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June 30, 2006

Mr. George Farrell, Jr.
210 Joseph Pond Lane
Cary, NC 27519

Re: Soil/Site Investigation for Proposed Reuse Water Distribution System Project (Farrell #2), Chatham Co., NC.

Dear Mr. Farrell:

This letter report discusses field work completed at the proposed project property completed during March-April, 2006 by Soil Water and Environment Group (SWE) personnel as well as data analysis in coordination with Mr. Hal House of Integrated Water Systems (IWS) for a proposed reuse water receiver system. The information contained in this report can be used in the application process for a Division of Water Quality (DWQ) non-discharge permit (15A NCAC 02H.0219) for the proposed reuse water distribution system at your Mom's property (Farrell #2). A site investigation and report by Agriwaste Technologies (June 2005) was utilized to confirm existing site conditions and proposed receiver areas. Additional site analysis was accomplished to investigate additional receiver area within buffers due to the quality of irrigation water proposed with the treatment system. Saturated hydraulic conductivity measurements were also completed to aide with system design.

The site was investigated and observations were recorded about the suitability of native, undisturbed soils to receive reuse-quality water from the IWS reuse system. The site is located off Farrington Road (SR. 1008) and southeast of Bennett Road (SR 1717) in Chatham County, NC (Figure 1). Soils found on the site and vicinity are characteristic of Triassic Basin soils. Vegetation on the site consists of a mixture of mature pine/hardwood forest (40-60 yrs.).

According to the Soil Survey for Chatham County (NRCS) soils present on the uplands of the site most resemble the Creedmor-Green Level Complex series soil. These soils individually are deep, slowly permeable, somewhat poorly drained, formed in residuum weathered from Triassic material of the Piedmont uplands. However field augerings revealed soils present are most similar to White Store series soil in the study area (~ 4.0 acres). White Store soils perch water seasonally due to the lower permeable subsoil at 1.0-2.5 feet during the winter and early spring months and after heavy rainfalls. These soils are generally not suitable for subsurface wastewater systems, but can be utilized with surface drip or spray irrigation systems as well as reclaimed water irrigation.

Figure 1 – Farrell Site #2 Proposed Reclaimed Water System Site Location Map

Based on texture alone, these soils may be able to accommodate less than 0.1 gpd/ft^2 flow rates for subsurface treatment. Soil boring logs for the proposed facility soils are included at the back of this report.

To refine the recommended liquid loadings for the reuse system based on soils and climate conditions, saturated hydraulic conductivity measurements were performed at various locations across the proposed receiver site. Recommendations for liquid loadings are based on surface land application and treatment. Therefore, the most limiting soil horizon and saturated hydraulic conductivities will be used to calculate recommended liquid loadings.

Site disturbance must be minimized to maintain the integrity and function of the proposed reclaimed water system. Site disturbance can create unsuitable conditions for a surface application system. The following calculations represent the allowable irrigation on the areas investigated.

The instantaneous loading rate for the White Store surface horizons found in the receiver Soil Area is found in Table 1 to be 0.4-0.7 (sandy loam Ap horizon) for the given slopes (4-8%) range. Since a good vegetative cover crop will be maintained, this rate can be increased by 25% to 0.5-0.8 in/hr. However, depth to the underlying clay horizon is variable and shallow in some cases, so this 25% increase is not recommended. In fact, a 25% decrease is recommended resulting in rates of 0.3 - 0.5 in/hr.

Table 1: Typical Ranges of Soil Infiltration Rates by Soil Texture and Slope.

	Basic Infiltration Rate (in/hr[1])		
	Slope		
Texture	**0-3%**	**3-9%**	**9+%**
sands	1.0+	0.7+	0.5+
loamy sands	0.7-1.5	0.5-1.0	0.4-0.7
sandy loams and fine sandy loams	0.5-1.0	0.4-0.7	0.3-0.5
very fine sandy loam and silt loam	0.3-0.7	0.2-0.5	0.15-0.3
sandy clay loam and silty clay loam	0.2-0.4	0.15-0.25	0.1-0.15
clay and silty clay	0.1-0.2	0.1-0.15	<0.1

Source: Sprinkler Irrigation Association, Sprinkler Irrigation (1969)
1. For good vegetative cover, these rates may be 25-50% greater. For poor surface conditions, rates may be as much as 50% less.

Water Balance:

A water balance or budget was calculated for water losses and gains based on specific site data and long-term climate data. Soil drainage rate was estimated based on qualitative observations, soil chemical and physical data, and site specific hydraulic conductivity data (K_{sat}). The percolation, or drainage rate was calculated as 10.0% of the saturated hydraulic conductivity of the most restrictive horizon in the soil (Table 2 – Saturated Hydraulic Conductivity Data) due to the site topography and landscape position. The rate used is .02 in/hr (lower subsoil for SBs-1, 2, and 3 – See attached borings). Thus 10.0% of 0.02 in/hr is .048 in/hr. No natural runoff was used in the water balance determination to be conservative. Long-term, 45 year precipitation values used in the water balance represent the 50th percentile year for the region (Chapel Hill, NC) obtained from the North Carolina State Climate Office. Evapotranspiration data was utilized from data determined by the Thornthwaite method for calculating PET, one appropriate method for the Southeastern region.

