

October 24, 2024

City of Aurora, Public Works  
15151 E. Alameda Parkway  
Aurora, CO 80012

Re: Windler Master Utility Conformance Letter

To whom it may concern,

This letter serves as a Master Utility update for the Windler Planning Area changes in PA 1, 3, 14, 15, and 16. Revised demand table and supporting calculations are included within this letter.

Based on the calculated water demand projects, water line identified as PW65 has increased from 8" to 12" to meet revised code change from Aurora Water to increase fire demand in MU-A zoning from 3,500 gpm to 4,000 gpm. The original layout had an average day demand of 470 GPM and a maximum day demand of 1,316 GPM. The proposed layout has an average day demand of 502 GPM and a maximum day demand of 1,408 GPM. This increase also does not pose any issues with low pressures anywhere on site. Pressure tables have been included to support the minor demand increases. The updated sewer demands fall into the same category. The original layout had an average daily flow of 492,947 GPD and the proposed layout has a daily flow of 532,125 GPD. This demand does not require any increase in pipe sizes or changes to major routing of sanitary sewer. These calculations have been included in this report

The portion of the site west of E-470 is not included in these calculations as these areas are largely unchanged from previous versions of the Land use map. Also the portion of this site west of E-470 does not impact the areas of concern east of E-470. Additional letters or amendments will be prepared for those areas if demands change from the approved study.

Calculations have been included showing that although demand has increased slightly, no changes to existing or proposed utilities needs to be made.

Please contact me if you have any questions.

