

**The Joliet Station has operated the Lincoln Stone Quarry (“LSQ”) for decades and done so responsibly. There are no groundwater impacts to the neighborhood and we will continue to monitor to confirm this in the future.**

- The data shows that there is not, and has not been movement of Lincoln Stone Quarry water towards the neighborhood to the northeast.

### **Purpose of Public Presentation:**

As required by the Federal Coal Combustion Residual Regulations, to present the Assessment of Corrective Measures and to present information about the potential remedies examined by Midwest Generation, LLC (“MWG”) for the Lincoln Stone Quarry, used by the Joliet Stations.

# Background and Operation



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'  
APPROXIMATE SCALE



ENVIRONMENTAL CONSULTATION & REMEDIATION

**K P R G** KPRG and Associates, Inc.

14665 West Lisen Road, Suite 28 Brookfield, Wisconsin 53005 Telephone 262 781 0475 Facsimile 262 781 0478

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630 325 1300 Facsimile 630 325 1599

PERMIT MONITORING WELL LOCATION MAP

LINCOLN STONE QUARRY  
JOLIET, ILLINOIS

Scale: 1" = 450' Date: April 4, 2014

KPRG Project No. 12313 FIGURE 1

**LEGEND**

- G47S/D PERMIT MONITORING WELL
- T01S ASSESSMENT MONITORING WELL
- X101 EXTRACTION WELL

## Background and Operation

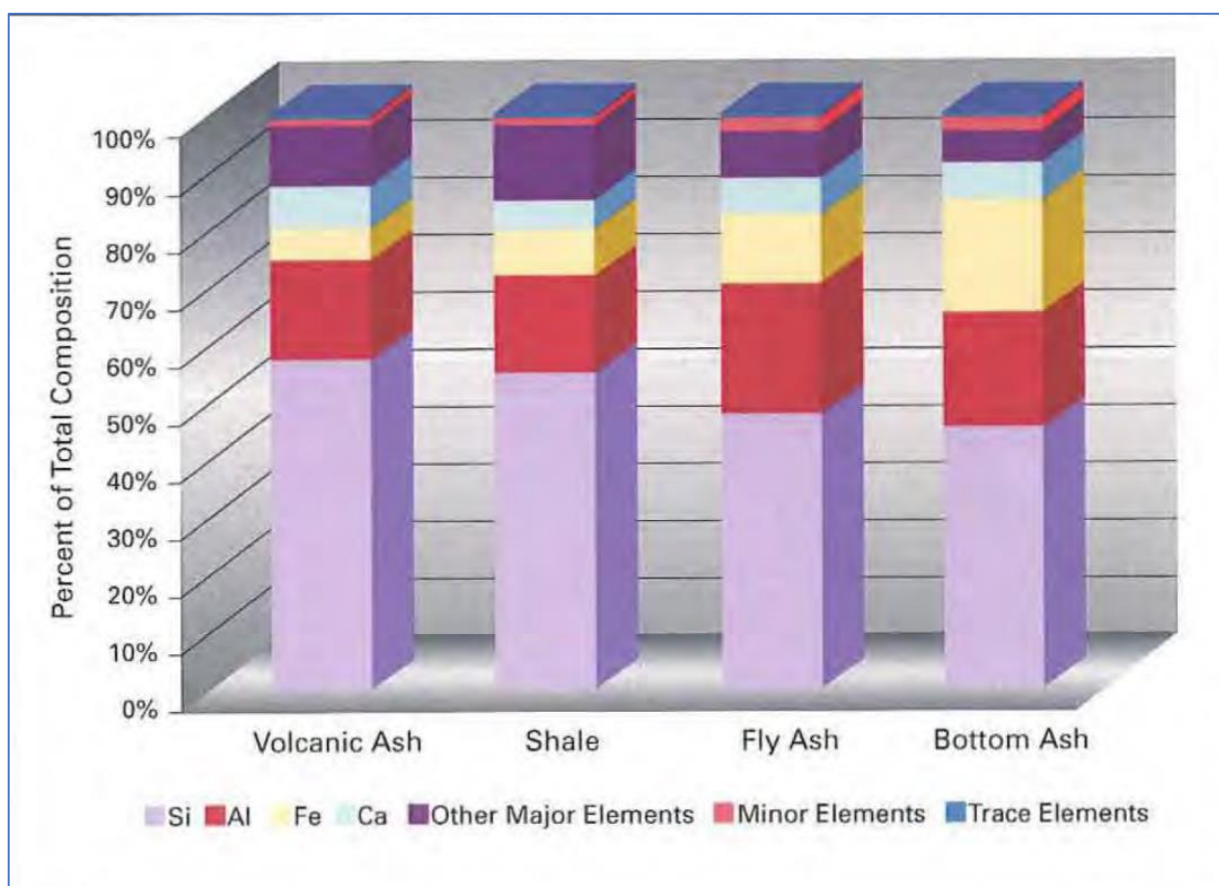
- The Joliet Stations are Joliet 9 (one unit) and Joliet 29 (two units). Combined, the Joliet Stations can generate 1360 MW of electricity, enough to power 1,088,000 homes.
- In 2016, the Joliet Stations were converted to natural gas and ceased burning coal. As a result, the Joliet Stations no longer produce ash from power generation.
- The Active Portion of the Lincoln Stone Quarry only received bottom ash from the Joliet Stations.

