BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
COAL COMBUSTION ASH PONDS	)	R14-10
AND SURFACE IMPOUNDMENTS AT	)	
POWER GENERATING FACILITIES:	)	(Rulemaking – Water)
PROPOSED 35 ILL. ADM. CODE 841	)	

NOTICE OF FILING

John Therriault
Assistant Clerk
Illinois Pollution Control Board
100 W. Randolph Street, Suite 11-500
Chicago, Illinois 60601

Office of Legal Services
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271

Timothy J. Fox
Hearing Officer
Illinois Pollution Control Board
100 W. Randolph Street, Suite 11-500
Chicago, Illinois 60601

Matt Dunn
Division Chief, Environmental Enforcement
Office of the Illinois Attorney General
69 W. Washington, Suite 1800
Chicago, Illinois 60602

Attached Service List

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the Illinois Environmental Protection Agency's Testimony of Richard P. Cobb, Testimony of William E. Buscher, Testimony of Lynn E. Dunaway, and Testimony of Amy L. Zimmer, a copy of each of which is herewith served upon you.

Respectfully submitted,

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: ______________________
James Jennings
Assistant Counsel
Division of Legal Counsel

DATED: 1/15/14

James Jennings #6300112
Illinois Environmental Protection Agency

Division of Legal Counsel
1021 N. Grand Ave. East
P.O. Box 19276
Springfield, IL 62794-9276
(217) 782-5544

SERVICE LIST

Stephen Sylvester
Assistant Attorney General
Office of the Attorney General
69 W. Washington Street, Suite 1800
Chicago, Illinois 60602

Christine G. Zeman
Office of Public Utilities
City of Springfield
800 East Monroe, 4th Floor
Springfield, Illinois 62757-0001

Faith E. Bugel
Environmental Law and Policy Center
35 East Wacker Drive, Suite 1600
Chicago, Illinois 60601

Jessica Dexter
Environmental Law and Policy Center
35 East Wacker Drive, Suite 1600
Chicago, Illinois 60601

Jennifer L. Cassel
Environmental Law and Policy Center
35 East Wacker Drive, Suite 1600
Chicago, Illinois 60601

Andrew Armstrong
Environmental Law and Policy Center
35 East Wacker Drive, Suite 1600
Chicago, Illinois 60601

Jack Darin
Sierra Club
70 E. Lake Street, Suite 1500
Chicago, Illinois 60601-7447

Ameren Services
One Ameren Plaza
P.O. Box 66419
St. Louis, Missouri 63166

Illinois Dept. Of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271

Jason McLaurin
Southern Illinois Power Cooperative
11543 Lake of Egypt Road
Marion, Illinois 62959-8500

Midwest Generation
440 S. LaSalle Street, Suite 3500
Chicago, Illinois 60605

Exelon Law Department
10 South Dearborn, 49th Floor
Chicago, Illinois 60603

Traci Barkley
Prairie Rivers Network
1902 Fox Drive, Suite 6
Champaign, Illinois 61820

Alec Messina
IERG
215 E. Adams Street
Springfield, Illinois 62701

Michael Smallwood
Consulting Engineer
Ameren
1901 Chouteau Avenue
St. Louis, Missouri 63103

Abel Russ
Environmental Integrity Project
1000 Vermont Avenue NW, Suite 1100
Washington, DC 20005

Electric Energy, Inc.
2100 Portland Road
P.O. Box 165
Joppa, Illinois 62953

Dominion
P.O. Box 260
Kincaid, Illinois 62540

Prairie Power, Inc.
P.O. Box 10
Peral, Illinois 62361

Prairie State Generating Company
3190 County Highway 12
Marissa, Illinois 62257

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PRE-FILED TESTIMONY OF RICHARD P. COBB, P.G., ON THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S PROPOSAL 35 Ill. ADM. CODE 841

My name is Richard P. Cobb. I am a licensed professional geologist and the Deputy Manager, Division of Public Water Supplies (DPWS, Bureau of Water ("BOW")), at the Illinois Environmental Protection Agency ("Illinois EPA" or "Agency"). I am also the manager of the Agency's Groundwater Section. Since 1985, I have worked on the development of legislation, rules and regulations related to protecting, monitoring and assessing, and restoring groundwater. I represent the Director as Chair of the Interagency Coordinating Committee on Groundwater ("ICCG") (415 ILCS 55/4), and serve as ICCG liaison to the Governor-appointed Groundwater Advisory Council ("GAC") (415 ILCS 55/5). I have served as a primary Agency witness at Illinois Pollution Control Board ("Board") proceedings in the matter of groundwater quality standards, technology control regulations, regulated recharge areas, maximum setback zones, clean-up regulations, radionuclide release reporting, right-to-know, and water well setback zone exceptions. Furthermore, I have served as a primary Agency witness in enforcement cases under these laws and regulations. Further, as the deputy drinking water program administrator, I assist with implementing the public water supervision program under the federal Safe Drinking Water Act ("SDWA"). Additionally, my responsibility includes the integration of source water protection with traditional water supply engineering and treatment practices, and to further assist with linking Clean Water Act, SDWA, and groundwater programs. The Groundwater Section applies Geographic Information System ("GIS") programs, global positioning system technology, hydrogeologic models (including, 3D geologic visualization, vadose zone, groundwater flow, particle tracking, solute transport, and geochemical models), and geostatistical programs for groundwater protection and remediation. The Groundwater Section also monitors and assesses groundwater quality in community water supplies on a state wide basis, and inventories and evaluates potential contamination threats to encourage source water protection program implementation. Moreover, I represent the BOW on Illinois EPA's Contaminant Evaluation Group, Strategic Management Planning Team, and Environmental Justice Committee. For further details on my qualifications I have enclosed a copy of my Curriculum Vitae in Attachment XV.

The purpose of my testimony is in regard to the continued policy of developing these proposed regulations to protect and restore groundwater and certain general provisions in Subpart A of the proposed rule.

Purpose

Long before the Tennessee Valley Authority ("TVA") ash pond failure in 2008, the Illinois EPA recognized that coal combustion waste ("CCW") might be an environmental concern. Illinois was one of the first states in the country to have and apply groundwater standards (i.e. 1972), groundwater monitoring requirements, and corrective actions to ash impoundments (e.g., *Central Illinois Public Service Company v. Pollution Control Board*, 116 Ill.2d 397). Corrective actions were implemented at surface impoundments where groundwater contamination resulted from CCW prior to the TVA event under consent orders that included approved groundwater management zones ("GMZs" or "GMZ") at Havana, Wood River, and

Hennepin. The corrective action conducted under the consent order GMZ at Dynegy's Havana Station has restored contaminated groundwater to meet the numerical groundwater standards. Moreover, since the early 1990s, new surface impoundments have been required to be lined and groundwater monitoring wells have been installed to monitor the effectiveness of the technology controls used to prevent groundwater contamination. However, Illinois EPA chose to make further improvements in response to the massive coal ash spill at the TVA facility in Kingston, Tennessee. Illinois EPA developed an aggressive strategy to assess existing ash impoundments at coal fired power plants. Under the ash impoundment strategy, the Illinois EPA identified facilities with existing CCW surface impoundments, determined if liners existed, requested groundwater monitoring well data, requested potable water system surveys, requested hydrogeologic site assessments (e.g., geologic cross sections, potentiometric surfaces, groundwater flow directions), requested statistical evaluation of groundwater monitoring well data, requested determination of background groundwater quality, required the installation of groundwater monitoring and conferred with the Illinois Department of Natural Resources on dam safety.

The Board's groundwater quality standards (35 Ill. Adm. Code 620) apply except due to natural causes. Therefore, naturally occurring concentrations can apply below or above the numerical standards. The naturally occurring level is the groundwater standard. The information gathered as a result of the Illinois EPA's ash impoundment strategy determined that 14 facilities have violations of the numerical groundwater quality standards on-site (Attachment I). The Technical Support Document ("TSD") provided graphical comparisons using box and whisker plots of the contaminants and concentrations being found in down gradient monitoring wells at each power generating facility. In order to further supplement the TSD, Attachments II -

XIV have been included to provide a site specific map of the power generating facilities where groundwater standards have been exceeded. These maps show the surface impoundment units and the associated groundwater monitoring wells used to assess the groundwater. Moreover, tables of the associated contaminants in these wells have also been included.

The assessments conducted determined that none of these sites with groundwater contamination threatened off-site potable water supply wells. However, Ameren Hutsonville has contamination that has migrated off-site. Hydraulic containment is part of the corrective action at Hutsonville that is needed to pull back contamination that has gone off-site and to prevent further migration of off-site contamination. Corrective actions, including a Board site specific regulation ("SSR"), GMZs, enforceable compliance commitment agreements ("CCA"), and consent orders ("CO"), have been initiated at 11 of these facilities. As part of the further evolution of the Agency's ash impoundment strategy, we developed these proposed regulations of general applicability specifically to fill a regulatory gap that exists pertaining to CCW surface impoundments at facilities.

The hydrogeologic assessments of the groundwater at CCW surface impoundment units used to treat waste water found the following inorganic chemical compounds ("IOC") exceeding groundwater standards at down gradient monitoring wells: pH; total dissolved solids ("TDS"); boron; sulfate; and manganese. Arsenic and thallium have also been detected in a few monitoring wells in more than two sampling events. Many of these surface impoundment units containing CCW have been in existence for long periods of time. Contaminants generally are transported in the direction of groundwater flow. Transport in this manner, that is, transport of dissolved contaminants (solutes) at the same speed as the average groundwater pore velocity, is called ***advection***.

Advective groundwater velocity, through a porous media, operates under ***Darcy's Law*** (see Equation 1):

$$Vx = -\frac{Kdh}{n_e\,dl}$$

Equation 1. Darcy's Law

Where:

V_x = average liner velocity in feet per day (ft/d)
K = hydraulic conductivity (ft/d)
n_e = effective porosity (dimensionless)
dh = change in hydraulic head elevation (ft)
dl = change in distance (ft)
$\frac{dh}{dl}$ = hydraulic gradient (dimensionless)

In porous natural materials the pores possess different sizes, shapes, and orientations. Similar to stream flow, a velocity distribution exists within the pore spaces such that the rate of movement is greater in the center of the pore than at the edges. Thus, in saturated flow through these materials, velocities vary widely across any single pore and between pores. As a result, when a miscible fluid is introduced into a flow system it will mix mechanically and diffuse (because of tightly packed molecules bumping into one another) to occupy an ever increasing portion of the flow field. This mixing phenomenon is known as ***hydrodynamic dispersion.*** In this sense, dispersion is a mechanism of ***dilution***. Dispersion acts to reduce the peak concentration of a contaminant introduced into a flow field as it moves down gradient over time from the source area of contamination (see Figure 1).

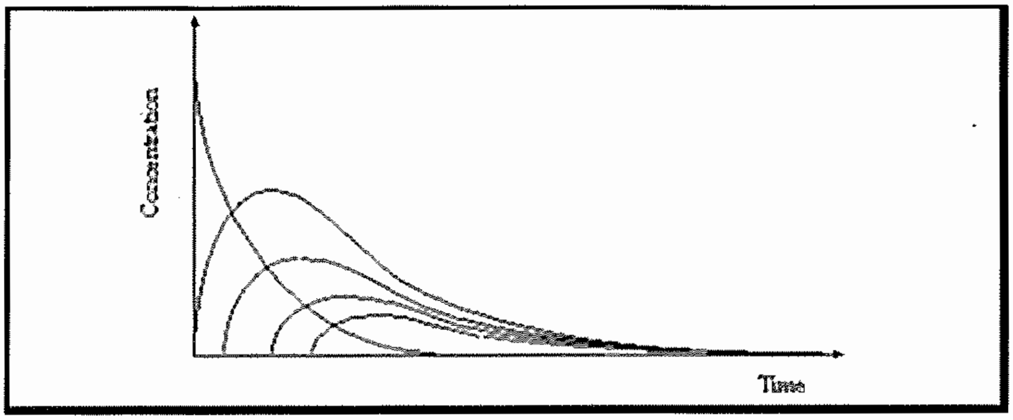

Figure 1. Hydrodynamic Dispersion Reducing Peak Concentration of a Contaminant

Solute transport can be described using the following simplified analytical version of the ***Advection-Dispersion Equation*** (see Equation 2):

$$C_{(x)} = C_{source} \bullet \exp\left[\left(\frac{X}{2\alpha_x}\right) \bullet \left(1 - \sqrt{1 + \frac{4\lambda \bullet \alpha_x}{U}}\right)\right] \bullet erf\left[\frac{S_w}{4 \bullet \sqrt{\alpha_y \bullet X}}\right] \bullet erf\left[\frac{S_d}{2 \bullet \sqrt{\alpha_z \bullet X}}\right]$$

Equation 2. Advection Dispersion Equation

<u>Where:</u>

$X =$ distance from the planar source to the location of concern, along the centerline of the groundwater plume (i.e., y=0, z=0)

$C_x =$ the concentration of the contaminant at a distance X from the source, along the centerline of the plume

$C_{source} =$ the greatest potential concentration of the contaminant of concern in the groundwater at the source of the contamination, based on the concentrations of contaminants in groundwater due to the release and the projected concentration of the contaminant migrating from the soil to the groundwater. As indicated above, the model assumes a planar source discharging groundwater at a concentration equal to C_{source}.

$\alpha_x =$ dispersivity in the x direction

$\alpha_y =$ dispersivity in the y direction

$\alpha_z =$ dispersivity in the z direction

$U =$ specific discharge (i.e., actual groundwater flow velocity through a porous medium; takes into account the fact that the groundwater actually flows only through the pores of the subsurface materials) where the aquifer hydraulic conductivity (K), the hydraulic gradient (dh/dl) and the total soil porosity θ_T must be known

$\lambda =$ first order degradation constant

S_w = width of planar groundwater source in the y direction
S_d = depth of planar groundwater source in the z direction

Thus, the highly soluble and mobile contaminants of concern (e.g., boron, sulfate, TDS) found at down gradient monitoring wells (included in Attachments II – XIV) represent the observed outcome of the hydrodynamic dispersion of CCW contaminants over time under various transient hydrologic and climatic conditions.

Heavy metals are not being found routinely in down gradient monitoring wells at these facilities in Illinois. However, numerous stakeholders have provided comments regarding their concern about the threat of heavy metals such as arsenic and mercury in CCW to groundwater. Further, as pointed out in the Statement of Reasons and TSD, nationwide studies have shown CCW to contain: antimony (Sb), arsenic (As), barium (Ba), boron (B), beryllium (Be), cadmium (Cd), chromium (Cr), chloride (Cl), iron (Fe), lead (Pb), mercury (Hg), manganese (Mn), nickel (Ni), selenium (Se), silver (Ag), sulfate (SO_4), and thallium (Tl). In contrast, numerous studies have also been conducted of coal ash chemistry from coal extracted from Illinois Basin coals (Suloway, 1983 and Natusch, 1977). These studies concluded that in addition to calcium (Ca), some of the more soluble IOC contaminants that leach from coal ash are: B, SO_4, and Mn. Sulaway 1983, indicates that from the 12 fly ashes studied in Illinois:

> The general trend for EP [extraction procedure] solubility for Illinois Basin fly ashes was: SO_4-S > Ca, B > Cd > Sb, Mn, Mg> Zn, Na, Mo > K, Ni, Cr, Cu >Be, Ba, Si, AL, and Fe.

In general, metals in groundwater are most soluble in water with a low pH where most of the mass occurs as a charged metal ion (Domenico, 1998). Ignoring for a moment the effects of sorption, metal mobility in groundwater begins to decline once pH increases to the point where equilibrium is reached with respect to a solid phase, usually a metal-hydroxide, metal carbonate, or metal sulfide (Domenico, 1998). Attachments II through XIV include the site specific contaminant data for the 12 facilities showing groundwater standards exceedences, including pH. The Board's regulations set a range of 6.5 - 9.0 units of pH (except due to natural causes) as the groundwater standard. Pure water has a pH of 7 at 25° C (Hem, 1992). Domenico (1998) indicates that most groundwater in the United States have a pH of 6.0 - 8.5. In total there were 46 exceedences of the Board's groundwater standards for pH. Figure 2 shows the statistical concentration distribution of the 46 pH exceedences.

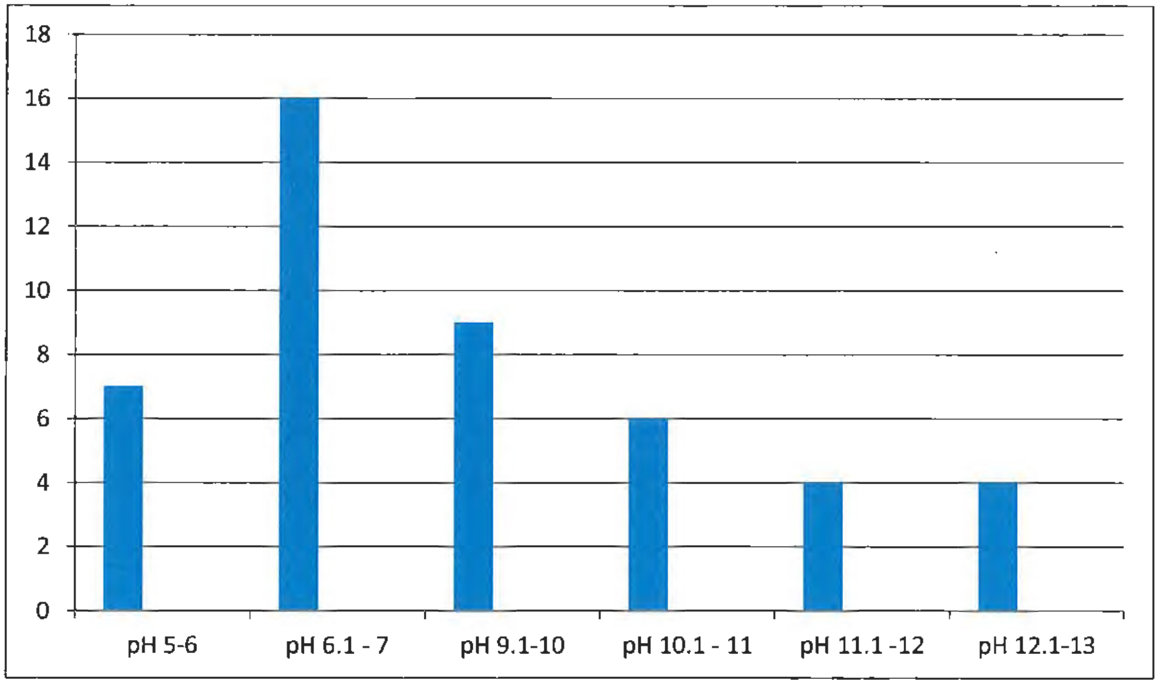

Figure 2. Concentration Distribution for pH Groundwater Standard Exceedences

For comparison purposes, the following provides the pH of some common solutions (Hein, 1997):

- Battery acid = 1;
- Acid rain = 1 – 5;
- Lemon juice = 2;
- Vinegar = 3
- Normal precipitation = 5 - 6.5;
- Milk = 5.8 - 7.9;
- Sea water = 10; and

- Lye = 13.

The lowest pH found from all of the groundwater standards exceedences was 5.49. Drever (1982) provides that waters that contain zero carbonate alkalinity and contain free strong acid (pH generally less than 4.5) are referred to as acid. Thus, acid groundwater are not being found in association with CCW in surface impoundments in Illinois, and that is the reason why the Illinois EPA believes heavy metals are not being routinely detected in groundwater monitoring wells.

Additional treatment for pH, TDS, sulfate, and boron above naturally occurring levels would be an economically and technically unacceptable burden for owners and operators of private drinking water system wells, semi-private drinking water system wells, non-community water system wells, and small community water systems (AWWA, 1995). If the contaminants found above naturally occurring levels in down gradient monitoring wells were to migrate off-site they have the potential to degrade groundwater and threaten/preclude its use. Contaminants such as TDS can cause: scaling within plumbing systems, loss of well yield, poor pump performance, and encrustation of the water line/pump that may render a water supply to be inoperable (AWWA, 1996). Further, it can cause objectionable taste and odor conditions (organoleptic), and cause poor performance and reduce the life time of hot water appliances (i.e., water heater, dishwasher, clothes washer and so forth). Participants in the study of Health Effects from Exposure to High Levels of Sulfate in Drinking Water Study (U.S. EPA, 1999) complained that they could not drink the water because it smelled and tasted so bad. Boron contamination may prevent watering of sensitive plants (U.S. EPA, 1986).

Private and semi-private drinking water system users utilize naturally occurring groundwater with little or no treatment. Additional treatment for these contaminants above naturally occurring levels would be an economically and technically unacceptable burden for owners of private drinking water system wells, semi-private drinking water system wells, non-community water system wells, and small community water systems. For this reason, the Agency is emphasizing prevention of groundwater degradation consistent with Section 2(b) of the Illinois Groundwater Protection Act ("IGPA") [415 ILCS 55/2(b)], Section 12(a) of the Illinois Environmental Protection Act ("Act") [415 ILCS 5/12(a)], and 35 Ill. Adm. Code 620.301.

Applicability

The proposed rules apply to units: (1) in operation after the effective date of the proposed rules or (2) that have groundwater contamination attributable to the unit prior to the effective date of these rules. However, these rules are not proposed to apply to units already operated and regulated under a solid waste landfill permit issued by the Agency; operated pursuant to procedural requirements for a landfill exempt from permits under 35 Ill. Adm. Code 815; or that are subject to 35 Ill. Adm. Code 840.

The Illinois EPA also believes it is important to delineate what does not represent a potential threat to groundwater in a surface impoundment unit relative to CCW. Therefore we proposed the following cumulative criteria that represent a de minimus threat to contaminating groundwater. The rules are proposed to not be applicable to units used to store CCW for less than one year or leachate from CCW if there is at least two feet of material with permeability equal or superior to 1 $X10^{-7}$ centimeters per second lining the bottom of the unit (Note: this is cumulative with the next two proposed criteria). As provided in the TSD, the low permeability layer impedes the migration of contaminants and reduces the threat of contaminating groundwater. Further, we also propose that CCW or leachate from CCW that remains in the unit for no longer than one year be excluded. This limited storage in a unit with a low permeability liner reduces the risk of exposure to seasonal recharge from precipitation and thereby also minimizes the threat of groundwater contamination. In addition to storage time and technology control, Illinois EPA also proposed a volume limitation based on a large dump truck that would be used to haul away CCW. A large off road mining dump truck could hold approximately 25 cubic yards ("yd^3"). Therefore, we propose that a CCW unit will be excluded if the unit's maximum volume is no more than 25 yd^3. In contrast, two inactive surface impoundments, at one facility that we are working with, contain up to 2.8 million yd^3 of CCW. This represents approximately 112,000 dump trucks to remove this much CCW. The Agency also excludes units used to only collect stormwater runoff, which does not contain leachate, because this represents a low potential for groundwater contamination. Groundwater recharge through exposed CCW via precipitation, and the hydraulic head[1] on the CCW in a surface impoundment unit is what drive the contaminants into the water table absent a low permeability liner or cover. The reason that hydraulic head is so significant is that as it increases so does the velocity of groundwater as illustrated in Equation 1.

Stormwater is a disperse nonpoint source of pollution that does not have a significant hydraulic head.

Definitions

The Agency proposes a compliance point definition for CCW surface impoundments based on the existing requirement under the Board's groundwater quality standards regulation. Specifically, Section 620.505(a)(2) specifies that compliance with the Board's standards for

[1] While surface water moves downhill in response to gravity, groundwater moves down-gradient from areas of higher potential energy to areas of lower potential energy. These areas of unequal energy are described as ***hydraulic head.***

groundwater that underlies a potential primary or secondary source is to be determined at the outermost edge as described in Section 620.240(e)(1). Potential primary sources of contamination (415 ILCS 5/3.345) include units that surface impound special waste (includes pollution control waste [415 ILCS 5/3.335]) that is generated on-site, and CCW is a pollution control waste. Additionally, we also proposed the definition of compliance point(s) to include compliance points for a GMZ. A GMZ is needed where chemical constituents attributable to a CCW surface impoundment have migrated to a delineated three dimensional region that already exceeds the groundwater quality standards set forth in Section 620.410 or Section 620.430, and a corrective action is applicable. Moreover, chemical constituent concentrations may exceed the standards in Section 620.410, but must not exceed existing concentrations, within the boundary of an Agency approved GMZ. A GMZ can be established on concurrence by the Agency that the groundwater is being managed to mitigate impairment caused by the release of contaminants from a site. Further, the compliance point data may be used to measure or predict via contaminant transport modeling contaminants that threaten the preclusion of an existing or potential use of resource groundwater beyond the GMZ compliance point(s).

The Illinois EPA proposed the on-site, on the site, or on the same site definition to be consistent with other Board regulations.

As described above, the hydraulic head on CCW in a surface impoundment unit is what increases the production of leachate migration into the water table. Therefore, the leachate definition we proposed is generated from the storage of CCW in a surface impoundment, and is not just stormwater runoff that may have come into contact with fugitive ash. Precipitation building head creates a downward vertical hydraulic gradient through a larger quantity of CCW stored in a surface impoundment that sets up the potential for producing a larger quantity of leachate and a higher concentration of contaminants that represent a threat to groundwater.

Public Act 85-0863 amended the Act at Sections 3.345 and 3.355 to establish a broad array of potential primary or potential secondary sources of groundwater contamination. Illinois EPA proposed a unit definition here to specifically focus on surface impoundments containing CCW at a power generating facilities.

Groundwater Standards

The Board's groundwater quality standards are the cornerstone of Illinois' groundwater protection program, and are the basis for restoration when contamination has occurred. Therefore, this proposed rule adopts the Board's groundwater quality standards at 35 Ill Adm. Code 620. The IGPA prioritizes groundwater in Illinois based on its inherent differences. Section 8 of the IGPA [415 ILCS 55/8(b)(2)] required the Board to consider in the adoption of groundwater standards:

> Classification of groundwaters on an appropriate basis, such as their utility as a resource or susceptibility to contamination.

Moreover, key terms such as ***potable***[2] ***resource groundwater*** and ***resource groundwater***[3] are used within the IGPA to distinguish between groundwaters with differing characteristics (i.e. aquifers[4] versus non-aquifers). For example, the classification criteria for Class I groundwater is based on the Illinois State Geological Survey's operational definition of an aquifer. Whereas Class II geologic materials saturated with groundwater, are comprised of non-aquifer formations

[2] *"Potable"* means generally fit for human consumption in accordance with accepted water supply principles and practices. [415 ILCS 55/3(h)]

[3] *Resource groundwater"* means groundwater that is presently being or in the future capable of being put to beneficial use by reason of being of suitable quality. [415 ILCS 55/3(j)]

[4] *"Aquifer"* means saturated (with groundwater) soils and geologic materials which are sufficiently permeable to readily yield economically useful quantities of water to wells, springs, or streams under ordinary hydraulic gradients. [415 ILCS 55/3(b)]

such as clay till or shale. These materials can have a high primary porosity[5] but a low effective porosity n_e[6], low transmissivity ("*T*")[7], and low hydraulic conductivity ("*K*"). *T* is calculated as the product of *K* and the saturated thickness of the aquifer ("*b*") (i.e. $T = K \times b$). Therefore, Class II geologic materials are not inherently susceptible to groundwater pollution due to their naturally low permeability. Studies around the State (Wehrmann, 1985), (Cobb, et. al., 1986, 1987, and 1988), (Cobb and Sinnott, 1986), and (Clarke and Cobb, 1988) have documented a variety of conditions including the existence of very pristine waters (e.g., certain Class III groundwaters), heavily contaminated waters resulting from human activities (e.g., previously mined areas), and waters whose quality is adversely affected by natural geologic conditions (e.g., brines in the Illinois Basin). Thus, the Agency has proposed, and the Board adopted, a resource-based classification under 35 Ill. Adm. Code 620, as follows:

- Class I: Potable Resource Groundwater;
- Class II: General Resource Groundwater;
- Class III: Special Resource Groundwater; and
- Class IV: Other Groundwater.

In the same consistent manner, this Agency proposal sets priorities for corrective action, closure and preventive response activities using the same differential resource classification system already adopted by the Board. Under the Board's groundwater standards regulation (35 Ill. Adm. Code 620), Class I and III groundwaters have the highest utility as a resource. These groundwater resources are also some of the most susceptible to contamination. Therefore, these

[5] "*Primary porosity*" means the original pore openings when a rock or sediment is formed.
[6] "*Effective porosity*" means the volume of the void spaces through which water or other fluids can travel in a rock or sediment divided by the total volume of the rock or sediment.
[7] "*Transmissivity*" means the rate at which water is transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient.

proposed regulations place the highest priority on corrective action/closure where contamination occurs within a setback zone of a potable water supply well. Moreover, preventive response occurs under 35 Ill. Adm. Code 620 to protect the groundwaters with the highest beneficial use designation of Class I or III. Thus, this proposal applies preventive response to Class I and III groundwater. In contrast, 35 Ill. Adm. Code 620 classifies groundwater that has the least utility as a resource as Class IV: Other Groundwater. Under this proposal corrective action/closure has the lowest priority in a previously mined area (i.e. one of the Class IV categories).