Sincerely,

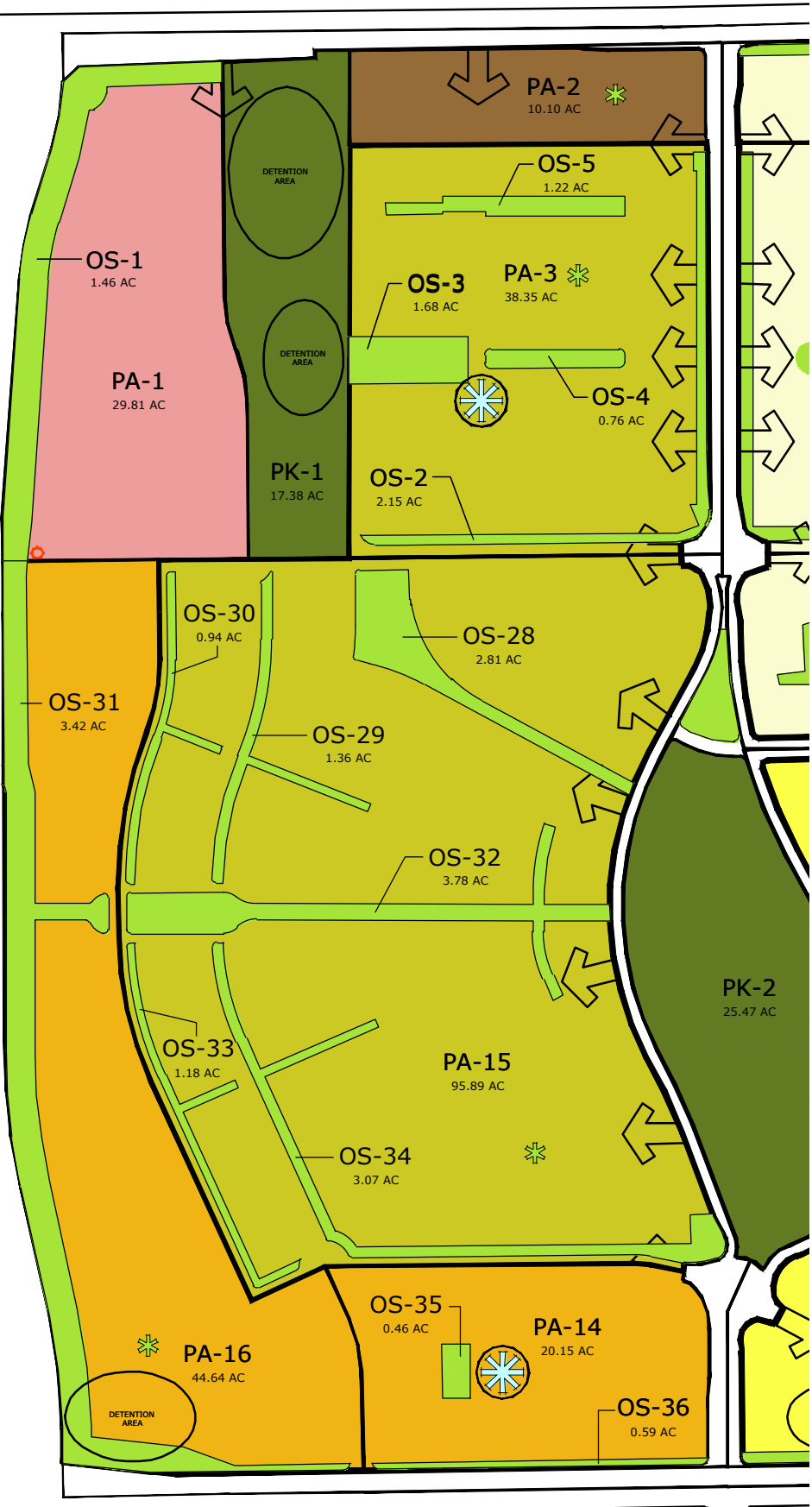
WESTWOOD PROFESSIONAL SERVICES

Tom Odle, PE  
Senior Project Manager

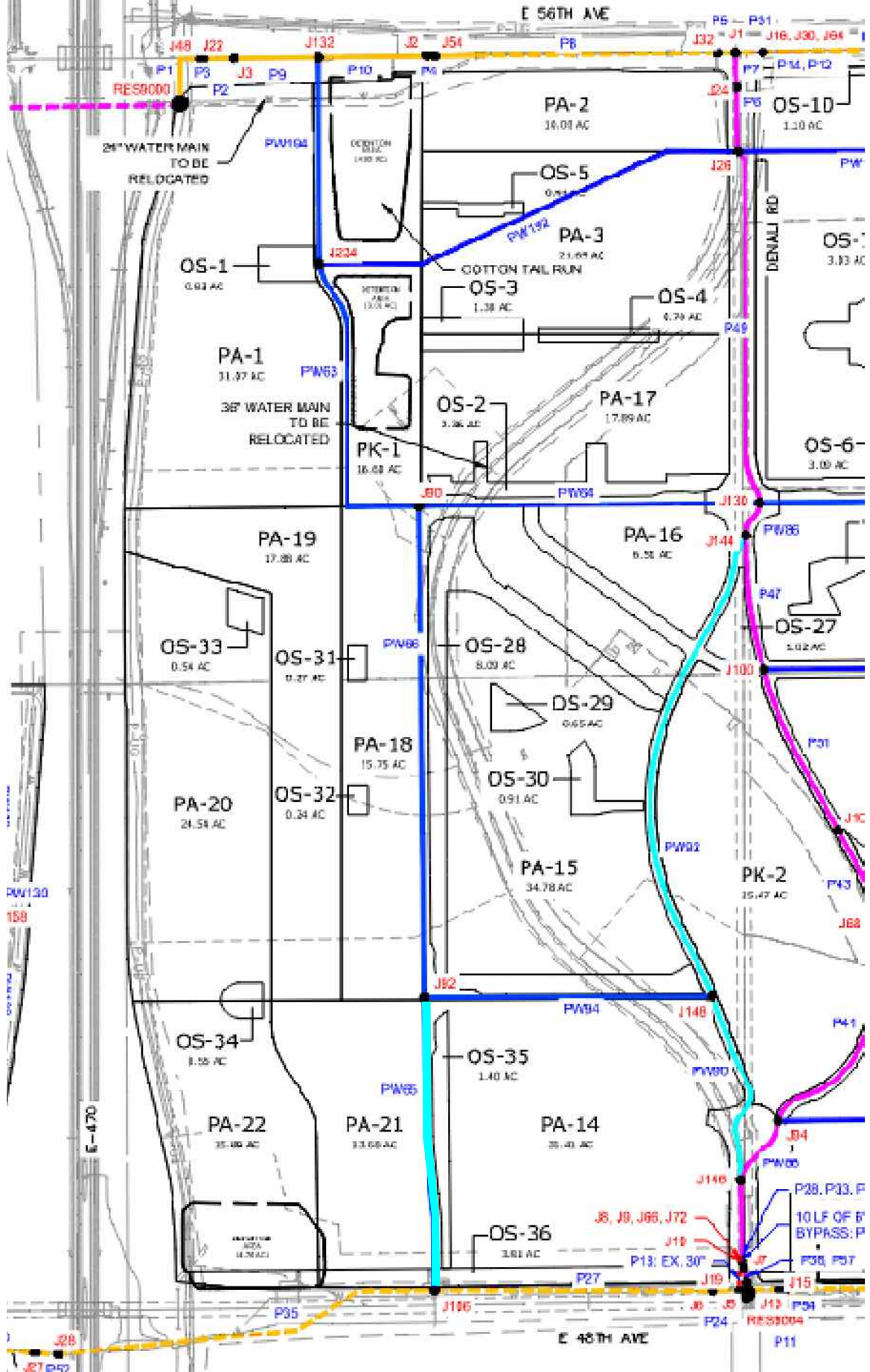




REVISED PLANNING AREAS



ORIGINAL PLANNING AREAS

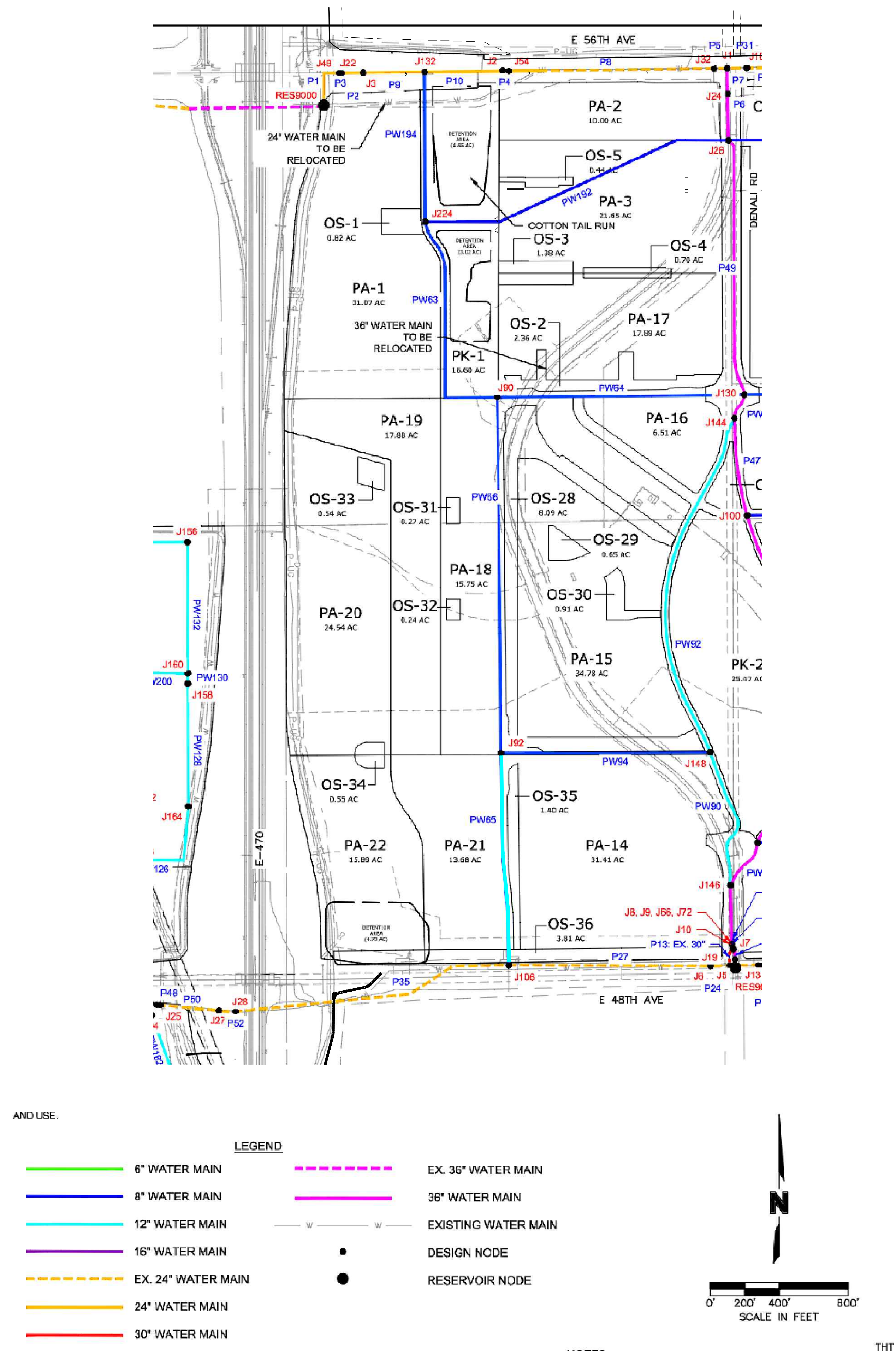



DATE: 10-24-2024

**Westwood**

Westwoodps.com  
Westwood Professional Services, Inc.  
10333 E DRY CREEK RD.  
SUITE 240  
ENGLEWOOD, CO 80112  
TEL: 720.482.9526





SHEET NUMBER  <b>1</b>	DRAWN BY: JCN	SCALE: AS SHOWN	<b>WINDLER</b>  <b>CONSTRUCTION DOCUMENTS</b>  OVERALL EXHIBIT	<b>WINDLER PUBLIC IMPROVEMENT AUTHORITY (WPIA)</b> 9155 E. NICHOLS AVENUE, SUITE 380 CENTENNIAL, CO 80112 CONTACT: CHRIS FELLOWS	 10333 E DRY CREEK RD. ENGLEWOOD, CO 80112 Westwoodps.com Westwood Professional Services, Inc.						
	CHECKED BY: STF	FILE NO:									
	DATE: 05-21-24										
						No.	Revisions	Date	Init.	Date	Appr.



Water Distribution Demand Criteria								Fire Flow		
Land Use	Avg Day (gdp/acres)	Max Day (gpd/acres)	Peak Hour (gpd/acres)	Residential Criteria	Peaking Factors			Classification	Demand (gpm)	Time (hrs)
				People/Unit	2.77	Max day	2.8	Residential	1500	2
	Commercial	1500	4200	6750	Avg day / Capita (gpd)	101	Max hour	4.5	Commercial/Multifamily	2500
	Industrial (school	1200	3360	5400				Industrial	4000	3
	Parks & Greenbel	1800	5040	N/A				MU-A Zoning	4000	3

Hotel	98	gpd/Room								
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Windler - Water Demand Projections (UPDATED LAYOUT)

Map Area Code	Land Use	Nodes	Total Acres	Proposed Units	Avg Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpd)	Max Day Demand (gpm)	Peak Hour Demand (gpd)	Peak Hour Demand (gpm)	Required Fire Flow (gpm)	Max Day Demand + Fire Flow (gpm)
PA-1	MIXED COMM		26.81	N/A	40,215	27.93	112,602	78	180,968	126	4,000	4,078
PA-1	HOTEL		3	150	14,700	10.21	41,160	29	66,150	46	4,000	4,029
PA-2	MF		10.1	303	84,770	58.87	237,357	165	381,466	265	4,000	4,165
PA-3	SFD/SFA FLEX		36.35	380	106,313	73.83	297,675	207	478,407	332	4,000	4,207
PA-3	COMMERCIAL		2	N/A	3,000	2.08	8,400	6	13,500	9	4,000	4,006
PA-14	SFD/SFA		2.15	86	24,060	16.71	67,369	47	108,271	75	4,000	4,047
PA-14	MF		8	320	89,526	62.17	250,674	174	402,869	280	4,000	4,174
PA-14	COMMERCIAL		10	N/A	15,000	10.42	42,000	29	67,500	47	4,000	4,029
PA-15	SFD/SFA FLEX		92.89	697	195,000	135.42	545,999	379	877,499	609	4,000	4,379
PA-15	MF		3	90	25,179	17.49	70,502	49	113,307	79	4,000	4,049
PA-16	MIXED COMM		19.75	N/A	29,625	20.57	82,950	58	133,313	93	4,000	4,058
PA-16	MF		10	345	96,521	67.03	270,258	188	434,343	302	4,000	4,188
PA-16	HOTEL		9	350	34,300	23.82	96,040	67	154,350	107	4,000	4,067
Total				2,721	723,909	502.71	2,026,946	1,408	3,257,591	2,262		49,408



Windler-Water Demand Projections (ORIGINAL LAYOUT)

Map Area Code	Land Use	Nodes	Total Acres	Proposed Units	Avg Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpd)	Max Day Demand (gpm)	Peak Hour Demand (gpd)	Peak Hour Demand (gpm)	Required Fire Flow (gpm)	Max Day Demand + Fire Flow (gpm)
PA-1	MIXED COMM		31.07	N/A	46,605	32	130,494	91	209,723	146	2,500	2,591
PA-2	MF		23.7	711	198,916	138	556,966	387	895,124	622	1,500	1,887
PA-3	SFA		6.95	76	21,388	15	59,888	42	96,248	67	1,500	1,542
PA-3	COMMERCIAL		1.00	N/A	1,500	1	4,200	3	6,750	5	2,500	2,503
PA-14	SFD/SFA		17.48	160	44,870	31	125,635	87	201,913	140	1,500	1,587
PA-14	MF		3.59	108	30,131	21	84,367	59	135,591	94	1,500	1,559
PA-14	COMMERCIAL		10.00	N/A	15,000	10	42,000	29	67,500	47	2,500	2,529
PA-15	SFD/SFA FLEX		34.78	313	87,574	61	245,206	170	394,081	274	1,500	1,670
PA-16	SFD/SFA FLEX		6.51	59	16,392	11	45,897	32	73,763	51	1,500	1,532
PA-17	SFD/SFA FLEX		16.89	152	42,528	30	119,078	83	191,376	133	1,500	1,583
PA-17	COMMERCIAL		1.00	N/A	1,500	1	4,200	3	6,750	5	2,500	2,503
PA-18	SFD/SFA/ FLEX		15.75	142	39,657	28	111,041	77	178,458	124	1,500	1,577
PA-20	MIXED COMM		24.54	N/A	36,810	26	103,068	72	165,645	115	2,500	2,572
PA-21	MIXED COMM		4.10	N/A	6,156	4	17,237	12	27,702	19	2,500	2,512
PA-21	MF		9.58	287	80,372	56	225,043	156	361,675	251	1,500	1,656
PA-22	MIXED COMM		4.77	N/A	5,151	5	20,021	14	32,177	22	2,500	2,514
Total				2,008	674,550	470	1,894,341	1,316	3,044,476	2,114		32,316



