C A S E S T U D Y

Lily Pad Floating Evaporator System

Three Rivers Solid Waste Authority | Jackson, South Carolina

Leachate Pond Evaporation — Zero Discharge Solution

Prepared by
New Waste Concepts, Inc.
Innovative Leachate Management Solutions

Project Period
2015 – 2025
200 ft × 200 ft Lined Leachate Pond

1. Executive Summary

New Waste Concepts, Inc. (NWCI) designed, supplied, and installed a Lily Pad Floating Evaporator System at the Three Rivers Solid Waste Authority (TRSWA) leachate retention pond in Jackson, South Carolina. The project began in 2015 and has operated continuously, delivering measurable, cost-effective leachate reduction through mechanical atomization evaporation.

Key Outcomes at a Glance

- Capital cost of ≤ $0.017 per gallon evaporated (CAPEX)
- Ongoing operating cost of < $0.008 per gallon evaporated (OPEX)
- Combined all-in cost below $0.025 per gallon — a fraction of trucking or off-site disposal
- System performance exceeded winter projections by 17.9% in first operating season
- Peak month: August 2017 — 653,346 gallons evaporated (21,076 gal/day average)
- Record quarter: 4Q 2017 — 839,367 gallons evaporated
- Inflow spikes from rain events tracked in near-perfect correlation, demonstrating system intelligence
- System operated continuously across summer peaks and winter lows with no reported failures

The TRSWA installation demonstrates that the NWCI Lily Pad system is capable of significantly reducing or eliminating the need for leachate trucking and off-site treatment at lined landfill ponds. By harnessing mechanical atomization and wind-aided evaporation, the system converts leachate into water vapor at a cost that is competitive with virtually all alternative disposal methods.

2. Project Overview

2.1 Client & Site

Client	Three Rivers Solid Waste Authority (TRSWA)
Site Location	Jackson, South Carolina
Contract Date	2015, subsequently modified in 2019
Installation Date	End of July 2015
Pond Dimensions	200 ft × 200 ft (40,000 sq ft)
Pond Type	HDPE-lined leachate retention pond
System	New Waste Concepts OD V 1.1 Lily Pad Floating Evaporator
Configuration	4 Typhoon-head floating evaporation units expanded to 8
Control	Wind-speed-adjusted RPM control system with data logging
Water Source	Landfill leachate; avg. 20,000 gal/day landfill pump inflow

2.2 The Challenge

Landfill leachate — the liquid that percolates through a landfill and accumulates in a retention pond — must be managed continuously to prevent pond overflow, regulatory violations, and environmental contamination. For TRSWA, the lined 200 ft × 200 ft pond received an average of approximately 20,000 gallons per day from landfill pumps, plus additional inflow from rainfall events that correlate almost perfectly with flow spikes recorded at the site.

Traditional leachate disposal involves trucking to a wastewater treatment facility — a method that is expensive, weather-dependent, and operationally complex. TRSWA sought a cost-effective, on-site solution that could sustainably manage the leachate volume and reduce or eliminate trucking costs.

2.3 The Solution — Lily Pad Floating Evaporator

New Waste Concepts proposed and installed its Typhoon Evaporators mounted on the Lily Pad Floating System. The system uses a VFD controlled high-rotation Typhoon atomizer heads mounted on floating platforms ("lily pads") to mechanically break leachate into ultra-fine droplets. These droplets, exposed to ambient air, convert into vapor rapidly. A wind-speed-responsive RPM control system automatically adjusts atomizer speed based on real-time weather conditions (temperature, relative humidity, wind speed and wind direction), maximizing evaporation efficiency while preventing drift during high-wind or high humidity periods.

The initial installation at TRSWA consisted of four Typhoon-head floating evaporation units operating under the OD V 1.1 system configuration at the time and an insultated & air conditioned control shed. The system was commissioned at the end of July 2015 and has operated without significant interruption other than for maintenance through the reporting period.

3. System Installation — Photo Gallery

The following images document the Lily Pad Floating Evaporator System installed at the Three Rivers



Figure 3: Three Rivers Solid Waste Authority in Jackson, SC and their leachate pond showing the Typhoon Evaporator using the Lily pad floatation system. Left hand photo shows high rpm and small droplet sized vapor with the Right hand photo in the low rpm, large droplet state

Solid Waste Authority leachate pond in Jackson, South Carolina.

