From: Mardi Bilsland
To: Benton Public Comment
Subject: Another short story
Date: Friday, July 11, 2025 9:46:52 PM

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

To County Commissioners,
My address is 37645 Govier place, Corvallis OR 97330
My name is Mardi Bilsland
My husband and I were born in Corvallis, we have lived, owned business, worked, raised a family in Corvallis. We choose to build a house in Soap Creek valley since we have both loved this area since we were children.
I remember swimming in the pond which was at the bottom of coffin butte , my husband hunted pheasants there too. It is now covered with an abundance of trash.

I also want to comment on the fact we have seen the landfill on fire. One night we saw a glow in the sky , followed the brightness and were shocked to see what had happened. The whole landfill was on fire, it plussed and glowed looking like a huge brain. You can imagine with videos of wildfires destroying towns and rural areas how scary this was. We live 3 miles from the landfill it would not take long for a fire to reach us.

On the top of the ridge to the south of Coffin Butte road was a historically First Nation Peoples road to Kings Valley and the coast. No research was done to protect this ridge.The area is already to go , republic has been prepping the area for the past year for their “expansion”. We do not consider it an expansion but an entirely NEW LANDFILL. Now they want to cover this area up with more trash hauled from counties far away that have no interest or care for our children, citizens, environment, city and county. Plus we know they will close our egress(Coffin Butte road) once they have domain on the south side of Coffin Butte Road.

We will watch our property value decrease if this new landfill is allowed.
Will the owners of the properties around the landfill ask for a decrease in their taxes due to this excessive mountain of bleaching gasses, fire hazard, eye sore, and poisons being allowed into our aquifer I would hope so. The county could lose more income from loss of property tax assessment now and into the future if this new landfill is allowed.
The landfill will close and the cash cow it has been but it will be affect property values for ever.
Please deny the expansion, no money is worth this ugly scar upon our beautiful county.
Mardi Bisland

Sent from my iPad

From: Ken Eklund
To: Benton Public Comment
Subject: Response to Republic Presentation, p. 26 – Wet vs. Dry Addendum
Date: Monday, July 14, 2025 12:26:48 PM
Attachments: Taking Care of Landfill Leachate.pdf
writerguy-cube2.png

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
REC: Please deny this application
ID: This is the "Wet vs. Dry Landfill" Addendum.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

This is testimony in response to the July 8, 2025, slide presentation made by Republic Services. It may also refer to evidence and testimonies previously submitted, and provide links to articles of evidence and testimonies in the Munidocs record, to help you locate them. This testimony also contains material that responds to the presentation cited above; you will find such material attached to this email (double-click each link in the Attachments section in the header of this email.)

WET vs. DRY LANDFILLS
Republic presentation, p. 26
Staff presentation by reference
Pawlowski by reference

In their presentation, Republic frames Public Comment as saying this:

> *Landfills in 'dry climates' are more suitable for landfill construction and waste disposal.*

Republic responds by saying this, in part:

> *Landfills that take in similar tonnage and waste profiles will produce the same amount of gas, regardless of their location.*

This is misdirection bordering on misinformation. Republic's response leaves out vital context.

1. **The timeframes for landfill gas production in the two instances are typically very different. A wet landfill produces landfill gas much more quickly – which is important context to include to actually respond to the public comment.**
    a. The rate at which a climate pollutant enters the atmosphere is a vital consideration in the efforts to address the climate crisis, and methane, the prime pollutant in landfill gas, is the focus of climate mitigation efforts. A wet landfill, with a high

rate of gas production, is much worse than a dry landfill in the context of climate damage.

b. Dry landfills recirculate leachate to catalyze landfill gas production (attachment). The gas is thus produced in a slow, controlled way – unlike wet landfills, where gas is produced quickly and everywhere and therefore difficult to control and collect.

2. **The public comment was actually focused more on leachate production than landfill gas production. The difference in leachate production is dramatic. An example would be: Coffin Butte Landfill, near Corvallis: 32-40 million gallons of leachate that has to be trucked from the dump. Columbia Ridge Landfill, near Arlington: no leachate leaves the site.**

   The main issues of the public comment were that the excessive leachate would spill over at Coffin Butte Landfill, and presented disposal problems, and that a dry landfill was therefore a better option. The main issues were therefore not addressed by Republic in their Response.

Ken Eklund, writerguy

37340 Moss Rock Dr
Corvallis OR 97330
408.623.8372

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

Hazardous Waste Leachate

Taking Care of Landfill Leachate

Leachate can be handled with a range of techniques. Which one is right for your landfill?

May 1, 2011 9 Min Read

By Michael Fickes

Managing landfill leachate is both an art and a science. Selecting a method of treatment that satisfies local and state regulations at a reasonable cost can be a complex undertaking. Fortunately, landfill operators have a host of treatment techniques from which to choose; their options range from the traditional — such as taking the leachate to a local sewage treatment plant — to more cutting-edge techniques, such as running the liquid through an engineered wetlands system or taking advantage of leachate-consuming trees.

In the end, the best option for a particular site depends upon the location of the landfill, the composition of the leachate, the volumes of leachate being generated and available on-site space.

The Basics

U.S. Environmental Protection Agency (EPA) regulations require municipal solid waste (MSW) landfills to install and maintain leachate collection systems. “You build the leachate collection system when you build the liner system,” says Leonard (Butch) Joyce, president and CEO of Richmond, Va.-based Joyce Engineering Inc. “As you expand the landfill, you add on to the collection system.”

In a landfill cell, a network of leachate collection pipes rests on top of the liner. As the cell grows in height, leachate drains to the piping system at the bottom. The piping system feeds a three- to six-foot deep sump. “Leachate is pumped out of the sump to a gravity pipe that flows into a collection tank,” Joyce says.

Once the leachate has been collected, it has to be managed. Broadly speaking, there are three basic ways to manage leachate, according to Ed Repa, director of environmental programs for the Washington-based National Solid Wastes Management Association (NSWMA).

First, you can re-circulate it in the landfill to accelerate waste decomposition; landfills that use this technique are called “bioreactors.” Second, with an appropriate National Pollutant Discharge Elimination System (NPDES) permit, you can treat the leachate on site and discharge it to a local stream. “Third, you can treat it partially to meet the standard set by your local municipal [wastewater] treatment plant and send it there for final treatment,” he says.

Within each of these broader management categories, any number of treatment techniques may be employed.

“We look at a lot of different treatment technologies,” says Brian Martz, senior manager of engineering with Phoenix-based Republic Services Inc. In some instances, a Republic landfill may truck the leachate to a nearby publicly owned treatment works (POTW) after treating it with a chemical process.

According to Tony Walker, Republic’s manager of engineering, two common chemical treatments for leachate are precipitation and oxidation. “Chemical precipitation is basically the removal of metal compounds from leachate [through the use of] precipitating chemicals such as lime, sodium hydroxide, soda ash, sodium sulfide and alum,” he says. Chemical oxidation can be used to remove ammonia, to oxidize cyanide, to reduce the concentration of residual organics, and to reduce the bacterial and viral content of wastewater, Walker adds.

The Natural Route

Landfill leachate also can be treated in more “natural” ways. In 2006, at its Jeffco Landfill near St. Louis, Republic Services was transporting leachate by truck to the local sanitary sewer, which carried it to the POTW.

Jeffco had closed several years before, and Republic was managing the 30-year, post-closure care period mandated by EPA. At the time, the firm was spending about $125,000 each year to dispose of the site’s leachate, an expense that was rising as the waste in the landfill aged and produced more and more leachate.

Working with Leggette, Brashears & Graham (LBG) Inc., a St. Paul, Minn.-based environmental engineering firm, Republic engineers implemented a leachate recirculation concept called “phytoremediation” at Jeffco. Phytoremediation is a sustainable concept that harnesses the ability of certain trees to absorb leachate and to use it as a nutrient.

At the end of 2007, LBG planted 2,100 hybrid poplar trees on six acres at the landfill. LBG also installed a system that pumps leachate from the landfill’s sump to a pretreatment tank for oxygenation. Next, the system injects the leachate into a surface drip irrigation system. During the winter, when the ground is frozen, another drip irrigation system buried beneath the frost line distributes the leachate.

Despite record-breaking precipitation in 2008, the tree roots absorbed all of the leachate produced by the landfill. Nothing was hauled away.

“It’s a cost-effective solution that we’ve used at several closed landfills,” Walker says. “It also improves safety by taking trucks off the road.”

Other landfills at which Republic uses the phytoremediation technique include the South Barrington Landfill in South Barrington, Ill., and the Watts Road Landfill in Atlanta.

Phytoremediation isn’t for every site, Walker cautions. It depends on the components and volume of the leachate, soil conditions and the trees. If the roots can’t absorb enough of the leachate, the area may become oversaturated and produce methane, which in turn will have to be managed.

Still, the technique has worked well at Jeffco. In fact, the project has earned two awards: the Grand Award in the Minnesota Chapter of the American Council of Engineering Companies’ (ACEC) Engineering Excellence Competition and the ACEC National Honor Award for Engineering Excellence.

There are variations on the theme of biological treatment. “One option we’re working with — so far on a small scale — involves constructing wetlands to treat leachate,” Joyce says. “It’s an on-site biological treatment system. The right plants will pick up heavy metals and other materials through their root systems. It’s possible to build a wetland that will treat leachate to the appropriate standards for discharge to a POTW or even a stream.”

Republic also has used wetlands to treat leachate at a landfill in southern Alabama, Martz says. The wetlands use “microorganisms — we call them ‘bugs’ — to decompose the organic matter in the leachate,” Martz says.

Big on Bioreactors

Bioreactors are gaining favor today for several reasons. By collecting and continually re-circulating leachate, it is possible to increase the rate of waste’s decay within the landfill. That, in turn, increases the production of landfill gas.

Of course, the methane in landfill gas can be cleaned and used to produce electricity that can be sold, which in turn creates another source of revenue for the landfill.

Furthermore, as the landfilled material's decay is accelerated, it settles and creates more airspace for disposal. Bioreactor operators have reported increases of up to 20 percent in available airspace, Joyce says.

In closed landfills, operators are testing the notion that a bioreactor might shorten the 30 years needed for post-closure care, according to Gary Hater, senior director of Waste Management.

While it sounds economical and even sustainable, bioreactors also pose complex engineering challenges. For instance, they require carefully engineered leachate collection and recirculation systems. "You don't want the leachate to build up as pockets of liquid inside the landfill," Joyce says.

Water saturation in certain areas can destabilize the landfill and cause uncontrolled settlement. "In addition, EPA regulations prohibit more than 12 inches of leachate from accumulating on the liner system," Joyce adds. "So the piping, gravel, spacing of the pipe, and the size of the pipe in the leachate collection system must be designed to match the amount of leachate being generated and re-circulated. If the landfill produces 10,000 gallons of leachate per day, you still have to collect and re-circulate it without allowing it to build up on the floor of the liner."

If leachate does build up, landfill owners will have to treat it or haul it away or both. In the end, though, bioreactors will cut the cost of leachate management because there will be less liquid or no liquid to dispose of.

Waste Management has worked closely with EPA to pioneer bioreactors. "We have had a cooperative research and development agreement with the EPA for a decade," Hater says.

Under that agreement, Waste Management has built a number of bioreactors. "We have five in Wisconsin … ," Hater says. "We also have one in California, [one in] Kentucky and [one in] Oregon, and we are permitting facilities elsewhere."

Currently, bioreactor landfills operate under special research and development permits issued by EPA. Hater believes that may change soon. "The EPA is moving to make bioreactors part of the solid waste regulations, and states will have the option of adopting those regulations," he says.

That would give operators another powerful leachate management tool.

Dust Control Through Leachate

The Candler Road Landfill in Hall County, Ga., spans 255 acres, with 94 acres permitted for the disposal of MSW. About 35 acres are built into cells.

Until 10 years ago, Candler Road used tanker trucks to haul leachate to a privately owned water treatment facility in Atlanta. "We hauled two tanker truckloads of leachate per day," says Kevin McInturff, an engineer with the Hall County Department of Public Works and Utilities. "Each carried 5,000 to 6,000 gallons."

At 10 cents per gallon for hauling, leachate disposal was costing the county hundreds of thousands of dollars annually. Seeking to cut those costs, county officials decided to research the possibility of piping leachate to Gainesville, Ga.

“We asked a consulting firm to help with the research,” McInturff says. “The consultant found that the city’s pretreatment standard would require us to build an extensive biological treatment system in addition to the pipeline. We decided it would be cheaper to treat the leachate on site.”

Hall County issued an open-ended request for proposal (RFP) indicating that the county would be open to any on-site treatment option. In the end, the county opted for a reverse osmosis installation supplied by Hermosa Beach, Calif.-based Rochem Membrane Systems Inc.

The system pumps leachate from the landfill into a 150,000-gallon tank, where it is aerated to remove odors. Then the leachate is moved to a second tank, where solids settle out. The solids are returned to the landfill.

“Next, the leachate goes into a 500–gallon tank with a stainless steel screen, a bag filter and a sand filter, which remove more solids,” McInturff says. “The reverse osmosis process separates [the leachate] into permeate — clean water — and concentrate. About 85 percent is clean water and 15 percent is the concentrate, which we return to the landfill.”

