



Heartland Water Technology

SWANA Presentation

Naples, FL



Agenda



- Heartland Overview
- Managing Leachate
- Heartland Landfill Leachate Solutions
- **Case Study #1 – ROVAP™**
Innovative approach to treat leachate with Reverse Osmosis & Evaporation
- **Case Study #2 – Onsite Leachate Management Service - 20 Year Contract**

Heartland Overview

Founded in 2008, Heartland Water Technology (“HT”) has patented and commercialized novel technology for treating difficult-to-treat industrial waste waters, available as Infrastructure as a Service (IaaS)

Solutions at the intersection of **Water, Energy and Resource Recovery.**

The Heartland Concentrator is a **direct contact evaporator** that sets new benchmarks for reliability and cost to treat.

Backed by investors with over \$30B in assets under management and dedicated to solving challenging environmental problems.

Proven technology with great customers in key applications:



Proven Applications

- Landfill Leachate
- RO Concentrate
- Flue Gas Desulfurization
- Produced Water
- Enhanced Pond Evaporation



Leachate: A Large and Increasing Expense



Key Items of Concern

- Leachate management is the single largest expense item for a landfill, up to 30% of revenue
- Regulatory changes and feedstock variability increase costs and uncertainty
- Inflation is exacerbating costs, especially for trucking and chemicals
- STPs are aggressively ending the practice of accepting leachate
 - Leachate is a strong wastewater and is causing STPs to miss their discharge requirements
 - Contaminants like PFAS, Microplastics and Pharma are treatment
- Once 'cutoff' from their traditional outlets, landfills experience 3x to 5x increase in cost as they transport leachate to the next closest available STP, which in some cases is another state away

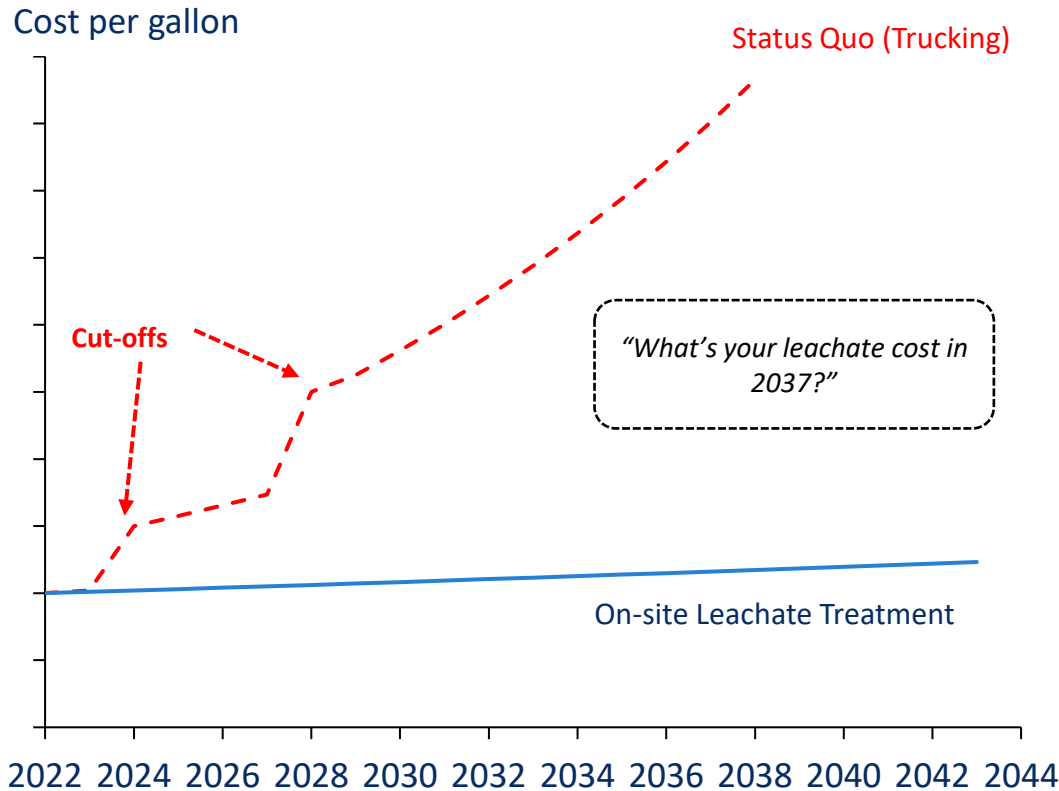
Implications

- Offsite disposal options shrinking at an accelerated rate
- Unprecedented uncertainty for both viable disposal options and costs

What can landfill operators do?