The installation incorporates a perimeter wind drift barrier (black fabric screen visible in Figure 3) that prevents unevaporated droplets from leaving the pond boundary during periods of elevated wind. This feature is critical for regulatory compliance and for maintaining evaporation efficiency — the RPM control system works in conjunction with the barrier to optimize the droplet residence time over the pond surface.

Three River SWA believed in the system that three years later, in 2018/19 they invested in expanding the number of heads to eight typhoon evaporators. The included an improvement in the hp of the motors, the flow meter measurement to inflow & outflow, as well as pond depth measurement, basket design for the atomizer.



4. Evaporation Performance Data

4.1 Monthly Performance Summary

The following table summarizes evaporation data from representative monthly reporting periods. All volumes were calculated using the mass-balance method: starting pond volume, plus all inflows (metered landfill pump inflow, unmetered inflow, and rainfall), minus all outflows (pumped out), yields an expected end-of-period volume. The difference between the expected and actual measured end volume equals gallons evaporated.

Reporting Period	Days	Total Gallons Evap.	Gal/Day Avg.	Inflow (Gal.)
Oct 4–31, 2015 *	28	34,100	1,218	419,800
November 2015	18	150,000	8,333	363,200
December 2015	31	202,556	6,534	601,900
January 2016	31	254,833	8,220	~490,000
February 2016	29	393,667	13,574	~470,000
March 2016	31	272,183	8,780	~480,000
June 2016	30	294,200	9,807	590,500
August 2016	27	246,167	9,117	435,200
September 2016	30	379,866	12,662	701,100
April 2017	30	403,500	13,450	750,100
August 2017 ★	31	653,346	21,076	1,034,200

** System commissioned July 2015; October reporting begins October 4, 2015 (28-day partial period). ★ Record monthly evaporation.*

4.2 Monthly Evaporation Rate Chart

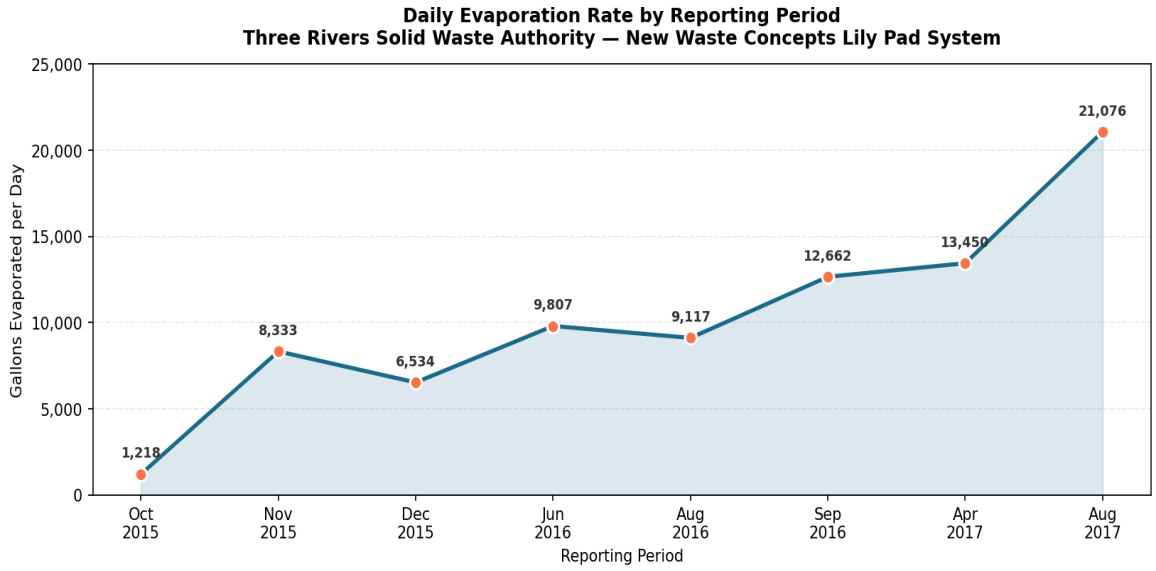


Figure 4: Daily evaporation rate (gal/day) across representative reporting periods, Oct 2015 – Aug 2017

The daily evaporation rate shows clear seasonal variation, as expected for an evaporation-based system. The first month of operation (October 2015) reflects a ramp-up period as the system reached full operational status. By November 2015, the system was achieving over 8,300 gallons per day despite approaching winter conditions — exceeding the projected baseline. Performance climbs through the warmer months, reaching a peak of 21,076 gallons per day in August 2017 as the system matured and additional capacity was optimized.

4.3 Quarterly Evaporation Performance

Quarterly totals provide the clearest picture of the system's long-term capacity growth and consistency. The data spans from the first partial operating quarter (4Q 2015) through 2Q 2018, covering more than two and a half years of continuous operation.

Quarter	Gallons Evaporated	Notes
4Q 2015	243,857	System commissioned late July 2015; partial quarter
1Q 2016	407,682	First full winter — exceeded projections +17.9%
2Q 2016	387,055	Spring performance, reduced daylight hours
3Q 2016	486,146	Summer peak conditions
4Q 2016	246,013	Winter baseline maintained
1Q 2017	520,742	+27.9% vs. same quarter prior year
2Q 2017	640,434	+65.4% vs. same quarter prior year
3Q 2017	770,336	+58.4% vs. same quarter prior year
4Q 2017	839,367	Record quarter — highest evaporation achieved
1Q 2018	492,776	Continued strong winter performance
2Q 2018	601,557	Consistent warm-season performance maintained

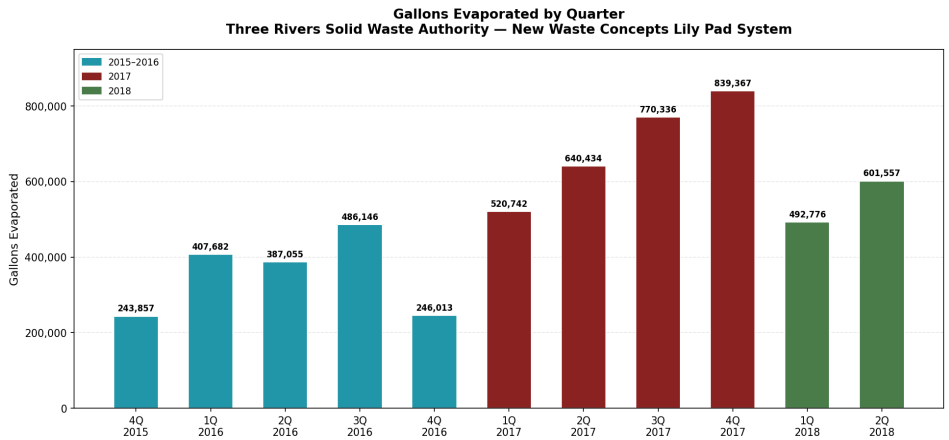


Figure 5: Gallons evaporated by quarter — Three Rivers SWA (4Q 2015 through 2Q 2018)

