BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

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| PROPOSED SITE SPECIFIC RULE FOR CITY OF SPRINGFIELD, ILLINOIS, OFFICE OF PUBLIC UTILITIES, CITY WATER, LIGHT AND POWER AND SPRINGFIELD METRO SANITARY DISTRICT FROM 35 ILL. ADM. CODE SECTION 302.208(g) | ) | R09-8 (Site Specific Rule – Water) |

**PRE-FILED TESTIMONY OF DON SCHILLING,**
**IN SUPPORT OF PROPOSED SITE SPECIFIC RULE**

NOW COMES the Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power ("CWLP") and Springfield Metro Sanitary District ("SMSD") (collectively "Petitioners"), by and through their attorneys, HODGE DWYER ZEMAN, and pursuant to 35 Ill. Adm. Code § 102.424 and the Hearing Officer Order, dated September 19, 2008, submits the following Pre-Filed Testimony of Don Schilling for presentation at the November 3, 2008 hearing scheduled in the above-referenced matter.

**TESTIMONY OF DON SCHILLING**

My name is Don Schilling. I am employed at Burns & McDonnell ("Burns") in Kansas City, Missouri, as a Senior Associate Chemical Engineer. I hold a Bachelor of Science degree in Engineering Science from Rockhurst University in Kansas City. I have over thirty-five years experience as a consultant in the power industry with primary emphasis on water and wastewater treatment. My current resume is attached.

My testimony today concerns Burns' study that included the review of boron treatment technologies, the alternatives considered, their relative effectiveness, and their

costs, as well as Burns' assessment of the impact on the flue gas desulfurization system ("FGDS") for CWLP's Dallman units.

In March 2004, Burns was contracted to investigate options available to treat FGDS wastewater for the removal of boron from the FGDS purge stream. The level of boron reduction was significant, either requiring greater than 95 percent removal or requiring zero liquid discharge from the FGDS. The purpose of this study was to identify and evaluate possible treatment options and to provide capital and operating cost estimates for comparison of the systems that were identified. This study was a continuation of the investigation of the sources of boron in the Dallman/Lakeside ash pond system that was performed by Hanson Professional Services Inc. ("Hanson"). The initial Hanson study identified the primary source as the FGDS purge stream and provided potential methods of treatment for consideration, but did not compare costs for various treatment options. I was assigned to review the technical comparison of the treatment options that were considered. Although I was not directly involved in preparing the cost comparison, Burns did provide capital and annual operating cost estimates that were used to compare viable options. The estimated equipment cost for each of the processes evaluated was based on pricing provided by equipment suppliers. A table summarizing these comparative costs is provided in Table 6-2 of Hanson's Technical Support Document that was filed with the Petition as Exhibit 1 in this rulemaking. As seen in Table 6-2, the brine concentrator ("BC")/spray dryer system offered the lowest comparative present value cost.

Boron removal processes that were evaluated included selective boron ion removal using activated carbon or chelating ion exchange resin,

precipitation/coagulation, reverse osmosis ("RO"), and mechanical evaporation. In addition to the above treatment processes, Burns investigated options available to dispose concentrated waste brine that resulted from the treatment processes. Each of the treatment processes considered would produce a waste brine, which consisted of either concentrated regeneration waste from the ion exchange process, concentrated RO reject, or brine from the BC evaporation process. Options that were considered included conditioning waste fly ash and disposal using an evaporation pond. At the time of the study, there was very little literature or experience available regarding FGDS wastewater treatment or boron removal. Most of the FGDS treatment processes targeted metals reduction and clarification.

Although a review of available literature did not reveal any applications where activated carbon provided any significant removal of boron, ion selective resins were available that target boron and provide the capability to selectively remove boron from water and wastewater streams. Boron in water is present in some form of boric acid. At the pH level of the FGDS blowdown boric acid is undissociated as $H_3BO_3$ and can be removed using a weak base ion exchange resin. Boron-selective resins are typically used for the removal of boron from drinking water supplies. In these applications, the boron concentration of the water to be treated was typically a few parts per million ("ppm"). There was no literature that discussed treatment of waste streams containing several hundred ppm boron level seen in the FGDS waste stream. Based on information from resin suppliers, high chlorides concentration and low pH generally seemed to reduce the effectiveness of the removal of boron. The FGDS wastewater shows both characteristics (high chlorides and low pH), thus boron removal efficiency was not expected to be high.

With the use of ion selective resin, dilute solutions of acid and caustic are used for the regeneration of the resin, producing a waste stream containing a higher concentration of boron and neutralized salts from the regenerant chemicals. The amount of wastewater would be dependent on the concentration of boron in the FGDS blowdown. Based on a boron level of 400 ppm in 175 gallons per minute gallons per minute ("gpm") of FGDS blowdown, the volume of wastewater generated was estimated to be about 80 gpm. This wastewater stream would then be treated using a BC and crystallizer to produce a dry waste product. This treatment option was not recommended because of the lack of operating experience treating FGDS waste or treating water containing high levels of boron, the high comparative cost, and the large amount of demineralized water required for regeneration, as well as the large volume of wastewater generated. Comparative capital and operating costs were not developed for this option because the capability of achieving the desired boron removal rate was questionable and would require pilot testing to demonstrate the effectiveness of this process.

Another treatment option considered was precipitation/coagulation. Because of the high solubility of boron (2.7 percent at 32 $^{o}$F, and 40 percent at 212 $^{o}$F), precipitation of boron is unlikely to occur at the concentrations in this application (boron concentration 200 – 400 ppm). Co-precipitation is also unlikely. Hanson reported a commercially available agent for boron co-precipitation, but indicated that it is more applicable at higher boron concentrations. Burns investigation of this agent indicated that the company that produced this material is no longer making it because the product failed to perform. Thus, this option was not recommended for further investigation. Subsequent to the initial evaluation, a program was initiated in the summer of 2007 to sample the

FGDS waste treatment plant at the Homer City Power Plant to evaluate FGDS wastewater treatment. The treatment process consisted of a two-stage lime softening/coagulation process. The inlet boron concentration was reported to be 224 ppm with a treated effluent boron concentration being reduced to 191 ppm. This removal rate of about 15 percent does not provide the boron removal needed to achieve the boron level required to discharge the wastewater from CWLP's Dallman units. This removal rate is also consistent with the boron removal achieved using the Dallman FGDS blowdown clarifier.

Both conventional RO and high efficiency RO ("HERO") treatment options were evaluated. Because the FGDS blowdown is saturated with calcium sulfate as well as other potential foulants, the conventional RO system would require pretreatment similar to the pretreatment used for the HERO process. Therefore, the study primarily considered the HERO process which includes full softening of the FGDS blowdown using both lime/soda ash softeners and ion exchange softeners for polishing prior to treatment with the RO. Because the waste stream from the HERO process contains sodium salts and not calcium and magnesium chloride, the waste steam could be treated using a crystallizer in lieu of the spray dryer. Because the HERO process does not produce as concentrated of a brine as would be produced using the BC, the brine flow rate would be considerably higher. Like the other treatment options, there was no operating experience using the HERO process on FGDS blowdown. This option was not recommended due to higher evaluated cost. Recently, the supplier of the HERO has declined to offer this treatment process for this application. Pilot tests for the HERO process have experienced significant fouling of the membranes when treating FGDS

wastewater, and the supplier has decided not to offer this process for FGDS treatment applications.

Burns recommended the boron mitigation approach which included a zero discharge FGDS wastewater treatment system consisting of two 50 percent BCs followed by two 50 percent spray dryers. BCs use an evaporation process to separate and recover clean water (condensate) from the wastewater brine solution. The recovered water is high-quality, and may be reused in many power plant applications. The concentrated brine is then discharged to either a crystallizer or evaporated in a spray dryer. The most commonly used BCs are called falling film seeded slurry BCs, and most of these use a mechanical vapor compression ("MVC") cycle to provide self-sufficient supply of steam to evaporate water from the recirculated wastewater stream. The brine is recirculated in a vertically mounted tube bundle (falling film heat exchanger), with the steam on the shell side. A stream of the concentrated brine is continuously bled from the system in order to maintain certain levels of total dissolved solids ("TDS") and total suspended solids content so that the system scaling is minimized and the unit operates efficiently.

Two approaches to using MVC evaporators are available. One uses a lime/soda ash softener to pretreat the evaporator feedwater. Because most of the hardness (calcium and magnesium) are present as noncarbonated hardness, the softening process essentially exchanges the hardness in the feedwater for sodium. The advantage of softening the feedwater is that the majority of the ions are sodium salts which can be crystallized using a crystallizer and filtered from the crystallizer recirculating brine. These salts are less soluble than the calcium and magnesium salts that would be present if the feedwater were not softened. The disadvantage of this process is the additional capital cost of the lime

and soda ash feed equipment, softener, and softener sludge dewatering equipment. This process also requires more space, which was not available and produces an additional solids waste product from the softening reaction. The second MVC evaporation method uses FGDS blowdown directly as feedwater to the BC without softening. The brine will consist primarily of calcium and magnesium chloride. These salts are very soluble and do not readily form crystals. A crystallizer can be used to further concentrate the brine but the final brine disposal would require the use of a spray dryer.

Some previous experience using a BC to treat FGDS blowdown was obtained with the Milliken Clean Coal Demonstration Project ("Milliken Project"). One of the goals of the FGDS treatment process was to obtain a marketable grade calcium chloride brine. Much was learned from this demonstration project that was used in the design of the BC system at CWLP. The Milliken Project's system has problems with high vibration in the vapor compressor, deposit formation on the vapor compressor blades, difficulty controlling the suspended solids concentration of the concentrated brine, corrosion, and scaling of the evaporator tubes. Even with these problems, the conclusion of the study was as follows: "[t]he unit ran satisfactorily except that the impurities levels, such as boron, in the product brine were higher than allowed by product specifications. Thus, satisfactory operation of the brine concentration system was not achieved during the time frame of this project. However, if the impurities levels can be reduced, acceptable operation of the system should be achieved." The failure of this demonstration was that a commercial product (calcium chloride brine) was not achieved.

