

New Trash Incinerators in Palm Beach County are Expensive Major Air Polluters

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Palm Beach Renewable Energy Facility 2 (REF 2) Trash Incinerator in West Palm Beach, Florida. Drawing by Linda Smithe.

Commissioned by Sierra Club Loxahatchee Group

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INTRODUCTION

Palm Beach County is home to the nation's largest waste burning complex, owned by the county's Solid Waste Authority. There are two trash incinerators with a combined capacity to burn 5,000 tons of waste per day.

The first incinerator came online in 1989 and has two burners, each with the capacity to burn 1,000 tons of waste per day. That facility burns refuse-derived fuel (RDF), which is trash that undergoes minimal processing to remove metals and small debris that doesn't burn well like rocks and broken glass before burning. Its three trash processing lines can handle up to a total of 2,650 tons per day processing this trash down to the RDF that is fed to the burners while metals go to recycling and other debris goes to the on-site landfill. Formerly known as the North County Resource Recovery Facility, the facility is now known as Palm Beach Renewable Energy Facility 1 (REF 1).

The second incinerator is "mass burn," meaning that it burns waste without processing it first. Built adjacent to REF 1, it came online in 2015 and has the capacity to burn 3,000 tons of waste per day with its three burners. The plant is considered to be the only new trash incinerator built in the U.S. since 1995, though a handful of existing incinerators have been expanded or rebuilt since that time. It is the only trash incinerator built under stricter standards that require modern pollution controls for nitrogen oxides (NOx), the pollutant known for creating ground-level ozone, or smog, triggering asthma attacks. This newer incinerator is known as Palm Beach Renewable Energy Facility 2 (REF 2).

Both incinerators are owned by the county, and are now operated by Reworld (formerly Covanta), the largest trash incineration corporation in the U.S.

The REF 2 incinerator has been held up as a model around the U.S. by consultants and counties claiming that incineration can be modern and clean. In fact, while Miami-Dade County was still trying to build a new 4,000 ton per day (tpd) incinerator throughout 2024, the county set up a webpage that boasted that "[t]he Renewable Energy Facility in West Palm Beach is a \$672,000,000, state-of-the-art waste-to-energy facility – the most advanced, efficient, cleanest and greenest waste-to-energy power plant in the world."¹

Emissions data reported by the REF 2 incinerator shows that it is far from clean or green and is among the largest industrial air polluters in the county, even though its emissions are generally lower than the older REF 1 incinerator.

In 2024, Palm Beach County Solid Waste Authority (SWA) revealed plans to build a \$1.5 Billion new incinerator to replace REF 1. This new incinerator would be located either at the same site, or immediately to the north or south of the two existing incinerators. In the following map from an October 23, 2024 SWA presentation, REF 2 sits just north of the area outlined in blue (REF 1) and south of the green "northern option" area. As of this writing, the SWA seems to favor the "northern option" site for the REF 1 replacement.

¹ Miami-Dade County, "The Future of Solid Waste in Miami-Dade." See section under "Waste-to-energy around the world." <u>https://www.miamidade.gov/global/solidwaste/sustainable-solid-waste/wte-home.page</u>



[Source: Solid Waste Authority of Palm Beach County workshop, October 23, 2024.]

This report examines the actual reported emissions from the Palm Beach Renewable Energy Facility 2 incinerator, models what a new incinerator would emit based on the emission rates of REF 2 combined with newer regulatory requirements, and compares how such a new incinerator would rank next to existing industrial air polluters in Palm Beach County.

Since it is unclear whether the county aims to build at the 3,000 tpd capacity or a 4,000 tpd size as Miami-Dade County was seeking, this report looks at both possibilities.

Both Broward and Miami-Dade Counties have been pursuing building new incinerators. Miami-Dade County's incinerator burned down in a three-week long fire in February 2023. Broward County has a privately owned old trash incinerator known as Wheelabrator South Broward still operating between Fort Lauderdale, Davie, and Hollywood. Political resistance to the building of new incinerators in both Broward and Miami-Dade Counties has led to increasing discussion of "regional collaboration" on waste management between Broward, Miami-Dade, Collier, and Palm Beach Counties.^{2,3} There is concern that this collaboration could mean Miami-Dade or Broward Counties sending their waste to be burned at the incineration complex Palm Beach County is working to expand.

² The scope of work for the consultant developing a Solid Waste Master Plan for Broward County includes this language on page 32:

"Provide recommendations for maintaining and optimizing existing infrastructure, expanding operations to support a countywide System, and examine potential collaboration with neighboring counties (e.g., Miami-Dade County, Palm Beach County, Collier County)." See "Agreement Between the Solid Waste Disposal and Recyclable Materials Processing Authority of Broward County, Florida and SCS Engineers for Consultant Services for the Preparation of a Regional Solid Waste and Recycling Master Plan," May 2024.

https://browardleague.org/wp-content/uploads/2024/05/48F050803-SCS-Engineers-Master-Plan-Consultant-Agreement-v3-1.pdf ³ Miami-Dade County Board of Commissioners approved Resolution #250227 on February 19, 2025 calling for regional cooperation with Broward and Palm Beach Counties on waste management matters. See

https://www.miamidade.gov/govaction/matter.asp?matter=250227&file=true&fileAnalysis=false&yearFolder=Y2025 and https://www.miamidade.gov/govaction/legistarfiles/Matters/Y2025/250227.pdf

This study finds that a new 3,000 or 4,000 ton/day trash incinerator in Palm Beach County would be one of the largest industrial air polluters in the county. In fact, it would be among the county's top five industrial air emitters of ammonia, cadmium, dioxins/furans, hydrochloric acid, mercury, nitrogen oxides, and sulfur dioxide and greenhouse gases.

The new incineration complex – the new incinerator replacing REF 1, combined with the REF 2 incinerator which would remain open – **would rank #1 in the county for air releases of cadmium, dioxins/furans, hydrochloric acid, mercury, nitrogen oxides, and sulfur dioxide**, and would rank #3 in ammonia, #4 in greenhouse gases, #5 or 6 in particulate matter (depending on the size of the new incinerator), and #6 in carbon monoxide. For 5 of the 11 pollutants examined, the new incineration complex would be responsible for over half of the industrial air emissions in Palm Beach County.

	<u>New incinerator</u> 's rank among Palm Beach County industrial air polluters and % share of total				Rank a combine bas	nd % share ed (REF 2 plu ed on size of	of <u>both i</u> Is REF 1 r f new inc	ncinerators eplacement) inerator
Pollutant	3,000 tons/day		4,000 tons/day		3,000 tons/day (total 6,000 tpd)		4,000 tons/day (total 7,000 tpd)	
Ammonia	3	7%	3	9%	3	13%	3	14%
Cadmium	1	51%	1	58%	1	84%	1	86%
Carbon monoxide	12	1%	10	1%	6	2%	6	3%
Dioxins/furans	1	100% *	1	100% *	1	100% *	1	100% *
Hydrochloric acid	2	33%	1	39%	1	74%	1	77%
Lead	9	1%	8	2%	8	2%	8	3%
Mercury	3	26%	1	32%	1	55%	1	58%
Nitrogen Oxides	5	9%	4	12%	1	18%	1	21%
Particulate Matter	7	1%	7	2%	6	4%	5	4%
Sulfur Dioxide	2	23%	2	28%	1	54%	1	57%
Greenhouse Gases	5	6%	4	8%	4	12%	4	14%

Summary of Rankings

* There are no reported source of dioxins/furans in the county via EPA's Toxics Release Inventory, so it would be 100% simply based on the lack of data. However, it's likely that one other significant source of dioxin emissions would be New Hope Power Company, which is burning sugar cane fiber (bagasse).

The above data is based on a new incinerator emitting these pollutants at the same rate as Palm Beach Renewable Energy Facility 2 except for two pollutants where pending new federal regulations would require meeting a stricter standard. This analysis assumes that emissions from these two pollutants, carbon monoxide and sulfur dioxide, are to be further reduced by 40% as needed to meet new federal regulations for Large Municipal Waste Combustors, as proposed by the U.S. Environmental Protection Agency (EPA) in 2024 – which are due to be finalized in December 2025 and in effect by around 2029.

This analysis is based solely on air emissions data reported from the incinerators themselves to the Florida Department of Environmental Protection, as well as emissions data from the U.S. Environmental Protection Agency's National Emissions Inventory, Greenhouse Gas Reporting Program, and Toxics Release Inventory databases, and the U.S. Energy Information Administration.

BACKGROUND

Municipal solid waste (MSW) is the term for household and commercial trash. The older incinerator, Palm Beach Renewable Energy Facility 1, burns refuse-derived fuel (RDF), which is MSW that undergoes minimal processing to remove metal and glass before burning. Most trash incinerators burn MSW with no processing and are called "mass burn" facilities. The RDF vs. mass burn distinction is significant because RDF incinerators are held to weaker emissions standards for carbon monoxide and nitrogen oxides.

