ReSource Institute

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September 14, 2006

Ms. Tena Hale Rush
Aqua Missouri, Inc.
P.O. Box 7017
Jefferson City, MO 65102

RE: Quail Valley Wastewater Treatment Plant

Dear Ms. Rush:

On behalf of Mr. Edward Storey and the Quail Valley Homeowners' Association, I would like to submit information to you concerning additional investigations conducted over the last three months at the Quail Valley Wastewater Treatment Plant. These investigations resulted as a follow-up to the meeting held with the Missouri Department of Natural Resources and the follow-up letter received from Mr. Keith Forck of MDNR dated May 5, 2006. In this May 5th letter, Mr. Forck recommended that we submit a short report on the capacity of the treatment plant and the potential remaining capacity. Therefore, following in this letter is additional information recommended to be investigated by MDNR.

1) Census Data

Based on the census data, 229 people are occupying 77 homes in the Quail Valley subdivision. This equates to 2.97 people per home in the Quail Valley subdivision. It is recommended that this value be utilized for calculating existing and proposed plant loadings.

2) Actual records were obtained from Cole County Public Water Supply District #1 and showed that 425,900 gallons of water usage occurred in 75 homes in the development. This was based on a 31-day billing cycle; however, some homeowners are self-readers and may not have read on the exact 31-day timeframe. Based on the best information available from the water district, the average water usage per household was 183 gallons per day. It is recommended that this average water usage be utilized in calculating influent wastewater hydraulic load.

3) The Quail Valley Homeowners' Association has modified the by-laws to require that the septic tanks be pumped a minimum of once every three years. The Homeowners' Association will be responsible for ensuring that the septic tanks are pumped. The Homeowners' Association recently completed pumping of all existing septic tanks in the development.

4) Septic Tank Pumping

All septic tanks were pumped before August 1, 2006. A sample was taken shortly thereafter. Two samples of the influent had previously been taken to get a reading before cleaning septic tanks. An additional sample was taken on August 21, 2006, after several weeks had passed following pumping of all septic tanks. All of this data is included in Table 1 attached to this letter. The average BOD influent from the four samples was 83 mg/l while the TSS concentration was 34 mg/l. Both of these values are significantly less than typical sanitary wastewater design parameters indicating that the plant is not overloaded.

5) Infiltration Inflow Analysis

As shown in Table 2, attached to this letter, an analysis of wastewater flows recorded at the wastewater treatment plant at Quail Valley was conducted. The high flow rate recorded at the treatment plant was 30,436 gallons per day. The average flow rate was 11,744 gallons per day. It is understood that the readings recorded are instantaneous; however, with over 160 readings taken, a statistically significant indication of the peak flows realized at the wastewater treatment plant is provided. Given the lack of an extensive gravity flow collection system, infiltration is not considered to be a significant contributor to the wastewater plant flows. By-laws for the Homeowners' Association also prevent direct connection of inflow sources to the wastewater system. Infiltration and inflow is not suspected to be a significant problem for the Quail Valley Wastewater Treatment Plant.

6) Treatment Capacity Calculations

As shown in the attached Table 1, maximum loading to the wastewater treatment plant has been calculated based upon effluent from the septic tanks. Using the average organic and solids concentrations of the four samples taken, calculations show that the wastewater plant has capacity for additional loading. In calculating the existing aeration basin and settling basin capacities, organic and solids loadings are within Missouri Department of Natural Resources design criteria guidelines based upon a projected maximum development of 120 homes in the Quail Valley Development. Hydraulic loadings, based upon water usage and census data, projected for 120 homes are also within design guidelines. Based upon this data, the wastewater treatment system is capable of accepting flow from an additional 40 homes. It should be noted that good engineering practice generally includes a safety factor to account for varying field conditions. Given the changes that can occur in a wastewater system, something less than the calculated maximum loading may be appropriate. As per previous discussions, we believe it is reasonable and appropriate to add an additional 10 homes to the system over the next couple of years. Monitoring of loadings and treatment plant effluent results will be performed to determine impacts of new hookups and to see if additional capacity is available beyond 90 homes. Table 3 shows the loadings with a maximum of 90 homes connected to the system.

7) Summary and Recommendations

Based upon the data provided, it is recommended that Aqua Missouri, Inc. allow a total of 90 homes from the Quail Valley Subdivision Development to be hooked-up to the wastewater treatment system. In accordance with MDNR's May 5, 2006 letter, Aqua Missouri's analysis of the capacity of the treatment plant is required as Aqua Missouri is ultimately responsible for the treatment plant and the water quality of the effluent there from.

Therefore, Mr. Ed Storey and the Quail Valley Homeowners' Association requests approval to hook-up a total of 90 homes to the wastewater treatment system based upon the data provided herein.