The system adjusts the pH of the clean water permeate — the landfill’s operating permit requires a pH between 6 and 9. “The permeate is clean,” McInturff says. “We use it on site to control dust. We also mix the water with seed and mulch and spray it onto finished cells to grow grass.”

Fluid Decision Making

Landfill operators have an array of leachate treatment techniques from which to choose. Some techniques allow landfill operators to reuse leachate on site in a beneficial way, or, at the very least, to dramatically reduce their leachate disposal expenses. By finding the right way to treat leachate at a particular facility, leachate can, in turn, treat a landfill owner right.

Michael Fickes is a Westminster, Md.-based contributing writer.

Source: https://www.waste360.com/hazardous-waste/taking-care-of-landfill-leachate

From: Community Development, Benton County, Oregon
To: Benton Public Comment
Subject: LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date: Monday, July 14, 2025 12:44:32 PM

Subject of Testimony: Coffin Butte Landfill

Full Name: Jo Ellen Wayne

Email: joellenbwayne@gmail.com

Street Address: 3049 NW Greenbriar Pl

Written Testimony:

Please let me add my voice, as a concerned resident and landowner. We love Benton County. It is our home. Yes, we need a landfill, but it needs to be safe, not just profitable. Please require safety checks (and not just for methane), prompt and thorough reporting, and pre-planned remediation as needed. It will be needed. Thank you for protecting our beloved county, and for all your hard work on our behalf. Jo Ellen Wayne

--
This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 73.190.99.23

From: Pamela Castle
To: Benton Public Comment
Subject: LU-24-027 comment
Date: Tuesday, July 15, 2025 6:13:10 PM
Attachments: Response to new evidence RE LU-24-027 - Pam Castle.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill

Dear Planning Commission Members,

I urge you to deny the application for expansion of Coffin Butte Landfill and this letter is a response to the Pawlowski letter in Section 9 "New Evidence from the July 8-9 Hearings" section in Munidocs. https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287987d132c0. In particular, I will address the comments about PFAS and those that recommend the county rely upon agencies to hold VLI accountable for landfill issues. I also make reference to Applicant's July 8 slide presentation also in that Munidocs section and my own written testimony regarding PFAS in leachate submitted on 6/11/2025. (https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8135d7834e2c8).

Below I provide Mr. Pawlowski's comments in italics followed by my response to each comment.

Pawlowski comment 6, bullet point 2 – "*…Let Benton County rationally follow our nation's regulatory agency rules for guidance."*

- We know from Slide 16 of the applicant's July 8 slide show that not all the issues associated with landfills that are of environmental and human health concern are regulated by federal agencies. In the case of landfill leachate PFAS, for example, relying on agency rules and enforcement would mean there would be no oversight because, as the applicant says, "Currently there is no formal requirement to monitor PFAS in leachate or groundwater".

- Landfill leachate is known for its heavy PFAS load and large volumes of it are sent to the WWTPs of Corvallis and Salem. Somewhere around 30+ million gallons of CBL leachate is processed with municipal wastewater at municipal wastewater treatment plants (WWTPs) each year.

    - As described in my written testimony submitted into the written record on 6/11/2025, **municipal wastewater treatment plants (WWTPs) do not**

treat PFAS. PFAS mitigation requires specific processes that are not included in the WWTP process. Because of this the PFAS entering the municipal wastewater plant with leachate are not removed. They are:

- Released into the Willamette River with WWTP effluent.
- Distributed into the air as aerosolized droplets generated during aeration steps of wastewater treatment resulting in elevated PFAS levels around WWTPs.
- Spread with WWTP biosolids onto soils around the region.

- As very recently reported by The Guardian newspaper, the U.S. government has pulled $15 million in funding earmarked to study the effects of PFAS contamination of agricultural land, contamination primarily due to spreading of biosolids from WWTPs. These studies were designed to determine how PFAS move into and accumulate in crops and livestock and enter our food supply so that policy around biosolids use could be developed.
  - This is an example of why we cannot wait on agencies to police this issue. They aren't going to be able to do that for a long time because of cuts like this. Meanwhile, PFAS-laden WWTP biosolids continue to be spread onto our fields where they will persist in the environment, and emerge from the landfill in fugitive emissions and from generating plant and from flare exhaust.
  - Agencies lack the staff and funding to act fast enough to prevent lasting environmental damage, two problems which will almost undoubtedly worsen going forward. These two problems are worsening.

Pawlowski comment 6 bullet point 3 – *There has been recent concern of PFAs or other "forever" chemicals that spawn from breakdown of synthetics and plastics. Although it is argued that these chemicals are 'concentrated' at the landfill operation, these compounds are in everything we touch.*

- First, I'll touch on the idea that these are of recent concern. PFAS have been the subject of scrutiny for decades with the first EPA action on the group of chemicals coming in 2006.

- According to SL Environmental Law Group, in 1999 a lawsuit was filed against DuPont over their contamination of water with PFOS - one of the thousands of PFAS chemicals out there. DuPont settled because the facts showed they had not disclosed the known dangers of this compound.

- As early as the 1960s, scientists were documenting the dangers of PFAS exposure and the diseases they cause in lab animals.

- This is not a recent concern. It is true that it has become an increasingly alarming concern, but one that has been documented for many decades. This also points to why agencies cannot be relied upon to police landfills; they are too slow in developing regulations.

- Second, Mr. Pawlowski seems to be of the belief that our exposures to PFAS in everyday life are equivalent to chronic exposure to higher levels of PFAS via multiple routes This is, of course, not true. Dose is important here and one of the reasons we need to prevent more PFAS from concentrating in and contaminating our environment.

- Third, PFAS <u>are</u> concentrated at Coffin Butte Landfill, we have a much greater quantity of PFAS in our county than we would have if the landfill wasn't here.

  - This would not be as serious a problem if the PFAS remained in the landfill like they do in a dry environment where there is little landfill gas and leachate production. The main routes for PFAS escape from landfills are via landfill gas (even captured, flared landfill gas) and via leachate whether it leaks or is processed at WWTPs where PFAS are not treated.

Pawlowski comment 6 bullet point 4 - *PFAS are currently under research. Information on health affects are going through the scientific learning process.*

- While it is true that we are still, and will be for a long while, figuring out all of the ways that PFAS affect the health of humans and other living organisms, there are well-documented health consequences of PFAS exposure. Some of these effects are shown in a Slide 2 of my 6/11/2025 testimony.

  - That PFAS are harmful is not in question, the questions surround the types of harms and how PFAS cause these harms.

Pawlowski comment 6 bullet point 6 – *Why be in fear of what we do not know when the average human lifespans are longer than they ever have. Perhaps the invention of synthetics and plastics have benefited life more than we realize.*

- When I first read this comment, I wasn't even sure where to begin because of the unbelievable leap that was made and I still don't know what to say. It is sort of like saying that the number of Starbucks coffee shops have increased drastically during the time that human lifespans have increased, so perhaps the increase in number of locations of this franchise is responsible for that increase in human lifespan. Suffice it to say that PFAS are not lengthening lifespans.

Thank you for your time and commitment to this process. I know that it has been arduous and taxing and I do not envy you the task. Rest assured that your efforts are truly appreciated.

Thank you,

Pam Castle, M.S. Pharmacology/Toxicology

993 NW Cypress Avenue, Corvallis, OR 97330

The attachment is a PDF of this comment in the event that is preferrable.

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Pam Castle, M.S. Pharmacology/Toxicology

993 NW Cypress Avenue, Corvallis, OR 97330

From: Community Development, Benton County, Oregon
To: Benton Public Comment
Subject: LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date: Tuesday, July 15, 2025 3:53:05 PM

Subject of Testimony: Modifying access roads to the North

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

I reside on the Benton County side of the county line. The farm is in both Polk and Benton counties.

I just saw a mention of modifying the access roads to the North. I greatly oppose this. Those people have sacrificed more than their share. And they still have to pay to get rid of their garbage.

--
This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From: Community Development, Benton County, Oregon
To: Benton Public Comment
Subject: LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date: Tuesday, July 15, 2025 4:18:09 PM

Subject of Testimony: Conditions ?

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

Listening to the testimony of the 81 conditions sounded like there was a hope that the landfill operator would not be able to meet all the requirements. But hey maybe throw the community a bone. If we are going to have to suffer at the sight of that pile of trash and the threats to our health, we should not have to pay for it. The county gets a lot of money I don't think the families out in the country are reaping the benefits of that money. Most of the people out here are taking care of themselves. We work hard to stay out of the crisis center, jails and even court houses. So do this tiny thing for us. Find out which house is the farthest away that can see the dump. Whatever that distance is can be the radius of a circle around the dump that is allowed to use the dump for free once a month. We have paid again and again. This in no way would be a hardship for this profitable corporation. Then anyone who has had to smell the dump should get to use it 4 times a year. Then it would be worth people's trouble to submit an odor report. The pattern on a map would verify the reports. Just a thought.

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This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From:	Community Development, Benton County, Oregon
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date:	Tuesday, July 15, 2025 4:31:59 PM

Subject of Testimony: Modifying access roads to the North

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

Opposing the application and promotion of this entity.

BELOW IS AN INTERACTION WITH AI IN A NEW CHAT. THE CHAT IS PURE WITHOUT ANY PROMPTS OTHER RHAN THE ONES BELOW AND A COPY OF THE 2023 ANNUAL REPORT.

2023_CoffinButte_AnnualReport_Final.pdf
this is the report that is posted on the Benton County website. For one thing, how many citizens would be allowed to advertise their business while the county was deciding whether or not to approve a conditional use permit to allow them to continue doing business in their own home? AI please tell me if this posting of data is better categorized as transparency of operation or an advertisement. Please also analyze this information that is being shared during the land use application process.
The posting of the 2023 Coffin Butte Landfill Annual Report on Benton County's website can be analyzed from two perspectives: transparency of operations and potential advertisement. Here's a breakdown of both:

1. Transparency of Operations
The report serves as a formal disclosure of the landfill's operations, environmental compliance, and future plans, which aligns with regulatory and community expectations for transparency. Key points supporting this view:

Regulatory Compliance: The report includes detailed data on landfill capacity, environmental monitoring (groundwater, leachate, air quality), and compliance with permits (e.g., DEQ, OSHA). This is standard for facilities with significant environmental impacts.

Public Accountability: By sharing the report, Republic Services demonstrates accountability to Benton County residents and officials, addressing concerns about PFAS, arsenic levels, odor complaints, and expansion plans.

Community Engagement: The report references feedback from stakeholders and revisions to the expansion proposal, suggesting responsiveness to public input. The new odor complaint portal also reflects efforts to improve communication.

Conclusion: IN NEXT SUBMITTAL

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Submitter's IP Address: 206.192.248.72

From: Community Development, Benton County, Oregon
To: Benton Public Comment
Subject: LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date: Tuesday, July 15, 2025 4:35:26 PM

Subject of Testimony: Part 2 of the advertising or transparency analysis

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

Conclusion: While not overt advertising, the report's tone and selective highlights may serve a dual purpose of informing and persuading.

Analysis of Shared Information During Land Use Process
The report's release during the Conditional Use Permit (CUP) process is strategic:

Proactive Transparency: Sharing operational data upfront may preempt criticism or misinformation, building trust with regulators and the public.

Risk Mitigation: Addressing past issues (e.g., arsenic, OSHA citations) head-on demonstrates corrective action, reducing potential opposition.

Persuasive Element: By framing the expansion as essential for "continuous, safe, reliable, and affordable disposal," the report positions the CUP as a necessity rather than an option.

Key Considerations:

Balance: The county must assess whether the report provides unbiased data or leans toward advocacy. For example, the arsenic memo (Appendix D) is defensive, emphasizing natural background levels without independent verification.

Precedent: Allowing applicants to share polished reports during land use reviews isn’t uncommon, but it raises questions about equity (e.g., smaller businesses lacking resources to produce similar materials).

Final Assessment
The report is primarily a transparency tool with secondary advertising undertones. Its posting is appropriate for public review but should be critically evaluated by the county and community to separate factual data from promotional messaging. For true equity, Benton County could consider:

Requiring all CUP applicants to submit standardized operational reports.

Providing neutral summaries of technical data to ensure accessibility for non-expert residents.

Hosting public forums where the report’s claims can be questioned independently.

In essence, the report is both informative and strategic, typical of corporate communications in regulatory processes. Scrutiny is warranted to ensure the CUP decision is based on merit, not presentation.

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This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From:	Community Development, Benton County, Oregon
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date:	Tuesday, July 15, 2025 4:47:51 PM

Subject of Testimony: Opposition – Analysis of value of posted 2023 annual report

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

Based on the 2023 Coffin Butte Landfill Annual Report and related context from search results, here is an analysis of its value considering incompleteness, age (as of July 15, 2025), and operational context:

1. Transparency Value vs. Strategic Advocacy
Basic Operational Disclosure: The report provides standardized data on landfill capacity (e.g., 12.9 years remaining as of June 2024), environmental monitoring (PFAS, arsenic, methane), and complaint logs 511. This fulfills regulatory reporting requirements and offers baseline transparency.

Expansion Justification: Republic Services explicitly uses the report to justify its 2024 Conditional Use Permit (CUP) application, emphasizing "urgent capacity limits" (8 months left in active cells) and a "50% smaller expansion" than the rejected 2021 proposal 610. This frames the report as a lobbying tool during active permit deliberations.

