Leachate Biological Treatment Study Results

City of Jacksonville Trailridge Landfill and North Landfill

July 17, 2018

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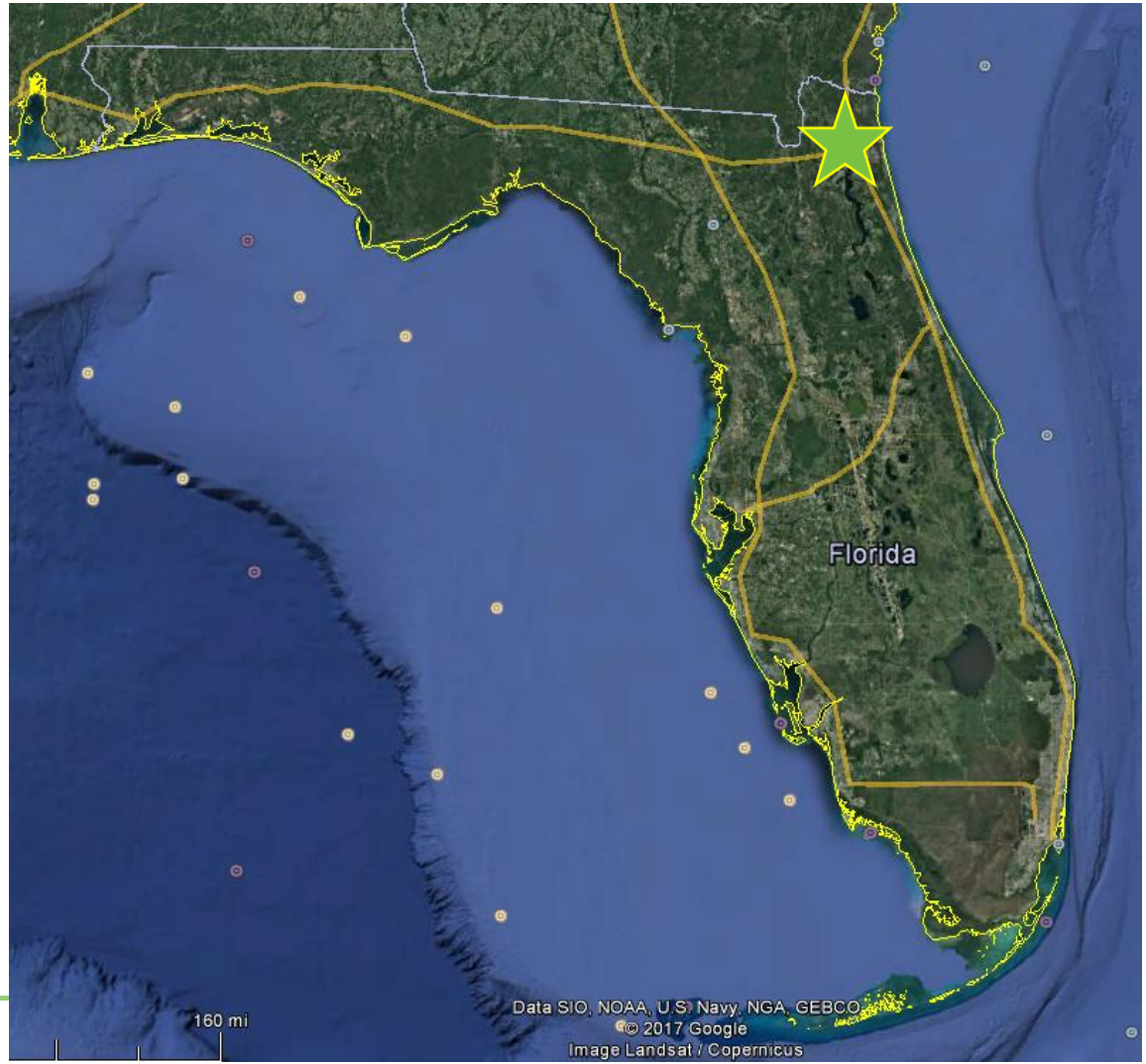
Specialties


