

JOHN R. HARMAN, PE

Professional Consulting Engineer
2112 White Oak Road
Raleigh, North Carolina 27608
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August 17, 2026

Attention: Wake County Health Department-Environmental Services

An Engineered Flow Reduction Request

Re: EFR for 5228 Alva Drive; Raleigh, NC 27606
(PIN #0782061103; Wake County)

Wake County Permit : WRP 033161-2020

**Flow Modification For a Four Bedroom (4 Bedroom) Principal Residence to a 360 GPD
Wastewater Flow from a 480 GPD Unadjusted ADF**

Purpose: The purpose of this correspondence is to request an Engineered Flow Reduction for a Four Bedroom Single Family Dwelling. The existing dwelling presently features four (4) Bedrooms and the Owners recently discovered that the septic permit (referenced above) states that septic sizing is for a 3 Bedroom, 360 gallons per day allocation. The Owners now desire to have the permit modified as may be required to classify the parcel as suitable for a Four (4) Bedroom Single Family Residence in order to one day sell it as such. This document will present a justification to show that the ADF should not exceed **360 gallons per day of Wastewater Flow from the existing Four (4) Bedroom home, based upon the employment of Low Flow Water usage Fixtures.**

Purpose: The purpose of this document is to ascertain and express the conclusion that, through the use of Water Conserving Fixtures, the amount of wastewater generated from the Existing Four Bedroom Residence is expected to be **360 gallons per day, or less.**

Supporting Information: The Unadjusted Average Daily Flow for the project described above is 480 gallons per day of domestic strength wastewater (ref. 15A NCAC 18E .0401(a)). The proposed Permit Modification should reference a revision that would indicate the septic system is suited for a Four Bedroom Home by virtue of an Engineered Flow Reduction. **Based upon a personal site inspection of the water use fixtures present in the home performed by me on August 17, 2026, do hereby confirm that the fixtures are equal to those presented in Exhibit "A" of this report.** A listing of existing fixtures are herewith attached (Refer to Exhibit "C"). The Attached Exhibit "A" presents the estimated flow reduction offered by the low flow water use fixtures present in the home for this project. The Wake County Septic Permit WRP 033161-2020 references installed 1200 Septic and Pump Tanks, which are properly sized for the Four (4) Bedroom classification, per the Wake County Local Rules.

The property owner acknowledges an obligation to conserve water usage generated from this residence. Such acknowledgement is signed and attached (Refer to Exhibit "B").

Potential Impacts of Increased Wastewater Strength: The Proposed Septic Tank is a minimum 1500 gallon liquid capacity per Wake County Local rules. Retention values of 1-3 days of domestic strength wastewater will normally accomplish the accepted standard reduction in strength of 50%. Calculations confirming that adequate retention time as required for suitable treatment of the waste is found in attached

Exhibit "D". Normal monitoring of scum and sludge levels and overall health of the septic tank via Operator regular inspections and pump out frequencies are presumed to remain the same.

Statement of Concurrence with Provisions of North Carolina SL 2014-120 (expanded SL 2013-413 to include Single Family Residences): It is my considered opinion that a flow reduction can be safely applied to the 18E .0401(a) usage rates, which will allow for a Septic Permit for this residence to be classified for this site as a **Four (4) Bedroom Primary Residence rated for 360 Gallons per Day;** provided, that: the system has been installed in accordance with the directives provided by Wake County Environmental Program Specialists, and recommendation per the design by the Soil Scientist; and, through the employment of water conserving fixtures and conservation efforts; and, is properly maintained with regular inspections; and, generates a maximum daily flow of **360 gallons** of wastewater per day. Based upon the foregoing, it is my belief that the system is capable of properly performing without compromising the public health, safety, and welfare. **This Daily Flow Modification can be granted under Session Law 2014-120 for an Engineered Flow Reduction.**

Please advise if any questions arise.