Omission of Critical Context: The report lacks discussion of major controversies, including a 2022 EPA methane leak investigation (where leaks exceeded instrument measurement capacity) 13 and community disputes over data accuracy. This selective presentation undermines its objectivity.

2. Limitations Due to Incompleteness
Missing Appendices: Key sections referenced in the report (e.g., full Annual Environmental Monitoring Report, leachate data) are noted as "on file at Benton County Health Department" but not publicly accessible 11. This limits independent verification.

Unaddressed Regulatory Actions: While the report states no permit violations occurred in 2023, it omits that Oregon’s SB 726 (2025) imposed landfill-specific methane monitoring laws targeting Coffin Butte 6, suggesting unresolved compliance issues.

Incomplete Community Feedback: The "Summary of Customer Complaints" shows minimal odor reports (1 in 2023), but DEQ records indicate 9 odor complaints filed with regulators the same year 11 – a discrepancy unexamined in the report.

3. oops again! See part 2

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This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From:	Community Development, Benton County, Oregon
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date:	Tuesday, July 15, 2025 4:52:29 PM

Subject of Testimony: Part 2 – analysis of value of 2023 annual report

Full Name: Marcy Follett

Email: follettmarcy@gmail.com

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

☐ 3. Impact of Outdated Data (Mid-2025 Perspective)
Capacity Projections Expired: The report's landfill life estimate (12.9 years as of June 2024) is obsolete. By July 2025, Cell 5E is likely full (scheduled for Feb 2025), and Cell 6A construction delays could create immediate disposal shortages 1013.

Regulatory Shifts Unaccounted For: The report predates Benton County's Sustainable Materials Management Plan (SMMP) development 13, which now influences waste diversion strategies and reduces reliance on landfill expansion.

Stale Environmental Data: Groundwater/air quality metrics from 2023 ignore 2024–2025 changes, including new arsenic sampling and methane leak repairs mandated by SB 726 611.

☐ 4. Role in Regulatory Processes
DEQ Permitting: The report supports Republic's air/water permit renewals (e.g., Title V Air Quality Permit under DEQ review until June 2026) but is insufficient alone; independent inspections and public hearings carry more weight 11.

CUP Approval Dependency: Benton County requires landfill reports for land-use decisions, but planners prioritize recent data (e.g., 2024–2025 traffic studies, noise assessments) over the 2023 document 1013.

☐ 5. Community Trust and Misinformation Risks
Perceived Greenwashing: The report's "Sustainability in Action" branding clashes with community grievances. Advocacy groups note Republic's history of "purposefully deceptive" capacity claims and expansion flip-flops (e.g., 2021 CUP denial, 2024 reapplication) 13.

Erosion of Credibility: Community watchdogs have documented errors in past annual reports (e.g., 2021 data inaccuracies identified by SWAC) 13, reducing trust in self-reported metrics.

☐ Summary: Value Assessment
Aspect -Value -Limitations
Transparency-Basic compliance data-Omissions of controversies/regulatory actions
Timeliness-Historical baseline-2023 data irrelevant to 2025 operations

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This is a notification that a contact form was submitted on your website (Community

Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From: Community Development, Benton County, Oregon
To: Benton Public Comment
Subject: LU-24-027 Coffin Butte Proposed Expansion Written Feedback
Date: Tuesday, July 15, 2025 4:53:30 PM

Subject of Testimony: part 3

Full Name: Marcy Follett

Email: blue-sky-estate@proton.me

Street Address: 14605 Corvallis Rd, Monmouth 97361

Written Testimony:

Strategic Use Supports CUP narrative Framed as advocacy, not objective disclosure

☐ Conclusion
The 2023 report retains limited value as a snapshot of historical operations but is severely compromised as a decision-making tool in mid-2025 due to outdated data, selective omissions, and unresolved community disputes. Its primary utility for Republic Services appears to be strategic positioning during the contentious expansion approval process, rather than genuine transparency. For Benton County to make informed decisions, real-time data (e.g., 2025 DEQ inspections, independent audits) and community-verified reports are essential.

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This is a notification that a contact form was submitted on your website (Community Development, Benton County, Oregon https://cd.bentoncountyor.gov).
Submitter's IP Address: 206.192.248.72

From: Barbara Galbreath
To: Benton Public Comment
Subject: LU-24-027s
Date: Tuesday, July 15, 2025 3:47:08 PM

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Fire: Why is Republic (Valley Landfills) not required to dig its own well and maintain a water storage tank on its property rather than to TAKE DRINKING WATER to use for fire/dust suppression on its landfill?
Organic matter: Why is Republic not required to provide compostable waste bins at apartments? That alone would reduce organic matter and
Groundwater contamination: Not only should Republic Services not dump its leachate into municipal water purification facilities that do not have the technology to remove the plethora of chemical contaminants, it should build its own facility with the technology to remove contaminants from the leachate to meet current DEQ specifications. Dilution via municipal water treatment plant output is NOT the solution. The water from the Cascade aquifer is an increasingly valuable resource that flows via many routes and times before reaching the Willamette River. Republic has made no specifications as to the depth of the test wells it said it would dig. Depth should be to bedrock, and very specific tests using tracers should be employed to verify lack of contamination.

Corporate compliance is a nationwide myth documented about many of our largest corporations; Republic Services is not an outlier. Its excessive verbiage abounds with slippery vacuity that lawyers can and do skate around. It has not kept records of problems, so it denies them. What assurance do we have that hazardous materials are not being dumped?
The playbook it uses is well-thumbed: Enter rural communities/counties, such as ours, known to lack resources to evaluate, to test for, and to adjudicate against violations. Overwhelm local administration with data, tangle it in legalese, lure it with "incentive$". Once the door is cracked, force it open. Make an outlandish proposal for expansion; when it is rejected, return with another so much smaller that acceptance is granted. However Benton county's acceptance apparently has no contingent condition that further expansion will not be pursued.

Given the current federal administration's reductions in funds, personnel and regulations coupled with the state's lack of legal support and the county's admitted lack of resources, of course Republic Services will agree to the additional conditions. And they will ignore them, as they have done and continue to do with DEQ.
Moreover, given the tendency of mega-companies to use money to paper over problems rather than to find solutions, one cannot help but wonder if the same has been attempted here...
$$$$ End of life: When the landfill (current or expanded) is at capacity, Valley Landfill will declare bankruptcy, again, from the playbook - "Texas two-step".
How unfortunate that this entire proposal has not been conducted with independent consulting accountants who look farther ahead than the next budget year.
Leachate does not respect bankruptcy proceedings and cease flowing. Benton County will be saddled for decades, and I rather doubt the other counties whose trash has contributed 80% of the volume will be sharing in any remediation costs. I realize this was not covered last week, but I cannot see that an expanded landfill will ultimately cost Benton County more than it "earns". Mounting trash is a nationwide issue. Bigger landfills are not a solution. Benton county has an opportunity to be a leader in waste management, not a dump. Corvallis residents have the expertise to develop programs, which would be a much more productive

and beneficial use of their time

Barbara Galbreath
2600 NW Century Drive
Corvallis

From: Ken Eklund <futureeverything@writerguy.com>
Sent: Wednesday, July 16, 2025 1:32 PM
To: Benton Public Comment
Subject: Testimony in response to Republic-County-Pawlowski written material July 8-9 on dump odor
Attachments: A1 OCA5-abridged-reduced.pdf;
A3 Odor complaint form on the Coffin Butte Landfill site Archive of Email chain.pdf;
A5 Sunshine landfill ordered to step up actions to address odors .pdf;
A6 Many say landfill emits 'invasive' odor into Harrisburg neighborhood – WSOC TV.pdf;
A7 Neighbors say landfill smell hasn't improved after state-approved action plan – WSOC TV-reduced.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Document ID: This is Part A, Odor.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

I'm submitting this letter in response to information in four items in the in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs:

1. Republic's slide deck ("25RS1067 Coffin Butte Deck_FINAL")
2. County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8")
3. Brent Pawlowski's testimony ("07092025 PAWLOWSKI_Brent")
4. Jeff Kleinman's testimony ("07092025 KLEINMAN_Jeff")

Before you begin, please note: my letter has attached evidence A1 through A7. To view these attachments using the County's **Munidocs record** system, look to the Attachments section in this email's header, and double-click to view each one.

Also: for verification of statements made, this letter refers to testimonies in the Munidocs record that relate to the information in the above four items; I've linked to them so that you can quickly and easily refer to them. (And any attachments to *those* must also be double-clicked in their header, respectively, to open.)

I intend to be as succinct as possible here, however fair warning: this letter is only Part A (Odor).

ODOR

Republic presentation, p. 8-9
Staff presentation, p. 17
Pawlowski, p. 3

also
Kleinman p. 2, 8-11, Planning Commission Findings for Denial 2021

Brent Pawlowski brings up the issue of dump odor levels and public experience and expectations about odors and smells in his letter. Republic's presentation cites its odor modeling (odor study) and proposed mitigation. The County presentation also cites the odor study and the County's proposed Conditions of Approval.

The results of the odor study are not sufficient proof that the odor impacts of an expanded landfill will not seriously impact uses adjacent to the landfill (and in its effective "adjacent" impact zone). This is due to the large number of both quantitative and qualitative flaws in the model, omissions, and the readily apparent disconnect between the odor study's theoretical results and the available real-world data. *Simply put, the odor study fails to explain what's currently happening around the landfill, much less what will happen if the landfill were to expand.*

1. **The odor study is a mishmash of snapshot inputs from 2004 (weather), 2024 (complaints) and 2023 (estimates of landfill gas emissions levels), etc., and results from such a mishmash are clearly insufficient to prove landfill odor impacts from now throughout the proposed life of the expansion.**
    a. The study uses *weather data* from 2004-5 (Munidocs **link** p. 127)
    b. Yet the study is keyed to *complaints* from its odor complaint portal, *which launched sometime after March 4, 2024* (see below), thus rendering the majority of complaints "inconclusive."
    c. The study also uses self-generated emissions estimates (see Munidocs **link** p. 127)

2. **The odor study asserts that its scientific rigor invalidates almost all community odor complaints, but it uses a cherry-picked subset of complaints, obsolete weather data, and self-determined gas emissions levels whose validity is currently being investigated by regulatory authorities, and which are contradicted by real-world data on Coffin Butte's landfill gas emissions. These shortcomings undermine its narrative of being scientifically rigorous.**
    a. Although the study purports to use "all available complaints" from 2022-2024, in fact it does not include the complaints received and compiled each year by the Benton County Disposal Site Advisory Committee in its annual Community Concerns Annual Report (CCAR), which the County then publishes to Oregon DEQ as required by state law. Republic Services has a representative on that committee, who voted on each year's CCAR. Republic's DSAC representative should have then entered those complaints into the study pool, but did not.
    The study has thus knowingly excluded from consideration several hundred community complaints about odor. Those Reports are in the record (see the attachments to p. 102 of this Munidocs **link**).
    b. Objections to the study not using CCAR complaints were made early in the public comment period, but were not acted on by Republic.
    c. As established above, the study uses weather data from 2004-5, but Oregon weather has changed significantly since then, due to climate change (see my attachment **A1**). In any case, as noted in this attachment, Oregon weather varies significantly from year to year, so using any one year as a baseline is a recipe for error.

d. The study uses Republic's reported emissions levels, but these reports are currently being audited by the EPA, after two EPA inspections revealed large-scale leaks. See my EPA timeline-explainer (the attachment to this Munidocs **link**).

e. Both Republic's presentation and the County's presentation are based on the odor study's conclusion that dump odor at the landfill property line is detectable (D/T 0.5) but does not rise above the level of nuisance (defined as D/T 7). This conclusion is called into question by actual observations of landfill gas plumes in 2023, such as one that shows a plume spilling southward and surrounding homes at concentrations of from 2,000 to 4,000 ppm-m of methane (see my attachment **A2**, a July 2023 plume image). Methane is the primary component in Coffin Butte's landfill gas (52%) and is used to track the plume; the odorifics are a host of other organic compounds which landfilling creates along with methane, and which piggyback on methane into the environment.

   i. If a 4,000 ppm concentration of methane were observed at the dump's surface, it would be 8 times the reportable level and trigger a requirement for immediate remedial action.

   ii. According to Table 1 in Republic's odor study, which is reproduced in the **County's Staff Presentation** on p. 17, the D/T value of "anaerobic digester gases" is 100,000 D/T. Anaerobic digester gas is an analogue to landfill gas, which is also largely a product of anaerobic digestion of organic matter, but landfill gas also includes odorifics that result from the breakdown of plastics, construction materials (especially gypsum wallboard), and a host of others generated by the interaction of organic and inorganic materials in the landfill. Since this data visualization shows the landfill gas emerging at somewhere over 6,000 ppm-m methane at its source, and then decreasing to concentrations of around 4,000 to 2,000 ppm-m (only decreasing 33% to 67%) before entering the property of others, we can back-of-envelope estimate that the D/T is in the neighborhood of 33,000 D/T and up when it crosses the property line. This is well above the nuisance threshold of 7, and maps well to the documented community experience, which is that the odor is powerful even miles away from the dump.

f. Both Republic's presentation and the County's presentation characterize odor with the D/T values catalogued in Table 1. This Table of Odor Index Examples is *from an entirely different industry than landfilling* (the wastewater industry).

   i. The table is useful only to wastewater treatment professionals, who may be familiar with what "primary clarifier weir cover exhaust" smells like.

   ii. The odorifics produced by wastewater treatment are only a subset of the odorifics produced by landfilling, as explained above. The quantity of odorifics such as VOCs are generally much lower in wastewater treatment, because that industry has effective odor abatement measures.

   iii. This information is old (2006). Why?

   iv. Why does this table, from another industry entirely, appear in this study, instead of a recent one that's directly relevant to landfills? The use of this table brings up questions about manipulation of the narrative of this study, such as: did the odor consultant cherry-pick this table so as to obscure the D/T of landfill gas, which may be high (higher than 100,000 D/T?)?