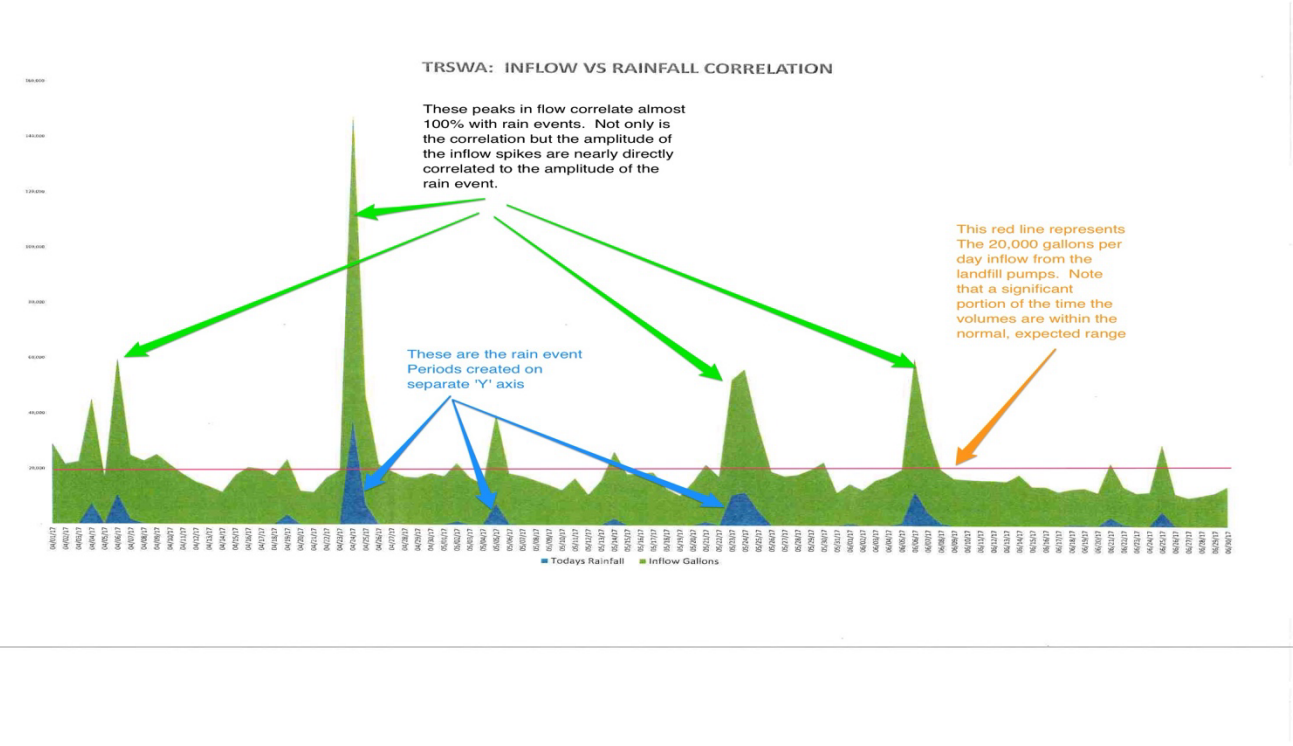
Performance vs. Projections — First Winter Season (Dec 2015 – Mar 2016)

The NWCI Lily Pad system exceeded winter performance projections in every month of the first winter season:

- December 2015: +24.9% above projected
- January 2016: +41.1% above projected
- February 2016: +32.1% above projected
- Winter average: +17.9% above projected

5. Inflow–Rainfall Correlation

One of the most critical operational insights from the TRSWA installation is the near-perfect correlation between rainfall events and leachate inflow spikes. The NWCI monitoring system — which logs daily rainfall (displayed on a secondary Y-axis in blue) against total inflow gallons (displayed in green) — reveals that inflow peaks correspond almost exactly with rain events in both timing and magnitude.



The chart demonstrates several important operational findings:

- Inflow spikes are nearly directly proportional to the amplitude of rain events — both in volume and in the number of days of elevated inflow following rainfall.
- During dry periods, inflow volumes typically remain within the normal expected range of approximately 20,000 gallons per day from the landfill pumps (indicated by the red horizontal reference line on the chart).
- The correlation enables proactive pond management — operators can anticipate inflow events based on weather forecasts and adjust evaporator scheduling accordingly.

- September 2016 recorded 14.28 inches of rainfall (357,000 gallons of rain-related inflow), yet the system maintained pond levels and achieved 379,866 gallons of evaporation that month — demonstrating system resilience under heavy precipitation.

This monitoring capability is built into the NWCI operating system platform, which also logs wind speed, RPM, and the proprietary "Fudge Factor" — a table-based wind speed adjustment that reduces atomizer RPM proportionally to wind conditions. This prevents drift, protects the surrounding environment, and optimizes evaporation per unit of energy consumed.

6. Cost Analysis — CAPEX & OPEX

6.1 Cost Structure

The economic case for the NWCI Lily Pad system is compelling when evaluated against the cost of trucking leachate to an off-site treatment facility. The following table summarizes the capital and operating cost structure as measured at the Three Rivers SWA installation:

Cost Category	Cost per Gallon	Description
CAPEX (Capital Expenditure)	**≤ $0.017 / gallon**	Total installed cost of the Lily Pad evaporator system amortized over total gallons evaporated through 2Q 2018
OPEX (Operating Expenditure)	**< $0.008 / gallon**	Ongoing operating costs including electricity, maintenance, and monitoring; averaged across all reported periods
Combined Total	**< $0.025 / gallon**	All-in cost; substantially lower than trucking or alternative treatment/disposal options