- **Control Your Destiny** with Onsite Leachate Management

Leachate Treatment: *Illustrative Cost per Gallon*



Heartland: "Control Your Destiny"

Many Positive ESG effects from recycling water to atmosphere

- **Carbon Footprint reduction** at disposal site
 - 5,500 metric tons of CO2 12,000 barrels of oil equivalent
- **Reduce trucking**
 - 73% decrease of offsite trucking
- **Volume reduction**
 - 97% (from raw leachate)
- **Energy efficiency improvement.**
 - Up to 75%
- **Closed System for Waste heat from flare**
 - LFG or CoGen (COVAP) solution

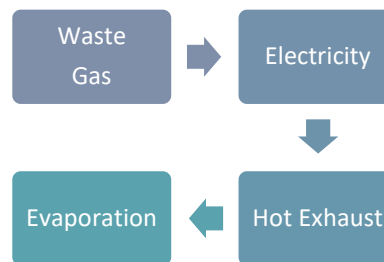
Heartland's Landfill Leachate Solution

Heartland™ Concentrator



The Heartland™ Concentrator is a direct-contact, rugged and cost-effective solution that can concentrate the widest range of challenging wastewaters all the way to zero liquid discharge (ZLD) in one-unit operation.

Landfill Solutions



- Two decades of leachate treatment
- 95% Availability
- 95%+ volume reduction
- MSW/Monofill or both
- Simple landfill gas integration and operation
- Only solution proven for treating leachate RO Concentrate
- Only solution proven for cogeneration applications
- Proven experience in integrating into landfill operations

Anatomy of the LM-HT[®] Heartland Concentrator™



1. Heat Source
2. Evaporation Zone
3. Feed and Recirculation
4. Droplet Separator
5. Sump and Blowdown
6. Exhaust

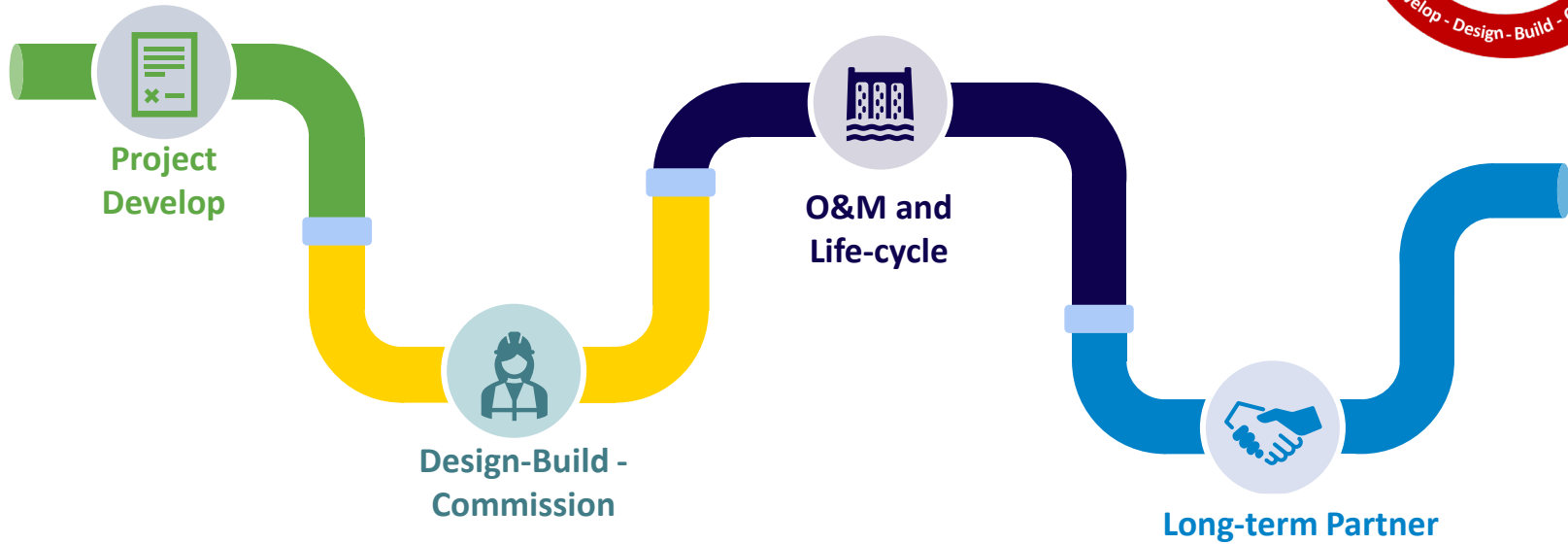
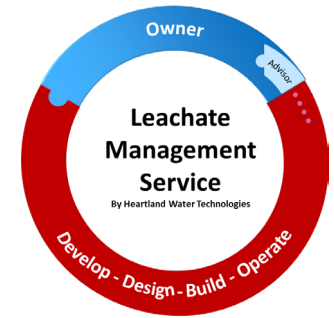
Sizes	12K to 144K gpd per unit
Applications	MSW, Brine Ponds, O&G, FGD Purge Water, Other
Delivery	6-9 months; Fully skidded, Modular and re-deployable
Flex-Fluid	Raw leachate, leachate RO Concentrate, Monofill
Flex-Heat	Flare, Recip Engine Exhaust, Turbine Exhaust, Hybrid
Lifespan	20+ years