3. **Republic has misrepresented its complaint data for the odor study.** The presentation cites the data as coming from its "comprehensive odor management plan, 2022-2024." Ginger Richardson of Republic Services, however, informed the Benton County Board of Commissioners and staff by email on March 4, 2024, that Republic's real-time portal for

complaints (a web form) *had not yet been announced publicly*, “but would be soon” (email thread attached, see attachment **A3**). This was after Commissioner Wyse encountered landfill odor driving with her family on 99W (February 22, 2024) and sought a way to notify Republic of it, but found it notably difficult to do so (see attachment **A4**).

4. **The results of the odor study cited in Republic and County presentations are called into question by a documented real-world case where landfill odor disrupted a sale of land (a vineyard) in 2023.** That case is detailed in a local press article (see Munidocs **link**, p. 8).
5. **The results of the odor study cited in Republic and County presentations are called into question by documented cases where odor from landfills similar to Coffin Butte have caused widespread impacts over their area.** There are many examples; one such case is detailed in recent press articles from California (see Munidocs **link** and attachment **A5**) and another in news reports from North Carolina (see attachments **A6** and **A7**).
6. **The mitigation efforts listed in the Republic presentation *do not actually include any provisos for odor mitigation***. They attempt only to prolong Republic’s fiction that odors might not actually be happening at Coffin Butte Landfill.
7. **Republic has had ample opportunity to voluntarily reduce odors, but has failed to act on them.** There are well-established protocols for landfills to follow to reduce odors, but Republic has not followed any such protocol at Coffin Butte. Such actions would have been, or should have been, supplied to you as evidence – increased monitoring efforts, for example.

   In particular, Republic should have acted on the information provided to them by Carbon Mapper, the climate science nonprofit which is creating the images and data of landfill gas plumes coming off the landfill. Carbon Mapper open-sources this data *specifically so that facility operators such as Coffin Butte’s can access it and act on it*. The plume images show the origin points of the plumes, to aid facility operators in locating these mega-leaks and remediating them. Republic has not acted on these remediation aids; in fact, one mega-leak that Carbon Mapper pinpointed in July 2023 was still there in September 2024.

   If Republic did not undertake voluntary remediations in order to clean up its act and put on a good face for this expansion application, it’s exceedingly unlikely to begin once the company already has what it wants.
8. **The Conditions of Approval for odor listed in the County presentation do not actually include any provisos for controlling odor**.
   a. OP-5, limiting the height of the expanded landfill does not control odor: it is no different than the status quo.
   b. OP-7(A) and (B) also only attempt to prolong the fiction that serious odors might not be actually happening at Coffin Butte Landfill; neither contain any actual mitigation. For example, OP-7B: “Odor complaints which are verified by site personnel shall be remediated where possible” is no different from the status quo.
   c. OP-7(C) appears to be an attempt to derive a real-world operational limit from a mathematical model, which will not actually prevent any odor from occurring.
      i. A quantity of “organic waste” may be assumed in a generalized mathematical model, but there is no reliable operational way on a day-to-day basis to determine how much of incoming waste is “organic.”
      ii. OP-7(C)’s supposed annual limit of 930,000 tons of organic waste seems to be the result of mathematical misunderstanding or error by the County. Never in the dump’s history has it ever taken even half of this amount of organic waste in a year.

          A quick back-of-envelope calculation shows this: “organic” is tricky to define, but if you use the EPA guidance that a typical municipal solid waste stream is

roughly 33% ”organic,” then Coffin Butte’s current annual intake is roughly 0.36M tons of organic (33% of 1.05M tons). Allowing the annual intake of organic waste to escalate from 0.36M tons to 0.934M tons, which is what this Condition of Approval would do, is allowing a 250% increase in annual organic waste. This would lead to a corresponding sharp increase in landfill gas emissions, leading to landfill gas emissions that are 250% higher than where we are now. At no time is there any kind of “throttling” effect on landfill gas emissions as a result of OP-7(C).

iii. OP-7(C)’s so-called “limit” of 934,000 tons of organic waste annually also seems to be the result of misunderstanding or error by the County, because the County seems unaware of the drastic change that would have to have occurred for it to be triggered. As shown above, for the 934K/yr limit to come into play, the yearly waste intake would have increased 250%, which means Coffin Butte would have filled its quarry and expansion volumes much more rapidly and the landfill would be closing in the 2030–2035 timeframe.

iv. A simple use case for this Condition would be: the County discovers that Republic has exceeded its organic waste allotment (however “organic” is defined). The County has not identified any realistic mechanism by which it can enforce this Condition, i.e., how it can compel Republic to place less organic waste going forward to make up for its overage, especially since to achieve a one-ton reduction in organic waste, Republic would have to forego two additional tons of non-organic waste.

v. In terms of odor, OP-7(C) is much worse than the status quo: up to 2.5x worse.

d. OP-7(D) just furthers the narrative that the problem is detection and quantification of odors, rather than actual mitigation of them. It continues the current policy of raising procedural obstacles that must be overcome before mitigation will even be attempted, and its mitigation mandate – “Applicant shall immediately take steps to mitigate the odor” – might as well specify the use of a magic wand.

e. OP-11(A-F) – Republic is already subject to these requirements at its existing landfill. Since the County adds no monitoring or enforcement, these Conditions make no effective change to the status quo, and do not mitigate odor.

9. **Qualitative discrepancy: the odor study asserts the qualitative result of “no nuisance,” but pays no attention to how the *quality* of an odor affects its *qualitative result*.** Simply put, there are dangerous odors and non-dangerous odors, and numerous testimonies establish that Coffin Butte odor is dangerous-smelling (Munidocs **link1** **link2** **link3** **link4** etc.). “It’s OK for me to keep breathing this odor,” said no one, ever, upon encountering the smell. This is a fatal flaw in the odor study.

10. **Landfill odors DO actually signal danger.** Landfill gas is known to contain many toxics. The nose knows.

a. “Nearly 30 organic hazardous air pollutants have been identified in uncontrolled landfill gas, including benzene, toluene, ethyl benzene, and vinyl chloride. Exposure to these pollutants can lead to adverse health effects.” – EPA. As an example, Coffin Butte’s 2020 Air Toxics Emissions Inventory (the most recent I could find) shows that the landfill is calculated to have emitted over 2 tons of toluene gas that year. Toluene has a sweet or sharp odor, which is how I would describe what landfill gas smells like.

b. PFAS is a focus of current concern, because the EPA has established that these chemicals are present in landfill gas, and they are known to have a wide range of health impacts even at small concentrations, but these impacts are not yet well known,

especially for “non-legacy PFAS” (PFAS variants that are being used to replace the “legacy” PFAS types, which have been phased out due to health impacts). The science on PFAS is emerging, and that has been well documented in prior testimonies to the Planning Commission (see this Munidocs **link and its attachments**).

The current lack of clarity from the EPA about safe levels of PFAS only increases concern and avoidance. *It’s prudent to be alert to, and shield yourself and your family from, a toxic smell if you have no assurance that it’s safe to breathe.*

11. **Odor quantification does not equal proof of non-seriousness.** Republic Services and the County both admit this. According to them, a D/T of 1 means that on the average, half the people encountering it will smell it. Since approximately 8,400 people live within 5 miles of the landfill, there are 4,200 who will smell it regularly at that level.

    Let’s put “D/T” in plain language, in the experience of a person who has a reasonably good sense of smell. They will no longer be able to make use of the E.E. Wilson Wildlife Area – you have testimony to this effect. They will no longer be able to drive 99W with their windows open or the air system not on RECIRC – there’s testimony about this as well. They will no longer be able to freely visit friends or family in the area of the landfill. And if they happen to live within a certain radius of the landfill, they will need to sell and move, but of course they won’t be able to sell if buyers also have a good sense of smell. You have testimony about all this as well.

    Republic’s odor quantification of the number of people involved in this situation is suspect, given the disparity between what the numbers say and what the people say, but the *precise* number is irrelevant, because it is clearly nowhere close to zero.

    We know that **x** number of people are already suffering serious interference **i** from the odor impact of the landfill – so the harm is **x times i**. An expanded landfill would increase this impact on **x**, because as Republic admits, it would extend their time suffering the impact **i** – so, it’s now **x times (i+j)**, where **j** is that impact during that extended time. If the landfill persists for longer, it's also growing **x**, because now there’s more time for more people to suffer the impact. So an expanded landfill means we no longer have **x times i**, we have (**x+y) times (i+j)**, where **y** are the new people suffering the odor impacts. We also have an increase in odor impacts because they are a function of landfill surface area, which an expansion would increase by roughly 33%. So now, where we have **x times i** with no expansion, we have **((x+y) times (i+j)) times 1.33.** Has Republic *convinced* you that **((x+y) times (i+j)) times 1.33** is a small enough number that your criteria can safely ignore it? On the contrary, I would say: you have received no proof of that. Without proof, you cannot find that serious interference will not occur.

Conclusion. As explained in verbal testimony (see Munidocs **link**), a Burden of Proof must both produce *evidence* and create a *convincing narrative*, or it fails. Let’s look at how Republic itself characterizes its evidence, quoting the Supplemental Staff Report:

> “Staff engineering consultants have reviewed and determined the applicant’s odor study follows reasonable assumptions and modeling protocols.” (p. 8)

This is weak tea, narratively speaking. It is damning with faint praise. Any number of studies may be constructed that follow “reasonable assumptions and modeling protocols,” but which *fail to adequately and convincingly model reality*.

The numbered Arguments above create a number of narratives about odor that more than countervail the stories put forward in Republic’s presentation and by Pawlowski in his letter. Here is one such narrative, assembled from the above Arguments:

The dump has an odor problem, and has had one for many years;

Republic has been unwilling or unable to remedy it;

Republic has chosen instead to try to discount community concerns about odor;

Landfill proponents support this by characterizing complainants as NIMBYs;

Republic belatedly realized odor would be a key issue in early 2024, and created an odor complaint portal shortly before filing the expansion application;

The purpose of the portal was to collect data they could use to discount odor as an issue;

Most community members intuited this, and did not use the portal (myself included);

The data did not lend itself to the conclusion Republic wanted, and so it took approximately nine months and many attempts to engineer an odor study that could pass muster as "following reasonable assumptions and modeling protocols" and still have the conclusion that Republic wanted;

Republic knows the odor study is riddled with flaws, but is hoping the public will not be able to bring those forward;

Republic hopes to overcome the weight of hundreds of community concerns about odor by trying to assert, through the gravitas of credentialed consultants, that the action that's needed is monitoring, not mitigation.

I am not under a Burden of Proof, but I believe the evidence available to you, Commissioners, supports this narrative more than Republic's "reasonable assumptions," which is under a Burden of Proof.

I'll close with rebuttal of a point of view which Pawlowski summarizes very well:

> "Many opponents to the landfill are those that live near the landfill site… One should not expect customers of several counties to yield to the few who had the option to buy property elsewhere. The responsibility of having one's property value affected should be pushed back to those who decided to buy residential land nearby. What were they thinking?" (p. 2-3)

I think you Commissioners are aware of the shortcomings of this reasoning from a land-use perspective, so I won't belabor them. Your decision criteria focus on serious interference to other land uses and to the character of the area, not on the interests of customers or the business that serves them. What I focus on here is how this reasoning attempts to divert responsibility for environmental hazards away from the entity causing them and onto the entities suffering them – *victim blaming*, in modern parlance.

