

# HAL OWEN & ASSOCIATES, INC.

L & ENVIRONMENTAL SCIEN TS

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30 January, 2008

Mr. Bryan McSwain  
Harnett County Environmental Health Division  
307 Cornelius Harnett Blvd  
Lillington, NC 27546

Reference: Septic System Expansion for Jonathan's House School

Dear Mr. McSwain,

A site investigation was conducted for the above referenced property located on the western side of US 401, Buckhorn Township, Harnett County, North Carolina. The purpose of the investigation was to determine the ability of this property to support expansion and modification to the subsurface sewage waste disposal system for a small private school facility. All sewage disposal ratings and determinations were made in accordance with "Laws and Rules for Sewage Treatment and Disposal Systems, 15A NCAC 18A .1900". This report represents my professional opinion as a Licensed Soil Scientist but does not guarantee or represent permit approval by the local Health Department.

## **Existing Facility and Client Proposals**

The existing facility, Jonathan's House, is a licensed school with a current enrollment of 40 students and 9 full-time teacher/staff positions. Typical hours of operation for the school are from 9:00 am to 2:30 pm Monday through Friday. The school has neither a cafeteria nor shower. Our clients wish to increase student enrollment and teaching/staff positions by twice their existing numbers. A new building is proposed to be constructed to accommodate additional students.

## **Determination of the Adjusted Daily Sewage Flow**

An adjusted design daily sewage flow was determined using total monthly water consumption for 12 consecutive months and 30 consecutive daily water consumption readings, supplied by the Harnett County Public Utilities and the client, as specified by rule 15A NCAC 18A.1949(c)(1) (See attachments 1 and 2). A peaking factor of 1.26 was calculated by dividing a total water usage measurement of 4800 gallons (achieved in November 2006 and June 2007) by 3800 gallons, the total monthly water usage during the 30 consecutive daily measurements (See Attachment 3). It should be noted that the monthly reading of 6200 total gallons for August 2007 was determined to be an outlier due to a running toilet and therefore was excluded for calculation of the adjusted design daily sewage flow. Rule 15A NCAC 18A.1949(c)(1) outlines that the adjusted design daily sewage flow be determined by taking the numerical average of the greatest ten percent of the daily readings and multiplying by the peaking factor. However, due to the fact that the water meter at the site measures water usage in 100-gallon increments, the

average daily water consumption per school day was calculated for each month and the highest value used in place of the average of the greatest ten percent (Table 1). Again it should be noted that data for August 2007 was excluded from all calculations. A value of 224 gallons per school day was multiplied by the calculated peaking factor of 1.26 and an adjusted design daily sewage flow of 282 gallons per day was calculated (See Attachment 3). The average daily water usage was calculated at 5.76 gallons per person and was rounded up to 6.0 gallons per person.

### **Existing System and proposed expansion**

The existing system is composed of 2 x 165-ft of EEE-ZZZ Lay accepted system drainline. Soil LTAR was determined by the Harnett Local Health Department to be 0.3 gal/day/sqft with a trench LTAR of 0.4 gal/day/sqft. This amount of drainline would allow for 396 gallons per day of sewage flow for the existing system. However, if the proposed facility is constructed and the current enrollment is increased by two, the existing system will not support the additional daily wastewater flow. Furthermore, there is inadequate usable soil area to modify the size of the existing system to accept the increase in wastewater flow and also inadequate usable soil area to 100% repair the existing system if it should fail. There is however an adequate amount of usable soil area located adjacent to US 401 to double the total amount of drainline in the existing system and therefore have two separate and equally sized nitrification fields. By installing 330-ft of accepted system drainline, each nitrification field would technically be sized at 75% of the total area required for a single field and under rule 15A NCAC 18A.1955 (p) would not need a repair area. A Zoeller 4000 series automatic multizone diversion valve will be utilized to alternate distribution of wastewater between the two nitrification fields.

Nitrification field A would include the existing system consisting of a 1000-gallon septic tank and the 2 x 165-ft of accepted system drainline (see attached site plan). Nitrification field B would consist of 330-ft of accepted system drainline installed ultra shallow with pressure manifold distribution. A 2000-gallon septic tank will be used commonly between the existing building and the proposed building for collection of all generated wastewater and a common 2000-gallon pump tank utilized to properly transport wastewater. The large septic tank will allow for more storage and initially a longer period of rest for the existing system. It is proposed that the existing septic tank associated with Nitrification field A be utilized so that wastewater is alternately pumped into the existing septic tank and subsequently transported to the existing drainlines. The Zoeller 4000 series automatic multizone diversion valve would need to be placed at an elevation higher than the commonly shared pump tank, existing septic tank and the pressure manifold for Nitrification field B to allow for wastewater to drain away from the diversion valve. The multizone diversion valve assembly would require clear schedule 40 pvc inspection pipes for the first foot of distribution lines leaving the valve as well as a Zabel A300 Commercial Filter installed in the commonly shared septic tank.



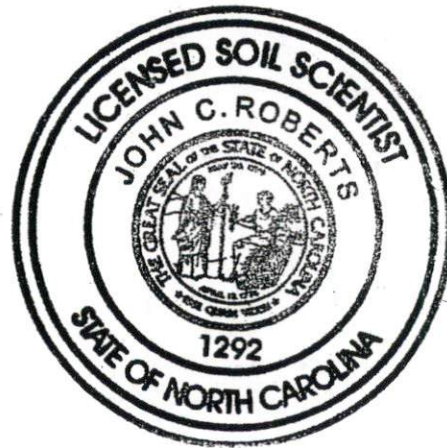
With utilization of the existing septic system and installation of the proposed system along with the accompanying water usage data, it appears that this system expansion is adequate to allow for no more than 130 students/teachers/staff. However, due to the marginal soils observed at the site and the wide range of wastewater flows observed from the existing facility, it is conservatively recommended that total occupancy of the two facilities not exceed 95 students/teachers/staff.

Attached is the septic system layout and supporting information for this facility. I trust that this report provides all the information that you require at this time. If you have any questions or need additional information, please contact me at your convenience.

Sincerely,



John C. Roberts  
Licensed Soil Scientist



# Attachment 1

**Johnathan's House, Inc.**  
*Educational Tutoring and Testing Center*  
 PO Box 42  
 Kipling, NC 27543  
 919-567-1626

## 30 Day Water Usage

### November 2007

7	176-000
8	176-100
9	176-200/300
12	176-400
13	176-500
14	176-600
15	176-700
16	176-800
19	176-900
20	177-100
21	177-200
23	177-300
26	177-400
27	177-500
28	177-600
29	177-800
30	177-900

### December 2007

3	178-100
4	178-200
5	178-300
6	178-400
7	178-500
10	178-800
11	178-900
12	179-100
13	179-200
14	179-300
17	179-400
18	179-500
19	179-600
20	179-700
21	179-800

(water leak over the weekend)

Attachment 3.

Calculation of Peaking Factor:

Peaking Factor = Highest monthly consumption / Sum of 30 day consecutive water meter readings

Peaking Factor = 4800 gallons / 3800 gallons

Peaking Factor = **1.26**

Calculation of Adjusted Daily Design Sewage Flow:

Adjusted daily design flow = Highest average water usage per school day x peaking facto

Adjusted daily design flow = 224 gallons x 1.26

Adjusted daily design sewage flow = **282 gallons per day**

Calculation of average gallons consumed per person:

Average gallons consumed per person = Calculated adjusted daily design flow / number of occupants

Average gallons consumed per person = 282 gallons per day / 49 occupants

Average gallons consumed per person = 5.76 gallons per person  $\approx$  **6.0 gallons per person**

Table 1. Total monthly water consumption values, school days and calculated average water usage per school day.

Date of Reading <sup>a</sup>	Total Actual Consumption (gallons) <sup>a</sup>	School days during reading period	Average water usage per school day (gallons/school day) <sup>c</sup>
9/26/06	3200	N/A	N/A
10/24/06	3100	20	155
11/30/06	4800	27	178
12/22/06	2800	16	175
1/26/07	3900	22	178
2/23/07	3800	20	190
3/26/07	4700	21	224 <sup>d</sup>
4/26/07	4200	22	191
5/23/07	4000	20	200
6/27/07	4800	25	192
7/25/07	2300	21	109
8/21/07	6200 <sup>b</sup>	18	345
9/25/07	4600	25	184

a. See Attachment 2

b. Data has been excluded due to a toilet that was running

c. Average water usage per school day was calculated by dividing total consumption by number of school days.

d. Value used to determine adjusted daily design sewage flow.