## Background and Operation

- The Lincoln Stone Quarry has been operating since approximately 1962, currently by MWG and previously by ComEd, the prior owner of the Joliet Stations.
- The Lincoln Stone Quarry has been permitted by the Illinois EPA since 1976 – the beginning of the environmental permitting and regulations in Illinois.
- As soon as a relatively small amount of remaining ash that is at a location on site at Joliet 29 is deposited in the Lincoln Stone Quarry, then no additional ash will be added to the Lincoln Stone Quarry.

## Bottom Ash

- Bottom ash is a by-product of coal-fired power generation.
- Bottom ash is a non-hazardous waste.
- Bottom ash can be used for beneficial purposes such as making concrete, sand blast media, roofing tiles, and fill material.
- The active portion of the Lincoln Stone Quarry contains 2.6 million cubic yards of ash.

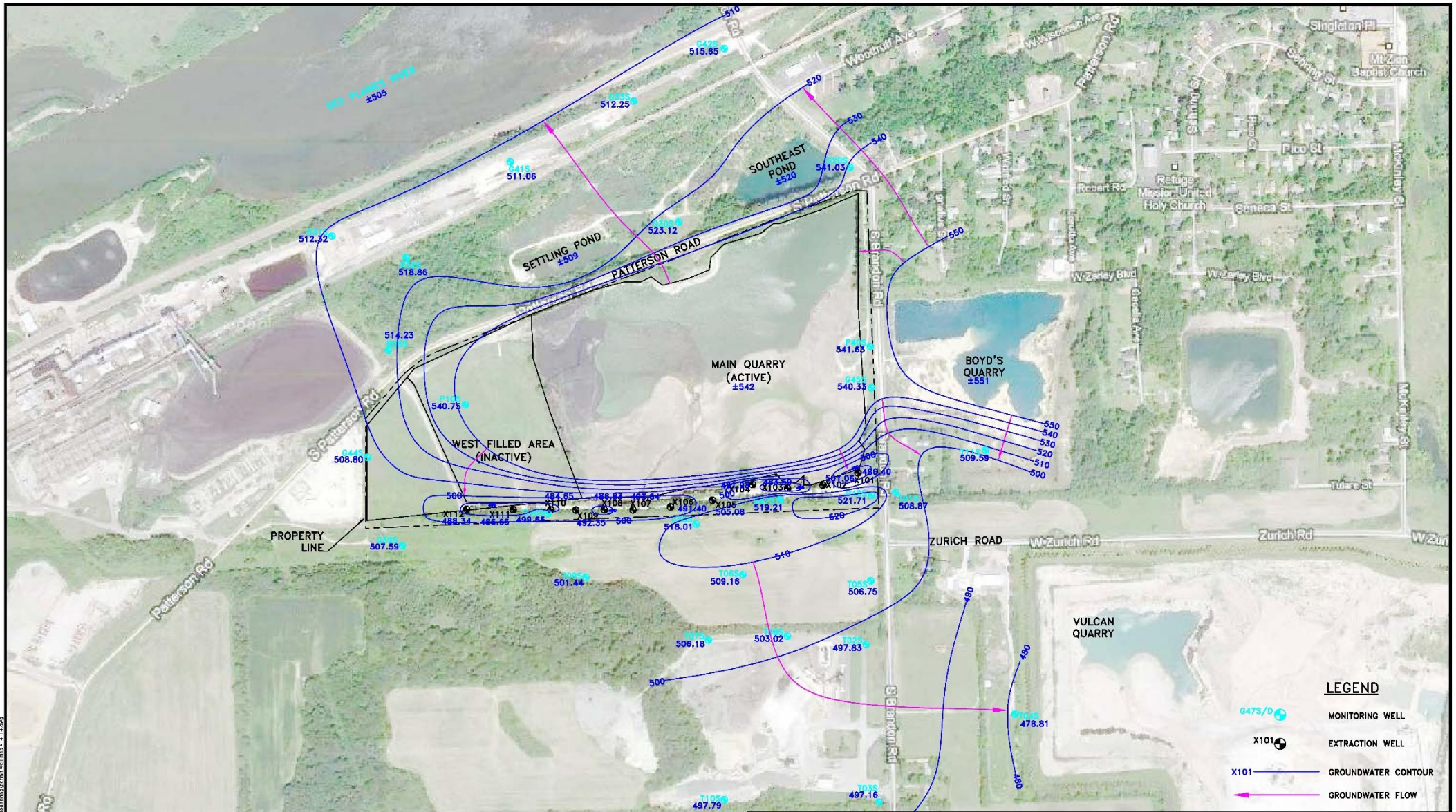


## Compliance with the Federal and Illinois Environmental Laws

**The Joliet Station has operated the Lincoln Stone Quarry for decades and done so responsibly. There are no groundwater impacts to the neighborhood and we will continue to monitor to confirm this in the future.**

- Groundwater is water that flows underground.
- Based on this extensive set of long-term groundwater flow and water quality data and evaluations, **the groundwater flow from the quarry is not, has not, and will not be in the direction of the neighborhood to the northeast of the quarry, and therefore, will not put the water wells at risk.**
- MWG conducted a detailed assessment of the Quarry's conditions and operations and determined that the Lincoln Stone Quarry is safe and continues to be operated and managed in a manner that is fully protective of the public health and the environment.
- For over 40 years, the Lincoln Stone Quarry has been operated under strict permit limits and the oversight of the Illinois EPA.

# Compliance with the Federal and Illinois Environmental Laws



Note: WT – Water Table Well; S – Shallow Zone Well; D – Deep Zone Well

0 450'  
APPROXIMATE SCALE



ENVIRONMENTAL CONSULTATION & REMEDIATION

**K P R G**

KPRG and Associates, Inc.

14665 West Lisbon Road, Suite 2B Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

SHALLOW ZONE GROUNDWATER FLOW MAP  
2nd QUARTER 2019

LINCOLN STONE QUARRY  
JOLIET, ILLINOIS

Scale: 1" = 450' Date: August 1, 2019

KPRG Project No. 21406.13 FIGURE 1

K:\Projects\2019\Lincoln Stone Quarry\20190801\20190801\_SZWGM\_20190801.dwg

## Lincoln Stone Quarry Compliance with Illinois Environmental Laws

- Per the permitting requirements, since 1976, groundwater monitoring wells have been installed around the Lincoln Stone Quarry.
- The landfill permit requires 39 monitoring wells to be sampled on a quarterly basis, but MWG actually samples 46 wells quarterly, more than are required. The samples are analyzed for 25 parameters.
- The groundwater wells have given MWG and the Illinois EPA a comprehensive understanding of the groundwater flow and quality conditions associated with the Lincoln Stone Quarry.
  - We know where the constituents are and where they are going.
  - The data shows that there is not, and has not been movement of Lincoln Stone Quarry water towards the neighborhood to the northeast.

# Lincoln Stone Quarry Compliance with Illinois Environmental Laws

- The groundwater data was also used to develop a 3-dimensional mathematical model of the groundwater flow system covering an approximate 4 square mile area.
  - The modeling also shows that there is no movement of Lincoln Stone Quarry water to the neighborhood to the northeast.
  - This model is now used to assist in evaluating engineering solutions to ensure that any work done within Lincoln Stone Quarry does not result in movement of water to the northeast.
- There are other mining operations in the area which MWG does not control. In response to dewatering operations at a neighboring active mining property to the southeast which has drawn water in that direction, MWG installed an extensive extraction well system to create a cone of depression to control/limit the movement of Lincoln Stone Quarry water in that direction.
  - In other words, water moving from Lincoln Stone Quarry is intercepted and pumped back into the quarry while also pulling back some of that water that was pulled in that direction by the active mining operation.

