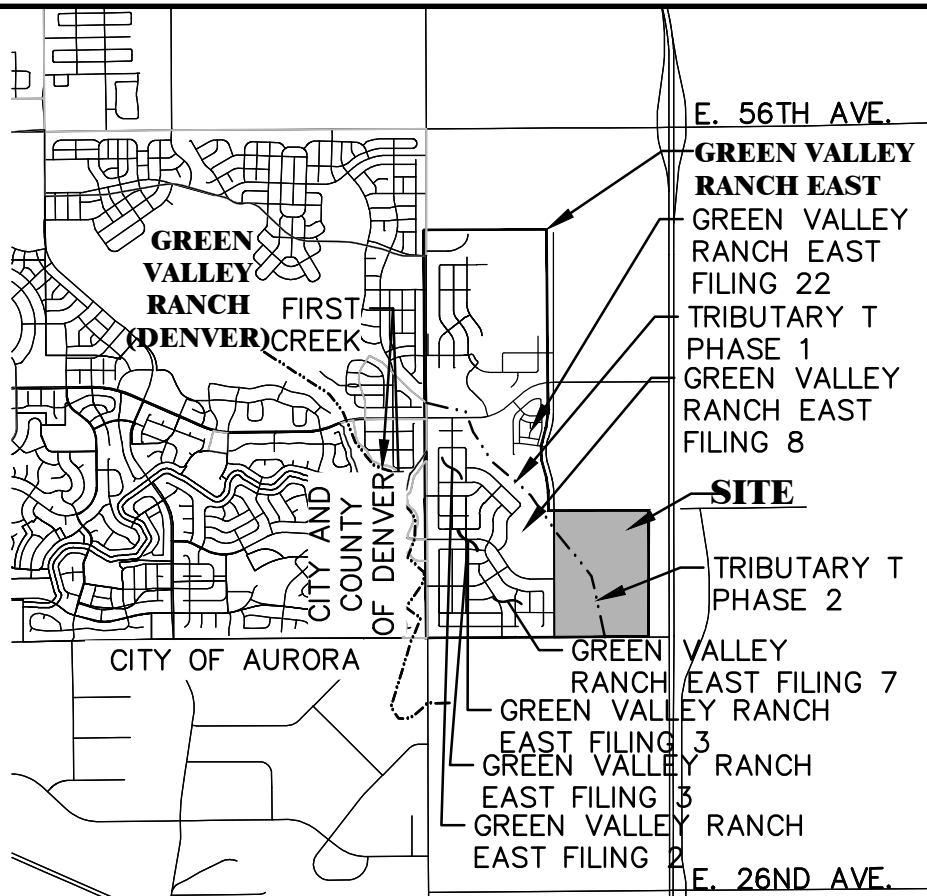
Project Number: 50145755  
Designed By: Drawn By: CJR  
Checked By: JS  
Sheet Number: \_\_\_\_\_

J:\DEWBERRY\OAKWOOD HOMES\310 PARCEL PLAN SETS\PA8-9 MASTER\PA8-9 MUR\SAN EXHIBIT.DWG 5/19/2025 4:52 PM ROME CONNER

GREEN VALLEY MASTER PLAN AMENDMENT 3



WATER MAIN LEGEND	
8-INCH PIPE	
12-INCH PIPE	
16-INCH PIPE	
24-INCH PIPE	
MODEL RESERVOIR	
EX. 8-INCH PIPE	
EX. 12-INCH PIPE	
EX. 16-INCH PIPE	



VICINITY MAP  
SCALE: 1"=4000'

Approved For One Year From This Date	
City Engineer	_____
Water Department	_____ Date
Parks, Recreation and Open Space	_____ Date
Fire Department	_____ Date
Traffic Manager	_____ Date

**Dewberry**  
Dewberry Engineers Inc.  
2011 Cherry Street, Suite 206  
Louisville, CO 80027  
Contact: Kenneth S. Cecil, P.E., CFM  
Email: kcecil@dewberry.com

GREEN VALLEY MASTER PLAN AMENDMENT 3  
MASTER UTILITY STUDY  
WATER MAIN MODELING EXHIBIT

Client Information  
OAKWOOD HOMES  
18655 GREEN VALLEY RANCH BLVD  
DENVER, CO 80249  
Tel: 303-486-8734  
Contact: DAVID CARRO

No.	Date	Description
1	2/14/2025	FIRST SUBMITTAL

DOCUMENT AMENDMENTS

PRELIMINARY  
NOT FOR  
CONSTRUCTION

Project Number:  
**50145755**

Designed By:  
**CJR**

Checked By:  
**JS**

Sheet Number: