

A & A Engineering & Consulting

28862 Vista Way, South Lyon, MI 48178

Subject: Grant's Place Development – Water Analysis

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A&A Engineering was contracted to complete a water analysis for the proposed Grant's Place development located in Pinkney, MI. The development consists of an existing church and converting the use to a 7-unit multifamily development. The property breakdown contains 1 unit with 1 bedroom and 6 units with 2 bedrooms, with a total occupancy of 20.

The tables below outline the calculations to project the normal water usage per day as well as the maximum water usage over the course of one hour, if all fixtures were at maximum usage.

Fixture Description	Quantity of Fixture	Gallons Per Minute (GPM/GPF) Rating	Projected Use Per Day	Gallon Usage Per Day
Water Closet	9	1.28	100 flushes	128
Shower Head	9	1.5	200 min	300
Kitchen Faucet	7	1.5	70 min	105
Lav Sink	9	1.2	100 min	120
Dishwasher	7	4 Gallons per Use	7	28
Mop Sink	1	1.8	30 min	54
Washing Machines	2	15 gallons per use	4	60
			Projected Gallons per Day	795

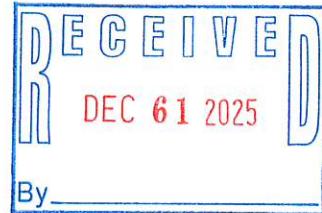
Table 1 - Projected Regular Water Usage in Gallons Per Day

Fixture Description	Quantity of Fixture	Gallons Per Minute (GPM/GPF) Rating	Max Usage Per Hour	Gallon Usage Per Hour
Water Closet	9	1.28	3 flushes	35
Shower Head	9	1.5	60 min	810
Kitchen Faucet	7	1.5	60 min	630
Lav Sink	9	1.2	60 min	648
Dishwasher	7	4 Gallons per Use	1	28
Mop Sink	1	1.8	60 min	108
Washing Machines	2	15 gallons per hour	2 loads	30
			Maximum Gallons Per Hour	2289

Table 2 - Maximum Flow Rate Per Hour

Several industry standards were applied to the calculations to complete the analysis, the following were applied to table 1:

- Normal daily use per occupant of the water closet is 5 times
- Average daily shower duration per individual is 10 minutes
- Kitchen faucet average daily usage per unit is 10 minutes
- Bathroom faucet daily average usage per occupant is 5 minutes
- Dishwashers in each unit will run 1 time per day
- Mop sink will have average usage of 30 minutes per day.
- 2 loads per washing machine daily, 4 total



Using these standards along with incorporating low flow fixtures in the plumbing design of the building would yield an average daily use of 735 gallons.

Another set of standards was used to calculate the maximum flow rate per hour of water possible. This scenario would simulate if all the fixtures in the building were operating continuously for 1 hour. These standards were applied to the calculations in table 2:

- Each water closet could flush a total of 3 times per hour
- Each dishwasher would run 1 load in a single hour
- Both washing machines run a single load in an hour
- All fixtures would have a continuous run time of 60 minutes

Using these standards along with incorporating low flow fixtures in the plumbing design of the building would yield a maximum hourly total of 2289 gallons.

Sincerely,

Stephan Hennard P.E.
A&A Engineering & Consulting