Sincerely,

John R. Harman, PE
919.818.2077



Attachments:

- Exhibit "A"-Reduced Flow Estimation;
- Exhibit "B"- Owner Flow Reduction Acknowledgement
- Exhibit "C"- Fixture Product Cut Sheets;
- Exhibit "D"- Septic Tank Sizing calculation to Account for Increased WW Strength

EXHIBIT "A"

Project: 5228 Alva Dr.; Raleigh (Wake County), NC
Wake Co. PIN # 0782061103; Permit # WRP-033161-2020

Engineer: John R. Harman, PE (NCPE #9810)

17-Aug-26

The Residence is to be a classified as a Four Bedroom Single Family Residence

480 GPD

480 GPD

Unadjusted ADF per Rules:

480 GPD

Flow Adjustment Request:

360 GPD

Percent Reduction Request:

25%

Fixture ID	Make & Model	GPM or Flush	1982 Usage Base, GPM or GPF	Percent Water Savings
Fixture type				
Lavatory Faucet	Moen Faucets or Other Equal-EPA Seal	1.2	2.5	52%
Showerhead	Moen, or Other Equa-EPA Seal	1.75	2.5	30%
Hand Shower w Slide Bar	Moen Brand or Equal	1.75	2.5	30%
Toilet/Water Closet	Gerber Maxwell Models (1.28 gpf)	1.28	3.5	63%
Kitchen/ Bar				
Kitchen or Bar Sink	Moen Models Pull Out Spray Head	1.5	3.0	50%
Laundry/Washing Machine	Top Loading "Water Sense"	15	40 gal/load	37%

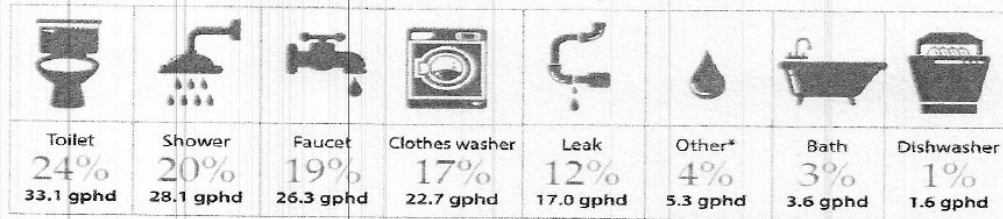
* Savings not included in Calcs below

WERF Study "Residential End Uses of Water, Version 3" (2026): Avg. Indoor Consumption Findings = 38.5 gpcd

<u>Fixture</u>	<u>Toilets</u>	<u>Kitchen Faucet</u>	<u>Shower</u>	<u>Clothes Washer</u>	<u>Leaks</u>	<u>Bath</u>	<u>Other</u>	<u>Dishwasher</u>	<u>Totals</u>
Percent of Household Water Use* Reference: Water Research Foundation Provided for Guidance	24%	19%	20%	17%	12%	3%	4%	1%	100%
Gallons per Day @ 4800 GPD Base Use	115.2	91.2	96	81.6	57.6	14.4	19.2	4.8	480
Percent Savings From Water Saving Fixtures	63%	50%	30%	0%	0	0	0	0	
Adjusted (Estimated) Daily Flow, GPD; Using WRF Guidance Info	42.1	45.6	67.2	81.6	57.6	14.4	19.2	4.8	332.5

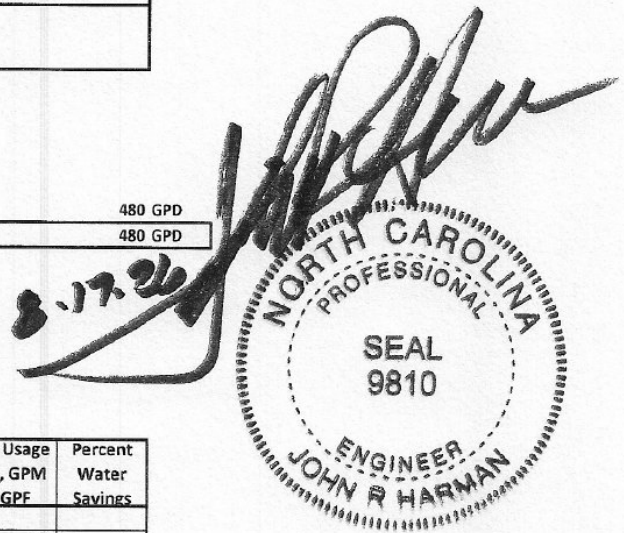
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Figure 1. Indoor household use by fixture



* The "Other" category includes evaporative cooling, humidification, water softening, and other uncategorized indoor uses.

