BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE

www.BREDL.org PO BOX 44 Saxapahaw, North Carolina 27340 (336) 525-2003 office

REVISED COMMENTS

April 18, 2008

Ms. Toya Fields
NPDES Program
Division of Water Quality
1617 Mail Service Center
Raleigh, NC 27699-1617

RE: Siler City WWTP, NPDES permit No. NC0026441.

Dear Ms. Fields:

On behalf of the Blue Ridge Environmental Defense League, North Carolina Healthy Communities, I am submitting comments on the Siler City Wastewater Treatment Plant (WWTP), Chatham County, NPDES permit No. NC0026441. The Blue Ridge Environmental Defense League (BREDL) is a regional, community-based, non-profit environmental organization with more than 40 chapters in North Carolina and the Southeast. Our founding principles are earth stewardship, environmental democracy, social justice, and community empowerment (www.bredl.org).

My comments specifically concern the cumulative impacts of sources of contaminants to the Rocky River from the Siler City WWTP from: 1) Contaminants currently not tested for which are likely present in wastewater effluent discharged to Loves Creek; and 2) Contaminants currently not tested for which are likely present in sewage sludge spread on fields as so-called "fertilizer" in the Rocky River Watershed.

Rocky River designations

The Rocky River has been identified by the NC Natural Heritage Program as three Nationally Significant Aquatic Habitats, and eight Natural Heritage Sights. Endangered species include the Cape Fear Shiner, and five threatened or endangered mussel species. People travel for miles to glimpse one of the state's natural wonders and the world's largest population of the Septima's Clubtail Dragonfly, which makes its home at the Rocky River.

Severely impaired

Loves Creek, a tributary of Rocky River, has been placed on the State 303D list of severely impaired streams. Loves Creek receives wastewater effluent from the Siler City WWTP. Mercury levels in the Rocky River have been reported to be 375 times higher than permitted limits. The Upper Cape Fear Basin Association and the NC Division of Water Quality (DWQ) have classified the Rocky River ecosystem as "Severely Stressed by pollution, sediment, and low stream flows."

Threats to the Rocky River include:

- Contaminants currently tested for in wastewater effluent discharged into Loves Creek from the Siler City WWTP that include toxic metals such as silver, zinc and copper, fecal coliform bacteria, and nitrogen and phosphorus
- Other contaminants currently untested for in wastewater effluent that include mercury, fire retardants (PBDEs), antimicrobial chemicals, endocrine disrupting chemicals found in pharmaceuticals and personal care products, additional untested pathogens such as MRSA, industrial solvents, dioxins, pesticides, herbicides, and PCBs – among others
- Agricultural runoff from farming activities, including livestock operations
- Sediment from land clearing activities
- Increased (severe) droughts
- Upper Rocky River Reservoir responsible for reduced high flows
- Violations of permitting levels for pollutants discharged by the Siler City WWTP into Loves Creek and Rocky River
- Fields that receive sewage sludge containing chemicals and toxic substances that can be transferred to surface waters through runoff and groundwater contamination.

We are recommending the following immediate actions:

1) The NCDENR/DWQ conduct a cumulative impact study of all potential sources of contaminants to the Rocky River, including the total actual volumes of sludge applied to 52 permitted sewage sludge fields located in the Rocky River Watershed;
2) The NCDENR/DWQ implement a monitoring and testing program to identify potential runoff from sewage sludge into surface waters;
3) The NCDENR/DWQ test for a select number of additional contaminants (pharmaceuticals, antimicrobials, fire retardants, etc.) currently not tested for in wastewater effluent and sewage sludge that may pose a potential threat to the ecosystem of the Rocky River Watershed;
4) The NCDENR/DWQ establish regulatory limits for amounts of phosphorus in sewage sludge discharged from WWTPs before it is spread on land;
5) The NCDENR/DWQ remove waivers that allow the spreading of sewage sludge to be applied closer than 100 ft. to adjacent properties located watershed areas that have been designated as either “Impaired” or “Severely Stressed;”
6) The NCDENR/DWQ require that sewage sludge applied on fields located in watershed areas be tilled or disced into the soil to lessen the potential for runoff into surface waters;
7) The NCDENR/DWQ require that all WWTPs adhere to the new 2T Rules that impose nitrogen limits at Realistic Yield Expectations (RYE) rates and reflect cumulative applications of commercial fertilizers, animal manure and sewage sludge in determining agronomic growth rates;
8) Over the longer term we recommend a prohibition of land application of sludge in watershed areas where runoff from sewage sludge may impact surface waters that have been designated as either “Impaired” or “Severely Stressed.”