The newer incinerator in West Palm Beach (Palm Beach Renewable Energy Facility 2) is the only one in the U.S. that operates under more protective modern standards for nitrogen oxides (NOx), a pollutant that contributes to ground-level ozone (smog) and triggers asthma attacks. It is the only incinerator in the nation using selective catalytic reduction (SCR) technology for reduction of nitrogen oxides. Any new incinerator would also have to use SCR.

Incinerator Name	Owner	Operator	Opened	Closed	Fuel*	Capacity (tons/day)
Palm Beach Renewable Energy Facility 1	Palm Beach County	Reworld (Covanta)	1989	Projected 2034-35	RDF	2,000
Palm Beach Renewable Energy Facility 2	Palm Beach County	Reworld (Covanta)	2015	Projected 2060	MSW	3,000
Proposed New Trash Incinerator	Palm Beach County	TBD	Projected 2034	Projected 2079	MSW	3,000 to 4,000

* RDF = Refuse Derived Fuel (pulled out the metals and glass, then pelletizing or shredding waste before burning);
MSW = municipal solid waste (burning waste without processing, also called "mass burn")

How are incinerator air emissions regulated?

There are many misconceptions about air pollution regulation. Smokestack industries paint a certain narrative. They claim that they use continuous emissions monitors to measure their pollution and that the state regulatory agencies get this data. They claim that the state regulatory agencies subject them to strict standards and would fine them heavily if they exceed a permit limit. They also claim that they are continually well within their permit limits and that staying within permit limits means that they're safe and clean and do not cause any harm to public health or the environment.

The reality is quite a different story, however.

In order to have a protective air pollution regulatory system, the following are needed:

- Strong, protective standards
- Continuous emissions monitoring
- Aggressive enforcement

In the U.S., all three links in this chain are broken, making the industry narrative misleading.

Incinerators are not always within permit limits. Violations in the industry are not unusual. Some incinerators are known to include a check with their quarterly reports to the state environmental agency when they submit their continuous emissions monitoring data, acknowledging and paying for the violations they've had in that quarter. It is the cost of doing business.

Enforcement is lax and fines are not sufficient to change behavior. State enforcement agencies are notoriously lax and understaffed. When notices of violation are issued, they're often accompanied by zero fines, or fine amounts are allowed to be negotiated down. Imagine being stopped for speeding and telling the officer that you think you should pay \$30, not \$150 for a ticket. This actually happens when incinerators and other industrial facilities are issued proposed fines for violations, and agencies allow fines to be negotiated down.

Fines are rarely significant enough to change profitable behaviors, no matter how harmful they might be. Even "large" fines can amount to just a few days of tipping fee revenue (the amounts paid to the incinerator to dispose of waste by the ton, which is an incinerator's main source of revenue). Fines are insufficient to cause an incinerator owner to invest in needed boiler upgrades or more protective emissions controls, which are more costly than habitually paying fines. Some states even limit the amount of fines under old laws that ensure that fines are just an annoyance to be budgeted for – a "cost of doing business," rather than a deterrent.⁴

Emissions limits are not strict. State environmental agencies issue air permits with emissions limits for about a dozen select pollutants (not all pollutants). State and local governments are empowered by the federal Clean Air Act to adopt more protective standards than the federal minimums.⁵ This rarely happens, though, as state agencies and permit limits are typically set to the minimum standards in federal regulations. The federal regulations for large municipal waste combustors⁶ were last adopted in 2006 and are required by federal law to be updated every five years. However, EPA had to be sued in federal court to enforce this requirement, and finally proposed a new rule in January 2024. That rule was to be finalized by December 2024, but that deadline was extended to December 2025 with the reopening of a comment period. It is unclear whether the rule will be finalized and implemented under the Trump administration. When EPA first proposed these overdue new regulations, during a presentation in early 2023, the agency suggested low, medium, and high levels of emissions reductions for nine pollutants. When EPA's draft rule came out, it became clear that EPA chose the weakest of the three options for eight of the nine regulated pollutants, and the middle option for nitrogen oxides.

⁴ For example, in October 2020, the Covanta Plymouth Renewable Energy trash incinerator in Montgomery County, Pennsylvania was fined \$218,393 for violations relating to operational problems causing loud noise and burning plastic and electrical fire smells in the community that have been recurring for over three years now. That amount was considered to be a large fine, but amounted to about three days of Covanta's tipping fee revenues, and failed to stop the recurring problems that continue to this day.

⁵ The Clean Air Act, at 42 U.S.C. § 7416, states: "Retention of State authority – Except as otherwise provided in sections 119(c), (e), and (f) (as in effect before the date of the enactment of the Clean Air Act Amendments of 1977), 209, 211(c)(4), and 233 (preempting certain State regulation of moving sources) **nothing in this Act shall preclude or deny the right of any State or political subdivision thereof** to adopt or enforce (1) any standard or limitation respecting emissions of air pollutants or (2) any requirement respecting control or abatement of air pollution; except that if an emission standard or limitation is in effect under an applicable implementation plan or under section 111 or 112, such State or political subdivision may not adopt or enforce any emission standard or limitation which is less stringent than the standard or limitation under such plan or section."

⁶ Large Municipal Waste Combustors are trash incinerators where each burner can burn more than 250 tons/day – a size which pertains to all of the incinerators discussed here. See: <u>https://www.epa.gov/stationary-sources-air-pollution/large-municipal-waste-combustors-lmwc-new-source-performance</u>

Permit limits are not based on health and safety, but are technology-based. Permitted emission limits set by state environmental agencies are not based on health and safety. Arguments that complying with permit limits equates to "no harm to health and the environment" are a fallacy. As some state environmental regulators have admitted, permit limits are technology-based standards, and do not ensure that there will be no harm to public health.⁷ Many permit limits also factor in the cost to a facility, allowing companies to choose cheaper control technologies if more protective ones are deemed too expensive.⁸

Bigger plants are permitted to be dirtier because permit limits are concentration-based. Air pollution permits are written in such a way that allowed emissions are in units such as parts *per* million (ppm) or micrograms *per* dry standard cubic meter (μ g/dscm). It's always "per" something, representing the concentration of a pollutant in a certain volume of air. This design means that a 1,000 ton/day trash incinerator would be allowed to emit a certain amount of a pollutant, but a 4,000 ton/day trash incinerator is allowed to emit four times as much.

Two ways to pass a test. Moreover, regulations allow incinerators to comply by showing a certain percentage reduction for certain pollutants such as mercury, sulfur dioxide, and hydrochloric acid as an alternative way to meet a limit. In other words, an incinerator can be violating a concentration-based limit, but if the amount going into the pollution control device is so high that they achieve a certain percentage reduction, then they are still deemed to be in compliance.

For example, the REF2 incinerator has a permit limit for mercury of "50 micrograms per dry standard cubic meter or 15 percent of the potential mercury emission concentration (85-percent reduction by weight)... whichever is less stringent." This means they can comply by measuring (once a year!) a mercury emissions concentration of 49 μ g/dcsm – or they could have 666 μ g/dcsm going into the pollution controls, and only 100 μ g/dcsm coming out, which is an 85% reduction that allows them to emit twice the 50 μ g/dcsm limit.

⁷ 8/28/2007 Pennsylvania Department of Environmental Protection public hearing on BioNol's proposed natural gas-powered ethanol biorefinery in Clearfield, Pennsylvania. <u>youtu.be/HQtYjEJq4wl</u> When questioned about why residents were told that the proposed air pollution permit means that the facility would be healthy and safe for the community, while permit limits were six times different at a same-sized second ethanol biorefinery proposed eight miles away in Curwensville (but powered by waste coal, not natural gas). DEP's engineer stated: "The quick answer is that our evaluation is based on technology standards, not health standards... The underlying concept around the country is technology based. What is says essentially is that as older plants and older sources fall apart and become useless and are replaced, they need to be replaced with things that are cleaner. ...We don't make evaluations of permits based on health standards in a direct fashion. ...For some of the large, very large permits like that one [a waste coal burning power plant], there are direct analysis of health issues. In this case, there is none. Typically, for smaller cases like this one, there isn't any. ...Are we looking at the cumulative impacts [of multiple large pollution sources] ... the answer is 'no.'"

⁸ The federal Clean Air Act has several standards that apply, nearly all of which allow for cost considerations. Sections 108-109 set National Ambient Air Quality Standards (NAAQS) for which states must adopt State Implementation Plans to reduce certain pollutants. In areas considered to be in attainment with NAAQS for criterial air pollutants (nitrogen oxides, sulfur dioxide, carbon monoxide, particulate matter, ozone precursors such as volatile organic compounds, and lead), a facility must meet Reasonably Available Control Technology (RACT) standards, where economic feasibility is a factor, and more expensive technology can be ruled out. In "nonattainment" (unacceptably polluted) areas, the Lowest Achievable Emissions Rate (LAER) standard is applied for that specific pollutant. LAER *does not* consider cost, but allows for a facility to buy offsets (a right to pollute) from polluters in other areas that have closed or reduced their pollution. Section 111 of the Clean Air Act sets New Source Performance Standards for nine pollutants: particulate matter, carbon monoxide, dioxins/furans, sulfur dioxide, nitrogen oxides, hydrogen chloride, lead, mercury, and cadmium. For these, EPA must look at what is maximally achievable to reduce emissions rates, but must also assess the financial implications and must avoid a mandate that would cause "serious economic disruption in the industry." Section 112 of the Clean Air Act sets National Emissions Standards for Hazardous Air Pollutants (NESHAPS), for which cost is not to be considered.