Left: Process fluids as they exit the concentrator.

Right: Solids accumulating in a settling tank. Liquid recycled back to the concentrator.

Onsite Leachate Management Service



1

- Innovative approaches
- Integrated team effort
- One Stop Shop

2

- Proven Technology
- Execution excellence
- Best Practices

3

- Performance certainty
- Total Leachate management
- Minimize cost impact

4

- Collaborative partner
- Maximize client benefits
- Achieve long-term goals

Case Study 1 – ROVAP™

On-site Evaporation of RO Concentrate



Location: Cumberland County, NJ Landfill

Leachate Treatment: Reverse Osmosis + Evaporation

Thermal Energy: Waste Heat from Reciprocating Engines

Capacity: 25,000 GPD



Case Study 2 – Heartland Strategic Asset Management Service

20-year Build and Operations contract



Location: Florida

Thermal Energy: Enclosed Dual Fuel Flares (Landfill Gas and Natural Gas)

Capacity: 30,000 GPD

Case Study # 1 ROVAP™

Cumberland County Improvement Authority



- Location: Cumberland County, NJ Landfill
- 275 acres permitted
- Over 6M tons of waste in place
- Receiving 750 tons per day solid waste

Early 2018...The Situation

- Hauling concentrated leachate over 40 miles to Delaware
- Over 25 truck trips per week
- Opportunity to beneficially utilize waste heat from 3 CAT 3520 landfill gas engines



Hauling RO concentrate for disposal

- Existing Reverse Osmosis (RO) membrane system
- Separates leachate into clean water for discharge and concentrate
- Concentrated residual (RO Concentrate)
Challenging wastewater must be managed