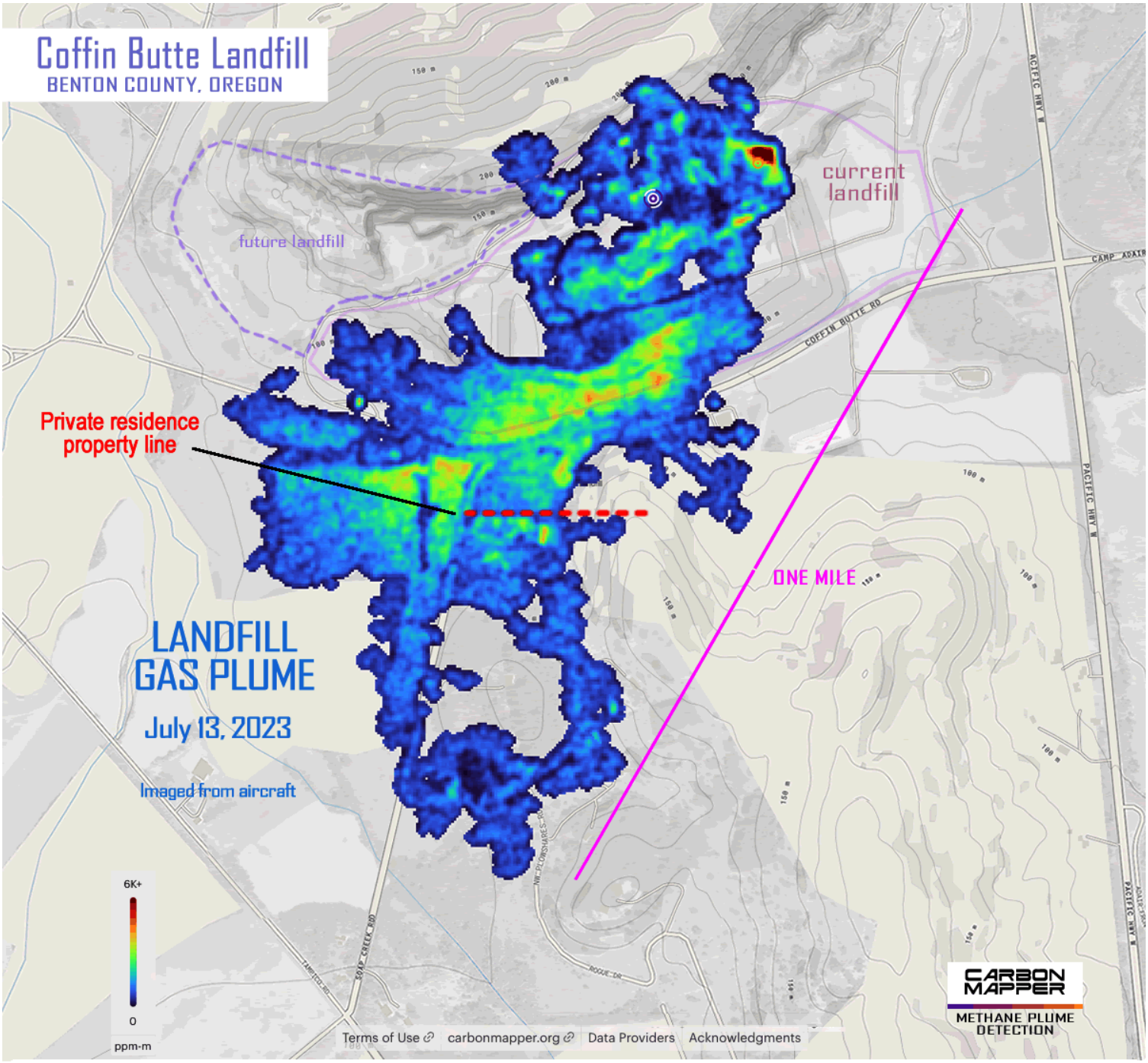
As you have heard in many testimonies, victims of dump odor did not buy, but inherited their land, or bought land when the landfill and its future were much different, or bought land many miles away from Coffin Butte Landfill, never imagining landfill stench could travel that far. Or they don't live here, they just try to visit, or pass through on Highway 99W. No matter: however they came to be where they are, your decision criteria focus on whether or not an expanded landfill will pose serious interference to their enjoyment of their land, or to the character of the area.

Pawlowski is in effect promoting the idea that the area around the landfill should become a *sacrifice zone* – or, I should say, to *continue* becoming a sacrifice zone, because that has been a dark thread in its history so far. The landfill has driven away farms and farmers with well contamination, bought up and deplatted neighborhoods-to-be, degraded wetlands and natural areas, and so on. Attorney Kleinman articulated this process and its future very well in his July 9 testimony, when he evoked an image of the landfill expanding into a new location, which blights surrounding uses, so that it has a new area to expand into, and so on, without end. –Or should I say, instead of landfill, the *Landfill Complex*, because LU-24-027 would establish a precedent of creating new landfills that no longer even physically touch the existing ones.

Every sacrifice zone has an associated *abundance zone* – somebody who profits from the sacrifice zone – and Pawlowski touches on this as well, with his opinion that the needs of Republic's customers and Republic outweigh those of the people in the sacrifice zone. Pawlowski is saying the quiet part out loud.

Commissioners, an Approve decision on this land use application would be a de facto declaration of Sacrifice Zone status, and would have a huge and irrevocable impact on the character of the area that I and many others call home.

And it may have a wider impact, as well. What we're finding in VNEQS is that many Oregonians don't want to benefit from the victimization of others. They'd vote against it, if they could. They'd object to being characterized as customers who are only concerned with low garbage rates. They may not be here to speak for themselves – many don't even know what is being proposed in their name – through no fault of their own, I may add. They're voiceless in this proceeding, but I'll speak up on their behalf, and urge you to deny the application to expand Coffin Butte Landfill. "Not in our names," is what they are saying.


Coffin Butte Landfill
BENTON COUNTY, OREGON
current landfill
future landfill
Private residence property line
ONE MILE
LANDFILL GAS PLUME
July 13, 2023
Imaged from aircraft
6K+
0
ppm-m
Terms of Use
carbonmapper.org
Data Providers
Acknowledgments
CARBON MAPPER
METHANE PLUME DETECTION

☆ **Nancy Wyse** February 28, 2024 at 8:53 PM

RE: Odor complaint form on the Coffin Butte Landfill site?

To: Ken Eklund

NW

Ken,

I don't recall if the link/online feature was ever formally shared with us (Benton County/Board of Commissioners)… it could have been, but I don't remember. I do remember seeing reports of complaints about the landfill, which included odors. Since I experienced the odors last week it made me think about that report and wonder if others were reporting. I saw your email come in and went to their website to look. It took me a few minutes to find it. I couldn't find a link. I had to do 3 or 4 searches to find it. I *think* the keyword that finally found it was "odor".

We (my family and I) were driving hwy 99W northbound on the 22nd around 5:30/5:45pm-ish. I had a respiratory infection at the time which affected my sense of smell, but just before Adair Village I noticed a "weird" smell and it got stronger right as we passed the landfill.

p.s. not to diminish the focus of your email, but I've not seen a golden eagle in Benton County before… but I'd like to! I'll keep my eyes peeled!

Benton County OREGON

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Fifth Oregon Climate Assessment

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Oregon Climate Change Research Institute

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Acknowledgments

This fifth Oregon Climate Assessment is consistent with the charge of the Oregon Climate Change Research Institute under Enrolled House Bill 3543 of the 74th Oregon Legislative Assembly.

We are grateful to the many authors, other contributors, reviewers, and advisors to this Assessment, especially during a year that was extraordinarily difficult for so many. We welcome readers to contact us with ideas for ensuring that the sustained assessment process is relevant to their priorities.

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Fifth Oregon Climate Assessment • January 2021
Executive Summary

Established and emerging understanding of observed and projected climate change in Oregon, and knowledge of the opportunities and risks that climate change poses to natural and human systems, may serve as a resource for actions including but not limited to planning for mitigation of climate-related natural hazards and implementation of Oregon's 2021 Climate Change Adaptation Framework.

State of Climate Science

Temperature. Oregon's annual average temperature increased by about 2.2°F per century since 1895. If greenhouse gas emissions continue at current levels, temperature in Oregon is projected to increase on average by 5°F by the 2050s and 8.2°F by the 2080s, with the greatest seasonal increases in summer.

Precipitation. Precipitation is projected to increase during winter and decrease during summer. The number and intensity of heavy precipitation events, particularly in winter, is projected to increase throughout the twenty-first century. Furthermore, as temperatures warm, the proportion of precipitation falling as rain rather than snow in Oregon is projected to increase, especially at lower to intermediate elevations in the Cascade Range.

Snowpack and runoff. Snowpack throughout Oregon, especially on the west slope of the Cascade Range, is accumulating more slowly, reaching lower peak values, and melting earlier. These trends are likely to continue, and may accelerate, as temperature increases. Concomitantly, runoff is expected to begin and peak earlier in the year, decline in summer, and increase in winter, but will vary geographically.

Science advances. In addition to simulations of future climate from the newest generation of global climate models, advances in climate science have improved the accuracy of climate forecasts one week to one month into the future. Also, it is becoming more feasible to estimate the extent to which human-caused climate change affects the likelihood of some types of extreme weather events.

Climate-Related Natural Hazards

Extreme heat. The frequency and magnitude of days that are warmer than 90°F is increasing across Oregon. During summer, relative increases in nighttime minimum temperatures have been greater than those in daytime maximum temperatures. The frequency, duration, and intensity of extreme heat events is expected to increase throughout the state during the twenty-first century.

Drought. Over the past 20 years, the incidence, extent, and severity of drought in the Northwest increased. These changes partially are attributable to human-caused climate change. As summers in Oregon continue to become warmer and drier, and mountain snowpack decreases, the frequency of droughts, particularly snow droughts such as those in 2014 and 2015, is likely to increase.

Wildfire. Wildfire dynamics are affected by climate change, past and contemporary land management and human activity, and expansion of non-native invasive grasses. From 1984 through 2018, annual area burned in Oregon increased considerably. Over the next 50 to 100 years, area burned and fire frequency are projected to increase substantially, initially east of the crest of the Cascade Range and then in the western Cascade Range. Over the long term, depending on how vegetation and fire weather shift with climatic changes and fuel and fire management, fire severity also may increase.

Floods. Flood magnitudes in Oregon are likely to increase. Heavy precipitation events are expected to become more intense because a warmer atmosphere can carry more moisture. Also, in a warmer climate, the relatively contribution to floods of rainfall will be greater than that of snowmelt. The consequence is larger flood peaks because, for a given amount of precipitation, the peaks of rainfall-driven floods tend to be larger than those of snowmelt-driven floods. Projected increases in wet-season precipitation also are likely to increase winter flood magnitude. Increases in regulated flows from the main stem of the Columbia River during winter appear likely to increase flood risk throughout the Columbia River reservoir system.

Coastal hazards. Sea-level rise, storminess, sediment supply, and human adaptation measures influence whether a given stretch of Oregon's coastline has eroded or built up in recent decades. Therefore,

predicting future shoreline change is challenging. As sea level rises, coastal storms and high tides are likely to increase the frequency and severity of flooding along Oregon's coastline. By the year 2050, relative sea level at Newport is very likely to rise between 0.6 and 1.8 feet, and at least one flood is likely to exceed four feet above mean high tide. Accounting for plausible, yet uncertain, estimates of Antarctic ice sheet melt suggests that sea level could rise 2.9 feet by the year 2050, with regular nuisance flooding occurring earlier.

Marine and coastal change. Off the Northwest coast, the open-ocean surface temperature increased by more than 1.2 ± 0.5°F since the year 1900, and is projected to increase by about another 5.0 ± 1.1°F by the year 2080. These changes in temperature have the potential to affect many other drivers of ocean change, such as by accelerating the rate of reduction in dissolved oxygen in the water and increasing the toxicity of harmful algal blooms. Ocean acidity also is projected to change by roughly 100–150%, resulting in a drop in open-ocean pH from 8.1 to 7.8. The change in pH is likely to affect shell formation in diverse species of commercial, recreational, and cultural value.

Adaptation Sectors

Natural systems. Climate change is affecting the timing of seasonal events in the life cycle of some plants and animals, and the viability of some species. Projected decreases in freshwater flows and connectivity are likely to decrease survival and growth of salmon. Projected increases in temperature and changes in precipitation also may have negative effects on some protected species. The ability of Oregon's species to adapt behaviorally, physically, or genetically to climate change in part depends on the speed of climate change, the level of other environmental stressors, and genetic diversity.

Built environment. Climate change is likely to stress Oregon's infrastructure. Projected increases in sea level and precipitation intensities are expected to strain levees, tide gates, and sewer and stormwater infrastructure. Droughts may diminish hydropower production and the effectiveness of water-supply infrastructure. Wildfires may threaten communities directly and indirectly via, for example, landslides and degraded water quality. Urban heat island effects are expected to increase summer electricity demand and risks of heat stress. Opportunities for mitigation and adaptation include wind and solar power, grid integration of electric transportation, and green infrastructure for resilience to flooding. Data-driven, science-based capital planning that engages stakeholders can help to realize these adaptations.

Public health. Racial and economic injustices have created disparities in health outcomes among populations in Oregon. Black, Indigenous, and People of Color; underinvested rural, Tribal, and low-income communities; the young and the old; and those with pre-existing conditions or disabilities are more likely to experience negative health effects of climate extremes. One in two households in Oregon spends 30% or more of their income on rent or a mortgage. These households are less likely to rebuild in the event of home loss or severe damage from an extreme weather event. Displacement and income loss associated with climate impacts will increase the risk of homelessness, food insecurity, and mental health effects.

Tribal cultural resources. Tribes may experience distinct impacts of climate change that relate to their cultures, identities, histories, relations with other governments, and land-holding status. Tribes throughout Oregon are using Traditional Knowledges to prepare for and increase their resilience to climate change. Priority topics include access to first foods, community health, changes in the distributions or status of native species, and wetland alterations. Tribal climate adaptation strategies also help to reassert treaty rights, advocate for equitable investment in civil infrastructure, and reestablish Tribal sovereignty.

Social systems. Social, political, and economic systems mediate the effects of climate change. The costs of adaptations to climate change in the agricultural sector likely will be passed on to consumers, exacerbating the existing challenges some communities face in obtaining affordable produce. Agricultural laborers' incidence of heat-related illnesses and exposure to wildfire smoke are expected to increase as climate changes. In Oregon, 28% of agricultural workers are undocumented immigrants who may be unable or reluctant to seek health care.