Further, as provided in the TSD, the Agency chose to tightly integrate these proposed regulations with the Board's groundwater standards because the groundwater standards apply to certain existing and all new CCW units. Some of the older legacy CCW units, without liners, have already been found to have caused and allowed exceedence of the numerical groundwater standards on-site. If a numerical standard set forth in Section 620.410 or Section 620.430 is exceeded at an existing or new unit, the appropriate remedy is corrective action under 35 Ill. Adm. Code 620.250. The Board's standards are very specific in Section 620.302(c) that if a contaminant exceeds a standard in Section 620.410 (i.e. Class I groundwater) or 620.430 (i.e. Class III groundwater), that the appropriate remedy is corrective action and Sections 620.305 and 620.310 do not apply. The Agency proposed, and the Board adopted, this approach in 35 Ill. Adm. Code 620 due to the potential technically infeasible treatment of groundwater at higher concentrations or in complex hydrogeologic settings.

However, a new unit should be properly engineered and designed to prevent contamination, and in the event that a release does occur a statistically significant contamination level in a plume should be detected via the groundwater monitoring network in the early stages of movement and at concentrations below the applicable numerical standards. Further, preventive response provisions would also apply if a release from an existing unit, subject to this proposed regulation, has not exceeded the numerical standards, but has exceeded the naturally occurring level of the contaminant(s). For example, an on-site TDS concentration exceeding the numerical Class I standard could be modeled to show the off-site shape, concentration, and distance of the TDS contaminant plume below the numerical standard, but above its naturally occurring level. Thus, the preventive response provisions of the Board's groundwater quality standards would be applicable to proactively address lower level contaminant concentrations in high value resource groundwater. This approach helps ensure the threat provision under Section 12(a) of the Act.

Under Section 620.250, a GMZ can be established to mitigate impairment of the groundwater contaminants from CCW unit(s) after Agency approval of a corrective action process. After approval of the GMZ, the standard(s) that applies initially is the existing concentration of the contaminants. Thereafter, the concentrations are not allowed to increase under the conditions of a GMZ. Corrective actions can be phased in based on measures in place to protect off-site groundwater. For example, hydraulic containment could be implemented to protect off-site resource groundwater prior to closure of the unit, if such a threat exists. This allows for the phase-in of the closure of operating units, in a manner similar to those proposed in U.S. EPA regulations. The intent of the corrective action process under a GMZ is to make every effort to first improve groundwater quality to the applicable numerical standards. However, after every effort has been made to improve groundwater quality, but it has been determined that it is not technically and economically feasible to restore the groundwater quality to the numerical standards where ***asymptotic*** levels of reduced contaminant concentrations have been reached via corrective actions (see Figure 2), Section 620.450 provides for alternative groundwater standards if the conditions in Subsection 620.450(a)(B) can be met. This is the point where the Agency will consider the appropriateness of alternative water supplies and restricted use ordinances, if necessary.

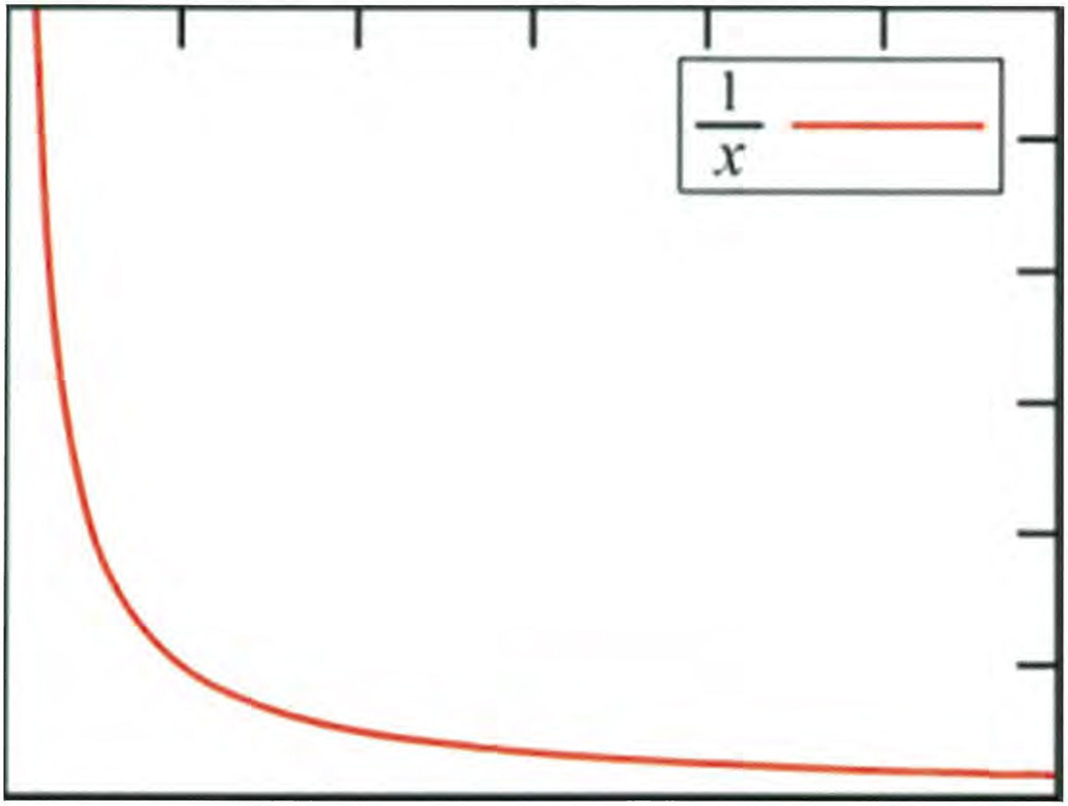

Figure 3. Asymptotic Levels

Submission of Plans, Reports and Notifications

The proposed regulations require all reports, plans, modifications and notifications be submitted to the Agency's Groundwater Section. The Groundwater Section has specialized expertise and years of experience with respect to reviewing hydrogeologic assessments and corrective actions, including, but not limited to, complex groundwater predictive models and statistics. Groundwater modeling is often requisite to predict the impact that various corrective action alternatives will have on groundwater quality. The Groundwater Section has previously reviewed all of the hydrogeologic assessments and compliance data associated with these sites, and would have also provided input if a new unit and groundwater monitoring wells were permitted. Moreover, in order to better assure compliance on the same order as a permit application, all documents submitted to the Groundwater Section must contain the seal and signature of a professional engineer or where appropriate a professional geologist. Further, given the complexity of this type of work decisions should be made by licensed professionals. This proposed regulation requires all plans and reports approved by the Agency to be maintained on site so that these materials would be available to our Field Operation Section staff for on-site inspections to help assure compliance.

Previous Investigations, Plans and Programs

The Illinois EPA has already evaluated a significant amount of information under: permit reviews, compliance monitoring, hydrogeologic assessments, consent orders, enforceable compliance commitment agreements, or GMZs for many of these sites. Therefore, the Agency proposes that previous investigations, plans or programs already in place may be used to meet the requirements of this section, provided all components required in this section are included. If an existing investigation, plan or program is missing a component required under this proposed part, the existing investigations, plans and programs may need to be modified to include the required missing component.

This concludes my pre-filed testimony. I will supplement the testimony as needed during the hearing and am happy to address any questions.

By: [signature]

Richard P. Cobb, P.G.
Deputy Division Manager
Division of Public Water Supplies

DATE: 12/20/2013

Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

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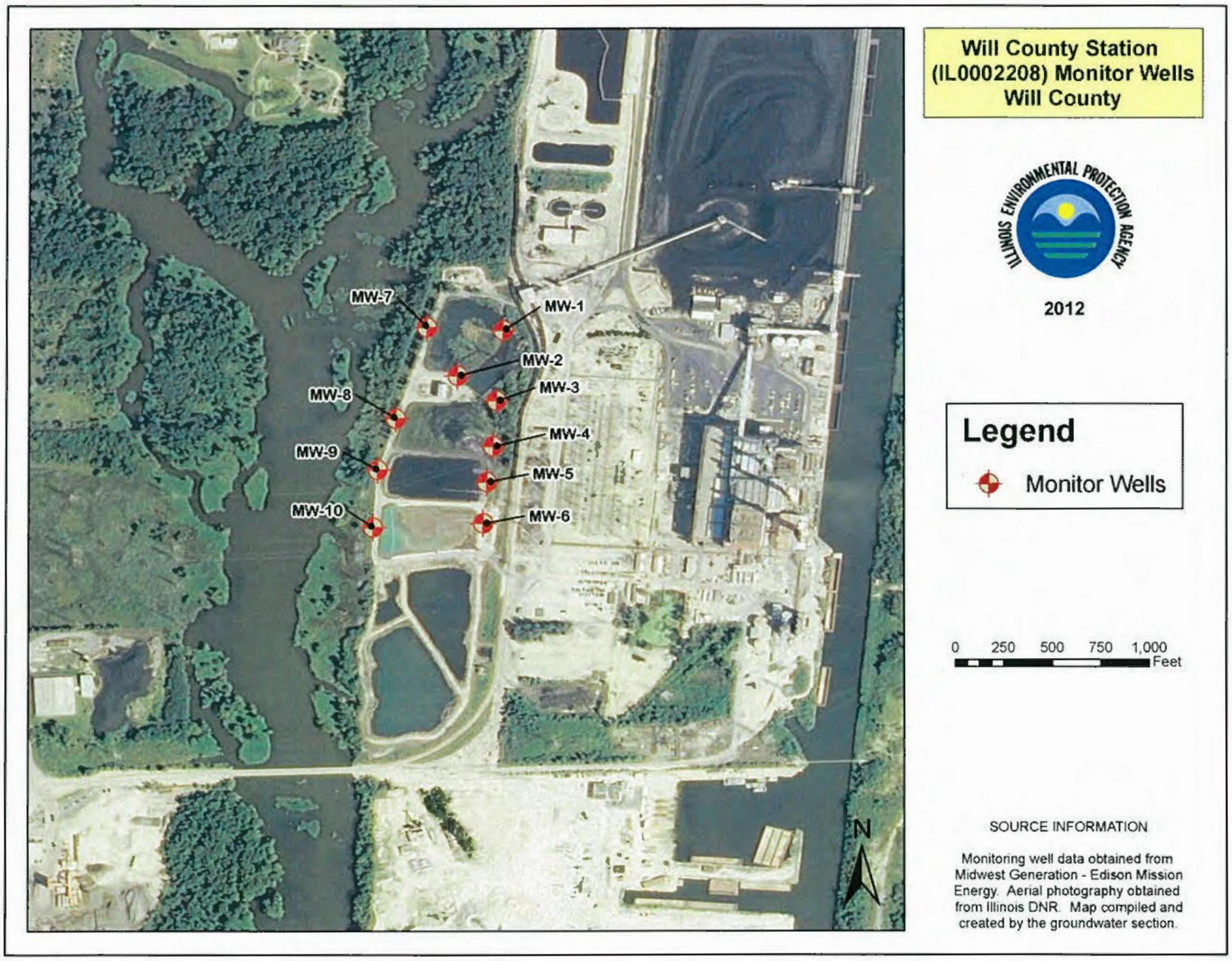
ATTACHMENT I

Name of Facility	Number of CCW Surface Impound -ments	VN	CCA	NIPLA	Corrective Actions	Other actions
Midwest Generation						
1. Will County Station	4	X	CCA		GMZ	
2. Waukegan Station	2	X	CCA			Further Assessment
3. Powerton	5	X	CCA		GMZ	
4. Joliet 29	3	X	CCA		GMZ	
5. Crawford		X	CCA		GMZ	
Dynegy Midwest						
6. Baldwin Energy Cen.	7	X		X		
7. Vermilion Station	5	X		X		
Ameren Energy						
8. Newton Station	2	X		X		
9. Coffeen Station	5	X		X		
10. Meredosia Station	3	X		X		
11. Hutsonville Station	5				SSR (Ash Pond D)	
12. Venice	2				GMZ	
City Water Light and Power						
13. City Water Light and Power	2					
Prairie Power Inc.						
14. Prairie Power Inc.	1	X			GMZ	

Note: GMZs were implemented at Dynegy's Havana, Wood River, and Hennepin Stations under consent orders prior to implementation of the Agency's Ash Impoundment Strategy.

ATTACHMENT II. MIDWEST GENERATION ("MWG") – WILL COUNTY STATION CCW SURFACE IMPOUNDMENTS MAP



MWG WILL COUNTY STATION MONITORING WELL DATA

Monitoring well MW-1 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Antimony	0.0063 mg/l	0.006 mg/l	12/08/2011
Manganese	0.16 mg/l	0.15 mg/l	03/16/2012
Manganese	0.17 mg/l	0.15 mg/l	12/08/2011
Manganese	0.16 mg/l	0.15 mg/l	09/15/2011
Manganese	0.22 mg/l	0.15 mg/l	06/15/2011
Manganese	0.20 mg/l	0.15 mg/l	12/13/2010
Sulfate	430 mg/l	400 mg/l	03/16/2012
Sulfate	530 mg/l	400 mg/l	12/13/2010
Chloride	210 mg/l	200 mg/l	03/28/2011

Monitoring well MW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Antimony	0.017 mg/l	0.006 mg/l	12/08/2011
Antimony	0.0073 mg/l	0.006 mg/l	09/15/2011
Boron	2.30 mg/l	2.0 mg/l	09/15/2011
Boron	2.30 mg/l	2.0 mg/l	06/15/2011
Sulfate	430 mg/l	400 mg/l	12/13/2010
Chloride	250 mg/l	200 mg/l	03/28/2011

Monitoring well MW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.7 mg/l	2.0 mg/l	03/16/2012
Boron	2.8 mg/l	2.0 mg/l	12/08/2011
Boron	3.3 mg/l	2.0 mg/l	09/15/2011
Boron	2.6 mg/l	2.0 mg/l	06/15/2011
Boron	2.4 mg/l	2.0 mg/l	03/28/2011
Boron	2.7 mg/l	2.0 mg/l	12/13/2010
Chloride	250 mg/l	200 mg/l	03/28/2011
Manganese	0.27 mg/l	0.15 mg/l	03/16/2012
Manganese	0.29 mg/l	0.15 mg/l	12/08/2011
Manganese	0.26 mg/l	0.15 mg/l	09/15/2011
Manganese	0.34 mg/l	0.15 mg/l	06/15/2011
Manganese	0.31 mg/l	0.15 mg/l	03/28/2011
Manganese	0.34 mg/l	0.15 mg/l	12/13/2010

Monitoring well MW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	4.0 mg/l	2.0 mg/l	03/16/2012
Boron	3.0 mg/l	2.0 mg/l	12/08/2011

Boron	4.3 mg/l	2.0 mg/l	09/15/2011
Boron	3.6 mg/l	2.0 mg/l	06/15/2011
Boron	3.3 mg/l	2.0 mg/l	03/29/2011
Boron	3.7 mg/l	2.0 mg/l	12/13/2010
Manganese	0.60 mg/l	0.15 mg/l	03/16/2012
Manganese	0.60 mg/l	0.15 mg/l	12/08/2011
Manganese	1.00 mg/l	0.15 mg/l	09/15/2011
Manganese	0.70 mg/l	0.15 mg/l	06/15/2011
Manganese	0.58 mg/l	0.15 mg/l	03/29/2011
Manganese	0.52 mg/l	0.15 mg/l	12/13/2010
Sulfate	2,000 mg/l	400 mg/l	03/16/2012
Sulfate	1,600 mg/l	400 mg/l	12/08/2011
Sulfate	4,800 mg/l	400 mg/l	09/15/2011
Sulfate	1,600 mg/l	400 mg/l	06/15/2011
Sulfate	1,500 mg/l	400 mg/l	03/29/2011
Sulfate	1,500 mg/l	400 mg/l	12/13/2010
TDS	3,700 mg/l	1,200 mg/l	03/16/2012
TDS	3,100 mg/l	1,200 mg/l	12/08/2011
TDS	6,000 mg/l	1,200 mg/l	09/15/2011
TDS	2,800 mg/l	1,200 mg/l	06/15/2011
TDS	2,600 mg/l	1,200 mg/l	03/29/2011
TDS	2,500 mg/l	1,200 mg/l	12/13/2010

Monitoring well MW-5 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.3 su	6.5-9.0 su	03/16/2012
pH	9.51 su	6.5-9.0 su	03/28/2011
Boron	4.0 mg/l	2.0 mg/l	03/16/2012
Boron	3.0 mg/l	2.0 mg/l	12/08/2011
Boron	4.3 mg/l	2.0 mg/l	09/15/2011
Boron	3.6 mg/l	2.0 mg/l	06/15/2011
Boron	3.3 mg/l	2.0 mg/l	03/29/2011
Boron	3.7 mg/l	2.0 mg/l	12/13/2010
Manganese	0.60 mg/l	0.15 mg/l	03/16/2012
Manganese	0.60 mg/l	0.15 mg/l	12/08/2011
Manganese	1.00 mg/l	0.15 mg/l	09/15/2011
Manganese	0.70 mg/l	0.15 mg/l	06/15/2011
Manganese	0.58 mg/l	0.15 mg/l	03/29/2011
Manganese	0.52 mg/l	0.15 mg/l	12/13/2010
Sulfate	2,000 mg/l	400 mg/l	03/16/2012
Sulfate	1,600 mg/l	400 mg/l	12/08/2011
Sulfate	4,800 mg/l	400 mg/l	09/15/2011
Sulfate	1,600 mg/l	400 mg/l	06/15/2011
Sulfate	1,500 mg/l	400 mg/l	03/29/2011
Sulfate	1,500 mg/l	400 mg/l	12/13/2010
TDS	3,700 mg/l	1,200 mg/l	03/16/2012

TDS	3,100 mg/l	1,200 mg/l	12/08/2011
TDS	6,000 mg/l	1,200 mg/l	09/15/2011
TDS	2,800 mg/l	1,200 mg/l	06/15/2011
TDS	2,600 mg/l	1,200 mg/l	03/29/2011
TDS	2,500 mg/l	1,200 mg/l	12/13/2010

Monitoring well MW-6 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.39 su	6.5-9.0 su	03/16/2012
pH	9.44 su	6.5-9.0 su	09/15/2011
pH	9.27 su	6.5-9.0 su	06/15/2011
pH	9.65 su	6.5-9.0 su	03/29/2011
Boron	2.5 mg/l	2.0 mg/l	03/16/2012
Boron	2.5 mg/l	2.0 mg/l	12/08/2011
Boron	3.0 mg/l	2.0 mg/l	09/15/2011
Boron	2.4 mg/l	2.0 mg/l	06/15/2011
Boron	2.5 mg/l	2.0 mg/l	03/28/2011
Boron	2.7 mg/l	2.0 mg/l	12/13/2010
Chloride	210 mg/l	200 mg/l	03/28/2011
Sulfate	440 mg/l	400 mg/l	12/08/2011
Sulfate	420 mg/l	400 mg/l	09/15/2011
Sulfate	570 mg/l	400 mg/l	06/15/2011
Sulfate	540 mg/l	400 mg/l	03/28/2011
Sulfate	500 mg/l	400 mg/l	12/13/2010

Monitoring well MW-7 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.20 mg/l	0.15 mg/l	03/16/2012
Manganese	0.20 mg/l	0.15 mg/l	12/08/2011
Manganese	0.18 mg/l	0.15 mg/l	09/15/2011
Boron	5.1 mg/l	2.0 mg/l	03/16/2012
Boron	5.0 mg/l	2.0 mg/l	12/08/2011
Boron	3.4 mg/l	2.0 mg/l	09/15/2011
Boron	5.7 mg/l	2.0 mg/l	06/15/2011
Boron	5.0 mg/l	2.0 mg/l	03/29/2011
Boron	4.7 mg/l	2.0 mg/l	12/13/2010
Sulfate	770 mg/l	400 mg/l	03/16/2012
Sulfate	710 mg/l	400 mg/l	12/08/2011
Sulfate	710 mg/l	400 mg/l	09/15/2011
Sulfate	1,000 mg/l	400 mg/l	06/15/2011
Sulfate	650 mg/l	400 mg/l	03/29/2011
Sulfate	610 mg/l	400 mg/l	12/13/2010
TDS	1,400 mg/l	1,200 mg/l	03/16/2012
TDS	1,300 mg/l	1,200 mg/l	12/08/2011
TDS	1,400 mg/l	1,200 mg/l	09/15/2011

TDS	1,600 mg/l	1,200 mg/l	06/15/2011
TDS	1,500 mg/l	1,200 mg/l	03/29/2011
TDS	1,300 mg/l	1,200 mg/l	12/13/2010

Monitoring well MW-8 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.3 mg/l	2.0 mg/l	09/15/2011
Chloride	270 mg/l	200 mg/l	03/29/2011
Manganese	0.40 mg/l	0.15 mg/l	12/08/2011
Manganese	0.45 mg/l	0.15 mg/l	09/15/2011
Manganese	0.47 mg/l	0.15 mg/l	06/15/2011
Manganese	0.44 mg/l	0.15 mg/l	03/29/2011
Manganese	0.33 mg/l	0.15 mg/l	12/13/2010
Sulfate	600 mg/l	400 mg/l	09/15/2011
Sulfate	420 mg/l	400 mg/l	06/15/2011
Sulfate	440 mg/l	400 mg/l	03/29/2011
Sulfate	440 mg/l	400 mg/l	12/13/2010
TDS	1,300 mg/l	1,200 mg/l	09/15/2011

Monitoring well MW-9 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	10.56 su	6.5-9.0 su	03/16/2012
pH	9.55 su	6.5-9.0 su	12/08/2011
pH	10.27 su	6.5-9.0 su	09/15/2011
pH	10.44 su	6.5-9.0 su	06/15/2011
pH	10.87 su	6.5-9.0 su	03/29/2011
Boron	2.2 mg/l	2.0 mg/l	12/13/2010
Chloride	230 mg/l	200 mg/l	06/15/2011
Chloride	280 mg/l	200 mg/l	03/29/2011
Sulfate	410 mg/l	400 mg/l	06/15/2011
Sulfate	410 mg/l	400 mg/l	12/13/2010

Monitoring well MW-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.1 mg/l	2.0 mg/l	03/16/2012
Boron	2.5 mg/l	2.0 mg/l	12/08/2011
Boron	2.8 mg/l	2.0 mg/l	09/15/2011
Boron	2.2 mg/l	2.0 mg/l	06/15/2011
Boron	2.1 mg/l	2.0 mg/l	12/13/2010
Manganese	0.25 mg/l	0.15 mg/l	03/16/2012
Manganese	0.29 mg/l	0.15 mg/l	12/08/2011
Manganese	0.27 mg/l	0.15 mg/l	09/15/2011

Manganese	0.25 mg/l	0.15 mg/l	06/15/2011
Manganese	0.22 mg/l	0.15 mg/l	03/28/2011
Manganese	0.25 mg/l	0.15 mg/l	12/13/2010
Sulfate	420 mg/l	400 mg/l	09/15/2011

ATTACHMENT III. MWG – WAUKEGAN STATION CCW SURFACE IMPOUNDMENTS MAP

MWG WAUKEGAN STATION MONITORING WELL DATA

Monitoring well MW-1 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.54 su	6.5-9.0 su	3/14/2012
pH	9.97 su	6.5-9.0 su	6/13/2011
pH	9.92 su	6.5-9.0 su	3/24/2011
Antimony	0.052 mg/l	0.006 mg/l	10/25/2010
Arsenic	0.078 mg/l	0.05 mg/l	3/14/2012
Arsenic	0.057 mg/l	0.05 mg/l	12/6/2011
Arsenic	0.077 mg/l	0.05 mg/l	9/13/2011
Arsenic	0.17 mg/l	0.05 mg/l	6/13/2011
Arsenic	0.054 mg/l	0.05 mg/l	10/25/2010
Boron	2.5 mg/l	2.0 mg/l	3/14/2012
Boron	2.8 mg/l	2.0 mg/l	12/6/2011
Boron	2.5 mg/l	2.0 mg/l	9/13/2011
Boron	2.6 mg/l	2.0 mg/l	6/13/2011
Boron	2.6 mg/l	2.0 mg/l	10/25/2010

Monitoring well MW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.31 su	6.5-9.0 su	3/24/2011
Boron	2.2 mg/l	2.0 mg/l	3/24/2011

Monitoring well MW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.20 su	6.5-9.0 su	9/13/2011
Boron	2.3 mg/l	2.0 mg/l	6/13/2011
Boron	2.2 mg/l	2.0 mg/l	3/24/2011

Monitoring well MW-4 for the following constituents:

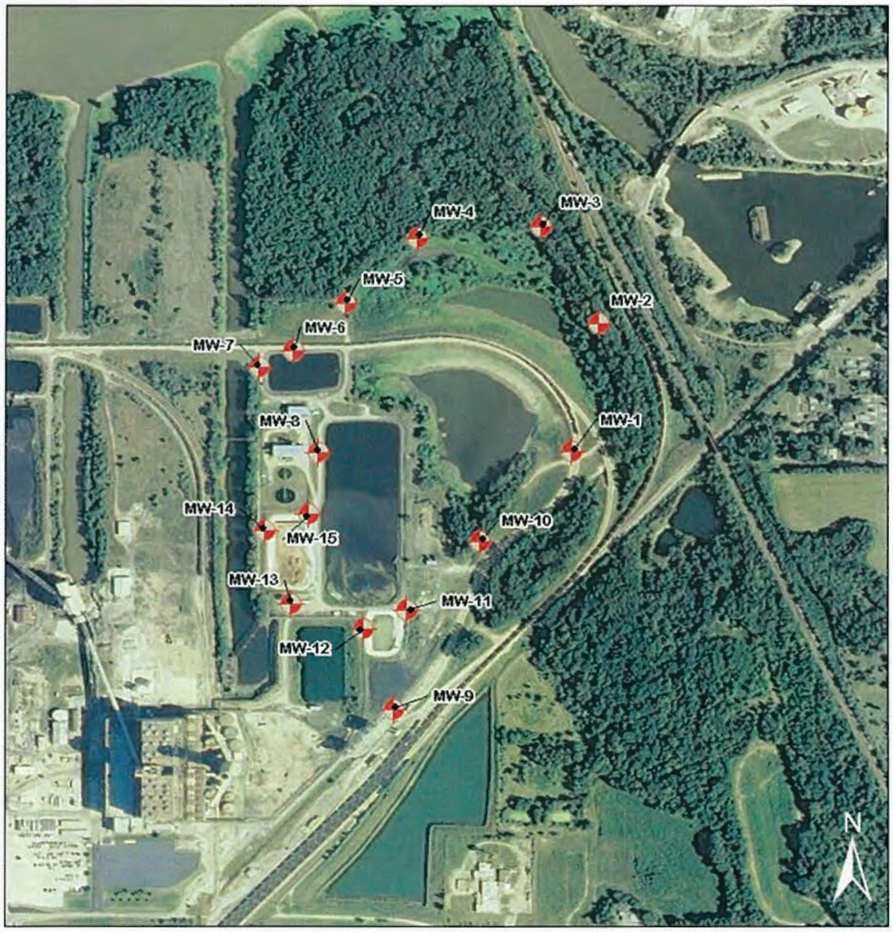
Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.36 mg/l	0.15 mg/l	9/13/2011
Boron	2.2 mg/l	2.0 mg/l	3/14/2012
Boron	2.1 mg/l	2.0 mg/l	12/6/2011
Boron	2.1 mg/l	2.0 mg/l	3/24/2011

Monitoring well MW-5 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	6.6 mg/l	5.0 mg/l	3/14/2012
Iron	5.6 mg/l	5.0 mg/l	12/6/2011
Manganese	0.76 mg/l	0.15 mg/l	3/14/2012

Manganese	0.99 mg/l	0.15 mg/l	12/6/2011
Manganese	0.28 mg/l	0.15 mg/l	6/13/2011
Manganese	0.60 mg/l	0.15 mg/l	3/24/2011
Boron	44 mg/l	2.0 mg/l	3/14/2012
Boron	37 mg/l	2.0 mg/l	12/6/2011
Boron	30 mg/l	2.0 mg/l	9/13/2011
Boron	12 mg/l	2.0 mg/l	6/13/2011
Boron	33 mg/l	2.0 mg/l	3/24/2011
Sulfate	980 mg/l	400 mg/l	3/14/2012
Sulfate	1,100 mg/l	400 mg/l	12/6/2011
Sulfate	810 mg/l	400 mg/l	9/13/2011
Sulfate	1,100 mg/l	400 mg/l	6/13/2011
Sulfate	780 mg/l	400 mg/l	3/24/2011
Sulfate	920 mg/l	400 mg/l	10/25/2010
Chloride	220 mg/l	200 mg/l	9/13/2011
Chloride	540 mg/l	200 mg/l	6/13/2011
TDS	2,000 mg/l	1,200 mg/l	3/14/2012
TDS	2,300 mg/l	1,200 mg/l	12/6/2011
TDS	2,300 mg/l	1,200 mg/l	9/13/2011
TDS	3,300 mg/l	1,200 mg/l	6/13/2011
TDS	1,800 mg/l	1,200 mg/l	3/24/2011
TDS	1,500 mg/l	1,200 mg/l	10/25/2010

ATTACHMENT IV. MWG – POWERTON STATION CCW SURFACE IMPOUNDMENTS MAP



Powerton Station (IL0002232) Monitor Wells Tazewell County

Legend

Monitor Wells

0 250 500 750 1,000 Feet

SOURCE INFORMATION

Monitoring well data obtained from Midwest Generation - Edison Mission Energy. Aerial photography obtained from Illinois DNR. Map compiled and created by the groundwater section.