## **WINDLER DEVELOPMENT**

**Active Scenario: STATIC**

**Reservoir Table - Time: 0.00 hours**

Label	Flow (Out net) (gpm)	Elevation (ft)
RES9000	0.00	5,710.00
RES9004	0.00	5,710.00
RES9008	0.00	5,710.00



## WINDLER DEVELOPMENT

### Active Scenario: STATIC

#### Pipe Table - Time: 0.00 hours

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
P-1	260	24.0	150.0	0.00	0.00
P-3	273	24.0	150.0	0.00	0.00
P-4	144	24.0	150.0	0.00	0.00
P-5	126	24.0	150.0	0.00	0.00
P-6	289	36.0	150.0	0.01	0.00
P-7	197	36.0	150.0	0.00	0.00
P-8	738	24.0	150.0	0.00	0.00
P-9	435	24.0	150.0	0.00	0.00
P-11	135	24.0	150.0	0.00	0.00
P-15	181	24.0	150.0	0.00	0.00
P-16	1,179	24.0	150.0	0.00	0.00
P-17	1,291	24.0	150.0	0.00	0.00
P-23	1,276	24.0	150.0	0.00	0.00
P-24	203	24.0	150.0	0.00	0.00
P-27	1,123	24.0	150.0	0.00	0.00
P-30	275	24.0	150.0	0.00	0.00
P-31	99	24.0	150.0	0.00	0.00
P-34	843	24.0	150.0	0.00	0.00
P-37	1,143	24.0	150.0	0.00	0.00
P-41	932	36.0	150.0	0.00	0.00
P-43	325	36.0	150.0	0.01	0.00
P-47	488	36.0	150.0	0.00	0.00
P-47	1,349	8.0	150.0	0.00	0.00
P-49	1,491	36.0	150.0	0.00	0.00
P-50	1,959	12.0	150.0	0.00	0.00
P-51	929	36.0	150.0	0.00	0.00
P-51	359	24.0	150.0	0.00	0.00
P-53	479	36.0	150.0	0.00	0.00
P-58	2,080	24.0	150.0	0.00	0.00
P-59	2,107	24.0	150.0	0.00	0.00
PW54	1,295	8.0	150.0	0.00	0.00
PW55	1,255	8.0	150.0	0.00	0.00
PW57	1,282	8.0	150.0	0.00	0.00
PW58	1,218	8.0	150.0	0.00	0.00
PW59	538	8.0	150.0	0.00	0.00
PW61	710	8.0	150.0	0.00	0.00
PW63	1,359	8.0	150.0	0.00	0.00
PW64	1,380	8.0	150.0	0.00	0.00
PW65	1,290	12.0	150.0	0.00	0.00
PW66	2,085	8.0	150.0	0.00	0.00
PW78	1,392	8.0	150.0	0.00	0.00
PW82	1,393	8.0	150.0	0.00	0.00
PW86	225	36.0	150.0	0.00	0.00
PW88	316	36.0	150.0	0.01	0.00
PW90	860	12.0	150.0	0.00	0.00



## **WINDLER DEVELOPMENT**

**Active Scenario: STATIC**

**Pipe Table - Time: 0.00 hours**

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
PW94	1,214	8.0	150.0	0.00	0.00
PW190	1,369	8.0	150.0	0.00	0.00
PW194	949	8.0	150.0	0.00	0.00
PW196	757	8.0	150.0	0.00	0.00
PW198	724	8.0	150.0	0.00	0.00



## WINDLER DEVELOPMENT

### Active Scenario: STATIC

#### Junction Table - Time: 0.00 hours

Label	Demand (gpm)	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)
J-4	0.00	5,430.00	5,710.00	121.14
J-110	0.00	5,439.92	5,710.00	116.85
J-2	0.00	5,445.00	5,710.00	114.65
J-54	0.00	5,445.00	5,710.00	114.65
J-132	0.00	5,447.85	5,710.00	113.42
J-48	0.00	5,450.00	5,710.00	112.49
J-22	0.00	5,450.00	5,710.00	112.49
J-32	0.00	5,450.00	5,710.00	112.49
J-1	0.00	5,450.00	5,710.00	112.49
J-16	0.00	5,450.00	5,710.00	112.49
J-224	0.00	5,455.00	5,710.00	110.33
J-26	0.00	5,460.00	5,710.00	108.16
J-24	0.00	5,460.00	5,710.00	108.16
J-220	0.00	5,468.69	5,710.00	104.40
J-142	0.00	5,470.00	5,710.00	103.84
J-128	0.00	5,480.00	5,710.00	99.51
J-130	0.00	5,485.00	5,710.00	97.35
J-90	0.00	5,490.00	5,710.00	95.18
J-144	0.00	5,492.49	5,710.00	94.11
J-106	0.00	5,495.45	5,710.00	92.83
J-100	0.00	5,505.00	5,710.00	88.69
J-15	0.00	5,505.50	5,710.00	88.48
J-19	0.00	5,510.00	5,710.00	86.53
J-92	0.00	5,510.00	5,710.00	86.53
J-146	0.00	5,515.28	5,710.00	84.25
J-17	0.00	5,518.50	5,710.00	82.85
J-11	0.00	5,518.50	5,710.00	82.85
J-148	0.00	5,520.00	5,710.00	82.20
J-102	0.00	5,525.00	5,710.00	80.04
J-68	0.00	5,525.00	5,710.00	80.04
J-94	0.00	5,525.00	5,710.00	80.04
J-98	0.00	5,530.00	5,710.00	77.88
J-226	0.00	5,540.00	5,710.00	73.55
J-18	0.00	5,545.00	5,710.00	71.39
J-12	0.00	5,545.00	5,710.00	71.39
J-96	0.00	5,545.00	5,710.00	71.39
J-138	0.00	5,550.00	5,710.00	69.22



## **WINDLER DEVELOPMENT**

**Active Scenario: AVERAGE DAY**

**Reservoir Table - Time: 0.00 hours**

Label	Flow (Out net) (gpm)	Elevation (ft)
RES9000	170.90	5,710.00
RES9004	795.08	5,710.00
RES9008	254.21	5,710.00



## WINDLER DEVELOPMENT

### Active Scenario: AVERAGE DAY

#### Pipe Table - Time: 0.00 hours

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
P-1	260	24.0	150.0	170.90	0.12
P-3	273	24.0	150.0	170.90	0.12
P-4	144	24.0	150.0	120.59	0.09
P-5	126	24.0	150.0	120.59	0.09
P-6	289	36.0	150.0	18.19	0.01
P-7	197	36.0	150.0	18.19	0.01
P-8	738	24.0	150.0	120.59	0.09
P-9	435	24.0	150.0	170.90	0.12
P-11	135	24.0	150.0	77.17	0.05
P-15	181	24.0	150.0	34.00	0.02
P-16	1,179	24.0	150.0	82.02	0.06
P-17	1,291	24.0	150.0	77.17	0.05
P-23	1,276	24.0	150.0	27.70	0.02
P-24	203	24.0	150.0	261.38	0.19
P-27	1,123	24.0	150.0	216.73	0.15
P-30	275	24.0	150.0	27.70	0.02
P-31	99	24.0	150.0	82.02	0.06
P-34	843	24.0	150.0	34.00	0.02
P-37	1,143	24.0	150.0	179.18	0.13
P-41	932	36.0	150.0	362.28	0.11
P-43	325	36.0	150.0	361.09	0.11
P-47	488	36.0	150.0	273.11	0.09
P-47	1,349	8.0	150.0	19.20	0.12
P-49	1,491	36.0	150.0	70.72	0.02
P-50	1,959	12.0	150.0	30.84	0.09
P-51	929	36.0	150.0	319.75	0.10
P-51	359	24.0	150.0	183.71	0.13
P-53	479	36.0	150.0	456.53	0.14
P-58	2,080	24.0	150.0	15.12	0.01
P-59	2,107	24.0	150.0	70.50	0.05
PW54	1,295	8.0	150.0	44.19	0.28
PW55	1,255	8.0	150.0	35.79	0.23
PW57	1,282	8.0	150.0	30.98	0.20
PW58	1,218	8.0	150.0	45.36	0.29
PW59	538	8.0	150.0	37.15	0.24
PW61	710	8.0	150.0	8.03	0.05
PW63	1,359	8.0	150.0	16.43	0.10
PW64	1,380	8.0	150.0	20.65	0.13
PW65	1,290	12.0	150.0	60.66	0.17
PW66	2,085	8.0	150.0	0.88	0.01
PW78	1,392	8.0	150.0	38.24	0.24
PW82	1,393	8.0	150.0	44.04	0.28
PW86	225	36.0	150.0	242.27	0.08
PW88	316	36.0	150.0	394.25	0.12
PW90	860	12.0	150.0	62.29	0.18



