SUBSURFACE PRE-TREATED DRIP SEPTIC SYSTEM PROPOSAL

Cole Park Veterinary Clinic
12171 US Hwy 15-501
Chatham County, NC
TCG Job # 7317

Prepared For:

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INTRODUCTION

The Catena Group, Inc (TCG) performed a Preliminary Soil & Site Evaluation on August 7, 2007 on approximately 2.0-acres for its suitability for an on-site septic system. At the time of the August 7, 2007 investigation, the project site constituted two adjoining lots located at 12171 US Hwy 15-501in Chatham County, NC. The two lots have subsequently been purchased and combined to be used for veterinary clinic.

TCG has been retained to propose an on-site subsurface septic system for the clinic. TCG evaluated the lot in accordance with North Carolina statutes for waste disposal ("Laws and Rules for Sewage Treatment and Disposal Systems", Sections .1940 through .1944 (amended June 2006)).

INVESTIGATION METHODOLOGY

Based upon the preliminary investigation and supplemented with additional borings, the site has been designed to optimize the most suitable soil on property. Soil borings were made with a hand-turned auger in various locations throughout the study area. Observations of the landscape (slope, drainage patterns, past use, etc.) as well as soil properties (depth, texture, structure, seasonal wetness, restrictive horizons, etc.) to a depth $\geq$ 48 inches were recorded when possible. Soil color was determined with a Munsell Soil Color Chart. A hand held global positioning system (GPS) unit with sub-meter accuracy was used to locate each soil boring as well as other pertinent site features.

The new clinic will take the place of the existing Cole Park Veterinary Clinic located in Cole Park Plaza. The new clinic will have approximately the same size, the same number of staff, and perform the same services as the existing clinic. The design engineer has therefore collected water meter data for the past year. Based upon this data, the clinic averages approximately 532 gpd. In order to account for potential issues that could compromise the amount of useable space, the septic system has been designed to handle 600 gpd.

Hydraulic conductivity (K_{SAT}) tests were performed using a compact constant-head permeameter (Amoozemeter). Prior to any readings, the pemeameter was given time to equilibrate, typically 30 minutes.

FINDINGS

Based upon numerous auger borings, three areas (Septic Area 1, Septic Area 2, Septic Area 3), as noted in Figure 1, were identified as the best area for accommodating a sub-surface drip wastewater system. The main limitation in all areas is depth to saprolite, which generally occurred from 19 – 36+ inches. K_{SAT} tests were performed to help ascertain a loading rate. The results are summarized below and locations of each test shown in Figure 1. As is noted, the geometric mean of the long-term acceptance rate (LTAR) is 0.93 gpd/ft^2.

K_{SAT} Results

Location	LTAR
1	0.871433
5	0.911894
6	0.364757
7	1.519823
8	1.644007
9	0.851101
	0.93751 = Geomean

The wastewater will be pre-treated to a Treatment Standard 2 (TS-2). As such, 20% of the geometric mean is proposed for the LTAR. Accordingly, 600 gpd at a 0.187 LTAR will require 1,605 linear feet of drip tubing placed on 2-foot centers. Based on this information, drip septic lines were field delineated (on 4-foot centers) in Septic Area 1 and Septic Area 2. The results are shown in Table 1.

Septic Area 1

Line	Color	Length	Total Length	System
1	O	18	36	Initial
2	P	22	80	Initial
3	Y	30	140	Initial
4	O	34	208	Initial
5	P	48	304	Initial
6	Y	52	408	Initial
7	O	58	524	Initial
8	P	69	662	Initial
9	Y	74	810	Initial
10	O	80	970	Initial
11	P	64	1098	Initial
12	Y	91	1280	Initial
13	O	102	1484	Initial
14	P	103	1690	Initial
15	Y	115	230	**Repair**
16	O	109	448	**Repair**
17	P	49	546	**Repair**

As noted, the last three lines (15-16) will be dedicated to the repair field.

Septic Area 2

Line	Color	Length	Total Length*	System
1	P	57	660	Repair
2	Y	70	800	Repair
3	P	63	926	Repair
4	O	55	1036	Repair
5	Y	50	1136	Repair
6	O	50	1236	Repair
7	Y	50	1336	Repair
8	O	33	1402	Repair
9	Y	33	1468	Repair
10	O	33	1534	Repair
11	O	33	1600	Repair
12	O	33	1666	Repair

* includes 546 feet from Septic Area 1

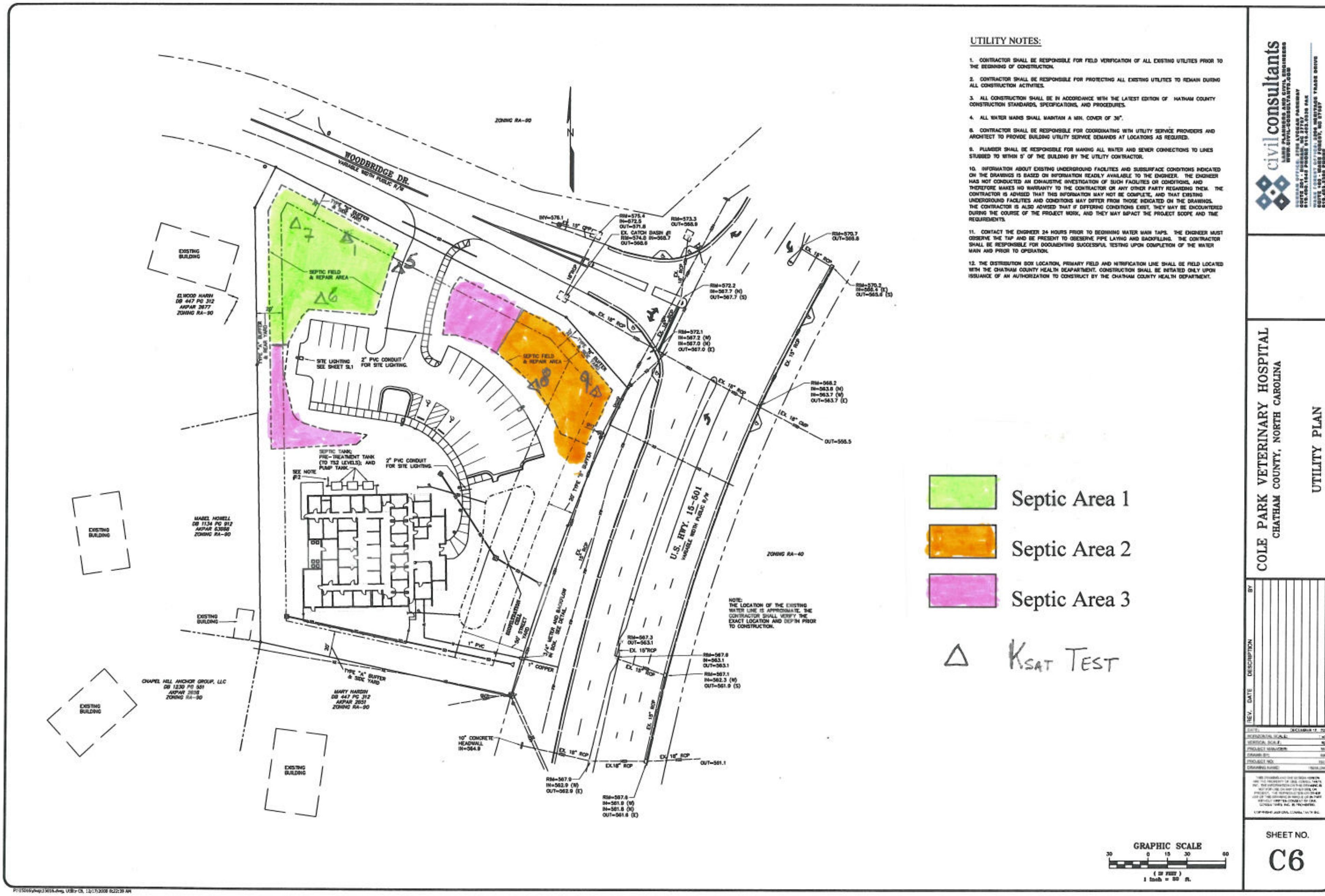
No part of Septic Area 3 is currently included in the septic field design though soil borings indicate that it can be used as a drianfield. However, due to topographic limitations, it was not feasible to field delineate drip tubes. It is anticipated that during site construction, this area will be smoothed out and returned to its original topography. Based on this scenario, if the area is ever needed for septic field, it will likely be years in the future which will provide additional time for the soil to return to its natural state.

CONCLUSIONS

The findings presented herein represent TCG's professional opinion based on our site and soils evaluation and knowledge of the current laws and regulations governing on-site wastewater systems in North Carolina (Section .1900 of the North Carolina Administrative Code). Soils naturally change across a landscape and contain many inclusions. As such, attempts to quantify them are not always precise and exact. Due to this inherent variability of soils and the subjectivity when determining limiting factors, there is no guarantee that a regulating authority will agree with the findings of this report.

Based upon the site evaluation, it is the opinion of TCG that there is an area suitable for a 600 gpd veterinary clinic using a pre-treated (TS-2) subsurface drip system at a 0.187 LTAR. Such systems are permitted via the Chatham County Environmental Health Department. Any concurrence with the findings of this report would be made at such time that an Improvement Permit is issued.

Figure 1 – Cole Park Vet



K_{SAT} Test Details

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 11/20/2008
Location: 1

SET UP

	cm	inches
Hole Depth (cm):	63.5	25.0
Reference (cm):	+ 15.2	6.0
Head (cm):	- 25.4	10.0
CHT Tube(s) setting:	= 53.3	21.0

Valve Setting: x
1-ON 2-ON

	cm	inches
Target Water Level:	25.4	10.0
Beginning Water Level:	22.9	9.0
Ending Water Level:	22.9	9.0

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00058707

NOTE: Readings based on Ending Water Level

Conversion Factor (C.F.): 105.0

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	(hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
48	0.0	105.0	0.0						
40.9	7.1	105.0	10.0	10.00	0.167	4473.0	2.6260	1.0338	15.468
40	0.9	105.0	20.0	10.00	0.167	567.0	0.3329	0.1311	1.961
39.3	0.7	105.0	30.0	10.00	0.167	441.0	0.2589	0.1019	1.525
38.7	0.6	105.0	40.0	10.00	0.167	378.0	0.2219	0.0874	1.307
38.2	0.5	105.0	50.0	10.00	0.167	315.0	0.1849	0.0728	1.089
37.6	0.6	105.0	60.0	10.00	0.167	378.0	0.2219	0.0874	1.307
37.1	0.5	105.0	70.0	10.00	0.167	315.0	0.1849	0.0728	1.089
36.6	0.5	105.0	80.0	10.00	0.167	315.0	0.1849	0.0728	1.089
36.2	0.4	105.0	90.0	10.00	0.167	252.0	0.1479	0.0582	0.871
35.8	0.4	105.0	100.0	10.00	0.167	252.0	0.1479	0.0582	0.871
35.4	0.4	105.0	110.0	10.00	0.167	252.0	0.1479	0.0582	0.871
						Final Ksat	**0.148**	**0.058**	**0.871**

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 12/9/2008
Location: 5

SET UP

	cm	inches
Hole Depth (cm):	64.8	25.5
Reference (cm):	+ 11.4	4.5
Head (cm):	- 17.8	7.0
CHT Tube(s) setting:	= 58.4	23.0

Valve Setting: x (1-ON / 2-ON)

	cm	inches
Target Water Level:	17.8	7.0
Beginning Water Level:	17.8	7.0
Ending Water Level:	17.8	7.0

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00086006

NOTE: Readings based on Ending Water Level

Conversion Factor (C.F.): 20.0

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	Elapsed Time (hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
50.5	0.0	20.0	0.0						
44.5	6.0	20.0	10.0	10.00	0.167	720.0	0.6192	0.2438	3.648
42.3	2.2	20.0	25.0	15.00	0.250	176.0	0.1514	0.0596	0.892
40.8	1.5	20.0	35.0	10.00	0.167	180.0	0.1548	0.0609	0.912
39.3	1.5	20.0	45.0	10.00	0.167	180.0	0.1548	0.0609	0.912
37.8	1.5	20.0	55.0	10.00	0.167	180.0	0.1548	0.0609	0.912
36.3	1.5	20.0	65.0	10.00	0.167	180.0	0.1548	0.0609	0.912
						Final Ksat	**0.155**	**0.061**	**0.912**

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 12/9/2008
Location: 6

SET UP

	cm	inches
Hole Depth (cm):	53.3	21.0
Reference (cm):	+ 10.2	4.0
Head (cm):	- 17.8	7.0
CHT Tube(s) setting:	= 45.7	18.0

Valve Setting: x (1-ON / 2-ON)

	cm	inches
Target Water Level:	17.8	7.0
Beginning Water Level:	17.8	7.0
Ending Water Level:	17.8	7.0

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00086006

NOTE: Readings based on Ending Water Level

Coversion Factor (C.F.): 20.0

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	Elapsed Time (hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
49	0.0	20.0	0.0						
45.8	3.2	20.0	10.0	10.00	0.167	384.0	0.3303	0.1300	1.945
45.5	0.3	20.0	20.0	10.00	0.167	36.0	0.0310	0.0122	0.182
44.4	1.1	20.0	30.0	10.00	0.167	132.0	0.1135	0.0447	0.669
43.2	1.2	20.0	40.0	10.00	0.167	144.0	0.1238	0.0488	0.730
42.6	0.6	20.0	50.0	10.00	0.167	72.0	0.0619	0.0244	0.365
42	0.6	20.0	60.0	10.00	0.167	72.0	0.0619	0.0244	0.365
41.4	0.6	20.0	70.0	10.00	0.167	72.0	0.0619	0.0244	0.365
40.8	0.6	20.0	80.0	10.00	0.167	72.0	0.0619	0.0244	0.365
						Final Ksat	**0.062**	**0.024**	**0.365**

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 12/9/2008
Location: 7

SET UP

	cm	inches
Hole Depth (cm):	52.1	20.5
Reference (cm):	+ 11.4	4.5
Head (cm):	- 17.8	7.0
CHT Tube(s) setting:	= 45.7	18.0

Valve Setting: x (1-ON / 2-ON)

	cm	inches
Target Water Level:	17.8	7.0
Beginning Water Level:	17.8	7.0
Ending Water Level:	17.8	7.0

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00086006

NOTE: Readings based on Ending Water Level

Coversion Factor (C.F.): 20.0

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	Elapsed Time (hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
32.9	0.0	20.0	20.0						
30.7	2.2	20.0	26.0	6.00	0.100	440.0	0.3784	0.1490	2.229
28.8	1.9	20.0	32.0	6.00	0.100	380.0	0.3268	0.1287	1.925
27.1	1.7	20.0	38.0	6.00	0.100	340.0	0.2924	0.1151	1.722
25.6	1.5	20.0	44.0	6.00	0.100	300.0	0.2580	0.1016	1.520
24.1	1.5	20.0	50.0	6.00	0.100	300.0	0.2580	0.1016	1.520
22.6	1.5	20.0	56.0	6.00	0.100	300.0	0.2580	0.1016	1.520
						Final Ksat	**0.258**	**0.102**	**1.520**

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 12/9/2008
Location: 8

SET UP

	cm	inches
Hole Depth (cm):	68.6	27.0
Reference (cm):	+ 12.7	5.0
Head (cm):	- 17.8	7.0
CHT Tube(s) setting:	= 63.5	25.0

Valve Setting: x (1-ON / 2-ON)

Coversion Factor (C.F.): 20.0

	cm	inches
Target Water Level:	17.8	7.0
Beginning Water Level:	17.8	7.0
Ending Water Level:	19.1	7.5

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00077528

NOTE: Readings based on Ending Water Level

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	Elapsed Time (hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
23	0.0	20.0	0.0						
21.5	1.5	20.0	5.0	5.00	0.083	360.0	0.2791	0.1099	1.644
20	1.5	20.0	10.0	5.00	0.083	360.0	0.2791	0.1099	1.644
18.5	1.5	20.0	15.0	5.00	0.083	360.0	0.2791	0.1099	1.644
17.1	1.4	20.0	20.0	5.00	0.083	336.0	0.2605	0.1026	1.534
15.6	1.5	20.0	25.0	5.00	0.083	360.0	0.2791	0.1099	1.644
14.1	1.5	20.0	30.0	5.00	0.083	360.0	0.2791	0.1099	1.644
12.6	1.5	20.0	35.0	5.00	0.083	360.0	0.2791	0.1099	1.644
						Final Ksat	**0.279**	**0.110**	**1.644**

HYDRAULIC CONDUCTIVITY STUDY
Pagel-Smith Tract 7317

Date: 12/9/2008
Location: 9

SET UP

	cm	inches
Hole Depth (cm):	57.2	22.5
Reference (cm):	+ 15.2	6.0
Head (cm):	- 17.8	7.0
CHT Tube(s) setting:	= 54.6	21.5

Valve Setting: x (1-ON / 2-ON)

Coversion Factor (C.F.): 20.0

	cm	inches
Target Water Level:	17.8	7.0
Beginning Water Level:	17.8	7.0
Ending Water Level:	17.8	7.0

Hole diameter (cm): 5.5
Hole radius (r): 2.75
coefficient A: 0.00086006

NOTE: Readings based on Ending Water Level

Water Reading	change in water level	Chamber C.F.	clock time (min)	Elapsed Time (min)	Elapsed Time (hr)	Q (cm3/hr)	K (cm/hr)	K (in/hr)	K (gpd/sq foot)
34	0.0	20.0	0.0						
33.6	0.4	20.0	8.0	8.00	0.133	60.0	0.0516	0.0203	0.304
33.6	0.0	20.0	18.0	10.00	0.167	0.0	0.0000	0.0000	0.000
31	2.6	20.0	28.0	10.00	0.167	312.0	0.2683	0.1056	1.581
29.4	1.6	20.0	38.0	10.00	0.167	192.0	0.1651	0.0650	0.973
27.9	1.5	20.0	48.0	10.00	0.167	180.0	0.1548	0.0609	0.912
26.4	1.5	20.0	58.0	10.00	0.167	180.0	0.1548	0.0609	0.912
25	1.4	20.0	68.0	10.00	0.167	168.0	0.1445	0.0569	0.851
23.6	1.4	20.0	78.0	10.00	0.167	168.0	0.1445	0.0569	0.851
						Final Ksat	**0.144**	**0.057**	**0.851**