MWG POWERTON STATION MONITORING WELL DATA

Monitoring well MW-1 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.39 su	6.5-9.0 su	12/12/2011
Boron	2.9 mg/l	2.0 mg/l	3/19/2012
Nitrate	11 mg/l	10.0 mg/l	9/20/2011

Monitoring well MW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.41 su	6.5-9.0 su	12/12/2011

Monitoring well MW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.37 su	6.5-9.0 su	12/12/2011
Manganese	0.35 mg/l	0.15 mg/l	12/12/2011
Manganese	0.69 mg/l	0.15 mg/l	9/20/2011
Manganese	0.41 mg/l	0.15 mg/l	6/16/2011
Manganese	0.68 mg/l	0.15 mg/l	3/25/2011

Monitoring well MW-5 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.34 su	6.5-9.0 su	12/12/2011
Manganese	0.26 mg/l	0.15 mg/l	3/19/2012
Manganese	0.50 mg/l	0.15 mg/l	12/12/2011
Manganese	0.64 mg/l	0.15 mg/l	9/20/2011
Manganese	0.48 mg/l	0.15 mg/l	6/16/2011
Manganese	0.49 mg/l	0.15 mg/l	3/25/2011
Manganese	0.51 mg/l	0.15 mg/l	12/15/2010

Monitoring well MW-6 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.61 mg/l	0.15 mg/l	3/19/2012
Manganese	0.63 mg/l	0.15 mg/l	12/12/2011
Manganese	0.66 mg/l	0.15 mg/l	9/20/2011
Manganese	0.63 mg/l	0.15 mg/l	6/16/2011
Manganese	0.68 mg/l	0.15 mg/l	3/25/2011
Manganese	0.68 mg/l	0.15 mg/l	12/15/2010
Chloride	210 mg/l	200 mg/l	9/20/2011

Monitoring well MW-7 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.45 su	6.5-9.0 su	12/12/2011
Arsenic	0.23 mg/l	0.05 mg/l	3/19/2012
Arsenic	0.23 mg/l	0.05 mg/l	12/12/2011
Arsenic	0.18 mg/l	0.05 mg/l	9/20/2011
Arsenic	0.12 mg/l	0.05 mg/l	6/16/2011
Arsenic	0.085 mg/l	0.05 mg/l	3/25/2011
Iron	31 mg/l	5.0 mg/l	3/19/2012
Iron	26 mg/l	5.0 mg/l	12/12/2011
Iron	22 mg/l	5.0 mg/l	9/20/2011
Iron	10 mg/l	5.0 mg/l	6/16/2011
Iron	7.5 mg/l	5.0 mg/l	3/25/2011
Iron	8.0 mg/l	5.0 mg/l	12/15/2010
Lead	0.039 mg/l	0.0075 mg/l	12/15/2010
Manganese	11 mg/l	0.15 mg/l	3/19/2012
Manganese	12 mg/l	0.15 mg/l	12/12/2011
Manganese	12 mg/l	0.15 mg/l	9/20/2011
Manganese	6.4 mg/l	0.15 mg/l	6/16/2011
Manganese	5.9 mg/l	0.15 mg/l	3/25/2011
Manganese	3.5 mg/l	0.15 mg/l	12/15/2010
Selenium	0.054 mg/l	0.05 mg/l	12/12/2011
TDS	1,400 mg/l	1,200 mg/l	3/19/2012
TDS	1,300 mg/l	1,200 mg/l	12/12/2011
TDS	1,300 mg/l	1,200 mg/l	9/20/2011
TDS	1,300 mg/l	1,200 mg/l	6/16/2011

Monitoring well MW-8 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.27 mg/l	0.15 mg/l	3/19/2012
Manganese	0.20 mg/l	0.15 mg/l	12/12/2011
Manganese	0.18 mg/l	0.15 mg/l	9/20/2011
Manganese	0.29 mg/l	0.15 mg/l	6/16/2011
Manganese	0.27 mg/l	0.15 mg/l	3/25/2011
Chloride	210 mg/l	200 mg/l	9/20/2011
Chloride	210 mg/l	200 mg/l	3/25/2011

Monitoring well MW-9 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.31 su	6.5-9.0 su	12/12/2011
Manganese	0.22 mg/l	0.15 mg/l	3/19/2012
Manganese	0.28 mg/l	0.15 mg/l	12/12/2011
Manganese	0.48 mg/l	0.15 mg/l	6/16/2011
Manganese	0.45 mg/l	0.15 mg/l	3/25/2011

Manganese	0.43 mg/l	0.15 mg/l	2/15/2011
Manganese	0.23 mg/l	0.15 mg/l	12/16/2010
Manganese	0.19 mg/l	0.15 mg/l	12/15/2010
Selenium	0.072 mg/l	0.05 mg/l	3/25/2011
Boron	2.6 mg/l	2.0 mg/l	3/19/2012
Boron	2.7 mg/l	2.0 mg/l	12/12/2011
Boron	2.5 mg/l	2.0 mg/l	9/20/2011
Boron	2.5 mg/l	2.0 mg/l	9/19/2011
Boron	2.1 mg/l	2.0 mg/l	12/16/2010
Boron	2.2 mg/l	2.0 mg/l	12/15/2010

Monitoring well MW-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.03 su	6.5-9.0 su	12/12/2011
Manganese	2.3 mg/l	0.15 mg/l	3/19/2012
Manganese	2.3 mg/l	0.15 mg/l	12/12/2011
Manganese	2.3 mg/l	0.15 mg/l	9/20/2011
Manganese	3.8 mg/l	0.15 mg/l	6/16/2011
Manganese	2.8 mg/l	0.15 mg/l	3/25/2011
Manganese	2.1 mg/l	0.15 mg/l	12/15/2010

Monitoring well MW-11 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.48 su	6.5-9.0 su	12/12/2011
Manganese	2.9 mg/l	0.15 mg/l	3/19/2012
Manganese	2.5 mg/l	0.15 mg/l	12/12/2011
Manganese	2.9 mg/l	0.15 mg/l	9/19/2011
Manganese	2.2 mg/l	0.15 mg/l	6/16/2011
Manganese	3.6 mg/l	0.15 mg/l	2/15/2011
Manganese	3.2 mg/l	0.15 mg/l	12/16/2010
Boron	2.3 mg/l	2.0 mg/l	3/19/2012

Monitoring well MW-12 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	5.6 mg/l	5.0 mg/l	6/16/2011
Iron	6.3 mg/l	5.0 mg/l	2/15/2011
Iron	5.5 mg/l	5.0 mg/l	12/15/2010
Manganese	0.25 mg/l	0.15 mg/l	12/12/2011
Manganese	0.37 mg/l	0.15 mg/l	9/19/2011
Manganese	0.26 mg/l	0.15 mg/l	6/16/2011
Manganese	0.58 mg/l	0.15 mg/l	2/15/2011
Manganese	0.32 mg/l	0.15 mg/l	12/15/2010
Mercury	0.0096 mg/l	0.002 mg/l	12/15/2010
Chloride	210 mg/l	200 mg/l	12/12/2011

Monitoring well MW-13 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	3.5 mg/l	0.15 mg/l	4/10/2012
Manganese	3.5 mg/l	0.15 mg/l	12/12/2011
Manganese	3.6 mg/l	0.15 mg/l	10/13/2011
Manganese	2.6 mg/l	0.15 mg/l	8/9/2011
Manganese	2.9 mg/l	0.15 mg/l	6/16/2011
Manganese	2.7 mg/l	0.15 mg/l	4/25/2011
Manganese	3.8 mg/l	0.15 mg/l	2/15/2011
Manganese	5.0 mg/l	0.15 mg/l	12/15/2010
Selenium	0.056 mg/l	0.05 mg/l	8/9/2011
Boron	4.0 mg/l	2.0 mg/l	4/10/2012
Boron	4.1 mg/l	2.0 mg/l	12/12/2011
Boron	3.0 mg/l	2.0 mg/l	10/13/2011
Boron	2.7 mg/l	2.0 mg/l	8/9/2011
Boron	3.0 mg/l	2.0 mg/l	6/16/2011
Boron	2.6 mg/l	2.0 mg/l	4/25/2011
Boron	3.1 mg/l	2.0 mg/l	2/15/2011
Boron	3.9 mg/l	2.0 mg/l	12/15/2010
Sulfate	1,100 mg/l	400 mg/l	4/10/2012
Sulfate	1,100 mg/l	400 mg/l	12/12/2011
Sulfate	660 mg/l	400 mg/l	10/13/2011
Sulfate	440 mg/l	400 mg/l	8/9/2011
Sulfate	540 mg/l	400 mg/l	6/16/2011
Sulfate	580 mg/l	400 mg/l	4/25/2011
Sulfate	770 mg/l	400 mg/l	2/15/2011
Sulfate	1,400 mg/l	400 mg/l	12/15/2010
Sulfate	580 mg/l	400 mg/l	4/25/2011
Sulfate	770 mg/l	400 mg/l	2/15/2011
Sulfate	1,400 mg/l	400 mg/l	12/15/2010
TDS	2,300 mg/l	1,200 mg/l	4/10/2012
TDS	2,100 mg/l	1,200 mg/l	12/12/2011
TDS	1,500 mg/l	1,200 mg/l	10/13/2011
TDS	1,300 mg/l	1,200 mg/l	6/16/2011
TDS	1,400 mg/l	1,200 mg/l	4/25/2011
TDS	1,600 mg/l	1,200 mg/l	2/15/2011
TDS	2,600 mg/l	1,200 mg/l	12/15/2010

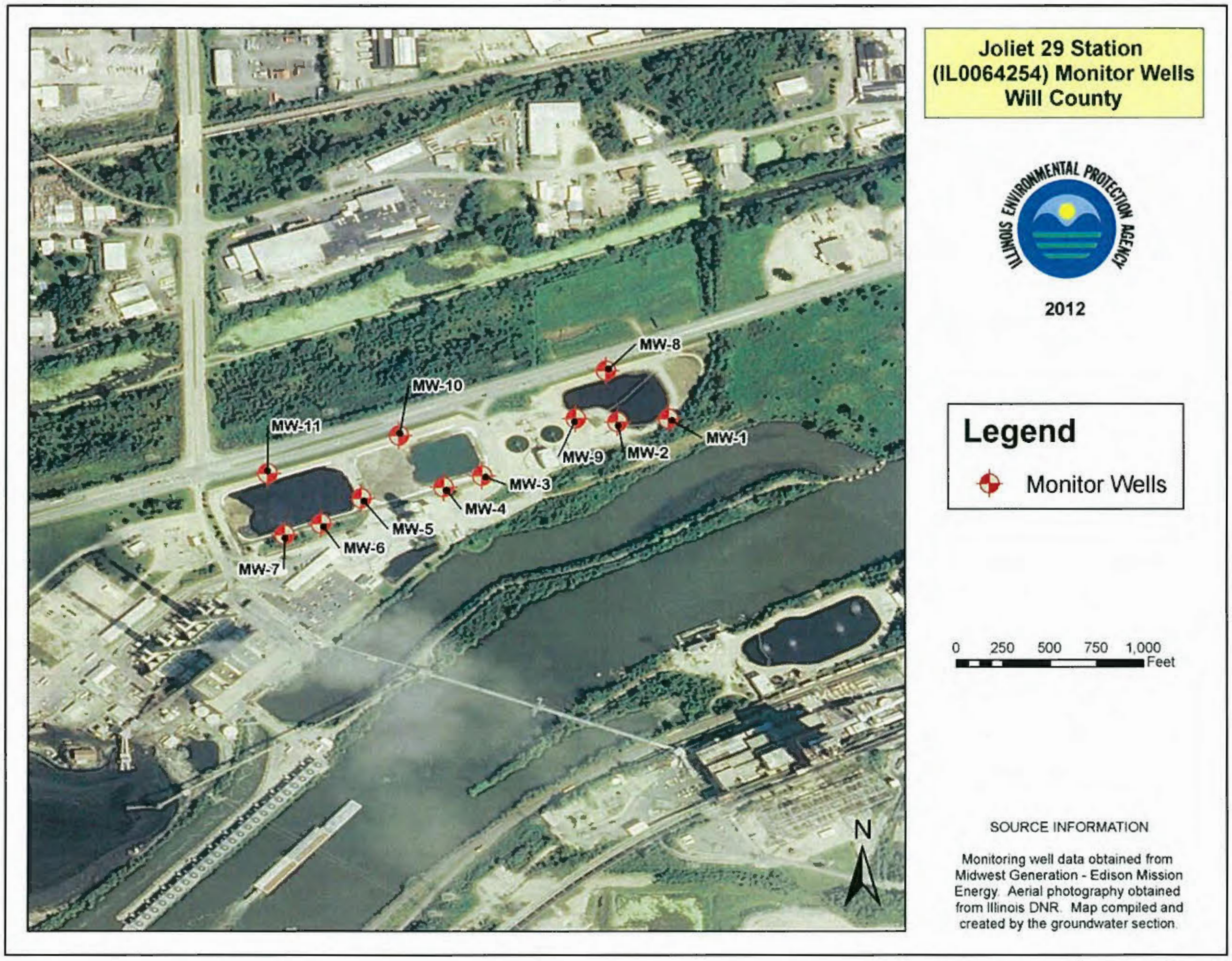
Monitoring well MW-14 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.05 su	6.5-9.0 su	12/12/2011
Manganese	0.63 mg/l	0.15 mg/l	4/10/2012
Manganese	0.84 mg/l	0.15 mg/l	10/13/2011
Manganese	0.57 mg/l	0.15 mg/l	8/9/2011
Manganese	0.36 mg/l	0.15 mg/l	6/16/2011
Manganese	0.29 mg/l	0.15 mg/l	4/25/2011
Manganese	0.81 mg/l	0.15 mg/l	2/15/2011
Manganese	0.68 mg/l	0.15 mg/l	12/15/2010
Selenium	0.065 mg/l	0.05 mg/l	4/25/2011
Thallium	0.0034 mg/l	0.002 mg/l	4/10/2012
Thallium	0.0027 mg/l	0.002 mg/l	8/9/2011
Thallium	0.0039 mg/l	0.002 mg/l	6/16/2011
Thallium	0.0035 mg/l	0.002 mg/l	4/25/2011
Sulfate	990 mg/l	400 mg/l	4/10/2012
Sulfate	880 mg/l	400 mg/l	12/12/2011
Sulfate	850 mg/l	400 mg/l	10/13/2011
Sulfate	940 mg/l	400 mg/l	8/9/2011
Sulfate	810 mg/l	400 mg/l	6/16/2011
Sulfate	770 mg/l	400 mg/l	4/25/2011
Sulfate	820 mg/l	400 mg/l	2/15/2011
Sulfate	960 mg/l	400 mg/l	12/15/2010
TDS	2,200 mg/l	1,200 mg/l	4/10/2012
TDS	1,800 mg/l	1,200 mg/l	12/12/2011
TDS	1,800 mg/l	1,200 mg/l	10/13/2011
TDS	2,000 mg/l	1,200 mg/l	8/9/2011
TDS	1,900 mg/l	1,200 mg/l	6/16/2011
TDS	1,800 mg/l	1,200 mg/l	4/25/2011
TDS	1,700 mg/l	1,200 mg/l	2/15/2011
TDS	1,800 mg/l	1,200 mg/l	12/15/2010

Monitoring well MW-15 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.25 mg/l	0.15 mg/l	4/10/2012
Manganese	0.39 mg/l	0.15 mg/l	12/12/2011
Manganese	0.48 mg/l	0.15 mg/l	10/13/2011
Manganese	0.37 mg/l	0.15 mg/l	8/9/2011
Manganese	0.60 mg/l	0.15 mg/l	6/16/2011
Manganese	0.36 mg/l	0.15 mg/l	4/25/2011
Manganese	0.42 mg/l	0.15 mg/l	2/15/2011
Manganese	0.56 mg/l	0.15 mg/l	12/15/2010
Sulfate	650 mg/l	400 mg/l	6/16/2011
Chloride	210 mg/l	200 mg/l	8/9/2011
TDS	1,600 mg/l	1,200 mg/l	6/16/2011

ATTACHMENT V. MWG – JOLIET 29 STATION CCW SURFACE IMPOUNDMENTS MAP



MWG JOLIET 29 STATION MONITORING WELL DATA

Monitoring well MW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	230 mg/l	200 mg/l	06/14/2011
Antimony	0.012 mg/l	0.006 mg/l	12/06/2010

Monitoring well MW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	250 mg/l	200 mg/l	03/15/2012
Chloride	260 mg/l	200 mg/l	12/07/2011
Chloride	300 mg/l	200 mg/l	06/14/2011
Chloride	240 mg/l	200 mg/l	03/28/2011
Chloride	260 mg/l	200 mg/l	12/07/2010

Monitoring well MW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	210 mg/l	200 mg/l	03/15/2012
Chloride	250 mg/l	200 mg/l	06/14/2011
Chloride	270 mg/l	200 mg/l	03/28/2011
Chloride	270 mg/l	200 mg/l	12/07/2010
Manganese	0.33 mg/l	0.15 mg/l	12/07/2010

Monitoring well MW-5 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	210 mg/l	200 mg/l	03/15/2012
Chloride	220 mg/l	200 mg/l	06/14/2011
Chloride	240 mg/l	200 mg/l	03/28/2011

Monitoring well MW-6 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	270 mg/l	200 mg/l	03/28/2011

Monitoring well MW-7 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	320 mg/l	200 mg/l	03/28/2011
Chloride	430 mg/l	200 mg/l	12/06/2010
Manganese	0.29 mg/l	0.15 mg/l	12/07/2010

Monitoring well MW-8 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	410 mg/l	200 mg/l	03/15/2012
Chloride	350 mg/l	200 mg/l	03/28/2011

Monitoring well MW-9 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	290 mg/l	200 mg/l	06/14/2011
Iron	7.3 mg/l	5.0 mg/l	06/14/2011
Manganese	1.3 mg/l	0.15 mg/l	03/15/2012
Manganese	0.66 mg/l	0.15 mg/l	12/07/2011
Manganese	0.82 mg/l	0.15 mg/l	09/14/2011
Manganese	0.95 mg/l	0.15 mg/l	06/14/2011
Manganese	1.6 mg/l	0.15 mg/l	03/28/2011
Manganese	1.1 mg/l	0.15 mg/l	12/06/2010
Sulfate	1,600 mg/l	400 mg/l	03/15/2012
Sulfate	1,600 mg/l	400 mg/l	12/07/2011
Sulfate	750 mg/l	400 mg/l	09/14/2011
Sulfate	580 mg/l	400 mg/l	06/14/2011
Sulfate	1,100 mg/l	400 mg/l	03/28/2011
Sulfate	1,600 mg/l	400 mg/l	12/06/2010
TDS	2,600 mg/l	1,200 mg/l	03/15/2012
TDS	2,400 mg/l	1,200 mg/l	12/07/2011
TDS	1,700 mg/l	1,200 mg/l	09/14/2011
TDS	1,500 mg/l	1,200 mg/l	06/14/2011
TDS	2,400 mg/l	1,200 mg/l	03/28/2011
TDS	2,600 mg/l	1,200 mg/l	12/06/2010

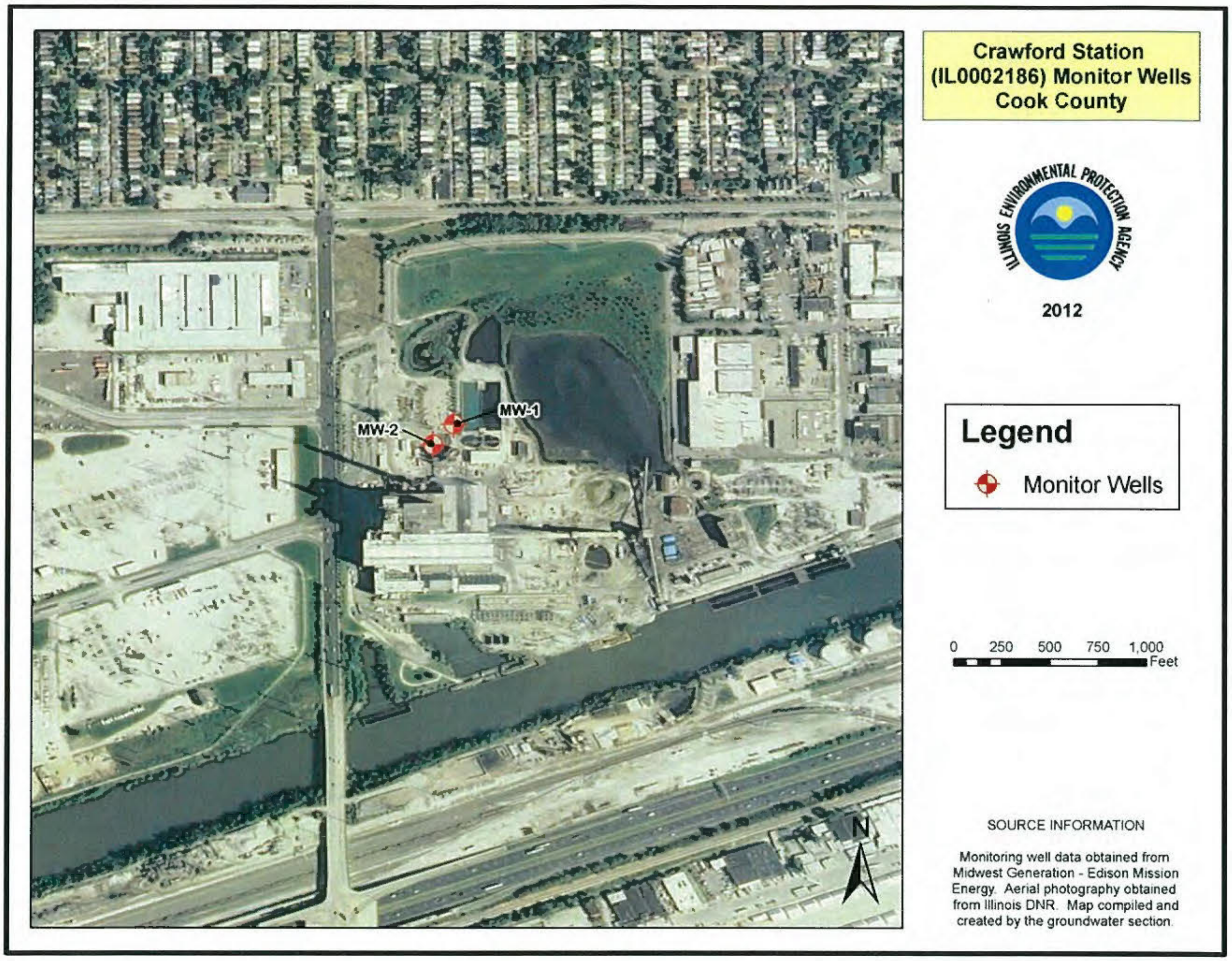
Monitoring well MW-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	300 mg/l	200 mg/l	03/28/2011

Monitoring well MW-11 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.2 mg/l	2.0 mg/l	06/14/2011
Boron	2.6 mg/l	2.0 mg/l	03/28/2011
Chloride	240 mg/l	200 mg/l	03/15/2012
Chloride	280 mg/l	200 mg/l	06/14/2011
Chloride	270 mg/l	200 mg/l	03/28/2011

ATTACHMENT VI. MWG – CRAWFORD STATION CCW SURFACE IMPOUNDMENTS MAP



MWG CRAWFORD STATION MONITORING WELL DATA

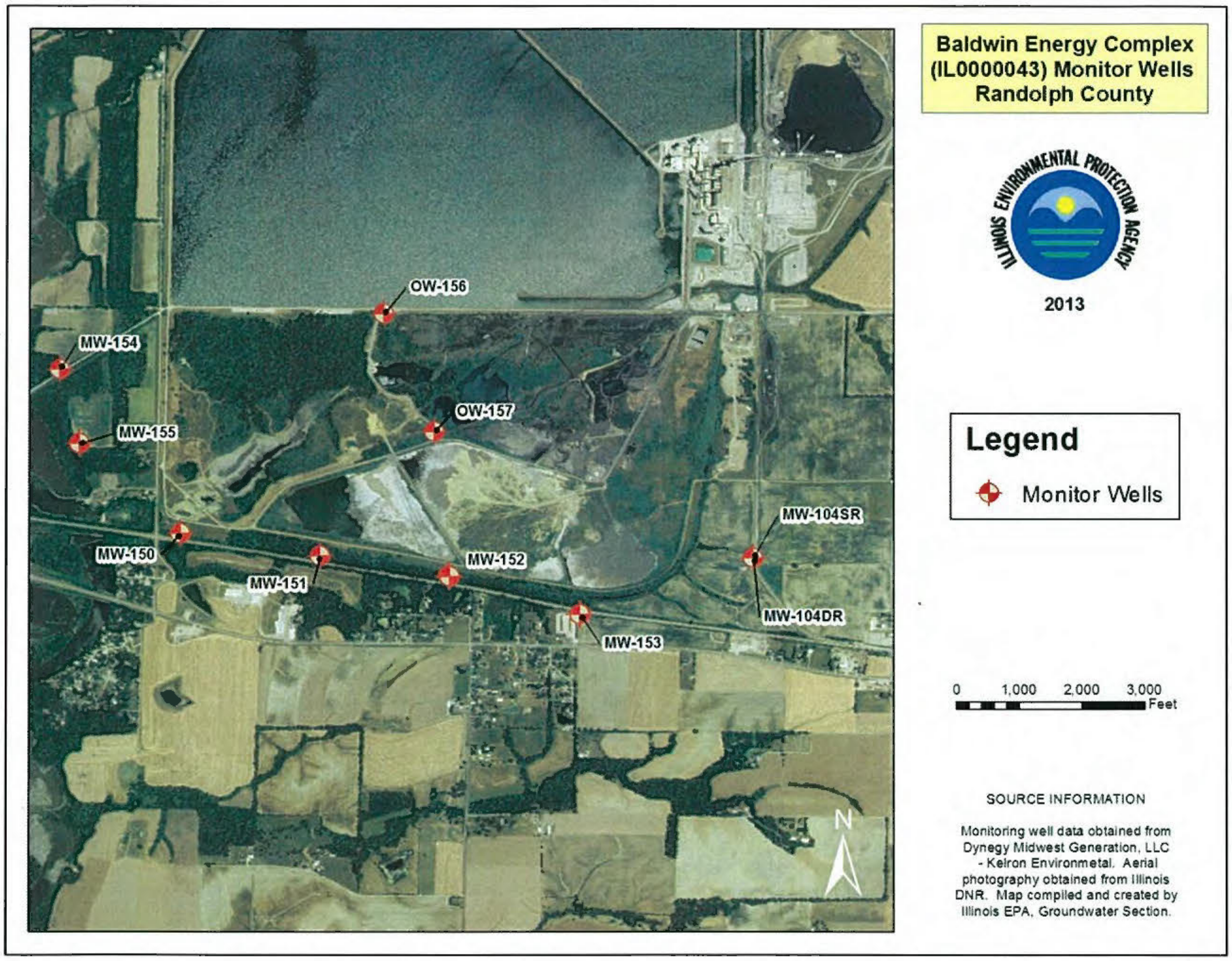
Monitoring well MW-1 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.20 su	6.5-9.0 su	12/9/2011
Iron	6.3 mg/l	5.0 mg/l	3/19/2012
Iron	5.1 mg/l	5.0 mg/l	6/13/2011
Iron	5.8 mg/l	5.0 mg/l	3/21/2011
Manganese	2.8 mg/l	0.15 mg/l	3/19/2012
Manganese	1.5 mg/l	0.15 mg/l	12/9/2011
Manganese	1.9 mg/l	0.15 mg/l	9/16/2011
Manganese	2.2 mg/l	0.15 mg/l	6/13/2011
Manganese	2.7 mg/l	0.15 mg/l	3/21/2011
Manganese	1.1 mg/l	0.15 mg/l	12/8/2010
Sulfate	810 mg/l	400 mg/l	3/19/2012
Sulfate	1,000 mg/l	400 mg/l	12/9/2011
Sulfate	750 mg/l	400 mg/l	9/16/2011
Sulfate	670 mg/l	400 mg/l	6/13/2011
Sulfate	800 mg/l	400 mg/l	3/21/2011
Sulfate	1,600 mg/l	400 mg/l	12/8/2010
Chloride	8,700 mg/l	200 mg/l	3/19/2012
Chloride	1,700 mg/l	200 mg/l	12/9/2011
Chloride	3,200 mg/l	200 mg/l	9/16/2011
Chloride	9,000 mg/l	200 mg/l	6/13/2011
Chloride	9,100 mg/l	200 mg/l	3/21/2011
TDS	15,000 mg/l	1,200 mg/l	3/19/2012
TDS	5,900 mg/l	1,200 mg/l	12/9/2011
TDS	11,000 mg/l	1,200 mg/l	9/16/2011
TDS	17,000 mg/l	1,200 mg/l	6/13/2011
TDS	18,000 mg/l	1,200 mg/l	3/21/2011
TDS	6,800 mg/l	1,200 mg/l	12/8/2010