Florida
160 mi
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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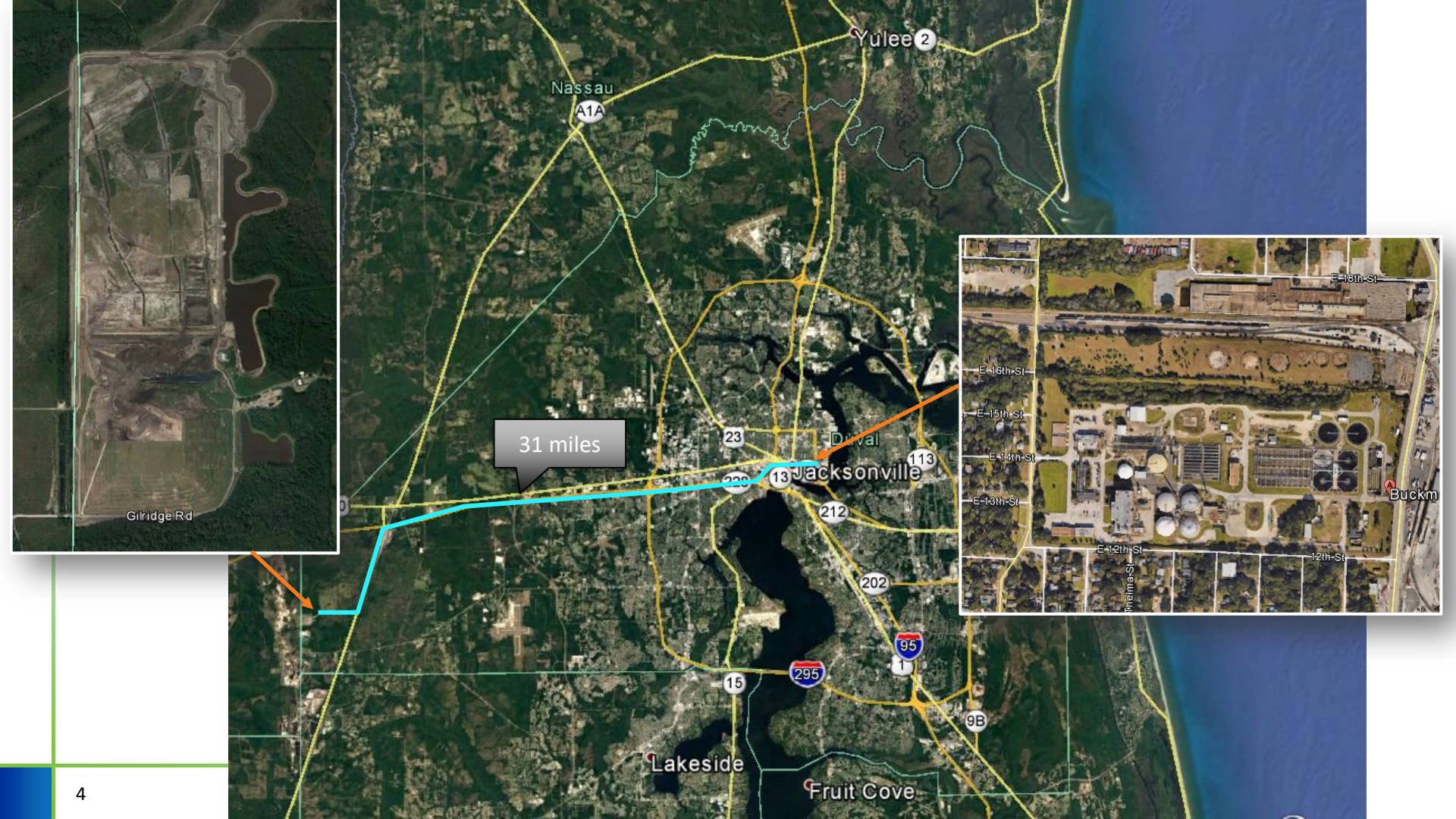

Yulee
2
Nassau
A1A
31 miles
23
Duval
Jacksonville
113
13
212
202
95
1
295
15
9B
Lakeside
Fruit Cove
Gilridge Rd
E 18th St
E 16th St
E 15th St
E 14th St
E 13th St
E 12th St
12th St
Buckm