The BC system that was recommended by Burns and purchased by CWLP from Aquatech International incorporated modifications designed to overcome problems

encountered during the Milliken Project. Some of the planned major modifications included:

- Low speed vapor compressors that operate at 4,000 rpm in lieu of the 30,000 rpm.
- Two-stage mist eliminators to eliminate brine droplets from becoming entrained in the inlet to the vapor compressor.
- Improved solids removal scheme to allow the operator to easily adjust the dissolved and suspended solids concentration of the brine.
- Upgraded materials of construction using higher grade chloride resistant stainless steel.
- Dual perforated plate distribution system for improved flow distribution of the brine to the heat exchanger tubes.

Based on the review of wastewater treatment options that were identified, and numerous discussions with various water treatment equipment suppliers, the process that seemed to have the most potential to effectively remove the boron from the FGDS purge stream with the fewest problems was the BC-based system. Because of the limited space available for this treatment process and the desire not to generate the addition solids from the pretreatment softening process, the BC system also included the spray dryer in lieu of the crystallizer. During the detailed design, more consideration was given to the method of disposing the waste solids from the spray dryer. It was determined that the solids generated would have a relatively low density and the resulting volume of solids would be significantly larger than first anticipated. The difficulty of handling and disposal of this waste product resulted in the abandonment of this treatment option. This same

disposal issue would be applicable to all treatment options considered. Although the solid waste from the BC/crystallizer would consist primarily of sodium salt, instead of calcium and magnesium salt, the volume would be much greater due to the sludge generated from the lime/soda ash softening that would be required for pretreatment.

In the spring of 2007, the Illinois Environmental Protection Agency requested CWLP investigate the use of electrocoagulation ("EC") to remove boron from the FGDS waste stream. EC uses charged plates to introduce an electrical current to the wastewater. This electrical current provides a driving force for chemical reactions forming more stable compounds or coalescing charged particles to form larger settleable solids. The method of removing boron could not be fully explained by the suppliers of this equipment; however, a demonstration pilot was performed in late spring of 2007 to determine the effectiveness of this process. These tests evaluated variable such as amps, volts, plate materials, and pH. The test results showed the boron is not a preferential reaction and removal was marginal (less than 10 percent reduction). The pilot test encountered significant foaming and scaling of the reactor plates. The demonstration pilot test demonstrated that this process was essentially ineffective and the plating of the electrodes with salts will cause the system to fail within a short amount of time.

I will be happy to answer any questions. Thank you.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER

and

SPRINGFIELD METRO SANITARY DISTRICT,

Date: October 20, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

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CWLP:002/Fil/Pre-Filed Testimony of Schilling

# Don Schilling, P.E.

***Project Consultant for Water Supply & Wastewater***

### Expertise

- Water Treatment
- Waste Water Treatment
- Chemical Conditioning
- Water Quality Control
- Material Selection

### Education

- B.S. Chemical Engineering, Rockhurst University, 1972

### Registration

- Professional Engineer - Missouri

### Total Years of Experience

32

### Years With Burns & McDonnell

7

### Start Date

2000

Mr. Schilling is a Senior Associate Chemical Engineer with more than thirty years of experience in water and wastewater treatment. His areas of expertise include the design, specification, and procurement of Chemical Treatment Systems for Industrial Facilities and Power Plant Water Treatment and Wastewater Treatment Systems. He has specialized experience in material selection, corrosion control, desalination systems, water treatment systems, ion exchange processes, and water chemical conditioning. Mr. Schilling has participated in the design of numerous power projects and provided design in an Owner Engineer capacity.

### Iatan Station, Kansas City Power & Light

*Weston, Missouri*

Responsible for the design and procurement of water and wastewater treatment systems for a new 850 MW coal fueled steam generating unit. The new unit design incorporates an FGD blowdown treatment system with reuse of cooling tower blowdown to achieve zero liquid discharge.

### J. K. Spruce Station, City Public Service

*San Antonio, Texas*

Prepared conceptual studies to determine additional water treatment system requirements for a new 750 MW coal fueled steam generating unit. Prepared EPC specifications for the procurement of the water treatment equipment.

### Council Bluffs Energy Center, MidAmerican Energy Company

*Iowa*

Responsible for the review of EPC Contractor submittals for water treatment systems for the 790 MW coal-fired plant utilizing one supercritical steam generator burning Powder River Basin (PRB) coal.

### Hugo Unit 2, Western Farmer's Electric Cooperative

*Fort Towson, Oklahoma*

Currently providing the conceptual design for the development of a 750 MW supercritical coal fired unit. The design includes a zero discharge concept for the new unit.

### Prairie State Generating Station, Peabody Energy

*Lively Grove, Illinois*

Responsible for the review of EPC Contractor submittals for the water treatment systems for two 750 MW coal fueled units. Major water treatment equipment includes raw water clarifier/softener, reverse osmosis treatment with mixed bed demineralizer, and deep bed full flow condensate polishing.

### Sugar Creek Combined Cycle, Mirant Sugar Creek, LLC

*Terre Haute, Indiana*

As a Project Process Engineer, he designed and procured water treatment consisting of multimedia filters, reverse osmosis followed by electrode ionization, cycle and circulating water chemical feed, and the sample and analysis system.

### Choctaw Gas Power Plant, Tractebel

*Ackerman, Mississippi*

He was assigned as a Project Process Engineer. He reviewed design of water treatment, wastewater treatment, and chemical conditioning systems as the Owner's Engineer for the combined cycle gas power plant. The design included wastewater treatment facilities to allow zero discharge operation.

**Zeeland Power Station, Mirant Corporation**
*Zeeland, Michigan*
As a Project Process Engineer, he designed and procured water treatment equipment for the combined cycle conversion, including 2-pass reverse osmosis system, sampling and analysis system, cycle chemical feed, and circulating water chemical feed.

**Chehalis Generation Facility, Chehalis Power Generating Limited Partnership**
*Lewis County, Washington*
He was assigned as a Project Process Engineer. He provided engineering review of the design of water treatment and water conditioning systems as the Owner's Engineer for the combined cycle generating plant.

**Perryville Combined Cycle Plant, Perryville Power Company, L.L.C.**
*Perryville, Louisiana*
As a Project Process Engineer, he designed and procured water treatment system consisting of greensand filters, reverse osmosis treatment followed by electrode ionization, sampling and analysis system, circulating water chemical feed, and cycle chemical feed systems for the Combined Cycle Project.

**Bosque County Unit 4, Southern Energy, Inc.**
*Laguna Park, Texas*
As a Project Process Engineer, he designed and procured water treatment equipment consisting of reverse osmosis treatment of Brazos River water, sampling and analysis system, circulating water chemical feed, and cycle chemical feed for the Combined Cycle Conversion Project.

Mr. Schilling provided design of water and wastewater treatment facilities for the following coal-fired units as the EPC contractor. His work included design, procurement, startup, and commissioning.

- JAWA Power, Paiton Power Project; Paiton, Indonesia: The EPC scope included seawater desalination, cycle makeup treatment, condensate polishers, electrochlorination, chemical feed, sampling systems, and wastewater treatment for heavy metals removal for two 650 MW coal-fired units. Mr. Schilling also provided on-site startup and commissioning assistance for all water treatment systems.

- Taiwan Power Company – Taichung Power Station; Taichung, Taiwan: The EPC scope included treatment of the wastewater generated by the flue gas desulfurization systems for eight coal fueled steam generated power plants. On-site assistance was needed to optimize the operation of the treatment process to achieve necessary discharge limits.

Mr. Schilling also had performed studies for several clients to review and develop water management programs or investigate problems associated with corrosion or plant operations. Following is an example of a study performed for a multi-unit facility:

- China Light & Power Company – Castle Peak Power Station; Hong Kong: Prepared a wastewater management study for a 4,500 MW generating facility. The station consisted of eight coal-fueled units and multiple gas/oil fueled combustion

## Don Schilling, P.E.
*(continued)*

turbines. The study evaluated the existing water and wastewater management practices and determined modifications necessary to achieve compliance with new environmental regulations. Following this study, Mr. Schilling managed the engineering effort to implement the recommendations of the study.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

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| PROPOSED SITE SPECIFIC RULE FOR CITY OF SPRINGFIELD, ILLINOIS, OFFICE OF PUBLIC UTILITIES, CITY WATER, LIGHT AND POWER AND SPRINGFIELD METRO SANITARY DISTRICT FROM 35 ILL. ADM. CODE SECTION 302.208(g) | ) | R09-8<br>(Site Specific Rule – Water) |

**PRE-FILED TESTIMONY OF WILLIAM BROWN,**
**IN SUPPORT OF PROPOSED SITE SPECIFIC RULE**

NOW COMES the Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power ("CWLP") and Springfield Metro Sanitary District ("SMSD") (collectively "Petitioners"), by and through their attorneys, HODGE DWYER ZEMAN, and pursuant to 35 Ill. Adm. Code § 102.424 and the Hearing Officer Order, dated September 19, 2008, submits the following Pre-Filed Testimony of William Brown for presentation at the November 3, 2008 hearing scheduled in the above-referenced matter.

**TESTIMONY OF WILLIAM BROWN**

My name is William Brown. I am employed at Crawford, Murphy & Tilly, Inc. in Springfield, Illinois, as a Senior Project Manager. I have twenty-eight years of experience in wastewater treatment, engineering and management. I hold a Bachelor of Arts degree in Physical Science from Sangamon State University (which is now known as the University of Illinois at Springfield) and a Master of Business Administration from the University of Illinois. My current resume is attached.

