



WATER & SEWER BASIS OF DESIGN

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Job Name: Paseo Village Gas Station
Job No: AZ23001
Date: 06/12/24

PRELIMINARY Basis of Design Report

- ☐ ACCEPTED
☒ ACCEPTED AS NOTED
☐ REVISE AND RESUBMIT



Disclaimer: If accepted, the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY jcampo

DATE 7/18/2024

PROJECT SUMMARY

Existing Conditions:

Gas Station 160 SF Retail Kiosk (8'x20') served by an existing 1" domestic water lead and 6" sanitary sewer lead. No sprinkler system.
(Refer to Topographic Survey Plan Sheet Sp-1.0 and Site, Utility & Geometry Plan Sheet UT-1)

Proposed Conditions:

Relocation and enlargement of 1,482 SF Retail Kiosk (20'x87'), utilizing and extending the existing 1" domestic water lead and 6" sanitary sewer lead. Also, providing an FDC and a sprinkler system for the new building with a proposed 4" water service tapping an existing 10" public main.
The nearest existing hydrant is approx 130' north of the proposed building.
(Refer to Site, Utility & Geometry Plan Sheet UT-1 and Fire Line Plan Sheet MS-1)

Note: The following demand and flow calculations are per City DSPM.
However, please refer to Memo dated 3/15/24 by the Mechanical Engineer for estimated water demand based on actual water fixtures proposed.

Ductile Iron Pipe (DIP) required for 4" fire line install. Confirmed via Utility Plan.

WATER DEMAND (Per City DSPM 6-1.202 Figure 6-1.2)

Existing / Proposed	Land Use	Name	Building Area (SF)	Ave Demand Factor (GPD per SF Area)	Ave Day Total Use (GPD)	Ave Day Total Use (GPM)	Max Day Demand (GPM)	Peak Hour Demand (GPM)
Existing	Retail	Paseo Village Gas Station	160	0.80	128	0.09	0.18	0.31
Proposed	Retail	Paseo Village Gas Station	1,684	0.80	1,347	0.94	1.87	3.27

FIRE FLOW (Per IFC & City DSPM 6-1.501)

Existing / Proposed	Land Use	Name	Building Area (SF)	Construction Type (Per IFC)	Min Fire Flow (GPM)	50% Fire Flow (GPM)	Building Sprinkled
Existing	Retail	Paseo Village Gas Station	160	V-B	1,500	750.00	No
Proposed	Retail	Paseo Village Gas Station	1,684	V-B	1,500	750.00	Yes


SEWER LOAD (Per City DSPM 7-1.403 Figure 7-1.2)

Existing / Proposed	Land Use	Name	Building Area (SF)	Ave Flow Factor (GPD per SF Area)	Ave Day Flow (GPD)	Ave Day Flow (GPM)	Peak Day Flow (GPM)
Existing	Retail	Paseo Village Gas Station	160	0.50	80	0.06	0.17
Proposed	Retail	Paseo Village Gas Station	1,684	0.50	842	0.58	1.75

- d. Pipe flow velocity in feet per second (fps)
- e. Each pipe segment's head loss rate (ft. /1,000ft or psi/ft.)
- f. PRVs: Upstream and downstream pressures (psi or HGL elevation)
- g. Tanks: Inflow and outflow (gpm)
- h. Shows all units for the values presented or provide a legend on the diagram page that indicates the units used

AVERAGE DAY WATER DEMANDS ⁽¹⁾							
IN GALLONS PER DAY (GPD) ⁽²⁾				IN GALLONS PER MINUTE (GPM) ⁽²⁾⁽³⁾			
Land Use	Inside Use	Outside Use	Total Use	Inside Use	Outside Use	Total Use	Units
Residential Demand per Dwelling Unit							
< 2 dwelling unit per acre (DU/ac)	208.9	276.7	485.6	0.30	0.39	0.69	per unit
2 – 2.9 DU/ac	193.7	276.7	470.4	0.27	0.39	0.66	per unit
3 – 7.9 DU/ac	175.9	72.3	248.2	0.25	0.11	0.36	per unit
8 – 11.9 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
12 – 22 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
High Density Condominium (condo)	155.3	30	185.3	0.22	0.05	0.27	per unit
Resort Hotel (includes site amenities)	401.7	44.6	446.3	0.56	0.07	0.63	per room
Service and Employment							
Restaurant	1.2	0.1	1.3	1.67E-03	1.39E-04	1.81E-03	per square foot (sq.ft.)
Commercial/ Retail	0.7	0.1	0.8	9.73E-04	1.39E-04	1.11E-03	per sq.ft.
Commercial High Rise	0.5	0.1	0.6	6.95E-04	1.39E-04	8.34E-04	per sq.ft.