# Compliance with the Federal and Illinois Environmental Laws

Sampling Location	pH	Nitrate +Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Sulfate mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Chloride mg/L	Flouride mg/L	Total Organic Carbon mg/L	Phenol ug/L	Arsenic, Dissolved mg/L
Des Plaines River upstream	7.2	4.43	0.7	80	625	12	180	0.4	5	6	0.002
Zone of Attenuation Wells Average	7.6	0.12	0.93	282*	800	--	97	0.6*	2.5	--	<0.010
Zone of Compliance Wells Average	7.3	0.15	0.47	164*	684	--	76	0.5*	2	--	<0.010
Discharge Pipe~	7.95	<0.10	<0.20	130	--	<5.0	--	0.43	5.7	<5	<0.005
Incidental Recreation Waters Acute Standards	6.5 to 9	NS	15	1524	NS	NS	500	16.2	NS	860,000	0.340
Incidental Recreation Waters Chronic Standards		NS			NS	4.0		NS	0.150		

Sampling Location	Total Barium mg/L	Total Boron mg/L	Cadmium, Dissolved mg/L	Cromium, Dissolved mg/L	Iron, Dissolved mg/L	Lead, Dissolved mg/L	Manganese, Dissolved mg/L	Total Molybdenum mg/L	Total Mercury ug/L	Total Selenium mg/L	Zinc, Dissolved mg/L
Des Plaines River upstream	0.024	0.156	<0.002	<0.004	0.057	<0.002	0.022	--	<0.05	0.013	0.014
Zone of Attenuation Wells Average	0.044	1.957*	<0.002	<0.005^	0.209^	<0.005^	0.039	0.311	<0.2	0.010	<0.020
Zone of Compliance Wells Average	0.072	4.370*	<0.002	--	0.603^	0.0053^	0.013	0.181	<0.2	0.010	<0.020
Discharge Pipe~	0.22	1.6	<0.001	<0.005^	0.88	<0.0025	0.07	0.035	0.0069	<0.005	<0.010
Incidental Recreation Waters Acute Standards	NS	NS	0.024	1.17	1.0	0.195	8.07	NS	0.012	1.0	0.252
Incidental Recreation Waters Chronic Standards	NS	NS	0.002	0.15		0.041	3.43	NS	0.012		0.066