## WINDLER DEVELOPMENT

### Active Scenario: AVERAGE DAY

#### Pipe Table - Time: 0.00 hours

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
PW94	1,214	8.0	150.0	16.67	0.11
PW190	1,369	8.0	150.0	24.04	0.15
PW194	949	8.0	150.0	17.83	0.11
PW196	757	8.0	150.0	41.72	0.27
PW198	724	8.0	150.0	34.69	0.22



## WINDLER DEVELOPMENT

### Active Scenario: AVERAGE DAY

#### Junction Table - Time: 0.00 hours

Label	Demand (gpm)	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)
J-4	4.53	5,430.00	5,710.00	121.14
J-110	62.48	5,439.92	5,710.00	116.85
J-2	1.73	5,445.00	5,710.00	114.65
J-54	0.00	5,445.00	5,710.00	114.65
J-132	19.07	5,447.85	5,710.00	113.42
J-48	0.00	5,450.00	5,710.00	112.49
J-22	0.00	5,450.00	5,710.00	112.49
J-32	0.00	5,450.00	5,710.00	112.49
J-1	184.42	5,450.00	5,710.00	112.49
J-16	0.00	5,450.00	5,710.00	112.49
J-224	19.07	5,455.00	5,709.99	110.32
J-26	58.87	5,460.00	5,710.00	108.16
J-24	0.00	5,460.00	5,710.00	108.16
J-220	22.93	5,468.69	5,709.98	104.39
J-142	11.33	5,470.00	5,710.00	103.84
J-128	132.05	5,480.00	5,709.94	99.48
J-130	106.71	5,485.00	5,710.00	97.34
J-90	37.96	5,490.00	5,709.98	95.18
J-144	0.00	5,492.49	5,710.00	94.10
J-106	156.07	5,495.45	5,709.99	92.82
J-100	1.28	5,505.00	5,710.00	88.69
J-15	0.00	5,505.50	5,710.00	88.48
J-19	44.65	5,510.00	5,710.00	86.53
J-92	76.45	5,510.00	5,709.98	86.52
J-146	0.00	5,515.28	5,710.00	84.25
J-17	0.00	5,518.50	5,710.00	82.85
J-11	1.45	5,518.50	5,710.00	82.85
J-148	76.45	5,520.00	5,709.99	82.20
J-94	0.99	5,525.00	5,710.00	80.04
J-68	1.19	5,525.00	5,710.00	80.04
J-102	41.34	5,525.00	5,710.00	80.04
J-98	56.54	5,530.00	5,709.94	77.85
J-226	35.55	5,540.00	5,709.97	73.54
J-18	0.00	5,545.00	5,710.00	71.39
J-12	6.30	5,545.00	5,710.00	71.39
J-96	56.19	5,545.00	5,709.95	71.37
J-138	4.58	5,550.00	5,710.00	69.22



## WINDLER DEVELOPMENT

### Active Scenario: MAX DAY

#### Reservoir Table - Time: 0.00 hours

Label	Flow (Out net) (gpm)	Elevation (ft)
RES9000	487.94	5,710.00
RES9004	2,204.00	5,710.00
RES9008	724.57	5,710.00



## WINDLER DEVELOPMENT

### Active Scenario: MAX DAY

#### Pipe Table - Time: 0.00 hours

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
P-1	260	24.0	150.0	487.94	0.35
P-3	273	24.0	150.0	487.94	0.35
P-4	144	24.0	150.0	359.54	0.25
P-5	126	24.0	150.0	359.54	0.25
P-6	289	36.0	150.0	85.34	0.03
P-7	197	36.0	150.0	85.34	0.03
P-8	738	24.0	150.0	359.54	0.25
P-9	435	24.0	150.0	487.94	0.35
P-11	135	24.0	150.0	216.30	0.15
P-15	181	24.0	150.0	95.28	0.07
P-16	1,179	24.0	150.0	242.18	0.17
P-17	1,291	24.0	150.0	216.30	0.15
P-23	1,276	24.0	150.0	77.64	0.06
P-24	203	24.0	150.0	658.37	0.47
P-27	1,123	24.0	150.0	533.35	0.38
P-30	275	24.0	150.0	77.64	0.06
P-31	99	24.0	150.0	242.18	0.17
P-34	843	24.0	150.0	95.28	0.07
P-37	1,143	24.0	150.0	514.30	0.36
P-41	932	36.0	150.0	1,043.14	0.33
P-43	325	36.0	150.0	1,039.81	0.33
P-47	488	36.0	150.0	793.59	0.25
P-47	1,349	8.0	150.0	53.95	0.34
P-49	1,491	36.0	150.0	188.93	0.06
P-50	1,959	12.0	150.0	102.30	0.29
P-51	929	36.0	150.0	924.06	0.29
P-51	359	24.0	150.0	526.98	0.37
P-53	479	36.0	150.0	1,329.33	0.42
P-58	2,080	24.0	150.0	42.37	0.03
P-59	2,107	24.0	150.0	197.59	0.14
PW54	1,295	8.0	150.0	123.57	0.79
PW55	1,255	8.0	150.0	100.15	0.64
PW57	1,282	8.0	150.0	86.68	0.55
PW58	1,218	8.0	150.0	126.89	0.81
PW59	538	8.0	150.0	104.09	0.66
PW61	710	8.0	150.0	22.52	0.14
PW63	1,359	8.0	150.0	59.02	0.38
PW64	1,380	8.0	150.0	80.00	0.51
PW65	1,290	12.0	150.0	96.36	0.62
PW66	2,085	8.0	150.0	32.73	0.21
PW78	1,392	8.0	150.0	107.18	0.68
PW82	1,393	8.0	150.0	123.50	0.79
PW86	225	36.0	150.0	691.28	0.22
PW88	316	36.0	150.0	1,132.59	0.36
PW90	860	12.0	150.0	196.73	0.56



## **WINDLER DEVELOPMENT**

### **Active Scenario: MAX DAY**

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

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
PW94	1,214	8.0	150.0	84.98	0.54
PW190	1,369	8.0	150.0	67.18	0.43
PW194	949	8.0	150.0	70.16	0.45
PW196	757	8.0	150.0	116.95	0.75
PW198	724	8.0	150.0	97.17	0.62



## WINDLER DEVELOPMENT

### Active Scenario: MAX DAY

#### Junction Table - Time: 0.00 hours

Label	Demand (gpm)	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)
J-4	12.68	5,430.00	5,709.99	121.14
J-110	174.94	5,439.92	5,709.97	116.84
J-2	4.84	5,445.00	5,709.97	114.64
J-54	0.00	5,445.00	5,709.97	114.64
J-132	53.40	5,447.85	5,709.98	113.41
J-48	0.00	5,450.00	5,710.00	112.49
J-22	0.00	5,450.00	5,709.99	112.49
J-32	0.00	5,450.00	5,709.97	112.47
J-16	0.00	5,450.00	5,709.96	112.47
J-1	516.38	5,450.00	5,709.96	112.47
J-224	53.40	5,455.00	5,709.89	110.28
J-26	164.84	5,460.00	5,709.96	108.15
J-24	0.00	5,460.00	5,709.96	108.15
J-220	64.20	5,468.69	5,709.84	104.33
J-142	31.72	5,470.00	5,709.99	103.83
J-128	369.74	5,480.00	5,709.59	99.33
J-130	298.79	5,485.00	5,709.96	97.33
J-90	106.29	5,490.00	5,709.79	95.09
J-144	0.00	5,492.49	5,709.97	94.09
J-106	437.00	5,495.45	5,709.97	92.81
J-100	3.58	5,505.00	5,709.97	88.68
J-15	0.00	5,505.50	5,710.00	88.48
J-19	125.02	5,510.00	5,709.99	86.53
J-92	214.06	5,510.00	5,709.73	86.42
J-146	0.00	5,515.28	5,709.99	84.24
J-11	4.06	5,518.50	5,709.99	82.85
J-17	0.00	5,518.50	5,709.99	82.85
J-148	214.06	5,520.00	5,709.91	82.17
J-94	2.77	5,525.00	5,709.99	80.04
J-68	3.33	5,525.00	5,709.98	80.03
J-102	115.75	5,525.00	5,709.98	80.03
J-98	158.31	5,530.00	5,709.60	77.70
J-226	99.54	5,540.00	5,709.79	73.46
J-12	17.64	5,545.00	5,709.99	71.38
J-18	0.00	5,545.00	5,709.99	71.38
J-96	157.33	5,545.00	5,709.68	71.25
J-138	12.82	5,550.00	5,709.99	69.22



## **WINDLER DEVELOPMENT**

**Active Scenario: MAX HOUR**

**Reservoir Table - Time: 0.00 hours**

Label	Flow (Out net) (gpm)	Elevation (ft)
RES9000	769.03	5,710.00
RES9004	3,577.86	5,710.00
RES9008	1,143.93	5,710.00