Team worked together to optimize asset utilization

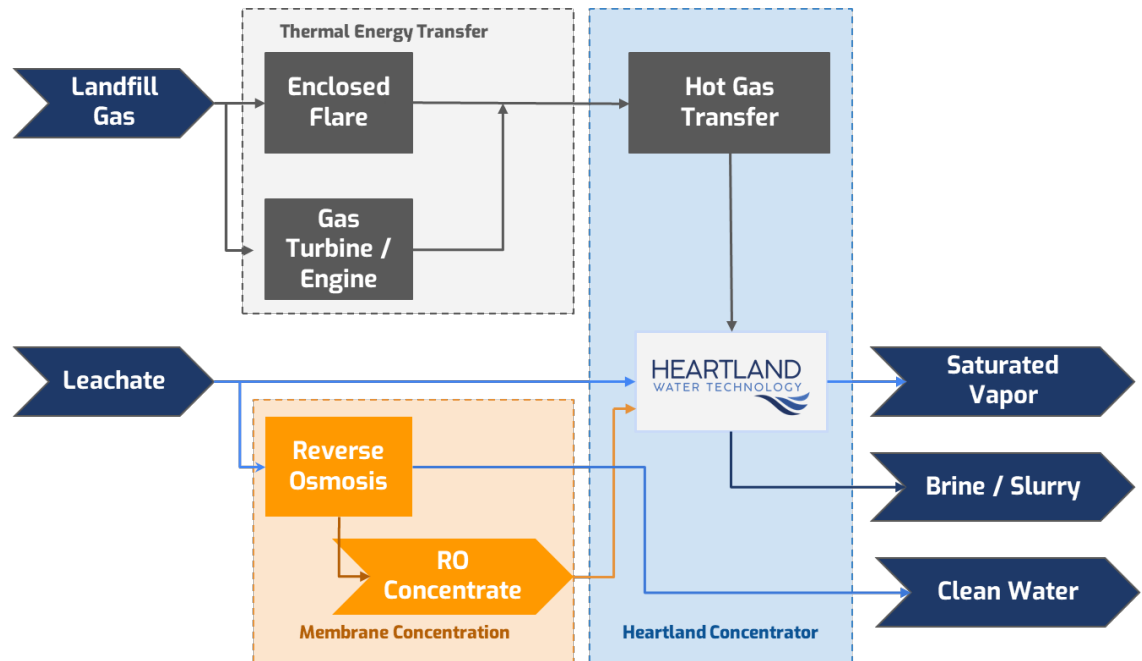
The Solution...ROVAP™

Proven Solution

- Utilization of mature technologies
- System integration to provide a complete solution
- Thermal provided from engine waste heat

Benefits

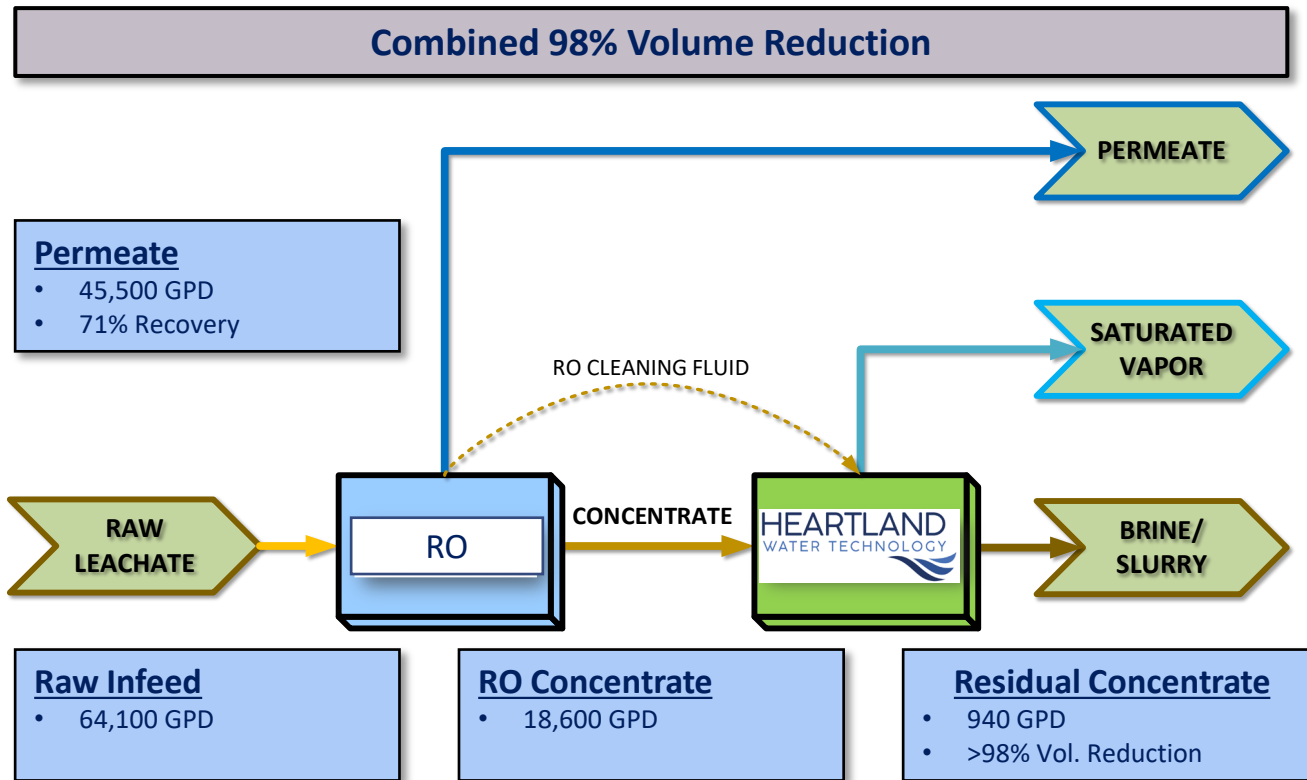
- Generate reusable water
- Take trucks off the road
- Lock-in Cost Certainty
- Reduced leachate disposal cost
- Utilization of waste heat



(1) Exhaust gas is ducted together to provide thermal energy for evaporation (2)