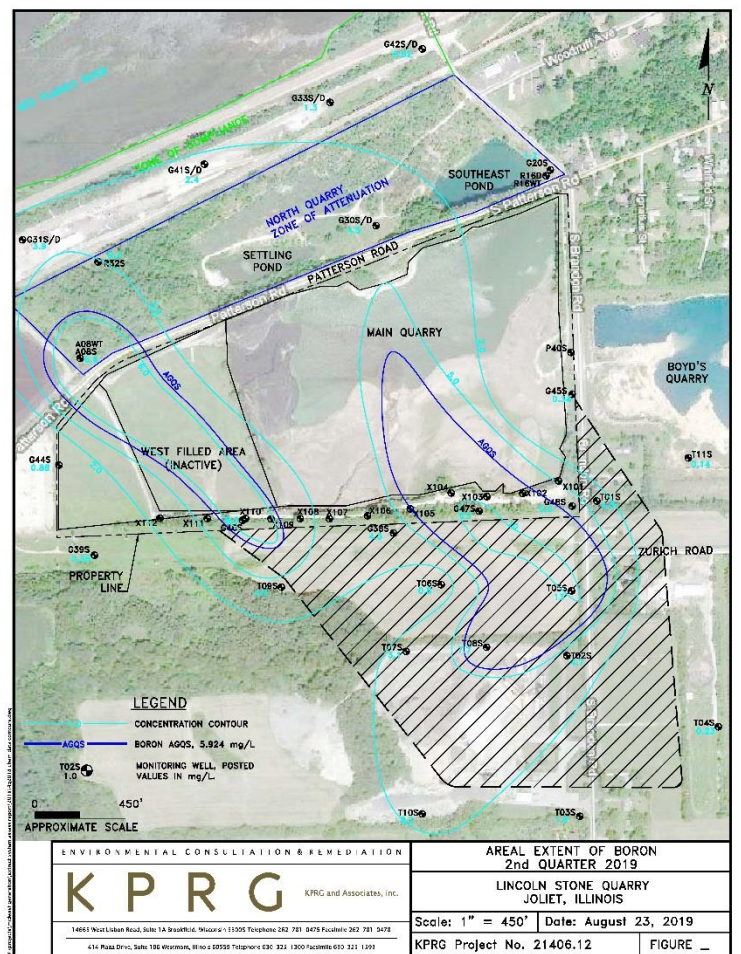
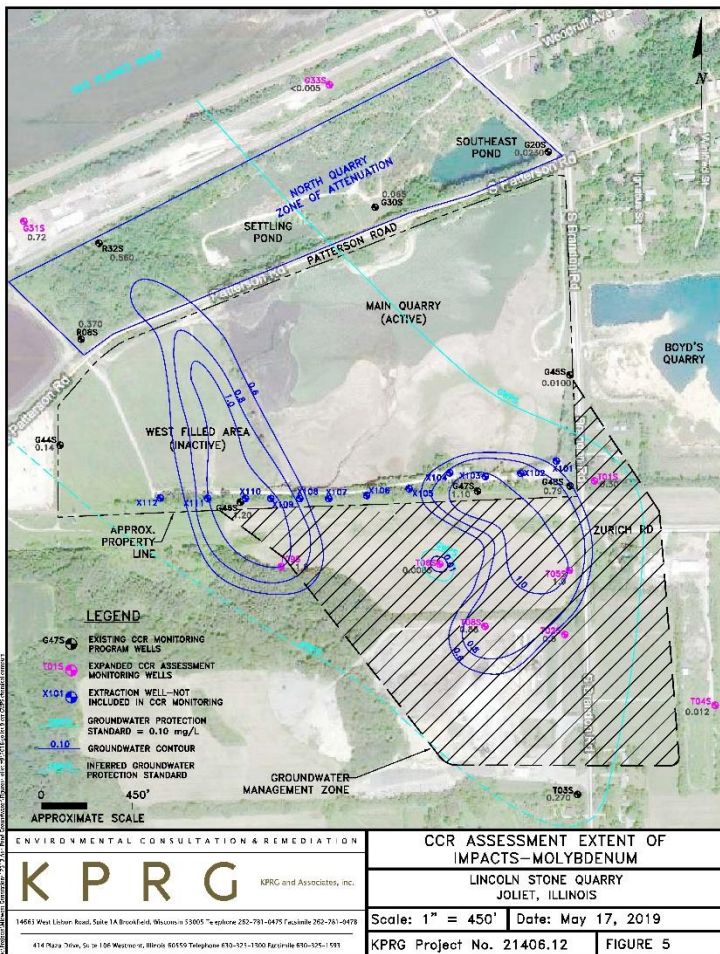
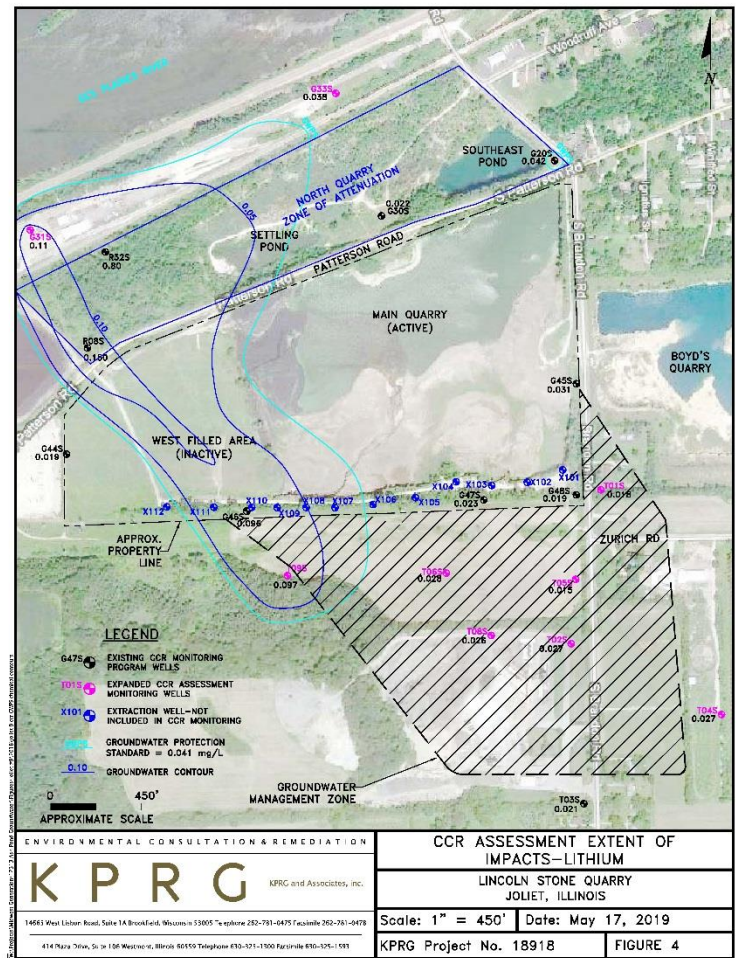
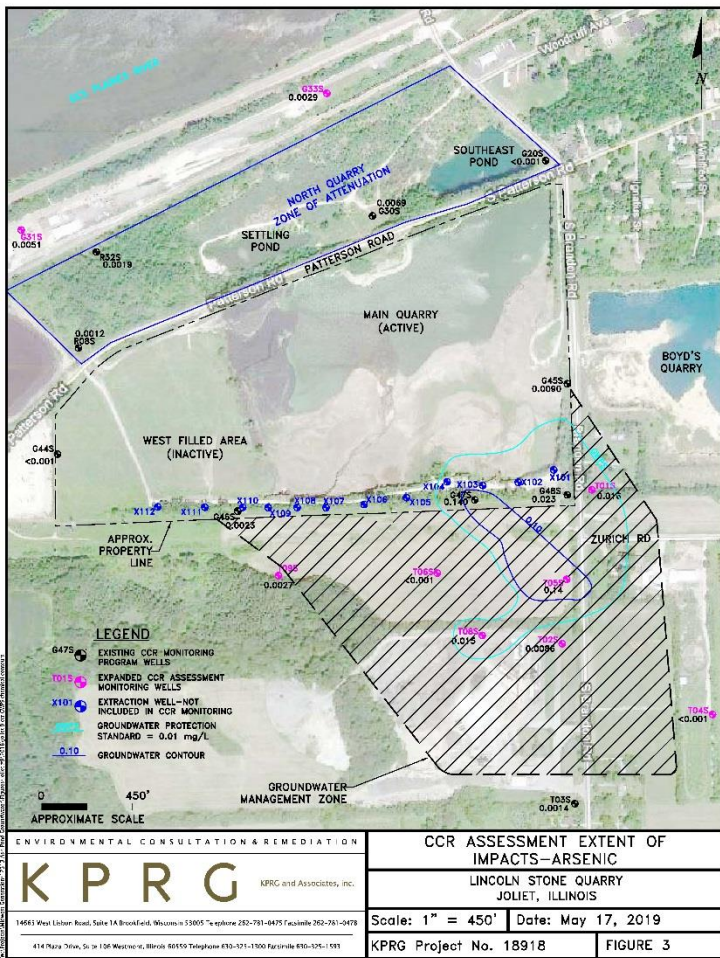
Notes: \* - Results are based on dissolved analysis  
 ^ - Results are based on total analysis  
 ~ - Results are based on maximum daily value from NPDES permit renewal  
 NS - No Standard  
 -- = Not analyzed for

