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ARCHITECTURE | CIVIL ENGINEERING
PLANNING | BRANDING
INTERIORS | BUILDING MEASUREMENT

October 23 , 2023

City of Aurora

15151 E. Alameda Parkway

Aurora, CO 80012

RE: Aurora One Master Plan Amendment 1 / Approved MUR EDN #222113

Dear City of Aurora/Aurora Water Staff,

Ware Malcomb has reviewed the proposed revisions to the Aurora One Master Plan with an approved Master Utility Report, dated July 7th, 2021. The proposed revisions call for changes to the land use areas and densities which result in changes to the proposed demands on the domestic water and sanitary sewer systems.

The proposed changes with this Master Plan revision do not substantially alter the proposed utility routing from the approved master utility report. In addition, Ware Malcomb has analyzed the proposed changes to the land uses and densities and calculated revised sanitary demands for each. While the total sewer demand has increased from the approved report, the proposed sanitary network remains under the maximum allowable capacity per City of Aurora standard. As a result, the proposed changes to the master plan are in substantial conformance with the previously approved master utility study. A table of the proposed demands at each of the design points is attached for reference.

Ware Malcomb also analyzed the proposed revisions as they relate to the approved domestic water network. The proposed water system is in accordance with the approved utility layout in the MUR and the demands are within the assumptions made in the approved report. Based on the available water pressures in the system and the calculated velocities, the proposed changes are in substantial conformance with the approved master utility study.

We thank you for your review of the above-referenced project. Should you have any questions, please do not hesitate to contact us.

Sincerely,

Ware Malcomb

Manuel H Nuno, PE

Sr. Project Manager

Colorado RCE#52773

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Sanitary Sewer Flows for Aurora One

PLANNING AREA	ZONING	ZONING TYPE	Design Point	AVG. DAY FLOW	DENSITY DU/AC	TOTAL AREA ACRES	EQUIVALENT TOTAL POPULATION (P)	LOCAL AVG. FLOW GPD
SANITARY FLOW SUMMARY (LOCAL)								
BASIN A								
1	PA-1	Commercial	1	1,500		5.90	88	8,850
Subtotal Basin A							**88**	**8,850**
BASIN B								
11	PA-11	Commercial	2	1,500		11.78	175	17,670
Subtotal Basin B							**175**	**17,670**
BASIN C								
13	PA-13	Single Family Attached Residential	5	68	12	26.68	887	60,305
14	PA-14	Commercial	5	1,500		3.09	46	4,635
15	PA-15	Open Space	2	0		2.99	0	0
Subtotal Basin C							**933**	**64,940**
BASIN D								
2	PA-2	Commercial	4	1,500		6.36	94	9,540
4-West	PA-4	Single-Family Attached Residential	3	68	12	3.46	115	7,821
8-West	PA-8	Commercial	4	1,500		4.96	74	7,440
9	PA-9	Commercial	4	1,500		8.19	122	12,285
Subtotal Basin D							**405**	**37,086**
BASIN E								
6	PA-6	Open Space	3	0		7.31	0	0
8-East	PA-8	Commercial	3	1,500		4.96	74	7,440
10	PA-10	MF Residential	3	68	33	12.31	1,108	75,358
Subtotal Basin E							**1,182**	**82,798**
BASIN F								
4-East	PA-4	Single-Family Attached Residential	3	68	12	25.50	848	57,638
5-R	PA-5	MF Residential	3	68	40	0.00	0	0
5-C	PA-5	Commercial	3	1,500		12.31	183	18,465
7	PA-7	Neighborhood Park	3	1,200		7.14	85	8,568
Subtotal Basin F							**1,115**	**84,671**
Offsite								
Horizon Uptown*		Retail/Commerical/Residential	6				13,291	904,363
Subtotal Offsite							**13,291**	**904,363**

$$Avg\ Flow = AREA\ (AC) \times AVG.\ DAY\ FLOW\ (\frac{GDP}{AC}) =$$

$$Peak\ Flow = Peak\ Factor \times Avg\ Flow =$$

$$I/I = Avg\ Flow \times 0.1 =$$

$$Peak\ Factor\ (PF) = \frac{5}{P^{0.167}} =$$
where P=Population in thousands

$$TOTAL\ AVERAGE\ FLOW = Avg\ Flow + (Avg\ Flow \times 0.1)$$

$$TOTAL\ PEAK\ FLOW = Peak\ Flow(Avg\ Flow \times 0.1) =$$

Zoning	Average Day
Commercial	1500 gpd/acre
Residential	68 gpd/pp
People per unit	2.77

*Equivalent Total Population and Local Average Flow Derived from the approved Horizon Uptown City Center Draft Master Utilities Report
prepared by Matrix Design Group, dated September 19, 2018. COA #218158
Flow and populations taken are the cumulative amounts at Horizon design point 7 less the assumed "Offsite South" amounts from the Horizon Report.