My testimony today is presented on behalf of SMSD, and concerns SMSD's Spring Creek Wastewater Treatment Plant ("Spring Creek Plant") operations; the Spring

Creek Plant's National Pollutant Discharge Elimination System ("NPDES") Permit and effluent data; the beneficial impact to CWLP of utilizing SMSD's operations; and the economic impact of utilizing SMSD's operations on CWLP.

SMSD owns and operates the Sugar Creek Wastewater Treatment Plant ("Sugar Creek Plant") and the Spring Creek Plant in Springfield, Illinois. The Sugar Creek Plant was put into service in 1973, and treats wastewater and storm water from the southeast and eastern sections of Springfield and adjacent service areas. The Spring Creek Plant was constructed in 1928, with major improvements in the 1930s. It handles wastewater and storm water flows from the southwest, west and northern parts of Springfield and surrounding service areas. The last major improvements to increase the capacity of the Spring Creek Plant were constructed in 1975.

The population served by the Spring Creek Plant from 2000 U.S. Census data was 90,300 and increased just over one percent per year on average for the previous ten years. It is an activated sludge treatment plant that provides treatment and removal of biological oxygen demand ("BOD"), total suspended solids ("TSS"), ammonia and bacteria, and consists of the following main unit processes:

1. Screening for large solids removal;
2. Grit removal for removing heavier sand and grit particles;
3. Primary clarifiers for removing solids and biological matter;
4. Aeration tanks for the main biological treatment process;
5. Secondary clarifiers for removing the remaining fine solids particles (activated sludge is returned from these clarifiers to the aeration tanks);

6. Disinfection, performed on a seasonal basis from May through October;

7. Anaerobic sludge digestion to stabilize primary and secondary waste sludge, which is then stored (biosolids are land applied when weather permits); and

8. Excess flow clarifiers to provide primary treatment during high flow storm events.

The Spring Creek Plant, which discharges its effluent into the Sangamon River ("River") at the confluence of Spring Creek and the River, flows into a 72-inch diameter concrete pipe and is conveyed approximately 5,990 feet before discharging into the River. The 72-inch outfall sewer was constructed in 1973. The 7-day 10-year low flow in the River upstream of the Spring Creek Plant discharge is 54.8 cubic feet per second ("cfs") or 35.4 million gallons per day ("MGD"). The 7-day low flow observed by the Illinois State Water Survey ("ISWS") per its 2002 map of the Spring Creek Plant discharge is 17.5 cfs or 11.31 MGD. The Spring Creek Plant has a seasonal disinfection exemption that only requires disinfection for the months of May through October.

The Spring Creek Plant operates 24 hours per day, seven days per week, and is staffed by seven full-time operators from 7 a.m. to 11 p.m. There is a separate maintenance crew on site eight hours per day, five days per week. It has an average design capacity of 20 MGD. Monthly flows in 2004 through 2006 have ranged from 11.8 MGD to peak flow of over 50 MGD. The design maximum flow of the Spring Creek Plant for complete treatment is currently 50 MGD, which is greater than the 2005 peak of 49 MGD, but 49 MGD puts the Spring Creek Plant at 98 percent of its rated maximum capacity.

On average, the discharge of the Spring Creek Plant is less than the 7-day 10-year low flow of the receiving stream, the River, which is 54.8 cfs or 35.4 MGD. A Spring Creek Plant 7-day low flow of 11.31 MGD has been used for calculating the boron concentration under the scenario for the proposed Site Specific Rule. This flow rate is based on the 7-day low flow presented on the 2002 ISWS map, the latest available. Daily effluent flows as low as 9.29 MGD were observed during an atypically dry September 2007.

The requirement for complete treatment of flows to the Spring Creek Plant is detailed in SMSD's NPDES Permit No. IL0021989 ("NPDES Permit"), which expires July 31, 2009. SMSD anticipates there will be changes in the current NPDES Permit upon renewal. By July 31, 2009, its current expiration date, construction of a new treatment plant should be underway, which will require modifications to the NPDES Permit due to the increased hydraulic capacity. The SMSD has given consideration for the reduction of ammonia nitrogen and total phosphorus to meet Illinois Environmental Protection Agency requirements in their future treatment facilities.

Based upon the 2006 plant influent data, the carbonaceous $BOD_5$ ("$CBOD_5$") concentration ranged from 157 to 214 milligrams per liter ("mg/L") with an average of 172 mg/L. The $CBOD_5$ removal after primary, secondary and tertiary treatment is about 98 percent, for an average effluent $CBOD_5$ of approximately 3 mg/L. The TSS concentration has a range from 132 to 307 mg/L with an average of 198 mg/L for 2006. With a removal rate of over 96 percent, the discharge to the receiving stream had only 7.3 mg/L of TSS on average.

Although not designed for nitrification, through operational adjustments to the Spring Creek Plant, the SMSD has been able to meet its seasonal NPDES Permit requirements for ammonia nitrogen. Data from 2006 shows a reduction in ammonia from an influent value of 12 mg/L to 1.38 mg/L in the tertiary effluent, which is over 88 percent removal. At the present time, ammonia nitrogen loading is at the Spring Creek Plant's maximum capacity, but recommended plant improvements will be designed to provide ammonia nitrogen removal.

Total phosphorus removal is not currently regulated by the Spring Creek Plant's NPDES Permit, so influent and effluent data values are not available, but plant expansion recommendations will take into account phosphorus removal requirements expected in the next permit renewal cycle.

The temperature of the wastewater leaving the Spring Creek Plant varied from a low of 50°F to a high of 78°F in 2006. Effluent leaves the Spring Creek Plant at a pH between 6.4 and 8.0, on average.

A current plant influent boron concentration of 0.25 mg/L was used as background to calculate the new concentration with the flue gas desulfurization system ("FGDS") wastewater included in the flow stream. Based on the 7-day low effluent flow of 11.31 MGD per ISWS, combined with the FGDS wastewater at 0.27 MGD of added flow, and a boron concentration of 450 mg/L, the maximum boron concentration of the Spring Creek Plant's effluent would be 11.0 mg/L. It is anticipated that the boron will not be significantly affected by or adversely affect the Spring Creek Plant's treatment process, and therefore the effluent boron concentration is expected to mirror the influent concentration. Thus, the Spring Creek Plant's effluent maximum boron concentration is

estimated to be 11.0 mg/L. The boron concentration downstream in the River is estimated to be approximately 4.5 mg/L under this scenario.

The Spring Creek Plant consistently meets NPDES regulated parameters. Pumping the CWLP FGDS wastewater to the Spring Creek Plant is not expected to have any effect on the Spring Creek Plant, other than the increase in boron concentration in the effluent. While granting this Site Specific Rule will not reduce, with any level of certainty, the need for the previously-granted 11.0 mg/L adjusted standard for boron, rather, granting this Site Specific Rule may enable CWLP to meet compliant levels in Sugar Creek.

SMSD has contracted with CWLP to accept the FGDS wastewater stream, at a cost to CWLP of $100,000/month, provided that its acceptance does not upset normal Plant operations. The pumping of the FGDS wastewater stream to the Spring Creek Plant will have a capital cost significantly lower than options investigated by CWLP. The estimated capital cost of the pretreatment system, including the pipeline to transfer the pretreated FGDS wastewater and chemical feed system(s) to control odor to the Spring Creek Plant, is $15.5 million. The annual operating and maintenance ("O & M") cost of such treatment is also anticipated to be significantly less than the brine concentrator treatment option, which is estimated to be at least $1.6 million. While some costs may remain fixed, other O & M costs will likely escalate. Using a $10,000 per year escalation factor, a pretreatment life of 30 years, and an interest rate of 8 percent, this equates to a present value of $36,100,000, a present value per electric service of $544. In addition, the pumping station will occupy significantly less space than other alternative technologies and no special or hazardous waste product would be generated.

For the pretreatment system, operation of the patented ClariCone™ has been demonstrated at over 300 installations nationwide. Mixing, tapered flocculation and sedimentation all take place within a completely hydraulically driven vessel. The ClariCone™ maintains a dense, suspended, rotating slurry blanket that provides solids contact, accelerated floc formation and solids capture. The conically shaped concentrator maximizes the slurry discharge concentration and allows plant personnel to visually monitor slurry discharge. The large mass of retained slurry and unique helical flow pattern in the ClariCone™ prevent short-circuiting and resists process upsets. While laboratory jar tests have shown in some instances that ten percent of the boron in the wastewater can be removed with solids settling, the jar test results have not been consistent; thus, CWLP is not claiming any boron removal for purposes of calculating boron concentrations in this proceeding.

A pumping station would be constructed near the Scrubber Building at the CWLP Plant. All sump and pump materials will be corrosion resistant. A 10" diameter fiberglass forcemain would be constructed from the pumping station to a sanitary sewer in the Spring Creek Plant sub-area. This area is generally west of Bergen Park on Eastdale Avenue in the eastern part of Springfield.

The preliminary alignment of the forcemain runs northerly from the CWLP Plant, crossing Stevenson Drive and Sugar Creek, to the CWLP Tansey Road electric substation. The main then turns northwest, bored under I-55, and along Old Rochester Road to South Grand Avenue. The last turn is to the north along Eastdale Avenue to a manhole where Jackson Avenue intersects.

It is anticipated that several air release valves will be required. Sealed and lined vaults will be used to minimize odors and corrosion. Lining of the receiving manhole and several hundred feet of the existing sewer is anticipated at a minimum. CWLP will install, operate and maintain one or more chemical feed sites or stations as deemed necessary by SMSD to control odors and corrosion.