LAND USE	DEMAND (gpd)	DESIGN PEAKING FACTOR
<i>Commercial/Retail</i>	0.5 per sq. ft.	3
<i>Office</i>	0.4 per sq. ft.	3
<i>Restaurant</i>	1.2 per sq. ft.	6
<i>High Density Condominium (Condo)</i>	140 per unit	4.5
<i>Resort Hotel (includes site amenities)</i>	380 per room.	4.5
<i>School: without cafeteria</i>	30 per student	6
<i>School: with cafeteria</i>	50 per student	6
<i>Cultural</i>	0.1 per sq. ft.	3
<i>Clubhouse for Subdivision</i>	100 per patron x 2	4.5
<i>Golf Course</i>	patrons per du per day	
<i>Fitness Center/ Spa/ Health club</i>	0.8 per sq. ft.	3.5

FIGURE 7-1.2 AVERAGE DAY SEWER DEMAND IN GALLONS PER DAY & PEAKING FACTORS BY LAND USE

HYDRAULIC DESIGN

7-1.404

No public SS lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

SS lines shall be designed and constructed to give mean full flow velocities equal to or greater than 2.5 fps, based upon Manning's Formula, using an "n" value of 0.013.

To prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, submit a hydraulic analysis along with construction recommendations to the Water Resources Department for consideration. In no case will velocities greater than 15 fps be allowed.

Actual velocities shall be analyzed for minimum, average day and peak day design flow conditions for each reach of pipe.

The SS system shall be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope shall be evaluated for hydraulic jump.

The depth to diameter ratio (d/D) for gravity SS pipes 12 inches in diameter and less shall not exceed 0.65 in the ultimate peak flow condition. This d/D ratio includes an allowance for system infiltration and inflow.

The d/D for gravity drains greater than 12 inches diameter shall not exceed 0.70 for the ultimate peak flow condition. This d/D includes an allowance for system infiltration and inflow.

Measures to mitigate hydrogen sulfide shall be analyzed at manhole drops, abrupt changes in pipe slope or direction and at changes in pipe diameter.

MANHOLES AND CLEAN OUTS

7-1.405

Manholes in city streets shall be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes shall not be in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all

MEMORANDUM
ABBREVIATED BOD

DATE: 3/15/2024
REGARDING: Arizona Gas Station Water Usage
FROM: Dan Dunaj
TO: Art Kalajian

The following is a list of proposed plumbing fixtures and the associated water and drainage requirements:

Fixture	Quantity	Domestic Water Usage (GPM)	Supply Fixture Units (SFU)	Drainage Fixture Units (DFU)
Water Closet	1	1.28	2	2
Lavatory	2	(2x0.25) 0.50	(2x1) 2	4
Mop Sink	1	2	4	2
Sink	1	1.75	4	2
Floor Drains	4	---	---	(4x2.5) 10
Totals		5.53	12	20

The existing site has the following fixtures:

Fixture	Quantity	Domestic Water Usage (GPM)	Supply Fixture Units (SFU)	Drainage Fixture Units (DFU)
Water Closet	1	1.28	2	2
Lavatory	1	0.25)	1	2
Mop Sink	1	2	4	2
Sink	0	0	0	0
Floor Drains	1	---	---	2.5
Totals		3.53	7	8.5

A fixture unit is equivalent to one cubic feet of water. 12 fixture units would be equal to a maximum flow rate of 16 Gallons per Minute or 2.1388 Cubic Feet per Minute according to IBC Plumbing Code Table E103.3 for a flush tank water closet system.

The proposed daily water usage based on 30 Gallons per Occupant for a 12 hour period and 15 Occupants is 450 Gallons per day.

The existing daily usage based on the above criteria and only 4 Occupants is 120 Gallons per day. The site and building usage remain the same.

The proposed changes to the site water usage is not significant. The existing water service to the new building addition will remain the same.

TABLE B105.1(1)

REQUIRED FIRE-FLOW FOR ONE- AND TWO-FAMILY BUILDINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
0-3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0-3,600	Section 903.3.1.3 of the <i>International Fire Code</i> or Section P2904 of the <i>International Residential Code</i>	500	$\frac{1}{2}$
3,601 and greater	Section 903.3.1.3 of the <i>International Fire Code</i> or Section P2904 of the <i>International Residential Code</i>	$\frac{1}{2}$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m.

TABLE B105.2

REQUIRED FIRE-FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) ^a	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the <i>International Fire Code</i>	25% of the value in Table B105.1(2) ^b	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire-flow shall be not less than 1,000 gallons per minute.

b. The reduced fire-flow shall be not less than 1,500 gallons per minute.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute) ^b	FLOW DURATION (hours)
Type IA and IB ^a	Type IIA and IIIA ^a	Type IV and V-A ^a	Type IIB and IIIB ^a	Type V-B ^a		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.

b. Measured at 20 psi residual pressure.