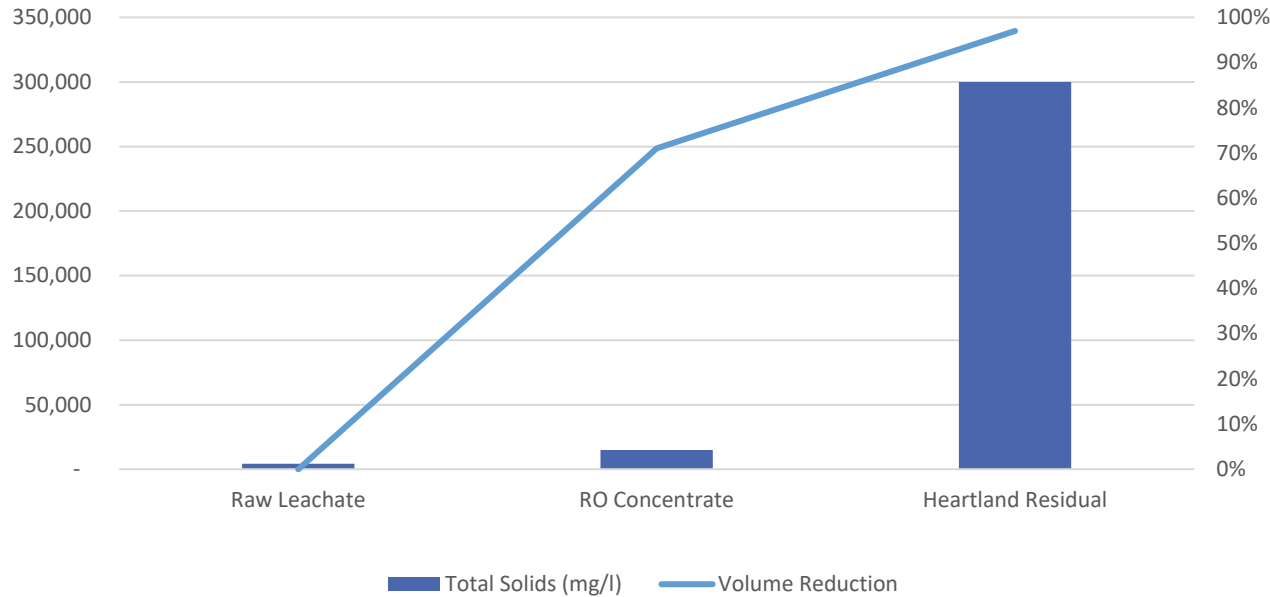
Proven Results

On-site Reverse Osmosis Concentrate Evaporation



System Performance Daily
Average
(June to September 2021)

System Performance



- >98% system volume reduction
- Generates concentrated residual with over 300,000 mg/l TS
- Engine Thermal Efficiency improvement from 36% to 76%

Engine Thermal Efficiency

	Exhaust Loss	Jacket/Other Loss	Electric Output	Recovered Jacket	Heartland Concentrator	Thermal Efficiency
Prior to Project	36%	28%	36%			36%
After Project	0	24%	36%	4%	36%	76%

Financial and ESG Benefits for the Authority



- Thermal efficiency increased
- Beneficial reuse of waste heat
- Removed trucks from the road
- Reduced Carbon Footprint
- Positive Community Relations
- Significant leachate volume reduction
- Annual cost savings 20-25%

Case Study # 2 – Leachate Management Service

20-yr Contract Florida Landfill

Project Approved by
County Board of
Commissioners

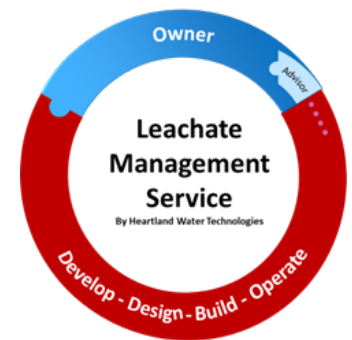


Situation

- Has discharged its leachate to the County STP for decades via pipeline
- County STP can no longer handle the high-strength leachate
- Successful Heartland pilot in 2020
- Development partner, Energy company