In conclusion, the Spring Creek Plant treats wastewater from a large area which includes approximately two-thirds of Springfield and the town of Chatham. Thus, the contribution of the CWLP wastewater will typically be a small fraction of the total treated daily flow, and this proposed change will not require any capital expenditures by SMSD.

I will be happy to answer any questions. Thank you.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER

and

SPRINGFIELD METRO SANITARY
DISTRICT,

Date: October 20, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

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CWLP:002/Fil/Pre-Filed Testimony of W. Brown

## William A. Brown

Senior Project Manager • **Crawford, Murphy & Tilly, Inc.**

Mr. Brown recently retired as Superintendent of Water Supply & Treatment at City Water, Light and Power, Springfield, Illinois, where he was employed for 20 years. He has a total of 28 years experience in water treatment, engineering and management. He has a keen understanding of city, county and state codes and regulations. He was responsible for operations in water resources, water quality and water purification, including lake and watershed management, new water source development and dealing with property and agricultural issues. He taught chemistry, mathematics and principles of operation for waterworks operators at the local community college. Prior to working at the treatment plant, he performed chemical and microbiological analyses on water and wastewater with State of Illinois certification, technical project manager for various lake and river water quality studies, water main and sewer design, facilities planning reports and construction inspection.

### Relevant Project Experience

**City of Aurora, Illinois**
Assisted the City in resolving operational problems and problematic treatment of Fox River water.

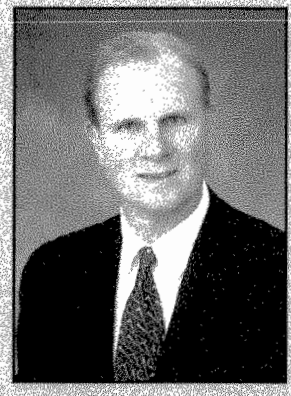
**City of West Chicago, Illinois**
Assisted the City in start up of new 9 mgd lime softening water treatment plant. This is the City's first ever water treatment facility.

**City of Springfield, Illinois**
As part of an alternate water supply study, ran a ClariCone pilot plant on the Sangamon River to determine treatment requirements and techniques during drought conditions.

Sampled and tested the Sangamon River and adjacent gravel pits to determine water quality during drought conditions, normal and flood flows. Discussed future lease/purchase options of the gravel pits with the owners.

### Professional Credentials

- Illinois State American Water Works Association:
  - Recipient of the Thurston E. Larson "Best Paper Award" 1999
  - Recipient of the "Operator's Meritorious Service Award" 2001
- Illinois Potable Water Supply Operators Association
- American Water Works Association
- Horse and Brush Creek Watershed Planning Committee
- Class "A" Water Works License in the State of Illinois
- State certified for microbiological analysis, State of Illinois



***Water Quality***

**Education:**
University of Illinois, MBA, 1989
Sangamon State University, BA, Physical Science, 1975

**Joined CMT in 2004.**

CMT

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

| | | |
|---|---|---|
| PROPOSED SITE SPECIFIC RULE FOR CITY OF SPRINGFIELD, ILLINOIS, OFFICE OF PUBLIC UTILITIES, CITY WATER, LIGHT AND POWER AND SPRINGFIELD METRO SANITARY DISTRICT FROM 35 ILL. ADM. CODE SECTION 302.208(g) | ) | R09-8 (Site Specific Rule – Water) |

**PRE-FILED TESTIMONY OF DEBORAH RAMSEY, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE**

NOW COMES the Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power ("CWLP") and Springfield Metro Sanitary District ("SMSD") (collectively "Petitioners"), by and through their attorneys, HODGE DWYER ZEMAN, and pursuant to 35 Ill. Adm. Code § 102.424 and the Hearing Officer Order, dated September 19, 2008, submits the following Pre-Filed Testimony of Deborah Ramsey for presentation at the November 3, 2008 hearing scheduled in the above-referenced matter.

**TESTIMONY OF DEBORAH RAMSEY**

My name is Deborah Ramsey. I am employed at Hanson Professional Services Inc. ("Hanson") in Springfield, Illinois. I have thirty years of professional experience. I hold a Bachelor of Science degree in Chemical and Petroleum Refining Engineering from the Colorado School of Mines, a Master of Business Administration from Southern Illinois University at Edwardsville, and a Master of Science in Environmental Science from Southern Illinois University at Edwardsville. My current resume is attached.

My testimony today concerns the derivation of and calculations supporting the proposed site specific water quality standard for boron; the condition of the receiving

streams; the historical flow and boron data for the receiving streams; the entities presently discharging to the affected water segments, as well as the entities using water downstream; and the investigation of the flue gas desulfurization system ("FGDS") blowdown as it relates to boron and its chemistry. I am the principal author and principally responsible for the development of Exhibit 1 to the Petition, entitled "*Technical Support Document for Site-Specific Boron Standard for the Springfield Metro Sanitary District Spring Creek Plant, Sangamon County, Illinois*" ("TSD").

CWLP's National Pollutant Discharge Elimination System ("NPDES") Permit, No. IL0024767, issued December 5, 2001, regulates 16 outfalls at the CWLP facility. Discharges from Outfall 003 and Outfall 004 contain high concentrations of boron. CWLP's NPDES Permit was reissued in 1993, and required CWLP to limit and monitor the concentrations of boron in Outfalls 003 and 004 to Sugar Creek. The permit limit for boron was 1.0 mg/L, with compliance to be achieved by December 14, 1994. In May 1994, CWLP filed a petition with the Illinois Pollution Control Board ("Board") seeking an adjusted standard from the Board's water quality standard for boron of 11.0 mg/L for process discharges into Sugar Creek (Outfalls 003 and 004) with downstream decreases in the receiving waterways until compliance was reached with the general water quality standard of 1.0 mg/L. The "*Technical Support Document for Petition for Adjusted Boron Standards for Sugar Creek and the Sangamon River*" was prepared by Hanson (which was, at that time, known as Hanson Engineers, Inc.), and is Exhibit 2 to the Petition. The Board granted the Adjusted Standard in December 1994, in Petition of the City of Springfield, Office of Public Utilities for an Adjusted Standard From 35 Ill. Adm. Code 302.208(e), AS 94-9. Thus, an alternative water quality standard for boron already

applies to portions of the surface waters at issue in this Petition. Figure 1 attached hereto shows the surface waters covered by the Adjusted Standard and the surface waters and other features at issue in this Petition.

The proposed site specific water quality standard for boron would include an area of dispersion with boron concentrations ranging between 4.5 and 11.0 milligrams per liter ("mg/L") from SMSD's Spring Creek Sanitary Treatment Plant ("Spring Creek Plant") Outfall 007 to 182 yards downstream in the Sangamon River; 4.5 mg/L in the Sangamon River from 182 yards downstream of the confluence of Salt Creek with the Sangamon River, a distance of 39.0 river miles; 1.6 mg/L in the Sangamon River from the confluence of Salt Creek with the Sangamon River to the confluence of the Sangamon River with the Illinois River, a distance of 36.1 river miles; and 1.3 mg/L in the Illinois River from the confluence of the Illinois River with the Sangamon River to 100 yards downstream of the confluence of the Illinois River with the Sangamon River. Figure 1 identifies the surface waters at issue in this proceeding.

The proposed site specific water quality standard is based on a 7Q10 low-flow of 54.8 cubic feet per second ("cfs") having a boron concentration of 2.0 mg/L in the Sangamon River upstream of Spring Creek and a 7-day low flow of 17.5 cfs from the SMSD Spring Creek Plant having a boron concentration of 11.0 mg/L. The 2.0 mg/L concentration in the Sangamon River is based on the Adjusted Standard granted to CWLP in 1994. The increase in the Sangamon River flow at Spring Creek is mainly due to discharge from the SMSD Spring Creek Plant. Based on the foregoing, the terms of the proposed site specific rule as set forth in the TSD (and Petition) were developed.

The Sangamon River watershed comprises about 5,419 square miles, all of which lie in the central part of Illinois. Practically all of the area is tillable and, for the most part, is cultivated. The Sangamon River originates in central McLean County, east of Bloomington, flowing such that it is joined by Salt Creek, its largest tributary, and then joins the Illinois River north of Beardstown. The total length of the Sangamon River is about 250 miles. The whole length of the Sangamon River is characterized by a series of pools and shoals, including five impoundments in its basin. Lake Decatur is the only lake located directly on the Sangamon River and is also the deepest portion of the river.

A field survey conducted by Hanson in October 2007 to characterize the general features of the Sangamon River downstream of the CWLP Plant discharge showed it to be a low gradient, meandering stream. Results reported to me from this field survey were as follows. The lower section, below the confluence of the Salt Creek, appears to have been channelized in the past and has scoured out a wider floodway in the sandier soils. Three structures were identified in the survey that create riffle areas that are a source of oxygenation for the Sangamon River during low flow: a former dam immediately upstream of the Spring Creek confluence in Springfield, and two rock check dams located near Petersburg, Illinois. According to the Illinois Streamflow Assessment Model, prepared by the Illinois State Water Survey ("ISWS") in 2007, the mean flow at the confluence with Spring Creek was 2,120 cfs for the base period from 1948 to 1997. During high flow periods, stream discharge can exceed 7,000 cfs at this location.

There are eight NPDES permitted discharges to the Sangamon River from the confluence of the South Fork of the Sangamon River to the Illinois River. These NPDES discharges include: Clear Lake Sand and Gravel Company; Lincoln Place Mobile Home

Park; Riverton Sewage Treatment Plant; Illinois Department of Transportation, Interstate 55, Sangamon County North; SMSD, Spring Creek Plant; Pleasant Plains Water Treatment Plant; Petersburg Sewage Treatment Plant; and Petersburg Water Treatment Plant. Other generally known uses of the Sangamon River include aquatic life habitat and recreation (boating, fishing, swimming). The reach of the Sangamon River at issue in this site specific rulemaking is not reported as used for irrigation of agricultural land, golf courses, nurseries, etc.