Sewage sludge or biosolids?

According to the federal government (40 CFR 260.10.) the term "sludge" is defined as "any solid, semi-solid or liquid waste generated from a municipality, commercial industry, waste water treatment plant, water supply treatment plant or air pollution control facility." Sewage sludge is also referred to as "biosolids" by industry pundits. The term was created in 1991 by the Water Environment Federation (WEF), formerly the "Federation of Sewage Works Associations." The idea was to make "sewage sludge" more acceptable to the public for use as a fertilizer. The name was selected by the Name Change Task Force from over 250 suggestions sent in by WEF members. The term "biosolids" was chosen over other suggestions, such as "bioslurp," "black gold," "geoslime," "sca-doo," "humanure," and hu-doo" – among others (*Biosolids*, Wikipedia, See: http://en.wikipedia.org/wiki/Biosolids).

Despite the name "biosolids," which likens sewage sludge to an all-organic, natural material, sewage sludge contains tens of thousands of other toxic substances and chemical compounds. These can include PCBs, pesticides, dioxin, heavy metals and industrial solvents -- basically, all the waste that gets flushed into a municipal wastewater system and removed and concentrated during the treatment process. Studies have also noted the presence in sludge of radioactive substances flushed into sewage systems by hospitals, decontamination laundries and other businesses.

Until the early 1990s, sewage sludge was typically dumped into the oceans. Congress banned that practice because of elevated bacterial levels, closed shellfish beds, and accumulated toxic organic compounds and heavy metals in bottom sediments which caused changes in diversity and abundance of marine life (*Reilly in New York to Mark End of Sewage Sludge Dumping*, EPA press release, June 30, 2002, http://www.epa.gov/history/topics/mprsa/03.htm).

Since then, EPA has instituted a policy promoting sewage sludge disposal on agricultural land. WWTPs offer sewage sludge to farmers free of charge to be used as a nutrient enhancer for soil. Sewage sludge is promoted by EPA, state governments, and industry pundits as a healthy alternative to expensive fertilizers for crops. For wastewater treatment plants, sludge is a cheap and easy solution to dispose of a waste product for which there is no clear disposal option. Haulers or appliers make billions transporting sludge to farmlands, often paying farmers to take it.

Siler City sewage sludge applications

In 2006, over 5 million gallons of sludge were spread on farmlands in Chatham County (*Email communication with Ed Hardee, Aquifer Protection Section*, DENR/DWQ, 2008). Cities that have permits to land apply sewage sludge in Chatham County include public utilities in Siler City, Burlington, Sanford, Cary, Apex, OWASA, Holly Springs, and Pittsboro (*Conversation with Ed Hardee, 4/17/08*).

According to a map provided by Friends of the Rocky River, approximately 52 fields in the Rocky River Watershed are permitted to receive sewage sludge applications. The Siler City WWTP has permits to spread sewage sludge on 34 fields. At least a dozen additional sludge fields are located on the peripheries of the Watershed boundaries (*Friends of Rocky River map of watershed showing locations of sludge fields*, 2008).

According to maps provided by Synagro, a number of fields receiving sludge are located extremely close to bodies of water (NCCH 50 1-6, 8; NCCH 49 3-9; NCCH 40 1-5; NCCH 10 1, 2, 4) and streams (NCCH 50 1-6, 8; NCCH 10 1,2, 4; NCCH 28 1-6). These maps state that 1-inch equals 660 ft. If these maps are to scale, the majority of these permitted fields do not meet the regulatory requirement of a minimum distance of 100 ft. to surface water.

Contaminants tested and not tested

The EPA 503 rules require that arsenic, beryllium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc are tested in sludge as well as testing and pretreatment for certain chemicals base on discharges from area industry. However, it is well documented that wastewater treatment plants are not capable of removing the tens of thousands of potentially harmful chemicals known as organic wastewater contaminants (OWCs) that escape treatment and removal that ultimately end up in wastewater effluent discharged into rivers and streams.

In addition to nitrogen, phosphorous, organic matter and other nutrients, sludge can contain industrial solvents, fire retardants, antimicrobial chemicals, prescription and non-prescription pharmaceuticals, endocrine disrupting compounds, heavy metals, PCBs, radioactive substances from research facilities and hospital waste, and pathogens not destroyed by conventional treatment.