Monitoring well MW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.95 su	6.5-9.0 su	12/9/2011
Antimony	0.018 mg/l	0.006 mg/l	3/19/2012
Manganese	0.31 mg/l	0.15 mg/l	3/19/2012
Manganese	0.42 mg/l	0.15 mg/l	12/9/2011
Manganese	0.65 mg/l	0.15 mg/l	9/16/2011
Manganese	1.3 mg/l	0.15 mg/l	6/13/2011
Manganese	1.2 mg/l	0.15 mg/l	3/21/2011
Manganese	1.4 mg/l	0.15 mg/l	12/8/2010
Sulfate	1,200 mg/l	400 mg/l	3/19/2012
Sulfate	1,900 mg/l	400 mg/l	12/9/2011
Sulfate	1,100 mg/l	400 mg/l	9/16/2011
Sulfate	1,000 mg/l	400 mg/l	6/13/2011
Sulfate	1,400 mg/l	400 mg/l	3/21/2011
Sulfate	950 mg/l	400 mg/l	12/8/2010
Chloride	2,200 mg/l	200 mg/l	3/19/2012
Chloride	2,200 mg/l	200 mg/l	12/9/2011
Chloride	1,500 mg/l	200 mg/l	9/16/2011
Chloride	2,400 mg/l	200 mg/l	6/13/2011
Chloride	2,000 mg/l	200 mg/l	3/21/2011
Chloride	610 mg/l	200 mg/l	12/8/2010
TDS	7,200 mg/l	1,200 mg/l	3/19/2012
TDS	7,200 mg/l	1,200 mg/l	12/9/2011
TDS	5,600 mg/l	1,200 mg/l	9/16/2011
TDS	7,300 mg/l	1,200 mg/l	6/13/2011
TDS	6,700 mg/l	1,200 mg/l	3/21/2011
TDS	2,700 mg/l	1,200 mg/l	12/8/2010

ATTACHMENT VII. DYNEGY MWG - BALDWIN CCW SURFACE IMPOUNDMENT(S) MAP



DYNEGY MWG BALDWIN WELL DATA

Monitoring well MW-9 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	7.53 mg/l	5.0 mg/l	02/23/2010
Lead	0.0101 mg/l	0.0075 mg/l	02/23/2010
Manganese	0.372 mg/l	0.15 mg/l	02/23/2010

Monitoring well MW-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.464 mg/l	0.15 mg/l	02/23/2010

Monitoring well MW-11 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.972 mg/l	0.15 mg/l	02/23/2010
TDS	1413 mg/l	1,200 mg/l	02/23/2010

Monitoring well MW-12 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	6.86 mg/l	2.0 mg/l	02/23/2010
Manganese	0.506 mg/l	0.15 mg/l	02/23/2010
Sulfate	805 mg/l	400 mg/l	02/23/2010
TDS	1,813 mg/l	1,200 mg/l	02/23/2010

Monitoring well MW104S for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.44 su	6.5-9.0 su	09/13/2011
Iron	14.0 mg/l	5.0 mg/l	06/07/2011
Iron	18.0 mg/l	5.0 mg/l	11/15-16/2010
Manganese	1.1 mg/l	0.15 mg/l	12/08/2011
Manganese	1.2 mg/l	0.15 mg/l	09/13/2011
Manganese	4.0 mg/l	0.15 mg/l	06/07/2011
Manganese	3.0 mg/l	0.15 mg/l	03/23/2011
Manganese	6.8 mg/l	0.15 mg/l	11/15-16/2010

Mmonitoring well MW104D for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.28 mg/l	0.15 mg/l	12/08/2011
Manganese	0.42 mg/l	0.15 mg/l	09/13/2011

Monitoring well MW150 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Sulfate	585 mg/l	400 mg/l	12/07/2011
Sulfate	513 mg/l	400 mg/l	09/13/2011
Sulfate	696 mg/l	400 mg/l	06/07/2011
Sulfate	555 mg/l	400 mg/l	03/23/2011
Sulfate	507 mg/l	400 mg/l	11/15-16/2010
TDS	1,278 mg/l	1,200 mg/l	12/07/2011
TDS	1,396 mg/l	1,200 mg/l	06/07/2011
TDS	1,205 mg/l	1,200 mg/l	03/23/2011

Monitoring well MW350 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	12.59 su	6.5-9.0 su	12/6-8/2011
pH	12.14 su	6.5-9.0 su	09/13/2011
pH	12.19 su	6.5-9.0 su	06/07/2011
pH	11.67 su	6.5-9.0 su	03/23/2011
pH	12.24 su	6.5-9.0 su	11/15-16/2010
Antimony	0.007 mg/l	0.006 mg/l	12/6-8/2011
Antimony	0.008 mg/l	0.006 mg/l	09/13/2011
TDS	1,423 mg/l	1,200 mg/l	12/6-8/2011
TDS	1,257 mg/l	1,200 mg/l	06/07/2011

Monitoring well MW152 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	18.0 mg/l	2.0 mg/l	12/6/2011
Boron	7.8 mg/l	2.0 mg/l	09/13/2011
Boron	3.6 mg/l	2.0 mg/l	06/07/2011
Boron	9.0 mg/l	2.0 mg/l	03/23/2011
Boron	12.0 mg/l	2.0 mg/l	11/15-16/2010
Sulfate	1,030 mg/l	400 mg/l	12/6/2011
Sulfate	763 mg/l	400 mg/l	09/13/2011
Sulfate	772 mg/l	400 mg/l	06/07/2011
Sulfate	914 mg/l	400 mg/l	03/23/2011
Sulfate	859 mg/l	400 mg/l	11/15-16/2010
TDS	1,983 mg/l	1,200 mg/l	12/6/2011
TDS	1,607 mg/l	1,200 mg/l	09/13/2011
TDS	1,634 mg/l	1,200 mg/l	06/07/2011
TDS	1,768 mg/l	1,200 mg/l	03/23/2011
TDS	1,759 mg/l	1,200 mg/l	11/15-16/2010

Monitoring well MW252 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	1.2 mg/l	0.15 mg/l	12/6/2011
Manganese	0.97 mg/l	0.15 mg/l	09/13/2011
Manganese	0.61 mg/l	0.15 mg/l	06/07/2011
Manganese	0.93 mg/l	0.15 mg/l	03/23/2011
Manganese	1.7 mg/l	0.15 mg/l	11/15-16/2010
Sulfate	490 mg/l	400 mg/l	12/6/2011
Sulfate	510 mg/l	400 mg/l	09/13/2011
Sulfate	578 mg/l	400 mg/l	06/07/2011
Sulfate	559 mg/l	400 mg/l	03/23/2011
Sulfate	528 mg/l	400 mg/l	11/15-16/2010
TDS	1,224 mg/l	1,200 mg/l	12/6/2011
TDS	1,301 mg/l	1,200 mg/l	09/13/2011
TDS	1,341 mg/l	1,200 mg/l	06/07/2011
TDS	1,335 mg/l	1,200 mg/l	03/23/2011
TDS	1,318 mg/l	1,200 mg/l	11/15-16/2010

Monitoring well MW352 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	10.66 su	6.5-9.0 su	12/8/2011
pH	10.96 su	6.5-9.0 su	09/13/2011
pH	11.20 su	6.5-9.0 su	06/07/2011
pH	11.55 su	6.5-9.0 su	03/23/2011
pH	10.63 su	6.5-9.0 su	11/15-16/2010
Chloride	603 mg/l	0.15 mg/l	09/13/2011
Chloride	514 mg/l	0.15 mg/l	06/07/2011
Chloride	535 mg/l	0.15 mg/l	03/23/2011
Chloride	521 mg/l	0.15 mg/l	11/15-16/2010

Monitoring well MW153 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Nitrate	15.0 mg/l	10.0 mg/l	12/08/2011
Nitrate	18.0 mg/l	10.0 mg/l	09/14/2011
Nitrate	12.0 mg/l	10.0 mg/l	06/07/2011
Nitrate	15.0 mg/l	10.0 mg/l	03/23/2011
Nitrate	13.2 mg/l	10.0 mg/l	11/15-16/2010

Monitoring well MW253 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	9.79 su	6.5-9.0 su	09/14/2011
pH	11.34 su	6.5-9.0 su	06/07/2011
Sulfate	483 mg/l	400 mg/l	12/08/2011
Sulfate	424 mg/l	400 mg/l	09/14/2011

Sulfate	411 mg/l	400 mg/l	06/07/2011
Sulfate	806 mg/l	400 mg/l	11/15-16/2010
TDS	1,441 mg/l	1,200 mg/l	11/15-16/2010
Manganese	0.37 mg/l	0.15 mg/l	11/15-16/2010

Monitoring well MW154 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.18 mg/l	0.15 mg/l	06/07/2011

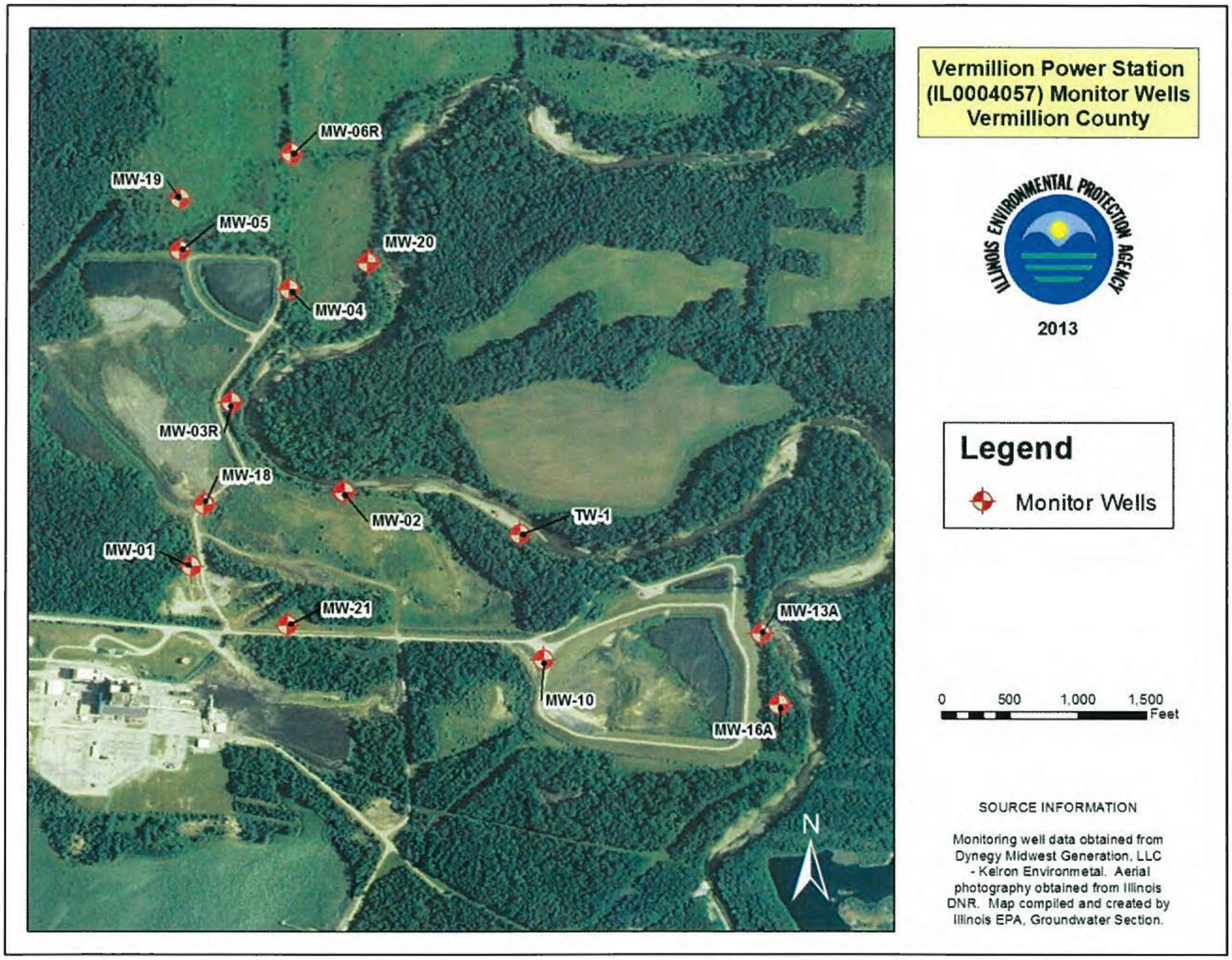
Monitoring well MW155 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.18 mg/l	0.15 mg/l	12/07/2011
Manganese	0.37 mg/l	0.15 mg/l	09/12/2011
Manganese	0.28 mg/l	0.15 mg/l	03/23/2011

Monitoring well MW355 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.43 mg/l	0.15 mg/l	12/07/2011
Manganese	0.34 mg/l	0.15 mg/l	09/12/2011
Manganese	0.20 mg/l	0.15 mg/l	06/07/2011
Manganese	0.45 mg/l	0.15 mg/l	03/23/2011
Manganese	0.87 mg/l	0.15 mg/l	11/15-16/2010

ATTACHMENT VIII. DYNEGY MWG VERMILLION - CCW SURFACE IMPOUNDMENT(S) MAP



DYNEGY MWG VERMILLION MONITORING WELL DATA

Monitoring well MW-04 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	7.8 mg/l	2.0 mg/l	10/10/2011
Boron	7.1 mg/l	2.0 mg/l	07/27/2011
Boron	5.7 mg/l	2.0 mg/l	05/24/2011
Boron	4.9 mg/l	2.0 mg/l	03/08/2011
Manganese	1.0 mg/l	0.15 mg/l	10/10/2011
Manganese	0.9 mg/l	0.15 mg/l	07/27/2011
Manganese	1.0 mg/l	0.15 mg/l	05/24/2011
Manganese	0.91 mg/l	0.15 mg/l	03/08/2011

Monitoring well MW-05 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	22 mg/l	2.0 mg/l	10/10/2011
Boron	19 mg/l	2.0 mg/l	07/27/2011
Boron	19 mg/l	2.0 mg/l	05/24/2011
Boron	20 mg/l	2.0 mg/l	03/08/2011
Manganese	0.34 mg/l	0.15 mg/l	10/10/2011
Manganese	0.31 mg/l	0.15 mg/l	07/27/2011
Manganese	0.29 mg/l	0.15 mg/l	05/24/2011
Manganese	0.31 mg/l	0.15 mg/l	03/08/2011
Sulfate	480 mg/l	400 mg/l	10/10/2011
Sulfate	450 mg/l	400 mg/l	07/27/2011
Sulfate	410 mg/l	400 mg/l	05/24/2011

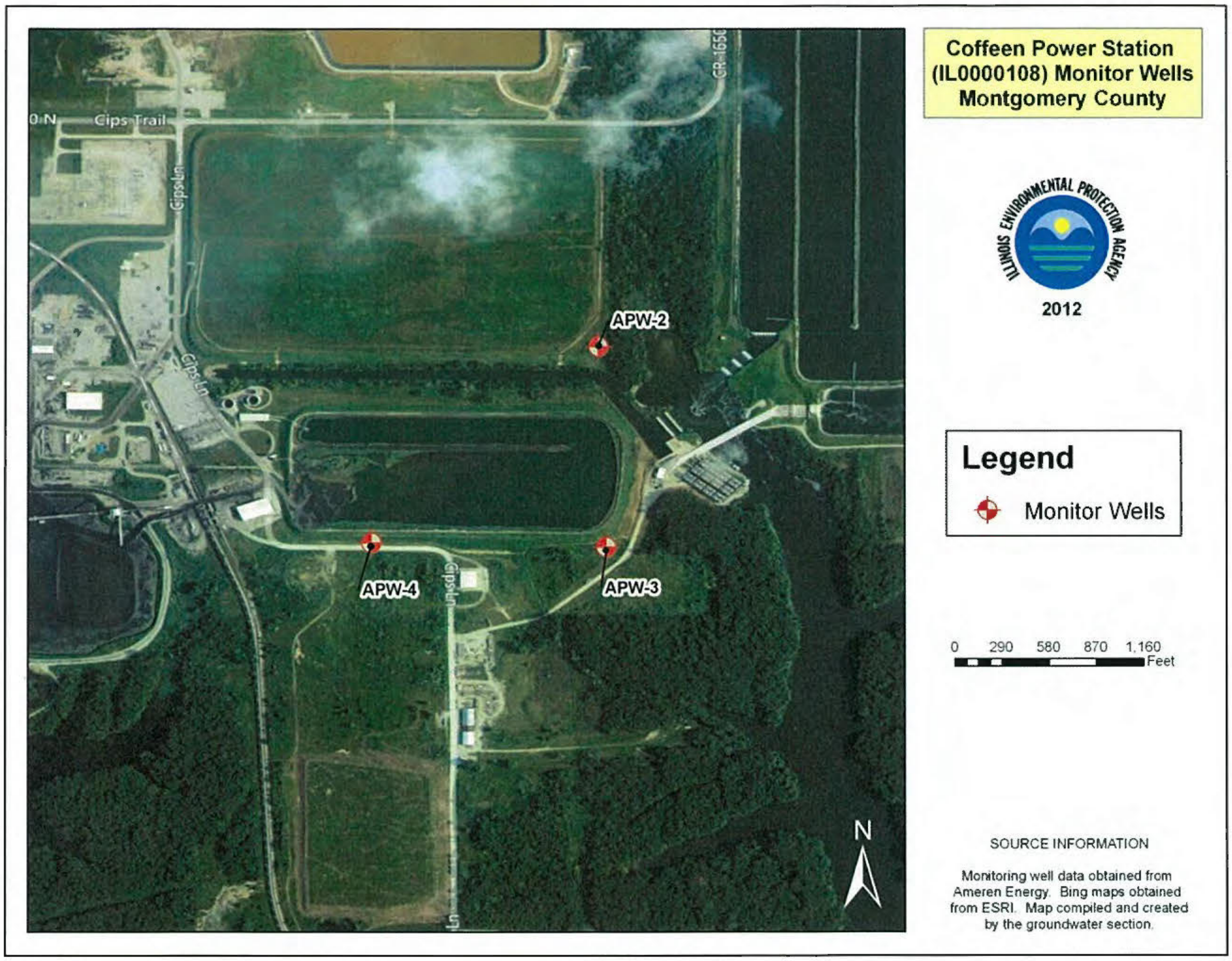
Monitoring well MW-08R for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.35 su	6.5-9.0 su	10/10/2011
Boron	40 mg/l	2.0 mg/l	10/10/2011
Boron	37 mg/l	2.0 mg/l	07/27/2011
Boron	29 mg/l	2.0 mg/l	05/24/2011
Manganese	0.22 mg/l	0.15 mg/l	05/24/2011
Sulfate	1,500 mg/l	400 mg/l	10/10/2011
Sulfate	1,300 mg/l	400 mg/l	07/27/2011
Sulfate	1,000 mg/l	400 mg/l	05/24/2011
TDS	2,200 mg/l	1,200 mg/l	10/10/2011
TDS	2,000 mg/l	1,200 mg/l	07/27/2011
TDS	1,700 mg/l	1,200 mg/l	05/24/2011

Monitoring well MW-34 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	5.3 mg/l	5.0 mg/l	07/26/2011
Iron	5.7 mg/l	5.0 mg/l	03/08/2011

ATTACHMENT IX. AMEREN ENERGY ("AE") COFFEEN CCW SURFACE IMPOUNDMENT MAP



AE COFFEEN MONITOING WELL DATA

Monitoring well APW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	7.4 mg/l	2.0 mg/l	01/25/2012
Boron	8.1 mg/l	2.0 mg/l	11/11/2011
Boron	6.3 mg/l	2.0 mg/l	07/28/2011
Boron	6.7 mg/l	2.0 mg/l	05/04/2011
Boron	7.2 mg/l	2.0 mg/l	01/26/2011
Boron	7.16 mg/l	2.0 mg/l	12/01/2010
Manganese	0.730 mg/l	0.150 mg/l	01/25/2012
Manganese	0.40 mg/l	0.150 mg/l	11/11/2011
Manganese	0.410 mg/l	0.150 mg/l	07/28/2011
Manganese	0.530 mg/l	0.150 mg/l	05/04/2011
Manganese	0.418 mg/l	0.150 mg/l	12/01/2010
Sulfate	840 mg/l	400 mg/l	01/25/2012
Sulfate	650 mg/l	400 mg/l	11/11/2011
Sulfate	840 mg/l	400 mg/l	05/04/2011
Sulfate	840 mg/l	400 mg/l	01/26/2011
Sulfate	833 mg/l	400 mg/l	12/01/2010
TDS	1600 mg/l	1200 mg/l	01/25/2012
TDS	1600 mg/l	1200 mg/l	11/11/2011
TDS	1600 mg/l	1200 mg/l	07/28/2011
TDS	1700 mg/l	1200 mg/l	05/04/2011
TDS	1600 mg/l	1200 mg/l	01/26/2011
TDS	1810 mg/l	1200 mg/l	12/01/2010

Monitoring well APW-3 for the following constituents:

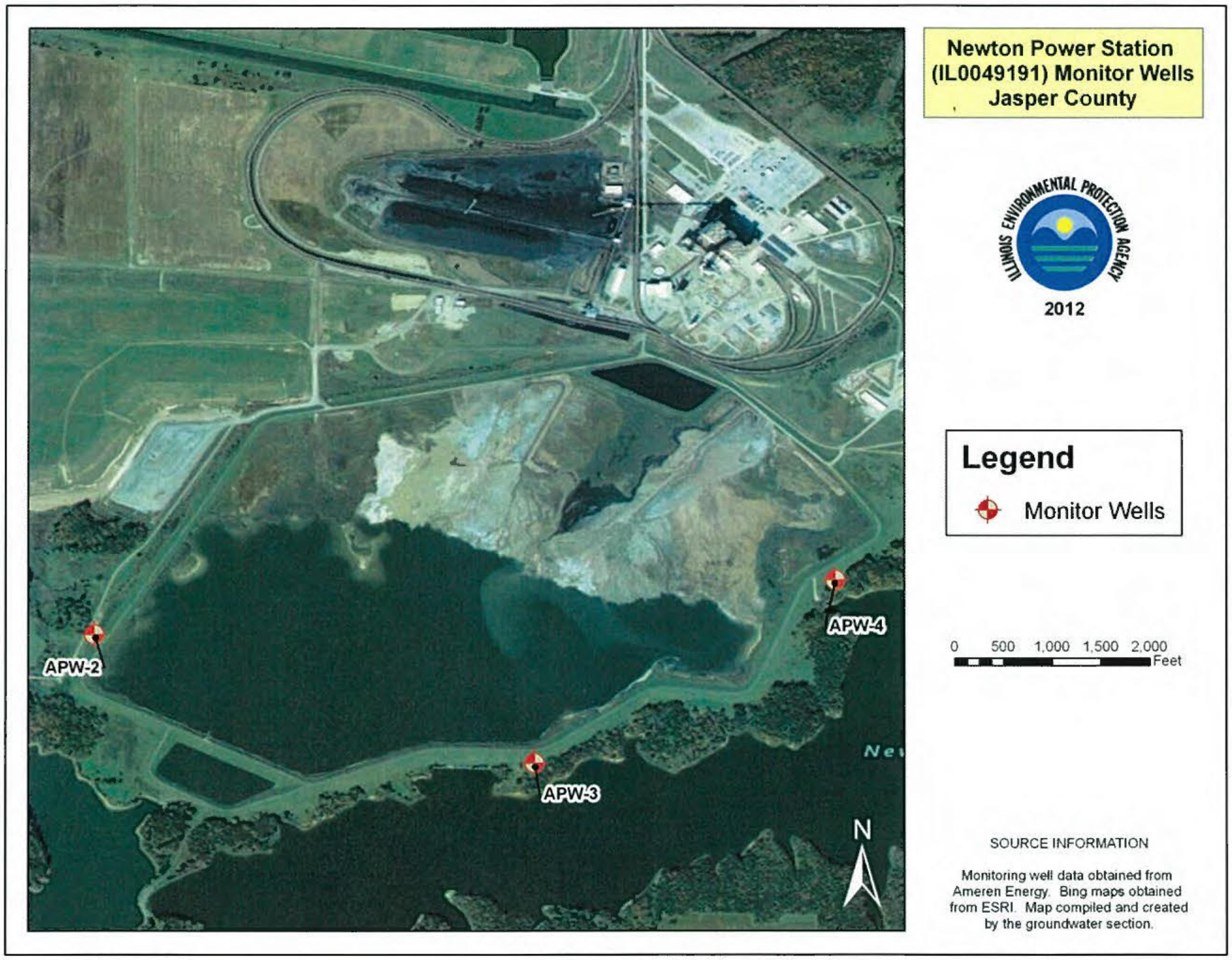
Parameter	Sample Value	GW Standard	Collection Date
Boron	2.1 mg/l	2.0 mg/l	01/25/2012
Boron	2.5 mg/l	2.0 mg/l	01/26/2011
Boron	2.07 mg/l	2.0 mg/l	12/01/2010
Manganese	0.37 mg/l	0.150 mg/l	01/25/2012
Manganese	0.866 mg/l	0.150 mg/l	11/11/2011
Manganese	0.84 mg/l	0.150 mg/l	07/28/2011
Manganese	0.85 mg/l	0.150 mg/l	05/04/2011
Manganese	0.44 mg/l	0.150 mg/l	01/26/2011
Manganese	0.866 mg/l	0.150 mg/l	12/01/2010
Sulfate	830 mg/l	400 mg/l	01/25/2012
Sulfate	761 mg/l	400 mg/l	11/11/2011
Sulfate	940 mg/l	400 mg/l	05/04/2011
Sulfate	810 mg/l	400 mg/l	01/26/2011
Sulfate	761 mg/l	400 mg/l	12/01/2010
TDS	1900 mg/l	1200 mg/l	01/25/2012

TDS	1760 mg/l	1200 mg/l	11/11/2011
TDS	2100 mg/l	1200 mg/l	07/28/2011
TDS	1800 mg/l	1200 mg/l	05/04/2011
TDS	1800 mg/l	1200 mg/l	01/26/2011
TDS	1760 mg/l	1200 mg/l	12/01/2010

Monitoring well APW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	3.6 mg/l	2.0 mg/l	01/25/2012
Boron	3.9 mg/l	2.0 mg/l	11/11/2011
Boron	3.2 mg/l	2.0 mg/l	07/25/2011
Boron	3.9 mg/l	2.0 mg/l	05/04/2011
Boron	3.8 mg/l	2.0 mg/l	01/26/2011
Boron	3.54 mg/l	2.0 mg/l	12/01/2010
Manganese	0.460 mg/l	0.150 mg/l	01/25/2012
Manganese	0.670 mg/l	0.150 mg/l	11/11/2011
Manganese	0.740 mg/l	0.150 mg/l	07/25/2011
Manganese	0.81 mg/l	0.150 mg/l	05/04/2011
Manganese	0.240 mg/l	0.150 mg/l	01/26/2011
Manganese	0.78 mg/l	0.150 mg/l	12/01/2010
Sulfate	680 mg/l	400 mg/l	01/25/2012
Sulfate	450 mg/l	400 mg/l	11/11/2011
Sulfate	750 mg/l	400 mg/l	07/25/2011
Sulfate	650 mg/l	400 mg/l	05/04/2011
Sulfate	670 mg/l	400 mg/l	01/26/2011
Sulfate	600 mg/l	400 mg/l	12/01/2010
TDS	1300 mg/l	1200 mg/l	11/11/2011
TDS	1300 mg/l	1200 mg/l	07/25/2011
TDS	1300 mg/l	1200 mg/l	05/04/2011

ATTACHMENT X. AE NEWTON
CCW SURFACE IMPOUNDMENT MAP



AE NEWTON MONITORING WELL DATA

Monitoring well APW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.49 su	6.5-9.0 su	11/30/2010
Manganese	0.45 mg/l	0.150 mg/l	04/10/2012
Manganese	0.71 mg/l	0.150 mg/l	01/31/2012
Manganese	0.91 mg/l	0.150 mg/l	10/11/2011
Manganese	0.63 mg/l	0.150 mg/l	07/12/2011
Manganese	0.24 mg/l	0.150 mg/l	05/04/2011
Manganese	0.17 mg/l	0.150 mg/l	02/08/2011
Manganese	0.907 mg/l	0.150 mg/l	11/30/2010
Sulfate	2,300 mg/l	400 mg/l	04/10/2012
Sulfate	3,000 mg/l	400 mg/l	01/31/2012
Sulfate	3,700 mg/l	400 mg/l	10/11/2011
Sulfate	2,900 mg/l	400 mg/l	07/12/2011
Sulfate	3,300 mg/l	400 mg/l	05/04/2011
Sulfate	3,300 mg/l	400 mg/l	02/08/2011
Sulfate	2,890 mg/l	400 mg/l	11/30/2010
TDS	4,900 mg/l	1,200 mg/l	04/10/2012
TDS	5,000 mg/l	1,200 mg/l	01/31/2012
TDS	5,000 mg/l	1,200 mg/l	10/11/2011
TDS	5,100 mg/l	1,200 mg/l	07/12/2011
TDS	5,100 mg/l	1,200 mg/l	05/04/2011
TDS	5,000 mg/l	1,200 mg/l	02/08/2011
TDS	1,910 mg/l	1,200 mg/l	11/30/2010
Zinc	62.0 mg/l	5.0 mg/l	04/10/2012

Monitoring well APW-3 for the following constituents:

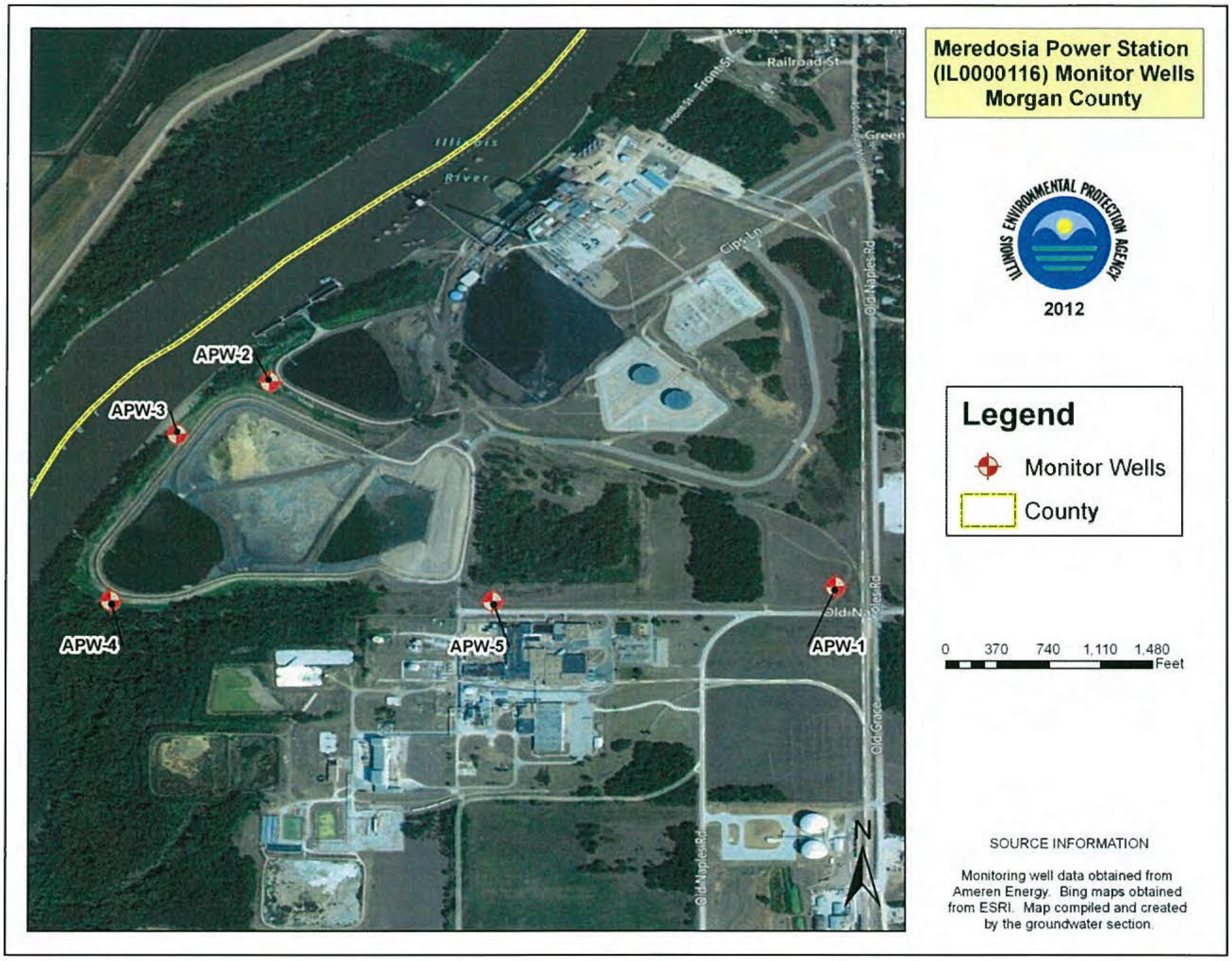
pH	6.07 su	6.5-9.0 su	11/30/2010

Monitoring well APW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.67 su	6.5-9.0 su	11/30/2010
Manganese	0.25 mg/l	0.150 mg/l	04/10/2012
Manganese	0.22 mg/l	0.150 mg/l	01/31/2012
Manganese	0.27 mg/l	0.150 mg/l	10/11/2011
Manganese	0.26 mg/l	0.150 mg/l	07/12/2011
Manganese	0.24 mg/l	0.150 mg/l	05/04/2011
Manganese	0.21 mg/l	0.150 mg/l	02/08/2011
Manganese	0.176 mg/l	0.150 mg/l	11/30/2010
Sulfate	1,500 mg/l	400 mg/l	04/10/2012
Sulfate	680 mg/l	400 mg/l	01/31/2012
Sulfate	1,300 mg/l	400 mg/l	10/11/2011

Sulfate	1,300 mg/l	400 mg/l	07/12/2011
Sulfate	1,300 mg/l	400 mg/l	05/04/2011
Sulfate	1,300 mg/l	400 mg/l	02/08/2011
Sulfate	618 mg/l	400 mg/l	11/30/2010
TDS	2,200 mg/l	1,200 mg/l	04/10/2012
TDS	2,400 mg/l	1,200 mg/l	01/31/2012
TDS	2,200 mg/l	1,200 mg/l	10/11/2011
TDS	2,300 mg/l	1,200 mg/l	07/12/2011
TDS	2,400 mg/l	1,200 mg/l	05/04/2011
TDS	2,300 mg/l	1,200 mg/l	02/08/2011
TDS	1,920 mg/l	1,200 mg/l	11/30/2010

ATTACHMENT XI. AE MERDOSIA CCW SURFACE IMPOUNDMENTS MAP



AE MEREDOSIA MONITORING WELL DATA

Monitoring well APW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.98 su	6.5-9.0 su	12/13/2010
Boron	3.6 mg/l	2.0 mg/l	03/26/2012
Boron	3.3 mg/l	2.0 mg/l	10/28/2011
Boron	2.8 mg/l	2.0 mg/l	09/15/2011
Boron	3.1 mg/l	2.0 mg/l	03/24/2011
Boron	2.11 mg/l	2.0 mg/l	12/13/2010
Manganese	0.91 mg/l	0.15 mg/l	03/26/2012
Manganese	0.79 mg/l	0.15 mg/l	10/28/2011
Manganese	0.82 mg/l	0.15 mg/l	09/15/2011
Manganese	0.48 mg/l	0.15 mg/l	03/24/2011
Manganese	0.931 mg/l	0.15 mg/l	12/13/2010
Manganese	6.5 mg/l	0.15 mg/l	11/29/2011
Manganese	6.6 mg/l	0.15 mg/l	05/07/2010

Monitoring well APW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Arsenic	0.19 mg/l	0.05 mg/l	03/26/2012
Arsenic	0.22 mg/l	0.05 mg/l	10/28/2011
Arsenic	0.21 mg/l	0.05 mg/l	09/15/2011
Arsenic	0.17 mg/l	0.05 mg/l	03/24/2011
Arsenic	0.148 mg/l	0.05 mg/l	12/13/2010
Boron	31 mg/l	2.0 mg/l	03/26/2012
Boron	35 mg/l	2.0 mg/l	10/28/2011
Boron	32 mg/l	2.0 mg/l	09/15/2011
Boron	28 mg/l	2.0 mg/l	03/24/2011
Boron	30.2 mg/l	2.0 mg/l	12/13/2010
Manganese	0.3 mg/l	0.15 mg/l	03/26/2012
Manganese	0.25 mg/l	0.15 mg/l	10/28/2011
Manganese	0.28 mg/l	0.15 mg/l	09/15/2011
Manganese	0.45 mg/l	0.15 mg/l	03/24/2011
Manganese	0.169 mg/l	0.15 mg/l	12/13/2010

Monitoring well APW-4 for the following constituents:

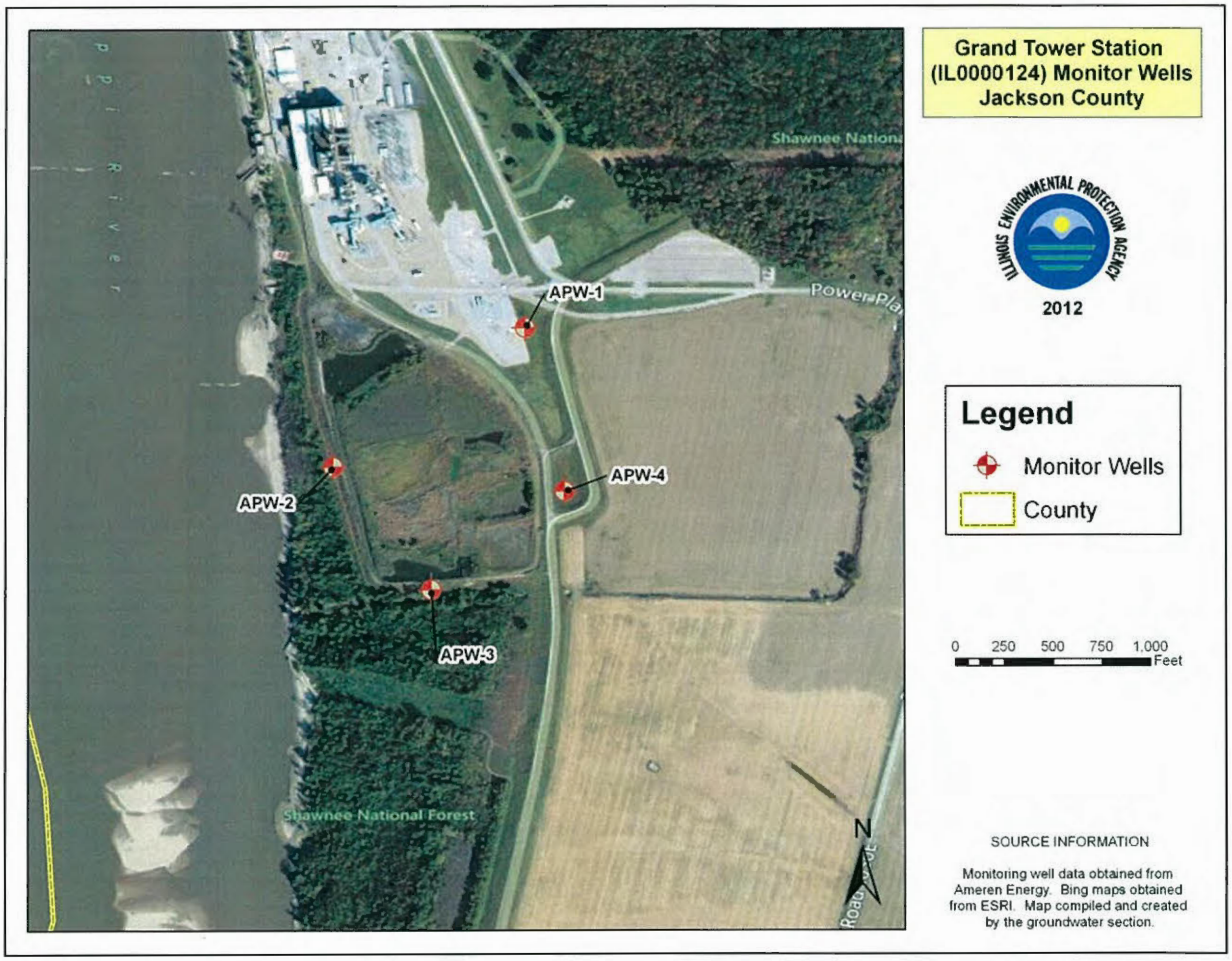
Parameter	Sample Value	GW Standard	Collection Date
pH	5.88 su	6.5-9.0 su	12/13/2010
Arsenic	0.18 mg/l	0.05 mg/l	10/28/2011
Arsenic	0.15 mg/l	0.05 mg/l	09/15/2011
Arsenic	0.053 mg/l	0.05 mg/l	12/13/2010
Boron	3.9 mg/l	2.0 mg/l	03/26/2012
Boron	6.3 mg/l	2.0 mg/l	10/28/2011

Boron	4.5 mg/l	2.0 mg/l	09/15/2011
Boron	2.55 mg/l	2.0 mg/l	12/13/2010
Iron	14 mg/l	5.0 mg/l	03/26/2012
Iron	6.6 mg/l	5.0 mg/l	10/28/2011
Iron	5.9 mg/l	5.0 mg/l	09/15/2011
Manganese	2.8 mg/l	0.15 mg/l	03/26/2012
Manganese	5.4 mg/l	0.15 mg/l	10/28/2011
Manganese	3.4 mg/l	0.15 mg/l	09/15/2011
Manganese	3.1 mg/l	0.15 mg/l	12/13/2010

Monitoring well APW-5 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.88 su	6.5-9.0 su	12/13/2010

ATTACHMENT XII. AE GRAND TOWER CCW SURFACE IMPOUNDMENT MAP



AE GRAND TOWER MONITORING WELL DATA

Monitoring well APW-1 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.25 su	6.5-9.0 su	03/23/2011
pH	5.76 su	6.5-9.0 su	11/29/2010
TDS	1,310 mg/l	1,200 mg/l	11/29/2010

Monitoring well APW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.93 su	6.5-9.0 su	11/29/2010
Boron	6.97 mg/l	2.0 mg/l	02/15/2012
Boron	5.84 mg/l	2.0 mg/l	11/28/2011
Boron	7.06 mg/l	2.0 mg/l	09/12/2011
Boron	8.61 mg/l	2.0 mg/l	06/22/2011
Boron	7.93 mg/l	2.0 mg/l	03/24/2011
Boron	6.16 mg/l	2.0 mg/l	11/29/2010
Iron	8.53 mg/l	5.0 mg/l	02/15/2012
Iron	10.1 mg/l	5.0 mg/l	03/24/2011
Iron	7.44 mg/l	5.0 mg/l	11/29/2010
Manganese	0.636 mg/l	0.15 mg/l	02/15/2012
Manganese	0.660 mg/l	0.15 mg/l	11/28/2011
Manganese	0.691 mg/l	0.15 mg/l	09/12/2011
Manganese	0.654 mg/l	0.15 mg/l	06/22/2011
Manganese	0.678 mg/l	0.15 mg/l	03/24/2011
Manganese	0.774 mg/l	0.15 mg/l	11/29/2010
Sulfate	410 mg/l	400 mg/l	02/15/2012
Sulfate	428 mg/l	400 mg/l	06/22/2011
Sulfate	425 mg/l	400 mg/l	03/24/2011

Monitoring well APW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.43 su	6.5-9.0 su	11/29/2010
Boron	4.90 mg/l	2.0 mg/l	02/15/2012
Boron	4.68 mg/l	2.0 mg/l	11/28/2011
Boron	4.65 mg/l	2.0 mg/l	09/12/2011
Boron	4.79 mg/l	2.0 mg/l	06/22/2011
Boron	4.90 mg/l	2.0 mg/l	03/24/2011
Boron	4.59 mg/l	2.0 mg/l	11/29/2010
Manganese	0.281 mg/l	0.15 mg/l	02/15/2012
Manganese	0.266 mg/l	0.15 mg/l	11/28/2011
Manganese	0.252 mg/l	0.15 mg/l	09/12/2011
Manganese	0.268 mg/l	0.15 mg/l	06/22/2011
Manganese	0.290 mg/l	0.15 mg/l	03/24/2011

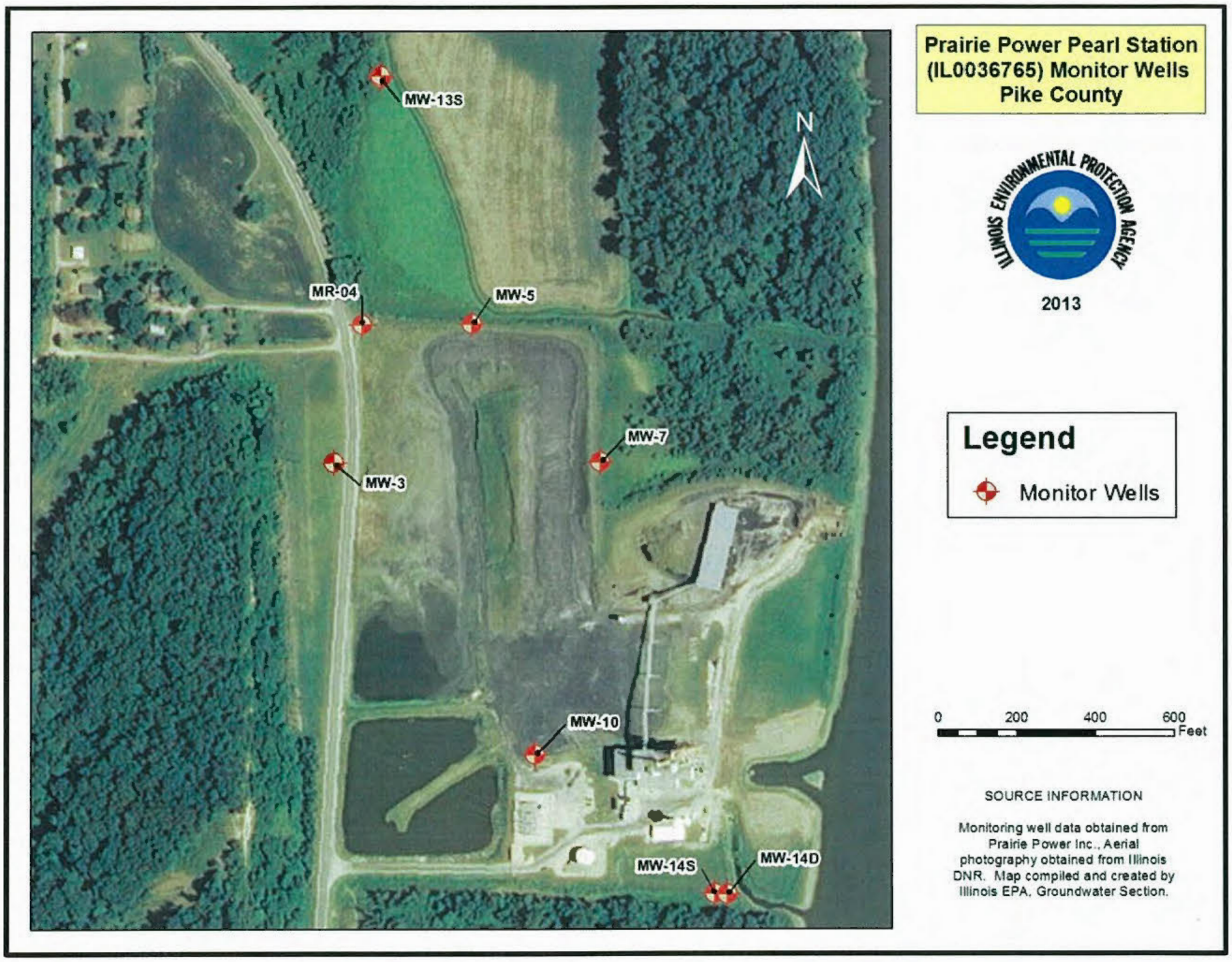
Manganese	0.315 mg/l	0.15 mg/l	11/29/2010

Monitoring well APW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.05 su	6.5-9.0 su	11/29/2010
Boron	2.97 mg/l	2.0 mg/l	02/15/2012
Boron	3.91 mg/l	2.0 mg/l	11/28/2011
Boron	6.17 mg/l	2.0 mg/l	09/12/2011
Boron	8.90 mg/l	2.0 mg/l	06/22/2011
Boron	7.01 mg/l	2.0 mg/l	03/24/2011
Boron	4.01 mg/l	2.0 mg/l	11/29/2010
Manganese	0.253 mg/l	0.15 mg/l	11/29/2010

ATTACHMENT XIII. CITY WATER LIGHT AND POWER ("CWLP") MAP OF CCW SURFACE IMPOUNDMENT(S)

ATTACHMENT XIV. PRAIRIE POWER INC. ("PPI") – PEARL STATION MAP OF CCW SURFACE IMPOUNDMENT(S)



PPI PEARL STATION MONITORING WELL DATA

Monitoring well B-1-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	25.0 mg/l	5.0 mg/l	05/07/2010
Manganese	6.2 mg/l	0.15 mg/l	05/07/2010

Monitoring well B-2-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	3.4 mg/l	2.0 mg/l	07/17/2012
Boron	3.4 mg/l	2.0 mg/l	02/23/2012
Boron	4.0 mg/l	2.0 mg/l	11/29/2011
Boron	3.0 mg/l	2.0 mg/l	05/07/2010
Iron	23.0 mg/l	5.0 mg/l	07/17/2012
Iron	23.0 mg/l	5.0 mg/l	02/23/2012
Iron	22.0 mg/l	5.0 mg/l	11/29/2011
Iron	23.0 mg/l	5.0 mg/l	05/07/2010
Manganese	6.5 mg/l	0.15 mg/l	07/17/2012
Manganese	6.2 mg/l	0.15 mg/l	02/23/2012

Monitoring well B-3-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	5.4 mg/l	2.0 mg/l	07/17/2012
Boron	5.5 mg/l	2.0 mg/l	02/23/2012
Boron	5.1 mg/l	2.0 mg/l	11/29/2011
Boron	4.8 mg/l	2.0 mg/l	05/06/2010
Manganese	4.8 mg/l	0.15 mg/l	07/17/2012
Manganese	4.3 mg/l	0.15 mg/l	02/23/2012
Manganese	3.4 mg/l	0.15 mg/l	11/29/2011
Manganese	4.8 mg/l	0.15 mg/l	05/06/2010

Monitoring well B-4-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	3.1 mg/l	2.0 mg/l	05/06/2010
Iron	8.6 mg/l	5.0 mg/l	05/06/2010
Manganese	5.2 mg/l	0.15 mg/l	05/06/2010
Sulfate	680 mg/l	400 mg/l	05/06/2010

Monitoring well B-5-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	6.6 mg/l	2.0 mg/l	07/17/2012
Boron	5.3 mg/l	2.0 mg/l	02/23/2012
Boron	6.4 mg/l	2.0 mg/l	11/29/2011

Boron	7.5 mg/l	2.0 mg/l	05/06/2010
Manganese	3.8 mg/l	0.15 mg/l	07/17/2012
Manganese	2.4 mg/l	0.15 mg/l	02/23/2012
Manganese	2.1 mg/l	0.15 mg/l	11/29/2011
Manganese	2.5 mg/l	0.15 mg/l	05/06/2010
Sulfate	710 mg/l	400 mg/l	07/17/2012
Sulfate	450 mg/l	400 mg/l	11/29/2011
Sulfate	720 mg/l	400 mg/l	05/06/2010
TDS	1,500 mg/l	1,200 mg/l	07/17/2012
TDS	1,300 mg/l	1,200 mg/l	05/06/2010

Monitoring well B-6-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	13.0 mg/l	2.0 mg/l	02/23/2012
Boron	7.7 mg/l	2.0 mg/l	11/29/2011
Boron	12.0 mg/l	2.0 mg/l	05/07/2010
Manganese	2.1 mg/l	0.15 mg/l	02/23/2012
Manganese	2.4 mg/l	0.15 mg/l	11/29/2011
Manganese	11.0 mg/l	0.15 mg/l	05/07/2010
Sulfate	960 mg/l	400 mg/l	02/23/2012
Sulfate	710 mg/l	400 mg/l	11/29/2011
Sulfate	920 mg/l	400 mg/l	05/07/2010
TDS	1,800 mg/l	1,200 mg/l	02/23/2012
TDS	1,500 mg/l	1,200 mg/l	11/29/2011
TDS	1,600 mg/l	1,200 mg/l	05/07/2010

Monitoring well B-7-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	15.0 mg/l	2.0 mg/l	07/17/2012
Boron	15.0 mg/l	2.0 mg/l	02/23/2012
Boron	17.0 mg/l	2.0 mg/l	11/29/2011
Boron	13.0 mg/l	2.0 mg/l	05/07/2010
Iron	10.0 mg/l	5.0 mg/l	07/17/2012
Iron	13.0 mg/l	5.0 mg/l	02/23/2012
Iron	13.0 mg/l	5.0 mg/l	11/29/2011
Manganese	25.0 mg/l	0.15 mg/l	07/17/2012
Manganese	22.0 mg/l	0.15 mg/l	02/23/2012
Manganese	23.0 mg/l	0.15 mg/l	11/29/2011
Manganese	18.0 mg/l	0.15 mg/l	05/07/2010
Sulfate	1,700 mg/l	400 mg/l	07/17/2012
Sulfate	1,500 mg/l	400 mg/l	02/23/2012
Sulfate	1,500 mg/l	400 mg/l	11/29/2011
Sulfate	1,400 mg/l	400 mg/l	05/07/2010
TDS	2,900 mg/l	1,200 mg/l	07/17/2012
TDS	2,800 mg/l	1,200 mg/l	02/23/2012
TDS	2,800 mg/l	1,200 mg/l	11/29/2011

TDS	2,400 mg/l	1,200 mg/l	05/07/2010

Monitoring well B-8-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	16.0 mg/l	2.0 mg/l	05/07/2010
Chloride	370 mg/l	200 mg/l	05/07/2010
Iron	20.0 mg/l	5.0 mg/l	05/07/2010
Manganese	18.0 mg/l	0.15 mg/l	05/07/2010
Sulfate	590 mg/l	400 mg/l	05/07/2010
TDS	1,700 mg/l	1,200 mg/l	05/07/2010

Monitoring well B-9-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Arsenic	0.06 mg/l	0.01 mg/l	02/23/2012
Boron	19.0 mg/l	2.0 mg/l	02/23/2012
Boron	7.8 mg/l	2.0 mg/l	11/29/2011
Boron	7.4 mg/l	2.0 mg/l	05/07/2010
Chloride	280 mg/l	200 mg/l	11/29/2011
Chloride	270 mg/l	200 mg/l	05/07/2010
Iron	19.0 mg/l	5.0 mg/l	02/23/2012
Iron	16.0 mg/l	5.0 mg/l	11/29/2011
Iron	6.9 mg/l	5.0 mg/l	05/07/2010
Lead	0.011 mg/l	0.0075 mg/l	05/07/2010
Manganese	6.8 mg/l	0.15 mg/l	02/23/2012
Manganese	5.8 mg/l	0.15 mg/l	11/29/2011
Manganese	3.4 mg/l	0.15 mg/l	05/07/2010
Sulfate	740 mg/l	400 mg/l	02/23/2012
TDS	2,500 mg/l	1,200 mg/l	02/23/2012
TDS	1,600 mg/l	1,200 mg/l	11/29/2011

Monitoring well B-10-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.2 mg/l	2.0 mg/l	05/07/2010
Manganese	6.2 mg/l	0.15 mg/l	07/17/2012
Manganese	2.6 mg/l	0.15 mg/l	02/23/2012
Manganese	9.1 mg/l	0.15 mg/l	05/07/2010
Sulfate	430 mg/l	400 mg/l	07/17/2012
Sulfate	810 mg/l	400 mg/l	02/23/2012
Sulfate	520 mg/l	400 mg/l	11/29/2011
Sulfate	460 mg/l	400 mg/l	05/07/2010
TDS	1,400 mg/l	1,200 mg/l	07/17/2012
TDS	1,700 mg/l	1,200 mg/l	02/23/2012
TDS	1,400 mg/l	1,200 mg/l	11/29/2011

Monitoring well B-11-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Manganese	0.39 mg/l	0.15 mg/l	07/17/2012
Manganese	0.21 mg/l	0.15 mg/l	02/23/2012
Manganese	2.2 mg/l	0.15 mg/l	11/29/2011
Manganese	5.3 mg/l	0.15 mg/l	05/07/2010

Monitoring well B-12-10 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Chloride	220 mg/l	200 mg/l	02/23/2012
Iron	32.0 mg/l	5.0 mg/l	02/23/2012
Iron	38.0 mg/l	5.0 mg/l	05/06/2010
Manganese	4.8 mg/l	0.15 mg/l	02/23/2012
Manganese	0.76 mg/l	0.15 mg/l	11/29/2011
Manganese	5.2 mg/l	0.15 mg/l	05/06/2010

Commercial Well for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	2.5 mg/l	2.0 mg/l	07/17/2012
Boron	2.7 mg/l	2.0 mg/l	02/23/2012
Boron	2.9 mg/l	2.0 mg/l	11/29/2011
Manganese	1.0 mg/l	0.15 mg/l	07/17/2011
Manganese	1.1 mg/l	0.15 mg/l	02/23/2012
Manganese	1.1 mg/l	0.15 mg/l	11/29/2011

ATTACHMENT XV

CURRICULUM VITAE of RICHARD P. COBB, P.G.