Water quality data including boron concentrations in the Sangamon River from the Illinois Environmental Protection Agency ("IEPA") for 1999 through 2004 for three of the monitoring stations on the Sangamon River upstream and downstream of the confluence of Spring Creek were reviewed. Stream discharge volumes in cfs from the United States Geological Survey National Water Information System were also reviewed. The station at Riverton (closest downstream of the existing CWLP NPDES discharge location) had the highest total boron concentrations over the four-year period. While total boron exceeded 1.0 mg/L in nine percent of the sampling events at this station, no boron value exceeded the adjusted standard of 2.0 mg/L of boron. The mean boron concentration at Riverton was 0.394 mg/L over the five-year period from 1999 to 2004.

The condition of four stream segments of the Sangamon River at issue show that all four are included on IEPA's 2006 list of waters where uses are impaired, the Section 303(d) List: the Sangamon River from the South Fork of the Sangamon River to Spring Creek (E-26), the Sangamon River from Spring Creek to Richland Creek (E-04), the Sangamon River from Richland Creek to Salt Creek (E-24), and the Sangamon River from Salt Creek to the Illinois River (E-25). All four segments are identified as impaired

for the designated use of fish consumption; a potential cause of fish consumption impairment is polychlorinated biphenyls from an unknown source. Three segments are identified as impaired for the designated use of primary contact recreation. A potential cause of primary contact recreation impairment is fecal coliform from an unknown source. Stream segment E-26 is identified as impaired for the designated use of aquatic life; potential causes of aquatic life impairment are boron, nitrogen, phosphorus, silver, total dissolved solids, and total suspended solids. Potential sources of these impairments are industrial and/or municipal point source discharges, on-site treatment systems, runoff, channelization, crop production, dams or impoundments, and streambank modifications/destabilization.

A current Spring Creek Plant influent boron concentration of 0.25 mg/L was used to calculate the new concentration with the FGDS wastewater included in the flow steam. Based on the 7-day low effluent flow of 11.31 MGD per ISWS, combined with the FGDS wastewater at 0.27 MGD of added flow and a boron concentration of 450 mg/L, the maximum boron concentration of the Spring Creek Plant effluent would be 11.0 mg/L. It is anticipated that the boron will not be significantly affected by nor adversely affect the Spring Creek Plant's treatment process and therefore the effluent boron concentration is expected to mirror the influent concentration. Thus, the Spring Creek Plant's effluent maximum boron concentration is estimated to be 11.0 mg/L. The boron concentration 182 yards downstream in the Sangamon River is estimated to be 4.5 mg/L under this scenario.

The Spring Creek Plant is reported to consistently meet its NPDES regulated parameters. Pumping the CWLP FGDS wastewater to the Spring Creek Plant is not

expected to have any effect on the Spring Creek Plant, other than the increase in boron concentration in the effluent. Reduction of the boron concentration in the wastewater stream anticipated for discharge by SMSD, in comparison to the concentration in CWLP's discharge, will not make its removal by SMSD any more feasible or economically reasonable than the removal alternatives studied by CWLP. While granting of this site specific rule will not reduce, with any level of certainty, the need for the previously-granted 11.0 mg/L adjusted standard for boron in Sugar Creek, rather, granting of this site specific rule should enable CWLP to meet complaint levels in Sugar Creek, as was typical prior to operation of the Selective Catalytic Reduction. The CWLP power plant is a crucial power supply for Springfield. Consistent with the testimony of Hanson's biologist, Jeff Bushur, no adverse effects are anticipated to the aquatic life of the Sangamon River or the Illinois River as a result of the proposed site specific boron water quality standard; thus, the proposed site specific boron water quality standard is justified.

I will be happy to answer any questions. Thank you.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER

and

SPRINGFIELD METRO SANITARY
DISTRICT,

Date: October 20, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

Katherine D. Hodge

Christine G. Zeman
HODGE DWYER ZEMAN
3150 Roland Avenue
P.O. Box 5776
Springfield, Illinois 62705
(217) 523-4900

CWLP:002/Fil/Pre-Filed Testimony of Ramsey

# Deborah A. Ramsey, P.E.

*Chemical Engineer*

**Education:**

- B.S./1978/Chemical & Petroleum Refining Engineering/Colorado School of Mines
- MBA/1984/Business Administration/Southern Illinois University at Edwardsville
- M.S./1986/Environmental Studies/Southern Illinois University at Edwardsville

**Registrations:**

- Professional Engineer/IL
- Professional Engineer/CO
- Professional Engineer/TX
- Class 4 Wastewater Treatment Plant Operator/IL

**Affiliations:**

- Air and Waste Management Association
- Consulting Engineers Council of Illinois, Environmental Committee
- American Institute of Chemical Engineers

**Publications:**

- Thesis: "Controlling Sulfur Oxide Emissions from Coal Fired Utilities", 1985

HANSON

Ms. Ramsey joined Hanson in 1993. She was previously employed as city engineer for the city of Staunton, Ill., and as a process engineer and production supervisor for Monsanto. Ms. Ramsey has distinguished herself as a budget-conscious, client-oriented project and task manager. Her involvement in the Illinois Emergency Management Agency's Kerr McGee technical oversight, FEMA (Fluor) Technical Assistance Contract for disaster recovery and AmerenCIPS groundwater treatment programs exemplify her versatility and both technical and management skills.

**City Water, Light and Power (CWLP) ash pond recycling study, Springfield, Ill.** Project engineer responsible for evaluating efforts to treat ash pond effluent and/or Springfield Metropolitan Sanitary District (SMSD) treatment plant effluent for ash sluicing at the CWLP power stations. The evaluation included a bench scale simulation of the recycle and reuse of CWLP effluent for ash sluicing. Evaluated the recycling of CWLP and SMSD effluent back to Lake Springfield.

**City Water, Light and Power (CWLP), investigation of mitigation strategies for boron increase, Springfield, Ill.** Project manager responsible for investigations into the source of increase in boron concentration at outfall 004 from the ash ponds. It was discovered that the significant boron contributor to the ash pond system was the gypsum dewatering stream from the Dallman Power Station flue gas desulferization system.

**CILCO Duck Creek facility permitting services, Canton, Ill.** Project engineer responsible for assisting in the preparation of a technical support document used with a petition for an adjusted water quality standard for boron. Also prepared a technical support document used with a petition for a five-year variance to the adjusted water quality standard for boron.

**Kerr-McGee closure application, West Chicago, Ill.** Assistant program manager responsible for preparing environmental analysis and safety evaluation reports; reviewed cost, environmental permitting, process and treatment facility design; and planned utility renovations for an Illinois Department of Nuclear Safety (IDNS) closure application. Responsible for daily coordination with and supervision of on-site construction observer. The project consists of remedial design, remedial action oversight and review of technical documents.

**Kerr-McGee West Chicago industrial wastewater facility design review, West Chicago, Ill.** Project manager responsible for reviewing drawings, specifications and startup plan for Kerr-McGee's industrial wastewater treatment facility, which is designed to remove suspended solids, soluble radium and fluoride. Soluble

*(Ramsey, cont.)*

radium and fluoride are removed via a coprecipitation process. Observed initial facility startup as a representative for the Illinois Department of Nuclear Safety (IDNS).

**FEMA disaster assistance, Mobile County, Ala.** Worked as a FEMA project officer during a FEMA-declared disaster to prepare project worksheets that detailed damages from Hurricane Ivan and estimated associated repair costs in Mobile County. Majority of worksheets prepared were related to public entities on Dauphin Island, a barrier island south of Mobile Bay that received significant damage from hurricane force winds and flooding due to the associated tidal surge. Damages were assessed for roads, sewers, sewage lift stations, water treatment plant, potable water booster tank, buildings, docks, park facilities including an historic fort, and an historic lighthouse. Additionally, project worksheets were prepared to document emergency work performed by the Town of Dauphin Island and the Dauphin Island Park and Beach Board and debris collection and disposal, including hazardous waste, related to Hurricane Ivan.

**AmerenCIPS groundwater treatment design, Taylorville, Ill.** Project engineer responsible for coordinating design, construction and startup services for a ground-water pump-and-treat system at a National Priority List Superfund site. The treatment system included pH adjustment to reduce the precipitation potential of the ground water; oxidation of the ferrous iron in the ground water to the ferric state with potassium permanganate; filtration to remove the iron precipitate; and removal of organics from the ground water using a two-stage, granular-activated carbon (GAC) adsorption system.

**American Bottoms Regional Wastewater Treatment Facility environmental audit services, Sauget, Ill.** Worked for the Illinois Environmental Protection Agency. Conducted annual independent audits to monitor industrial user compliance with the pretreatment program and regulatory requirements; monitored operations and maintenance at industrial pretreatment facilities; and reviewed quality control and assurance procedures followed by Sauget in monitoring and testing of industrial users. Completed U.S. Environmental Protection Agency *Control Authority Pretreatment Audit Checklist* for each audit.

**Staunton water treatment plant operations, Staunton, Ill.** Oversaw potable water treatment plant operation for more than six years. Process improvements that were designed, permitted and installed included replacing a prechlorination system with potassium permanganate. The sand filters were upgraded to dual media, and the water treatment plant's monitoring and control systems were significantly improved.

*(Ramsey, cont.)*

**Staunton wastewater treatment plant, sewage lift station and collection system, Staunton, Ill.** Provided grant administration, project management and resident inspection for a $4.5 million wastewater treatment plant, a 10.8-million-gallon-per-day (mgd) sewage lift station, and a collection system. Interacted with federal and state agencies as required by grant agreement. Suggestions for design modification of collection system resulted in savings of $500,000.