The full Fifth Oregon Climate Assessment is available at blogs.oregonstate.edu/occri/oregon-climate-assessments/.

Introduction

Consistent with its charge under Oregon House Bill 3543, the Oregon Climate Change Research Institute (OCCRI) conducts a biennial assessment of the state of climate change science, including biological, physical, and social science, as it relates to Oregon and the likely effects of climate change on Oregon. This fifth Oregon Climate Assessment builds on previous assessments (Dello and Mote 2010; Dalton et al. 2013, 2017; Mote et al. 2019) by continuing to evaluate past and projected future changes in Oregon's climate and hydrology. This Assessment is structured with the goal of serving as a resource for the state's mitigation planning for natural hazards and implementation of the 2021 Oregon Climate Change Adaptation Framework.

The first section of this Assessment, *State of Climate Science*, reflects OCCRI's sustained appraisal of observed trends and future projections of temperature, precipitation, snowpack, and streamflow. New research and insights are consistent with previous key messages about projected changes in Oregon's climate, such as warmer temperatures, drier summers, wetter winters, heavier rains, less snowpack, and associated shifts in the timing and discharge of streamflow. *State of Climate Science* also summarizes the latest research related to simulations of future climate, including preliminary insights on the newest generation of global climate models, subseasonal to seasonal climate prediction, and attribution of extreme events.

The dependence of human communities on their surrounding natural, economic, and social environment is magnified by climate extremes and associated hazards (Guidotti et al. 2016, Martinez-Diaz et al. 2020). The second section of this Oregon Climate Assessment explores how climate change is expected to affect climate-related natural hazards, including extreme heat, drought, wildfire, floods, and coastal hazards, in support of Oregon's 2020 Natural Hazards Mitigation Plan. Furthermore, this Oregon Climate Assessment examines recent observed and projected changes in the physical and biological environment of marine and coastal systems in Oregon and the Northwest. Implicit in the Assessment's treatment of hazards is the fact that disasters may result either from single, major events or from recurrent events that individually are not extreme, but degrade a community's social and economic infrastructure (Field et al. 2012).

The third section of this Assessment addresses six sectors within which Oregon's 2021 Climate Change Adaptation Framework aggregates vulnerabilities and strategic responses: economy, natural world, built environment and infrastructure, public health, cultural heritage, and social systems. The Framework aims to guide state decisions about investment of resources as climate changes and to facilitate collaboration among state agencies. This Assessment dedicates a chapter each to five of the sectors. These chapters describe the latest research in climate science and climate adaptation that is relevant to the sector in Oregon. Economic aspects of climate change are integrated throughout chapters on other sectors rather than treated independently. The economic risks of gradual changes in climate and extreme climate-related events vary among regions. Additionally, given the distinct impacts of climate change on Tribal cultures, identities, histories, relations with other governments, and land-holding status, this Assessment emphasizes Tribal cultural heritage.

Both the Climate Change Adaptation Framework and this Assessment recognize that the myriad interactions and feedbacks among natural and human systems are complex and can be difficult to differentiate. Evidence from Oregon's natural hazards mitigation planning process, the climate science literature, and a sustained assessment process can help indicate the extent to which natural hazards may affect adaptation sectors, and inform selection of actions to maximize resilience.

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State of Climate Science

Meghan Dalton, Heejun Chang, Benjamin Hatchett, Paul Loikith, Philip Mote, Laura Queen, and David Rupp

This chapter synthesizes observed trends and projections of future climate and hydrology from previous Oregon Climate Assessments, provides updates, and reports on new knowledge. In addition, this chapter reports on major advances in the field of climate science that are relevant to Oregon, including simulations of future climate under a new generation of global climate models, prediction of weather conditions three to four weeks into the future, and attribution of extreme weather events.

Observed and Projected Trends in Greenhouse Gases

In 2019, carbon dioxide concentrations measured at the long-term monitoring site on Mauna Loa, Hawaii, averaged 411 parts per million (ppm) by volume (NOAA 2020). Monthly concentrations from January through October 2020 were above 411 ppm. Global carbon dioxide emissions decreased during 2020 due to the COVID-19 pandemic. In April 2020, at the maximum confinement in many countries, carbon emissions dropped by 17% compared to 2019, reducing emissions to 2006 levels. However, by June 2020, carbon dioxide emissions had nearly rebounded to 2019 levels. Estimated 2020 carbon dioxide emissions are four to seven percent lower than those in 2019, similar to the yearly declines of emissions sustained over decades that are necessary to limit global warming to 2.7°F (1.5°C) (Luterbracher et al. 2020). Nevertheless, despite the temporarily lowered emissions, global concentrations of greenhouse gases in the atmosphere continued to increase, albeit at a slower rate.

Projections and analysis of future climate in this and other chapters primarily are based on the suite of global climate models from the fifth phase of the Coupled Model Intercomparison Project (CMIP5; Taylor et al. 2012). The future climate scenarios associated with CMIP5, called representative concentration pathways (RCPs), encompass plausible trajectories of greenhouse gas emissions and concentrations that would lead to different amounts of warming by the end of the twenty-first century (van Vuuren et al. 2011). This assessment references the two most commonly cited future scenarios, RCP 4.5 and RCP 8.5. RCP 4.5, a lower scenario, represents moderate reductions in global greenhouse gas emissions, with a peak near mid-century. RCP 8.5, a higher scenario, represents a continuation of current levels of emissions throughout the twenty-first century. The newest generation of global climate models, which are part of phase six of the Coupled Model Intercomparison Project (CMIP6), simulate future climate under scenarios called shared socioeconomic pathways (SSPs). CMIP6 and SSPs are described in more detail in *Recent Advances in Climate Science*, below.

Observed and Projected Trends in Climate

Temperature

Oregon's average temperature increased at a rate of 2.2°F (1.2°C) per century from 1895–2019 (NCEI 2020). All of the past 20 years (2000–2019) except 2011 were warmer than the twentieth century (1900–1999) average, and all except the two strongest La Niña years in the twenty-first century, 2008 and 2011, were warmer than the 1970–1999 average (NCEI 2020). The year 2015 was Oregon's warmest on record from 1895 through 2019 (NCEI 2020) (Fig. 1a).

	2050s		2080s	
	RCP 4.5	**RCP 8.5**	**RCP 4.5**	**RCP 8.5**
Annual	3.6 (1.8, 5.4)	5.0 (2.9, 6.9)	4.6 (2.1, 6.7)	8.2 (4.8, 10.7)
Winter	3.3 (1.6, 5.1)	4.5 (2.4, 6.5)	4.2 (1.8, 6.5)	7.4 (4.2, 9.8)
Spring	3.1 (1.4, 5.0)	4.1 (2.0, 5.9)	3.8 (1.7, 6.0)	6.7 (3.8, 9.2)
Summer	4.5 (2.2, 6.8)	6.3 (3.6, 8.9)	5.5 (2.7, 8.3)	10.2 (6.5, 13.9)
Autumn	3.7 (1.5, 5.4)	5.2 (2.6, 7.0)	4.7 (2.0, 6.9)	8.6 (4.6, 11.4)

Table 1. Projected future changes in mean annual and seasonal temperature (°F) in Oregon from the historical baseline (1970–1999) for the 2050s (2040–2069) and 2080s (2070–2099) under RCP 4.5 and RCP 8.5. Values in boldface are the average changes from 35 global climate models and the 5th to 95th percentile range across those models. Table reproduced from Dalton et al. 2017, with data for Oregon from Rupp et al. 2017. Winter includes December, January, and February; spring includes March, April, and May; summer includes June, July, and August; autumn includes September, October, and November.

Oregon's temperatures are projected to increase in all seasons, particularly summer. Dalton et al. (2017) reported projected average changes in Oregon's annual and seasonal temperatures for the periods 2040–2069 and 2070–2099 relative to 1970–1999 under RCP 4.5 and RCP 8.5 (Table 1). These projections, which were based on 35 global climate models from CMIP5, are still the most current projections for Oregon. Preliminary results from comparisons of CMIP6 with CMIP5 for Oregon, reported in *Recent Advances in Climate Science* (below), suggested slightly greater warming under CMIP6 than CMIP5. Under the CMIP5 models and RCP 8.5, Oregon's annual average temperature is projected to increase by 5°F (~2.8°C) by the 2050s and 8.2°F (~4.6°C) by the 2080s (Dalton et al. 2017) (Fig. 1a, Table 1). Summer temperatures are projected to increase by 6.3°F (~3.7°C) by the 2050s and 10.2°F (~5.7°C) by the 2080s under RCP 8.5 (Table 1). Changes in extreme temperatures and heat events are described in *Extreme Heat* (this volume).

Precipitation

Oregon's annual precipitation varies considerably among years, and has not changed significantly over the observational record (+0.58 inches [1.5 cm] per century from 1895–2019) (NCEI 2020). Some statistically significant increases in heavy precipitation have been documented in Oregon (e.g., Dalton et al. 2017 and reviews therein). However, the relatively small sample sizes and large variability in intense precipitation makes it difficult to detect long-term observed trends, and results often depend on location, time frame, and definition of heavy precipitation (Mote et al. 2013). The maximum consecutive five-day precipitation in October and March in Portland, Oregon, increased from 1977 through 2016 ($p < 0.1$), but not in the intervening months (Cooley and Chang 2020).

	2050s		2080s	
	RCP 4.5	**RCP 8.5**	**RCP 4.5**	**RCP 8.5**
Annual	1.9 (-4.9, 9.0)	2.7 (-6.0, 11.4)	3.4 (-5.6, 15.3)	6.3 (-5.2, 19.9)
Winter	4.9 (-6.4, 16.5)	7.9 (-4.7, 24.3)	7.3 (-6.3, 19.9)	14.5 (-2.8, 37.1)
Spring	1.9 (-8.9,12.1)	2.7 (-7.2, 17.4)	3.4 (-7.7, 14.9)	3.6 (-9.4, 15.6)
Summer	-6.3 (-28.5, 16.1)	-8.7 (-33.1, 22.5)	-4.6 (-24.2, 22.3)	-7.7 (-38.7, 33.5)
Autumn	0.5 (-17.0, 14.4)	-0.8 (-17.1, 14.9)	1.5 (-15.0, 18.1)	1.9 (-17.2, 24.2)

Table 2. Projected future relative changes in total annual and seasonal precipitation (%) in Oregon from the historical baseline (1970–1999) for the 2050s (2040–2069) and 2080s (2070–2099) under RCP 4.5 and RCP 8.5. Values in boldface are the average changes from 35 global climate models and the 5th to 95th percentile range across those models. Table reproduced from Dalton et al. 2017, with data for Oregon from Rupp et al. 2017. Winter includes December, January, and February; spring includes March, April, and May; summer includes June, July, and August; autumn includes September, October, and November.

Annual variability is expected to continue to dominate annual precipitation, with a slight increasing trend (Fig. 1b, Table 2). Precipitation is expected to increase during the wet season and decrease in summer in the Columbia River Basin (Rupp et al. 2017) and, on average, for Oregon as a whole (Table 2). In general, the intensity of heavy precipitation events during the twenty-first century in Oregon is projected to increase, although not uniformly across the state (e.g., Dalton et al. 2017 and reviews therein, Cooley and Chang 2020).

Atmospheric rivers. Atmospheric rivers are long, narrow corridors that transport high amounts of atmospheric water vapor and are important mechanisms for precipitation across the Pacific Northwest (Ralph et al. 2020). Atmospheric rivers are common features of autumn and winter storms in Oregon (Payne and Magnusdottir 2014), and are associated with around 25–30% of precipitation in those seasons over most of the state. The majority of autumn and winter extreme precipitation events, defined on the basis of three-day total precipitation, also are associated with atmospheric rivers, especially in western Oregon (Fig. 2) (Slinskey et al. 2020).

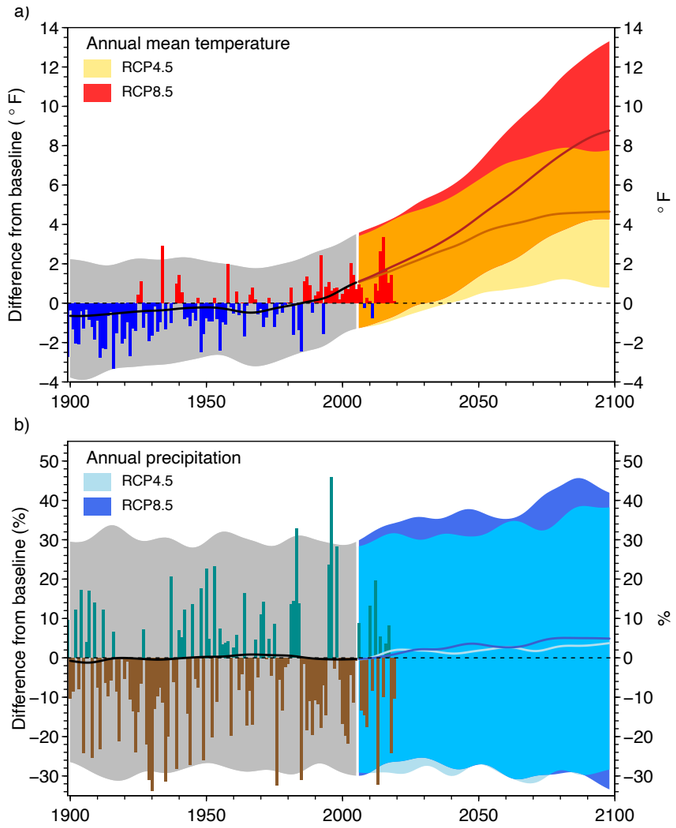

Figure 1. Observed, simulated, and projected changes in Oregon's mean annual (a) temperature and (b) precipitation relative to 1970–1999 (baseline) under RCP 4.5 and RCP 8.5 future scenarios. Colored bars are observed values (1900–2019) from the National Centers for Environmental Information. The thicker solid lines are the mean values of simulations from 35 climate models for the 1900–2005 period, which were based on observed climate forcings (black line), and the 2006–2099 period for the two future scenarios (orange [RCP 4.5] and red [RCP 8.5] lines in the top panel, light blue [RCP 4.5] and darker blue [RCP 8.5] lines in the bottom panel). Shading indicates the range in annual temperatures or precipitation from all models. The mean and range were smoothed to emphasize long-term variability.