Organic wastewater contaminants (OWCs)

A study conducted by Eastern Washington University and the USGS found that OWCs have been found to concentrate in sewage sludge examined nine different biosolids products destined for land application produced by municipal wastewater treatment plants in seven different states. Fifty-five OWCs from a total of 87 OWCs were detected in one biosolids product with a minimum of 30 and a maximum of 45 OWCs detected in any one sample. Among the most commonly detected compounds were pharmaceuticals (prescription and non-prescription), hormones, detergent metabolites, steroids, fragrances, plasticizers, pesticides, fire retardants, and disinfectants in the biosolids. The compounds detected in greater concentrations were nonlyphenol and octyylphenol detergent metabolites.

The study concluded that a range of compounds are “incompletely removed during wastewater treatment and sequestered in biosolids [a.k.a., sewage sludge] that are subsequently land applied.” The potential concerns surrounding the presence of these compounds in the environment include adverse psychological effects, increased cancer, reproductive impairment in humans and other animals, and antibiotic resistance among pathogenic bacteria (*Survey of Organic Wastewater Contaminants in Biosolids Destined for Land Application*, Kinney et al, Environmental Science Technology, Vol. 40, 2006, p. 7207-7215).

Kinney, a chemist with Eastern Washington University, adds that “little is known about the potential effects of organic wastewater contaminants in wastewater effluent or biosolids disposed of in surface water or on soil” and that potential concerns about the presence of these contaminants in the environment include “adverse physiological effects, increased rates of cancer, and reproductive impairment in humans and other animals as well as antibiotic resistance among pathogenic bacteria.” The study concludes: “the high frequency of organic waste water contaminants detected in biosolids tested and

the high concentrations of individual organic wastewater contaminants present suggest that biosolids can be an important organic wastewater contaminant source to terrestrial environments, and projections about their environmental fate are warranted."

It is quite likely that many of these OWCs are present in wastewater effluent discharged by the Siler City Wastewater Treatment Plant into Loves Creek as well as in sewage sludge from the Siler City WWTP that is land applied in the Rocky River Watershed. However, without testing for these and other emerging contaminants a baseline for contaminant levels cannot be established.

Closer to home, a 2002 USGS study of organic wastewater compounds (OWCs) in surface waters in the Triangle area of North Carolina found similar results. Of the 108 OWCs tested, 24 were detected in at least one sample during the study that included 3 pharmaceutical compounds, 6 fire retardants and plasticizers, 3 antibiotics, 3 pesticides, 6 fragrances and flavorants, 1 disinfectant, and 2 "miscellaneous compounds." Though source identification was not the objective of the study, the results indicated that municipal WWTPs were likely the source of antibiotics and synthetic musks (USGS, *Occurrence of Organic Wastewater Compounds in Selected Surface-Water Supplies, Triangle Area of North Carolina*, 2002-05).

Excessive nitrates and phosphorus in sludge

As noted earlier, sewage sludge has been hailed as an excellent fertilizer because of its nutrient-rich content. However, there are many examples of nitrate contamination to ground water as a result of land applied sewage sludge. The ground water near a sludge application site in Rutherford County was contaminated with nitrates at levels greater than the EPA limit of 10 ppm suggesting that a nearby sludge field spread was responsible for contaminating groundwater and residential private wells (*Supplemental Site Assessment Report, Raleigh Waste Water Treatment Plant*, September, 2003). In another instance, nitrates traveled 1,400 ft. from where they were applied in sludge on land in Robeson County resulting in contamination to residential wells that exceeded the 10 ppm limit (DENR, *Hydrogeologic Characterization and Water quality assessment at Parnell Farm Site, Robeson County, NC*. Soil and Environmental Consultants, December 1996).

Short-term exposure to drinking water with a nitrate level at or just above the health standard of 10 mg/l nitrate-N is a potential health problem primarily for infants. Babies consume large quantities of water relative to their body weight, especially if water is used to mix powdered or concentrated formulas. The digestive systems of babies are more likely than adult digestive tracts to allow the reduction of nitrates to nitrites. In particular, the presence of nitrites in the digestive tract of newborns can lead to a disease called methemoglobinemia (*Nitrate: Health Effects in Drinking Water,* M. McCasland, N. Trautmann, and K. Porter, Natural Resources Cornell Cooperative Extension: http://pmep.cce.cornell.edu/facts-slides-self/facts/nit-heef-grw85.html).

In addition to being toxic to human babies, nitrates affect young animals and are a problem for ruminant animals of all ages. Some livestock have been known to abort fetuses due to drinking water containing high levels of nitrates (*Animal Waste and Water Quality,* Alabama Cooperative Extension System, p.5: http://www.aces.edu/crd/publications/wtrqlty/wq-animalwaste.pdf).