If you have any questions or need further information, please give me a call at (573) 634-5008.

Sincerely,

Gregory G. Haug, PE

Attachments

cc: Mr. Keith Forck, MDNR
Mr. Ed Storey
Quail Valley Homeowners' Association
Mr. Mark A. Ludwig, Carson & Coil ✓

Table 1

Rev 9/14/06

Quail Valley Lake Subdivision WWTP
Quail Valley Lake, Route C
Jefferson City, MO 65109
Permit No. MO-0114081

Owner/Continuing Authority: Aqua Missouri, Inc

Permit Description:
Extended Aeration/chlorination/sludge hauled to Jefferson City WWTP

	Based on Permit		Actual		Max Capacity		Proposed	
Population Equiv.	296		229	*	352		264	
Plant Flow	22000	GPD	14274	GPD **	21960	GPD **	16470	GPD **
Flow per PE	74	GPD	62	GPD	62	GPD	62	GPD
Sludge Production	5.3	dry TPY	0.375	dry TPY	0.58	dry TPY	0.43	dry TPY
BOD loading	50	lbs/day	9.9	lbs/day	15.2	lbs/day	11.4	lbs/day
Homes connected	**80**		**78**		**120**		**90**	
Flow per home	275	GPD	183	GPD **	183	GPD **	183	GPD **

Wastewater Plant Description
23,000 GPD Extended Aeration Plant
6450 Gallon sludge holding tank
Chlorine contact tank with tablet chlorinator
Effluent flow measurement = V-notch weir
Settling zone capacity = 3958 gallons
Settling zone area = 72 square feet
Weir length = 11'
Air for lift pumps = 36,200 CFD
Motor = 5 HP
Blower speed = 2050 RPM
Air available = 134,000 CFD (93 CFM)
Operating psi = 5
Plant length = 47' 10"
Plant width = 13' 10"

Plant Influent Testing	**BOD (mg/l)**	**TSS (mg/l)**	
4/5/2006	81	33	before septic tank cleaning
6/1/2006	84	32	before septic tank cleaning
8/4/2006	98	44	shortly after septic tank cleaning
8/21/2006	68	28	2 weeks after septic tank cleaning
Average	**83**	**34**	

* Obtained from census of the development
** Actual January water usage for Quail Valley (425900 gal/75 homes/31 days = 183 gal/home)

Table 2

Quail Valley Lake Subdivision WWTP
Quail Valley Lake, Route C
Jefferson City, MO 65109
Permit No. MO-0114081

Date	Flow (gpd)		Monthly Average	Monthly Low	Monthly High
11/1/05	7,609	November-05	9,671	1,902	15,218
11/3/05	11,413				
11/4/05	7,609				
11/7/05	9,131				
11/8/05	5,707				
11/9/05	11,413				
11/10/05	7,609				
1/11/05	3,801				
11/14/05	15,218				
11/15/05	11,413				
11/16/05	15,218				
11/17/05	1,902				
11/18/05	5,707				
11/21/05	7,609				
11/22/05	11,413				
11/23/05	15,218				
11/28/05	11,413				
11/29/05	9,131				
11/30/05	15,218				
10/3/05	15,218	October-05	10,228	1,660	22,827
10/4/05	5,707				
10/5/05	4,565				
10/6/05	11,413				
10/7/05	9,131				
10/10/05	2,853				
10/11/05	15,218				
10/13/05	7,609				
10/14/05	11,413				
10/17/05	1,902				
10/19/05	18,261				
10/20/05	22,827				
10/24/05	15,218				
10/25/05	1,660				
10/27/05	13,044				
10/31/05	7,609				
9/1/05	7,608	September-05	10,558	2,853	15,218
9/2/05	7,609				
9/6/05	15,218				
9/8/05	15,218				
9/9/05	15,218				
9/12/05	5,707				