Sampling Location	pH	Nitrate +Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Sulfate mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Chloride mg/L	Flouride mg/L	Total Organic Carbon mg/L	Phenol ug/L	Arsenic, Dissolved mg/L
Des Plaines River upstream	7.2	4.43	0.7	80	625	12	180	0.4	4.8	6.0	0.002
Upstream Data Standard Deviation	0.3	1.6	0.3	20.9	161.4	7.7	88.0	0.1	0.9	1.0	0.000
Downstream Wells Contribution	0.0003	0.000005	0.00002	0.0077*	0.0258	--	0.003	0.00002*	0.0001	--	<0.0003

Sampling Location	Total Barium mg/L	Total Boron mg/L	Cadmium, Dissolved mg/L	Cromium, Dissolved mg/L	Iron, Dissolved mg/L	Lead, Dissolved mg/L	Manganese, Dissolved mg/L	Total Molybdenum mg/L	Total Mercury ug/L	Total Selenium mg/L	Zinc, Dissolved mg/L
Des Plaines River upstream	0.024	0.156	<0.002	<0.004	0.057	<0.002	0.022	--	<0.05	0.013	0.014
Upstream Data Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	--	--	0.000	0.0
Downstream Wells Contribution	0.000002	0.00011*	<0.0000001	--	0.0000141^	0.0000002^	0.0000009	0.0000085	<0.00001	0.0000004	0.0000007