A growing number of studies suggest that nitrates have the potential to be an endocrine disrupting contaminant and pose a direct threat to the conservation and restoration of vertebrate populations and the ecosystems they depend on for survival (*Is Nitrate an Ecologically Relevant Endocrine Disruptor in Vertebrates*? L.Guillette, Jr. and T.M. Edwards, Society for Integrative and Comparative Biology, 2005, 45(1):19-27: http://icb.oxfordjournals.org/cgi/content/full/45/1/19).

It is well documented that increased amounts of nutrients can kill fish due to a lack of oxygen as a result of excessive algal growth (What are the Usual Causes of Fish Kills? USGS: http://water.usgs.gov/owq/FAQ.htm#Q10). However, in addition to fish kills, research conducted by Pieter Johnson of the University of Colorado has found that increased levels of nitrogen cause deformities in amphibians. Snail populations that host microscopic parasites known as trematodes reproduce dramatically in nitrogen rich environments infecting frogs with the parasites which then cause cysts in the limbs of developing tadpoles (*Aquatic Eutrophication Promotes Pathogenic Infection in Amphibians*, Johnson et al, 2007: http://www.colorado.edu/eeb/facultysites/pieter/documents/Johnson%20et%20al.%202007.pdf).

Excess phosphorus also results in algae blooms and disrupts the growth of underwater plants necessary to healthy freshwater ecosystems (*Phosphorus Based Nutrient Management: Essential for Clean Water,* Horne and Goldman, Limonology 2nd Edition, 1994).

While the impacts of sewage sludge on surface waters have not been formally studied, in 2005 the DENR/NCSU conducted a survey of agricultural activities in the Haw River Watershed and found that over 50% of fields with sewage sludge applications had very high levels of phosphorous (*Delineating Agriculture in the Lake Jordan River Basin*, p. 34, DENR/NCSU, 2005-2007, http://h2o.enr.state.nc.us/nps/documents/DelineatingAgricultureintheLakeJordanRiverBasin-REVISED-DeannaOsmond_000.pdf). While phosphorus is tested in sludge by WWTPs, currently there are no restrictions regulating the amounts of phosphorus in sewage sludge applications.

Endocrine disrupting compounds

Studies conducted by the USGS have found hormones, antibiotics, and prescription drugs in urban streams receiving effluent from wastewater treatment plants across the nation. Some of these chemicals such as the detergent degradation product nonylphenol and the fragrances AHTN and HHCB have been shown to disrupt reproduction and growth in fish by affecting the endocrine systems (*Assessing the biological potency of binary mixtures of environmental estrogens using vitellogenin induction in juvenile rainbow trout*, Thorpe et al, Environmental Science and Technology, v. 35, no, 12, 201). Other research shows that sheep reared on pastures containing sludge have disrupted cellular development and hormonal functions (*Common Environmental Chemicals In Diet Affect Fetal Ovarian Development*, Science Daily, 2007, http://www.sciencedaily.com/releases/2007/07/070704144531.htm).

Another chemical known as triclosan, found in popular liquid anti-bacterial soaps, may increase the antibiotic resistance of bacteria in the environment (*Resistance to triclosan in laboratory and clinical strains of Escherichia coli*, McMurry et al, FEMS Microbiology

Letters, v. 166, no. 2, 1998) and reduce algae diversity in streams (*Effects of three pharmaceutical and personal care products on natural freshwater algal assemblages*, Wilson et al, Environmental Science and Technology, v. 37, no. 9, 2003).
Other studies have found that levels of triclosan and triclocarban resist degradation (50% and 76 % respectively) and remain unchanged by aerobic and anaerobic digestion in a WWTP. Both these unregulated chemicals have been found to concentrate in sewage sludge that is spread on land. Triclosan disrupts the functions of the endocrine system in cultured cells while triclocarbon contains trace amounts of dioxins, a known carcinogen (*Antimicrobials accumulate in municipal sludge used to fertilize crops*, American Scientist Observer, 2006, http://www.americanscientist.org/template/AssetDetail/assetid/54434).

U.S. Geological Survey Scientists and their colleagues from Colorado State University at Pueblo published findings which demonstrate that organic chemicals introduced to the environment via the land application of sewage sludge and are transferred to earthworms and enter the food chain. Several compounds detected in earthworms included including phenol (disinfectant), tributylphosphate (antifoaming agent and flame retardant), benzophenone (fixative), trimethoprim (antibiotic), and the synthetic fragrances galaxolide and tonalide, detergent metabolites and the disinfectant triclosan (*Earthworms Found to Contain Chemicals From Households and Animal Manure*, Science Daily, 2008, http://www.sciencedaily.com/releases/2008/02/080223112253.htm).