## WINDLER DEVELOPMENT

### Active Scenario: MAX HOUR

#### Pipe Table - Time: 0.00 hours

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
P-1	260	24.0	150.0	769.03	0.55
P-3	273	24.0	150.0	769.03	0.55
P-4	144	24.0	150.0	542.67	0.38
P-5	126	24.0	150.0	542.67	0.38
P-6	289	36.0	150.0	81.85	0.03
P-7	197	36.0	150.0	81.85	0.03
P-8	738	24.0	150.0	542.67	0.38
P-9	435	24.0	150.0	769.03	0.55
P-11	135	24.0	150.0	347.27	0.25
P-15	181	24.0	150.0	153.00	0.11
P-16	1,179	24.0	150.0	369.07	0.26
P-17	1,291	24.0	150.0	347.27	0.25
P-23	1,276	24.0	150.0	124.65	0.09
P-24	203	24.0	150.0	1,176.19	0.83
P-27	1,123	24.0	150.0	975.26	0.69
P-30	275	24.0	150.0	124.65	0.09
P-31	99	24.0	150.0	369.07	0.26
P-34	843	24.0	150.0	153.00	0.11
P-37	1,143	24.0	150.0	806.31	0.57
P-41	932	36.0	150.0	1,630.25	0.51
P-43	325	36.0	150.0	1,624.89	0.51
P-47	488	36.0	150.0	1,228.98	0.39
P-47	1,349	8.0	150.0	86.42	0.55
P-49	1,491	36.0	150.0	318.25	0.10
P-50	1,959	12.0	150.0	138.77	0.39
P-51	929	36.0	150.0	1,438.86	0.45
P-51	359	24.0	150.0	826.70	0.59
P-53	479	36.0	150.0	2,054.40	0.65
P-58	2,080	24.0	150.0	68.05	0.05
P-59	2,107	24.0	150.0	317.23	0.22
PW54	1,295	8.0	150.0	198.85	1.27
PW55	1,255	8.0	150.0	161.08	1.03
PW57	1,282	8.0	150.0	139.41	0.89
PW58	1,218	8.0	150.0	204.12	1.30
PW59	538	8.0	150.0	167.18	1.07
PW61	710	8.0	150.0	36.11	0.23
PW63	1,359	8.0	150.0	73.94	0.47
PW64	1,380	8.0	150.0	92.93	0.59
PW65	1,290	12.0	150.0	272.95	0.77
PW66	2,085	8.0	150.0	3.95	0.03
PW78	1,392	8.0	150.0	172.09	1.10
PW82	1,393	8.0	150.0	198.19	1.27
PW86	225	36.0	150.0	1,090.21	0.34
PW88	316	36.0	150.0	1,774.11	0.56
PW90	860	12.0	150.0	280.28	0.80



## **WINDLER DEVELOPMENT**

**Active Scenario: MAX HOUR**

**Pipe Table - Time: 0.00 hours**

Label	Length (ft)	Diameter (in)	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)
PW94	1,214	8.0	150.0	75.03	0.48
PW190	1,369	8.0	150.0	108.18	0.69
PW194	949	8.0	150.0	80.21	0.51
PW196	757	8.0	150.0	187.75	1.20
PW198	724	8.0	150.0	156.08	1.00



## WINDLER DEVELOPMENT

### Active Scenario: MAX HOUR

#### Junction Table - Time: 0.00 hours

Label	Demand (gpm)	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)
J-4	20.39	5,430.00	5,709.98	121.14
J-110	281.16	5,439.92	5,709.93	116.82
J-2	7.78	5,445.00	5,709.94	114.63
J-54	0.00	5,445.00	5,709.94	114.63
J-132	85.82	5,447.85	5,709.96	113.40
J-48	0.00	5,450.00	5,709.99	112.49
J-22	0.00	5,450.00	5,709.98	112.48
J-32	0.00	5,450.00	5,709.92	112.46
J-16	0.00	5,450.00	5,709.92	112.46
J-1	829.89	5,450.00	5,709.92	112.45
J-224	85.82	5,455.00	5,709.84	110.26
J-26	264.92	5,460.00	5,709.92	108.13
J-24	0.00	5,460.00	5,709.92	108.13
J-220	103.18	5,468.69	5,709.61	104.23
J-142	50.99	5,470.00	5,709.98	103.83
J-128	594.23	5,480.00	5,709.01	99.08
J-130	480.20	5,485.00	5,709.92	97.31
J-90	170.82	5,490.00	5,709.68	95.05
J-144	0.00	5,492.49	5,709.92	94.07
J-106	702.31	5,495.45	5,709.91	92.79
J-100	5.76	5,505.00	5,709.93	88.66
J-15	0.00	5,505.50	5,710.00	88.48
J-19	200.93	5,510.00	5,709.98	86.52
J-92	344.02	5,510.00	5,709.68	86.39
J-146	0.00	5,515.28	5,709.98	84.24
J-11	6.53	5,518.50	5,709.99	82.85
J-17	0.00	5,518.50	5,709.99	82.85
J-148	344.02	5,520.00	5,709.82	82.13
J-94	4.45	5,525.00	5,709.97	80.03
J-68	5.36	5,525.00	5,709.95	80.02
J-102	186.03	5,525.00	5,709.95	80.02
J-98	254.43	5,530.00	5,709.03	77.46
J-226	159.98	5,540.00	5,709.51	73.34
J-18	0.00	5,545.00	5,709.98	71.38
J-12	28.35	5,545.00	5,709.98	71.38
J-96	252.86	5,545.00	5,709.23	71.06
J-138	20.61	5,550.00	5,709.98	69.22



## WINDLER DEVELOPMENT

### Active Scenario: MAX DAY + FIRE FLOW

**Fire Flow Node FlexTable: Fire Flow Results Table**

Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Fire Flow (Upper Limit) (gpm)	Fire Flow (Total Upper Limit) (gpm)	Pressure (Calculated Zone Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
J-1	2	True	2,016.37	47,405.76	2,016.37	47,405.76	47,405.76	47,405.76	69.20	105.12	J-138	True	8.33	P-9
J-2	2	True	4,000.83	24,686.51	4,000.83	24,686.51	24,686.51	24,686.51	69.22	110.05	J-138	True	9.20	P-5
J-4	2	True	1,512.67	16,075.01	1,512.67	16,075.01	16,075.01	16,075.01	69.22	120.11	J-138	True	8.55	P-51
J-11	3	True	1,504.06	21,119.03	1,504.06	21,119.03	21,295.04	21,295.04	65.94	77.34	J-138	True	10.00	P-11
J-12	3	True	1,517.64	23,343.68	1,517.64	23,343.68	24,483.30	24,483.30	62.79	62.30	J-18	True	10.00	P-15
J-15	3	True	1,500.00	15,787.07	1,500.00	15,787.07	16,246.90	16,246.90	68.96	87.95	J-138	True	10.00	P-11
J-16	3	True	1,500.00	19,450.80	1,500.00	19,450.80	20,642.12	20,642.12	69.22	110.74	J-138	True	10.00	P-31
J-17	3	True	1,500.00	20,654.94	1,500.00	20,654.94	20,698.06	20,698.06	65.73	77.11	J-138	True	10.00	P-15
J-18	2	True	1,500.00	14,100.44	1,500.00	14,100.44	14,100.44	14,100.44	66.46	67.64	J-138	True	5.82	P-15
J-19	3	True	1,500.00	14,294.02	1,500.00	14,294.02	34,575.80	34,575.80	69.22	85.74	J-138	True	10.00	P-24
J-22	3	True	4,000.00	20,319.98	4,000.00	20,319.98	36,828.77	36,828.77	69.22	110.43	J-138	True	10.00	P-3
J-24	2	True	4,000.00	55,619.27	4,000.00	55,619.27	55,619.27	55,619.27	69.19	98.28	J-138	True	9.61	P-9
J-26	2	True	4,000.00	56,467.03	4,000.00	56,467.03	56,467.03	56,467.03	69.19	98.17	J-138	True	9.47	P-9
J-32	3	True	1,500.00	19,628.86	1,500.00	19,628.86	20,913.97	20,913.97	69.22	110.64	J-138	True	10.00	P-5
J-41	2	True	4,000.00	5,000.00	4,000.00	5,000.00	5,000.00	5,000.00	69.22	113.67	J-138	True	1.88	P-9
J-42	2	True	4,000.00	5,000.00	4,000.00	5,000.00	5,000.00	5,000.00	69.22	93.68	J-138	True	7.28	PW194
J-48	2	True	4,000.00	15,921.10	4,000.00	15,921.10	15,921.10	15,921.10	69.22	111.69	J-138	True	8.83	P-1
J-54	2	True	1,500.00	24,351.10	1,500.00	24,351.10	24,351.10	24,351.10	69.22	110.26	J-138	True	9.53	P-5
J-68	4	True	1,503.32	45,291.55	1,503.32	45,291.55	50,420.69	50,420.69	69.20	75.97	J-138	True	10.00	P-53
J-90	3	True	4,090.37	4,230.71	4,090.37	4,230.71	5,000.00	5,000.00	69.22	75.93	J-138	True	10.00	PW64
J-92	2	True	4,355.30	5,000.00	4,355.30	5,000.00	5,000.00	5,000.00	69.22	77.21	J-138	True	8.88	PW65
J-94	4	True	1,502.76	40,340.30	1,502.76	40,340.30	45,530.16	45,530.16	69.21	78.13	J-138	True	10.00	P-53
J-96	3	True	1,657.33	3,802.26	1,657.33	3,802.26	5,000.00	5,000.00	69.13	59.96	J-138	True	10.00	PW59
J-98	3	True	1,658.30	4,054.96	1,658.30	4,054.96	5,000.00	5,000.00	68.89	64.98	J-96	True	10.00	PW61
J-100	4	True	1,503.57	51,420.91	1,503.57	51,420.91	60,143.74	60,143.74	69.19	81.89	J-138	True	10.00	P-53
J-102	4	True	1,615.74	46,920.75	1,615.74	46,920.75	54,553.12	54,553.12	69.20	75.25	J-138	True	10.00	P-53
J-106	3	True	4,208.76	15,135.76	4,208.76	15,135.76	23,019.86	23,019.86	69.22	87.73	J-138	True	10.00	P-24