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4 December, 2008

Mr. Graham Byrd  
Harnett County Environmental Health Division  
307 Cornelius Harnett Blvd  
Lillington, NC 27546

Reference: Septic System Proposal for Sierra Day Treatment Academy

Dear Mr. Byrd,

A site investigation was conducted for the above referenced property located on the southern side of US 421, Upper Little River Township, Harnett County, North Carolina. The purpose of the investigation was to determine the ability of this property to support a proposed private school operation utilizing the existing subsurface sewage waste disposal systems at the site. All sewage disposal ratings and determinations were made in accordance with "Laws and Rules for Sewage Treatment and Disposal Systems, 15A NCAC 18A .1900". This report represents my professional opinion as a Licensed Soil Scientist but does not guarantee or represent permit approval by the local Health Department.

### **Change of Use for Existing Facility and Owner Proposals**

The existing facility has previously been utilized as a retirement home for several residents. The current owners are proposing to change the use of the facility to a school with an enrollment of 50 students and 20 full-time teacher/staff positions for grades K - 12. Hours of operation for the school will follow a traditional format from 8:00 am to 3:00 pm Monday through Friday. The school has an existing cafeteria and shower components. The current owners wish to use the cafeteria facilities and abandon the use of the showers.

### **Existing Systems and Determination of Enrollment for Proposed School**

Currently there are three separate existing subsurface wastewater systems located within the property boundaries at the site. The original system, described in this report as septic area A, includes 5 conventional drainlines and is located just southeast of the school. A repair system, septic area B, was installed that incorporated 7 x 140-ft conventional drainlines located immediately east of the facility. The majority of the drainlines in areas A and B has since been paved over and is now under the school's parking lot. Each drainline in septic areas A and B was investigated to establish the linear footage of drainline not covered by the parking lot and was determined that each area totaled 200-ft of conventional drainline. A second septic repair system, septic area C, was installed to the south of the facility and is composed of 631-ft of low-pressure pipe (LPP) drainline. Two septic tanks were located on the property along with two pump tanks. A septic tank and pump tank serves the low-pressure pipe system while the other septic tank and pump tank serves septic areas A and B. A bull-run valve is also incorporated into areas A and B and is not proposed to be used.

The design daily flow rate used in determining the maximum enrollment for the school was taken from daily and monthly flow rate data analyzed from Jonathan's House School, a facility located in Harnett County and comparable to the proposed school. The daily flow rate per student determined at Jonathan's House was 6 gallons per day per student/teacher. Since the cafeteria facilities are to be utilized at the site for the proposed school, an additional 2 gallons per day is added, totaling 8 gallons per day per student/teacher. Total enrollment for the proposed school was based on the total gallons per day the existing LPP septic system can manage at a long-term acceptance rate of 0.2 gal/day/sqft. Thus by utilizing all 631-ft of LPP drainline and the subsequent maximum daily flow rate of 631 gallons per day, it was determined that the LPP system can support 78 students/teachers and therefore is capable of supporting the proposed 50 students and 20 teachers/staff positions.

### **Design Specifications for Initial and Repair Septic Systems**

The LPP system is proposed to function as the school's initial subsurface wastewater septic system. The septic tank and pump tank connected to the LPP system are to remain functioning and the supply line from the LPP pump tank is to be rerouted to the septic tank associated with septic areas A and B. A new supply line will then need to be installed from the pump tank of areas A and B to the manifolds of the LPP system (see attached site plan). A Zabel A300 Commercial Filter will be installed in the commonly shared septic tank.

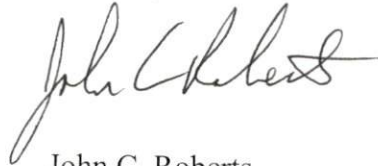
The unpaved portions of drainlines in areas A and B are proposed to be utilized for the majority of repair system. Wastewater will be prevented from entering the portions of paved over drainlines with the creation of earthen dams on the end near the parking lot. A long-term acceptance rate of 0.4 gal/day/sqft is proposed for these areas and can account for 480 gallons per day and can support 60 students/teachers. If needed in the future, these existing drainlines will utilize pressure manifolds to equalize distribution. Two additional areas are allocated for repair and appear adequate to support a total of 650-ft of LPP drainline or 650 gallon per day at 0.2gpd/sqft/day. A Zoeller series automatic multizone diversion valve will need to be utilized to alternate distribution of wastewater between all available septic areas. The Zoeller series automatic multizone diversion valve would need to be placed at an elevation higher than the commonly shared pump tank, existing septic tank and the pressure manifolds for to allow for wastewater to drain away from the diversion valve. The multizone diversion valve assembly would require clear schedule 40 PVC inspection pipes for the first foot of distribution lines leaving the valve.