System Specifications for the Study Area (Soil Area 1) (Figure 1 – Site Investigation Map):

Allowable Average Design Flow (gpd)	2661 gpd
Allowable Irrigation Rate (in/wk)	.18 in/wk
Estimated Sprayfield Area Available (ac)	4.0 ac.
Maximum Instantaneous Application Rate (in/hr)	.3-.5 in/hr

Buffers required around buildings, property lines, and surface waters will need to be accounted for in the final irrigation design. Treating the effluent to reuse-quality standards will reduce buffer distances for most applications. These final calculations should be completed by the system designer to accommodate the area required for land treatment. Approximate areas and total suitable area (~ 4.0 ac.) for the proposed system were determined using existing site planning data and on-site information (Figure 3 – Soil Area Map).

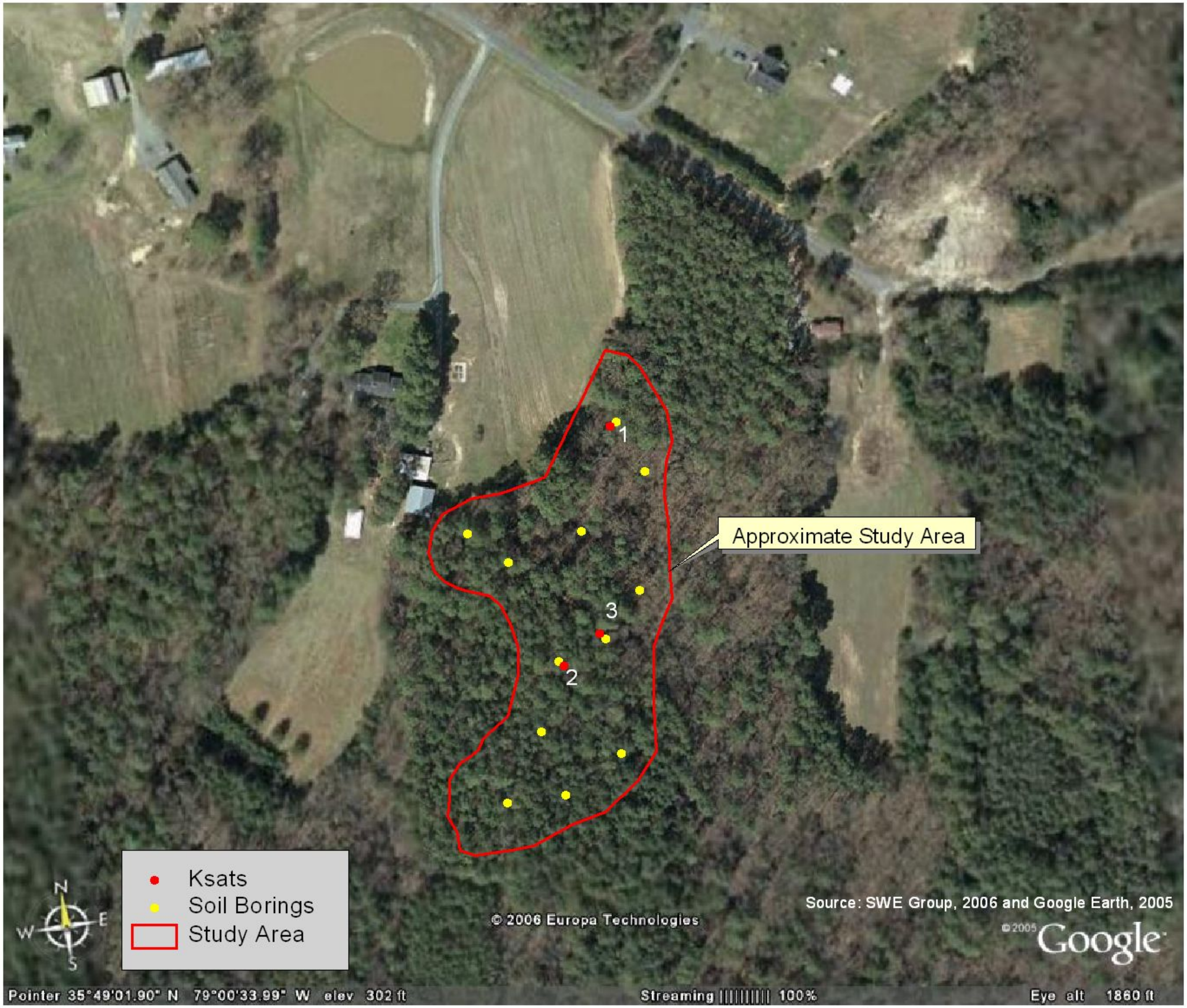

Figure 2: Farrell #2 Site Investigation Map

Overall, the site proposed is a viable receiver site for reclaimed water distribution. Integrating the proposed reclaimed water technologies will serve to provide flexibility in wastewater operations and additional treatment capacity for an otherwise unsuitable site. We look forward to working with you on this project and IWS personnel. Let us know if you have any questions about the information and services provided to date and additional work proposed to permit this system with the DWQ Non-Discharge Unit.

Sincerely,

Scott J. Frederick, EI, NCLSS
Environmental Scientist
President

swe
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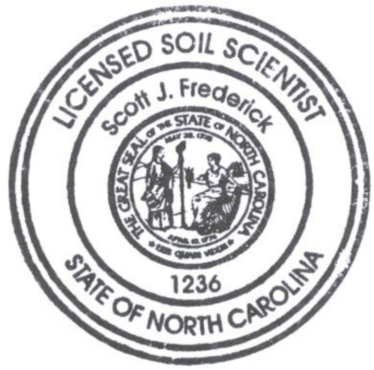

Cc: Mr. Hal House, IWS

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