## WINDLER DEVELOPMENT

### Active Scenario: MAX DAY + FIRE FLOW

**Fire Flow Node FlexTable: Fire Flow Results Table**

Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Fire Flow (Upper Limit) (gpm)	Fire Flow (Total Upper Limit) (gpm)	Pressure (Calculated Zone Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
J-110	2	True	1,674.95	26,537.55	1,674.95	26,537.55	26,537.55	26,537.55	69.22	111.68	J-138	True	9.39	P-51
J-128	3	True	3,869.75	5,751.30	3,869.75	5,751.30	7,005.34	7,005.34	69.16	83.71	J-138	True	10.00	PW61
J-130	4	True	4,268.10	53,409.82	4,268.10	53,409.82	60,776.05	60,776.05	69.19	89.42	J-138	True	10.00	PW86
J-132	2	True	2,651.59	20,297.34	2,651.59	20,297.34	20,297.34	20,297.34	69.22	110.62	J-138	True	8.55	P-9
J-138	2	True	1,512.81	29,101.06	1,512.81	29,101.06	29,101.06	29,101.06	61.10	54.04	J-18	True	9.97	P-15
J-142	3	True	1,531.71	23,281.49	1,531.71	23,281.49	24,007.93	24,007.93	64.11	95.70	J-138	True	10.00	P-59
J-144	4	True	4,000.00	53,840.21	4,000.00	53,840.21	62,891.51	62,891.50	69.19	86.26	J-138	True	10.00	P-53
J-146	4	True	4,000.00	38,241.83	4,000.00	38,241.83	40,851.93	40,851.93	69.21	83.09	J-138	True	10.00	P-53
J-148	2	True	4,090.43	6,267.89	4,090.43	6,267.89	6,267.89	6,267.89	69.22	75.63	J-138	True	9.31	PW90
J-220	3	True	1,564.19	3,750.21	1,564.19	3,750.21	4,690.14	4,690.14	69.22	94.26	J-138	True	10.00	PW198
J-224	3	True	4,000.00	4,418.92	4,000.00	4,418.92	5,000.00	5,000.00	69.22	97.04	J-138	True	10.00	PW194
J-226	3	True	1,599.55	4,103.18	1,599.55	4,103.18	4,403.60	4,403.60	66.46	62.92	J-96	True	10.00	PW196





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SANTIARY SEWER MASTER PLAN

# WINDLER MIXED USE DEVELOPMENT MASTER UTILITY PLAN

2021

AURORA, CO

drawn by: \_\_\_\_\_  
checked by: \_\_\_\_\_  
approved by: \_\_\_\_\_  
QA/QC by: \_\_\_\_\_  
project no.: \_\_\_\_\_  
drawing no.: \_\_\_\_\_  
date: \_\_\_\_\_

SHEET  
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Sanitary Distribution Demand Criteria

Land Use	Equivalent		Residential Criteria	PEAKING FACTOR		INFILTRATION	
	Avg Day (gdp/acres)	Pop/AC					
Commercial	1500	22	People/Unit	2.77	MIN	1.7	Peaking Factor = 5/P^0.167
Industrial (school	1200	18	Avg day / Capita (gpc	68	MAX	4	
Parks & Greenbelts							
							p = population in thousands

HOTEL 98 gpd/Room

Windler - Sanitary Demand Projections (UPDATED LAYOUT)

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)
PA-1	MIXED COMM	25.9	N/A	570	38,850	4.00	155,400	3,885	42,735	95	30	159,285	0.2465
PA-1	HOTEL	3	150	0	14,700	4.00	58,800	1,470	16,170	36	11	60,270	0.0933
PA-2	MF	10.1	303	839	57,073	4.00	228,292	5,707	62,780	140	44	234,000	0.3621
PA-3	SFD/SFA FLEX	36.35	400	1108	75,344	4.00	301,376	7,534	82,878	185	58	308,910	0.4780
PA-3	COMMERCIAL	2	N/A	44	3,000	4.00	12,000	300	3,300	7	2	12,300	0.0190
PA-14	SFD/SFA	2.15	86	238	16,199	4.00	64,796	1,620	17,819	40	12	66,416	0.1028
PA-14	MF	8	320	886	60,275	4.00	241,101	6,028	66,303	148	46	247,128	0.3824
PA-14	COMMERCIAL	10	N/A	220	15,000	4.00	60,000	1,500	16,500	37	11	61,500	0.0952
PA-15	SFD/SFA FLEX	92.89	697	1931	131,287	4.00	525,148	13,129	144,416	322	100	538,276	0.8329
PA-15	MF	3	90	249	16,952	4.00	67,810	1,695	18,648	42	13	69,505	0.1075
PA-16	MIXED COMM	25.64	N/A	564	38,460	4.00	153,840	3,846	42,306	94	29	157,686	0.2440
PA-16	MF	10	345	956	64,984	4.00	259,937	6,498	71,483	159	50	266,435	0.4123
PA-16	HOTEL	9	350	0	34,300	4.00	137,200	3,430	37,730	84	26	140,630	0.2176
Total			2,741		532,125			53,212	585,337	1,304	406		3.5934



Windler-Sanitary Demand Projections (ORIGINAL LAYOUT)

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	Peak Flow + Infiltration (GPD)	Peak Flow + Infiltration (CFS)
PA-1	MIXED COMM	31.07	N/A	684	46,605	4	186,420	4661	51,266	114	36	191,081	0.2957
PA-2	MF	23.7	711	1969	133,924	4	535,696	13392	147,316	328	102	549,088	0.8496
PA-3	SFA	6.95	76	211	14,315	4	57,261	1432	15,747	35	11	58,693	0.0908
PA-3	COMMERCIAL	1.00	N/A	22	1,500	4	6,000	150	1,650	4	1	6,150	0.0095
PA-14	SFD/SFA	17.48	160	443	30,138	4	120,550	3014	33,151	74	23	123,564	0.1912
PA-14	MF	3.59	108	299	20,343	4	81,372	2034	22,377	50	16	83,406	0.1291
PA-14	COMMERCIAL	10.00	N/A	220	15,000	4	60,000	1500	16,500	37	11	61,500	0.0952
PA-15	SFD/SFA FLEX	34.78	313	867	58,957	4	235,827	5896	64,852	145	45	241,722	0.3740
PA-16	SFD/SFA FLEX	6.51	59	163	11,113	4	44,453	1111	12,225	27	8	45,564	0.0705
PA-17	SFD/SFA FLEX	16.89	152	421	28,631	4	114,523	2863	31,494	70	22	117,386	0.1816
PA-17	COMMERCIAL	1.00	N/A	22	1,500	4	6,000	150	1,650	4	1	6,150	0.0095
PA-18	SFD/SFA/ FLEX	15.75	142	393	26,747	4	106,988	2675	29,422	66	20	109,663	0.1697
PA-20	MIXED COMM	24.54	N/A	540	36,810	4	147,240	3681	40,491	90	28	150,921	0.2335
PA-21	MIXED COMM	4.10	N/A	90	6,150	4	24,600	615	6,765	15	5	25,215	0.0390
PA-21	MF	9.58	287	795	54,059	4	216,237	5406	59,465	132	41	221,643	0.3430
PA-22	MIXED COMM	4.77	N/A	105	7,155	4	28,620	716	7,871	18	5	29,336	0.0454
PA-22	MF	11	334	925	62,912	4	251,649	6291	69,203	154	48	257,940	0.3991
Total					492,947								