Reference-"Residential End Uses of Water", ver 2 (2016); Water Research Foundation



JOHN R. HARMAN, P.E.

PROFESSIONAL CONSULTING ENGINEER

2112 White Oak Road.....Raleigh, North Carolina.....27608

919.818.2077.....jackharman53@gmail.com

August 17, 2026

Exhibit "B"

Kevin S. Johnson & Lisa H. Johnson

Owner(s) of Parcel at 5228 Alva Drive; Raleigh, NC 27606

PIN # 0782061103; Wake County, NC

Re: An Engineered Flow Reduction (EFR) for a WW Permit ...Owner Acknowledgement of Reduced Flow Conditions for Residence

Whereas, the Owners of the parcel listed above, desire to utilize a Four Bedroom residence on the subject lot which has been found to accommodate only **360 gallons per day** of septic effluent flow. In recognition of the foregoing, the Owners do hereby acknowledge that certain flow conservation measures must be employed..

Per State and Local Rules, component sizing of the pretreatment aspects of the proposed **Four (4) bedroom Residence** (septic tank, and field dose pump tank,) must be suited for flow allocation of **480 Gallons per Day** 15A NCAC 18E .0801(a), but the field application be restricted to a maximum anticipated flow of **360 gallons per day**. A Flow Modification Request is being prepared where the residence can be classified and listed as a **Four (4) Bedroom Dwelling**, but with an Average Daily Flow **restricted to 360 gallons per day**.

NC Session Law 2014-120 allows a Professional Engineer, upon justification, to adjust the Estimated Daily Flow generated by a residence or facility based upon the presence of low water use fixtures and/or water conserving measures. To this end, I have proposed that the water usage fixtures in the residence need to be compliant or similar to those meeting EPA criteria and bearing the "WaterSense" seal.

The Attachment is an estimated usage computation and is provided for your review and concurrence. It will be used as the justification of the Flow Modification Request to Wake County Environmental Health Services.

Therefore, by your signature in the acknowledgement area below, as Owner(s) of the above reference lot and proposed residence, you agree to the reasonableness of the assumptions for usage presented and will exercise all due care in the conservation of water generated from the residence and will employ such measures as necessary to achieve compliance with the maximum water usage of **360 Gallons per Day**.

The Owner(s) hereby acknowledges that neither the State nor the Local Health Department shall be liable for any damages caused by an engineered system approved or permitted pursuant to S.L. 2014-120 Section 53. The Owner(s) also hereby acknowledges that EFR Engineer shall not be held liable for the adequacy or sufficiency of the assimilative capacity of the soils, or the septic system design which is performed by others.

Sincerely,

John R. Harman, PE
Consulting Engineer NCPE #9810
Attachments: Exhibit "A";

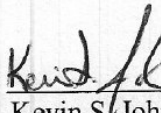
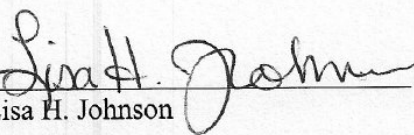
Owner(s) Accepted & Acknowledgement:   Date: 17 Aug 2026
Owner(s): Kevin S. Johnson & Lisa H. Johnson

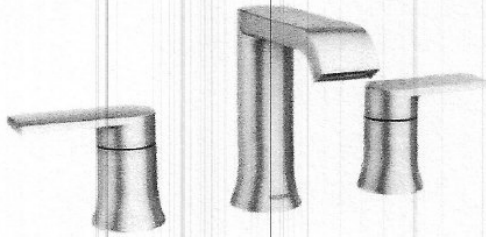
Exhibit “C”
Water Fixture Products Cut Sheets