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Sanitary Calculations for Aurora One

City of Aurora Standards		
City of Aurora Density	2.77	people / unit
Residential average demand:	68	gal / person / day

Design Point	Basins	Average Daily Flow (GPD)	Population	Used Peaking Factor	Peak Flow	I+I	Peak Flow + (I+I) (gpd)	Peak flow (q) (cfs)	Pipe Size (in)	Minimum Pipe Slope (%)	Q_{full} (cfs)	Full Flow Capacity[1] (%)	$Q_{cap.}$ (cfs)	q/Q_{full} (%)
1	A	8,850	88	4.0	35,400	885	36,285	0.06	8	0.50%	1.01	75%	0.76	5.6%
2	B	17,670	175	4.0	70,680	1,767	72,447	0.11	8	0.50%	1.01	75%	0.76	11.1%
3	E + F	167,469	2297	4.0	669,877	16,747	686,624	1.06	10	0.50%	1.83	75%	1.37	58.0%
4	D + E + F	204,555	2702	4.0	818,220	20,455	838,675	1.30	12	0.50%	2.98	75%	2.23	43.6%
5	C + D + E + F	269,495	3635	4.0	1,077,981	26,950	1,104,931	1.71	12	0.50%	2.98	75%	2.23	57.4%
6	A + B + C + D + E + F + Offsite	1,200,379	13291	3.2	3,896,315	120,038	4,016,353	6.21	18	0.40%	7.85	80%	6.28	79.1%

DCS19-4081_Sewer Pipes

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Aurora One
Water Demand Calculations

Commercial Average Day Demand =	1,500	gpd/acre
Residential Average Day Demand =	101	gpdpp
Park Average Day Demand =	1,800	gpd/acre
Persons/Unit =	2.77	Residential
Maximum Daily Demand =	2.8	x Average Day Demand (Residential)
Maximum Hourly Demand =	4.5	x Average Day Demand (Residential)
Commercial Fire Demand =	2500	gpm
Residential Fire Demand =	1500	gpm
Industrial Fire Demand =	3500	gpm

PLANNING AREA	AREA (AC)	ZONING/LAND USE	DENSITY (DU/AC)	UNITS	PEOPLE/ UNIT	AVERAGE DAY FACTOR	AVERAGE DAY DEMAND (gpd)	AVERAGE DAY (gpm)	MAX DAY FACTOR	MAX DAY DEMAND (gpd)	MAX DAY DEMAND (gpm)	MAX HOUR FACTOR	MAX HOUR DEMAND (gpd)	MAX HOUR DEMAND (gpm)
PA-1	5.90	Commercial				1,500	8,850	6.1	2.8	24,780	17.2	4.5	39,825	27.7
PA-2	6.36	Commercial				1,500	9,540	6.6	2.8	26,712	18.6	4.5	42,930	29.8
~~PA-3~~	~~0.00~~	~~Park (detention removed)~~				~~1,800~~	~~-~~	~~-~~	~~2.8~~	~~-~~	~~-~~	~~0~~	~~-~~	~~-~~
PA-4	28.96	Single Family Attached	12	348	2.77	101	97,226	67.5	2.8	272,232	189.0	4.5	437,516	303.8
PA-5 - Comm.	12.31	Mixed Comm - Comm				1,500	18,465	12.8	2.8	51,702	35.9	4.5	83,093	57.7
PA-5 - MF	0.00	Mixed Comm - MF	25	0	2.77	101	-	-	2.8	-	-	4.5	-	-
PA-5 - TOTAL	12.31	Mixed Commercial					18,465	12.8	2.8	51,702	35.9	4.5	83,093	57.7
PA-6	7.31	Open Space				0								
PA-7	7.14	Neighborhood Park				1,800	12,845	8.9	2.8	35,965	25.0	0	-	-
PA-8	9.00	Commercial				1,500	13,500	9.4	2.8	37,800	26.3	4.5	60,750	42.2
PA-9	8.19	Commercial				1,500	12,285	8.5	2.8	34,398	23.9	4.5	55,283	38.4
PA-10	12.31	Multi-Family	25	308	2.77	101	86,099	59.8	2.8	241,078	167.4	4.5	387,446	269.1
PA-11	11.78	Commercial				1,500	17,670	12.3	2.8	49,476	34.4	4.5	79,515	55.2
~~PA-12~~	~~0.00~~	~~Open Space~~				~~0~~								
PA-13	26.68	Single Family Attached	12	320	2.77	101	89,571	62.2	2.8	250,799	174.2	4.5	403,070	279.9
PA-14	3.09	Commercial				1,500	4,635	3.2	2.8	12,978	9.0	4.5	20,858	14.5
PA-15	2.99	Open Space				0	-	-	2.8	-	0.0	4.5	-	-