Work Experience

Deputy Division Manager, Division of Public Water Supplies (DPWS), Bureau of Water (BOW), Illinois Environmental Protection Agency (EPA). (5/02- Present) My primary responsibilities include managing the: Groundwater Section, and the Administrative Support Unit of the Division. Further, I assist with administering the public water supervision program under the federal Safe Drinking Water Act ("SDWA") and the Wellhead Protection Program ("WHPP") approved by the United States Environmental Protection Agency ('U.S. EPA"). Additionally, my responsibility includes the integration of source water protection with traditional water supply engineering and treatment practices, and to further assist with linking Clean Water Act and SDWA programs. I also directly manage the BOW's Groundwater Section. The Groundwater Section applies Geographic Information System ("GIS") programs, global positioning system ("GPS") technology, hydrogeologic models (3D geologic visualization, vadose zone, groundwater flow, groundwater particle tracking, solute transport, and geochemical models), and geostatistical programs for groundwater protection and remediation projects. The Groundwater Section also continues to operate a statewide ambient groundwater monitoring program for the assessment of groundwater protection and restoration programs. I also do extensive coordination with federal, state and local stakeholders. I am the Illinois EPA liaison to the Governor appointed Groundwater Advisory Council ("GAC"), and I am the Director's designee to chair the Interagency Coordinating Committee on Groundwater ("ICCG"). I also coordinate with four Priority Groundwater Protection Planning Committees, Illinois Source Water Protection Technical and Citizens Advisory Committee, and with the Ground Water Protection Council ("GWPC"), Association of State Drinking Water Administrators ("ASDWA"), and the Association of State and Interstate Water Pollution Control Administrators ("ASWIPCA") to develop and implement groundwater protection policy, plans, and programs. I represent the BOW on Illinois EPA's: Contaminant Evaluation Group ("CEG") making Right-to-Know law recommendations; Strategic Management Planning Team; Environmental Justice Committee; GIS Steering Committee; Information Management Steering Committee; and Leadership in Energy and Environmental Design for Existing Building ("LEED-EB") Committee. Since starting with Illinois EPA in 1985, I have worked on the development of legislation, rules and regulations. I have also served as a primary Illinois EPA witness before Senate and House legislative committees, and at Illinois Pollution Control Board ("Board") proceedings in the matter of groundwater quality standards, technology control regulations, cleanup regulations, regulated recharge areas, maximum setback zone, water well setback zone exceptions, clean construction and demolition debris, and site specific coal ash impoundment closure and corrective action. Furthermore, I have served as primary Illinois EPA witness in enforcement matters.

Manager, Groundwater Section, DPWS, BOW, Illinois EPA. (9/92-Present) My primary responsibilities included development and implementation of Illinois statewide groundwater quality protection, USEPA approved WHPP, and source water protection program. The Groundwater Section worked with the United States Geological Survey ("USGS") to refine

Illinois EPA's ambient groundwater monitoring network using a random stratified probability based design. The Groundwater Section continued to operate a statewide ambient groundwater monitoring program for the assessment of groundwater protection and restoration programs based on the new statistically-based design. I co-authored a *Guidance Document for Conducting Groundwater Protection Needs Assessments* with the Illinois State Water and Illinois State Geological Surveys. I also continued to conduct extensive coordination with federal, state and local stakeholders including the Governor appointed GAC, the ICCG, four Priority Groundwater Protection Planning Committees, Illinois Source Water Protection Technical and Citizens Advisory Committee, and at the national level as Co-chair of the GWPC Ground Water Division to develop and implement groundwater protection policy, plans, and programs. I also served periodically as Acting Manager for the Division of Public Water Supplies. Additionally, the Groundwater Section provided hydrogeologic technical assistance to the BOW Permit Section and Mine Pollution Control Program to implement source water protection, groundwater monitoring and aquifer evaluation and remediation programs. I continued to work on the development of legislation, rules and regulations. I also served as a primary Illinois EPA witness at Board proceedings in the matter of groundwater quality standards, technology control regulations, regulated recharge areas and water well setback zone exceptions. Furthermore, I served as an Agency witness in enforcement matters.

Acting Manager, Groundwater Section, DPWS, BOW, Illinois EPA. (7/91-9/92) My responsibilities included continued development and implementation of Illinois statewide groundwater quality protection, U.S. EPA approved WHPP, and ambient groundwater monitoring program. The Groundwater Section developed the Illinois EPA's WHPP pursuant to Section 1428 of the SDWA and was fully approved by U.S. EPA. Illinois EPA was the first state in U. S. EPA Region V to obtain this approval. I performed extensive coordination with state and local stakeholders including the Governor appointed GAC, the ICCG to develop and implement groundwater protection, plans, policy, and programs. Developed and implemented the establishment of Illinois' Priority Groundwater Protection Planning Committees. Developed and implemented Pilot Groundwater Protection Needs Assessments. The Groundwater Section also provided hydrogeologic technical assistance to the BOW Permit Section and Mine Pollution Control Program staff to develop groundwater monitoring and aquifer evaluation, remediation and/or groundwater management zone programs. I also served as a primary Agency witness at Board proceedings in the matter of groundwater quality standards and technology control regulations. Additionally, I served as an Agency total quality management ("TQM") facilitator, and TQM trainer.

Manager of the Hydrogeology Unit, Groundwater Section, DPWS, Illinois EPA (7/88-7/91) Managed a staff of geologists and geological engineers that applied hydrogeologic and groundwater modeling principals to statewide groundwater protection programs. Developed, and integrated the application of GIS, GPS, geostatistical, optimization, vadose zone, solute transport, groundwater flow and particle tracking computer hardware/software into groundwater protection and remediation projects. Conducted extensive coordination with state and local stakeholders including the Governor appointed GAC and ICCG to develop and implement groundwater protection policy, plans, and programs. Developed and implemented a well site survey program to inventory potential sources of contamination adjacent to community water supply wells. Additionally, I worked on the development of rules to expand setback zones based on the lateral area of influence of community water supply wells. Furthermore, I provided administrative support to the Section manager in coordination, planning, and supervision of the groundwater program. I also assisted with the development of grant applications and subsequent management of approved projects. In addition, I assisted the section manager with regulatory and legislative development in relation to the statewide groundwater quality protection program. I also served on the Illinois EPA's Cleanup Objectives Team ("COT").

Environmental Protection Specialist I, II, and III, Groundwater Section, DPWS, Illinois EPA. (7/85-7/88) I was the lead worker and senior geologist in the development and implementation of Illinois statewide groundwater quality protection program. I worked on the development of Illinois EPA's ambient groundwater monitoring network, and field sampling methods and procedures with the USGS. I published the first state-wide scientific paper on volatile organic compound occurrence in community water supply wells in Illinois. In addition, I assisted with the development of *A Plan for Protecting Illinois Groundwater*, and the legislation that included the *Illinois Groundwater Protection Act.*

Consulting Well Site Geologist, Geological Exploration (GX) Consultants, Denver Colorado. (3/81-12/83) I worked as a consulting well site geologist in petroleum exploration and development for major and independent oil companies. I was responsible for the geologic oversight of test drilling for the determination and presence of petroleum hydrocarbons. Prepared geologic correlations and performed analysis of geophysical logs, drilling logs and drill cuttings. Supervised and analyzed geophysical logging. Made recommendations for conducting and assisted with the analysis of drill stem tests and coring operations. In addition, I provided daily telephone reports and final written geologic reports to clients.

Undergraduate Teaching Assistant, Geology Department, Illinois State University. (3/79-3/81) I was responsible for teaching and assisting with lecture sessions, lab sessions, assignment preparation and grading for Petrology, Stratigraphy and Geologic Field Technique courses.

Undergraduate Education

B.S Geology, 1981, Illinois State University ("ISU"). Classes included field geology at South Dakota School of Mines and Technology, and Marine Ecology Paleoecology at San Salvador Field Station, Bahamas

Post Graduate Education

Applied Hydrogeology, 1984, ISU Graduate Hydrogeology Program

Engineering Geology, 1984, ISU Graduate Hydrogeology Program

Geochemistry for Groundwater Systems, 1986, USGS National Training Center

Hydrogeology of Waste Disposal Sites, 1987, ISU Graduate Hydrogeology Program

Hydrogeology of Glacial Deposits in Illinois, 1995, ISU Graduate Hydrogeology Program

MODFLOW, MODPATH and MT3D groundwater modeling, 1992, USGS National Training Center

24 Hour Occupational Health & Safety Training, 1994

Computer Modeling of Groundwater Systems, 1995, ISU Graduate Hydrogeology Program

Introduction to Quality Systems Requirements and Basic Statistics, 2001, U.S. EPA

Source Water Contamination Prevention Measures, 2001, U.S.EPA, Drinking Water Academy

Fate and Transport Processes and Models, 2006, Risk Assessment and Management Group, Inc.,

National Response Framework (NRF) *IS-800.b*, 2012, EMI

National Response Plan (NRP), an Introduction *IS-800.a*, 2007, EMI

National Incident Management System (NIMS) an Introduction *IS-00700*, 2006, Emergency Management Institute (EMI),

Introduction to the Incident Command System (ICS) *IS-00100*, 2006, EMI

ICS for Single Resources and Initial Action Incidents *IS-00200*, 2006, EMI,

Intermediate ICS for Expanding Incidents *IS-00300*, 2008, EMI

License

Licensed Professional Geologist 196-000553, State of Illinois, expires 3/31/2015

Certification

Certified Professional Geologist 7455, Certified by the American Institute of Professional Geologists 4/88

Certified Total Quality Management Facilitator, 5/92, Organizational Dynamics Inc.,

Summary of Computer Skills

I have utilized the following computer programs ARC VIEW, Aqtesolv, SURFER, WHPA, DREAM, AQUIFEM, MODFLOW, MODPATH, and MT3D.

Professional Representation

Chair of the ***ICCG*** in 2013.

Illinois EPA liaison to the ***GAC*** and representative on the ***ICCG*** (1988 – present)

Senate Working Committee on Geologic Mapping.

Illinois EPA representative and subcommittee chairman, ***State Certified Crop Advisory Board,*** and ***Ethics and Regulatory Subcommittee*** established in association with the American Society of Agronomy/American Registry of Certified Professionals in Agronomy, Crops and Soils (1995 – 2001)

Illinois groundwater quality standards regulations technical work group (1988 – 1991).

ICCG State Pesticide Management Plan Subcommittee for the protection of groundwater.

Illinois EPA representative, ***State task group involved with developing the siting criteria for a low level radioactive waste site in Illinois.***

Fresh Water Foundation's Groundwater Information System (GWIS) project in the great lakes basin.

Illinois EPA technical advisor, ***four priority regional groundwater protection planning committees*** designated by the Director to advocate groundwater protection programs at the local level (1991 – present)

Groundwater Subcommittee of the National Section 305(b) Report, of the Clean Water Act Consistency Workgroup.

Ground Water Protection Council's Wellhead Protection Subcommittee.

Co-Chair, ***Groundwater Division of the GWPC*** on (September 1997 to 2003)

Chairman, ***Illinois' Source Water Protection Technical and Citizens Advisory Committee.***

United States Environmental Protection Agency National Ground Water Report Work Group. One of 10 state representatives serving on a work group sponsored by U.S. EPA headquarters charged with development of a national report to be submitted to the U.S. Congress on the status and needs for groundwater protection programs across the country. (January 1999 to July 2000)

Illinois EPA representative, ***Northeastern Illinois Planning Commission Water Supply Task Force.*** The purpose of this task force is to assist the Commission in the development of a Strategic Plan for Water Resource Management. (March 1999 to 2001)

GWPC/U.S. EPA Futures Forum Work Group providing input on source water protection for the next 25 years. (January 1999 to 2001)

GWPC/ASDWA work group providing input into the U.S. EPA Office of Ground and Drinking Water Strategic Plan for Source Water Protection. June 2000 to March 2005.

Co-Chair, ***U.S. EPA Headquarters/GWPC/ASDWA/ASWIPCA workgroup to develop the second Ground Water Report to Congress***. March 2002 –present.

Chair, ***ICCG Groundwater Contamination Response Subcommittee*** responsible for developing a new strategy for responding to groundwater contamination and the subsequent notification of private well owners. March 2002 – April 2002.

Illinois EPA representative, ***ICCG Water Quantity Planning Subcommittee*** working on development of a surface and groundwater quantity- planning program for Illinois. June 2002 – January 2003

Chair, ***ICCG Right-to-Know (RTK) Subcommittee**, 2006*

GWPC, Groundwater Science and Research Advisory Board, 2007

Co-chair, Illinois Drought Response Task Force, 2012.

Professional Affiliation

American Institute of Professional Geologists
Illinois Groundwater Association
Ground Water Protection Council
National Groundwater Association -Association of Groundwater Scientists and Engineers
Sigma Xi – The Scientific Research Society

Honors

Sigma Xi - Elected to *Sigma Xi* - The Scientific Research Society for undergraduate research conducted and presented to the Illinois Academy of Science. 4/81

Director's Commendation Award - Participation in the development of the City of Pekin, Il. Groundwater Protection Program and commitment to the protection of Illinois groundwater. 7/95

Certificate of Appreciation - Outstanding contribution to the development of the Ground Water Guidelines for the National Water Quality Inventory 1996 Report to Congress from the United States Environmental Protection Agency Office of Ground Water and Drinking Water. 8/96

Groundwater Science Achievement Award - Illinois Groundwater Association for outstanding leadership and service in the application of groundwater science to groundwater protection in

Illinois and in the development of the wellhead protection program and pertinent land-use regulations. 11/97

Certificate of Appreciation - GWPC for distinguished service, remarkable dedication, valuable wisdom and outstanding contribution as a GWPC member, division co-chair and special committee member. 9/99

Drinking Water Hero Recognition - United States Environmental Protection Agency Administrator Carol Browner at the 25th Anniversary of the Federal Safe Drinking Water Act Futures Forum in Washington D.C. 12/99.

Certificate of Recognition - United States Environmental Protection Agency Region V Administrator Fred Lyons for outstanding achievements in protecting Illinois' groundwater resources. 12/99

Exemplary Systems in Government (ESIG) Award - Nomination by the Governor's Office of Technology from the Urban and Regional Information Systems Association (URISA) for the Illinois EPA's Source Water Assessment and Protection Internet Geographic Information System. 6/01

Expert Witness Experience

IN THE MATTER OF: GROUNDWATER QUALITY STANDARDS (35 ILL. ADM. CODE 620), R89-14(B) (Rulemaking). Subject: I served as the principal witness recommending adoption of this Illinois EPA Agency proposal. R89-14(B) was adopted by the Board. The standards became effective January 1991.

STATE OIL COMPANY vs. DR. KRONE, McHENRY COUNTY and ILLINOIS EPA, PCB 90-102 (Water Well Exception). Subject: This case involved obtaining an exception from the owner of a non-community water supply well for placing new underground gasoline storage tanks within the 200-foot setback zone of well. I served as the principal witness for Illinois EPA on this case. The Board granted the exception with conditions.

People vs. AMOCO OIL COMPANY and MOBIL CORPORATION, Case no. 90-CH-79, Tenth Judicial Court, Tazewell County, Illinois. Subject: Groundwater contamination resulting from releases at above ground bulk petroleum storage terminals resulting in violation of Illinois' Groundwater Quality Standards Regulations (35 Illinois Administrative Code 620). I served as the principal Illinois EPA witness on this case. The case was settled with a penalty of $125,000 and the requirement of a comprehensive corrective action program.

IN THE MATTER OF: GROUNDWATER PROTECTION: REGULATIONS FOR EXISTING AND NEW ACTIVITIES WITHIN SETBACK ZONES AND REGULATED RECHARGE AREAS (35 ILL. ADM. CODE 601, 615, 616 and 617), R89-5 (Rulemaking). Subject: I served as the principal Illinois EPA witness supporting adoption of this Agency proposal. R89-5 was adopted by the Board and became effective January 1992.

HOUSE BILL 171 METHYL TERTIARY BUTYL ETHER (MTBE) ELIMINATION ACT, House Environmental and Energy Committee. Subject: This law required the phase out MTBE within 3 years of enactment. I served as a principal Illinois EPA witness in support of the proposed legislation. The legislation was adopted as Public Act 92-0132 on July 24 2001. PA 92-132 required the ban of MTBE within three years.

IN THE MATTER OF: GROUNDWATER QUALITY STANDARDS (35 ILL. ADM. CODE 620), R93-27 (Rulemaking). Subject: I served as the principal Illinois EPA witness recommending amendments of new constituent standards in this Agency proposal.

SHELL OIL COMPANY vs. COUNTY of DuPAGE and THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, PCB 94-25 (Water Well Setback Exception). Subject: A new underground gasoline storage tank was seeking an exception from the Illinois Pollution Control Board in relation to a private drinking water supply well setback zone. The DuPage County and the Illinois EPA held that the tank would be a significant hazard and opposed the exception. I served as the principal Illinois EPA witness. Shell withdrew the petition from the Board after hearings were held.

People ex rel. Ryan v. STONEHEDGE, INC., 288 Ill.App.3d 318, 223 Ill.Dec. 764, 680 N.E.2d 497 (Ill.App. 2 Dist. May 22, 1997). Subject: The State brought Environmental Protection Act action against company engaged in business of spreading deicing salt, alleging that salt stored on company's industrial property leaked into area's groundwater supply, thereby contaminating it. The Circuit Court, McHenry County, James C. Franz, J., granted company's motion for summary judgment. State appealed. The Appellate Court, Colwell, J., held that: (1) wells existing before Illinois Water Well Construction Code was enacted are not "grandfathered" in as being in compliance with Code, so as to be automatically subject to testing for groundwater contamination, and (2) fact issues precluded summary judgment on claim arising from alleged deposit of at least 50,000 pounds of salt in pile within 200 feet of two existing water supply wells. Affirmed in part and reversed in part; cause remanded.

People vs. STONEHEDGE INC. Case no. 94-CH-46, Circuit Court of the 19th Judicial Circuit, McHenry County. Subject: This case involved a violation of the potable well setback zone provisions of Section 14.2 of the Illinois Environmental Protection Act. Stonehedge Inc. placed a salt pile of greater than 50,000 pounds within the 200 foot setback of multiple private drinking water supply wells. I served as an Agency principal witness. Stonehedge Inc. was found to be guilty of violating the setback prohibition in this case and was assessed a penalty of $1,500 and attorneys fees of $4,500.

SALINE VALLEY CONSERVANCY DISTRICT vs. PEABODY COAL COMPANY, Case No. 99-4074-JLF, United States District Court for the Central District of Illinois. Subject: Groundwater contamination from the disposal of 12.8 million tons of coarse coal refuse, slurry and gob. Witness for the Illinois EPA. This is an on-going case.

IN THE MATTER OF: PROPOSED REGULATED RECHARGE AREAS FOR PLEASANT VALLEY PUBLIC WATER DISTRICT, PROPOSED AMENDMENTS TO (35 ILL. ADM. CODE 617), R00-17 (Rulemaking). Subject: I served as the principal Illinois EPA witness supporting adoption of this Agency proposal. The proposal was adopted on July 26, 2001 and became effective September 1, 2001.

IN THE MATTER OF: PROPOSED AMENDMENTS TO TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (35 Ill. Adm. Code 742), (R00-19(A) and R00-19(B)) (Rulemaking). Subject: I served as a supporting Illinois EPA witness recommending inclusion of MTBE in this Agency proposal.

IN THE MATTER OF: NATURAL GAS-FIRED, PEAK-LOAD ELECTRICAL GENERATION FACILITIES (PEAKER PLANTS), R01-10 (Informational Hearing) Subject: I served as a supporting Illinois EPA witness to discuss the impact of peaker plants on groundwater.

IN THE MATTER OF: GROUNDWATER QUALITY STANDARDS AND COMPLIANCE POINT AMENDMENTS (35 ILL. ADM. CODE 620), R01- 14 (Rulemaking). Subject: I served as the principal Illinois EPA witness recommending amendments of a groundwater standard for MTBE and compliance point determinations in this Agency proposal. The Board adopted the proposal unanimously on January 24, 2002.

TERESA LeCLERCQ; AL LeCLERCQ; JAN LeCLERCQ; WALT LeCLERCQ, individually; and on behalf of all persons similarly situated vs. THE LOCKFORMER COMPANY, a division of MET-COIL SYSTEMS CORPORATION, Case no. 00 C 7164, United States District Court, Northern District of Illinois. Subject: I was called as a witness by Lockformer Company to testify about a Well Site Survey prepared and published in 1989 by the Illinois EPA for Downers Grove community water supply.

TERESA LeCLERCQ; AL LeCLERCQ; JAN LeCLERCQ; WALT LeCLERCQ, individually; and on behalf of all persons similarly situated vs. THE LOCKFORMER COMPANY, a division of MET-COIL SYSTEMS CORPORATION, Case no. 00 C 7164, United States District Court, Northern District of Illinois. Subject: I was called as a witness by Lockformer Company to testify about groundwater contamination in the Lisle and Downers Grove area.

HOUSE BILL 4177 PRIVATE WELL TESTING PROPERTY TRANSFER and DISCLOSURE ACT, House Environmental and Energy Committee. Subject: Legislation to require volatile organic chemical contamination testing of private wells at the time of property transfer and reporting to the Illinois Department of Public Health and the Illinois EPA. I served as a principal Illinois EPA witness in support of the proposed legislation. The legislation was not supported due to the opposition from the realtors association.

MATTER OF PEOPLE vs. PEABODY COAL, PCB 99-134 (Enforcement). Subject: the State of Illinois developed an amended complaint against Peabody Coal Company (PCC) for violation of the groundwater quality standard for total dissolved solids, chloride, iron, manganese, and sulfate. I developed testimony to address PCC's affirmative defense of challenging the basis for the groundwater quality standards for these contaminants.

IN THE MATTER OF: PROPOSED AMENDMENTS TO TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (35 Ill. Adm. Code 742) (TACO), (Rulemaking). Subject: I served as the Illinois EPA witness supporting amendments TACO to include wellhead protection areas. September 2004.

IN THE MATTER OF MAXMIUM SETBACK ZONES FOR MARQUETTE HEIGHTS PUBLIC WATER SUPPLY (35 ILL. ADM. CODE 618), R05-09 (Rulemaking). Subject: Pursuant to request by the Village of Marquette Heights the Illinois EPA developed a maximum setback zone for the Marquette Heights community water supply wells. I served as Illinois EPA's principal witness. The proposal was adopted on May 4, 2006.

IN THE MATTER OF: STANDARDS AND REQUIREMENTS FOR POTABLE WATER WELL SURVEYS AND FOR COMMUNITY RELATIONS ACTIVITIES PERFORMED IN CONJUNCTION WITH AGENCY NOTICES OF THREATS FROM CONTAMINATION UNDER P.A. 94-134 (35 Ill. Adm. Code 1505), R06-023 (Rulemaking), JANUARY 2006. I served as an Agency panel witness to support the adoption of the RTK regulation.

IN THE MATTER OF: PROCEDURES REQUIRED BY P. A. 94-849 FOR REPORTING RELEASES OF RADIONUCLIDES AT NUCLEAR POWER PLANTS: NEW 35 Ill. Adm. Code 1010, R07-20. I served as the Agency primary witness in this proceeding.

IN THE MATTER OF: GROUNDWATER QUALITY STANDARDS (35 ILL. ADM. CODE 620), R08-18 (Rulemaking). Subject: I served as the principal witness recommending amendments and updates to the exiting regulation. Thirty nine (39) new contaminant standards were added and wellhead protection areas were included under the compliance determination section. The Board went to First Notice on October 20, 2011. The Board adopted Second Notice on August 9, 2012. These amendments became final on October 4, 2013.

IN THE MATTER OF: IN THE MATTER OF: AMEREN ASH POND CLOSURE RULES (HUTSONVILLE POWER STATION): PROPOSED 35 ILL. ADM. CODE PART 840.101 THROUGH 840.144 (R09-21) (Rulemaking – Land) Subject: I served as the one of principal witnesses on this site specific regulation. These regulatory amendments were adopted by the Board on January 20. 2011.

PEOPLE OF THE STATE OF ILLINOIS vs., EXELON CORPORATION (No. 06 MR 248), Will County Circuit Court. Subject: I served as one of the primary Illinois EPA technical witnesses in a case where the State of Illinois and Will County sued Exelon for water pollution and exceeding groundwater standards beginning in 2001 at its Dresden Nuclear Generating Station near Morris. **Exelon paid more than $1 million** to resolve three civil complaints stemming from radioactive tritium leaks at the Braidwood, Bryon and Dresden nuclear power plants.

IN THE MATTER OF MAXMIUM SETBACK ZONES FOR FAYETTE WATER COMPANY PUBLIC WATER SUPPLY (35 ILL. ADM. CODE 618), R011-25 (Rulemaking). Subject: Pursuant to request by the Fayette Water Company the Illinois EPA developed a maximum setback zone for the Fayette Water Company community water supply wells. I am serving as Illinois EPA's principal witness. The adopted rule was published by the Secretary of State on March 16, 2012.

IN THE MATTER OF: Proposed Amendments To Clean Construction Or Demolition Debris Fill Operations (CCDD): Proposed Amendments To 35 Ill. Adm. Code 1100, R12-9. In response to Joint Committee on Administrative Rules recommendation; the Board agrees to open Subdocket B to consider groundwater monitoring August 23, 2012. I served as a panel witness to support the need for groundwater monitoring.

Publications Authored or Co-authored

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Cobb, R.P., and Sinnott, C.L., 1987. ***Organic Contaminants in Illinois Groundwater***. Proceedings of the American Water Resources Association, Illinois Section, Annual Conference, Champaign, IL, April 28-29, p. 33-43.

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Groundwater in Illinois: A Threatened Resource, A Briefing Paper Regarding the Need for Groundwater Protection Legislation, April 1987, Governors Office and Illinois Environmental Protection Agency, 34 pp.

Clarke, R.P., Cobb, R.P. and C.L. Sinnott, 1988. ***A Primer Regarding Certain Provisions of the Illinois Groundwater Protection Act.*** Illinois Environmental Protection Agency. 48 pp.

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Cobb, R.P., Wehrman, H.A., and R.C. Berg, 1994. ***Groundwater Protection Needs Assessment Guidance Document***. Illinois Environmental Protection Agency. +94 pp.

Cobb, R.P., and Dulka, W.A., 1995. ***Illinois Prevention Efforts: The Illinois Groundwater Protection Act Provides a Unified Prevention-Oriented Process to Protect Groundwater as a Natural and Public Resource***, The AQUIFER, Journal of the Groundwater Foundation, Volume 9, Number 4, March 1995. 3pp.

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Dulka, W.A., and R.P. Cobb, 1995. ***Grassroots Group Forges Groundwater Protection Law***. American Water Works Association, Opflow, Vol. 21 No. 3. 2pp.

Cobb, R.P., 1996. ***A Three Dimensional Watershed Approach: Illinois Source Water Protection Program***. In the proceedings of the Ground Water Protection Council's Annual Ground Water Protection Forum in Minneappolis Minnesota.

Cobb, R.P., and W.A. Dulka, 1996. ***Discussion Document on the Development of a Regulated Recharge Area for the Pleasant Valley Public Water District***. Illinois Environmental Protection Agency. pp 28.

Cobb, R.P., 1996. ***Illinois Source Water Protection Initiatives-Groundwater Perspective***. In the proceedings of the American Water Works Association's Annual Conference and Exposition in Toronto Canada. pp 585- 594.

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Wilson, S., Cobb, R.P., and K. Runkle, January 2002. ***Arsenic in Illinois Groundwater***. Illinois State Water Survey, Illinois Environmental Protection Agency, and Illinois Department of Public Health. http://www.epa.state.il.us/water/groundwater/publications/arsenic/index.html, 7 pp.

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Illinois Environmental Protection Agency's ***Homeland Security Strategy***, March 2003, 20pp.

Illinois Environmental Protection Agency' ***Strategic Plan***, *Bureau of Water Section*, September 2003, pp.

Opinions and Conclusions of Richard Cobb for the Matter of People v. Peabody Coal, PCB 99-134 (Enforcement), May 23, 2003. 60 pp.

Cobb, R.P., Fuller, C., Neibergall, K., and M. Carson, February 2004. ***Community Water Supply Well Shooting/Blasting near the Hillcrest Subdivision Lake County, Illinois Fact Sheet***. Illinois Environmental Protection Agency. 4 pp.

Cobb, R.P. and J. Konczyk, June 2011, ***McCullom Lake Evaluation Report***, Illinois Environmental Protection Agency, 39 pp., http://www.epa.state.il.us/water/groundwater/publications/mccullom-lake-evaluation-rpt.pdf

Additional Legislative Publications that I Participated in Developing

A Plan for Protecting Illinois Groundwater, Illinois Environmental Protection Agency, January 1986. 65 p.

Groundwater in Illinois: A Threatened Resource, A Briefing Paper Regarding the Need for Groundwater Protection Legislation, Governors Office and Illinois Environmental Protection Agency, April 1987. 34 pp.

Illinois Groundwater Protection Act, Public Act 85-0863, September 1987. 68 pp.

Public Act 92-0132 (***MTBE Elimination Act***), July 24 2001.

Executive Order #5 - requires the ICCG to designate a subcommittee to develop an integrated groundwater and surface water resources agenda and assessment report. The report shall analyze the burden's on Illinois finite water resources, quantify Illinois' water resources, and prioritize an agenda to plan for the protection of these water resources. The Director of the Department of Natural Resources chaired this subcommittee. The ICCG and GAC shall use the subcommittee's agenda and report to establish a water-quantity planning procedure for the State. The Governor signed executive order #5 on Earth Day April 22, 2001.

Amendments to Sections 2, 3 and 4 of the Illinois Groundwater Protection Act 415 ILCS 55/2 to establish a Groundwater and Surface Water Quantity Protection Planning Program, January 2002, 3 pp. These amendments were never adopted due to opposition from the Illinois Farm Bureau.

Public Act 92 –652 (Senate Bill 2072)- Amends the Illinois Groundwater Protection Act to require the Environmental Protection Agency to notify the Department of Public Health, unless notification is already provided, of the discovery of any volatile organic compound in excess of the Board's Groundwater Quality Standards or the Safe Drinking Water Act maximum contaminant level. The Governor signed this into law as Public Act 29-652 (effective July 25, 2002).