Emissions monitoring is not always honest. There's the possibility that Covanta's emissions data is not honest. Both annual stack tests and continuous emissions monitors have been rigged at trash incinerators, by Covanta and others, but are rarely caught. In Connecticut, Covanta was fined \$20,000 in a civil action filed by the state Attorney General in response to an employee adjusting a continuous emissions monitoring device to alter a reading in order to pass a continuous emissions monitoring audit.⁹ In Tulsa, Oklahoma, Covanta was the target of a criminal investigation by the U.S. Attorney's Office "related to alleged improprieties in the recording and reporting of emissions data" in which Covanta entered into a non-prosecution agreement to follow applicable laws and regulations and pay a \$200,000 "community service payment" to the state environmental agency.¹⁰ At other incinerators, including some run by Covanta, the operator has stockpiled cleaner-burning materials like cardboard to use on its annual stack testing day, to make it seem as if their emissions are cleaner year-round.

There is no safe dose of several chemicals incinerators release. Some chemicals released by incinerators have no safe dose, such as dioxins, ¹¹ lead, ¹² mercury, ¹³ and particulate matter. ¹⁴

Only a few chemicals are monitored continuously (none of the toxic ones), and only about ten others are tested at all (typically once per year). Only three pollutants are monitored on a continuous basis at most trash incinerators: nitrogen oxides (NOx), sulfur dioxide (SO₂), and carbon monoxide (CO). Some larger incinerators will also continuously monitor carbon dioxide (CO₂). Some parameters are also continuously monitored, like temperature, oxygen, and opacity (darkness of emissions). In rare cases, additional pollutants are monitored on a continuous basis, such as the six trash incinerators in Pennsylvania having to continuously monitor their hydrochloric acid emissions. Other pollutants, if monitored at all, are typically tested once per year, and sometimes less frequently. These other pollutants that are typically tested once per year in an annual stack test are ammonia, dioxins/furans, hydrochloric acid, particulate matter, mercury, lead, and cadmium.

In the case of dioxins and furans, the most toxic chemicals known to science, federal regulations allow just one burner to be tested each year, so an incinerator with three burners (like Palm Beach Renewable Energy Facility 2 or Wheelabrator South Broward) test each burner once every three years, rotating which burner they test each year.

To illustrate, if speeding motorists were regulated the way most industrial air polluters are, it would be akin to enforcing a speed limit by allowing drivers to drive all year with no speedometer. Once a year, a speed trap would be set on the highway with signs warning "slow down… speed trap ahead," and the driver's designee would be running the speed trap (companies choose who they pay to conduct the test).

¹⁴ World Health Organization, "Ambient (outdoor) air pollution," May 2, 2018. www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-guality-and-health

⁹ See page 37 for this 1993 incident reported in this 93-page compilation of Covanta's U.S. violations through September 2006: <u>www.energyjustice.net/files/incineration/covanta/violations2006.pdf</u>

 ¹⁰ Covanta Holding Corporation's 2019 10-K Securities and Exchange Commission filing, p. 105. (see "Tulsa Matter" describing the consequences of this 2013 incident) <u>d18rn0p25nwr6d.cloudfront.net/CIK-0000225648/992dfb7f-398d-4b17-8e33-75e956f6f235.pdf</u>
¹¹ "No evidence of dioxin cancer threshold," *Environmental Health Perspectives* 2003 Jul; 111(9): 1145–1147.
www.ncbi.nlm.nih.gov/pmc/articles/PMC1241565/

¹² "Lead in the environment: No safe dose," Harvard University excerpt of *The Lancet* (Sept. 11, 2010). <u>www.hsph.harvard.edu/news/multimedia-article/lead/</u>

¹³ "Mercury Exposure and Children's Health," *Current Problems in Pediatric and Adolescent Health Care*, 2010 September; 40(8): 186–215. <u>www.ncbi.nlm.nih.gov/pmc/articles/PMC3096006/</u>

The technology exists to continuously monitor over 50 pollutants from incinerators,¹⁵ but this is not required by state or federal regulations, so it is rare than an incinerator monitors any of the toxic chemicals on a continuous basis.

Failure to continuously monitor these more dangerous chemicals means that testing is only done during optimal operating conditions, as testing is not allowed to be conducted during startup, shutdown, or malfunction times, when emissions are known to be higher.

Testing emissions just once per year can greatly understate actual emissions. At the nation's largest waste incinerator, Reworld (Covanta) Delaware Valley in the City of Chester, Pennsylvania, continuous emissions monitoring of hydrochloric acid emissions shows that actual emissions are 62% higher than their annual stack tests indicate.

Dioxin and furan emissions are an even more stark example. One study out of Europe documented that using continuous sampling for dioxins at incinerators revealed the actual emissions to be 32-52 times higher than we think they are in the U.S. when requiring incinerators to test each unit just once every one to four years under ideal operating conditions.¹⁶ A more recent study found that failure to use continuous sampling technology is underestimating dioxin emissions by 460 to 1,290 times.¹⁷

In 2023, the Oregon state legislature passed a law (SB 488) requiring the state's only trash incinerator, also a Covanta plant, to continuously monitor nine toxic metals and to continuously sample dioxins/furans and PCBs.¹⁸ After many delays, legal threats, and winning an exemption from the legally required dioxin/furan and PCB monitoring, Covanta announced that they'll be closing their incinerator by December 31, 2024 – just before they'd have to start continuously monitoring for their toxic metal emissions.¹⁹ They continued to violate the law until closing in January 2025. Instead of complying, the company filed a legal challenge to the monitoring law while also getting legislation introduced seeking to repeal the law in the 2025 legislative session in the hopes of continuing to operate the plant and seeking to sell it back to the county.

Covanta lobbied against Oregon's SB 488, and against a similar bill in the Hawaii state legislature in 2024.²⁰ Covanta is the nation's largest waste incineration corporation, and operates 32 of the 62 remaining trash incinerators still operating as of March 1, 2025 (after closing both of their California incinerators in 2024 and their Oregon incinerator in early 2025). The aggressive effort to avoid continuous monitoring at their Oregon incinerator raises questions of whether the company is concerned about what results from continuous monitoring at any single facility would reveal about underestimated emissions across their entire fleet.

¹⁵ "Continuous Emissions Monitors (CEMs)." <u>https://www.ejnet.org/toxics/cems/</u>

¹⁶ De Fré R, Wevers M. "Underestimation in dioxin emission inventories," Organohalogen Compounds, 36: 17–20. www.ejnet.org/toxics/cems/1998 DeFre OrgComp98 Underest Dioxin Em Inv Amesa.pdf

¹⁷ Arkenbout, A, Olie K, Esbensen, KH. "Emission regimes of POPs of a Dutch incinerator: regulated, measured and hidden issues." <u>docs.wixstatic.com/ugd/8b2c54_8842250015574805aeb13a18479226fc.pdf</u>

¹⁸ Oregon SB 488 of 2023. <u>https://olis.oregonlegislature.gov/liz/2023R1/Downloads/MeasureDocument/SB488</u>

¹⁹ Beyond Toxics, "Reworld Waste Incinerator Announces Closure," Oct. 11, 2024. <u>https://www.beyondtoxics.org/wp-content/uploads/2024/10/BeyondToxics_PressRelease_Reworld-announces-closure_10-11-24.pdf</u>

²⁰ Hawai'i SB 2101 SD1 of 2024. <u>https://www.capitol.hawaii.gov/session/measure_indiv.aspx?billtype=SB&billnumber=2101&year=2024</u>

The chart below shows the frequency of testing required by Palm Beach Renewable Energy Facility 2 under their Title V Operating Permit, the air pollution permit granted by Florida DEP. This arrangement is typical for trash incinerators in the U.S.

		Testing frequency	
Chemical	Abbreviation	under state permit	Category
Sulfur dioxide	SO ₂	Continuous	Criteria air pollutant
Nitrogen Oxides	NOx	Continuous	Criteria air pollutant
Carbon Monoxide	СО	Continuous	Criteria air pollutant
	PM / PM10 /		
Particulate Matter *	PM2.5	Annual	Particulate matter
		Optional (must	
	60	monitor CO_2 or	
Carbon dioxide		oxygen continuousiy)	Global warming pollutant
Ammonia	NH ₄	Annual	
		One burner per year	
Dioxins/Eurans	D/F	(each burner once	Highly toxic organobalogons
Dioxinsyl draits		Nover	
Polychionnated biphenyis	PCDS	Never	Highly toxic organonalogens
substances	ΡΕΔ	Never	Highly toxic organobalogens
Polycyclic Aromatic	117(3		
Hydrocarbons	PAHs	Never	
Volatile Organic Compounds	VOC	Annual	
Hydrochloric Acid	HCI	Annual	Acid gas
Hydrofluoric acid	HF	Never	Acid gas
Arsenic	As	Never	Toxic metal
Beryllium	Ве	Never	Toxic metal
Cadmium	Cd	Annual	Toxic metal
Chromium (VI)	Cr (VI)	Never	Toxic metal
Lead	Pb	Annual	Toxic metal
Manganese	Mn	Never	Toxic metal
Mercury	Hg	Annual	Toxic metal
Nickel	Ni	Never	Toxic metal
Selenium	Se	Never	Toxic metal
Zinc	Zn	Never	Toxic metal

Testing Requirements in Title V Operation Permit for Palm Beach Renewable Energy Facility 2 Trash Incinerator

* Opacity (darkness of emissions) is an indirect way of monitoring particulate matter and has to be monitored continuously and in an annual test of visible emissions, but is not a true replacement for actual PM testing.

DIOXIN/FURAN EMISSIONS

Dioxins and furans are the most toxic class of chemicals known to science. They are largely created in combustion systems like waste incinerators and backyard burn barrels. Dioxins and furans are measured in relation to the most toxic variety of dioxin, which is known as 2,3,7,8 Tetrachlorodibenzo-p-dioxin, or 2,3,7,8-TCDD. Dioxins and furans are chemically similar and are often simply just referred to as dioxins, as the rest of this section does.

Dioxins are a known human carcinogen.^{21,22} In addition to causing cancers, exposure to dioxin can also cause severe reproductive and developmental problems at levels 100 times lower than those associated with its cancer-causing effects. Dioxin is well-known for its ability to damage the immune system and interfere with hormonal systems. It is associated with causing birth defects, inability to maintain pregnancy, decreased fertility, reduced sperm counts, endometriosis, diabetes, learning disabilities, immune system suppression, lung problems, skin disorders, lowered testosterone levels and much more.^{23,24}

EPA has documented that 93% of exposure to dioxins comes through consuming meat and dairy products, since dioxins are fat-soluble and readily bioaccumulate in the food chain. EPA describes dioxins as hydrophobic and lipophilic, meaning that they avoid water but cling to fat. The following chart shows where people consuming a typical North American diet get their dioxin exposure.²⁵





²³ Dioxin Homepage. http://www.ejnet.org/dioxin

²¹ See National Toxicology Program, "Report on Carcinogens, Fifteenth Edition -- 2,3,7,8-Tetrachlorodibenzo-p-dioxin," <u>https://ntp.niehs.nih.gov/sites/default/files/ntp/roc/content/profiles/tetrachlorodibenzodioxin.pdf</u>

²² International Agency for Research on Cancer, "Polychlorinated Dibenzo-para-Dioxins and Polychlorinated Dibenzofurans," IARC Monographs on the Evaluation of Carcinogenic Risks to Humans – Volume 69, 1997. https://publications.iarc.fr/87

²⁴ Center for Health, Environment & Justice, "The American People's Dioxin Report," p.11, 1999. <u>https://chej.org/wp-content/uploads/American%20Peoples%20Dioxin%20Report.pdf</u>

²⁵ U.S. Environmental Protection Agency, "Estimating Exposure to Dioxin-Like Compounds, Volume 1: Executive Summary," June 1994, p.36, Figure II-5. "Background TEQ exposures for North America by pathway."

https://oaspub.epa.gov/eims/eimscomm.getfile?p_download_id=438673

Once ingested, men do not have a way of ridding their bodies of dioxin, but women have two ways: if pregnant, dioxin will cross the placenta into the growing fetus, and after childbirth, a nursing infant will be exposed via its mother's breast milk. It is estimated that approximately 10-14% of total lifetime dioxin exposure can occur via nursing.^{26,27}

EPA classifies dioxins as 140,000 times more toxic than mercury for toxicity via oral exposure.²⁸ Health impacts are found at levels so small that emissions are measured in nanograms (ng) and exposures are measured in picograms (pg) as the chart above shows. While dioxins are the most toxic chemicals known to be released from incinerators, they are the least monitored. Typically, only one burner per year has to be tested, so an incinerator with three burners has each burner tested just once every third year, while all other pollutants have to be tested at each burner annually (if not also continuously).²⁹

Truly continuous emissions monitoring technology exists for dioxins but is not commercially available. However, continuous *sampling* technology has been commercially established since at least the late 1990s. Instead of having results immediately available on-site, continuous sampling collects a sample in a cartridge for up to 4-6 weeks, then that cartridge is switched out with a new one and sent to a lab to test for the cumulative amount of dioxins emitted over that span of time. This makes it possible to get the full picture of emissions, capturing data during startup, shutdown and malfunction times when dioxins are known to spike, even though the spikes aren't particularly visible because they're averaged into the sample across several weeks.

The most common continuous sampling method is known as AMESA (Adsorption Method for Sampling of Dioxins and Furans).^{30,31} This and other methods were tested and verified by EPA in 2006.³² Dioxin continuous sampling technology is not used in the U.S., but is used at incinerators in Europe as well as at the only new trash incinerator in Canada, the Durham York Energy Centre in Clarington, Ontario. When that incinerator opened in 2015 (same year as Palm Beach Renewable Energy Facility 2), it failed both of its initial dioxin stack tests, and has continued to experience documented exceedances at times (once with dioxin emissions 13.6 times the permitted limit), though it's hard to know how often there are exceedances because much of the data is not being released.

³¹ Wikipedia, "Adsorption Method for Sampling of Dioxins and Furans,"

²⁶ Patandin, S., Dagnelie, P.C., Mulder, P.G.H., Op de Coul, E., van der Veen, J.E., Weisglas-Kuperus, N., and Sauer, P.J.J. (1999) "Dietary exposure to polychlorinated biphenyls and dioxins from infancy until adulthood: A comparison between breast-feeding, toddler and long-term exposure." Environmental Health Perspectives 107 (1): 45-51. <u>https://pmc.ncbi.nlm.nih.gov/articles/PMC1566290/</u>

²⁷ Schecter, A., Papke O., Lis, A., Ball, M., Ryan, J.J., Olson, J.R., Li, L., and Kessler, H. (1996) "Decrease in milk and blood dioxin levels over two years in a mother nursing twins: Estimates of decreased maternal and increased infant dioxin body burden from nursing." Chemosphere 32 (3): 543-549. <u>https://pubmed.ncbi.nlm.nih.gov/8907231/</u>

 ²⁸ U.S. Environmental Protection Agency, Risk-Screening Environmental Indicators (RSEI) Model. <u>https://www.epa.gov/rsei</u>
²⁹ The alternative performance testing schedule for dioxins/furans (D/F) specified in 40 CFR 60.58b(g)(5)(iii) allow testing at just one unit each year so long as they stay under 7 ng/dscm. <u>https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60/subpart-Eb/section-60.58b</u>

 ³⁰ U.S. Environmental Protection Agency, "ETV Joint Verification Statement -- Adsorption Method for Sampling Dioxins and Furans,"
2006. <u>https://archive.epa.gov/nrmrl/archive-etv/web/pdf/600etv06047sv2.pdf</u>

https://en.wikipedia.org/wiki/Adsorption_Method_for_Sampling_of_Dioxins_and_Furans

³² U.S. Environmental Protection Agency Environmental Technology Verification Program, "Dioxin Emission Monitoring Systems," <u>https://archive.epa.gov/nrmrl/archive-etv/web/html/vt-ams.html#dems</u>

[The following is drawn verbatim from "CAUTIONARY TALES: Examples from across Canada," a report discussing Canada's trash incinerators.³³ Find the footnoted references in original, as cited.]

Issues At The Durham/York Incinerator (DYEC): Stack Exceedances in 2015, 2016 for dioxins and furans

Acceptance stack testing in early October 2015, found dioxin/furan emissions in exceedance of the stack limit for both boilers during initial tests.⁷ Stack source testing in May 2016 again found a dioxins/furans exceedance. One boiler was emitting 818 pg TEQ/m3 while the emission limit is 60 pg TEQ/m3.⁸ For the May 2016 major exceedance there was no indication from the continuous emissions monitors (CEMS) in the control room that there were problems.⁹

Stack source testing is pre-announced and completed only twice a year (once for compliance, once voluntarily). Dioxins/furans stack source testing only provides a snapshot as it covers less than 0.5% of the facility's operating time. Short-term (hourly, daily, weekly) dioxins/furans stack concentrations for the remaining 99.5+% of the year are unknown. This concern applies to most pollutants - including heavy metals, polycyclic aromatic hydrocarbons (PAH)s, and volatile organic compounds (VOCs) which are monitored at the stack less than 1% of operational time.

The duration of the exceedance for dioxins/furans in 2016 is unknown. The Regions are required under the Environmental Compliance Approval (ECA) to conduct long-term sampling of dioxins and furans,¹⁰ however the Regions have withheld the monthly sampling data from 2015 to 2019, despite public requests. Two [Freedom of Information] requests filed in May 2019 remain active. The owners shut down the DYEC for a period after the May 2016 exceedance. An abatement plan followed.¹¹ Multiple problems were identified.¹² Major repairs, operational changes were made.¹³

Ambient air exceedance in 2018 for dioxins/furans

A concerning ambient air exceedance of dioxins/furans occurred in May 2018 at a DYEC ambient air monitoring station.¹⁴ The Regions' consultant's limited review concluded "the DYEC is unlikely to have substantially contributed to the elevated D/F concentration".¹⁵ Members of the public contend that the investigation of this troubling exceedance was inadequate and did not include review of all pertinent data. The source cause of the exceedance remains unexplained.

Ongoing concerns with dioxins/furans AMESA reporting

Long-term sampling for dioxins and furans is required under the ECA. Durham uses the AMESA system for sampling. Dioxins/furans are collected in a cartridge over a month and sent for analysis. The public advocated for this monitoring during the Environmental Assessment and ECA phases. The Regions have withheld the monthly data for years 2015 to 2019. From 2020 onward, the Regions have provided some of the data, however, do not provide the underlying lab and other reports. Over time the Regions modified the sampling equipment and developed sampling procedures and protocols, including for data validation. In short, the reporting is neither traceable nor transparent.

³³ Maxwell, S., Benneian, L., Bracken, W., and Gasser, L., "CAUTIONARY TALES: Examples from across Canada," Dec. 2023. <u>https://drive.google.com/file/d/1-oet-KSfK60A7tTVUR5SaTYPZHVT4qui/view</u>

HOW DO INCINERATORS COMPARE TO TO LANDFILLS ENVIRONMENTALLY?

Multiple Life Cycle Assessment (LCA) studies commissioned by other counties have documented that incineration (and landfilling of the incinerator ash) is 2-3 times more harmful to human health and our environment than going directly to the landfill without burning the waste first. The most comprehensive LCA tool for waste systems is the Measuring Environmental Benefits Calculator (MEBCalc[™]) by Sound Resource Management Group.³⁴

Unlike other LCA tools, this tool looks at nine different health and environmental criteria, including climate impacts, but also cancer and non-cancer effects of toxic chemicals, impacts on respiratory health from pollutants like nitrogen oxides, and impacts of particulate matter, such as heart attacks and strokes. The model can also monetize these impacts using accepted standard economic values for the social cost of carbon and other pollutant impacts. This enables the model to present a single chart that can sum up the diverse impacts into a dollar value representing externalized health and environmental costs. These are costs that people pay in medical bills and that society pays in impacts from climate change, premature deaths and many other sorts of harms.

Two of the more recent studies that best summarize this are from Montgomery County, Maryland and Delaware County, PA, and are represented in the summary charts on the following pages. These LCAs were contained in these two reports.^{35,36}



 ³⁴ Measuring Environmental Benefits Calculator (MEBCalc[™]), Sound Resource Management Group. <u>https://srmginc.com/mebcalc/</u>
³⁵ "Beyond Incineration, Best Waste Management Strategies for Montgomery County, Maryland," Zero Waste Montgomery County, March 2021. <u>https://www.energyjustice.net/md/beyond.pdf</u>

³⁶ "Delaware County's Path Toward Zero Waste," Zero Waste Associates, March 2024.

<u>https://drive.google.com/file/d/1_ZEDM_z5MifMx2JfRJRvmuKbvVeUAfus/</u> Find just the LCA portion here: <u>https://energyjustice.net/incineration/DelcoLCA.pdf</u>

Incineration vs. Landfilling

Montgomery County

Resource Recovery

Health & Environmental Impacts per Ton of Waste **Disposed at Montgomery County Trash** Incinerator vs. Landfills in the Region

\$300



Transportation Impacts Insignificant

Greenhouse Gas (GHG) Emissions in Carbon Dioxide Equivalents (CO₂e)

20-year CO2e (lbs/ton of waste disposed)



Note: This chart shows greenhouse gas emissions per ton of waste disposed. The "20-year" is a reference to the potency of methane, which is measured in terms of how much more potent it is compared to carbon dioxide. Methane has a global warming potential (GWP) that is over 80 times more potent than CO2 over a 20-year time frame and close to 30 times more potent over a 100-year time frame. This evaluation uses the 20-year GWP, which makes landfills (yellow) look worse than if measured over 100 years.

Source: Life Cycle Assessment (LCA) from 2021 report, "Beyond Incineration: Best Waste Management Strategies for Montgomery County, Maryland" www.energyjustice.net/md/moco

Transportation climate impacts (trucking in blue, rail in black) are minor compared to incineration (red) or landfilling (yellow). No realistic transportation distance can justify incinerating in-county over hauling waste to distant landfills. Even driving a diesel truck across the country to reach a landfill fails to catch up to the impacts of incineration. Similar results are found when looking at pollutants other than GHGs.

Incineration vs. Landfilling

Health & Environmental Impacts per Ton of Waste Disposed at Covanta Delaware Valley Incinerator vs. Rolling Hills Landfill



Greenhouse Gases (climate change)

landfill.

Impacts of Adopting Zero Waste Plan

Annual Health and Environmental Impacts of Implementing



While the previous chart looked at externalized health and environmental costs <u>per</u> <u>ton</u>, this looks at the entire impact of Delaware County, Pennsylvania's waste system (all tons in a year), showing \$104 million dollars of health and environmental costs per year.

Adopting the Zero Waste Plan (ending incineration and reducing waste) cuts those harms by 85%, while the benefits (avoided harms) that already happen from current recycling efforts (about \$400 million a year) would be doubled.

Examples of these avoided harms are not needing to log or mine new raw materials because we're now consuming less, reusing/repairing, recycling and composting.

85% reduction of disposal impacts from a combination of diverting materials from disposal, and switching from incineration (and landfilling ash) to direct use of landfilling.

Note: This chart combines Figure S1 / Figure 1 and Figure S4 / Figure 5, but all expressed in positive dollars. Table A1, A2, B1, and B2 provide the raw numbers behind this chart.

> <u>Source:</u> Life Cycle Assessment (LCA) from 2024 report, "Delaware County's Path Toward Zero Waste," Zero Waste Associates, March 2024. www.energyjustice.net/incineration/DelcoLCA.pdf

Incineration worse than the worst landfills; Transportation impacts insignificant

Yellow lines show difference between hauling from two transfer stations 3 and 13 miles from the incinerator (last bar) vs. trucking all trash to landfill 60 miles away (first 3 bars)



Two notable lessons from this chart. First, it includes a sensitivity analysis to see how much the landfill gas capture rate matters. Even with zero gas capture (all leaking out), the overall impacts of incineration are worse than landfilling because the other impacts of incineration – asthma, cancer, heart attacks,

<u>Source</u>: Life Cycle Assessment (LCA) from 2024 report, "Delaware County's Path Toward Zero Waste," Zero Waste Associates, March 2024.

www.energyjustice.net/incineration/DelcoLCA.pdf

etc. (grey) – add up to significant harm on top of the climate impacts (black). If only looking at climate impacts, landfill gas capture rate would have to be as low as 30% to be comparable to incineration.

The collection trucks (red) are the same in all scenarios. The greater hauling distance to landfill (yellow) in the three landfill scenarios is more than the nearby incinerator, but so insignificant that trucking emissions cannot justify a preference for incinerating in-county vs. trucking to landfills.

METHODOLOGY

In Florida, emissions data is reported by incinerator owners to the state Department of Environmental Protection (DEP). Documents on these facilities are available online through DEP's Oculus system. Stack test reports and annual operating reports are among these online files. Stack test reports offer the emissions test data for the once-per-year tests, presenting them in units that line up with the permit limits in the incinerators 'Title V air pollution permit issued by DEP under the Clean Air Act. Annual operating reports offer calculated estimates of the annual amount of each pollutant released. Since few air pollutants are measured continuously, most of this data is based on once per year stack tests under optimal operating conditions. This means that the emissions data can be optimistic since the calculation method assumes that the facility operates under those optimal conditions all year. The lack of continuous emissions monitoring results in annual emissions estimates that are likely lower than reality.

2020 data for the Palm Beach County incinerators was not able to be found in DEP's Oculus system, so values were obtained from EPA's National Emissions Inventory, which contains the same sort of data as obtained from state agencies like DEP.

The pounds of each pollutant released per year from each facility were totaled and divided into the total amount of tons burned over those same years. Since a 2020 annual operating report could not be found for the Palm Beach County incinerators, data on the tons of waste burned was obtained from the Energy Information Administration's Form 923 database, which tracks fuel usage by month for all electric generators.

With data from the Palm Beach Renewable Energy Facility 2 incinerator, the pounds of emissions per ton of waste were used as a model for what a new incinerator in Palm Beach County would release. This was done in cases where the concentration-based emissions data fell within the limits of the January 2024 draft EPA regulations for Large Municipal Waste Combustors. There are two pollutants for which the Palm Beach Renewable Energy Facility 2 emissions exceed this new standard for new incinerators: carbon monoxide and sulfur dioxide. For each of these, a further 40% reduction in emissions was assumed in order to bring emissions down sufficiently to meet the new standard.

Greenhouse gases are not tracked in the DEP's files, so data for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) were obtained from EPA's Greenhouse Gas Reporting Program, the most accurate data source for such data. Since EPA intentionally uses outdated global warming potentials for methane, that data was adjusted to bring it in line with the latest global warming potentials for methane and nitrous oxide, and look at them over 20 years instead of 100.³⁷

Dioxin data is not tracked in EPA's National Emissions Inventory, but can be obtained from EPA's Toxics Release Inventory (TRI) for many types of industrial facilities, which is released annually.³⁸ However, there were no data points available for dioxin emissions from Palm Beach County sources. Because

³⁷ A chart showing the evolving science on methane global warming potentials across International Panel on Climate Change (IPCC) reports, with links to the sources, is here: <u>https://www.energyjustice.net/naturalgas#GWP</u> EPA still uses global warming potential data from IPCC's Fourth Assessment Report in 2007, when the Fifth Assessment Report (2013) and Sixth Assessment Report (2021) show larger impacts from methane.

³⁸ U.S. Environmental Protection Agency, Toxics Release Inventory database. <u>https://www.epa.gov/toxics-release-inventory-tri-program</u>

waste incinerators have always been exempt from reporting to the TRI database, data on the Palm Beach County trash incinerators are not available in that data source, either.³⁹

Using "pounds of a pollutant released per ton of waste burned" metrics for each air pollutant (see the table below), these metrics were multiplied times 3,000 and 4,000 tons of waste burned per day times 365 days per year times 95% for the capacity factor, which represents the percentage of a year that the facility is operating at full capacity. 95% is what a well-run facility should be capable of, but many older generation incinerators operate closer to 90% capacity.

HOW POLLUTING IS A NEW INCINERATOR?

No incinerator is "clean," as all involve putting significant amounts of pollutants into the air.

The question is a relative one. Yes, newer trash incinerators such as Palm Beach Renewable Energy Facility 2 are less polluting than the older generation, as the charts below show. However, Palm Beach Renewable Energy Facility 2 is still a major air polluter. A new incinerator such as the Palm Beach County Solid Waste Authority is pursuing would largely use the same technology that Palm Beach Renewable Energy Facility 2 uses.

A new incinerator may have to meet somewhat stricter EPA regulations for Large Municipal Waste Combustors. However, except for two pollutants, Palm Beach Renewable Energy Facility 2 already meets these pending regulations, which means that the emissions from a new incinerator can be expected to be similar to those from Palm Beach Renewable Energy Facility 2 except for carbon monoxide (CO) and sulfur dioxide (SO₂), where an additional 40% emissions reduction would be needed to meet the proposed new regulations.

³⁹ In April 2023, Energy Justice Network and the Public Employees for Environmental Responsibility filed a formal rulemaking petition with EPA to require that incinerators start reporting to the TRI database. On December 20, 2024, EPA granted the petition, requiring trash incinerators and certain other incinerators to start reporting to the TRI database. See: http://www.energyjustice.net/tri

The following chart shows the pounds per ton burned for the Palm Beach Renewable Energy Facility 2, averaging all available years of their emissions test data, then the calculated amount of emissions from a new 4,000 ton/day incinerator. The final column is the same except that carbon monoxide and sulfur dioxide are reduced by 40% to ensure that the emissions would fall within EPA's proposed new regulations for Large Municipal Waste Combustors.

Chemical (all in lbs except GHGs)	Palm Beach REF 2 Lbs/Ton burned	Annual lbs from new 4,000 tpd plant	Annual lbs from new 4,000 tpd plant after adjusting for new regs, if adopted
Ammonia	0.0294	40,715	40,715
Cadmium	0.00000585	8	8
Carbon monoxide	0.345	477,945	286,767
Dioxins/Furans	0.000000036	0.0050	0.0050
Hydrochloric acid	0.0626	86,895	86,895
Lead	0.0000231	32	32
Mercury Compounds	0.00000768	11	11
Nitrogen Oxides	0.659	913,588	913,588
Particulate Matter	0.0318	44,138	44,138
Sulfur Dioxide	0.551	764,375	496,844
Greenhouse Gases (GHGs) [metric tons of CO2 equivalents]	0.879	1,219,103	1,219,103

In the next two sets of charts, Palm Beach Renewable Energy Facility 1 and Palm Beach Renewable Energy Facility 2 are referred to as West Palm Beach #1 and West Palm Beach #2 or simply "WPB1" and "WPB2." In the first set of charts, where data was available, Wheelabrator South Broward (a 2,250 ton/day mass burn trash incinerator operating in Broward County, Florida since 1991) is also included for reference.

The following set of charts shows the actual emissions from each incinerator, averaging the available stack test data from 2015 through 2024. These actual emissions levels are in **blue**. The **yellow** lines represent the current emissions limits in the facility's permits, which typically match the minimum federal standards (set in 2006) for that type of incinerator, which could vary based on whether it's an RDF-burning incinerator or a mass burn type, and on the age of the plant. The **green** lines represent the standard that will apply if the (long-overdue) January 2024 draft federal regulations for Large Municipal Waste Combustors are finalized in December 2025 as planned, and implemented (they're expected to be implemented by states around 2029-2030 unless litigation or the Trump administration cause this to be delayed). The Solid Waste Authority has pursued litigation against these standards, claiming that they will force their incinerators to close, even though they would have little impact on the REF 2 incinerator.

Based on how permits are written, pollutant are measured in different units. Here is what they mean:

ppm = parts per million mg/dcsm = milligrams per dry standard cubic meter µg/dcsm = micrograms per dry standard cubic meter ng/dcsm = nanograms per dry standard cubic meter











This next set of charts shows the total tons of emissions from the two Palm Beach County incinerators (REF1 and REF2 are labeled as WPB1 and WPB2) in the first column. In the second column, it shows the same data in pounds per ton burned, which is a more fair comparison since the newer incinerator is larger and burns more waste each year.



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How would a new incinerator in Palm Beach County rank among existing industrial air polluters?

The following charts show how a new trash incinerator burning 3,000 or 4,000 tons per day operating under the pending regulations for new trash incinerators compares to existing industrial air polluters in Palm Beach County. The comparison data is the latest available from EPA's National Emissions Inventory, which is data from 2020. That data is published every third year, and 2023 data is supposed to be available in 2026. The tables below include the two existing county trash incinerators (REF 1 and REF 2) as well as modeled estimates for new 3,000 and 4,000 ton per day incinerators. The rankings use the 2020 emissions data, but are ranked as if the theoretical proposed incinerator is operating in place of the old incinerator (REF 1).

CONCLUSIONS

This study finds that a new 3,000 or 4,000 ton/day trash incinerator in Palm Beach County would be one of the largest industrial air polluters in the county. In fact, it would be among the county's top five industrial air emitters of ammonia, cadmium, dioxins/furans, hydrochloric acid, mercury, nitrogen oxides, and sulfur dioxide and greenhouse gases.

The new incineration complex – the new incinerator replacing REF 1, combined with the REF 2 incinerator which would remain open – **would rank #1 in the county for air releases of cadmium, dioxins/furans, hydrochloric acid, mercury, nitrogen oxides, and sulfur dioxide**, and would rank #3 in ammonia, #4 in greenhouse gases, #5 or 6 in particulate matter (depending on the size of the new incinerator), and #6 in carbon monoxide. For 5 of the 11 pollutants examined, the new incineration complex would be responsible for over half of the industrial air emissions in Palm Beach County.

	New incinerator's rank among Palm Beach County industrial air polluters and % share of total				Rank a <u>combine</u> base	nd % share ed (REF 2 plu ed on size of	of <u>both i</u> Is REF 1 r f new inc	ncinerators replacement) inerator
Pollutant	3,000 ton/day		,000 ton/day 4,000 ton/day		3,000 ton/day (total 6,000 tpd)		4,000 ton/day (total 7,000 tpd)	
Ammonia	3	7%	3	9%	3	13%	3	14%
Cadmium	1	51%	1	58%	1	84%	1	86%
Carbon monoxide	12	1%	10	1%	6	2%	6	3%
Dioxins/furans	1	100% *	1	100% *	1	100% *	1	100% *
Hydrochloric acid	2	33%	1	39%	1	74%	1	77%
Lead	9	1%	8	2%	8	2%	8	3%
Mercury	3	26%	1	32%	1	55%	1	58%
Nitrogen Oxides	5	9%	4	12%	1	18%	1	21%
Particulate Matter	7	1%	7	2%	6	4%	5	4%
Sulfur Dioxide	2	23%	2	28%	1	54%	1	57%
Greenhouse Gases ⁴⁰	5	6%	4	8%	4	12%	4	14%

* There are no reported source of dioxins/furans in the county via EPA's Toxics Release Inventory, so it would be 100% simply based on the lack of data. However, it's likely that one other significant source of dioxin emissions would be New Hope Power Company, which is burning sugar cane fiber (bagasse).

 $^{^{40}}$ Note that there are no incinerators in the U.S. using any sort of carbon capture and sequestration technology, which is prohibitively expensive. There are no legal requirements for it, nor are any such regulations on the horizon. The rankings are based on the current regulatory requirements plus proposed regulations, which do not include CO₂ limits.

Pollutant	Facility	Industry

Greenhouse Ga	Greenhouse Gases (CO2e) [Metric tons]					
7,041,497	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant				
3,105,634	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill				
2,249,041	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant				
1,219,103	Proposed 4,000 ton/day Trash Incinerator	Incinerator				
935,360	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator				
914,327	Proposed 3,000 ton/day Trash Incinerator	Incinerator				
836,038	New Hope Power Company	105 MW Biomass Power Plant				
652,681	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator				
115,626	Solid Waste Authority of PBC - Dyer Park Landfill	Landfill				
75,016	Palm Beach County Landfill #1 (Lantana)	Landfill				
46,439	Palm Beach International Airport	Airport				
12,962	North Palm Beach County Airport	Airport				
12,762	Palm Beach County Park Airport	Airport				
10,161	Boca Raton Airport	Airport				
5,740	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant				
4,475	Palm Beach County Glades Airport	Airport				
213	Belle Glade State Municipal Airport	Airport				
130	Antiquers Aerodrome	Airport				

Ammonia (lbs)		
309,615	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
70,012	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant
40,715	Proposed 4,000 ton/day Trash Incinerator	Incinerator
30,537	Proposed 3,000 ton/day Trash Incinerator	Incinerator
28,459	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
15,447	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
13,786	New Hope Power Company	105 MW Biomass Power Plant

Cadmium (lbs)		
114.51	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
8.10	Proposed 4,000 ton/day Trash Incinerator	Incinerator
6.10	Proposed 3,000 ton/day Trash Incinerator	Incinerator
3.88	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
0.84	New Hope Power Company	105 MW Biomass Power Plant
0.75	Sugar Cane Growers Co-op	Sugar Mill
0.17	Aerojet Rocketdyne, Inc.	Missile and Space Vehicle Propulsion Unit Manufacturing
0.08	South Florida Materials Corp.	Brick, Stone, and Construction Material Wholesaler
0.07	Adma Biomanufacturing, LLC	Biological Product Manufacturing
0.01	Okeelanta Corp	Sugar Mill
0.01	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant

0.01	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
0.0007	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
0.0005	Raytheon Technologies Corp.	Aircraft Engine Manufacturing

Hydrochloric ad	cid (lbs)	
86,895	Proposed 4,000 ton/day Trash Incinerator	Incinerator
82,922	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
65,172	Proposed 3,000 ton/day Trash Incinerator	Incinerator
56,164	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
37,698	New Hope Power Company	105 MW Biomass Power Plant
7,852	Sugar Cane Growers Co-op	Sugar Mill
5,456	Osceola Farms	Sugar Mill
		Electroplating, Plating, Polishing,
189	Purecoat International, LLC	Anodizing, and Coloring
		Turbine and Turbine Generator Set Units
91	Power Systems Mfg., LLC	Manufacturing

Lead (lbs)		
466	Palm Beach County Park Airport	Airport
420	North Palm Beach County Airport	Airport
277	Boca Raton Airport	Airport
238	Palm Beach International Airport	Airport
170	New Hope Power Company	105 MW Biomass Power Plant
168	Palm Beach County Glades Airport	Airport
155	Osceola Farms	Sugar Mill
60	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
32	Proposed 4,000 ton/day Trash Incinerator	Incinerator
31	Sugar Cane Growers Co-op	Sugar Mill
24	Proposed 3,000 ton/day Trash Incinerator	Incinerator
21	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
8	Belle Glade State Municipal Airport	Airport
5	Antiquers Aerodrome	Airport
0.46	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
0.08	Aerojet Rocketdyne, Inc.	Missile and Space Vehicle Propulsion Unit Manufacturing
0.04	South Florida Materials Corp.	Brick, Stone, and Construction Material Wholesaler
0.02	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
0.01	Adma Biomanufacturing, LLC	Biological Product Manufacturing
0.01	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
0.01	Okeelanta Corp	Sugar Mill
0.00	Raytheon Technologies Corp.	Aircraft Engine Manufacturing

Mercury (lbs)		
10.6	Proposed 4,000 ton/day Trash Incinerator	Incinerator

8.9	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
8.8	Osceola Farms	Sugar Mill
8.0	Proposed 3,000 ton/day Trash Incinerator	Incinerator
6.0	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
3.0	Sugar Cane Growers Co-op	Sugar Mill
1.6	New Hope Power Company	105 MW Biomass Power Plant
0.3	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill
	Solid Waste Authority of PBC - Sewage Sludge Pelletization	
0.3	Facility	Sewage sludge pelletization
0.023	Solid Waste Authority of PBC - Dyer Park Landfill	Closed landfill
		Brick, Stone, and Construction Material
0.018	South Florida Materials Corp.	Wholesaler
0.015	Palm Beach County Landfill #1 (Lantana)	Closed landfill
0.002	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
0.001	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
0.000	Adma Biomanufacturing, LLC	Biological Product Manufacturing
0.000	Apogee Investment Partners LLC	Testing Laboratories and Services
0.000	South Florida Water Management District - Sta 1 West	Water Pumping Station
0.000	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant

Nitrogen Oxide	s (lbs)	
1,596,862	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
1,201,347	Sugar Cane Growers Co-op	Sugar Mill
1,016,430	New Hope Power Company	105 MW Biomass Power Plant
1,015,805	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
913,588	Proposed 4,000 ton/day Trash Incinerator	Incinerator
701,202	Osceola Farms	Sugar Mill
685,191	Proposed 3,000 ton/day Trash Incinerator	Incinerator
633,359	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
350,321	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant
225,957	Palm Beach International Airport	Airport
157,410	Raytheon Technologies Corp.	Aircraft Engine Manufacturing
135,296	South Florida Water Management District - Loxahatchee North	Water Pumping Station
	South Florida Water Management District - Loxahatchee -	
134,466	Southern Blvd	Water Pumping Station
121,799	South Florida Water Management District - Clewiston	Water Pumping Station
116,303	South Florida Water Management District - Holey Land Tract	Water Pumping Station
116,303	South Florida Water Management District - L18 Canal	Water Pumping Station
83,863	South Florida Water Management District - West Palm Beach	Water Pumping Station
82,984	South Florida Water Management District - Loxahatchee South	Water Pumping Station
79,520	South Florida Water Management District - L-6 Canal	Water Pumping Station
58,612	Florida Gas Transmission Company	Natural Gas Compressor Station
57,840	Apogee Investment Partners LLC	Testing Laboratories and Services
57,434	South Florida Water Management District - Sta 1 West	Water Pumping Station
41,312	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill

37,823	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
21,562	Okeelanta Corp	Sugar Mill
13,864	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
13,688	Solid Waste Authority of PBC - Sewage Sludge Pelletization Facility	Sewage sludge pelletization
12,700	Solid Waste Authority of PBC - Class III Landfill & Flare	Landfill
12,176	Solid Waste Authority of PBC - Other operations	County waste operations
11,484	North Palm Beach County Airport	Airport
10,474	Boca Raton Airport	Airport
10,063	Palm Beach County Park Airport	Airport
7,327	Community Asphalt Corp	Hot Mix Asphalt Plant
7,148	South Florida Materials Corp.	Brick, Stone, and Construction Material Wholesaler
3,844	Aerojet Rocketdyne, Inc.	Missile and Space Vehicle Propulsion Unit Manufacturing
3,469	JW Cheatham, LLC	Hot Mix Asphalt Plant
3,278	Palm Beach County Glades Airport	Airport
1,695	Adma Biomanufacturing, LLC	Biological Product Manufacturing
1,413	Bimbo Bakeries USA, Inc.	Bakery
437	Solid Waste Authority of PBC - MRF	Recycling sorting facility
154	Belle Glade State Municipal Airport	Airport
94	Antiquers Aerodrome	Airport

Sulfur Dioxide (lbs)		
499,060	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
496,844	Proposed 4,000 ton/day Trash Incinerator	Incinerator
372,633	Proposed 3,000 ton/day Trash Incinerator	Incinerator
322,385	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
305,281	Sugar Cane Growers Co-op	Sugar Mill
217,148	New Hope Power Company	105 MW Biomass Power Plant
78,442	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
30,656	Palm Beach International Airport	Airport
29,318	Raytheon Technologies Corp.	Aircraft Engine Manufacturing
24,610	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant
22,411	Osceola Farms	Sugar Mill
11,333	Solid Waste Authority of PBC - Sewage Sludge Pelletization Facility	Sewage Sludge Pelletization
8,180	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill
7,832	Florida Gas Transmission Company	Natural Gas Compressor Station
5,018	Solid Waste Authority of PBC - Other operations	County Waste Operations
2,891	Apogee Investment Partners LLC	Testing Laboratories and Services
2,280	North Palm Beach County Airport	Airport
2,054	Palm Beach County Park Airport	Airport
2,013	Boca Raton Airport	Airport