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Aurora One
Junction Distribution

Date: 10/6/2023
Prepared by: MHN

PLANNING AREA	11	16	20	23	24	30	31	32	34	35	38	39	41	42	45	46	47	48	49	50	51	52	53	55	56	57	61	62
PA-1																						50%	50%					
PA-2		33%									33%	33%																
PA-3											50%				50%													
PA-4											15%		40%	15%	15%	15%												
PA-5 - TOTAL			30%							40%						30%												
PA-6																												
PA-7																		50%	50%									
PA-8					25%				25%			25%						25%										
PA-9	25%			25%	25%												25%											
PA-10																	20%	20%	40%	20%								
PA-11		25%																			25%			25%	25%			
PA-12																												
PA-13							25%	25%																25%		25%		
PA-14							50%																					50%

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Aurora One
Average Day Demand (gpm)

Date: 10/6/2023
Prepared by: MHN

PLANNING AREA	Junction/Node																											
	11	16	20	23	24	30	31	32	34	35	38	39	41	42	45	46	47	48	49	50	51	52	53	55	56	57	61	62
PA-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0
PA-2	0	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-4	0	0	0	0	0	0	0	0	0	0	10	0	27	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0
PA-5 - TOTAL	0	0	4	0	0	0	0	0	0	5	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
PA-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0
PA-8	0	0	0	0	2	0	0	0	2	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
PA-9	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
PA-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	24	12	0	0	0	0	0	0	0	0
PA-11	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3	0	0	0
PA-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-13	0	0	0	0	0	0	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	16	0	0
PA-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	5	4	2	4	0	16	16	2	5	12	5	27	10	10	14	14	19	28	12	3	3	3	19	3	16	0	0

Aurora One
Max Day Demand (gpm)

Date: 10/6/2023
Prepared by: MHN

PLANNING AREA	Junction/Node																											
	11	16	20	23	24	30	31	32	34	35	38	39	41	42	45	46	47	48	49	50	51	52	53	55	56	57	61	62
PA-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0	0	0	0
PA-2	0	6	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-4	0	0	0	0	0	0	0	0	0	0	28	0	76	28	28	28	0	0	0	0	0	0	0	0	0	0	0	0
PA-5 - TOTAL	0	0	11	0	0	0	0	0	0	14	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0
PA-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	0	0	0	0	0	0	0	0	0
PA-8	0	0	0	0	7	0	0	0	7	0	0	7	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
PA-9	6	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
PA-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	33	67	33	0	0	0	0	0	0	0	0
PA-11	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	9	9	0	0	0
PA-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-13	0	0	0	0	0	0	44	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	44	0	0
PA-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	15	11	6	13	0	44	44	7	14	35	13	76	28	28	39	39	53	79	33	9	9	9	52	9	44	0	0

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Aurora One
Max Hour Demand (gpm)

Date: 10/6/2023
Prepared by: MHN

PLANNING AREA	Junction/Node																											
	11	16	20	23	24	30	31	32	34	35	38	39	41	42	45	46	47	48	49	50	51	52	53	55	56	57	61	62
PA-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0
PA-2	0	10	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-4	0	0	0	0	0	0	0	0	0	0	46	0	122	46	46	46	0	0	0	0	0	0	0	0	0	0	0	0
PA-5 - TOTAL	0	0	17	0	0	0	0	0	0	23	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0
PA-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-8	0	0	0	0	11	0	0	0	11	0	0	11	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
PA-9	10	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
PA-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	54	108	54	0	0	0	0	0	0	0	0
PA-11	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	14	14	0	0	0
PA-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PA-13	0	0	0	0	0	0	70	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	70	0	0
PA-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10	24	17	10	20	0	70	70	11	23	56	20	122	46	46	63	63	64	108	54	14	14	14	84	14	70	0	0