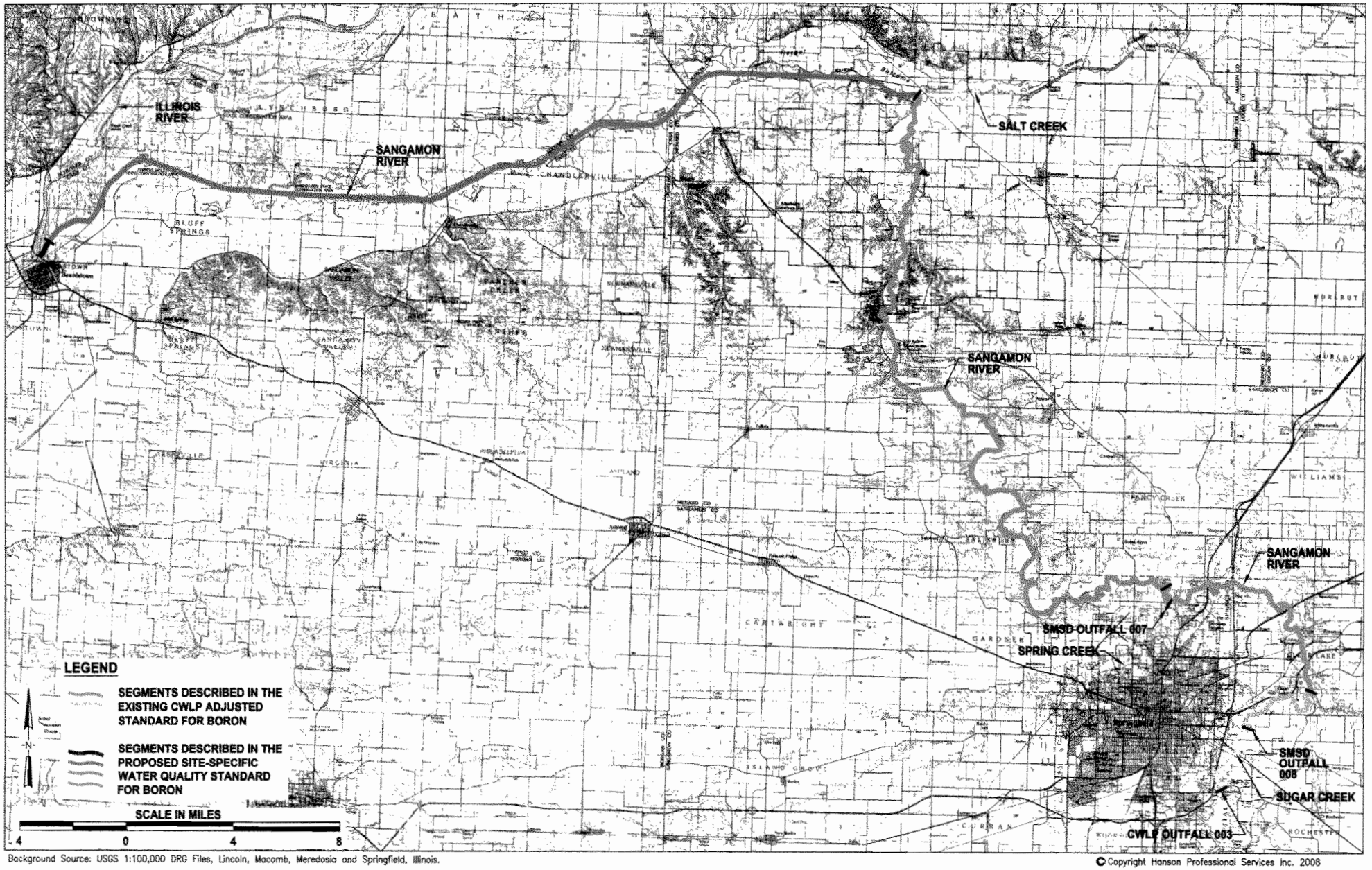
**U.S.-Ukraine Foundation, Svitlovodsk, Ukraine.** Provided technical review and recommendations for improvement of portable water treatment system to Svitlovodsk, Ukraine (Springfield, Illinois' sister city). Also reviewed Svitlovodsk's municipal wastewater treatment plant operations.

**Central National Bank Diamond "E" Packers demolition, Mattoon, Ill.** Project manager for "turn-key" services associated with demolition of a former manufacturing facility. Environmental services performed included removing one underground storage tank and two aboveground storage tanks; excavating and disposing of stained soils observed at three locations; and packaging, disposing and recycling miscellaneous chemicals, special wastes and hazardous wastes located at the facility. Clean up in areas of stained soils evaluated with remediation objectives obtained from 35 IAC 742 (TACO) regulations. Used remediation objectives obtained from 35 IAC 742 (TACO) regulations to evaluate the cleanup in areas that had stained soils.

**Raynor Hotels design and construction services, Holiday Inn East, Springfield, Ill.** Project engineer responsible for preparing plans and specifications, conducting bid letting and providing construction observation. Oversaw the demolition of the hotel and adjacent gas station. Also participated in the removal of asbestos-containing material and in the collection and disposal of hazardous and special waste. Characterized portion of facility contaminated from service station operations.

**U.S. Army Corps of Engineers, Rock Island District, Lock and Dam 12 Storage Yard, Illinois.** Project manager. Prepared a Preliminary Assessment (PA) for the Lock and Dam 12 Storage Yard which has been discovered to contain lead. The USACE was currently under an Illinois EPA enforcement action. The PA was developed following superfund guidance documents as the first step in site investigation and cleanup. Subsequently selected to perform a site invesigation (SI) for the Lock and Dam 12 Storage Yard seeking to quantify lead contamination at the site.


**U.S. Army Corps of Engineers, Rock Island District, East Peoria, Ill.** Project manager. Performed a limited phase IIA soil sampling at a 3.2-mile levee in East Peoria, Ill. The purpose of the sampling was to determine if environmental issues were present in soil at the levee prior to a flood control project upgrading the levee.




Background Source: USGS 1:100,000 DRG Files, Lincoln, Macomb, Meredosia and Springfield, Illinois.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

| | | |
|---|---|---|
| PROPOSED SITE SPECIFIC RULE FOR CITY OF SPRINGFIELD, ILLINOIS, OFFICE OF PUBLIC UTILITIES, CITY WATER, LIGHT AND POWER AND SPRINGFIELD METRO SANITARY DISTRICT FROM 35 ILL. ADM. CODE SECTION 302.208(g) | ) | R09-8 (Site Specific Rule – Water) |

**PRE-FILED TESTIMONY OF JEFF BUSHUR,**
**IN SUPPORT OF PROPOSED SITE SPECIFIC RULE**

NOW COMES the Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power ("CWLP") and Springfield Metro Sanitary District (collectively "Petitioners"), by and through their attorneys, HODGE DWYER ZEMAN, and pursuant to 35 Ill. Adm. Code § 102.424 and the Hearing Officer Order, dated September 19, 2008, submits the following Pre-Filed Testimony of Jeff Bushur for presentation at the November 3, 2008 hearing scheduled in the above-referenced matter.

**TESTIMONY OF JEFF BUSHUR**

My name is Jeff Bushur. I am employed at Hanson Professional Service Inc. ("Hanson") in Springfield, Illinois, as an Environmental Biologist. I have fifteen years of experience in environmental health, water and wastewater treatment, and environmental/engineering consulting. I hold a Bachelor of Science degree in Environmental Biology from Eastern Illinois University, and a Master of Science in Environmental Biology from Eastern Illinois University. My current resume is attached.

My testimony today concerns the toxicological effects of boron and a description of the available data concerning such effects, especially to aquatic life; the conditions of the receiving streams and the potential effects of boron on the water downstream from the

Spring Creek Sanitary Treatment Plant ("Spring Creek Plant") discharge; and assessments of the receiving stream. Further, based on reviews of existing studies, documents and reports, I will testify that the proposed site specific standard for boron, based upon the 7-day low flow conditions, can be granted without any anticipated adverse effects to either aquatic life uses or other known uses of the Sangamon River, and that the Illinois River biological community would not be observably affected by the anticipated maximum boron concentration under this scenario.

The methodology and approach Hanson used in preparing our analyses included review of existing water quality data, biological studies and stream flow information that were obtained from several agencies, existing published literature regarding possible toxicological effects of boron, and studies and technical documents produced for CWLP and for Central Illinois Light Company of Peoria in support of petitions for adjusted water quality standards for boron, and a variance to an adjusted water quality standard for boron. I helped develop Sections 3.0, 4.0 and 5.0 of the "*Technical Support Document for Site-Specific Boron Standard for the Springfield Metro Sanitary District Spring Creek Plant, Sangamon County, Illinois*" ("TSD") used to support the Petition filed in this rulemaking. Section 3.0 of the TSD discusses the resources of the Sangamon River, Section 4.0 of the TSD discusses issues of concern, and Section 5.0 discusses the environmental effects of boron. I will testify as to how we developed information for these sections of the TSD. The figure attached identifies the surface waters at issue in this proceeding, on which my testimony is based.

I conducted a field survey along with another Hanson biologist in October 2007 to characterize the general features of the Sangamon River downstream of the CWLP Plant

discharge. Three areas were visited by canoe including: north of Springfield from Riverside Park to downstream of the confluence of Spring Creek, Petersburg at Illinois Route 123, and Oakford at Illinois Route 97. The survey showed the Sangamon River north of Springfield and at Petersburg to be a low gradient, meandering stream. The lower section, below the confluence of the Salt Creek, appears to have been channelized in the past and has scoured out a wider floodway in the sandier soils. Three structures were identified in the survey that create riffle areas which are a source of oxygenation for the Sangamon River during low flow: a former dam immediately upstream of the Spring Creek confluence in Springfield, and two rock check dams located near Petersburg, Illinois. According to the Illinois Streamflow Assessment Model, prepared by the Illinois State Water Survey in 2007, the mean flow at the confluence with Spring Creek was 2,120 cfs for the base period from 1948 to 1997. During high flow periods, stream discharge can exceed 7,000 cfs at this location.

