

# Nclear Comes to the Rescue for Abandoned Hazardous Wastewater Site



## A Fiery Environmental Disaster

The locals in the small rural town of Talmo, located about an hour northeast of Atlanta, GA, with a meager population of 412, affectionately refer to their town as, “The Jewel of Jackson County”. However, back in 2004, the appeal of the small town was beginning to wane in the wake of the opening of a new business, Agri-Cycle, located along GA Highway 332 at the site of the former Valley Fresh facility. Agri-Cycle opened as a wastewater treatment operation, accepting organic waste and wastewater from outside sources for the purpose of treating the collected wastewater onsite through various treatment methods, including four ponds and a land application system to

spray pre-treated waste on grassy portions of the property. However, soon after opening, the locals began to complain to community and state leaders about the constant stench, increase in nuisance insects such as flies, and the visible pollution of nearby Allen Creek. In 2005-2006, the Georgia Environmental Protection Division (EPD) indicated that Agri-Cycle was not operating in accordance with its state permit



and that furthermore, the company had excavated new ponds on the property without EPD approval. Eventually, in 2007, the EPD issued an administrative order against the company requiring it to cease operations and submit closure plans within 30 days. Mysteriously, a few days after this order, one of the onsite ponds caught on fire, prompting significant legal discussions on how to properly shut down the plant and properly clean up the onsite hazardous waste. After several years of legal proceedings and unfulfilled court orders for the company to properly clean up the abandoned property, the EPD began working on identifying potential cleanup solutions in 2016. In 2018, the site was officially listed on the EPD’s Hazardous Site Inventory List, as the company was determined to be “...unable or unwilling to conduct the required investigation and/or cleanup under the Hazardous Site Response Act for source materials, soil, and groundwater.” The site was ultimately designated as a Class 1 cleanup priority and deemed to require corrective action for released

regulated substances, including ammonia, phosphorus, and lead. Funding for the cleanup was made available from the Hazardous Waste Trust Fund.



Typical Onsite Pond

## Help is on the Way

The Land Protection Branch of the EPD began working on identifying a treatment solution in January 2016 for the 84-acre site, including partnering with KEMRON Environmental (KEMRON), to conduct testing to determine the most appropriate clean-up methods for the onsite sludge and wastewater treatment before final disposal. At that time, it was estimated there was between 18-26 million gallons of wastewater, at least 20 abandoned drums, along with an unknown volume of associated sludge within the ponds. While most of the sludge was dewatered and disposed of in approved landfills, the wastewater treatment plan was still being evaluated. In September 2018, the EPD issued a NPDES Permit to KEMRON for the discharge of the treated onsite wastewater into Allen Creek.

In early 2019, KEMRON authorized Nclear to conduct a series of laboratory bench scale tests to analyze the potential treatment benefits of Nclear's patented wastewater treatment solutions, including TPX™ for phosphorus reduction and ElectrX™ for ammonia reduction. After successfully demonstrating effective jar testing of numerous wastewater samples from multiple onsite pond sources in Nclear's corporate laboratory, an onsite Pilot Evaluation (PE) for the treatment of the ponded wastewater was authorized by EPD and began in June 2019. Initially focused on just one onsite source (Pond 8), the scope was later modified to evaluate two additional ponds (Ponds 4 & 5).

# The TPX™ Solution

Nclear's patented TPX™ nanocrystal technology was designed as a non-toxic, effective and efficient means to remove certain contaminants, especially phosphorus, from water and wastewater. Because TPX™ is a calcium-silicate synthetic mineral, it does not contain any toxic metal salts, making it a preferred environmental treatment technology. Indeed, TPX™ has been verified to meet US EPA acute/chronic toxicity and productivity standards, as well as US FDA GRAS guidelines. In addition to enhancing phosphorus removal, TPX™ has coagulative properties that, used in conjunction with certain polymers or other coagulants, can help meet stringent discharge levels for TSS, COD and BOD. Additionally, TPX™ is proudly Made in the USA.

# The ElectrX™ Solution

ElectrX™ electrochemical cells provide industry leading efficiency to produce hypochlorous acid based on a patented monopolar, multi-pass circular configuration. As such, the design provides substantially longer residence time for the oxidation of ammonia into nitrogen gas. The design further ensures the electrodes have consistent electron emissions and current density over all electrode surface areas. Additionally, the unique physical and electrical design enhances flow and power efficiency and promotes longer anode/cathode life. The proprietary mixed metal oxide precious metal blend coating of the anodes is designed for maximum efficiency in converting ammonia into nitrogen gas and provides an extended life. ElectrX™ is also capable of oxidizing other contaminants such as viruses, bacteria, and other organic matter, thereby lowering BOD/COD levels.