Notes:  
 \* - Results are based on dissolved analysis  
 ^ - Results are based on total analysis  
 NS - No Standard  
 -- = Not analyzed for

# Compliance with the Federal and Illinois Environmental Laws



## Federal Coal Combustion Residuals Rule

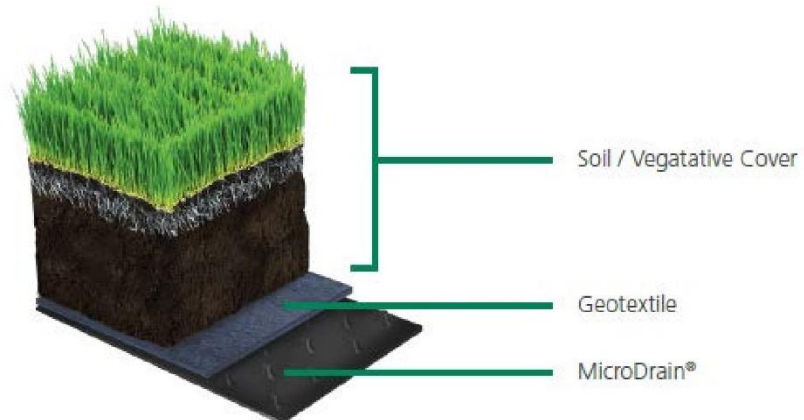
- In 2015, USEPA promulgated rules to regulate coal ash landfills and impoundments – commonly referred to as the Federal Coal Combustion Residuals Rule, or CCR Rule.
- Under the Federal CCR Rule, Lincoln Stone Quarry's Main Quarry has been treated as an impoundment.
- That means that at the state level, Lincoln Stone Quarry's Main Quarry is a landfill and at the Federal level, LSQ is an impoundment. There are differences between State and Federal requirements and Lincoln Stone is in compliance with both sets of rules.
- Under the CCR rules, MWG followed the Federal CCR requirements for determining whether impacts exist.

# LSQ Options for Remedy

## Dry Closure in Place with the Soil Dry Cover System

- Two-layer system composed of a Geomembrane and Soil
- 50-mil HDPE MicroDrain low permeability layer.
  - HDPE is a thick synthetic membrane layer commonly used for landfill covers.
  - The purpose of the membrane layer is to provide a barrier that is designed to prevent infiltration of water into the quarry and separates the clean soil layer from the ash below.
- Final protective layer = Geotextile + 2 feet of clean soil + 4 inches topsoil + native prairie grass seed.
  - The purpose of the final protective layer is to protect the HDPE liner from any damage.
  - Soil and grass are the final cover historically used for covering landfills.

### Geomembrane & Soil Cover



- There will also be an underdrain system in the Main Quarry that will remove a majority of water.
- **Result and Effect of Closure Option**
  - Closure occurs within approximately two years from start of closure
  - **Some Truck Traffic in neighborhood – approximately 13,000 truckloads to deliver the soil cover materials.**
  - Significant reduction of contact between ash and water
  - Minimal disturbance of coal ash

# LSQ Options for Remedy

## Dry Closure in Place with the ClosureTurf Cover System

- ClosureTurf is a State-of-the-Art two layer cover system that is designed to prevent infiltration of water into the Quarry without requiring soil. It will be placed on top of the ash.
- Bottom Layer is a 50-mil HDPE MicroDrain low permeability layer
- **Final Protective Layer:**