9/13/05	9,131				
9/16/05	11,413				
9/20/05	15,218				
9/23/05	13,044				
9/26/05	11,413				
9/29/05	2,853				
9/30/05	7,609				
8/1/05	7,609	August-05	12,098	4,565	22,827
8/2/05	11,413				
8/3/05	7,609				
8/8/05	15,218				
8/9/05	7,609				
8/11/05	11,413				
8/15/05	4,565				
8/17/05	11,413				
8/18/05	22,827				
8/19/05	11,413				
8/22/05	7,609				
8/23/05	22,827				
8/25/05	22,827				
8/29/05	11,413				
8/30/05	5,707				
7/1/05	11,413	July-05	11,426	2,075	22,827
7/5/05	15,218				
7/7/05	11,413				
7/11/05	15,218				
7/12/05	11,413				
7/15/05	7,609				
7/18/05	15,218				
7/19/05	11,413				
7/20/05	15,218				
7/21/05	11,413				
7/26/05	22,827				
7/27/05	2,075				
7/28/05	3,804				
7/29/05	5,707				
6/6/05	7,609	June-05	10,711	4,565	22,827
6/9/05	5,707				
6/11/05	11,413				
6/13/05	22,827				
6/14/05	4,565				
6/17/05	5,707				
6/20/05	7,609				
6/21/05	11,413				
6/23/05	11,413				
6/24/05	11,413				
6/27/05	9,131				
6/28/05	15,218				
6/30/05	15,218				
5/2/05	15,218	May-05	8,574	1,440	15,218
5/3/05	9,130				
5/5/05	15,218				

5/6/05	11,413				
5/9/05	7,609				
5/10/05	5,707				
5/12/05	13,044				
5/13/05	11,413				
5/16/05	7,609				
5/19/05	3,804				
5/20/05	3,261				
5/23/05	1,440				
5/24/05	11,413				
5/26/05	2,853				
5/27/05	11,413				
5/30/05	11,413				
5/31/05	3,804				
4/5/05	15,218	April-05	14,524	4,565	22,827
4/7/05	18,262				
4/8/05	13,044				
4/11/05	15,218				
4/12/05	18,262				
4/14/05	15,218				
4/15/05	11,413				
4/18/05	11,413				
4/19/05	9,130				
4/25/05	4,565				
4/26/05	11,413				
4/28/05	22,827				
4/29/05	22,827				
3/1/05	11,413	March-05	12,355	1,630	22,827
3/3/05	3,804				
3/4/05	3,804				
3/7/05	15,218				
3/8/05	15,218				
3/10/05	22,827				
3/14/05	15,218				
3/15/05	15,218				
3/17/05	15,218				
3/18/05	4,565				
3/21/05	1,630				
3/22/05	15,218				
3/24/05	13,043				
3/25/05	22,827				
3/28/05	11,413				
3/29/05	11,413				
3/30/05	9,130				
3/31/05	15,218				
2/1/05	11,413	February-05	13,593	2,536	22,827
2/3/05	2,536				
2/4/05	7,609				
2/7/05	15,218				
2/8/05	11,413				
2/9/05	5,707				
2/11/05	11,413				

2/14/05	22,827				
2/15/05	22,827				
2/17/05	22,827				
2/18/05	15,218				
2/21/05	11,413				
2/22/05	7,609				
2/24/05	22,827				
2/25/05	15,218				
2/28/05	11,413				
1/3/05	30,436	January-05	16,039	2,536	30,436
1/4/05	22,827				
1/5/05	30,436				
1/6/05	30,436				
1/7/05	22,827				
1/10/05	2,536				
1/11/05	11,413				
1/13/05	5,707				
1/14/05	5,707				
1/17/05	15,218				
1/19/05	15,218				
1/21/05	14,400				
1/25/05	15,217				
1/27/05	11,413				
1/28/05	11,413				
1/31/05	11,413				
Avg Flow	11,744				
High Flow	30,436				
Low Flow	1,440				

Table 3

Quail Valley Lake Subdivision WWTP
Quail Valley Lake, Route C
Jefferson City, MO 65109
Permit No. MO-0114081

rev. 9/14/06

Alternative: Pretreatment with Maintained septic tanks

Proposed Design Parameters:

	Septic effluent **WW Plant Influent**		
Homes connected	90		
Pop. Equiv. =	264		
Flow =	16470	GPD	
BOD =	11	lbs/day	(83 mg/l influent **)
TSS =	5	lbs/day	(34 mg/l influent **)
sludge prod. =	0.9	dry tons/yr	

Aeration Basin

basin size req'd	5685	gallons @ 15 lbs/1000 CF
air required	29642	CFD @ 2600 CF/lb BOD

Keep current plant the same

Current aeration volume =	22081	gallons	
Added aeration volume =	0	gallons	
Total aeration volume =	22081	gallons	
Air for lift pumps =	36200	CFD	
Motor =	5	HP	
Blower speed =	2050	RPM	
Air available =	134,000	CFD (93 CFM)	
Operating psi =	3. 5		

Settling Basin

Existing clarifier =	72	square feet	
Min. Depth = 10.25'	5520	volume in gallons	
Detention time =	8.04	hours	
Total Weir length =	11	linear feet	
Recorded Peak Flow	30436	GPD	(based upon records from Aqua MO)
Detention time =	4.35	hours	

** Based upon the average of 4 samples taken of the WW plant influent
two samples were taken before septic tank cleaning and two samples after cleaning