## Pilot Evaluation Overview

The treatment objectives of the PE were primarily to reduce the Total Phosphorus (TP) and Ammonia (NH<sub>3</sub>) concentrations contained within the onsite ponds to acceptable discharge effluent limits per the site's NPDES Permit. Accordingly, the following treatment regimen was executed for the PE:

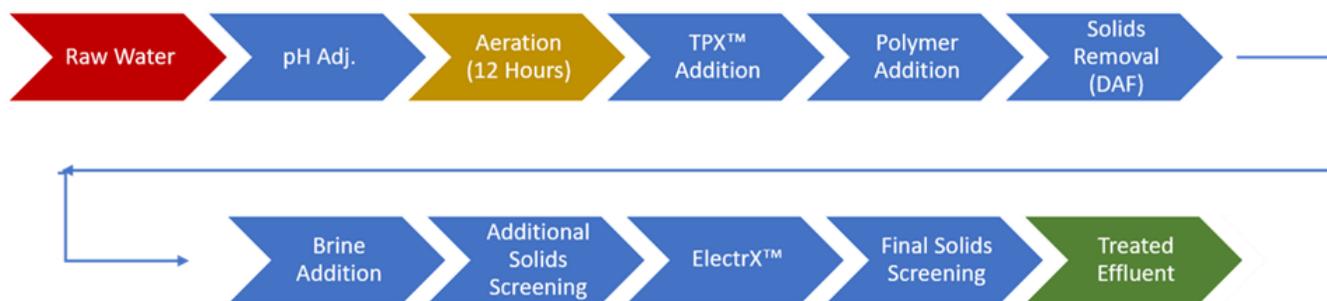
- Treatment Flowrate (Q) = 5 gpm
- PE Duration = 34 days, including setup, commissioning, treatment, breakdown
- Treatment Runtime = 17 days @ 5 days/week
- Treatment Volume Yielded = 48,000 gallons

Nclear's mobile pilot configuration included an acidulation/aeration tank, TPX™ slurry system, custom-built Dissolved Air Flotation (DAF) unit with multiple chemical injection points and floc tubes for mixing polymers and coagulants, brine storage tank, ElectrX™ system, and solids screening.

Nclear's onsite laboratory provided real-time analysis of daily final effluent composite samples for pH, TP, Ortho P (OP), and COD. Composite samples were also sent to a local third-party lab for independent verification of results and additional analyses of BOD, NH<sub>3</sub>, O&G, TKN and TSS.



Nclear's pilot infrastructure, including custom-built DAF, ElectrX™ and TPX™ systems



## Pilot Evaluation Results

Representative results from the testing of Ponds 4, 5 and 8 are shown in Table 1, and demonstrate that Nclear’s total treatment solution achieved final effluent discharge results that were below the maximum levels for the targeted analytes shown.

**Table 1. Pilot results listed as average of 24-hour composite samples taken during PE treatment period, as reported by AES laboratory (Atlanta GA).**

Permit Limit: Daily Average	0.8	30	NA	11	10	NA	30	0.202	0.105	1.46	2.17
Permit Limit: Daily Max <i>(all values as mg/L)</i>	1.3	45	NA	16.5	15	NA	45	0.271	0.13	2.49	2.17
<b>Sample</b>	<b>TP</b>	<b>BOD</b>	<b>COD</b>	<b>NH3</b>	<b>O &amp; G</b>	<b>TKN</b>	<b>TSS</b>	<b>Chromium</b>	<b>Copper</b>	<b>Nickel</b>	<b>Zinc</b>
<b>Pond 4 Raw Grab</b>	5.8	N/A	463.0	9.7	4.8	26.4	270.0	BRL	0.006	0.015	0.026
<b>Pond 4 Treated Avg</b>	<b>0.2</b>	<b>23.2</b>	<b>163.5</b>	<b>1.4</b>	<b>2.2</b>	<b>5.4</b>	<b>3.3</b>	<b>0.008</b>	<b>0.002</b>	<b>0.011</b>	<b>0.029</b>
<b>Pond 5 Raw Grab (1)</b>	59.3	143.0	14800.0	199.0	360.0	368.0	11000.0	1.150	5.370	0.619	30.300
<b>Pond 5 Treated Avg</b>	<b>0.5</b>	<b>NA</b>	<b>730.4</b>	<b>0.2</b>	<b>2.5</b>	<b>60.1</b>	<b>7.9</b>	<b>0.013</b>	<b>0.050</b>	<b>0.203</b>	<b>0.144</b>
<b>Pond 8 Raw Grab</b>	1.2	17.9	N/A	2.1	4.9	13.2	84.8	BRL	0.012	0.007	0.017
<b>Pond 8 Treated Avg</b>	<b>0.3</b>	<b>13.0</b>	<b>102.7</b>	<b>0.6</b>	<b>1.7</b>	<b>4.4</b>	<b>4.5</b>	<b>0.006</b>	<b>0.003</b>	<b>0.000</b>	<b>0.043</b>

(1) Data shown is from four separate grab samples at different points in time as there was not one sample tested for all analytes.

## Conclusion

Based on the favorable outcomes achieved during this PE, in early 2020 Nclear was awarded a Contract Service Agreement from KEMRON to implement a full-scale treatment system funded by EPD. This Agreement includes the design, construction, and operation of a 300 gpm mobile wastewater treatment plant located onsite. It is expected that treatment of all onsite ponded water will be complete by Q4 2021. Operation is anticipated to commence in January 2021.

Note: For complete analytical results, please contact Nclear for a copy of the full Pilot Evaluation Report



**Raw and Treated Pond 5 Water Samples**