Because a warmer atmosphere can hold more water vapor, the intensity of atmospheric rivers, as defined by the amount of water vapor transported, is projected to increase (Gao et al. 2015, Warner and Mass 2017, Espinoza et al. 2018, Ralph et al. 2020), and possibly to penetrate further inland (Mahoney et al. 2018). How this translates into changes to atmospheric river-related precipitation across Oregon and other parts of the west coast is an active area of research (Payne et al. 2020). The number of days with an atmospheric rivers present across Oregon is projected to increase by roughly 5–10% over western Oregon by the end of the twenty-first century under RCP 8.5, although this does not mean that the number of atmospheric rivers, or of the storms with which they are associated, will change (Espinoza et al. 2018, Massoud et al. 2019). The increase in water

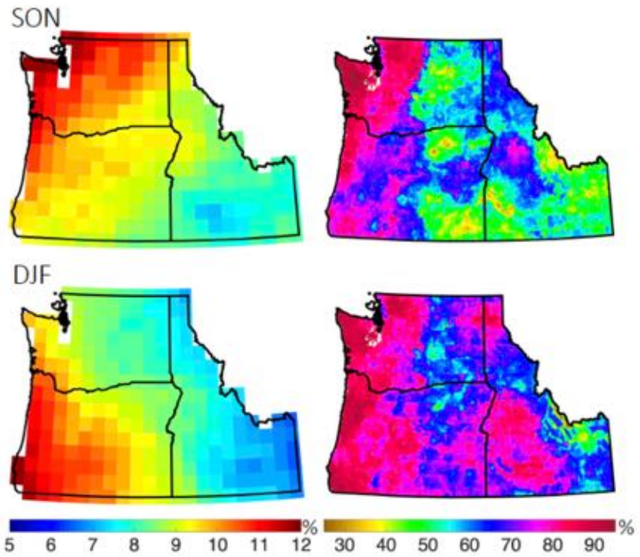

Figure 2. Percentage of days with (left) atmospheric rivers and (right) extreme precipitation that also have an atmospheric rivers, based on data from 1981–2016. Results are for (top row) September, October, and November and (bottom row) December, January, and February. Source: Slinskey et al. 2020 © American Meteorological Society. Used with permission.

vapor-holding capacity of the atmosphere as it warms also is projected to increase the intensity of atmospheric rivers. As reported in Dalton et al. (2017), the latter inference is supported by a projected 250% or greater increase in the number of days with extreme atmospheric river conditions (highest 1% of intensity) by the end of the twenty-first century under RCP 8.5 (Warner et al. 2015). Climate models also project an increase in the contribution of atmospheric river-produced precipitation to total annual precipitation across the region (Gershunov et al. 2019).

Observed and Projected Trends in Hydrology

Snowpack

Snow is a major source of water for natural ecosystems and for human consumption and recreation in Oregon. Snow is most common in Oregon's mountain ranges (Fig. 3), but also occurs at lower elevations, particularly east of the Cascade Range. Many ecosystem processes and human consumptive uses depend on the presence of a seasonal snowpack that accumulates during the cool season and melts during spring and summer, providing streamflow during the warm season and refilling reservoirs. Snowpack, often analyzed in terms of snow water equivalent (SWE)—the amount of water contained in the snowpack—can be classified as seasonal, ephemeral, or non-snowy (Fig. 4) on the basis of a snow seasonality metric (Petersky and Harpold 2018). The snow seasonality metric is based on the duration of seasonal (persisting 60 or more consecutive days) and ephemeral (persisting for fewer than 60 consecutive days) snowpacks compared to the total number of days with snow. Oregon's highest mountain ranges, including the Cascade Range and Wallowa, Blue, Steens, Siskiyou, Trout Creek, and Santa Rosa Mountains, have seasonal snowpacks. Ephemeral snowpacks occur at lower elevations east of the Cascades Range, in the northern Coast Ranges, along the west slope of the Cascade Range, and in the Klamath and Siskiyou Mountains.

Median peak SWE increases as elevation increases. The greatest SWE values, which often exceed 39.4 inches (1000 mm), are in the Cascade Range (Fig. 5a). Along the west side of the Cascade Range, peak SWE increases as the snowpack transitions from low-elevation non-snowy to mid-elevation ephemeral to high-elevation seasonal. On the east side of the northern Cascade Range, peak SWE decreases sharply as elevation decreases. This elevational gradient in SWE is less apparent

in the southern Cascade Range. Peak SWE values are lower (less than 7.9 inches [200 mm]) in the Coast Ranges and the Klamath and Siskiyou Mountains. The lower-elevation ranges of eastern Oregon generally have relatively low peak SWE values, whereas the higher-elevation Wallowa Mountains, Steens Mountains, and Strawberry and Elkhorn Mountains within the Blue Mountains have relatively high SWE values. Peak SWE values in the Blue Mountains of east-central Oregon and the Warner, Santa Rosa, and Trout Creek Mountains of southeastern Oregon are relatively low, less than 15.7 inches (400 mm), but colder temperatures facilitate seasonal snowpacks.

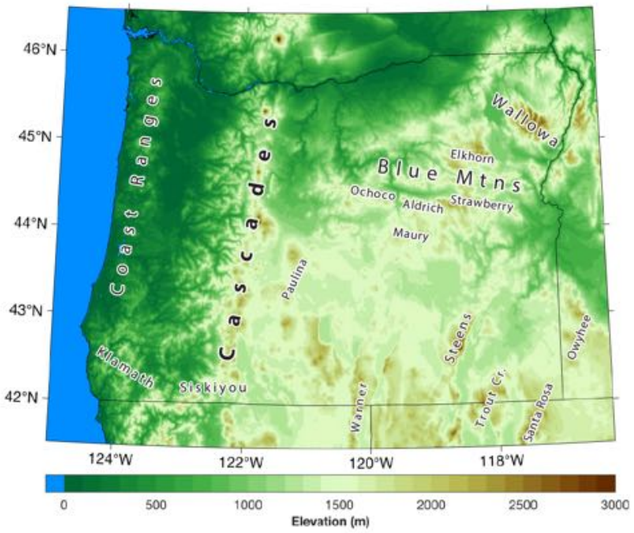

Figure 3. Elevations and major mountain ranges in Oregon.

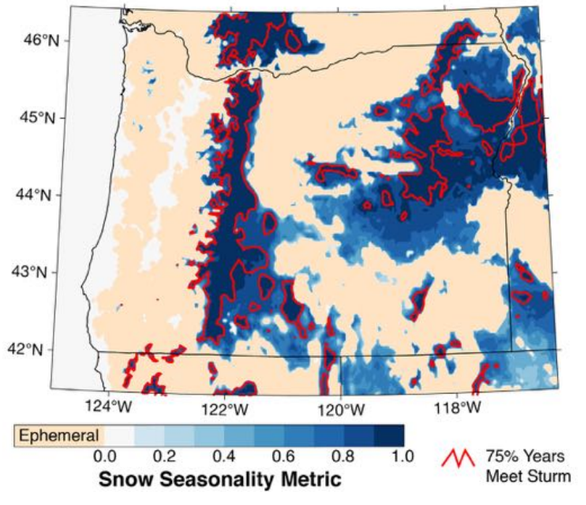

Figure 4. Snow seasonality classified by the median snow seasonality metric (Petersky and Harpold 2018). The metric varies continuously from -1 (ephemeral) to 1 (seasonal). Values greater than zero indicate seasonal snowpack and values less than zero indicate ephemeral snowpack. White indicates non-snowy areas (no days with SWE greater than zero). Red contour denotes the area in which 75% of years meet the Sturm et al. (1995) definition of seasonal snowpack, generally snow seasonality metric values greater than about 0.9.

The median timing of peak SWE in Oregon occurs from February (low elevation, ephemeral snowpacks) through May (high elevation, seasonal snowpacks; Fig. 5b). In the interior mountain ranges, elevated valleys, and plateaus, SWE values are relatively low. Nevertheless, colder winter temperatures, which are typical of inland regions where mountains inhibit the moderating effect of warmer oceanic airmasses, generally correspond to later dates of peak SWE. The latest peak SWE occurs near the crest of the Cascade Range and in the Steens and Wallowa Mountains.

Observed trends. From 1955 through 2016, spring snowpack, in terms of 1 April SWE, decreased at nearly every snow-observing station in Oregon (Mote et al. 2018, 2019). Because computing the area

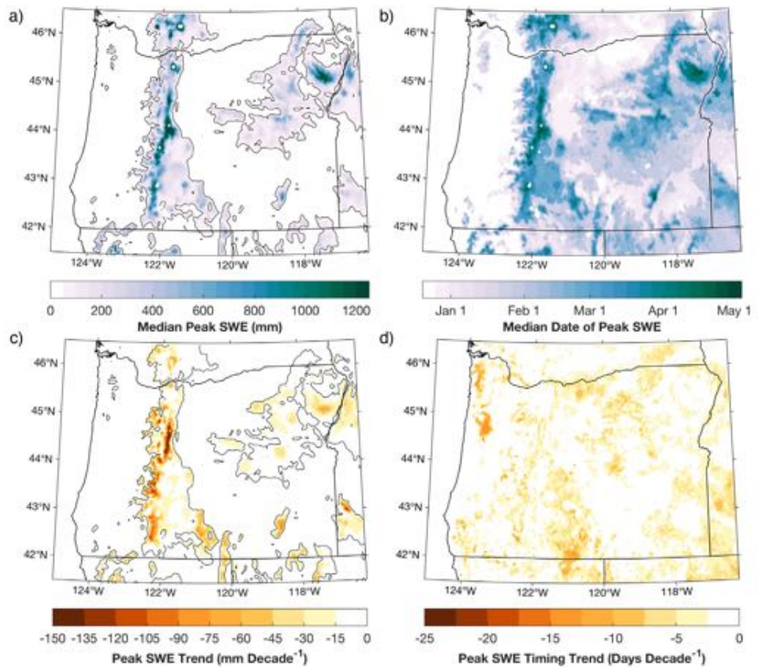

Figure 5. Oregon snowpack characteristics and trends analyzed over the period 1982–2017. (a) Median peak snow water equivalent (SWE; mm) and (b) timing of peak SWE (days past 1 October). (c–d) As in (a–b) but illustrating decadal trends (none statistically significant at $p<0.001$). Trends were assessed with nonparametric Mann-Kendall tests with lag-1 autocorrelation removed (Hamed and Rao 1998). Black contour lines in (a) and (c) enclose areas exceeding 2 inches (50 mm) median peak SWE.

averages from point observations alone is challenging, Mote et al. (2018) also analyzed gridded outputs from a variable infiltration capacity hydrologic model, and found that 1 April SWE averaged over the western United States decreased by roughly 15–30% since the middle of the twentieth century. The effects of anthropogenic forcing on spring snowpack trends since 1980 may have been mitigated by natural variability forced by large-scale changes in atmospheric circulation. Those changes in circulation, in turn, were driven by Pacific sea surface temperatures, suggesting that once the cycle of natural variability shifts from its current mode, snowpack declines may accelerate (Siler et al. 2019).

This section presents a new examination of trends and characteristics of Oregon's snowpack that was based on a new, gridded data product that interpolates point-based observations and normalizes by prior-year snowfall accumulations to estimate daily SWE and snow depth on a continuous 4 km horizontal grid over water years 1982–2017 (Broxton et al. 2016, Zeng et al. 2018). This gridded product also was used to calculate the snow seasonality metric (Fig. 4). The new exploration described here addressed the amount and timing of peak SWE (Fig. 5), number of days with snow cover, and timing of snowmelt and snow sufficient for recreation (Fig. 6). Results indicated that from 1982–2017, the snowpack throughout all of Oregon's mountains, especially the west slope of the Cascade Range, accumulated more slowly, had lower peak SWE values, and melted earlier.