Kitchen (First Floor)	Faucet Dishwasher	Moen Align Bosch Dishwasher shp865zd5n 01	1.5 GPM 3.5 G per cycle	623.5 G per year from sheet
Master Bedroom (First Floor)	Faucets (x2) Toilet 1 of 5 in the house Shower Head 1 Shower Head 2 Bath Tub	Moen Gerber Maxwell Moen Multi Spray Function Wand Moen Moen 395	1.2 GPM 1.28 GPF 1.75 GPM 2.5 GPM 6 GPM	
Powder Room (First Floor)	Faucet Toilet 2 of 5 in the house	Moen Gerber Maxwell	1.2 GPM 1.28 GPF	
Laundry Room (First Floor)	Washing Machine Faucet	Maytag MVW6230RHW Top Load HE Moen Arbor	14 Gallon per wash 1.5 GPM	
Upstairs Bathroom 1 (Second Floor)	Faucet Toilet 3 of 5 in the house Shower Head	Moen 84763 Gerber Maxwell Moen	1.2 GPM 1.28 GPF 1.75 GPM	
Upstairs Bathroom 2 (Second Floor)	Faucet Toilet 4 of 5 in the house Shower Head	Moen 84763 Gerber Maxwell Moen	1.2 GPM 1.28 GPF 1.75 GPM	
Upstairs Bathroom 3 (Second Floor)	Faucet Toilet 5 of 5 in the house Shower Head	Moen 84763 Gerber Maxwell Moen	1.2 GPM 1.28 GPF 1.75 GPM	

Upstairs Bathrooms – Moen Genta Collection

3 Bathrooms so 3 of Each Type

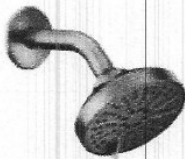
MOEN



Moen 84763 Specifications:

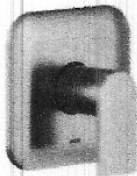
- Height: 5-3/8" (deck to top of faucet)
- Spout Height: 4-3/8" (deck to spout outlet)
- Spout Reach: 4-1/2" (faucet base to spout outlet)
- Flow Rate: 1.2 gallons-per-minute ← 1.2 GPM
- Faucet Centers: 8" (distance between centers of outside faucet holes)
- Maximum Deck Thickness: 1-1/4" (cannot mount on thicker decks)
- Hole Size: 1-1/8"
- Faucet Holes: 3 (minimum number of holes required for installation)

MOEN



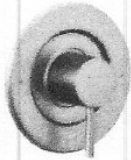
Shower Head Specifications:

- Multi function shower head with 6 spray patterns
- Shower Head Flow Rate: 1.75 gallons-per-minute ← 1.75 GPM
- Shower Head Width: 4-1/2"
- Shower Head Height: 2-1/4"



Primary Bath – Moen Align Collection

MOEN



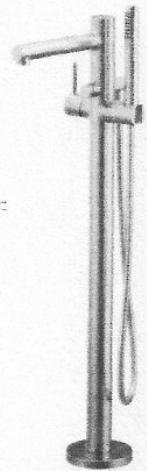
Product Specifications:

- Valve Trim Diameter: 7"
- Shower Head Diameter: 3-11/16"
- Shower Arm Reach: 6"
- Flow Rate: 2.5 GPM (gallons-per-minute)

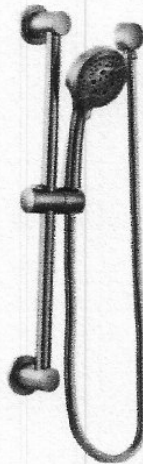
1.75 GPM →

Moen 395 Specifications:

- Height: 38-1/2" (bottom to top of faucet)
- Spout Height: 35-1/2" (deck to spout outlet)
- Spout Reach: 9-3/4" (center of faucet body to center of spout outlet hole)
- Flow Rate: 6 gallons-per-minute
- Hand Shower Flow Rate: 1.75 gallons-per-minute
- Hose Length: 58"
- Faucet Holes: 1 (minimum number of holes required for installation)
- Faucet Hole Size: 4-3/4"



MOEN

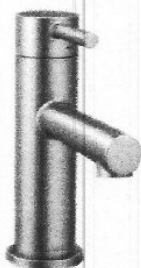


Product Specifications:

- Multiple spray functions - featuring 4 spray patterns
- Flow Rate: 1.75 GPM (gallons-per-minute)
- Hand Shower Height: 3-3/4"
- Hand Shower Spray Head Diameter: 4"
- Hose Length: 69"
- Slide Bar Length: 30-5/8" (center-to-center distance between mounting holes)
- Includes adjustable sliding parking bracket for hand shower
- Integrated dual-check valves

← 1.75 GPM

MOEN



2 Faucets in Primary & 1 of the same in Half Bath

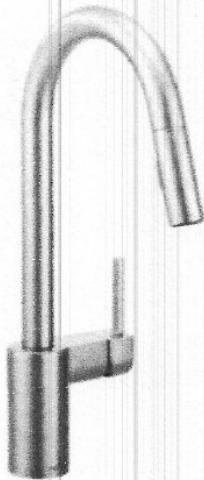
Product Specifications:

- Overall Height: 6-9/16" (measured from counter top to the highest part of the faucet)
- Spout Height: 3-1/4" (measured from counter top to the spout outlet)
- Spout Reach: 8-9/16" (measured from center of faucet base to center of spout outlet)
- Number of Holes Required for Installation: 1
- Flow Rate: 1.2 GPM (gallons-per-minute)
- Single handle included with faucet
- Valve Type: Dual-disc common valve system

← 1.2 GPM

Kitchen Sink – Moen Align Collection

MOEN

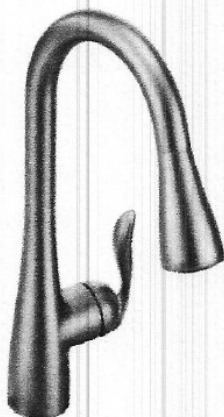


Product Specifications:

- Overall Height: 15-5/8" (measured from counter top to highest part of faucet)
- Spout Height: 9-1/2" (measured from counter top to spout outlet)
- Spout Reach: 7-17/32" (measured from center of faucet base to center of spout outlet)
- Number of Holes Required for Installation: 1
- Flow Rate: 1.5 GPM (5.7 L/min) ← 1.5 GPM
- Max Deck Thickness: 2-1/2"
- 1 handle included with faucet
- Designed for use with standard U.S. plumbing connections
- All hardware needed for mounting is included with faucet

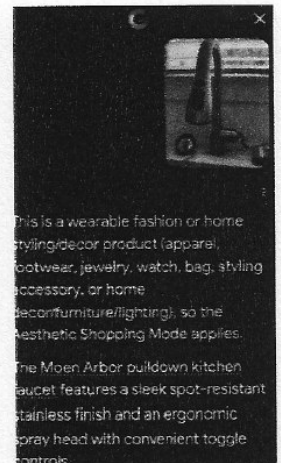
Laundry Room Faucet – Moen Arbor Collection

MOEN



Product Specifications:

- Overall Height: 15-1/2" (measured from counter top to highest part of faucet)
- Spout Height: 8-1/4" (measured from counter top to spout outlet)
- Spout Reach: 7-7/8" (measured from center of faucet base to center of spout outlet)
- Number of Holes Required for Installation: 1
- Flow Rate: 1.5 GPM (5.7 L/min) ← 1.5 GPM
- Max Deck Thickness: 2-1/2"
- 1 handle included with faucet
- Designed for use with standard U.S. plumbing connections
- All hardware needed for mounting is included with faucet



This is a wearable fashion or home styling/decor product (apparel, footwear, jewelry, watch, bag, styling accessory, or home decor/furniture/lighting), so the Aesthetic Shopping Mode applies.

The Moen Arbor pulldown kitchen faucet features a sleek spot-resistant stainless finish and an ergonomic spray head with convenient toggle controls.

Note: it appears our exact model is not made any longer. This is the model that comes up when I image search my faucet.