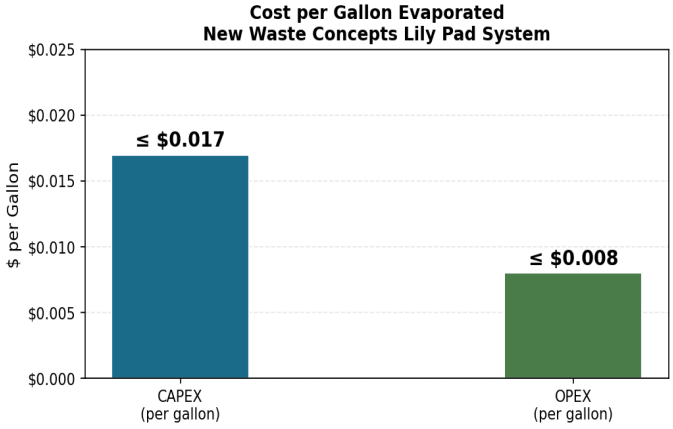


Figure 7: CAPEX and OPEX cost per gallon evaporated — Three Rivers SWA installation

6.2 Comparative Economics

To place these figures in context, leachate trucking and off-site disposal typically ranges from $0.05 to $0.20+ per gallon when all costs are included (transportation, fuel, treatment fees, regulatory documentation, and vehicle wear). The NWCI Lily Pad system delivers an all-in cost below $0.025 per

gallon — representing a potential cost avoidance of 60–85% compared to trucking alternatives, depending on local rates and hauling distance.

Cost Comparison Summary

Lily Pad System (CAPEX + OPEX): < $0.025 per gallon
Typical Leachate Trucking & Disposal: $0.05 – $0.20+ per gallon

Estimated cost avoidance over project life (2015–2018, ~6M+ gallons): $150,000 – $1,000,000+

Note: Actual savings vary by location, hauling distance, and treatment facility rates.

These economics improve over time as the capital cost component diminishes relative to cumulative gallons evaporated. Systems installed at larger ponds or higher-inflow facilities will see even more favorable CAPEX per gallon figures.

7. Measurement & Data Integrity

All reported evaporation volumes were calculated using a rigorous mass-balance methodology, with data sourced from calibrated instrumentation throughout the reporting period:

- Pond volume — continuous monitoring via calibrated pressure transducers, converted to gallons by known pond geometry.
- Metered inflow — all landfill pump discharge measured by in-line flow meter; supplemented by a constant unmetered inflow component of 1,200 gallons/day (separately measured Siemens meter).
- Rainfall contribution — on-site rain gauge, converted at 25,000 gallons per inch (based on the 40,000 sq ft pond surface area).
- Outflow — metered discharge volumes.

A separate validation study comparing digital meter readings to manual measurement methods confirmed measurement accuracy, with inbound flow variance averaging less than 1,500 gallons per day and outbound flow variance averaging approximately 500 gallons per day — confirming that reported evaporation figures are reliable and auditable.

8. Conclusions & Takeaways

The Three Rivers Solid Waste Authority installation demonstrates that the New Waste Concepts Lily Pad Floating Evaporator System is an effective, reliable, and economically superior solution for landfill leachate management. Key takeaways for prospective clients include:

- David Greene of SCS Engineers estimated that Three Rivers SWA, using the 4 head evaporator, would save nearly $250,000 annually using the Lily Pad / Typhoon Evaporator developed by NWCI.

- Proven performance: The system evaporated more than 6 million gallons of leachate between commissioning (July 2015) and mid-2018, with year-over-year performance improvements.
- Exceptional economics: CAPEX ≤ $0.017/gallon and OPEX < $0.008/gallon deliver total costs well below all conventional disposal alternatives.
- Exceeds projections: The system delivered 17.9% more evaporation than projected during the critical first winter season, establishing confidence in conservative design estimates.
- Scalable and intelligent: Wind-speed-responsive RPM control, drift barriers, and detailed SCADA-quality data logging make the system suitable for facilities with varying pond sizes, inflow rates, and regulatory environments.
- Minimal operations burden: The system operates autonomously with remote monitoring capability, reducing the operational demand on facility staff.

For more information, contact New Waste Concepts, Inc.

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Confidential. Prepared for client reference and evaluation purposes only. All evaporation volumes independently calculated via mass-balance methodology from calibrated field instrumentation.