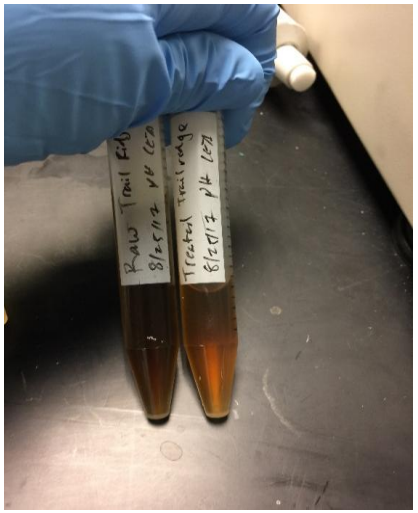
Trailridge Landfill Leachate Study

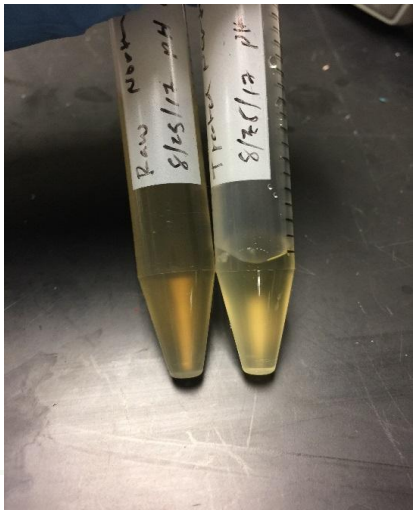
- Currently transport approximately 60,000 gpd leachate to Buckman WWTP
- Leachate impacts UV disinfection O&M
- Cost: $3/kgal → $51/kgal → $110/kgal

- Two components to the study
  - Leachate treatability study: biological, chemical, and dilution
  - Alternative disposal options

Biological Treatment Summary

- Biological treatment with denitrification reduced the color in both leachates
- Oxidation with peroxide and peracetic acid did not improve transmittance
- North leachate achieves target transmittance at 1% dilution
- TRLF leachate achieves target transmittance at 0.1% dilution



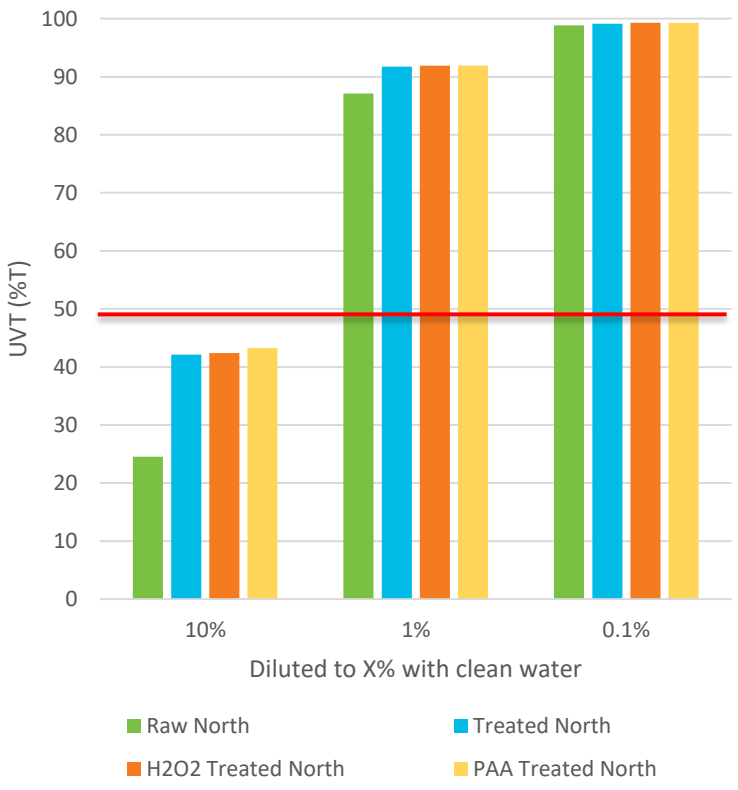


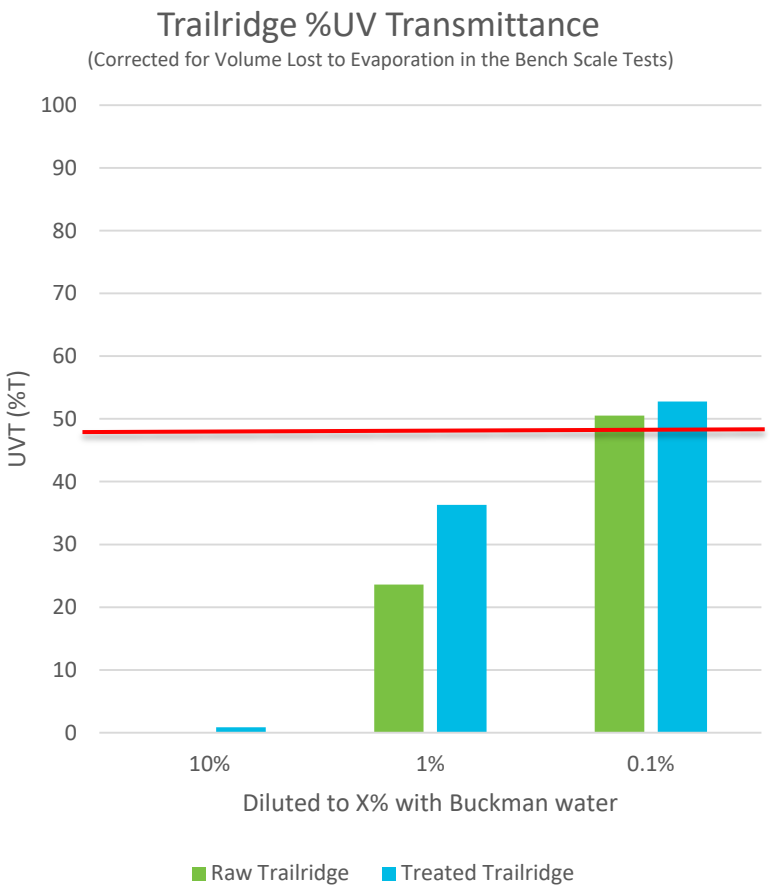
Trailridge %UV Transmittance

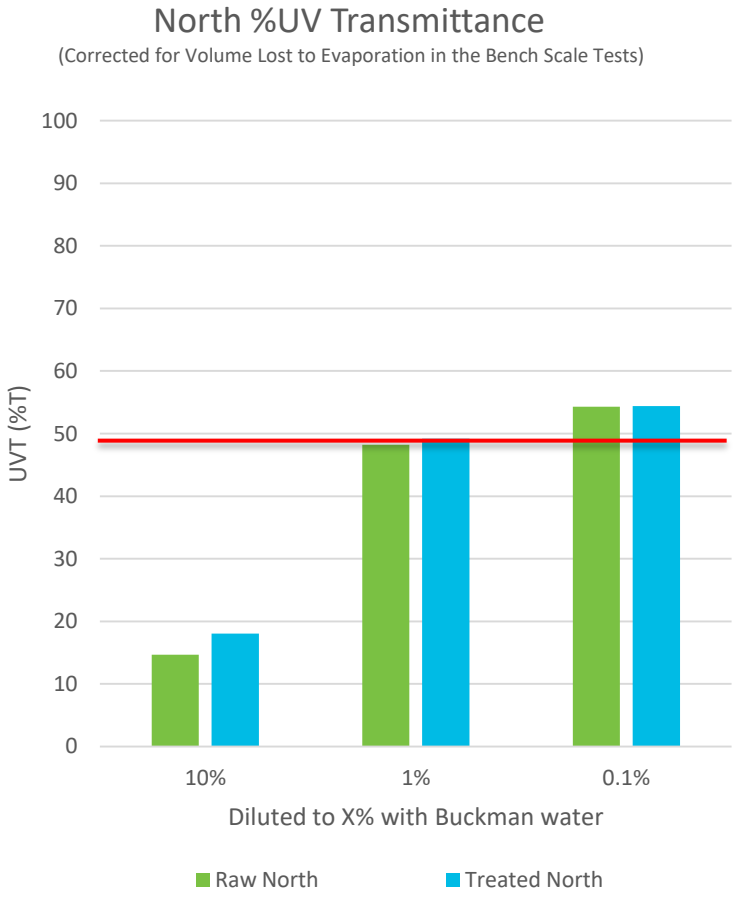
(Corrected for Volume Lost to Evaporation in the Bench Scale Tests)

North %UV Transmittance

(Corrected for Volume Lost to Evaporation in the Bench Scale Tests)




Trailridge %UV Transmittance
(Corrected for Volume Lost to Evaporation in the Bench Scale Tests)
100
90
80
70
60
50
40
30
20
10
0
UVT (%T)
10%
1%
0.1%
Diluted to X% with Buckman water
Raw Trailridge
Treated Trailridge


North %UV Transmittance
(Corrected for Volume Lost to Evaporation in the Bench Scale Tests)
100
90
80
70
60
50
40
30
20
10
0
UVT (%T)
10%
1%
0.1%
Diluted to X% with Buckman water
Raw North
Treated North

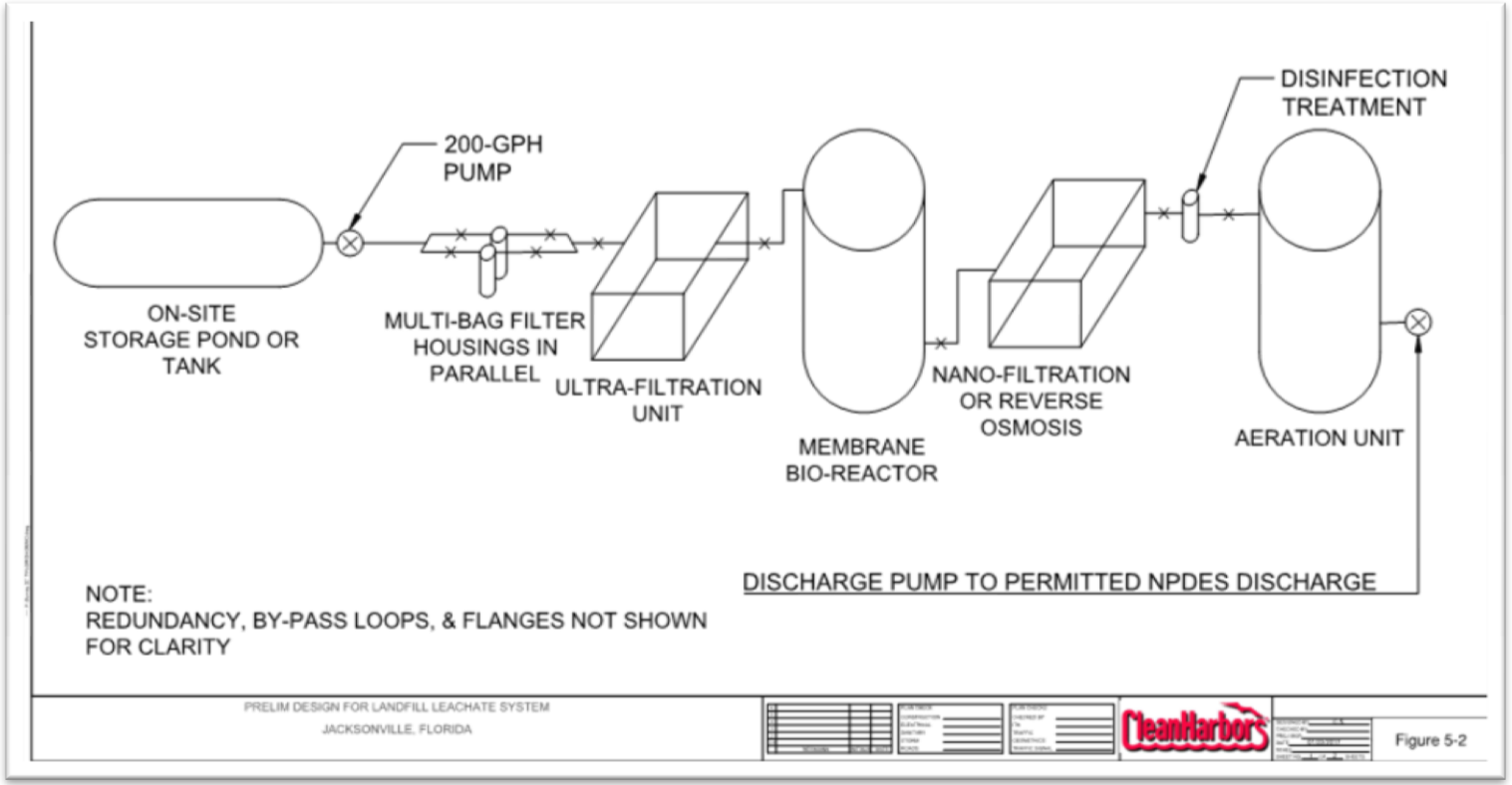
Disposal and Treatment Options

- Onsite Treatment
- Deep Well Injection
- Third Party WWTP
- Evaporation

- Cost Recap

Current Treatment	$51/kgal
Standard Industrial Treatment	$45/kgal
UV Update Treatment	$110/kgal

Clean Harbors Onsite Package Plant



Clean Harbors Onsite Package Plant

- Filtration to remove suspended solids
- Membrane bioreactor (MBR) to reduce BOD and target specific contaminants
- Nanofiltration (NF) or RO to remove organic molecules and metal ions.
- Disinfection and aeration prior to discharge.
- Pilot Study recommended by vendor to size equipment

Capital and Operating Costs

	72,000 gpd Capacity	224,000 gpd Capacity
Capital	$18.5M	$29.6M
O&M	$344,000/yr	$555,000/yr
Lifetime (20 yr)	$25.6M	$41.3M
Unit cost	$49/kgal	$25/kgal

Permitting Requirements

- Solid Waste Operating Permit Modification – Recirculate Leachate
- Establish a new NPDES Outfall (North or TRLF)
  - Nitrogen
  - Phosphorus
  - Ammonia
  - Nickle
  - Iron
  - Copper

Discharge Water Quality

	Class III Surface WQ Standard	TRLF Treated Leachate (mg/L)	North Treated Leachate (mg/L)
CBOD		13	6.3
TKN		57	11
Total Nitrogen		937	341
Total Phosphorus		150	140
Arsenic	50	180	ND
Iron	1.0	1.9	0.57
Nickle	0.165	0.200	0.025
Copper	0.030	0.043	0.170
Ammonia	1.51	8.4	3.7

Permitting Requirements (cont.)

- Develop a Plan of Study for FDEP
- Collection of receiving water body WQ data (12 months)
- Collection of leachate water quality data (min 1 grab)
- Current/Flow study to establish 7Q10 for mixing zone
- Mixing zone study (diffuser design and CORE Mix Analysis)
- Bioassay toxicity testing protocol (3 grab samples)

Disposal and Treatment Options

- Onsite Treatment
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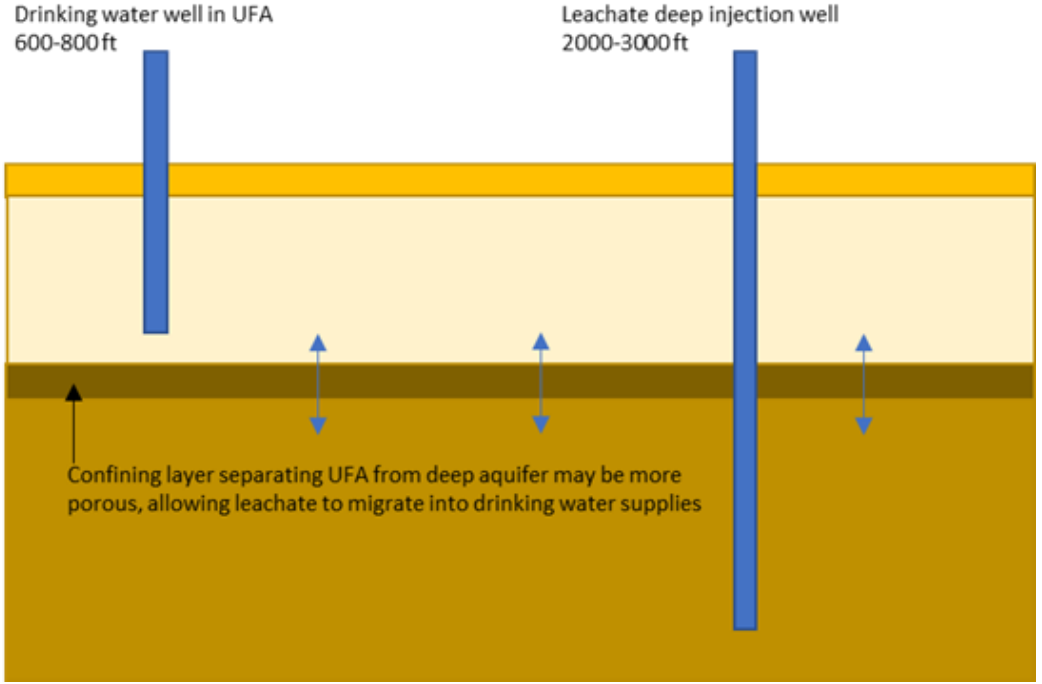
- Third Party WWTP
- Evaporation

- Cost Recap

Current Treatment	$51/kgal
Standard Industrial Treatment	$45/kgal
UV Update Treatment	$110/kgal
Onsite Treatment	$25-47/kgal

Waste Management has placed deep well injection investigations on hold…

- Potential transmissivity of the confining layer
- Potential impacts to future drinking water supplies



Disposal and Treatment Options

- Onsite Treatment
- Deep Well Injection
- Third Party WWTP
- Evaporation

- Cost Recap

Current Treatment	$51/kgal
Standard Industrial Treatment	$45/kgal
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Onsite Treatment	$25-47/kgal

Moran Environmental – Water Recovery LLC

- WRI treats water using chemical and physical separation techniques before discharging to JEA.
- Discharge limits for TN would limit TRLF leachate to 20,000 gal/day (1/3 of required volume)

Transportation	$34/kgal
Disposal	$46/kgal
Total Cost	$80/kgal

Liquid Environmental Solutions

- LES treats water using chemical and physical separation techniques before discharging to JEA.
- No current discharge limit projected

Transportation	$240/kgal
Disposal	$110/kgal
Total Cost	$350/kgal

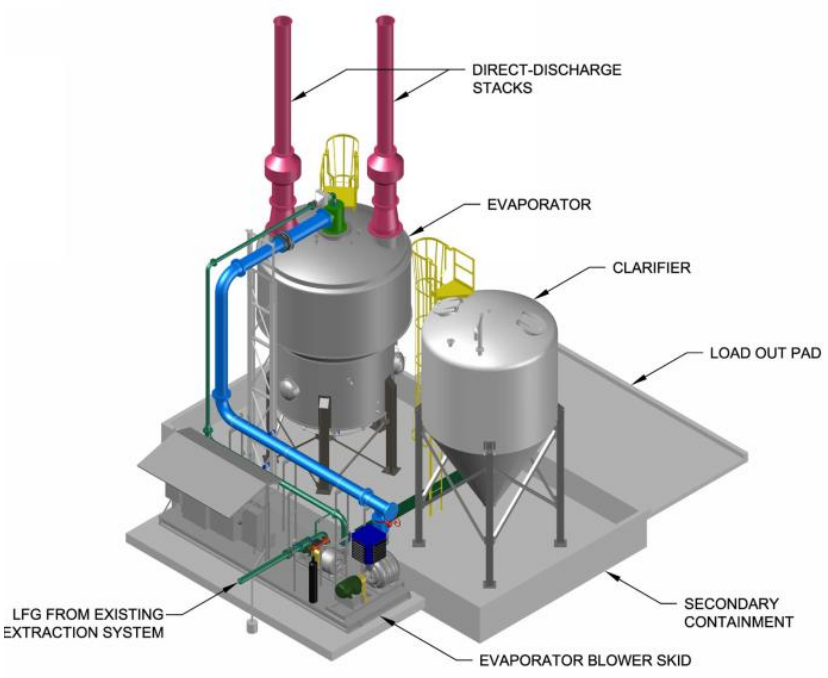
Disposal and Treatment Options

- Onsite Treatment
- Deep Well Injection
- Third Party WWTP
- Evaporation

Current Treatment	$51/kgal
Standard Industrial Treatment	$45/kgal
UV Update Treatment	$110/kgal
Onsite Treatment	$25-47/kgal
WRI (20 kgal limit)	$46/kgal
LES	$110/kgal

Aptim E-Vap® Leachate Evaporation System

- Leachate volume is reduced through evaporation
- 10% of volume recycled to the landfill, concentration of pollutants
- Requires solid waste and Title V permit modifications
- Requires a gas fuel source for evaporation



Domestic Sites			GPD
Hunt Road	MA	1997	10,000
Olympic View	WA	2000	20,000
Okeechobee	FL	1998	20,000
Liberty	IN	1998	10,000
Earthmovers	IN	1998	10,000
Southern Allegheny	PA	1999	13,000
Okeechobee	FL	2003	20,000
Sauk Trail	MI	1999	20,000
Forest Lawn	MI	1999	20,000
Greenridge	PA	1999	30,000
Cherokee	OH	1998	10,000
Brunner	PA	2004	20,000
Waters	MI	2007	30,000
Northern Oaks	MI	2008	30,000
Glens	MI	2009	30,000
Sampson County	NC	2012	30,000
Forest Lawn	MI	2013	30,000
Richland County	SC	2016	40,000
Cedar Hill	AL	2017	30,000