GERBER

MAXWELL® 1.28 gpf (4.8 Lpf) ErgoHeight™ ADA Elongated Toilet

Features:

GWS20918

Include Components:

- Combination GWS20918
- Bowl GMX21928
- Tank G0028990

- Vitreous China
- 12" Rough-In
- 3" Flush Valve for Maximum Water Force
- Gerber Pilot Fill Valve
- Corrosion-Resistant Flapper
- Extra-Large Dual Fed Siphon Jet for High Power Bowl Clearing
- 100% Glazed, 2" Large Trapway for Clog-Free Waste Removal
- Double Nut Multi-Point Tank-to-Bowl Mounting System for Tool-Free Installation
- Color Matched Tank Lever
- Color Matched Bolt Caps Included
- Toilet Seat Not Included



Technical Information:

Configuration	Two-Piece, ErgoHeight™ ADA Elongated Toilet
Water Consumption	1.28 gpf (4.8 Lpf)
Rough-In	12"
Height	30 3/4"
Width	17 3/8"
Depth	28 3/4"
Trapway	2"
Water Surface	8 1/16" x 6 5/16"
Shipping Weight Bowl	51 lbs
Shipping Weight Tank	30.4 lbs

Accessories Sold Separately:

N/A

Other Tank Options: (Sold Separately)

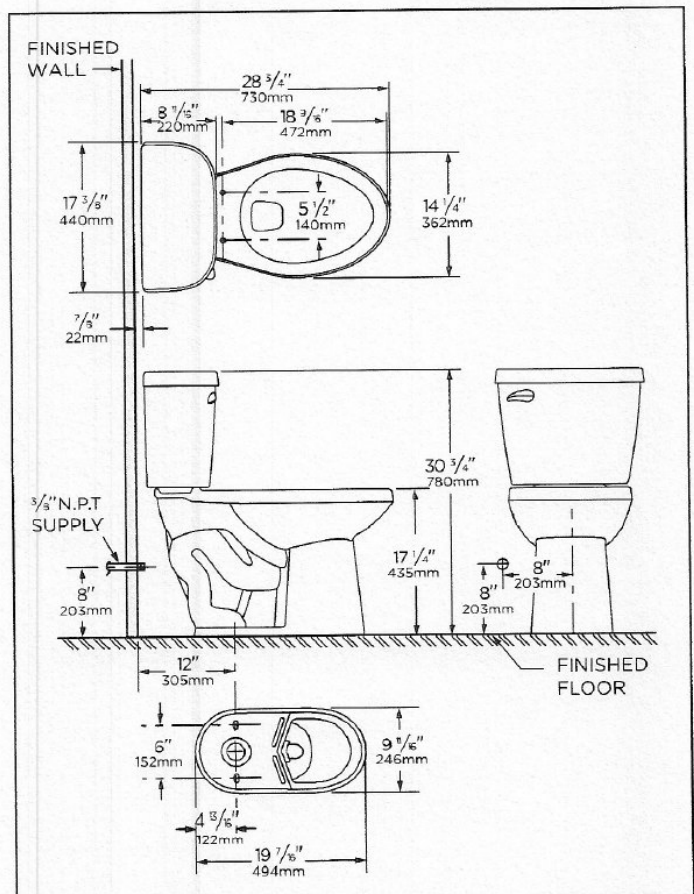
- Insulated Tank G0028992
- Tank with Right Hand Lever G002899097

Available Colors:

- White
- Other: Refer to Price Book for Additional Colors

Warranty:

- Limited Lifetime on Vitreous China, refer to the website for more details.



HIGH EFFICIENCY TOILET
HET



NOTES: All dimensions are in inches and millimeters. Illustrations may not be drawn to scale.

IMPORTANT:

Dimensions of fixtures are nominal and may vary within the range of tolerances established by ASME standard A112.19.2/CSA B45.1. THIS FIXTURE QUALIFIES ACCORDING TO ASME TEST PROCEDURES AS A HIGH EFFICIENCY WATER CLOSET WITH AN AVERAGE CONSUMPTION OF 1.28 gpf (4.8 Lpf). WATER CLOSET CONSUMPTION IS DETERMINED BY THE TANK.

Because we are committed to continual product improvement, specifications are subject to change without notice.