It appears that the existing LPP system is adequate to support the proposed 50 students and 20 teachers/staff. Due to the past septic system issues, the scarcity of area for repair and the complexity of the proposed repair system it is recommended that total occupancy of the facilities not exceed 70 students/teachers/staff as proposed in this report.

Attached is the septic system layout and supporting information for this facility. I trust that this report provides all the information that you require at this time. If you have any questions or need additional information, please contact me at your convenience.

Sincerely,



John C. Roberts  
Licensed Soil Scientist



## Pressure Manifold Design Criteria

### Repair System Area A

Line Number	Line Color	Elevation	Drainline Length(ft)	Tap Size/ Schedule	Flow/tap (gpm)	gpd/ft	LTAR (gpd/sqft)
1	B	n/a	40	FD 1/2"sch 80	5.05	1.142	0.381
2	Y	n/a	40	FD 1/2"sch 80	5.05	1.142	0.381
3	B	n/a	40	FD 1/2"sch 80	5.48	1.239	0.413
4	W	n/a	40	FD 1/2"sch 80	5.48	1.239	0.413
5	R	n/a	40	FD 1/2"sch 80	5.48	1.239	0.413

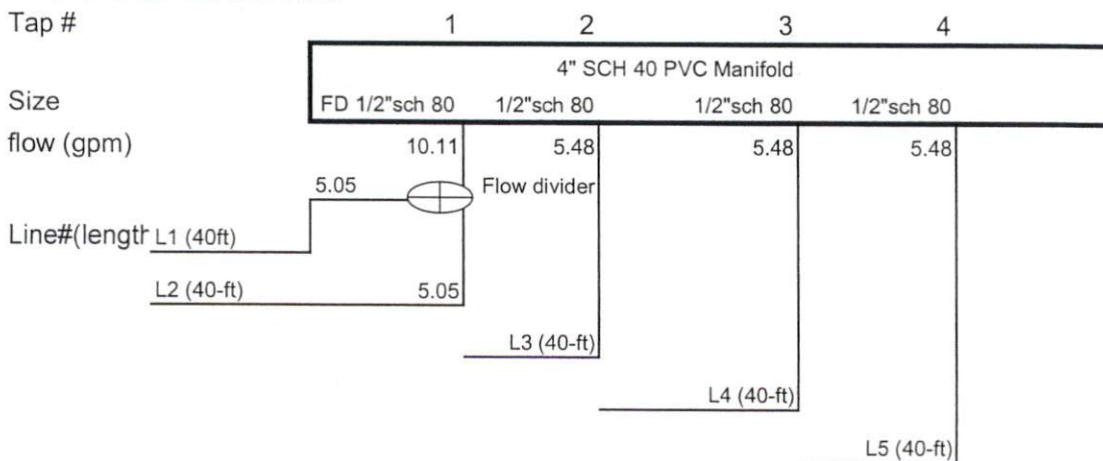
Total Drainline= 200 Total Flow= 26.54

Pressure Head (ft)= 2 Target LTAR= 0.4 gpd/sqft LTAR + 5% 0.42

Daily Flow= 240 Total Flow (gpm)= 26.54 Daily PRT(min)= 9.04

Dose Vol= 104.48 gallons w/ Pipe Vol @% 80 Dose PRT (min)= 3.94

### MANIFOLD DIAGRAM:



## Pressure Manifold Design Criteria

### Repair System Area B

Line Number	Line Color	Elevation	Drainline Length(ft)	Tap Size/Schedule	Flow/tap (gpm)	gpd/ft	LTAR (gpd/sqft)
6	Y	n/a	32	FD 1/2"sch 80	2.74	1.250	0.417
7	R	n/a	32	FD 1/2"sch 80	2.74	1.250	0.417
8	W	n/a	33	FD 1/2"sch 80	2.74	1.212	0.404
9	B	n/a	34	FD 1/2"sch 80	2.74	1.176	0.392
10	Y	n/a	34	FD 1/2"sch 80	2.74	1.176	0.392
11	W	n/a	35	FD 1/2"sch 80	2.74	1.143	0.381

Total Drainline= 200 Total Flow= 16.44

Pressure Head (ft)= 2 Target LTAR= 0.4 gpd/sqft LTAR + 5% 0.42  
 Daily Flow= 240 Total Flow (gpm)= 16.44 Daily PRT(min)= 14.60  
 Dose Vol= 104.48 gallons w/ Pipe Vol @ 80 Dose PRT (min)= 6.36

### MANIFOLD DIAGRAM:

