



FROM PILOT TO PRACTICE

*Insights Gained in Advanced
Wastewater/Leachate Treatment of PFAS*

BY:

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PRESENTATION TEAM



Pat Lewis

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Patrick Lewis is a water treatment and environmental technology specialist with more than 30 years of experience developing, implementing, and optimizing advanced treatment solutions across municipal, industrial, agricultural, mining, landfill, and energy markets. His expertise includes industrial wastewater treatment, PFAS management, landfill leachate treatment, produced water treatment, chemical program development, advanced oxidation processes, electrochemical treatment systems, water reuse, and environmental compliance. Patrick has successfully led treatment system design, pilot testing, technology commercialization, and operational optimization efforts throughout North America, helping clients solve complex water quality and environmental challenges.

Brad Pekas PE/PG is a senior engineer and hydrogeologist with more than 35 years of experience in environmental engineering, water resources, wastewater management, underground injection control (UIC) well permitting and operations, groundwater modeling, and environmental remediation. His expertise includes Class I, V, and VI UIC wells, carbon sequestration projects, industrial wastewater disposal, landfill leachate management, power generation facilities, mining operations, and regulatory permitting. He has led multidisciplinary technical teams across multiple states and EPA regions and has served as a technical expert and expert witness in hydrogeology, water resources engineering, and environmental compliance matters.



Brad Pekas, PE/PG

Chief Engineer/ Hydrogeologist

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TREATMENT TECHNOLOGY SCREENING CRITERIA & SELECTION PROCESS

TECHNOLOGY SCREENING FACTORS FOR CONSIDERATION

✓ Robustness

Equipment is capable of enduring severe environmental constraints and exhibits strong mechanical stability

✓ Reliability

Equipment is capable of high ops uptime, and is not too susceptible to routine failures (e.g., high maintenance)

✓ Modularity

Equipment is designed to be readily integrated into and enhances other treatment processes

✓ Adaptability

Equipment is functionally capable to handle a wide-range of water quality fluctuations with minimal adjustments

✓ Mobility

Equipment is designed and packaged to have a minimal footprint, “plug-n-play” connections, and easily relocated

✓ Resource Use

Relevant to equipment operational requirements -electrical demand, chemical usage, waste production

• ENERGY DEMAND

Describes the energy requirements to operate the system -low to very high

• CHEMICAL DEMAND

Describes the chemical usage requirements to operate the system -low to very high

• WASTE GENERATION

Describes the amounts of waste/byproducts generated by operating the system -low to very high

✓ Technology Cost

Relevant to overall treatment system equipment capital, installation/ construction, and operational costs

• CAPITAL COSTS

• CONSTRUCTION COSTS

• OPERATIONAL COSTS

Describes the overall comparative capital cost for the system equipment and facility – low to very high

CONTAMINANT TREATMENT & REMOVAL EFFICENCY

Contaminant Types/ Chemical Groups

- pH/Eh
- TSS, TDS,
Spec. Cond.,
Turbidity
- DO/ORP
- BOD/CBOD/COD
- Inorganics/Metals
- VOCs/SVOCs
- Nitrogen
Compounds
- Phosphate
Compounds
- PFAS Isomers

Removal Efficiency Ranking

- 5** Highly Effective - able to attain targeted criteria for all contaminants of concern
- 4** Effective -able to treat and reduce contaminant levels, may attain some criteria
- 3** Slightly Effective - able to treat/reduce most contaminant levels, but more needed
- 2** Limited Effectiveness - only treats/reduces some contaminants, much more needed
- 1** Not Effective -unable to treat these contaminants



VALHALLA ADVANCED WASTEWATER TREATMENT

The **Valhalla Advanced Wastewater Treatment (AWT)** service program is a flexible, modular treatment platform designed to address the most challenging industrial and municipal wastewaters. By integrating patented and licensed, high-intensity treatment technologies, Valhalla AWT systems consistently deliver superior contaminant removal with reduced chemical consumption, lower energy demand, and simplified, highly automated operation. Individual technologies may be deployed independently or configured into a customized treatment train to meet stringent discharge, reuse, or regulatory requirements.

**Controlled Hydrodynamic Cavitation
(CHC) & Electrolysis (EO)**

"Valhalla CHC-EO AWT"



Controlled Hydrodynamic Cavitation (CHC) Video

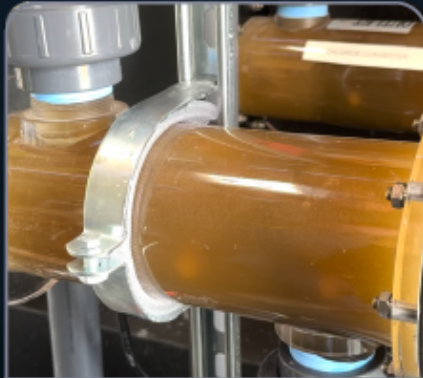


Electrolysis (EO) Video



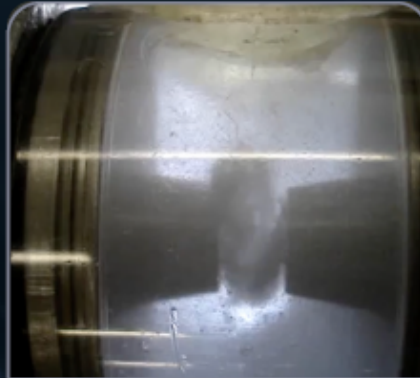
VALHALLA ADVANCED WASTEWATER TREATMENT SYSTEM

An integrated, multi-stage mechanical treatment system engineered to maximize water reuse and eliminate unnecessary water loss.



CHLORIDE CONVERTER ELECTRO-OXIDATION CONDITIONING

Inline oxidation, biological control, and water stabilization for high-cycle water conditioning prior to cavitation processing.



HYDRODYNAMIC CAVITATION CAVITATION IN ACTION

Bubble collapse creates localized high-energy events for oxidation, conditioning, contaminant destabilization, and inline softening.



FILTRATION & POLISHING MULTI-STAGE FILTRATION

Continuous solids removal, polishing and water stabilization for high-cycle reuse applications using ceramic media and PFAS certified GAC.



REAL WATER RESULTS DATA DRIVEN RESULTS

Measurable improvements in water quality, system performance, and operational efficiency.



LEACHATE



BSD FILTRATE



EO CONDITIONING



CHC REACTOR



FILTRATION



POLISHING



RECLAIM / REUSE

Pretreat

Condition and stabilize high-strength waste streams prior to treatment.



Strip

Separate ammonia, organics, and volatile contaminants and gas from the water stream.



Capture

Remove suspended solids, metals, PFAS-bearing residuals, and destabilized material.



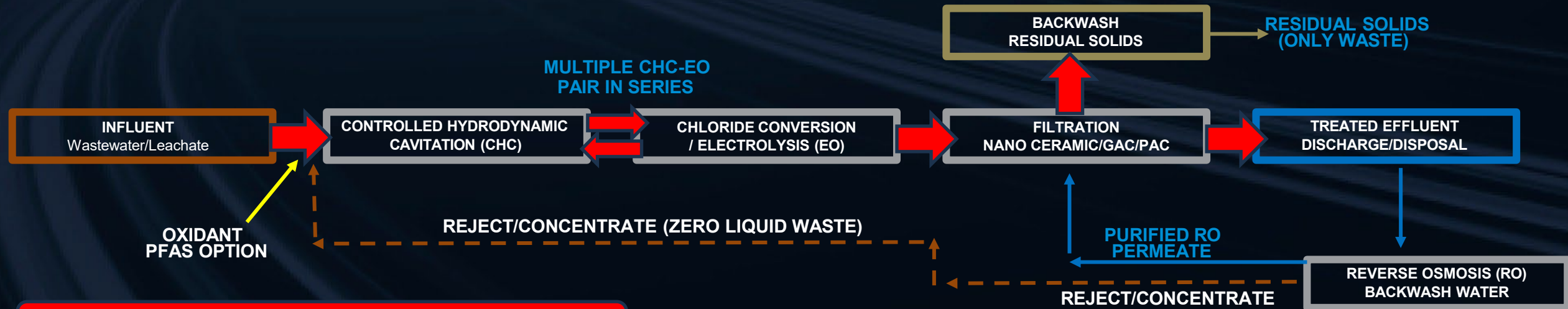
Reuse

Produce reclaimed-quality water for beneficial reuse applications.

Condition. Break. Filter. Reuse.

Advanced treatment transforms landfill leachate and biosolids filtrate from costly waste streams into reusable reclaimed water assets.

VALHALLA CHC-EO AWT PROCESS



KEY VALHALLA CHC-EO PROCESS SYNERGIES

CHC – Breaks down bacteria/organics, weakens chemical bonds, optimizes EC performance.

EO – Directly oxidizes contaminants through hydroxyl radicals/reactive species, promotes mineralization, and prepares water for filtration.

Multi CHC-EO Pair – Significantly enhances and improves overall treatment system performance.

NC Filtration – Removes tiny colloids, fine organics, and dissolved metals to protect the carbon system.

GAC/PAC – Removes low-level organics, oxidation by-products, color, odor, and PFAS (when properly designed).

RO – Removes remaining dissolved ions and PFAS, providing ultra-pure water for backwash or discharge.

Optional PFAS Treatment Enhancements

Oxidant – Injection of an oxidant (e.g., persulfate) could significantly improve PFAS destruction performance.

RESIDUAL SOLID WASTE MANAGEMENT

Spent Granular Activated Carbon (Spent GAC)

Extensive treatment and filtration occurs within the process prior to GAC

Potential Organic Constituents – other than Spent GAC

- Humic/ Fluvic acids (leachate)
- VOCs/ SVOCs – low levels
- Personal Care Products/ Pharmaceuticals – trace to low levels
- PFAS Isomers

Potential Inorganic Constituents – other than Spent GAC

- Adsorbed/ precipitated metals and hydroxides
- Sulfides/ sulfates species – if H₂S present in leachate

Reactivation & Final Disposal – Contracted with Carbon Source/ Supplier(s)

- Carbon suppliers/ facilities – Suitable High Temp process for PFAS destruction

Waste Characterization Profile – Site specific profile required

- Anticipated to pass TCLP – nonhaz, non-regulated solid waste

RESIDUAL SOLID WASTE MANAGEMENT

Residual “Backwashed” Solids

Extensive treatment occurs within process prior to backwashing

“TYPICAL” ESTIMATES:

1.5 to 2.5 cyds wet sludge per million gallons

1.25 to 1.75 tons wet sludge per million gallons

Potential Organic Constituents [10-40%]

Suspended/Colloidal (COD) organic fines Biosolids carryover, Residual humic substances, Biologic cell remnants from cavitation/ oxidation process, PFAS Isomers

Potential Inorganic Constituents

Metal Hydroxides/ Precipitates [40-70%] – iron/ aluminum hydroxides (EO electrodes)

Inorganic Salts/ Precipitates [5-20%] - (carbonates, chloride, sulfates)

Bonded Heavy Metal [1-10%]

Carryover silts/ clays – if present in the influent

WASTE CHARACTERIZATION/ PROFILE

– Site specific profile required

Anticipated to typically pass TCLP – nonhaz, non-regulated solid waste

WHY TCLP MIGHT FAIL

Highly elevated chlorides – may form soluble metals (PbCl_3 , CdCl_4)

High Humic loading – may allow certain metals to remobilize during TCLP

Occasional - arsenic (As) and mercury (Hg) issues – site specific conditions



PILOT TESTING PROGRAM



PILOT TESTING PROGRAM

The Value of Pilot Testing



Collaborative technical scoping provides improved understanding of key wastewater challenges, water quality characteristics, and other site specific constraints facing our clients and their facilities.



CIP Solutions on-site pilot testing of our clients challenging wastewater provides a real **“Proof-of-Concept”** performance test of our capabilities and our treatment technologies

- Pass, Fail, or Adjust/Retest.



This diagnostic evaluation is low risk for clients that provides mutually beneficial information regarding potential alternatives for the future development of a long-term, cost-effective (pay-for-performance) relationship.

PILOT STUDY AND RESULTS

Valhalla CHC-EO Pilot Trailer – Layout & General Process (water) Flow

KEY SYSTEM SAMPLE POINTS

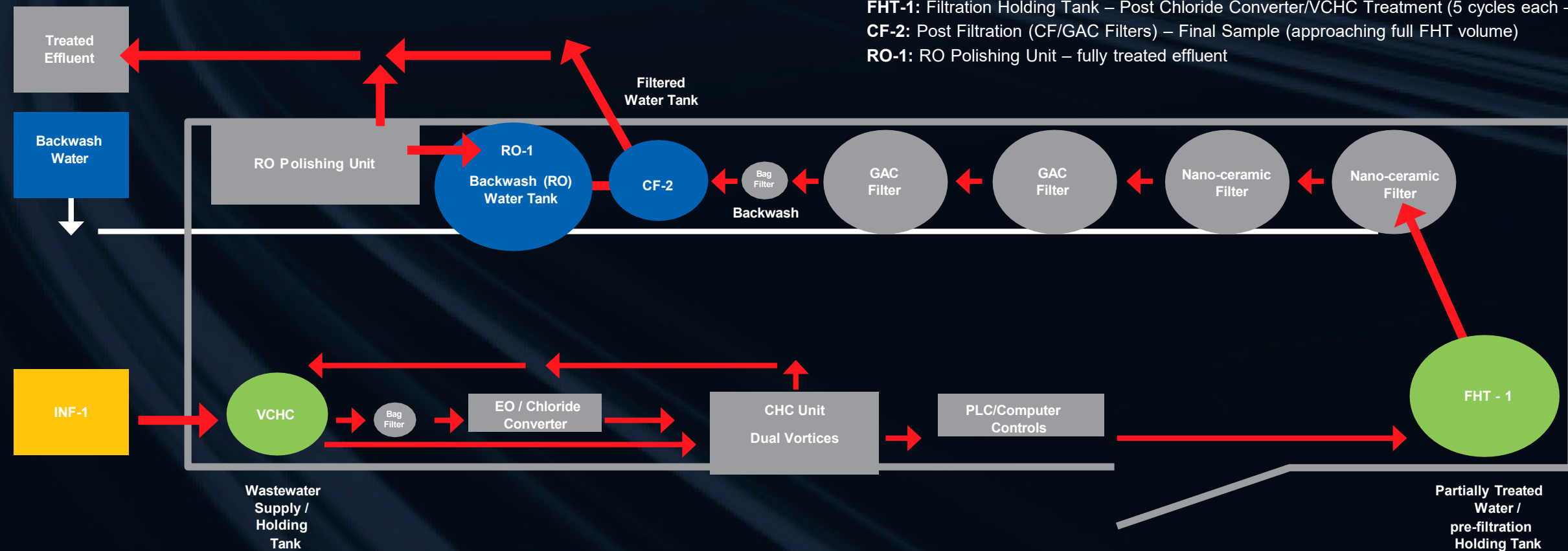
INF-1: Influent – Wastewater Stream (untreated tote)

VC-C#: Post CC-VCHC Treatment – Sample for field parameters from CC-VCHC

FHT-1: Filtration Holding Tank – Post Chloride Converter/VCHC Treatment (5 cycles each – 3 batches)

CF-2: Post Filtration (CF/GAC Filters) – Final Sample (approaching full FHT volume)

RO-1: RO Polishing Unit – fully treated effluent



TREATMENT/DISCHARGE CRITERIA

The following treatment benchmarks demonstrate the system's ability to eliminate nutrient bottlenecks, expand downstream capacity, and support high-quality effluent management pathways for utilities facing nitrogen constraints.

Based on family specific permitting and its conditions, the Vahalla AWT Pilot test treatment performance (aka discharge) criteria include the following:



PRIMARY & SECONDARY

- Meets primary & secondary drinking water quality standards
- Applicable for high-purity effluent and advanced polishing

REUSE/ RECLAIMED

- Achieves reuse/ reclaimed water quality standards for land application
- Supports irrigation, beneficial reuse, and non-potable offsets

REUSE/ RECHARGE

- Meets recharge-quality requirements for injection and aquifer support
- Enables recharge pathways where permitted

AWT CRITERIA

- Consistently meets or exceeds AWT standards
- CBOD: 5 mg/L
TSS: 3 mg/L
TN: 3 mg/L
TP: 1 mg/L

TYPICAL CHC PFAS PILOT TEST SAMPLING PROGRAM

	Sample IDs	1633A	TOP Assay	TF	AOF	Inorganics	Metals	Coliforms
TEST RUN 1 - WASTE STREAM 1								
QA/QC	F/EQ Blank	X	X	X	X	X	X	X
LR-1	INF-1	X	X	X	X	X	X	X
QA/QC	DUP-1	X	X			X	X	X
QA/QC	CF Baseline	X	X	X	X	X	X	X
LR-1	CF-2	X	X	X	X	X	X	X
QA/QC	DUP-2	X	X			X	X	X
QA/QC	RO Baseline	X	X	X	X	X	X	X
LR-1	RO-1	X	X	X	X	X	X	X
LR-1	RO-Reject	X	X			X	X	X
	Sample IDs	1633A	TOP Assay	TF	AOF	Inorganics	Metals	Coliforms
TEST RUN 2 - WASTE STREAM 2								
LR-2	INF-1	X	X			X	X	X
LR-2	CF-2	X	X			X	X	X
LR-2	RO-1	X	X			X	X	X
LR-2	RO-Reject	X	X			X	X	X

Method 1633A 40 Common PFAS Isomers - Non-potable liquids and solids (e.g., leachate, biosolids, and carbon)

TF Total Fluorine - Analyses measures all fluorine, organic and inorganic, compounds contained in a sample

SOURCE: CIP SOLUTIONS 2026

AOF Adsorbable Organic Fluorine - A subset of TOF focused on organic fluorine compounds that adsorb onto activated carbon

TOP Assay A screening test designed to detect PFA precursors unlikely to be detected by other PFAS analysis

VALHALLA CHC-EO PILOT TEST PHOTOS



VALHALLA AWT - CHC-EO PILOT TEST PROGRAMS

PILOT TEST PROGRAM & EQUIPMENT

- Pretreatment – if necessary
- Valhalla CHC & EO treatment (2 to 5 cycles)
- Filtration – combination of nano-ceramic & GAC media
- Backwash (RO Polishing)
- Replicate the process

OVERVIEW OF MONITORING & SAMPLING PROGRAM

- Field parameters monitored throughout treatment process at each treatment stage and/or batch/cycle
- Samples collected and analyzed for key inorganic parameters
- Samples collected and analyzed for key metal parameters
- Samples collected and analyzed for PFAS parameters – targeted/non-targeted

LEACHATE ANALYTICAL DATA TABLE

Key Indicators	Units	Landfill Leachate #1				Landfill Leachate #2				Landfill Leachate #3 ★				Landfill Leachate #4 ★			
		Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change
pH	su	7.2	7	-0.2	-3%	7.3	6.9	-0.4	-5%	7.48	5.88	-1.6	-21%	6.74	6.27	-0.47	-7%
Spec Conductivity	ms/cm	7.69	0.153	-7.537	-98%	5.884	0.311	-5.573	-95%	31.18	0.18	-31	-99%	30.25	0.69	-29.56	-98%
TDS-Total Dissolved Solids	mg/L	6,304	98	-6,206	-98%	4,647	205	-4,442	-96%	29,560	111.8	-29,448	-100%	21,900	260	-21,640	-99%
TSS-Total Suspended Solids	mg/L	104	48	-56	-54%	22	1	-21	-95%	670	<5	-668	-100%	2,940	<5	-2,938	-100%
Turbidity	NTUs	54	0.3	-53.7	-99%	63	0.16	-62.84	-100%	>1,000	1.34	>998	-100%	>1,000	1.9	>998	-100%
ORP - Redox Potential	millivolts	73	211	138	aerobic	86	209	123	aerobic	-131	103	234	aerobic	-225	93	318	aerobic
DO-Dissolved Oxygen	ppm	7.23	3.02	-4.21	-58%	2.25	1.93	-0.32	-14%	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -
TOC - Total Organic Carbon	mg/L	310	1.1	-308.9	-100%	230	<0.5	-230	-100%	7,040	10.4	-7,030	-100%	8,300	31.6	-8,268	-100%
COD-Chemical Oxygen Demand	mg/L	1,000	<20	-990	-99%	780	<20	-760	-100%	19,300	34.8	-19,265	-100%	23,300	95.8	-23,204	-100%
TP - Total Phosphorus	mg/L	< 45	<0.3	-22.35	-99%	< 23	<0.8	-11.1	-97%	3.4	0.4	-3	-88%	35	0.18	-34.82	-99%
TN - Total Nitrogen	mg/L	484	8.1	-475.9	-98%	354	17.4	-336.6	-95%	1,990	8.6	-1,981	-100%	1,800	36	-1,764	-98%
NH3-N - Ammonia	mg/L	370	6.7	-363.3	-98%	360	14	-346	-96%	1,790	10	-1780	-99%	1,800	36	-1,764	-98%

##% - Bold > 90% parameter reduction achieved

##% Bold > 95% parameter reduction achieved

##% - Bold > 98% parameter reduction achieved

★ Effluent achieved Primary/ Secondary DWSs

LEACHATE - PFAS DATA TABLE

PFAS Results	Units	DWS MCLs	LEACHATE - PT Run 1						LEACHATE - PT Run 2			
			LR1-INF-1	LR1-DUP-1	LR1-CF-2	LR1-DUP-2	LR1-RO-1	LR1-RO-Reject	LR2-INF-1	LR2-CF-2	LR2-RO-1	LR2-RO-Rej
PFAS - TARGETED ANALYSES			Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
PFOA	ng/L	4	370	360	6.63	7.44	<0.537	14.5	183	9.7	<1.38	11
PFNA	ng/L	10	17.1	16.4	<0.537	<0.550	<0.555	0.986	5.47	<1.51	<1.38	<1.50
PFBS	ng/L		95.7	106	2.15	2.2	<0.492	4.99	68.8	2.93	<1.38	3.64
PFHxS	ng/L	10	165	164	3	3.23	<0.481	6.52	75.5	4.38	<1.38	5.01
PFOS	ng/L	4	109	107	2.61	2.83	<0.571	4.56	27.6	3.39	<1.38	4.01
HFPO-DA (GenX)	ng/L	10	<1.65	<1.66	<1.60	<1.64	<1.65	<1.54	<6.55	<6.04	<5.54	<5.99
Total 1633 A PFAS Mass	ng/L		756.8	753.4	14.4	15.7	0.0	31.6	360.4	20.4	0.0	23.7
% PFAS Mass Reduction				0.4%	98.1%	97.9%	>99%	95.8%		94.3%	>99%	93.4%
Total 1633 A PFAS # of Isomers	#		21	21	8	8	1	14	18	9	1	10
%# Isomer Reduction				0.0%	61.9%	61.9%	95.2%	33.3%		50.0%	94.4%	44.4%
PFAS - NONTARGETED ANALYSES												
TF - Total Flourine	mg/L		<4.0	NS	<4.0	NS	<4.0	NS	NS	NS	NS	NS
AOF - Adsorbable Organic Fluorine	ug/L		9.7	NS	8.4	NS	<3.4	NS	NS	NS	NS	NS
TOP Assay Diff (PFAS Precursors)	ng/L		238J	277J	5.35J	3.65J	ND	6.6J	120.3J	4.71J	ND	7.83J
% Precursor Mass Reduction				-16.4%	97.8%	98.5%	>99%	97.2%		96.1%	>99%	93.5%

##-Bold – Parameter Detected above MCL

##-Bold – Parameter Detected





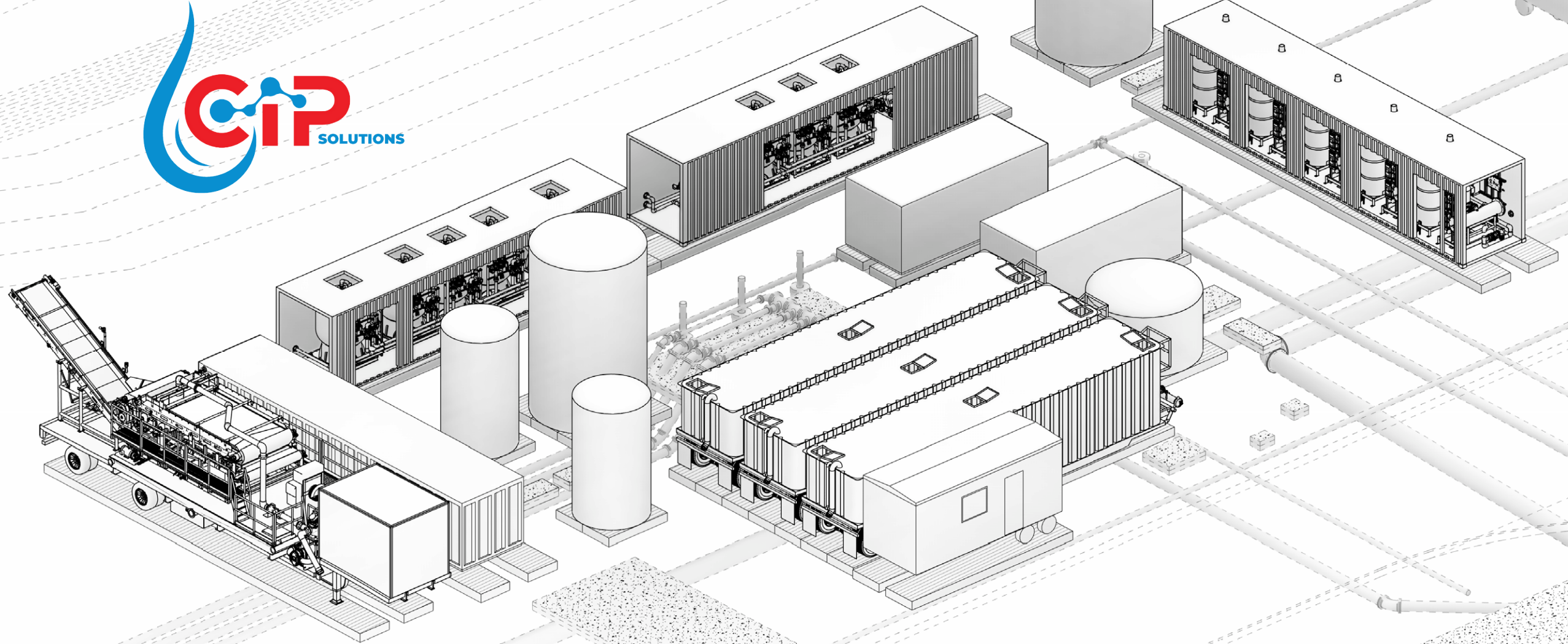
PROJECT VIKING VALHALLA CHC EO AWT IMPLEMENTATION

AERIAL PHOTO OF PROJECT SITE

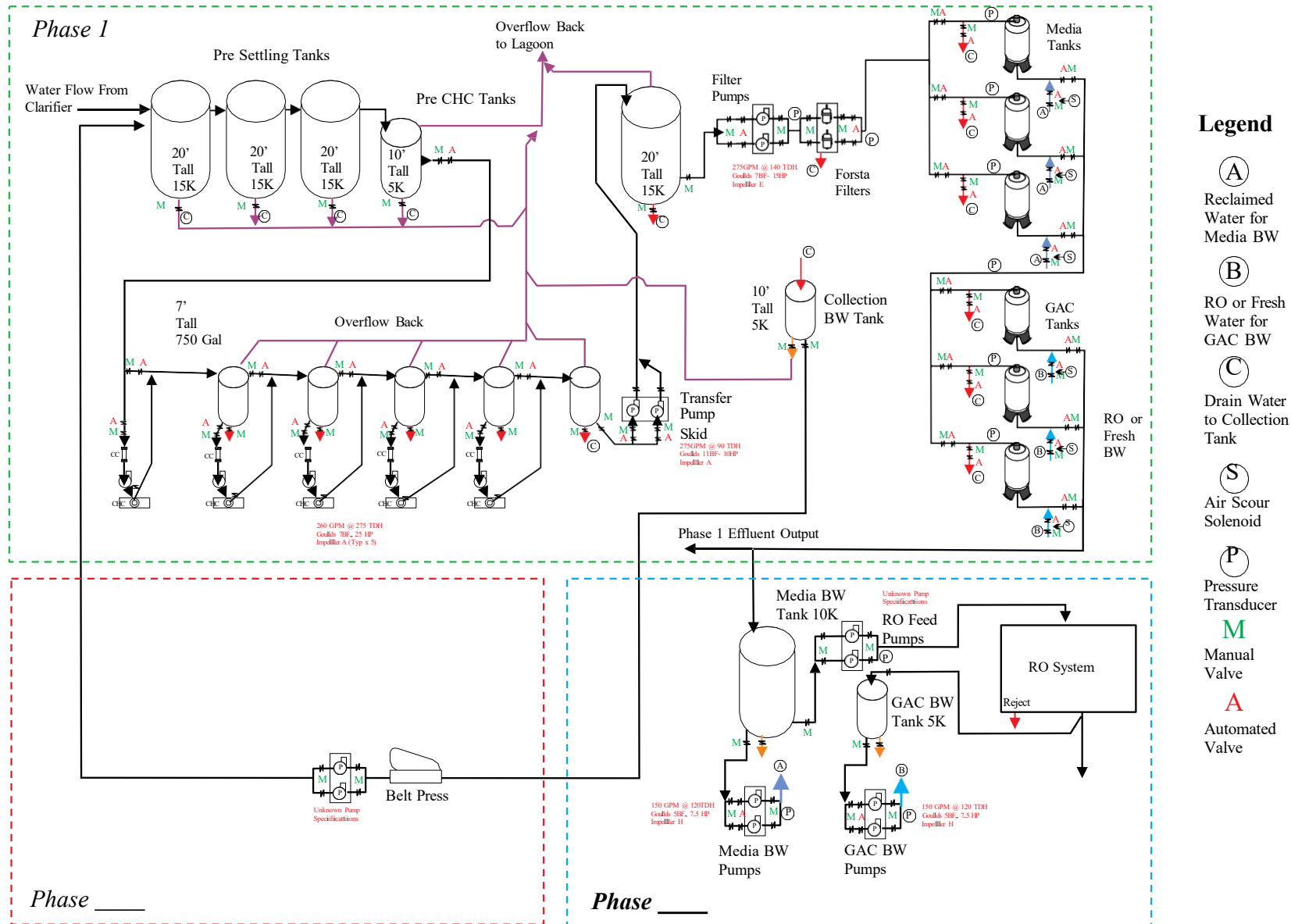
Project Viking - Phase 1: 0.3 MGD on ~0.26 acres



PROJECT VIKING SITE PLAN



CONCEPTUAL VALHALLA CHC-EO TREATMENT SYSTEM

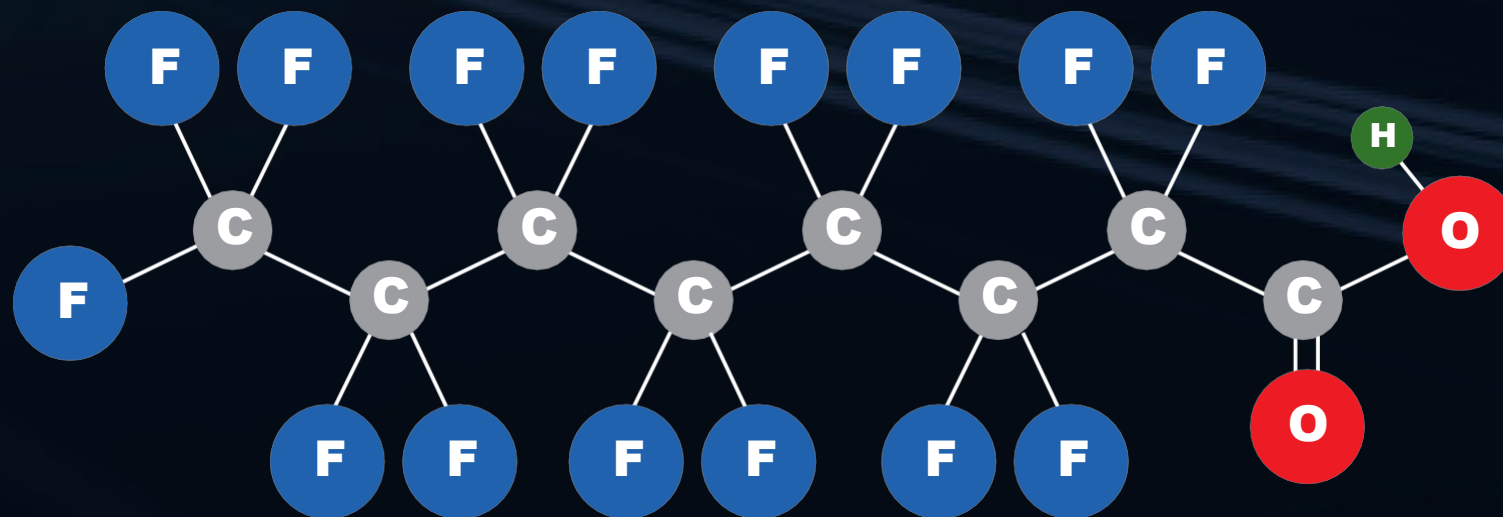


WHAT IS PFAS? - *Forever Chemicals*

Long-chain fluorinated compounds engineered to resist breakdown.

PFAS chemistry is persistent by design -the same stability that made it useful creates long-term water, disposal, and liability problems.

CIP's proprietary Valhalla Technology can break the carbon-fluorine bonds that make PFAS a "forever chemistry" into smaller chains that can be destroyed or removed. The process combines Controlled Hydrodynamic Cavitation (CHC) with EO (Electro Oxidation) to generate Hydroxyl Radicals — one of the most aggressive oxidizers used in advanced water treatment. The system also utilizes existing solids and minerals within the water to promote aragonite crystal formation, helping gather and condition PFAS chains for enhanced destruction and collection.



REPEATED CHC-EO CYCLES BREAKS BONDS, DEFLUORINATES, & REMINERALIZES CONTAMINANTS

ENVIRONMENTAL COMPLIANCE, PFAS REDUCTION & CLOSED-LOOP MANAGEMENT

Environmental Compliance, PFAS Reduction & Closed-Loop Management

- Advanced Valhalla treatment process designed to support compliance-driven treatment objectives for landfill leachate and associated high-strength waste streams
- PFAS reduction capabilities targeting up to 96% removal efficiency based on pilot and treatment pathway evaluations
- Closed-loop PFAS media handling program with full chain-of-custody documentation and approved transportation/disposal workflows
- CIP Solutions responsible for management, coordination, transport, and compliant disposition of spent PFAS-bearing media through authorized vendors and approved facilities
- Comprehensive operational monitoring, sampling, and reporting framework aligned with FDEP coordination and permit modification pathways
- Treated water routed back into the County reuse infrastructure (“purple pipe”) supporting long-term reclaimed water value creation, once Permit is modified project-specific” goal.
- Modular system architecture allows future technology upgrades and evolving PFAS management approaches without major infrastructure replacement



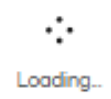
LESSONS LEARNED - VALHALLA CHC-EO AWT SYSTEM

THINGS TO WATCH	PILOT TEST	SYSTEM DESIGN	BRIEF DESCRIPTION
TESTING CONSIDERATIONS			
Operational Logistics	X	X	Safety, site layout, waste management, onsite support
High Sediment Content	X	X	Upfront coarse screening/pretreatment
	X	X	Equipment/System protection – especially CHC
pH	X	X	Optimized treatment performance – ~4.5–7.5 SU
Flow Rate	X	X	Filtration contact/polishing time
Filter Media -Backwash	X	X	Captures residual solids; important system safety factor
Operational Logistics	X		Availability of clean water for backwashing purposes
PFAS Concentrations	X	X	Sampling protocols; treatment enhancements
OPERATIONAL FLEXIBILITY			
Influent Flow Rate		X	Operational/seasonal quantity variability
Inline Sensors/Monitors		X	Operational performance data - real time adjustments
Unit Redundancy		X	Better suited for quality/quantity variability
Unit(s) - Additional Options		X	PFAS - Oxidant injection/Foam fractionation options
Media Backwash		X	Residual solids should pass TCLP/profile requirements

WHY PROJECT VIKING & VALHALLA CHC-EO AWT MATTER

- ✓ **Creates a replicable Florida landfill-leachate treatment system model**
- ✓ **Supports future PFAS regulatory pathways**
- ✓ **Provides scalable infrastructure approach for future growth**
- ✓ **Converts impaired water into reclaimed/reuse supply**
- ✓ **Restores WWTP treatment capacity without major capital expansion**







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DO-Dissolved Oxygen	ppm	7.23	3.02	-4.21	-58%	2.25	1.93	-0.32	-14%	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -
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##% - Bold > 98% parameter reduction achieved

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INDUSTRIAL WASTEWATER ANALYTICAL DATA TABLE

Key Indicators	Units	Industrial WW #1				Industrial WW #2				Industrial WW #3				Industrial WW #4			
		Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change	Influent	Effluent	Change(+/-)	% Change
pH	su	5.2	6.6	1.4	27%	<3	>6	~3.5	120%	<3	<5	1.7	106%	<3	<4	0.9	56%
Spec Conductivity	ms/cm	6.762	0.122	-6.6	-98%	34.3	0.016	-34.284	-100%	38.27	0.016	-38.254	-100%	36.01	3.45	-32.56	-90%
TDS-Total Dissolved Solids	mg/L	5,800	<10	-5,795	-100%	48,000	930	-47,070	-98%	61,000	480	-60,520	-99%	57,000	2,800	-54,200	-95%
TSS-Total Suspended Solids	mg/L	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -	- NA -
Turbidity	NTUs	19	0.5	-18.5	-97%	14.1	0.5	-13.6	-96%	2.13	1.4	-0.73	-34%	2.07	0.25	-1.82	-88%
ORP - Redox Potential	millivolts	-138	255	393.0	aerobic	263	274	11	aerobic	408	81	-327	drop/anoxic	264	230	-34	drop/anoxic
DO-Dissolved Oxygen	ppm	3.1	3.84	0.7	24%	7.5	5.5	-2	-27%	3	5.9	2.9	97%	5.8	4.6	-1.2	-21%
TOC - Total Organic Carbon	mg/L	34	1.3	-32.7	-96%	140	42	-98	-70%	150	14	-136	-91%	110	4.3	-105.7	-96%
COD-Chemical Oxygen Demand	mg/L	230	<200	-130.0	-57%	280	100	-180	-64%	1,700	82	-1,618	-95%	1,300	230	-1070	-82%
TP - Total Phosphorus	mg/L	398	8.4	-389.6	-98%	15,400	<0.76	-15,400	-100%	6,610	176	-6,434	-97%	6,530	807	-5,723	-88%
TN - Total Nitrogen	mg/L	343	<0.25	-342.9	-100%	4,880	20.1	-4,860	-100%	1,530	220	-1,310	-86%	1,580	316	-1,264	-80%
NH3-N - Ammonia	mg/L	170	0.46	-169.5	-100%	730	15	-715	-98%	1,600	60	-1,540	-96%	1,500	200	-1,300	-87%

##% - Bold > 90% parameter reduction achieved

##% - Bold > 95% parameter reduction achieved

##% - Bold > 98% parameter reduction achieved

★ Effluent achieved Primary/ Secondary DWSs

BIOSOLID EFFLUENT ANALYTICAL DATA TABLE

Key Indicators	Units	Biosolids Effluent #1				Biosolids Effluent #2			
		Influent	Effluent	Change (+/-)	% Change	Influent	Effluent	Change (+/-)	% Change
pH	su	7.2	6.3	-0.9	-13%	7.2	6.3	-0.9	-13%
Spec Conductivity	ms/cm	2.117	0.088	-2.0	-96%	2.125	0.087	-2.038	-96%
TDS-Total Dissolved Solids	mg/L	1,300	30	-1,270	-98%	1,200	<10	-1,195	-100%
TSS-Total Suspended Solids	mg/L	124	<1	-123.5	-100%	60	<1	-59.5	-99%
Turbidity	NTUs	134	0.015	-134.0	-100%	67	0.14	-66.86	-100%
ORP - Redox Potential	millivolts	73	318	245.0	aerobic	70	130	60	aerobic
DO-Dissolved Oxygen	ppm	3.54	4.55	1.01	29%	4.55	3.99	-0.56	-12%
TOC - Total Organic Carbon	mg/L	45	0.57	-44.4	-99%	40	<0.5	-39.75	-99%
COD-Chemical Oxygen Demand	mg/L	300	<20	-290	-97%	260	<20	-250	-96%
TP - Total Phosphorus	mg/L	7.4	<0.15	-7.3	-99%	5.9	0.46	-5.44	-92%
TN - Total Nitrogen	mg/L	63.4	4.2	-59.2	-93%	27.9	3.6	-24.3	-87%
NH3-N - Ammonia	mg/L	25	3.4	-21.6	-86%	31	3.3	-27.7	-89%

##% - Bold > 90% parameter reduction achieved

##% - Bold > 95% parameter reduction achieved

##% - Bold > 98% parameter reduction achieved

★ Effluent achieved Primary/ Secondary DWSs

LEACHATE PFAS DATA TABLE

PFAS Results	Units	DWS MCLs	LEACHATE - PT Run 1						LEACHATE - PT Run 2			
			LR1-INF-1	LR1-DUP-1	LR1-CF-2	LR1-DUP-2	LR1-RO-1	LR1-RO-Reject	LR2-INF-1	LR2-CF-2	LR2-RO-1	LR2-RO-Rej
PFAS - TARGETED ANALYSES			Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
PFOA	ng/L	4	370	360	6.63	7.44	<0.537	14.5	183	9.7	<1.38	11
PFNA	ng/L	10	17.1	16.4	<0.537	<0.550	<0.555	0.986	5.47	<1.51	<1.38	<1.50
PFBS	ng/L		95.7	106	2.15	2.2	<0.492	4.99	68.8	2.93	<1.38	3.64
PFHxS	ng/L	10	165	164	3	3.23	<0.481	6.52	75.5	4.38	<1.38	5.01
PFOS	ng/L	4	109	107	2.61	2.83	<0.571	4.56	27.6	3.39	<1.38	4.01
HFPO-DA (GenX)	ng/L	10	<1.65	<1.66	<1.60	<1.64	<1.65	<1.54	<6.55	<6.04	<5.54	<5.99
Total 1633 A PFAS Mass	ng/L		756.8	753.4	14.4	15.7	0.0	31.6	360.4	20.4	0.0	23.7
% PFAS Mass Reduction				0.4%	98.1%	97.9%	>99%	95.8%		94.3%	>99%	93.4%
Total 1633 A PFAS # of Isomers	#		21	21	8	8	1	14	18	9	1	10
%# Isomer Reduction				0.0%	61.9%	61.9%	95.2%	33.3%		50.0%	94.4%	44.4%
PFAS - NONTARGETED ANALYSES												
TF - Total Flourine	mg/L		<4.0	NS	<4.0	NS	<4.0	NS	NS	NS	NS	NS
AOF - Adsorbable Organic Fluorine	ug/L		9.7	NS	8.4	NS	<3.4	NS	NS	NS	NS	NS
TOP Assay Diff (PFAS Precursors)	ng/L		238J	277J	5.35J	3.65J	ND	6.6J	120.3J	4.71J	ND	7.83J
% Precursor Mass Reduction				-16.4%	97.8%	98.5%	>99%	97.2%		96.1%	>99%	93.5%

##-Bold – Parameter Detected above MCL

##-Bold – Parameter Detected

BSD EFFLUENT ANALYTICAL DATA TABLE

PFAS Results	Units	DWS MCLs	BSD Effluent - PT Run 1						BSD Effluentwnt - PT Run 2			
			BR1-INF-1	BR1-DUP-1	BR1-CF-2	BR1-DUP-2	BR1-RO-1	BR1-RO-Reject	BR2-INF-1	BR2-CF-2	BR2-RO-1	BR2-RO-Reject
PFAS - TARGETED ANALYSES			Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
PFOA	ng/L	4	17.9	18.5	<1.56	<1.60	<1.49	9.48	16.7	<1.64	<1.62	<1.56
PFNA	ng/L	10	<1.66	<1.64	<1.56	<1.60	<1.49	<1.58	<1.57	<1.64	<1.62	<1.56
PFBS	ng/L		7.53	7.72	<1.56	<1.60	<1.49	3.32	7.26	<1.64	<1.62	<1.56
PFHxS	ng/L	10	6.41	7.46	<1.56	<1.60	<1.49	3.89	5.07	<1.64	<1.62	<1.56
PFOS	ng/L	4	8.17	8.84	<1.56	<1.60	<1.49	3.06	7.2	<1.64	<1.62	<1.56
HFPO-DA (GenX)	ng/L	10	<6.63	<6.55	<6.26	<6.39	<5.97	<6.33	<6.27	<6.57	<6.48	<6.24
Total 1633 A PFAS Mass	ng/L		40.0	42.5	BDL	BDL	BDL	19.8	36.2	BDL	BDL	0.0
% PFAS Mass Reduction				-17.4%	>99%	>99%	>99%	45.5%		>99%	>99%	100.0%
Total 1633 A PFAS # of Isomers	#		12	12	BDL	BDL	BDL	9	10	BDL	BDL	1
%# Isomer Reduction				0%	>99%	>99%	>99%	25%		>99%	>99%	90.0%
PFAS - NONTARGETED ANALAYSES												
TF - Total Flourine	mg/L		<4.0	NS	<4.0	NS	<4.0	NS	NS	NS	NS	NS
AOF - Adsorbable Organic Fluorine	ug/L		23	NS	16	NS	<3.5	NS	NS	NS	NS	NS
TOP Assay Diff (PFAS Precusors)	ng/L		148.72J	132.82J	ND	ND	ND	45.12J	86.7J	7.92J	ND	3.58J
% Precursor Mass Reduction				10.7%	>99%	>99%	>99%	69.7%		90.9%	>99%	95.9%

##-Bold – Parameter Detected above MCL

##-Bold – Parameter Detected