South Florida Water Management District - L-6 Canal	Water Pumping Station
Community Asphalt Corp	Hot Mix Asphalt Plant
Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
Palm Beach County Glades Airport	Airport
Solid Waste Authority of PBC - Class III Landfill & Flare	Landfill
JW Cheatham, LLC	Hot Mix Asphalt Plant
Solid Waste Authority of PBC - MRF	Recycling Sorting Facility
City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
South Florida Water Management District - Loxahatchee North	Water Pumping Station
South Florida Water Management District - Holey Land Tract	Water Pumping Station
South Florida Water Management District - L18 Canal	Water Pumping Station
South Florida Water Management District - Loxahatchee -	
Southern Blvd	Water Pumping Station
South Florida Water Management District - Loxahatchee South	Water Pumping Station
	Brick, Stone, and Construction Material
South Florida Materials Corp.	Wholesaler
South Florida Water Management District - West Palm Beach	Water Pumping Station
South Florida Water Management District - Clewiston	Water Pumping Station
Belle Glade State Municipal Airport	Airport
South Florida Water Management District - Sta 1 West	Water Pumping Station
	Missile and Space Vehicle Propulsion
Aerojet Rocketdyne, Inc.	Unit Manufacturing
Antiquers Aerodrome	Airport
Adma Biomanufacturing, LLC	Biological Product Manufacturing
Bimbo Bakeries USA, Inc.	Bakery
Okeelanta Corp	Sugar Mill
	South Florida Water Management District - L-6 Canal Community Asphalt Corp Palm Beach County Water Utilities Dept. Palm Beach County Glades Airport Solid Waste Authority of PBC - Class III Landfill & Flare JW Cheatham, LLC Solid Waste Authority of PBC - MRF City of Lake Worth Utilities - Tom G. Smith South Florida Water Management District - Loxahatchee North South Florida Water Management District - Holey Land Tract South Florida Water Management District - L18 Canal South Florida Water Management District - L18 Canal South Florida Water Management District - L0xahatchee - Southern Blvd South Florida Water Management District - Loxahatchee South South Florida Water Management District - Loxahatchee South South Florida Water Management District - Loxahatchee South South Florida Water Management District - West Palm Beach South Florida Water Management District - Sta 1 West Aerojet Rocketdyne, Inc. Antiquers Aerodrome Adma Biomanufacturing, LLC Bimbo Bakeries USA, Inc. Okeelanta Corp

Carbon Monox	ide (lbs)	
11,438,763	Sugar Cane Growers Co-op	Sugar Mill
7,586,161	Osceola Farms	Sugar Mill
1,858,992	New Hope Power Company	105 MW Biomass Power Plant
784,056	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill
749,960	Palm Beach International Airport	Airport
572,893	Palm Beach County Park Airport	Airport
529,309	North Palm Beach County Airport	Airport
459,060	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
385,836	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
363,566	Boca Raton Airport	Airport
286,767	Proposed 4,000 ton/day Trash Incinerator	Incinerator
270,756	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
234,462	Solid Waste Authority of PBC - Class III Landfill & Flare	Landfill
215,075	Proposed 3,000 ton/day Trash Incinerator	Incinerator
205,596	Palm Beach County Glades Airport	Airport
65,366	Raytheon Technologies Corp.	Aircraft Engine Manufacturing
63,897	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant

42,541	Florida Gas Transmission Company	Natural Gas Compressor Station
36,634	Community Asphalt Corp	Hot Mix Asphalt Plant
34,741	Okeelanta Corp	Sugar Mill
26,040	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
18,515	Apogee Investment Partners LLC	Testing Laboratories and Services
14,268	JW Cheatham, LLC	Hot Mix Asphalt Plant
13,195	Solid Waste Authority of PBC - Sewage Sludge Pelletization Facility	Sewage Sludge Pelletization
9,908	Belle Glade State Municipal Airport	Airport
8,924	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
6,033	Antiquers Aerodrome	Airport
6,004	South Florida Materials Corp.	Brick, Stone, and Construction Material Wholesaler
4,535	Solid Waste Authority of PBC - Other operations	County Waste Operations
3,285	South Florida Water Management District - Loxahatchee - Southern Blvd	Water Pumping Station
3,229	Aerojet Rocketdyne, Inc.	Missile and Space Vehicle Propulsion Unit Manufacturing
1,681	South Florida Water Management District - Holey Land Tract	Water Pumping Station
1,518	Solid Waste Authority of PBC - Dyer Park Landfill	Closed landfill
1,513	South Florida Water Management District - Loxahatchee North	Water Pumping Station
1,468	South Florida Water Management District - Clewiston	Water Pumping Station
1,415	Adma Biomanufacturing, LLC	Biological Product Manufacturing
1,248	South Florida Water Management District - L18 Canal	Water Pumping Station
1,187	Bimbo Bakeries USA, Inc.	Bakery
1,136	South Florida Water Management District - Loxahatchee South	Water Pumping Station
985	Palm Beach County Landfill #1 (Lantana)	Closed landfill
889	South Florida Water Management District - L-6 Canal	Water Pumping Station
615	South Florida Water Management District - Sta 1 West	Water Pumping Station
262	South Florida Water Management District - West Palm Beach	Water Pumping Station
239	Solid Waste Authority of PBC - MRF	Recycling Sorting Facility

Particulate Matter (lbs)		
895,660	Florida Power & Light - West County Energy Center	3,750 MW Gas-fired Power Plant
512,135	Sugar Cane Growers Co-op	Sugar Mill
464,838	Osceola Farms	Sugar Mill
277,775	Florida Power & Light - Riviera Beach Energy Center	1,300 MW Gas-fired Power Plant
93,973	Solid Waste Authority of PBC - REF 1 Trash Incinerator	Incinerator
91,954	New Hope Power Company	105 MW Biomass Power Plant
56,943	Solid Waste Authority of PBC - REF 2 Trash Incinerator	Incinerator
44,138	Proposed 4,000 ton/day Trash Incinerator	Incinerator
33,104	Proposed 3,000 ton/day Trash Incinerator	Incinerator
31,780	Solid Waste Authority of PBC - Class I Landfill & Flare	Landfill
19,573	Palm Beach International Airport	Airport
13,083	North Palm Beach County Airport	Airport

12,792	Palm Beach County Park Airport	Airport
11,780	Solid Waste Authority of PBC - Other operations	County Waste Operations
10,327	Boca Raton Airport	Airport
9,771	Solid Waste Authority of PBC - Class III Landfill & Flare	Landfill
5,875	Okeelanta Corp	Sugar Mill
4,477	Palm Beach County Glades Airport	Airport
4,097	Raytheon Technologies Corp.	Aircraft Engine Manufacturing
3,128	South Florida Water Management District - Loxahatchee - Southern Blvd	Water Pumping Station
2,757	South Florida Water Management District - Loxahatchee North	Water Pumping Station
2,471	South Florida Water Management District - L-6 Canal	Water Pumping Station
2,370	South Florida Water Management District - Holey Land Tract	Water Pumping Station
2,357	South Florida Water Management District - L18 Canal	Water Pumping Station
1,680	South Florida Water Management District - Loxahatchee South	Water Pumping Station
1,591	City of Lake Worth Utilities - Tom G. Smith	100 MW Gas-fired Power Plant
1,430	South Florida Water Management District - West Palm Beach	Water Pumping Station
1,415	South Florida Materials Corp.	Brick, Stone, and Construction Material Wholesaler
1,170	South Florida Water Management District - Sta 1 West	Water Pumping Station
991	Apogee Investment Partners LLC	Testing Laboratories and Services
926	Florida Gas Transmission Company	Natural Gas Compressor Station
902	Solid Waste Authority of PBC - Sewage Sludge Pelletization Facility	Sewage Sludge Pelletization
843	Palm Beach County Water Utilities Dept.	Sewage Treatment Plant
716	Aerojet Rocketdyne, Inc.	Missile and Space Vehicle Propulsion Unit Manufacturing
600	Community Asphalt Corp	Hot Mix Asphalt Plant
315	Adma Biomanufacturing, LLC	Biological Product Manufacturing
306	Bimbo Bakeries USA, Inc.	Bakery
229	JW Cheatham, LLC	Hot Mix Asphalt Plant
213	Belle Glade State Municipal Airport	Airport
130	Antiquers Aerodrome	Airport
18	Solid Waste Authority of PBC - MRF	Recycling Sorting Facility
0	South Florida Water Management District - Clewiston	Water Pumping Station