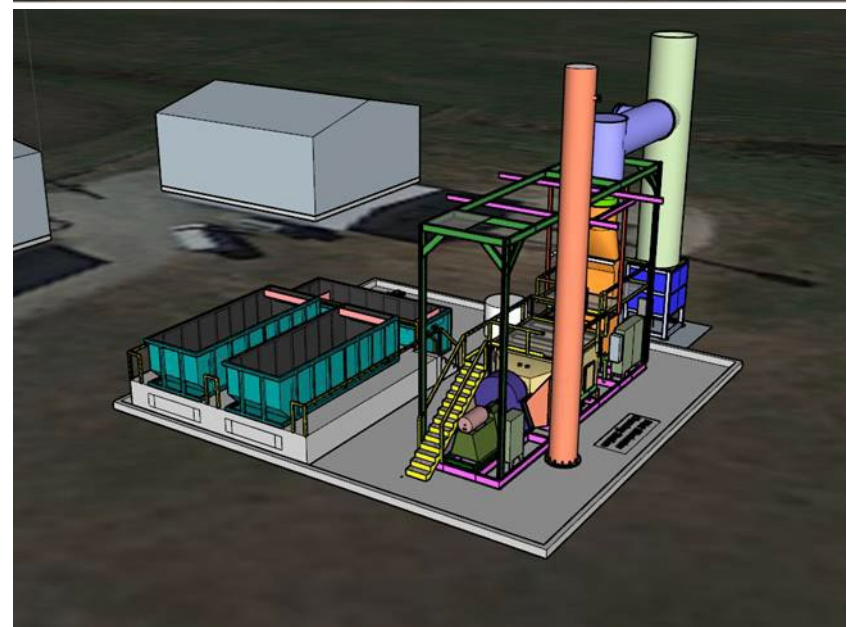
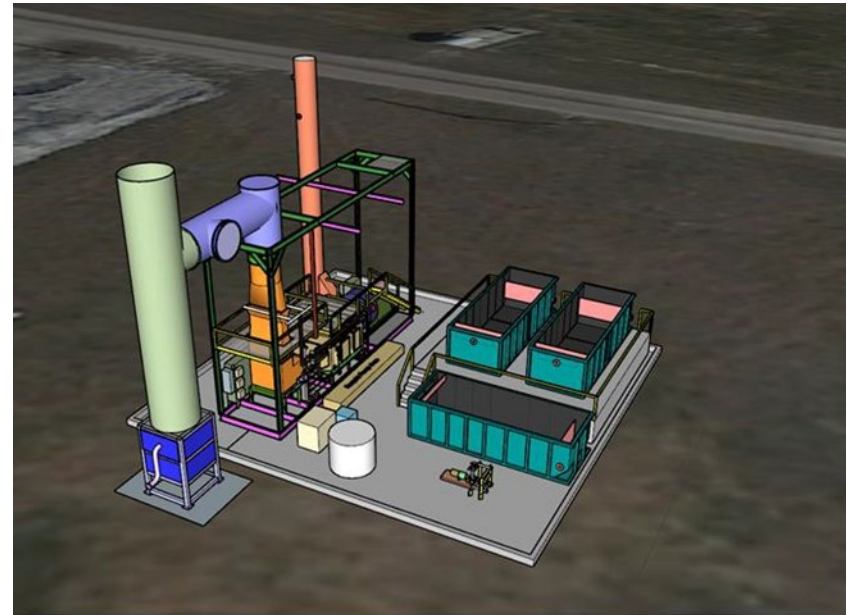
Value Proposition

- ✓ **No upfront capital**
- ✓ **Risk-transfer to Service Provider**
- ✓ **Long-term solution certainty**
- ✓ **Long-term cost certainty**
- ✓ **Beneficial use of landfill gas**
- ✓ **Highly concentrated residual**



Concept of Operation

1. Raw leachate will be stored for process in the existing leachate storage tank
2. The “Plant” will be capable of evaporating nominally 30,000 gpd of leachate
3. The Plant will initially operate on LFG. When the RNG plant is commissioned, the Plant will convert from LFG to Natural Gas. In the future, the plant could be configured to combust a blend of LFG and NatGas if desired
4. Residual from evaporation will be stored in lined roll-off boxes
5. Operations Command and Lab will domicile at Facility



20-yr LMS - Highlights

Heartland Offering

- 100% project financing
- 100% system design
- Turnkey installation and commissioning
- Operations and maintenance

Benefits

- 30,000 gpd leachate treatment capacity
- Revenue Generation
 - Ability to bring in third-party fluids
- KPI monitoring via dashboard
- Seamless integration with site controls, SCADA, and IT Systems
- Lifecycle performance optimization
- Risk mitigation for plant operations and cost uncertainty





Thank You!

www.HeartlandTech.com

(800) 759-1758

Ram Natarajan

Business Development

rnatarajan@heartlandtech.com

(804) 363-6096