Interviews

- Performance
- Residuals Management
- O&M Issues
- O&M Resources
- Applicability

COJ Own & Operate

- Natural Gas Supply
- Landfill Gas Supply

Aptim Own & Operate

- Natural Gas Supply
- Landfill Gas Supply

	COJ, NG	COJ, LFG	APTIM, NG	APTIM, LFG
Capital	$6.0M	$4.1M	$2.3M	$0.7M
O&M	$382,000/yr	$236,000/yr	$1.0M/yr	$879,000/yr
Lifetime (10 yr)	$10.2M	$6.7M	$13.9M	$10.4M
Unit cost	$64/kgal	$42/kgal	$87/kgal	$65/kgal

Disposal and Treatment Options

- Onsite Treatment
- Deep Well Injection
- Third Party WWTP
- Evaporation

Current Treatment	$51/kgal
Standard Industrial Treatment	$45/kgal
UV Update Treatment	$110/kgal
Onsite Treatment	$25-47/kgal
WRI (20 kgal limit)	$46/kgal
LES	$110/kgal
Evaporation – COJ/NG	$64/kgal
Evaporation – COJ/LFG	$42/kgal
Evaporation – Aptim/NG	$87/kgal
Evaporation – Aptim/LFG	$65/kgal

Summary

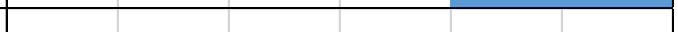
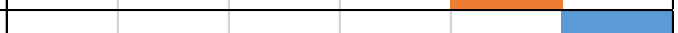
	Treatment and Dilution (2017 Existing Condition)	Evaporation	Third Party WWTP	On-site Treatment & New NPDES Outfall
Treatment Capacity	60,000 gpd	40,000 gpd	20,000 gal/day (MER) 60,000 gal/day (LES)	72,000-224,000 gpd
Unit Cost	$51/kgal	$42-$64/kgal (COJ) $65-$87/kgal (Aptim)	$46/kgal (MER) $110/kgal (LES)	$47/kgal (72kgpd)
Capital Cost	None	$6.0M (COJ, NG) $4.1M (COJ, LFG) $2.3M (Aptim, NG) $0.7M (Aptim, LFG)	None	$18.5M (72 kgpd) $29.6M (224 kgpd)
O&M Costs	$1.1M/yr	$382,000/yr (COJ, NG) $236,000/yr (CPJ, LGF) $1.0M/yr (Aptim, NG) $879,000/yr (Aptim, LFG)	$336,000/yr (MER) $2.4M/yr (LES)	$344,000/yr (72 kgpd) $555,000/yr (224 kgpd)
Operations	None	Performed by third party or City staff	None	Licensed operator required
Permitting	No permitting required	Modification to Title V Air Permit and Solid Waste Operations Permit	No permitting required	Modification to Solid Waste Operations Permit and permitting of new NPDES Outfall
Implementation Timeline	N/A	12-18 months	3-6 month	24 months minimum
Additional Considerations	JEA can change treatment costs based on operations. JEA is proposing $110/kgal if UV disinfection is continued	Timeline dependent on third-party gas supplier	Volume limited based on facility discharge permit. Cost of treatment is equivalent to JEA	Highest capital investment, highest permitting risk

Recommendations – North Leachate

- Appx 17,000 gpd
- Negotiate standard industrial rate with JEA - $45/kgal ,
  OR
- Contract with MER for $46/kgal
- Cost: $280,000/yr

Recommendations – TRLF Leachate

- Appx 40,000 gpd
- Negotiate JEA treatment for 24 months
- Design and install a gas collection system for Phase 6 (12-18 months).
- Title V Permit modifications (18-24 months).
- Design, procure, and install leachate evaporation system (12 months).
- Visit the leachate evaporation installation in Richland County, South Carolina.
- Avg Cost: $607,000/yr

Title V Permit Modifications	18 months	
Design Gas Collection System	6 months	
Procurement and Contracting	3 months	
Install Gas Collection System	6 months	
Solid Waste Permit Modification	3 months	
Preliminary Design Report for Evporation System	6 months	
Procurement and Contracting	3 months	
Install Evaporation System	3 months	

Questions?