There are eight National Pollutant Discharge Elimination System ("NPDES") permitted discharges to the Sangamon River from the confluence of the South Fork of the Sangamon River to the Illinois River. These NPDES discharges include: Clear Lake Sand and Gravel Company; Lincoln Place Mobile Home Park; Riverton Sewage Treatment Plant; Illinois Department of Transportation, Interstate 55, Sangamon County North; SMSD, Spring Creek Plant; Pleasant Plains Water Treatment Plant; Petersburg Sewage Treatment Plant; and Petersburg Water Treatment Plant. Other generally known uses of the Sangamon River include aquatic life habitat and recreation (boating, fishing, swimming). The reach of the Sangamon River at issue in this site specific rulemaking is not reported as used for irrigation of agricultural land, golf courses, nurseries, etc.

Water quality data including boron concentrations in the Sangamon River from the Illinois Environmental Protection Agency ("IEPA") for 1999 through 2004 for three of the monitoring stations on the Sangamon River upstream and downstream of the confluence of Spring Creek were reviewed. Stream discharge volumes in cfs from the United States Geological Survey National Water Information System were also reviewed. The station at Riverton (closest downstream of the existing CWLP NPDES discharge location) had the highest total boron concentrations over the four-year period. While total boron exceeded 1.0 milligrams per liter (mg/L) in nine percent of the sampling events at this station, no boron value exceeded the adjusted standard of 2.0 mg/L of boron. The mean boron concentration at Riverton was 0.394 mg/L over the five year period from 1999 to 2004.

The condition of four stream segments of the Sangamon River at issue show that all four are included on IEPA's 2006 list of waters where uses are impaired, the Section 303(d) List: the Sangamon River from the South Fork of the Sangamon River to Spring Creek (E-26), the Sangamon River from Spring Creek to Richland Creek (E-04), the Sangamon River from Richland Creek to Salt Creek (E-24), and the Sangamon River from Salt Creek to the Illinois River (E-25). All four segments are identified as impaired for the designated use of fish consumption. A potential cause of fish consumption impairment is polychlorinated biphenyls from an unknown source. Three segments are identified as impaired for the designated use of primary contact recreation. A potential cause of primary contact recreation impairment is fecal coliform from an unknown source. Stream segment E-26 is identified as impaired for the designated use of aquatic life; potential causes of aquatic life impairment are boron, nitrogen, phosphorus, silver,

total dissolved solids, and total suspended solids. Potential sources of these impairments are industrial and/or municipal point source discharges, on-site treatment systems, runoff, channelization, crop production, dams or impoundments, and streambank modifications/destabilization. (Ex. 1, pp. 3-9, 3-11.)

Regarding boron, it is an element that is widespread in the environment, and is widely distributed in surface and groundwater. Most boron that occurs in the fresh water aquatic environment is due to the relatively high water solubility of all boron compounds, especially boron-containing laundry products and sewage, while another, although very localized, source of boron to the aquatic environment is coal ash. Many commercially-mined coal seams contain significant concentrations of boron. Of the total boron in coal, most may be lost to the atmosphere upon combustion, though more than 50 percent of the boron found in coal ash is readily water soluble.

Hanson reviewed existing literature documenting boron's effects on various biota, although the primary focus of the TSD regarding potential effects from boron concerns freshwater biota. The United States Environmental Protection Agency classifies boron as a Group D element, meaning that there is no human and animal evidence of boron carcinogenicity. In mammals, while exposure to excessive boron may result in reduced growth rate, loss of body weight, and eye irritation, one study found no overt signs of toxicosis in one mammal species exposed to 120 mg/L of boron, nor at 300 mg/L of boron when consumed via drinking water. Toxic effects of boron in birds have been exclusively studied in ducks and chickens, with results of chronic feeding studies using mallards demonstrating that diets containing 13 mg of boron per kilogram of feed weight produce no adverse effects. While boron rapidly accumulates in mallard tissues, it also is

rapidly eliminated. After boron was removed from the mallards' diet, it was completely cleansed from the liver and blood within one day.

Regarding tolerance ranges for some species of fish, one researcher studied the effects of boron compounds upon rainbow trout and guppies, and determined these compounds to be relatively non-toxic using 24-hour bioassay procedures. In mosquito fish (*Gambusia affinis*), which are native to Illinois, using 96-hour bioassay procedures, no mortalities were observed in concentrations of boric acid up to 1,800 mg/L (315 mg B/L). One study indicated that 30 and 33 mg/L of boron are "safe" levels for game fish species such as the largemouth bass and bluegill, though one study reported an 11-day lowest-observed-effect concentration of 12.17 mg/L of boron for freshly fertilized eggs of largemouth bass. One study found the lowest-observed-effect concentrations for embryo-larval stages of channel catfish ranged from 1.0 to 25.9 mg B/L, depending on water hardness and boron compound administered, although a British Columbia literature review study of boron considered these low concentration toxicity levels to be outliers.

Studies have found that amphibians respond to boron at concentrations similar to those for fish. While some boron compounds were found to be more toxic to embryos and larvae than to adult amphibians, no effects occurred on embryos of Fowler's toad (*Bufo fowleri*) until 53 mg/L of boron was applied, while leopard frog (*Rana pipiens*) embryos suffered 100 percent lethality or teratogenesis in water treated with boron compounds at levels of 200 and 300 mg/L of boron, respectively.

Regarding plant life, boron is essential for the growth of plants. However, excess boron is known to be phytotoxic. Studies have shown that optimal growth in plants occurs at 2 to 5 mg/L, while toxic effects are evident at 5 to 12 mg/L. However, some

species, such as citrus, stone fruits, and nut trees, are more sensitive. No use of irrigation, however, has been reported for the reach of the Sangamon River at issue in this site specific rulemaking. While toxic effects have been observed in aquatic plants at various concentrations, one blue green alga exhibited no adverse effects with respect to cell growth or organic constituents at 50 mg/L of boron and significant adverse effects at greater than 100 mg/L over a 72-hour exposure. A British Columbia study found a lowest-observed-effect-level for growth of inhibition on a green alga of 12.3 mg B/L.

Boron effects on aquatic life are highly species specific and vary depending on its life stage and environment. Studies show that early stages are more sensitive to boron than later ones, and that administering boron in natural water is less toxic than in reconstituted lab water. Of the species and life stages investigated, the early life stages of rainbow trout, not present in the Sangamon River, appear to be most sensitive to boron. Boron in natural water courses was found to be substantially less toxic to trout embryo-larval stages than in reconstituted lab water. Wild, healthy trout in surface waters containing 13 mg/L of boron have been reported. A 20-day no-observed-effect concentration of 18 mg/L of boron for rainbow trout embryos has also been reported. Hanson has provided a table summarizing our literature search as it pertains to aquatic life in the Sangamon and Illinois Rivers at page 5-7 of the TSD. A British Columbia government study considered two related studies which found low concentration boron toxicity levels for a variety of aquatic species to be outliers since the results could not be reproduced by other studies. Similarly, it has been suggested that the low-level effects observed in reconstituted laboratory water may not accurately predict the effects under

natural water exposure conditions. And, it is unlikely that boron is bioconcentrated significantly by organisms in water.

CWLP was granted an adjusted standard for boron in 1994. The "*Technical Support Document for Petition for Adjusted Boron Standards for Sugar Creek and the Sangamon River*," (Hanson Engineers Inc., March 1994), presented scientific evidence showing no detectable degradation to Sugar Creek receiving discharges having boron levels as high as 18 mg/L of boron. The 1994 Hanson document demonstrated the toxicological effects of boron at varying concentrations on the biological community of an aquatic ecosystem. Overall, the results indicate that the Sangamon River biological community would not be observably affected by the anticipated maximum boron concentration of 4.5 mg/L downstream, or by the maximum boron concentration of 11.0 mg/L in the area of dispersion. Likewise, the Illinois River biological community would not be observably affected by the anticipated maximum boron concentration.

To summarize, based on the reviews of existing toxicity studies, documents and reports, and the previous 1994 Hanson document, no adverse effects are anticipated to the aquatic life of the Sangamon River or the Illinois River as a result of the proposed site-specific standard.

I will be happy to answer any questions. Thank you.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER

and

SPRINGFIELD METRO SANITARY DISTRICT,

Date: October 20, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

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CWLP:002/Fil/Pre-Filed Testimony of Bushur

# Jeffrey L. Bushur

*Environmental Biologist*

**Education:**

- B.S./1991/Environmental Biology/Eastern Illinois University
- M.S./1993/Environmental Biology/Eastern Illinois University

**Affiliations:**

- Illinois Lake Management Association
- Water Environment Federation
- Illinois Geographic Information Systems Association

**Awards:**

- Presidential Award in Environmental Biology, Presidential Award in Environmental Biology, 1991

**Publications:**

- Thesis: A Preliminary Study Using the Willow Cutting Method to Reduce Lake Shoreline Erosion, 1993

HANSON

Mr. Bushur joined Hanson in 2000. An environmental biologist, he primarily serves the local government market. His experience includes conducting water quality analyses, habitat assessments, wetlands delineations, Section 404 permitting and wetland mitigation design. He has previous experience in water and wastewater treatment, environmental health and laboratory analysis. He has been trained in wetlands delineation by the U.S. Army Corps of Engineers and Geographic Information Systems technology.