Synthetic Turf



- UV resistant
- Wind & runoff resistant

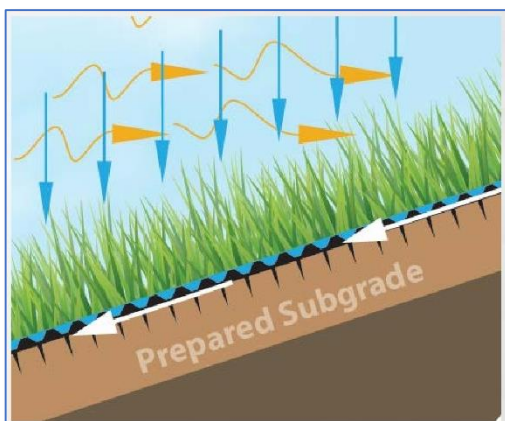
Sand Infill



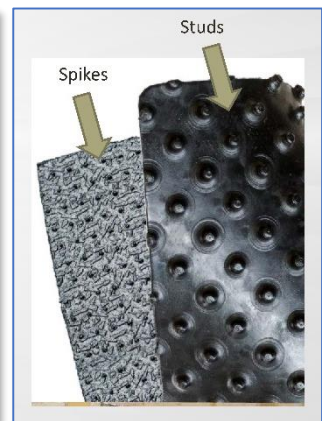
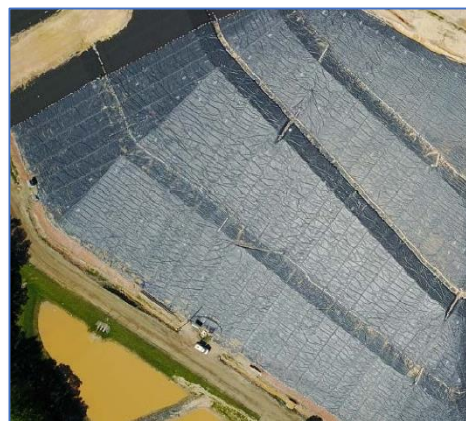
- Runoff resistant-sized to be held by turf blades

- **There will also be an underdrain system in the Main Quarry that will remove a majority of water:**

ClosureTurf



MicroDrain



- **Result and Effect of Closure Option:**

- Closure occurs within approximately two years from start of closure
- **Minimal Truck Traffic in neighborhood – approximately 400 truckloads to deliver the Closure Turf materials for cover construction**
- Significant reduction of contact between ash and water
- Minimal disturbance of coal ash

# LSQ Options for Remedy



<b>GENERAL NOTES</b> ATTORNEY-CLIENT PRIVILEGE WORK PROJECT MAP GENERATED BY SERRILA COMPANY FROM AN AERIAL PHOTO DATED MAY 2014.		
<b>EXISTING CONDITIONS LEGEND</b>		
<b>PROPOSED CONDITIONS LEGEND</b>		
<b>APPROXIMATE BOUNDARY OF QUARRY</b> SEE SURVEY RECORDS		
NO.	REVISION	DATE
<b>KPRG</b> Professional, Collaborative & Multi-Disciplinary		
PROJECT FIRM AND ADDRESS		
<b>LINCOLN QUARRY CLOSURE</b>		
1601 S. PATTERSON ROAD JOLIET, IL 60438		
KPRC PROJECT NO. 19115		
SHEET TITLE ClosureTurf INSTALLATION PLAN		
DRAWING DATE 02/15/19		
DRAWING SCALE 1" = 100'		
SHEET NO. 4		

## Closure by Removal of All Ash

- Closure by Removal would take – best-case - approximately 20 years assuming 50 trucks per day for 240 working days per year.
  - This is a best-case estimate because it assumes that there are no weather delays and that there is sufficient landfill space at some other location to take this material. If not then new landfills(s) will need to be sited, permitted and constructed to provide the space. The new landfill siting, permitting and construction process itself can take 5 to 10 years.
- Removal would disturb the coal ash, re-exposing historic layers of ash to stormwater infiltration over a lengthy construction period and likely resulting in additional release of constituents into the groundwater.



## Closure by Removal of all ash

- Lincoln Stone Quarry contains 2.6 million cubic yards but when excavation and transportation begin the volume would swell to 3.4 million cubic yards.
- Removal of 3.4 million cubic yards = 225,000 truckloads
- 50 trucks per day driving to and from the quarry to retrieve a load = 1 truck every 5-10 minutes driving on one of the three roads leading from the LSQ.
- In other words: **1 truck every 5-10 minutes, 5 days per week, for at least 20 years on Laraway Road, Zurich Road, and/or Patterson Road on the way to Route 53.**



# LSQ Options for Remedy

## Expected Truck Routes for Remedies

- Dry Closure in Place with the Soil Dry Cover System = **13,000 truckloads**
- Dry Closure in Place with the Closure Turf Cover System = **400 truckloads**
- Closure by Removal = **225,000 truckloads**