	Node	Map Area Code	Population	Sum Population	Avg Day (GPD)	Sum Avg Day (GPD)	Peaking Factor	Sum Avg Day (GPM)	Infiltration (GPM)	Avg Day + Infiltration (GPM)	Peak Flow + Infiltration (GPM)	Peak Flow + Infiltration (CFS)	Avg Day + Infiltration (CFS)	Pipe Diameter (in.)	Min. Slope (%)	Min Slope Velocity (ft/s)	Max Slope (%)
Tributary to Second Creek																	
	Line A																
	A.9	PA-15 (-26 ACRES OF SF)	1903	1,903	129,403	129,403	4.00	90	9	99	368	0.821	0.220	8	0.40	2.93	10.44
	A.8		0	1,903	129,403	129,403	4.00	90	9	99	368	0.821	0.220	8	0.40	2.93	10.44
	A.7	PA-16 (MIXED COMM + 1 hotel)	564	564	53,160	53,160	4.00	37	4	41	151	0.337	0.090	8	0.40	2.40	21.85
	A.6		0	2,467	-	182,563	4.00	127	13	139	520	1.158	0.311	8	0.80	4.14	7.98
	A.5	PA-1	570	3,037	53,550	236,113	4.00	164	16	180	672	1.498	0.402	10	0.41	3.44	6.89
	A.12	PA-3	1097	1,097	74,577	74,577	4.00	52	5	57	212	0.473	0.127	8	0.40	2.62	16.52
	A.11	PA-2	839	1,936	57,073	131,650	4.00	91	9	101	375	0.835	0.224	8	0.42	3.00	10.34
	A.4		0	4,973	-	367,763	3.83	255	26	281	1002	2.234	0.626	12	0.40	3.80	5.24
	A.3	PA-5	632	5,604	42,946	410,709	3.75	285	29	314	1098	2.446	0.699	12	0.41	3.89	4.88
	A.2.5	LINE B	0	8,006	-	589,017	3.53	409	41	450	1486	3.311	1.003	15	0.40	4.24	4.06
	A.2	PA-6	892	8,898	60,652	649,669	3.47	451	45	496	1611	3.590	1.106	15	0.40	4.31	3.82
	A.10	PA-7	756	756	51,419	51,419	4.00	36	4	39	146	0.326	0.088	8	0.40	2.38	22.47
	A.1		0	9,654	-	701,088	3.42	487	49	536	1716	3.823	1.193	15	0.40	4.36	3.63
	Line B																
	B.3	PA-10, PA-11	1083	1,083	73,649	73,649	4.00	51	5	56	210	0.467	0.125	8	0.40	2.61	16.62
	B.2	PA-8, PA-9	443	1,526	45,138	118,786	4.00	82	8	91	338	0.754	0.202	8	0.40	2.90	11.21
	B1	PA-4	875	2,402	59,522	178,308	4.00	124	12	136	508	1.131	0.303	8	0.76	4.04	8.18
Tributary to First Creek	Total Contribution to Second Creek Lift Station			9,654	-	701,088	3.42	487	49	536	1716	3.823	1.193				
	Line C																
	C.4	PA-14	1125	1,125	91,474	91,474	4.00	64	6	70	260	0.580	0.156	8	0.40	2.75	13.87
	C.3	PA-15 (10 ACRES OF SF)	277	1,402	18,836	110,310	4.00	77	8	84	314	0.700	0.188	8	0.40	2.86	11.90
	C.2	PA-16 (2 HOTELS AND MF)	956	2,357	84,584	194,894	4.00	135	14	149	555	1.236	0.332	8	0.91	4.42	7.61
	C.1		0	2,357	-	194,894	4.00	135	14	149	555	1.236	0.332	8	0.91	4.42	7.61



## Worksheet for A.9 TO A.8

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	8.0 in
Discharge	0.82 cfs
Results	
Normal Depth	6.0 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	5.1 in
Percent Full	74.8 %
Critical Slope	0.006 ft/ft
Velocity	2.93 ft/s
Velocity Head	0.13 ft
Specific Energy	0.63 ft
Froude Number	0.743
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	28.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	5.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for A.8 TO A.6

<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	8.0 in
Discharge	0.82 cfs
<b>Results</b>	
Normal Depth	6.0 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	5.1 in
Percent Full	74.8 %
Critical Slope	0.006 ft/ft
Velocity	2.93 ft/s
Velocity Head	0.13 ft
Specific Energy	0.63 ft
Froude Number	0.743
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	12.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	5.1 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for A.7 TO A.6

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	0.34 cfs
Results	
Normal Depth	3.4 in
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	3.2 in
Percent Full	42.3 %
Critical Slope	0.005 ft/ft
Velocity	2.40 ft/s
Velocity Head	0.09 ft
Specific Energy	0.37 ft
Froude Number	0.916
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	15.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.4 in
Critical Depth	3.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for A.6 TO A.5

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.008 ft/ft
Diameter	8.0 in
Discharge	1.16 cfs
Results	
Normal Depth	6.0 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	6.1 in
Percent Full	74.6 %
Critical Slope	0.008 ft/ft
Velocity	4.14 ft/s
Velocity Head	0.27 ft
Specific Energy	0.76 ft
Froude Number	1.052
Maximum Discharge	1.37 cfs
Discharge Full	1.28 cfs
Slope Full	0.007 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	74.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	6.1 in
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft



## Worksheet for A.5 TO A.4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	10.0 in
Discharge	1.50 cfs
Results	
Normal Depth	7.4 in
Flow Area	0.4 ft <sup>2</sup>
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.0 in
Top Width	0.73 ft
Critical Depth	6.6 in
Percent Full	74.4 %
Critical Slope	0.006 ft/ft
Velocity	3.44 ft/s
Velocity Head	0.18 ft
Specific Energy	0.80 ft
Froude Number	0.784
Maximum Discharge	1.78 cfs
Discharge Full	1.66 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	31.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.4 in
Critical Depth	6.6 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for A.12 TO A.11

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	0.47 cfs
Results	
Normal Depth	4.1 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.67 ft
Critical Depth	3.9 in
Percent Full	51.4 %
Critical Slope	0.005 ft/ft
Velocity	2.62 ft/s
Velocity Head	0.11 ft
Specific Energy	0.45 ft
Froude Number	0.886
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	19.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.1 in
Critical Depth	3.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for A.11 TO A.4

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	0.84 cfs
Results	
Normal Depth	5.9 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	5.2 in
Percent Full	74.4 %
Critical Slope	0.006 ft/ft
Velocity	3.00 ft/s
Velocity Head	0.14 ft
Specific Energy	0.64 ft
Froude Number	0.765
Maximum Discharge	1.00 cfs
Discharge Full	0.93 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	28.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.9 in
Critical Depth	5.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for A.4 TO A.3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	2.23 cfs
Results	
Normal Depth	8.4 in
Flow Area	0.6 ft <sup>2</sup>
Wetted Perimeter	2.0 ft
Hydraulic Radius	3.6 in
Top Width	0.92 ft
Critical Depth	7.7 in
Percent Full	70.1 %
Critical Slope	0.005 ft/ft
Velocity	3.80 ft/s
Velocity Head	0.22 ft
Specific Energy	0.93 ft
Froude Number	0.835
Maximum Discharge	2.86 cfs
Discharge Full	2.66 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	32.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.4 in
Critical Depth	7.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for A.3 TO A.2.5

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	2.45 cfs
Results	
Normal Depth	9.0 in
Flow Area	0.6 ft <sup>2</sup>
Wetted Perimeter	2.1 ft
Hydraulic Radius	3.6 in
Top Width	0.87 ft
Critical Depth	8.0 in
Percent Full	74.7 %
Critical Slope	0.005 ft/ft
Velocity	3.89 ft/s
Velocity Head	0.23 ft
Specific Energy	0.98 ft
Froude Number	0.806
Maximum Discharge	2.90 cfs
Discharge Full	2.70 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	35.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.0 in
Critical Depth	8.0 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for B.3 TO B.2

<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	8.0 in
Discharge	0.47 cfs
<b>Results</b>	
Normal Depth	4.1 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.1 ft
Hydraulic Radius	2.0 in
Top Width	0.67 ft
Critical Depth	3.8 in
Percent Full	51.0 %
Critical Slope	0.005 ft/ft
Velocity	2.61 ft/s
Velocity Head	0.11 ft
Specific Energy	0.45 ft
Froude Number	0.888
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	39.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.1 in
Critical Depth	3.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for B.2 TO B.1

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	0.75 cfs
Results	
Normal Depth	5.6 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.4 in
Top Width	0.61 ft
Critical Depth	4.9 in
Percent Full	69.9 %
Critical Slope	0.006 ft/ft
Velocity	2.90 ft/s
Velocity Head	0.13 ft
Specific Energy	0.60 ft
Froude Number	0.782
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	26.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.6 in
Critical Depth	4.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for B.1 TO A.2.5

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.008 ft/ft
Diameter	8.0 in
Discharge	1.13 cfs
Results	
Normal Depth	6.0 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	6.1 in
Percent Full	74.7 %
Critical Slope	0.007 ft/ft
Velocity	4.04 ft/s
Velocity Head	0.25 ft
Specific Energy	0.75 ft
Froude Number	1.025
Maximum Discharge	1.34 cfs
Discharge Full	1.24 cfs
Slope Full	0.006 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	74.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	6.1 in
Channel Slope	0.008 ft/ft
Critical Slope	0.007 ft/ft



## Worksheet for A.2.5 TO A.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	3.31 cfs
Results	
Normal Depth	9.1 in
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	2.2 ft
Hydraulic Radius	4.2 in
Top Width	1.22 ft
Critical Depth	8.8 in
Percent Full	60.8 %
Critical Slope	0.004 ft/ft
Velocity	4.24 ft/s
Velocity Head	0.28 ft
Specific Energy	1.04 ft
Froude Number	0.934
Maximum Discharge	5.19 cfs
Discharge Full	4.83 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	31.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.1 in
Critical Depth	8.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft



## Worksheet for A.2 TO A.1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	3.59 cfs
Results	
Normal Depth	9.6 in
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	2.3 ft
Hydraulic Radius	4.3 in
Top Width	1.20 ft
Critical Depth	9.2 in
Percent Full	64.2 %
Critical Slope	0.005 ft/ft
Velocity	4.31 ft/s
Velocity Head	0.29 ft
Specific Energy	1.09 ft
Froude Number	0.911
Maximum Discharge	5.19 cfs
Discharge Full	4.83 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	33.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.6 in
Critical Depth	9.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for A.10 TO A.1

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	0.33 cfs
Results	
Normal Depth	3.3 in
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	3.2 in
Percent Full	41.5 %
Critical Slope	0.005 ft/ft
Velocity	2.38 ft/s
Velocity Head	0.09 ft
Specific Energy	0.36 ft
Froude Number	0.918
Maximum Discharge	0.97 cfs
Discharge Full	0.90 cfs
Slope Full	0.001 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	14.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.3 in
Critical Depth	3.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for A.1 TO OFFSITE

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	3.82 cfs
Results	
Normal Depth	10.1 in
Flow Area	0.9 ft <sup>2</sup>
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.4 in
Top Width	1.17 ft
Critical Depth	9.5 in
Percent Full	67.1 %
Critical Slope	0.005 ft/ft
Velocity	4.36 ft/s
Velocity Head	0.30 ft
Specific Energy	1.14 ft
Froude Number	0.891
Maximum Discharge	5.19 cfs
Discharge Full	4.83 cfs
Slope Full	0.003 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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	35.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.1 in
Critical Depth	9.5 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for C.4 TO C.3

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	0.58 cfs
Results	
Normal Depth	4.7 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.2 ft
Hydraulic Radius	2.2 in
Top Width	0.66 ft
Critical Depth	4.3 in
Percent Full	58.3 %
Critical Slope	0.005 ft/ft
Velocity	2.75 ft/s
Velocity Head	0.12 ft
Specific Energy	0.51 ft
Froude Number	0.854
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	22.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.7 in
Critical Depth	4.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft



## Worksheet for C.3 TO C.2

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	0.70 cfs
Results	
Normal Depth	5.3 in
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.3 in
Top Width	0.63 ft
Critical Depth	4.7 in
Percent Full	66.1 %
Critical Slope	0.006 ft/ft
Velocity	2.86 ft/s
Velocity Head	0.13 ft
Specific Energy	0.57 ft
Froude Number	0.808
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	25.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	4.7 in
Channel Slope	0.004 ft/ft
Critical Slope	0.006 ft/ft



## Worksheet for C.2 TO C.1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.011
Channel Slope	0.009 ft/ft
Diameter	8.0 in
Discharge	1.24 cfs
Results	
Normal Depth	6.0 in
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.4 in
Top Width	0.58 ft
Critical Depth	6.3 in
Percent Full	74.7 %
Critical Slope	0.008 ft/ft
Velocity	4.42 ft/s
Velocity Head	0.30 ft
Specific Energy	0.80 ft
Froude Number	1.122
Maximum Discharge	1.47 cfs
Discharge Full	1.36 cfs
Slope Full	0.007 ft/ft
Flow Type	Supercritical
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	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	74.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	6.3 in
Channel Slope	0.009 ft/ft
Critical Slope	0.008 ft/ft





September 12, 2024

Chong Woo  
Aurora Water – Utilities Division  
26711 E Quincy Ave  
Aurora, CO 80016

RE: Windler PA 26-PA29 Utility Conformance Letter

Dear Chong Woo,

This letter serves as a utility conformance letter for the Windler's PA 26, 27, 28, and 29, designated as industrial/commercial area that is proposed west of E470, north and south of E 48<sup>th</sup> Ave, in the City of Aurora.

Reviewing the Master Utility Study done by Olsson on May 2022 Approval #222155, these parcels were anticipated to be industrial use.

The proposed user for PA 26 – PA 29 will be a commercial use that requires up to 3,300,000 sq. ft. of building area. Despite the large building coverage, the intended use will require much lower volume of employees than the original assumed industrial use and therefore will not adversely impact the proposed design of the water and sanitary system previously approved MUS #222155. Comparison tables are shown within this letter to show that the expected demand rates are less than the original approved demand rates.

The sanitary demand was based on as industrial population of 18 people per acre (146 acres = **2636 people**). The proposed user of these parcels would need 124 employees, for below the original consideration.



The approved report had a combined Max Day + Fire Flow (gpm) of 4,048 gpm for PA-26-29.

Windler - Water Demand Projections												
Water Distribution Design Criteria				Residential Criteria		Peaking Factors		Fire Flow				
Land Use	Avg Day (gdp/acre)	Max Day (gdp/acre)	Peak Hour (gdp/acre)	People / unit	2.77 Max Day	2.8	Classification	Demand (gpm)	Time (hrs)			
Commercial	1,500	4,200	6,750	Avg day / capita (gpd)	101	Max Hour	4.5	Residential	1500	2		
Industrial (schools)	1,200	3,360	5,400					Commercial/Multifamily	2500	2		
Parks & Greenbelts	1,800	5,040	N/A					Industrial	3500	3		
Map Area Code	Land Use	Nodes	Total Acres	Proposed Units	Avg Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gdp)	Max Day Demand (gpm)	Peak Hour Demand (gdp)	Peak Hour Demand (gpm)	Required Fire Flow (gpm)	Max Day Demand + Fire Flow (gpm)
PA-13	MF		6.50	195	54,555	38	152,754	106	245,498	170	1500	1606
PA-13	COMMERCIAL		0.50	N/A	750	1	2,100	1	3,375	2	2500	2501
PA-14	SFD/SFA		17.82	160	44,870	31	125,635	87	201,913	140	1500	1587
PA-14	MF		3.59	108	30,131	21	84,367	59	135,591	94	1500	1559
PA-14	COMMERCIAL		10.00	N/A	15,000	10	42,000	29	67,500	47	2500	2529
PA-15			34.78	313	87,574	61	245,206	170	394,081	274	1500	1670
PA-16	SFD/SFA FLEX		6.51	59	16,392	11	45,897	32	73,763	51	1500	1532
PA-17			16.89	152	42,528	30	119,078	83	191,375	133	1500	1583
PA-17	COMMERCIAL		1.00	N/A	1,500	1	4,200	3	6,750	5	2500	2503
PA-18	SFD/SFA FLEX		15.75	142	39,657	28	111,041	77	178,458	124	1500	1577
PA-19	SFA		17.88	161	45,021	31	126,058	88	202,593	141	1500	1588
PA-2	MF		23.70	711	198,916	138	556,966	387	895,124	622	1500	1887
PA-20			24.54	N/A	36,810	26	103,068	72	165,645	115	2500	2572
PA-21	MIXED COMM		4.10	N/A	6,156	4	17,237	12	27,702	19	2500	2512
PA-21			9.58	287	80,372	56	225,043	156	361,675	251	1500	1656
PA-22	MF		11.12	334	93,356	65	261,398	182	420,104	292	1500	1682
PA-22	MIXED COMM		4.77	N/A	7,151	5	20,021	14	32,177	22	2500	2514
PA-23			20.50	209	58,472	41	163,721	114	263,124	183	1500	1614
PA-24	SFD/SFA FLEX		13.24	118	33,043	23	92,446	64	148,558	103	1500	1563
PA-25			32.94	276	77,217	54	216,206	150	347,474	241	1500	1650
PA-26			35.55	N/A	42,660	30	119,448	83	191,970	133	3500	3583
PA-27			9.66	N/A	11,592	8	32,458	23	52,164	36	3500	3523
PA-28	IND-3.3.5.Y, IND-3.3.5.Z		44.61	N/A	53,532	37	149,890	104	240,894	167	3500	3604
PA-29			56.61	N/A	67,932	47	190,210	132	305,694	212	3500	3632
PA-3	SFA		6.95	76	21,388	15	59,888	42	96,248	67	1500	1542
PA-3	COMMERCIAL		1.00	N/A	1,500	1	4,200	3	6,750	5	2500	2503

The proposed Max Day + Fire Flow (gpm) with new user would generate approximately 2,563 gpm compared to 4,048gpm previously approved.

## Water Demands

Map Area Code	Land Use	Total Acres	Proposed People	Avg Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpd)	Max Day Demand (gpm)	Peak Hour Demand (gpd)	Peak Hour Demand (gpm)	Required Fire Flow (gpm)	Max Day Demand + Fire Flow (gpm)
PA 26-PA29	Commercial	146.43	N/A	219,645	153	615,006	427	988,403	686	2500	2,927
PA 26-PA29	Commercial	146.43	200	20,200	14	90,900	63	988,403	686	2500	2,563

200 people is rounded up from the expected employment of 124 employees



# Westwood



Please contact me if you have any questions.

Sincerely,

Tom Odle, PE  
Senior Project Manager