Numerous research studies have shown that endocrine-disrupting compounds and pharmaceuticals that have the ability to alter the sex of fish and create antibiotic resistance. In Boulder Creek and the South Platte River, Colorado, researchers found more feminized fish downstream of sewage effluent sites than upstream. At least two estrogen compounds, a natural estrogen and a type of synthetic estrogen found in birth control pills, contributed to the feminization. The Colorado study found that each compound was potent enough to cause changes in fish on its own, but together had an even greater impact (*Wading in Hormones: Estrogen Invades Colorado's South Platte River*, ScienceLine, Aug, 1, 2007: http://scienceline.org/2007/08/01/environment-anderson-water_hormones/).

Endocrine disrupting compounds found in effluent discharged into tributaries from wastewater treatment plants are capable of disrupting the endocrine systems of fish and birds essential to maintaining a healthy ecosystem. A 2002 USGS study documented the presence of emerging contaminants, including prescription and non-prescription drugs, hormones, and other wastewater compounds, in a network of 139 targeted streams across the United States. The study found that in the Boulder Creek, upstream, where the water flows clear out of the Rocky Mountains, the ratio of males to females is 50-50. Downstream, below the Boulder wastewater-treatment plant, the females outnumber the males by 5 to 1. About 10% of the fish had both male and female sexual characteristics (*Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams*, USGS Fact Sheet, http://toxics.usgs.gov/regional/emc_surfacewater.html).

PBDEs (polybrominated diphenyl ethers)

PBDEs are a class of chemicals found in fire retardants that have been associated with developmental disorders and thyroid malfunctions. Low concentrations of PBDEs found in samples of surface waters in Triangle area of North Carolina. Three classes of chemicals include Penta, Deca and Octa BDEs. DECA-BDEs have also been found at

5,000 ppm in sewage sludges. PBDEs are chemically similar to PCBs, which were also used as a flame retardant prior to being banned due to adverse health effects on the immune system, reproductive system, nervous system, and endocrine system, and are likely human carcinogens. PBDEs are ubiquitous in the environment and as far as Antarctica. Canada and the U.S. are reported to have the largest concentrations as EU has banned many chemicals. PBDE levels in humans are reported to be 10-to-100 times higher in U.S. than in Europe as U.S. is the lead producer and consumer of products containing PBDEs.

New data collected by Dr. Robert Hale with the Virginia Marine Institute, suggests that PBDEs are both more toxic and widespread in humans and wildlife, and that DECA-BDEs breaks down into additional toxic substances (*Flame Retardants May Be More Toxic Than Thought*, Oakland Tribune, 2007). Studies show that PBDEs cause neurological damage and thyroid damage in lab animals. A study done in Berkeley, CA, of PBDEs in children's blood of one family who volunteered to be monitored showed high concentrations of PBDEs. DECA-BDEs have also been linked to Cryptorchidism, or undescended testicles in infant males. North Carolina is currently examining legislation to ban certain products that contain PBDEs (*Power point presentation by Dr. Heather M. Stapleton, Duke University, Nicholas School of the Environment & Earth Sciences, Durham, NC*, See: http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=12.

Senator Barbara Boxer has called for Senate hearings to investigate the risks of pharmaceuticals in drinking water and the risks to water, food and health from sewage sludge used for fertilizer on farmlands (*Press release: Sixty-eight Public Interest Groups Applaud Senator Barbara Boxer's Investigation and Hearing on Toxics in Drinking Water and Sewage Sludge Poisoning on Food*, 2008).

It is clear that an array of chemicals are entering our food chain and ecosystems via effluent from wastewater treatment plants and sewage sludge (being promoted as a low cost alternative to high-priced fertilizer) are not being tested or monitored. Research shows that these chemicals can and do harm the reproductive systems of fish and other aquatic species. The long-term impacts on humans are unknown.

In light of this information, and in light of the fact that the federal government is not fulfilling its mission to investigate these matters in protecting human health and the environment in a timely manner, we respectfully request that NCDENR/DWQ take the necessary steps to address the actual, cumulative impacts of all potential sources of contamination to the rivers and streams in North Carolina, starting with the Rocky River.

We appreciate this opportunity to present our comments. Please keep me apprised of the status of the draft NPDES permit and any other matters that may affect the Rocky River and Rocky River Watershed. Thank you.

Sincerely,

Susan Dayton
(336) 525-2003 /sdayton@swcp.com

cc: Joel J. Brower, Town Manager, Siler City
Coleen Sullins, Director, DWQ