House Bill 4177 - Amends the Illinois Groundwater Protection Act. Provides that before property that has a well used for drinking water on it can be sold, the owner must have the well water tested for volatile organic chemical groundwater contaminants. Provides that if the well water does not meet the Illinois Pollution Control Board's Groundwater Quality Standards (35 Il Adm Code Part 620), the owner shall notify the Illinois Department of Public Health (IDPH) and the prospective buyer of the property. The realtors association July 2002 opposed House Bill 4177.

House Resolution 1010 - The resolution drafted by in cooperation with Senator Patrick Dunn' staff urge the Illinois Environmental Protection Agency to further strengthen its public outreach efforts by developing, after negotiations with individuals representing areas affected by contamination and other relevant State agencies, a procedure to notify property owners whenever the Agency has confirmed an exceedence of applicable health and safety standards, using scientifically credible data and procedures under Illinois regulations. HR 1010 was adopted by voice vote on June 1, 2004.

Public Act 94-314 (Senate Bill 0214) – This is referred to as Right-to-Know (RTK) law. The law includes providing the Illinois EPA with administrative order authority (AO), information order authority, and established the requirements for providing notices to residents or business exposed or potentially exposed to contamination. The Illinois EPA had been seeking this type of AO authority for the past 35 years. Senate Bill 0214 was unanimously passed by both the Senate and the House May 2005. The legislation was signed into law by the Governor July 27, 2005.

Public Act 94-849 (House Bill 1620) - Amends the Environmental Protection Act. Requires the owner or operator of a nuclear power plant to report to the Environmental Protection Agency any unpermitted release of a contaminant within 24 hours. The bill was signed by the Governor on June 12, 2006.

Public Act 96-0603 (Crestwood Bill) - Amends the Environmental Protection Act. This law requires the owners and operators of community water systems to maintain certain documents and to make those documents available to the Agency for inspection during normal business hours. Provides that the Agency shall provide public notice within 2 days after it refers a matter for enforcement under Section 43 or issues a seal order under subsection (a) of Section 34. Further, the bill provides that the Agency must provide notice to the owners and operators of the community water system within 5 days after taking one of these actions. Moreover, the bill requires that within 5 days after receiving that notice, the owner or operator of the community water system must send a copy of the notice to all residents and owners of premises connected to the community water system. In addition, indirect notification of institutional residents is provided. Requires the owner or operator of the community water system to provide the Agency with proof that the notices have been sent. Sets forth similar notice requirements that must be complied with when groundwater contamination poses a threat of exposure to the public above the Class I groundwater quality standards. The bill creates a civil penalty for violations of these notice requirements, and makes it a felony to make certain false, fictitious, or fraudulent statements. The bill passed both houses on May 30, 2009. The bill was sent to the Governor for signature on June 26, 2009, and was signed into law on August 24, 2009.

Public Act 096-1366 – Amends the Environmental Protection Act. This new law requires public water supplies to submit a corrective action plan to the Illinois EPA upon the Agency's issuing a right-to-know notice upon verifying that the finished public water has in fact exceeded 50% of the MCL for carcinogenic VOCs. Requires the response plan to include periodic sampling to measure and verify the effectiveness of the response plan, but also requires the Illinois EPA to take into account the technical feasibility and economic reasonableness of the response plane in approving, modifying, or denying the response plan. Signed into law on July 28, 2010; effective July 28, 2010.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
COAL COMBUSTION ASH PONDS	)	R14-10
AND SURFACE IMPOUNDMENTS AT	)	
POWER GENERATING FACILITIES:	)	(Rulemaking – Water)
PROPOSED 35 ILL. ADM. CODE 841	)	

PRE-FILED TESTIMONY OF WILLIAM E. BUSCHER, P.G., ON THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S PROPOSAL 35 Ill. ADM. CODE 841

My name is William E. Buscher. I am a licensed professional geologist and the Manager of the Hydrogeology and Compliance Unit ("HCU"), Groundwater Section, Division of Public Water Supplies, Bureau of Water ("BOW"), at the Illinois Environmental Protection Agency ("Illinois EPA" or "Agency"). I began working at the Agency in 1988 and have worked on the development and implementation of rules and regulations related to protecting, monitoring and assessing, and restoring groundwater. The HCU provides technical expertise to the BOW Permit Section on groundwater issues. I have enclosed a copy of my Curriculum Vitae as Attachment 1. In my testimony I discuss aspects of the proposed Part 841- Subpart C Corrective Action and Part 841- Subpart D Closure.

Beginning in 1991, when the Groundwater Quality Standards were adopted, the HCU has worked closely with the BOW Permit Section on groundwater issues related to the handling of ash at coal fired electrical generation stations. Since the early 1990s, new ash impoundments have been built with low permeability liners to minimize impacts to groundwater resources, and groundwater monitoring systems have been installed. Generally, ash impoundments constructed prior to this time did not have low permeability liners and groundwater monitoring systems.

A statewide assessment of groundwater quality at ash impoundments at coal fired power plants was initiated in 2009. The Illinois EPA identified facilities with existing ash impoundments, and requested the owners to assess groundwater conditions at these facilities. Information collected included monitoring well data, potable water system surveys, and hydrogeologic site assessments (e.g., geologic cross-sections, potentiometric surfaces, groundwater flow directions).

Many of the ash impoundments which were constructed without liners have leaked and impacted groundwater resources. The proposed regulations establish a process for assessing groundwater quality at ash impoundments which includes verifying the sources of the groundwater impacts, addressing impacts to potable wells, initiating corrective actions and initiating impoundment closure. The actions required at each of the ash impoundments will be based upon the specific conditions encountered at each impoundment.

In cases where the owner or operator identifies confirmed exceedences of the groundwater quality standards which are not attributable to a release from another source, the owner or operator is required to address the exceedences. First, the owner or operator is required to replace the water supply for the owner of any potable well in use where contamination exceeds a standard within the setback zone of the potable water supply well. Second, the owner or operator is required to initiate a corrective action under proposed Part 841- Subpart C or initiate closure under proposed Part 841- Subpart D.

SUBPART C: CORRECTIVE ACTION

An Agency top priority is to protect the health of individuals using groundwater and the groundwater resources near ash impoundments. The most common inorganic chemical compounds exceeding groundwater standards in down-gradient monitoring wells at Units included: pH; total dissolved solids ("TDS"); boron; sulfate; and manganese. Treatment of water containing pH, TDS, sulfate, and boron above naturally occurring levels is an economically and technically unacceptable burden for owners of private drinking water system wells, semi-private drinking water system wells, non-community water system wells, and small community water systems (AWWA, 1995). Contaminants found above naturally occurring levels in down-gradient monitoring wells have the potential to degrade groundwater and threaten/preclude its use if they migrate off-site. Contaminants such as TDS can cause: scaling within plumbing systems, loss of well yield, poor pump performance, and encrustation of the water line/pump that may render a water supply to be inoperable (AWWA, 1996). TDS can also cause objectional taste and odor conditions (organoleptic), and cause poor performance and reduce the lifetime of hot water appliances (i.e., water heater, dishwasher, clothes washer, and so forth). Participants in the study of Health Effects from Exposure to High Levels of Sulfate in Drinking Water Study (U.S. EPA, 1999) complained that they could not drink the water containing sulfate because of objectionable smell and taste. Groundwater containing boron contamination may be harmful when used to water sensitive plants (U.S. EPA, 1986).

When an exceedence of the groundwater standards under 35 Ill. Adm. Code 620.Subpart D has been confirmed an onsite ash impoundment unit ("Unit"), the owner operator has the option to demonstrate that the exceedence is not a result of the operation of the Unit. This could be accomplished by identifying the contaminants of concern up-gradient of the Unit. If the owner or operator has not demonstrated an exceedence is attributable to an alternative cause, the owner or operator must pursue closure or a corrective action. The corrective action plan

("CAP") provides a means of addressing groundwater contamination while the Unit continues to operate. The purpose of the CAP is to mitigate groundwater contamination caused by a Unit. A CAP must be submitted to the Agency for review and approval. Furthermore, if the concentration of any chemical constituent monitored exceeds the groundwater quality standards in 35 Ill. Adm. Code 620.Subpart D within the setback zone of a potable well, the owner or operator must replace the water supply with a supply of equal or better quality and quantity within 30 days of discovering that such impact has occurred.

The CAP could include groundwater extraction wells or groundwater collection trenches used to remove contaminated groundwater from the aquifer. The use of low permeability barriers which would impede the flow of groundwater could also be included in the CAP. The CAP must include the steps taken to mitigate the exceedence of groundwater quality standards, including plans and specifications, a proposed timeline for implementation and completion of the corrective action, estimated cost, establishment of a groundwater management zone using 35 Ill. Adm. Code 620.250, a description of the construction quality assurance program, and an evaluation of a final cover if requested by the Agency. If an institutional control prohibiting potable water use is utilized, a copy of the instrument must be provided. Where applicable, a description of a preventive response developed pursuant to proposed Section 841.235 or 35 Ill. Adm. Code 620.230 is required.

Groundwater collection systems are designed to control the migration of contaminated groundwater using pumping wells, collection trenches, or other means to capture the impacted groundwater. These devices remove contaminated groundwater from the aquifer. Groundwater collection systems may be needed to address off-site groundwater contamination at a Unit. The

Ameren Hutsonville power station is an example of site where contamination has migrated off-site. Hydraulic containment utilizing a collection trench is part of the corrective action at Hutsonville which will pull back contamination that has gone off-site and prevent further migration of off-site contamination.

The need for a groundwater collection system will based upon the specific conditions encountered at each Unit. The effects of the corrective action will be assessed by monitoring the groundwater quality at a site to determine when groundwater quality standards are met and the corrective action may be terminated. The Agency must approve installation of a groundwater collection system and approve discontinuing its use. When a groundwater collection system is inactivated, the groundwater system resumes its normal flow conditions. An additional four quarterly samples must be completed after the operation of a groundwater collection system is terminated to verify compliance with the applicable groundwater standard under normal flow conditions. If compliance is not confirmed, operation of the system must resume.

The discharge of waste water from groundwater collection systems must be handled properly. In some instances, the owner or operator may have a permit to discharge treated waste water to waters of the United States. This permit would need to be modified in order to receive the waste water from a groundwater collection system. In some cases the owner or operator may need to obtain an NPDES permit to discharge to waters of the United States. Groundwater discharge system plans, including proper operation and maintenance, must be included in the CAP that is submitted to the Agency for review and approval.

SUBPART D: CLOSURE

Each Unit will at some time be taken out of service and closed. This process may be completed with ash left in place or after ash has been removed. In cases where the Units provide wastewater treatment in addition to ash handling, an alternative wastewater treatment system may need to be designed and constructed prior to taking the ash impoundment out of service. The purpose of the closure provisions is to ensure that Units are closed in a manner which minimizes impacts to the environment including groundwater, surface water, and air medias. If all ash is removed from the impoundment, a final cover system would not be required but the impounding structure would need to be removed. However if the groundwater standards under 35 Ill. Adm. Code 620.Subpart D are exceeded, a CAP may be a component of the closure plan.

There are many options for addressing materials remaining in the Units. In some cases, recovering marketable materials from the Unit may be possible. Recovering useable materials is highly dependent on local market conditions. When ash is left in place, this material may need to be stabilized in order to construct a final cover system. The final cover system will be designed to minimize impacts to groundwater. This will be accomplished by covering the ash with a low permeability soil or synthetic cap material which will then be covered with a protective soil layer and revegitated. In some cases, a portion of the ash in an impoundment may be marketable. However, if ash remains in the Unit after some ash has been removed, a final cover system will be required. The final cover system will minimize releases from the impoundment to the subsurface.

The closure process addresses the proper management of Units which are no longer receiving ash. It integrates closing the impoundment with the corrective actions designed to address identified groundwater problems. During closure, construction of the final cover of the Unit takes place, which will complement the components of any required corrective action. The post-closure period begins when the construction of the final cover system has been completed. Finally, the post-closure report and certification is produced to document completion of closure and post-closure requirements.

Closure Prioritization

The Agency has progressed with implementing its Ash Impoundment Strategy. The 24 facilities with approximately 83 total Units have conducted hydrogeologic investigations, installed new or supplemented their existing groundwater monitoring networks, and assessed groundwater quality. Initial groundwater monitoring and evaluation of potential off-site threats has been completed for all facilities. Prioritization of the work to be completed at these Units is necessary due to the large number of existing impoundments. The Agency anticipates that significant capital resources will be required to address issues at these Units.

The proposed Closure Prioritization section provides a schedule for closure once a decision is made to close an impoundment. The Closure Prioritization section requires the Units which are impacting groundwater to be divided in to four categories. The length of time required to close an impoundment varies with each category.

A Unit is classified as Category 1 when an existing potable water supply well is potentially impacted or threatened by a release attributable to the Unit. The owner or operator of a Category 1 Unit must replace the water supply with a supply of equal or better quality and quantity within 30 days of notice that such impact has occurred. Category 1 requires a closure plan to be submitted to the Agency within 180 days of confirmation of an exceedence of the applicable groundwater quality standard attributable to a release from the Unit. The Unit must be closed within two years of the Agency's approval of the closure plan, unless the Agency approves a longer timeline. Presently there are no Units in this category. While there are no Units in this category at this time, in the future a potable well could be impacted, and this Part would directly address this issue.

Unless Categories 1 or 4 apply, Category 2 applies where the Unit is inactive. A Unit is inactive if it has not received coal combustion waste, or leachate from coal combustion waste, within the most recent period of eighteen months. If an impoundment has not received ash within eighteen months it is expected that the power plant has other impoundments it is utilizing. If the Unit is inactive, a closure plan must be submitted to the Agency within 180 days of confirmation of an exceedence of the applicable groundwater quality standard attributable to a release from the Unit. The Unit must be closed within five years of the Agency's approval of the closure plan, unless the Agency approves a longer timeline.

Unless Categories 1 or 4 apply, Category 3 applies where the Unit is active. A Unit is active if it has received coal combustion waste, or leachate from coal combustion waste, within the most recent period of eighteen months. If the Unit is active, a closure plan must be submitted to the Agency within two years of confirmation of an exceedence of the applicable groundwater quality standard attributable to a release from the Unit. The Unit shall be closed within five years of the Agency's approval of the closure plan, unless the Agency approves a longer timeline. Active Units are provided more time to submit a plan for closure to the Agency than inactive Units in order to minimize disruption of the daily power plant operations. Additional time is needed to design and construct replacement water treatment/ash impoundment Units.

Unless Category 1 applies, Category 4 applies where the Unit is located on a site that has been characterized as Class IV groundwater beyond a lateral distance of 25 feet from the edge of the Unit. Category 4 Units are located in areas where coal mining has previously taken place and has adversely impacted groundwater quality. If the Unit is located in a Class IV groundwater area, a closure plan must be submitted to the Agency within three years of confirmation of an exceedence of the applicable groundwater quality standard attributable to a release from the Unit. The Unit shall be closed within six years of the Agency's approval of the closure plan, unless the Agency approves a longer timeline. Presently there is one power plant with Units in this category.

Closure

The purpose of the proposed Closure Plan section is to provide the details of plans for closing a Unit which will no longer be accepting ash. Prior to closing a Unit, the owner or operator is required to submit a closure plan, which will include the plans, specifications and drawings, and the description of the construction quality assurance program for the closure of the unit. The plan would include details of the groundwater monitoring, on-going groundwater corrective action measures, the final cover system including final slope design, groundwater management zone details, and a proposed schedule for completing the work. Before a Unit may be closed, the owner or operator must submit a closure plan to the Agency for review and approval.

The Closure Plan section requires owners or operators to lay out a plan which will comprehensively address closing a Unit. The plan must specify the steps the owner or operator will take to close the Unit. The initial step taken to close a Unit is to grade the site so there will be proper drainage. Because these Units were designed to hold liquid, they are not filled to the top of the inclosing embankments in order to keep the impoundment from overflowing during a rain event. During closure grading must be completed so that the drainage from the top of the Unit is optimized. An issue which arises is how steep the slopes of the final cover will be and remain stable. The proposed Final Slope and Stabilization section addresses how steep the slope of the Unit may be.

The Unit final cover system must include a three feet thick earth layer compacted to achieve a permeability of less than or equal to $1x10^{-7}$ centimeters per second or an equivalent geosynthetic membrane. This low permeability layer will be covered by a final protective layer which is three feet thick and designed to protect the underlying layer from freezing and minimize root penetration.

After completion of construction, the owner or operator of the Unit must prepare and submit to the Agency a closure report and a closure certification for review and approval, which documents the completion of the required work. The closure certification must be made on forms prescribed by the Agency and must contain a certification by a professional engineer that the Unit has been closed in accordance with the approved closure plan. Corrective action, closure, and post-closure activities will not be deemed complete until the reports are approved by the Agency. The certification must be signed by the owner or operator and by the certifying registered professional engineer.

When a final cover system is used to close the Unit, the owner or operator of the Unit must maintain the surface of the cover system beginning immediately after construction until approval of the post-closure report by the Agency. Post-closure care continues until compliance with the groundwater quality standards set forth in 35 Ill. Adm. Code 620 or in a groundwater management zone established pursuant to 35 Ill. Adm. Code 620.250 is achieved. At a minimum, post-closure care must continue for ten years from the Agency's approval of the closure report. During this period, the owner or operator of the Unit must conduct inspections of the final cover system quarterly to make sure that it is not being eroded, is properly drained and free of woody vegetation, and fix any deficiencies when identified.

A post-closure care plan is required to be submitted to the Agency at the same time the closure plan is submitted. These two plans are submitted simultaneously because if the final cover system is not properly maintained it will not perform as designed. The post-closure care plan specifies the duties of the owner or operator to properly maintain the integrity of the final cover system and any other corrective actions taking place at the site once the final cover is in place. This plan includes the post-closure care activities, a description of the operation and maintenance that will be required for the groundwater collection and discharge systems, if applicable, and the information and documents required in the closure plan. The post-closure care activities include inspecting the cover system and repairing any eroded or degraded areas, as well as maintaining pumps required for groundwater collection systems.

The owner or operator of the Unit must prepare and submit to the Agency for review and approval a post-closure report and post-closure certification after satisfying the requirements of the approved post-closure care plan and achieving the applicable groundwater quality standards. The post-closure report also must contain documentation demonstrating compliance with the applicable groundwater quality standards; any photographs relied upon to document construction activities, including but not limited to, photographs of the final cover system and groundwater collection system, if applicable, a written summary of post-closure care requirements and activities as set forth in the post-closure care plan and their completion, and any other information relied in making the post-closure care certifications.

Conclusion

This concludes my pre-filed testimony. I will supplement the testimony as needed during the hearing and am happy to address any questions.

By: William E Buscher

William E. Buscher
Unit Manager
Hydrogeology and Compliance Unit
Division of Public Water Supplies

DATE: 1/15/2014
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

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American Water Works Association (AWWA), 1995, *Water Treatment*, 630 pps.

AWWA, 1996, *Water Transmission and Distribution*, AWWA, 630 pps.

U.S. EPA, 1986, *Quality Criteria for Water,* 477 pps.

U.S. EPA, 1999, *Health Effects from Exposure to High Levels of Sulfate in Drinking Water Study,* 25 pps.

ATTACHMENT 1

CURRICULUM VITAE

CURRICULUM VITA

WILLIAM E. BUSCHER P.G.
853 South MacArthur Blvd.
Springfield, Illinois 62704

Professional Experience

Illinois Environmental Protection Agency **April 1988 to Present**
Bureau of Water
Division of Public Water Supplies
Groundwater Section
Springfield, Illinois

Public Service Administrator **September 1994 to Present**

Duties Performed: Hydrogeology and Compliance Unit Manager generally responsible for the direct supervision of technical & professional staff implementing groundwater protection, assessment and remediation programs. Functions include construction & review of analytical and numerical groundwater flow models, evaluation of the hydrogeologic aspects of groundwater protection & remediation programs.

Environmental Protection Specialist IV **April 1993 to August 1994**

Duties Performed: Hydrogeology and Compliance Unit Manager generally responsible for the direct supervision of technical & professional staff implementing groundwater protection, assessment and remediation programs. Functions include construction & review of analytical and numerical groundwater flow models, evaluation of the hydrogeologic aspects of groundwater protection & remediation programs.

Environmental Protection Engineer III **March 1991 to April 1993**

Duties Performed: Reviewing hydrogeologic aspects of implementing Illinois' groundwater protection program. Including construction and reviewing analytical and numeric groundwater flow models, completing groundwater protection needs assessments, and reviewing groundwater remediation corrective action plans. Providing technical assistance to community water supplies interested in implementing well recharge area protection program.

Environmental Protection Engineer II **June 1990 to April 1991**

Duties Performed: Reviewing hydrogeologic aspects of implementing Illinois' groundwater protection program. Including construction and reviewing analytical and numeric groundwater flow models, completing groundwater protection needs assessments, and reviewing groundwater remediation corrective action plans. Providing technical assistance to community water supplies interested in implementing well recharge area protection programs.

Environmental Protection Engineer I **April 1988 to May 1989**

Duties Performed: Review hydrogeologic aspects of implementing Illinois' groundwater protection program. Including reviewing the lateral area of influence determinations for pumping wells, and groundwater remediation corrective action plans. Provided technical assistance to community water supplies interested in implementing well recharge area protection programs.

Metropolitan St. Louis Sewer District
2000 Hampton Avenue
St. Louis, Mo 63139-2979

Construction Inspector **July 1987 to November 1987**

Duties Performed: Inspected sewer line installation, logged soil and rock test borings and completed seismic studies for proposed sewer lines.

Lincoln Devore Inc. Geotechnical Consultants
1000 West Fillmore St.
Colorado Springs Co. 80907

Engineering Geologist **July 1984 to November 1986**

Duties Performed: Geotechnical report writing, soil and rock boring logging, monitor well installation, percolation tests, geological mapping aerial photo interpretation, seismic and resistivity studies, excavation observations and drilled pier observations.

Education

Bachelor of Science Geological Engineering **May 1984**
University of Missouri-Rolla
Rolla, Missouri

Licenses

Illinois Licensed Professional Geologist **September 1998**

License Number 196.000656
Expiration Date March 31, 2013

Additional Training

United States Geological Survey (MODFLOW and MODPATH groundwater modeling) **1992**
Geology 435 - Computer Modeling of Groundwater Systems **1995**

Publications

Buscher, W.E., and Cobb, R.P., 1990. Maximum Setback Zone Workbook. Illinois Environmental Protection Agency. 62 pp.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
COAL COMBUSTION ASH PONDS	)	R14-10
AND SURFACE IMPOUNDMENTS AT	)	
POWER GENERATING FACILITIES:	)	(Rulemaking – Water)
PROPOSED 35 ILL. ADM. CODE 841	)	

PRE-FILED TESTIMONY OF LYNN E. DUNAWAY, P.G. ON THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S PROPOSAL 35 ILL. ADM. CODE 841

My name is Lynn E. Dunaway. I am an Environmental Protection Specialist, have a Bachelor of Science degree in geology and am a licensed professional geologist. I work in the Hydrogeology and Compliance Unit, Groundwater Section, Division of Public Water Supplies, Bureau of Water, Illinois Environmental Protection Agency ("Agency"). I have worked in the Groundwater Section for over 25 years and have completed multiple courses to enhance my professional knowledge. My curriculum vitae (Attachment 1) is included for further detail about my training and experience. My duties in the Groundwater Section include: Providing review of hydrogeologic assessments and reports, and providing technical input on the same as well as special projects requiring geologic expertise; Providing geologic and hydrogeologic expertise to Bureau of Water permit programs (industrial, municipal and mines) and Public Water Supply permits; Responding to questions from the regulated community, public and other governmental agencies about the provisions of the Illinois Environmental Protection Act ("Act") and Illinois Pollution Control Board ("Board") rules adopted thereunder; Project management of sites subject to corrective actions under the Act or Board rules; Assist the regulated community with required steps to be compliant with setback zones, technology control regulations (35 Ill. Adm. Code 615 and 35 Ill. Adm. Code 616) and minimal hazard certification; Testifying before the Board on proposed rules and setback zone exceptions; assisting in the implementation of source water protection programs and; Mentoring interns and student workers. My pre-filed testimony focuses on the determination of background, statistical methods, sampling frequency, annual statistical analysis and confirmation sampling as presented in the proposed Part 841. I can explain my pre-filed testimony and answer additional questions as needed.

Determining Background Values

Owners or operators will be required to determine the background concentration of the chemical constituents for which monitoring is required at each monitoring well for all regulated units. In the proposed Part, the term "background" is applied broadly, because background values must be calculated for all monitoring wells, not just those wells which are up gradient of regulated units. Also, any chemical constituent that does not originate from a unit regulated by this proposed Part will generally be referred to as naturally occurring. This is necessary to accommodate site specific considerations such as site lay-out, groundwater flow direction, statistical methods and naturally occurring variability in groundwater quality. In some instances, historical activities at a site or at up gradient sites, such as fill areas in flood plains, may cause elevated chemical constituent concentrations both up gradient and down gradient of regulated units. Under such conditions particular attention must be given to determining whether a regulated unit is in compliance with applicable groundwater quality standards, which may be different than the numerical standards. The Unified Guidance (U.S. EPA, March 2009), provides statistical methods (e.g. intrawell analysis) that can be applied in these circumstances. Because groundwater quality can vary significantly over time, the Unified Guidance recommends periodic updates to up gradient background be calculated. The Unified Guidance does not provide a specific guideline for the frequency of updates, but recommends there be enough new data to be statistically validated against existing background, which is on the order of one to three years. In proposed Section 841.220(c) the Agency imposed a requirement on owners or operators to recalculate background chemical concentrations no less often than every five years. This time frame surpasses the one to three year recommendation, but insures a background groundwater quality that reflects existing conditions will be periodically recalculated.

Statistical Methods

Naturally occurring chemical constituent concentrations in groundwater vary spatially and temporally. The chemical constituents may occur naturally at concentrations above or below numerical groundwater quality standards. Therefore, a simple comparison to a numerical standard does not adequately represent this variability in many instances. In order to evaluate chemical constituent concentrations to determine background, compliance with applicable groundwater standards or the need for further assessment, statistical methods must be utilized. The Agency incorporated the Unified Guidance into this proposed Part for several reasons. First, the Unified Guidance has been through a formalized review process by USEPA. Second, the Unified Guidance is applicable for compliance and assessment monitoring at facilities subject to the Resource Conservation and Recovery Act, Subtitles C and D facilities. Third, the Unified Guidance is publicly available on the USEPA website. Fourth, the Unified Guidance contains a number of reasonable and current statistical methods with broad applicability to groundwater analysis. The Agency did not limit owners or operators to statistical methods contained within the Unified Guidance, in recognition that advances in statistical analysis may yield new or modified statistical methods that better suit some sites.

Any statistical method(s) that is selected must meet the performance criteria of proposed Section 841.225(b). The statistical method must be appropriate for the distribution of the chemical constituent concentrations. In other words, chemical constituents that occur parametrically (i.e. normally distributed in a bell shaped curve) must be analyzed using methods for normal distributions. If the chemical constituents' concentrations are nonparametric, then the data must either be transformed (e.g. using the log of the chemical constituent concentration) or a nonparametric statistical method must be used. When comparing individual chemical constituents to a background chemical constituent concentration, the Type I error level (false positive rate) must be less than 0.01 (1%). As related to monitoring at regulated units pursuant to this proposed Part, false positive detections represent potential exceedences of groundwater standards. Statistical methods are used to estimate the highest chemical constituent concentration that is likely to be found in groundwater with a specified degree of certainty (e.g. 1%, 5%, etc.). When chemical constituent concentrations are analyzed at a laboratory, the measured concentration should be less than or equal to the statistically estimated concentration. However, depending on the degree of certainty used for the statistical estimation, a certain number of measured results may exceed the maximum statistically estimated concentration, without representing an exceedence of the groundwater standard. For instance, if a 1% error level or degree of certainty is used, that means 1 out of 100 samples collected is likely to exceed the statistically estimated maximum concentration of a chemical constituent in groundwater. The possibility that 2 out of 100 samples analyzed would detect an exceedence of an estimated groundwater chemical constituent concentration, simply by random chance, is remote. The second sample (2 of 100) is the confirmation sample discussed later. It should be noted that the 1% false positive error rate is achieved by setting the estimated maximum groundwater concentration at a higher concentration. If a 5% false positive error rate is used, 1 out of 20, or 5 out of 100, samples of a given chemical constituent could exceed the estimated maximum groundwater concentration by random chance, but the estimated maximum concentration would be lower. Hence, the smaller the error rate for false positives, the higher the estimated maximum groundwater chemical concentration will be. While a 5% false positive error rate will require additional examination by the Agency and the owner or operator more often than a 1% false positive error rate, results that are indicative of significantly increasing concentrations will be noted at lower chemical concentrations. Proposed Section 841.225 allows the use of control charts if approved by the Agency. The Agency must find that a control chart will monitor chemical constituent concentrations in a manner that will protect human health and the environment. This requirement is included for control charts because they are not highly sensitive to changes in monitored chemical constituents. Therefore, with respect to this proposed Part, site specific circumstances that might require a tighter control on groundwater quality, for example nearby potable groundwater use, would not represent an optimal site for the use of control charts for statistical analysis. When a statistical method that generates tolerance or prediction intervals is used, the owner or operator must propose, and the Agency must approve, the levels of confidence or the percent coverage of the chemical constituent concentration that must be included. This requirement relates to the false positive error rate (Type I error level) discussed previously. The owner or operator and the Agency must weigh the risks associated with allowing groundwater quality standards exceedences to go unnoticed versus the added burden on resources of frequent reassessment resulting from false positive detections. Any selected statistical method must account for chemical constituent concentrations that are below the practical quantitation limit (PQL). The PQL is defined as:

> The lowest concentration or level that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions in accordance with "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", EPA Publication No. SW-846, incorporated by reference at Section 841.120.