**Raccoon Lake Restoration Study, Centralia, Ill.** Environmental scientist. Assisted in the preparation of the diagnostic and feasibility study of the lake through sediment sampling, data analysis, and report preparation. Raccoon Lake, with 4,000-acre-feet volume, is the primary water source for Centralia, Ill. Hanson provided the bathymetric survey data, coordinated lake water and sediment sampling and analysis with city and state agencies, and analyzed sources of water quality and aesthetic problems and proposed solutions. The phase I diagnostic/feasibility study of the 940-acre surface area is funded through the Illinois Environmental Protection Agency Clean Lakes 2000 Program.

**Charleston Water Treatment Plant, Charleston, Ill.** Graduate research assistant. Assisted in the preparation and completion of the IEPA Clean Lakes Program Diagnostic and Feasibility Study of the Charleston Side-Channel Reservoir. The hypereutrophic reservoir is the primary water source for the city of Charleston and has problems of algal blooms, high gizzard shad population, low dissolved oxygen, nutrient loading, shoreline erosion, and sedimentation. The study addressed the water quality and recreational problems of the reservoir and outlined feasible solutions for improving the lake quality.

**Lake Decatur dredging, Decatur, Ill.** Assessed the environmental impacts associated with the site selection of a sedimentation basin for the dredging of Lake Decatur. Responsibilities included sediment sampling and water quality analysis to support Section 401 water quality certification through the Illinois Environmental Protection Agency. Additional duties included preparing and obtaining an individual section 404 permit from the U.S. Army Corps of Engineers, Rock Island District.

**TR-61 improvement, Cumberland County, Ill.** Conducted a preliminary environmental resource review and prepared the environmental survey requests for the rural roadway improvement and bridge construction over the Embarras River. Potential resource impacts included wetland, floodplain, threatened and endangered fish and mussel species, archaeological resources, and river habitat.

*(Bushur, cont.)*

**U.S. 34 roadway widening, Plano, Ill.** Environmental scientist responsible for preparing the resource impacts for an environmental class of action determination (ECAD) document for the U.S. 34 roadway widening. Resources and issues having potential impacts included relocations, economics, noise, special waste, section 4(f) lands and surface water quality.

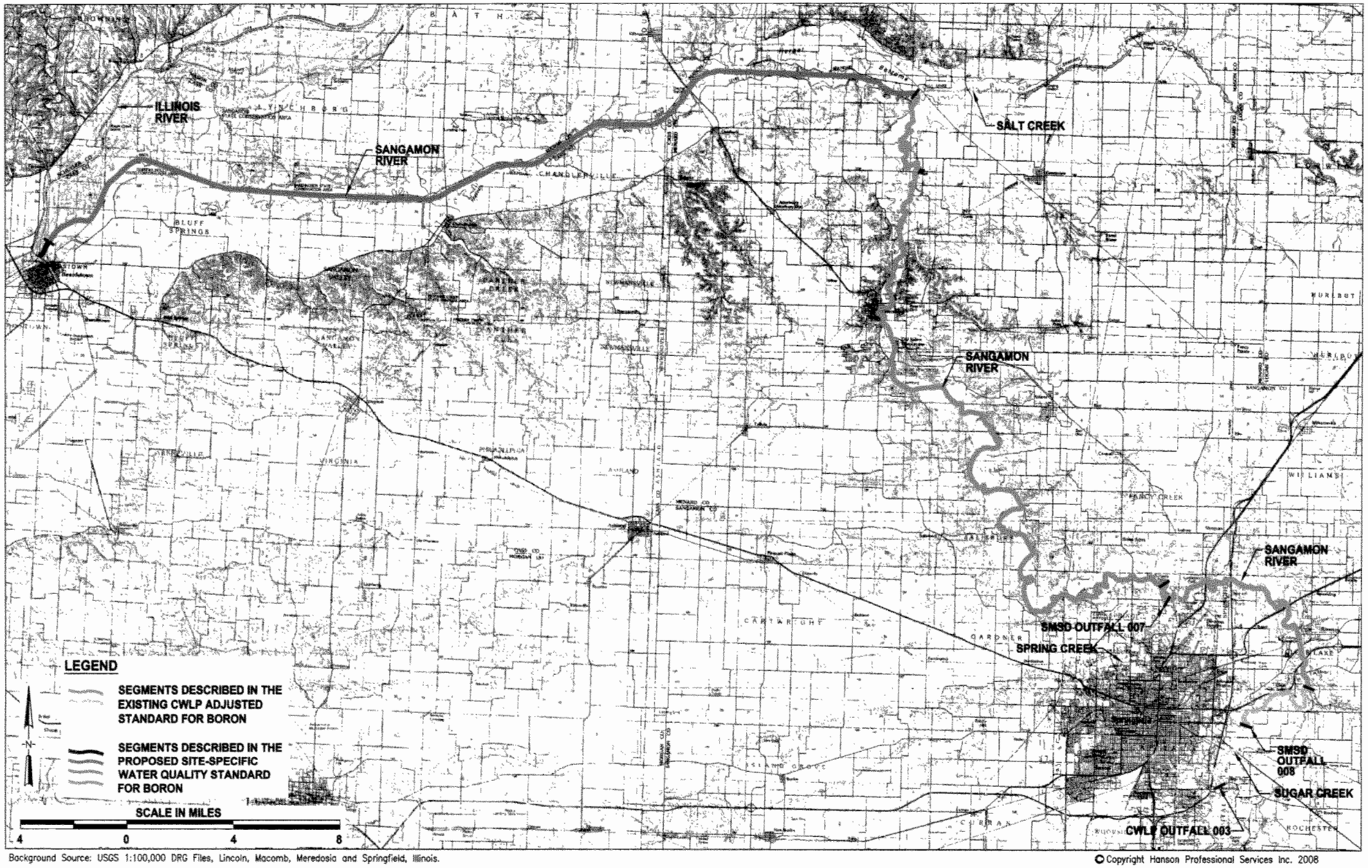
**Veteran's Memorial Drive Overpass, Mount Vernon, Ill.** Environmental scientist responsible for preparing the environmental class of action determination (ECAD) for a new roadway overpass at Interstate 57/64 and Veteran's Memorial Drive. Resource impacts included forested wetlands, a residential displacement, agricultural conversion, and a surface water crossing. Located a wetland mitigation site and developed a wetlands compensation plan for 12 acres of wetland impacts.

**Fairfield Road/Gilmer Road grade separation, Lake County, Ill.** Environmental scientist involved in conducting a wetlands determination survey, air quality and noise analysis, floristic quality assessment and tree survey; assessed habitat coverage; and prepared the environmental survey request for a proposed grade separation at the intersection of Fairfield and Gilmer roads. Utilized GIS and GPS technology for environmental resource data gathering and mapping.

**MacArthur Boulevard extension, Springfield, Ill.** Environmental scientist responsible for preparing the resource impacts for an environmental class of action determination (ECAD) document for the MacArthur Boulevard extension project. The assessment included wetland and stream crossing impacts, threatened species habitat concerns, and the preparation of a programmatic section 4(f) evaluation for a public recreational facility.

**Chicago Region Environmental and Transportation Efficiency (CREATE) Program, Chicago, Ill.** Environmental scientist responsible for assessing the environmental impacts for five railroad/highway improvement projects within the beltway corridor of Chicago. Each project required the preparation of an environmental class of action determination (ECAD) document for the FHWA, Illinois Department of Transportation, and various railroad companies.

**Rock Creek Public Sewer District, Imperial, Mo.** Laboratory director. Created and managed the wastewater laboratory for the District which treated a total of two MGD of wastewater in Jefferson County. Operated and troubleshooted several treatment facilities including contact stabilization, oxidation ditch, extended aeration, sand filter, and lagoon systems. Managed regulatory tasks of NPDES permit renewal applications and reporting requirements, and sludge reporting, biosolids land application, and lagoon closure compliance.




Background Source: USGS 1:100,000 DRG Files, Lincoln, Macomb, Meredosia and Springfield, Illinois.

## CERTIFICATE OF SERVICE

I, Christine G. Zeman, the undersigned, certify that I have served the attached PRE-FILED TESTIMONY OF DAVE FARRIS, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; PRE-FILED TESTIMONY OF GREGG FINIGAN, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; PRE-FILED TESTIMONY OF DOUG BROWN, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; PRE-FILED TESTIMONY OF DON SCHILLING, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; PRE-FILED TESTIMONY OF WILLIAM BROWN, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; PRE-FILED TESTIMONY OF DEBORAH RAMSEY, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE; and PRE-FILED TESTIMONY OF JEFF BUSHUR, IN SUPPORT OF PROPOSED SITE SPECIFIC RULE, upon:

Mr. John Therriault
Assistant Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601

Albert F. Ettinger, Esq.
for Prairie Rivers Network
c/o Environmental Law and Policy Center
35 East Wacker Drive
Suite 1300
Chicago, Illinois 60601
aettinger@elpc.org

via electronic mail on October 20, 2008; and upon:

Joey Logan-Wilkey, Assistant Counsel
Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

Bill Richardson, Chief Legal Counsel
Illinois Department of Natural Resources
One Natural Resources Way
524 S. Second Street
Springfield, Illinois 62702-1271

Matthew Dunn, Chief
Environmental Bureau
Office of the Attorney General
69 West Washington Street, 18th Floor
Chicago, Illinois 60602

Marie E. Tipsord
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph, Suite 11-500
Chicago, Illinois 60601

by depositing said documents in the United States Mail, postage prepaid, in Springfield, Illinois on October 20, 2008.

By: /s/ Christine G. Zeman
Christine G. Zeman

CWLP:002/Filings/ NOF-COS – Pre-Filed Testimonies