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05/25

Exhibit “D”
Septic Tank Sizing to Achieve Domestic
Strength Effluent Quality

EXHIBIT "D"

Evaluating Sizing Required of Septic Tank to Achieve Domestic Wastewater Strength

Project: 5228 Alva Dr.; Raleigh, NC

Calculations Prepared By: John R. Harman, PE

Date: 7/16/2026

Input Estimated Influent BOD, mg/l:	500 mg/l @	480 gpd Unadjusted flow	Inf. BOD lb/day
Desired Effluent Septic Tank BOD, mg/l:	150 mg/l		2.0016
Engineered Flow Reduction, GPD:		360 gpd, Flow Reduced	
Adjusted BOD Concentration, Due to Reduced Flow Volume:		667 mg/l	

*Ref. "Process Kinetics of Septic Tanks," C.D. Okereke; Environment Protection Engineering, Vol. 23, 1997

**Ref. RJ Otis/NJ Hutzler, WC Boyle, 1974, Onsite household wastewater treatment alternatives. Laboratory & Field Studies", Water Research 1974, Vol 8, pp1099-1113

*Bo-Bt = Bo(1-10^{-k(t)})

Where, Bo is the Influent BOD, mg/l

Bt is the Outlet BOD achieved after Detention Time "t", mg/l

k is a Rate Constant; Use 0.24**;

t is Retention Time, days

From Above Estimated Influent BOD= 667 mg/l @ Reduced Flow
Desired Septic Tank BOD Effluent= 150 mg/l

From 18E .0402 Septic Tank Effluent Characteristics

Table III. Septic tank effluent standards for DSE

Constituent	Maximum DSE mg/L
BOD	≤ 350
TSS	≤ 100
TN*	≤ 100
FOG	≤ 30

*TN is the sum of TKN, nitrate nitrogen, and nitrite nitrogen

Calculating Required Retention Time, Days:

Assume Influent BOD: 667 mg/l (Influent Concentration @ Reduced Flow, mg/l)

Desired Effluent BOD: 150 mg/l (Effluent Concentration @ Reduced Flow)

k, Constant (Ottis): 0.24

Bo-Bt: 516.7

2.7 Days (Per "What If" Analysis***)

516.7 See Note **

Septic Tank Volume Required by Formula, Gallons: 972 Gallons, Minimum Size to Achieve Effluent @ 150 mg/l

Proposed Septic Sizing (per State or Local Rules): 1200 Gallons Therefore, OK

***Solving for Retention Time "t", Days: 2.7 Days, Min. Retention Required @ Reduced Flow GPD

***[Run What If Analysis, Goal Seek the value in (Bo-Bt) by changing value in H33 (time)]

Table 1: Characteristics of Raw Domestic Sewage

Source	Flow L(gal)/capita/day	BOD ₅ mg/l	TSS mg/l	Grease mg/l	pH
Watson et al-Home 1	295 (78)	542	363	95	8
Watson et al-Home 2	250 (66)	284	293	33	8
Watson et al-Home 3	91 (24)	479	473	66	8.3
Watson et al-Home 1	269 (71)	518	478	134	7.6
Watson et al-Home 2	193 (51)	356	360	41	8.2
Watson et al-Home 3	110 (29)	598	602	92	8.4
Kreissl	242 (64)	435	380	65	
Kreissl		490	480	89	
Lawrence-Home 1	117 (31)	241	200	21	7.5
Lawrence-Home 2	185 (49)	146	126	16	7.2
Otis et al.		233	269		
U. Wisconsin	121 (32)	415	296	122	
U. Wisconsin	129 (34)	465	394	129	
U. Wisconsin		343	259		
Bennett, ASAE	168 (45)	278	396		7.4
Carcich et al	121 (32)	330	310	81	7.8
Comm. on Rural Water	220 (58)	207	165		
Schmidt	151 (40)	400			
Bounds, 1982-Grinders	189 (50)	304	226	42	6.9
Metcalf and Eddy, 3rd. Ed.	189 (50)	392	436	70	7.2
Ziebell, 1974		343	259		
Average	179 (47)	371	338	73	