The analysis of chemical concentrations below the PQL is important because the value for that constituent is an unknown. Substituting an arbitrary concentration for these non-detected chemical constituents will alter the statistically predicted values. If the number of non-detects is large enough they may cause chemical constituent concentrations to be nonparametric. In such an instance, a different statistical method may be required to analyze the particular chemical constituent(s) that are nonparametric. Since groundwater quality can change seasonally and spatially, any approvable statistical method must be able to compensate for those conditions. Finally, the sample size must be large enough to meet the requirements of the selected statistical method. Statistical methods set a minimum number of data points that will allow the method to predict chemical constituent concentrations within specified confidence.

Sampling Frequency

The lowest frequency for monitoring required by this proposed Part is semiannual. Depending on the amount of existing groundwater quality data that is available to establish background chemical constituent concentrations, site specific characteristics of groundwater quality and the statistical method(s) selected by the owner or operator, the sampling frequency may be more frequent. For example, if statistical analysis demonstrates that there is a seasonal component to groundwater monitoring results at a particular site, it may be necessary to monitor more frequently. In addition to a monitoring frequency that is controlled by the requirements of a statistical method, other circumstances will require quarterly monitoring. Detections of chemical constituent concentrations that exceed the standards of 35 Ill. Adm. Code 620.Subpart D, will require quarterly monitoring for those chemical constituents that exceed those standards, unless a more frequent schedule is already in place. If a regulated unit is found to be causing statistically significant increases in chemical constituent concentrations, quarterly monitoring will be required for those chemical constituents, unless a more frequent schedule is already in place.

> "Statistically significant" means the application of a statistical method pursuant to Section 841.225 of this Part to determine whether consecutive groundwater sampling data showing greater or lesser concentrations of chemical constituents represents a pattern rather than chance occurrence.

At locations where a statistically significant difference between up gradient and down gradient chemical constituent concentrations occurs over time, quarterly monitoring will be required for those chemical constituents that have statistically significant differences. Monitoring wells that have been switched from a semiannual monitoring schedule to a quarterly schedule due to exceedences of groundwater quality standards or statistically significant increasing chemical constituent concentrations may revert to a semiannual schedule if: the chemical constituent is not detected in a down gradient well during four consecutive monitoring events; the chemical constituent concentration does not differ significantly between up gradient and down gradient wells; or the owner or operator successfully demonstrates to the Agency an alternative cause for the chemical constituent concentrations. Any owner or operator that has been required to increase its monitoring schedule to quarterly due to observed chemical constituent concentrations must have Agency approval to reduce monitoring to a semiannual schedule. Groundwater monitoring may be discontinued upon approval of the certified post-closure report by the Agency.

Annual Statistical Analysis

The groundwater monitoring plan submitted by each owner or operator and approved by the Agency must include a schedule for submitting an annual statistical analysis for each down gradient monitoring well. The annual statistical analysis may also require the evaluation of the up gradient wells to identify similarities or differences in chemical constituent concentrations between up gradient and down gradient monitoring wells. If a chemical constituent concentration does not exceed a numerical groundwater standard, the annual statistical analysis must determine if a statistically significant increase, below the numerical groundwater standard, has occurred in any chemical constituent. This comparison allows the application of the preventive response provisions of 35 Ill. Adm. Code 620.Subpart C. If an increase in chemical constituent concentrations is found to be statistically significant and does not exceed a numerical standard, the owner or operator has 60 days after the submission of the annual report to investigate the cause of the statistically significant increase and notify the Agency in writing stating the cause of the increase, and the means by which the alternative cause was determined. If the investigation by the owner or operator does not find a cause other than the regulated unit, the sampling frequency must be increased to quarterly, if the monitoring frequency is semiannual. The owner or operator must also conduct further investigation including groundwater flow and contaminant transport modeling if the regulated unit is located over resource groundwater as defined in 35 Ill. Adm. Code 620.210(a)(1), (a)(2) or (a)(3), or 35 Ill. Adm. Code 620.230. Using the data from the investigation and modeling, the owner or operator must determine if the statistically significant increasing chemical constituent concentrations pose a threat to resource groundwater that would require treatment or additional treatment to continue a use of the groundwater, or if an existing or potential use of the resource groundwater would be precluded. The owner or operator must notify the Agency within 30 days of determining that such a threat to resource groundwater exists. An owner or operator must develop a preventive response plan for Agency approval, if the owner or operator determines that a regulated unit causes, threatens or allows impairment or exclusion of a use, or potential use of a resource groundwater. The preventive response plan must be submitted to the Agency within 180 days after the submission of the annual statistical analysis, and must include provisions to control, minimize and prevent releases to resource groundwater. The proposed Part requires that the preventive response plan be consistent with 35 Ill. Adm. Code 620.310. If the statistically significant increasing chemical constituent concentrations persist for more than two years, additional site investigation is required since the investigation and resulting actions to date have not resolved the problem. In instances where a Groundwater Management Zone ("GMZ") is established pursuant to 35 Ill. Adm. Code 620.250, the schedule for the annual statistical analysis may be altered from the schedule originally included in the groundwater monitoring plan, but will be included as part of the GMZ or as approved by the Agency.

Confirmation Sampling

A confirmation sample must be collected if groundwater monitoring being conducted by an owner or operator detects a chemical constituent concentration that exceeds the numerical groundwater standard or a site specific standard, which has been established at a concentration above the numerical groundwater standard. The owner or operator must submit the confirmation sample to the Agency within 30 days of the date that the groundwater monitoring analyses required by the monitoring plan were submitted to the Agency. Proposed Section 841.300 does not require confirmation sampling be conducted by the owner or operator when groundwater monitoring detects statistically significant increasing chemical constituent concentrations that are below a numerical standard. However, resampling a monitoring well may be necessary to meet the requirements for preventive response pursuant to proposed Section 841.235 and 35 Ill. Adm. Code 620. If detections of a chemical constituent at concentrations above a groundwater standard are confirmed, the owner or operator must notify the Agency within 30 days of the date the confirmation sample is submitted to the Agency of the action it intends to take. The notification must state in which monitoring wells and for which chemical constituents groundwater quality standards have been exceeded. If the confirmation sample confirms the initial exceedence, the owner or operator has three options: it may make a demonstration that a source other than a regulated unit is the cause of the groundwater standards exceedence; submit a corrective action plan pursuant to proposed Section 841.310; or submit a closure plan pursuant to proposed Subpart D. A demonstration that a regulated unit is not the cause of the groundwater standards exceedence does not relieve the owner or operator of liability for the exceedence if the owner or operator owns or controls the source of the alternate cause.

Conclusion

This concludes my pre-filed testimony. I will supplement the testimony as needed during the hearing and am happy to address any questions.

By: Lynn E. Dunaway
Lynn E. Dunaway
Environmental Protection Specialist
Division of Public Water Supplies

DATE: 1/13/2014
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Attachment 1

Curriculum Vitae

Lynn E. Dunaway

Lynn E. Dunaway
516 South Cherokee
Taylorville, Illinois 62568
Phone (H) 217/827-7960 (W) 217/785-2762

Professional Experience

Illinois Environmental Protection Agency **February 1988 to Present**
Bureau of Water
Division of Public Water Supplies
Groundwater Section
Springfield, Illinois

Environmental Protection Specialist III **April, 1991 to Present**
Duties include: Currently in this position: provide review and technical input on hydrogeologic assessments and reports to all Bureau of Water Programs and Office of Emergency Response on groundwater issues; regularly respond to questions concerning the Illinois Environmental Protection Act (Act) and associated regulations, from the public, press, other governmental bodies and industry; review and respond to documents submitted pursuant to the regulations; remedial project management at facilities under Bureau of Water permits and unpermitted sites; assist with the development of regulations in support of the (Act) including testimony before the Illinois Pollution Control Board (Board) and at public hearings; provide technical input for special projects requiring geologic expertise, including pre-trial documents and testimony in court and before the Board; design and routine maintenance of tracking logs and data bases for the support of various groundwater programs; assist in the preparation of routine reports concerning various aspects of the States groundwater protection programs; assist in the design of a data base to track and enhance compliance with the regulations under the Act; Participate as mentor in the Graduate Public Service Internship (GPSI) program and the Governor's Environmental Corp (GEC) program; Temporary assignment as Unit Supervisor during supervisor's absence.

Environmental Protection Specialist II **June, 1989 to April, 1991**
Duties include: the quality control process used for the Sections ambient groundwater monitoring programs before entry into the SAFE system for periodic transfer to the STORET data base; use the SAFE System; use of the STORET System; assist with the development of regulations in support of the Illinois Groundwater Protection Act (Act); regularly respond to questions concerning the Act; provide technical review of assessments submitted to the Section; provide technical input for special projects requiring geologic expertise; lead worker for the Agency's first Draft submittal for approval of the (WHPP); assist in the preparation of routine combined section 106/319 grant reports; design and routine maintenance of tracking logs and data bases for the support of various groundwater programs; assist in the preparation of routine reports concerning various aspects of the States groundwater protection programs.

Environmental Protection Specialist I **February, 1988 to June, 1989**
Duties include: learn the quality control process used for the Sections ambient groundwater monitoring programs before entry into the SAFE System for periodic transfer to the STORET data base; learn to use the SAFE System; occasionally respond to questions concerning the Act; provide technical input for special projects requiring geologic expertise; routine maintenance of tracking logs for the support of various groundwater programs; assist in the preparation of routine reports concerning various aspects of the States groundwater protection programs.

Analytical Logging Inc. **August, 1982 to January, 1986**
Shreveport Louisiana
South Texas District
Corpus Christi, Texas

Lead Well Site Geologist **March, 1984 to January, 1986**
Duties Included: over site of a two or three man team; provide daily progress reports summarizing drilling activities and important hydrocarbon detections to field office and home office geologists and engineers; correlation and interpretation of geophysical logs; geologic evaluation of lithologic samples to determine geologic formation and hydrocarbon potential; packed column gas chromatography for hydrocarbon analysis; evaluation techniques to predict high pressure zones; routine maintenance of all systems utilized; creating a graphical representation correlating the geology, drilling parameters and hydrocarbon detections for each well.

Well Site Geologist **August, 1982 to February, 1984**
Duties Included: correlation and interpretation of geophysical logs; geologic evaluation of lithologic samples to determine geologic formation and hydrocarbon potential; assist with packed column gas chromatography for hydrocarbon analysis; learn evaluation techniques to predict high pressure zones; learn routine maintenance of all systems utilized; creating a graphical representation correlating the geology, drilling parameters and hydrocarbon detections for each well.

Other Work Experience

Grain/ Livestock Farm Hand — **February 1986 to July 1986 and October 1987 to December 1987**

Shipping/Receiving Clerk — **August 1986 to November 1986**

Agrichemical Service Company Laborer — **March 1987 to June 1987**

Meat Packing Company Laborer — **July 1987 to September 1987**

Education and Training

Bradley University — **August, 1978 to May, 1982**
Peoria, Illinois
Bachelor of Science; Geology

Northern Illinois University — **May, 1982 to July, 1982**
Dekalb, Illinois
Post-graduate work; Field Mapping of the Black Hills Region, South Dakota

USEPA Groundwater Monitoring and Restoration — **June 1 & 2, 1993**
Short course on behavior of DNAPLs in the subsurface and case studies

USEPA Risk Assessment Guidance for Superfund — **October 18-21, 1993**
Environmental response training and case studies

Computer Modeling for Groundwater Systems — **August 21, to December 16, 1995**
Basis of groundwater models, Dr. Larry Barrows, Illinois State University

Applied Ground Water Statistics for Landfills Short Course — **July 8 & 9, 1997**
Statistical techniques for detection and compliance monitoring

Statistical Methods in Water Resources — **August 6-10, 2001**
Application of statistical methods, University of Illinois, Springfield

Ozark Underground Laboratory Karst Short Course — **March 12, 2003**
Unique features and case studies in karst geologic settings

Aqueous Geochemistry for Environmental Regulators — **March 9 & 10, 2004**
Short Course by Dr. Stephen Van der Hoven, Illinois State University

Overview of Environmental Geophysics — **May 6, 2004**
Review of common equipment advantages/disadvantages, by USEPA and Tetra Tech.

Geotechnology for Non-Engineers — **April 20, 2005**
Key principles and concepts of Geotechnolgy, by Dr. Timothy Stark, University of Illinois

Fate and Transport Processes and Models — **March 29 & 30, 2006**
Key elements of transport, models & assumptions, by Dr. Atul Salhotra, RAM, Inc.

Introduction to ArcGIS I **March 10 & 11, 2008**
Introduction to the features and functions of ArcGIS and use thereof, by Carmen Maso', USEPA

National Groundwater Association Conference **June 26 & 27, 2012**
Day 1: Presentations of general interest for groundwater assessment and protection, Day 2: Presentations related to hydraulic fracturing and groundwater quality

The Environmental Sampling Field Course **August 21-24, 2012**
Classroom and field training collecting soil, surface water and groundwater samples, by David & Gillian Nielson

Practical Geophysics
for Engineering, Archeology and Hydrogeology **September 27 & 28, 2012**
Classroom and hands on field demonstrations of resistivity, seismic, down-hole logging, by Drs. Ismail, Larson and Young, Illinois State Geological Survey

Forty Hour Safety Training with Annual Eight Hour Refresher per 29 CFR 1910.120
Last refresher 3/7/2013

Licenses

Licensed Professional Geologist (Illinois) **March 31, 1998**
License Number: 196-000608
Expiration Date: March 31, 2015

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
COAL COMBUSTION ASH PONDS	)	R14-10
AND SURFACE IMPOUNDMENTS AT	)	
POWER GENERATING FACILITIES:	)	(Rulemaking – Water)
PROPOSED 35 ILL. ADM. CODE 841	)	

PRE-FILED TESTIMONY OF AMY L. ZIMMER ON THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S PROPOSAL 35 ILL. ADM. CODE 841

Qualifications/Introduction

My name is Amy L. Zimmer. I am an Environmental Protection Geologist in the Hydrogeology and Compliance Unit, Groundwater Section, Division of Public Water Supplies in the Illinois Environmental Protection Agency's ("Agency") Bureau of Water. I have worked in the Groundwater Section for more than fifteen years. My curriculum vitae is attached. My responsibilities include application of the Illinois Environmental Protection Act and Illinois Pollution Control Board Rules. This includes review of sites regulated by the Bureau of Water and Title 35 Part 620 Groundwater Quality Standards. My responsibilities also include hydrogeologic characterization of aquifers utilized by community water supplies, developing conceptual and mathematical models of flow systems, and identifying groundwater flowpaths in order to define the wellhead protection areas for community water supplies. In addition, I review and evaluate groundwater models and hydrogeologic data received from regulated sites and community water supplies submitted to the Agency, including wastewater permits and mine permits, provide technical input for special projects requiring geologic expertise, and assist in the preparation of routine reports concerning various aspects of the state's groundwater protection programs. I will present testimony and answer questions related to the hydrogeologic site characterization, groundwater monitoring system, groundwater monitoring program, chemical constituents to be monitored, inspections, and alternative cause demonstrations.

Hydrogeologic Site Characterization

The Agency proposed a hydrogeologic site characterization at all sites for which these proposed rules will be applicable. For new proposed units, this characterization is expected to take place prior to design of the groundwater monitoring system and the groundwater monitoring plan. The site characterization needs to be conducted prior to the design of the monitoring system and monitoring plan because information from the characterization should be taken into account during the design of the system and plan. For instance, depth to groundwater, identification of stratigraphic units that may be contaminant migration pathways, and the direction of groundwater flow in the various stratigraphic units are important pieces of information needed for design of the groundwater monitoring system and monitoring plan. Review of the direction of groundwater flow helps determine appropriate locations for up-gradient wells, down-gradient wells, and compliance point wells for the unit(s). Identification of stratigraphic units that may be migration pathways is necessary so monitoring wells are screened at appropriate intervals during installation to monitor these potential contaminant pathways. For existing sites, the monitoring plan, monitoring system design, and site characterization may have been conducted in a different order or conjunctively. The Agency will evaluate the site characterization data for existing sites in relation to monitoring plan and monitoring system design. Any discrepancies noted between the site characterization data and proper designs of the monitoring systems and monitoring plans will be noted and addressed on a site-by-site basis.

Information gathered during the hydrogeologic site characterization is also an important component for development of a corrective action plan, closure plan, or any groundwater modeling done to evaluate alternatives. The information is necessary in order to ensure the plans and modeling correctly identify and minimize any impacts or potential impacts from the unit to surrounding groundwater.

Groundwater Monitoring System

A groundwater monitoring system is required for all units to which proposed Part 841 applies. A groundwater monitoring system is necessary in order to identify any violation of Part 620 Groundwater Quality Standards that may be attributable to the regulated unit or multiple regulated units. One monitoring system may be proposed for one unit or for more than one unit. However, if one monitoring system is proposed for multiple units it must be capable of identifying all violations for all of those units. At some facilities with units regulated by proposed Part 841, multiple units may be placed so closely together that it may be more feasible to propose one monitoring system for the units rather than a separate monitoring system for each unit. The monitoring system is also necessary to evaluate on-going trends in contaminant levels that may be detected in the groundwater monitoring wells.

Standards for monitoring well design and construction are included in proposed Part 841 in order to ensure accurate and representative data from an appropriate interval. An appropriate interval is one that represents a stratigraphic unit that could be a contaminant migration pathway. Proper construction of the well, including protective caps and vents, helps to ensure the integrity of the sample taken from the monitoring well and the accuracy of the resulting data. As contaminant detections, trend analyses, and resulting decisions regarding potential corrective action and closure are dependent upon the groundwater monitoring data, accuracy of this data is paramount.

The locations and number of groundwater monitoring wells necessary at a facility with units regulated by proposed Part 841 are dependent on a number of factors. The monitoring data from the wells must be able to represent groundwater quality not affected by units at the site. In order to determine the background groundwater quality for various parameters, the groundwater monitoring wells used to determine background must not be affected by the units themselves. The number and location of the wells should appropriately represent groundwater quality at the compliance points. There may be more than one compliance point at a site or facility with multiple units far enough away from each other that they would require separate distinct compliance points. In addition, if a groundwater management zone ("GMZ") is approved as part of a corrective action, additional points of compliance in relation to the GMZ boundary and the modeled or monitored extent of contamination may then be required to be monitored.

Groundwater monitoring systems already in place at existing sites with regulated units may be used to fulfill this portion of proposed Part 841, with Agency approval, provided all required components of proposed Part 841 are included in the existing monitoring systems. If a required component is missing, the groundwater monitoring system may need to be revised.

Groundwater Monitoring Plan

A groundwater monitoring plan is also required for all sites with units regulated by proposed Part 841. The groundwater monitoring plan includes information necessary for a person reviewing the information and sampling data to have a complete understanding of the accuracy of the data and how the data relates to the site. The plan includes information such as a quality assurance plan for sample collection, preservation, and analysis to ensure quality data is produced from sampling the monitoring wells that is representative of groundwater quality. A site map identifying buildings, regulated units, groundwater monitoring wells, compliance points, and other information if requested by the Agency, is included to provide a complete understanding of the geographic layout of the site.

A description of the dates of operation, contents, including dates when each unit began receiving coal combustion waste or leachate, changes in coal sources, volumes, changes in type of wastes, dates when each unit stopped accepting combustion waste or leachate, and type of any existing engineered liner and date of installation should be included when available and practical. Many of these units have been in existence for decades and the related history of the contents of the units may be difficult if not impossible to obtain. However, if available, the existence of this data would be beneficial for modeling groundwater impacts and future impacts from regulated units. Computer modeling of groundwater requires large amounts of input data related to site geology, source material, and source concentrations. When site specific data is not available for certain required parameters, parameter approximations based upon similar sites or materials from scientific research must be assumed. The more site specific data that is available for use in a groundwater model, the more accurate the modeled representation of the site and modeled impacts.

To avoid the need to track down separate reports for the hydrogeologic site characterization and the groundwater monitoring system, a description and results of the characterization, and plans and drawings of the monitoring system must be submitted with the groundwater monitoring plan. An explanation of the statistical method for background, assessment, and compliance monitoring must also be included. A maintenance plan must be included for the groundwater monitoring system to ensure no deterioration of the system will occur.

The proposed rule allows sixty days for analysis and reporting of sample results. This allows time for the facility to conduct the sampling and analysis and provide the results to the Agency in a timely manner. Including a schedule for annual reports submission in the groundwater monitoring plan allows the Agency to keep track of when required reports are due. Samples must be analyzed by a certified laboratory using proper procedures and techniques in order to have confidence in the results of the analysis.

Any change to the groundwater monitoring plan must be approved by the Agency. Facilities with regulated units that already have an existing groundwater monitoring plan in place that contains all of the required components may use these plans to meet proposed Part 841. However, if any component is missing, the facility may be asked to modify its plan to include the required components.

Chemical Constituents and Other Data to be Monitored

The chemical constituents to be monitored in groundwater for the regulated units include the inorganic chemical constituents for which there are Class I numerical groundwater standards. The reason these constituents are included is that they are the ones most likely to be affected by activities at these types of units. The only exceptions to this are radium-226 and radium-228. Radium-226 and radium-228 are less likely to be associated with activities at these units and are also more difficult and expensive tests to run. In addition, research by the United States Geological Survey indicates radium and radioactive elements are not found above naturally occurring concentrations in coal ash. Specific conductance, groundwater elevation, and monitoring well depths provide information important in the review of the sampling data. For instance, the monitoring well depth along with the construction and well log of the monitoring well help determine the geologic unit from which the sample is obtained. Existing groundwater monitoring plans at regulated units would be required to be altered if any of the required components are missing.

Inspections

Weekly inspections and an inspection after any defined "25-year, 24-hour" storm event are required during operation of all regulated units. The Agency believes even if a regulated unit is not currently receiving coal ash there is an on-going potential threat of deterioration until closure of the unit is completed. The inspections are intended to detect such things as deterioration, malfunctions or improper operation of overtopping control systems, sudden drops in the level of the contents, severe erosion or other signs of deterioration in dikes or containment devices, or visible leaks. These are the types of issues that could indicate or lead to a catastrophic leak of the unit and result in groundwater or surface water violations. Reports of each inspection and any repairs made as a result must be completed. If an inspection indicates a sudden drop in the level of the contents that is not related to influent or effluent changes, the Agency must be notified. If an explanation of the drop cannot be given, the Agency may conduct an inspection or take further action in coordination with the owner or operator in order to address any leakage from the unit, with an ultimate goal to prevent a violation of the groundwater quality standards due to the unit. The Agency would prefer to prevent or mitigate a problem before it develops into a major leak at the unit.

Alternative Cause Demonstration

There may be instances where a confirmed exceedence of a groundwater quality standard is not caused by a unit regulated under proposed Part 841. In such a case, an owner or operator may choose to make an alternative cause demonstration under Section 841.305. This Section allows demonstration that a confirmed exceedence is due to sampling, analysis, or evaluation error, a natural cause, or a source other than the unit. For instance, it could be shown that an exceedence is actually due to a contaminant plume emanating from a nearby site. In addition, it could be shown through further investigation that an exceedence is due to historic activities on other portions of the site itself. Many of the existing facilities have been in existence for decades and during that time various activities have occurred at these sites, some of which may be known and some of which are long forgotten. This could also be true of a neighboring up-gradient site. The alternative cause demonstration allows an owner or operator to show that another source may be the cause of the exceedence of a groundwater standard at a compliance point for a regulated unit. While the design of the monitoring system should take into account and minimize such a possibility, unknown and site-specific factors may still cause an exceedence of a groundwater standard at a compliance point that is not due to the unit itself. Data produced as part of the hydrogeologic site characterization may also be beneficial in the alternative cause demonstration and in any groundwater modeling that may be conducted as part of the demonstration.

Because of the amount of information that may need to be gathered and included in the alternative cause demonstration and the possible need to conduct some further investigation, 180 days is a reasonable timeframe to submit an alternative cause demonstration if an owner or operator chooses. The Agency must then review the information and give written concurrence or non-concurrence within 90 days. If the Agency does not concur with the alternative cause demonstration, the owner or operator then has the choice to either appeal the decision to the Illinois Pollution Control Board or submit a corrective action plan or closure plan. This process allows opportunity for the owner or operator to present its case for an alternative cause of the confirmed groundwater exceedence. However, it also moves the process along in a timely manner so that if the alternative cause demonstration to the Agency is not successful, the facility can start down the path to either corrective action or closure to solve the groundwater exceedence issue.

Conclusion

This concludes my pre-filed testimony. I will supplement the testimony as needed during the hearing and am happy to address any questions.

By: Amy L. Zimmer

Amy L. Zimmer
Environmental Protection Geologist
Division of Public Water Supplies

DATE: 1/13/14

Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Amy L. Zimmer
1205 Larchmont Dr.
Springfield, IL 62704
Phone (H) 217/793-2059 (W) 217/557-3181

Professional Experience

Ilinois Environmental Protection Agency **August 1998 to Present**
Bureau of Water
Division of Public Water Supplies
Groundwater Section
Springfield, Illinois

Environmental Protection Geologist III **September 2000 to Present**
Duties include: Geologic investigations and hydrogeologic characterization of aquifers utilized by community water supplies. This includes development of conceptual and mathematical models of flow systems, application of the appropriate solution techniques and application of advective particle-tracking techniques to identify groundwater flowpaths. Regularly respond to questions concerning the Illinois Groundwater Protection Act, provide technical input for special projects requiring geologic expertise, and assist in the preparation of routine reports concerning various aspects of the state's groundwater protection programs. Provide technical review of assessments submitted to the Groundwater Section. This includes evaluation of groundwater models and hydrogeologic data received from regulated sites and community water supplies.

Environmental Protection Geologist II **August 1999 to September 2000**
Duties include: Geologic investigations and hydrogeologic characterization of aquifers utilized by community water supplies. This includes development of conceptual and mathematical models of flow systems, application of the appropriate solution techniques and application of advective particle-tracking techniques to identify groundwater flowpaths. Regularly respond to questions concerning the Illinois Groundwater Protection Act, provide technical input for special projects requiring geologic expertise, and assist in the preparation of routine reports concerning various aspects of the state's groundwater protection programs, including preparation of reports for Illinois' Source Water Assessment Program. Provide technical review of assessments submitted to the Groundwater Section. This includes evaluation of groundwater models and hydrogeologic data received from regulated sites and community water supplies.

Environmental Protection Geologist I **August 1998 to August 1999**
Duties include: Geologic investigations and hydrogeologic characterization of aquifers

utilized by community water supplies. This includes development of conceptual and mathematical models of flow systems, application of the appropriate solution techniques and application of advective particle-tracking techniques to identify groundwater flowpaths. Regularly respond to questions concerning the Illinois Groundwater Protection Act, provide technical review of assessments submitted to the Groundwater Section, provide technical input for special projects requiring geologic expertise, and assist in the preparation of routine reports concerning various aspects of the state's groundwater protection programs.

Department of Geology **August 1996 to May 1998**
Northern Illinois University
DeKalb, IL 60115

Teaching Assistant
Duties Include: Laboratory preparation, lecture presentation, and grading for introductory geology, geomorphology, mineralogy, and sedimentary geology laboratories.

City of DeKalb, Water Division **May 1997 to August 1997**
1216 Market St.
DeKalb, IL 60115

Summer Intern
Duties Include: Assistance with literature search and hydrogeologic investigations of the Troy Bedrock Valley as a potential municipal groundwater source. Field work included assisting with seismic refraction studies, test drilling, geophysical well logging, and pump tests.

Education

Northern Illinois University **August 1996 to May 1998**
Dekalb, Illinois
Post-graduate work

Northern Illinois University **August 1991 to December 1995**
Dekalb, Illinois
Bachelor of Science: Geology

Introduction to ArcGIS II **July 12-14, 2006**
Short course by Environmental Systems Research Institute, Inc.

Rockworks workshop **May 2 & 3, 2006**
Short course by Rockworks, Inc.

Interpolation and Contouring Environmental Data **November 29 & 30, 2005**

Short course by Dan Keefer, Illinois State Geological Survey

Geotechnology for Non-Engineers **April 20, 2005**
Key principles and concepts of geotechnolgy, by Dr. Timothy Stark, University of Illinois

Aqueous Geochemistry for Environmental Regulators **March 9 & 10, 2004**
Short course by Dr. Stephen Van der Hoven, Illinois State University

Introduction to ArcGIS I **December 18 & 19, 2003**
Short course by Environmental Systems Research Institute, Inc.

Statistical Methods in Water Resources **August 6-10, 2001**
Application of statistical methods, University of Illinois, Springfield

Unix Operating System **March 27 & 28, 2000**
Introduction, by Dr. David Doss, Illinois State University

Programming with Avenue **May 1999**
Short course by Environmental Systems Research Institute, Inc.

GMS Groundwater Modeling Course **February 17-19, 1999**
Short course by BOSS International

Fluid Flow in Carbonates: Interdisciplinary Approaches **September 20-24, 1998**
Society for Sedimentary Geology research conference

Introduction to ArcView GIS **August 25 & 26, 1998**
Short course by Environmental Systems Research Institute, Inc.