Peak SWE declined in the southern and central Cascade Range, Warner Mountains, Steens Mountains, Trout Creek Mountains, and Wallowa Mountains (Fig. 5c). The largest declines (on the order of more than 5.3 inches [135 mm] per decade, or a >70% decline over the 36-year period) were observed on the east side of the central Cascade Range near Mt. Jefferson. Declines were greater than 3.5 inches (90 mm) per decade (a 50–80% decline over the 36-year period) along the

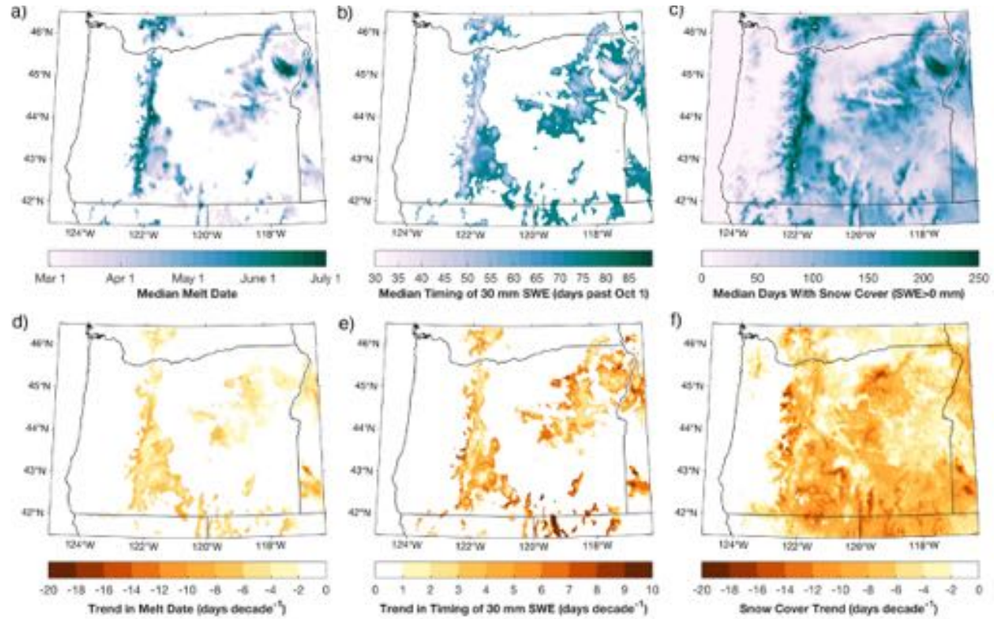

Figure 6. Additional Oregon snowpack characteristics and trends analyzed over the period 1982–2017. (a) Median timing of melt date, (b) median timing of sufficient snow for recreation (1.2 inches [30 mm] snow water equivalent [SWE]; days past 1 October), (c) median days with snow cover (SWE>0); (d–f) As in (a–c) but illustrating decadal trends. Trends were assessed with nonparametric Mann-Kendall tests with lag-1 autocorrelation removed (Hamed and Rao 1998).

west side of the Cascade Range. Trends in other mountain ranges and the easternmost side of the southern Cascades ranged from 0.6–3.5 inches (15–90 mm) per decade (a 20–50% decline over the 36-year period). However, these trends in peak SWE were not statistically significant at the conservative $p<0.001$ level. Trends in the timing of peak SWE varied (Fig. 5d). The largest negative (earlier) trends, on the order of 5–10 days per decade, were along the southeastern side of the Cascade Range. Negative trends of lower magnitude (2.5–7.5 days per decade) were observed along the west side of the Cascade Range and scattered throughout other mountain ranges in Oregon.

Complete melting of winter snowpack—defined as the day on which SWE decreases to zero—occured in early spring (March) at lower elevations in the interior mountains (Fig. 6a) and progressively later as elevation increased. The highest elevations in the Cascade Range and Wallowa Mountains generally retained snow until late June or early July. Melting trended earlier (albeit not significant at $p<0.001$) in all mountain regions in Oregon (Fig. 6d), with the greatest changes (more than 16 days earlier per decade) in the northern margins of the Great Basin east of the central Cascade Range, and near the Warner Mountains and high-elevation valleys near the California-Oregon-Nevada border. Changes were smaller (2–10 days earlier per decade) along the western slopes of the Cascade Range, particularly in the central Cascade Range (north of Mt. Jefferson), in the southern and northern Blue Mountains (e.g., the Maury and Elkhorn Ranges), throughout the Steens and Warner Mountains, and along the lower elevations of the Wallowa Mountains.
The first date of sufficient snowpack for recreation was defined as the first date with 1.2 inches (30 mm) SWE (Hatchett and Eisen 2019). This value commonly is used by land managers to open

areas for over-snow vehicle recreation (Hatchett and Eisen 2019). It also is a reasonable benchmark for sufficient snowpack to enjoy backcountry recreation activities. Over the period 1982–2017, snowpack usually was sufficient for recreation by early to mid-November in the higher elevations of Oregon's mountains and by mid-December at lower elevations (Fig. 6b). The timing shifted later by 3–8 days per decade (Fig. 6e), with the largest shifts along the western slope of the Cascade Range, in parts of the eastern slope of northern and central Cascade Range, and throughout the interior mountains (e.g., Blue, Wallowa, and Steens).

Most of Oregon had an average of at least 10 days of snow cover (non-zero SWE) per year from 1982–2017 (Fig. 6c). Despite low peak SWE values, often less than 3.9 inches (100 mm), much of interior southeastern Oregon had an average of 80 or more days of snow cover. However, due to sparse observations in this region, these model-based estimates should be compared against independent data from satellite-based observations or other direct measurements. Duration of snow cover increased as elevation and distance from the Pacific Ocean increased. Many of the highest-elevation and snowiest regions had more than 200 days of snow cover. The Siskiyou Mountains, northern Coast Range, and Klamath Mountains had one to two months of snow cover on average.

The number of days with snow cover decreased throughout much of Oregon (Fig. 6f). The largest declines in snow-cover duration were on the order of 12 or more days per decade and were on the west side of the central Cascade Range, Warner Mountains, and Wallowa Mountains. Widespread declines of 4–12 days per decade were observed in the inland mountain ranges and in the northern regions of the Great Basin. Changes in southeastern Oregon did not appear to be limited to high elevations. It would be quite informative to evaluate the physical drivers of declines in snow cover during the accumulation (autumn) and melting (spring) seasons with different definitions of snow cover and additional data sources.

Future projections. Oregon's snow cover and snowpack are likely to decrease further as the climate becomes warmer, which will cause a greater proportion of precipitation to fall as rain than as snow in many locations that historically received substantial snowfall during winter (Nolin and Daly 2006, Klos et al. 2014, Catalano et al. 2019, Lynn et al. 2020). Catalano et al. (2019) used projected changes in the elevation of the freezing level to quantify how the proportion of wet days with snow to all wet days will change at Snow Telemetry (SNOTEL) stations across the Northwest (Fig. 7). The proportion decreased rapidly at low to intermediate elevations, especially in the Cascade Range. For example, at most SNOTEL stations in the Oregon Cascade Range, fewer than 25% of wet days are projected to be days with snow by the mid-twenty-first century, compared to about 50% at most stations during the late twentieth to early twenty-first centuries. Such a decrease in the proportion of snow days may have a major impact in areas that rely on Cascade Range snowpack for water. The proportion of snow to rain will decrease more slowly at higher elevations and in eastern Oregon; some stations are projected to continue to have snow on at least 25% of wet days.

Runoff

Watersheds in Oregon have one of three distinctive runoff regimes: rainfall dominated, mixed rain and snow, and snow dominated. Distance from the Pacific Ocean, elevation, position on the leeward or windward side of a mountain range, vegetation, and geology affect variability in the temporal distribution of runoff in Oregon (Chang and Jung 2010). Rainfall-dominated systems occur in coastal regions and the Willamette Valley. In these areas, flow closely follows the timing of precipitation, leading to a single, extended runoff peak in winter, populated by multiple local runoff

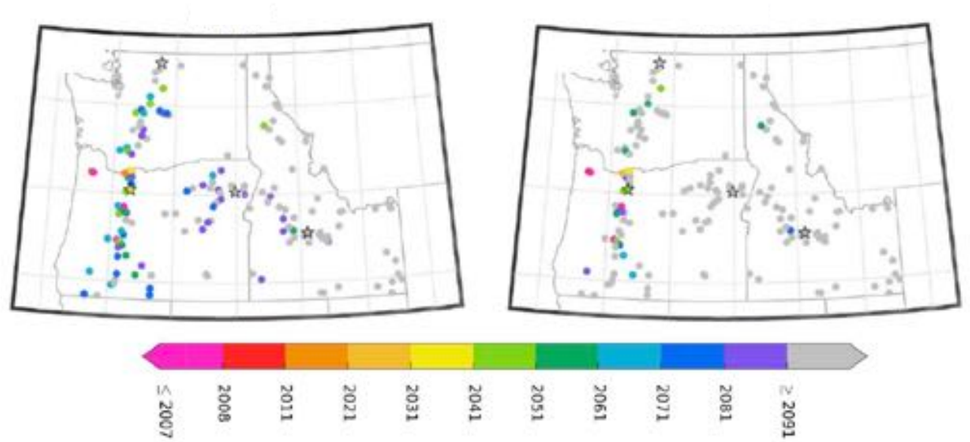

Figure 7. (Left) RCP 8.5 and (right) RCP 4.5 projections of the first decade during which the percentage of wet days that have snow falls below 25% at SNOTEL stations across the Northwest. For example, a circle with color shading corresponding to the year 2041 means that at that station, the 10-year period starting in 2041 is the first decade during which fewer than 25% of wet days will be cold enough for snow to fall. Gray circles indicate that the models do not project that the percentage of snow days will fall below 25% during the twenty-first century. Stations with stars are specific to Catalano et al. (2019), from which this figure is adapted.

maxima corresponding to rainfall events. Mixed rain and snow systems, characterized by two runoff peaks that correspond to rainfall and snowmelt, occur in many watersheds at high elevations in the Cascade Range and mountains to the east. In snow-dominated systems above 4000 feet (1219 m) in south-central and northeast Oregon, runoff peaks in early to mid-summer. Peak flow in streams at higher elevations of the Cascade Range are delayed due to snowmelt and sustained summer flow; their continuous baseflow reflects discharge from groundwater basins with high specific yield (the ratio of the volume of water that the soil can yield by gravity to the total volume of the soil).

Previous Oregon Climate Assessments reported that multiple studies detected trends toward earlier runoff in many snowmelt-dominated watersheds in the Northwest, consistent with a warming climate (e.g., Stewart et al. 2005, Dalton et al. 2017 and reviews therein). Observed changes in the amount and timing of streamflow, especially years with exceptionally early or high midwinter runoff (2015, for example), are eliciting responses from reservoir managers. These managers aim to assess impacts of changes in streamflow on water resources and ecosystems, with the goal of informing management actions (e.g., Cohen et al. 2020, Jones and Hammond 2020). Continued warming is projected to result in earlier streamflow, declining summer flows, and increasing winter flows, particularly for mixed rain and snow and snow-dominated basins (e.g., Dalton et al. 2017 and reviews therein). Three new studies (Burke and Ficklin 2017, Yazzi and Chang 2017, Chen and Chang 2020) projected runoff changes in specific basins in Oregon.

Burke and Ficklin (2017) reported changes in runoff volume and timing in the coastal Siletz watershed, a watershed on the central Oregon coast that provides habitat for Coho salmon (*Oncorhynchus kisutch*). They projected that wet season (November–March) flow will increase by 18% by the end of the twenty-first century under RCP 8.5. The median center timing of flow was projected to shift three days earlier by the middle of the twenty-first century and, in one global climate model, 10 days earlier by the end of the twenty-first century.

Chen and Chang (2020) investigated the effects of climate change on the runoff in the Clackamas River watershed, which provides drinking water to 350,000 people in the Portland metropolitan area. Median summer runoff in the watershed was projected to decline by 50% under the study's warmest scenario (the HadGEM2-ES climate model assuming RCP 8.5). In addition, extreme high flows, defined by the 90th percentile flow volume, were projected to increase by up to 19%, and extreme low flows, defined by the seven-day low flow, were projected to decrease by as much as 20 cubic meters per second by the middle and late twenty-first century (Chen and Chang 2020). The center timing of flow was projected to shift two to three weeks earlier by the 2080s (2070–2099) under the study's warmest scenario. Chen and Chang (2020) also found that land-cover change had minimal impact on watershed-level runoff. Similarly, in the snow-dominated upper Umatilla River in eastern Oregon, which is the main source of irrigation water in that river basin, the center timing of flow was projected to occur nearly one month earlier (Yazzi and Chang 2017).

Projections of future streamflow have several sources of uncertainty, including the selection of climate models, emission scenarios, downscaling methods, and hydrologic model structure and parameters (Praskievicz and Chang 2009). In the Northwest, differences among climate models and representative concentration pathways (RCPs) are the greatest sources of uncertainty in projections of the volume and timing of annual runoff, whereas differences among hydrologic models are the greatest source of uncertainty in projections of low flows in many locations (Fig. 8; Chegwidden et al. 2019). Information about the greatest sources of uncertainty in future hydrological projections for different flow metrics and locations (e.g., Chegwidden et al. 2019) can inform selection of the most appropriate set of hydrological projections for a given application. For the majority of the Columbia River Basin, applications might consider the timing of annual runoff and analyze results among multiple representative concentration pathways, because difference among the latter are the largest source of uncertainty (Fig. 8). In the Willamette Basin, however, it may be sensible to prioritize analysis of results among multiple global climate models, because difference among those models are the greatest source of uncertainty in that geographic area (Fig. 8).

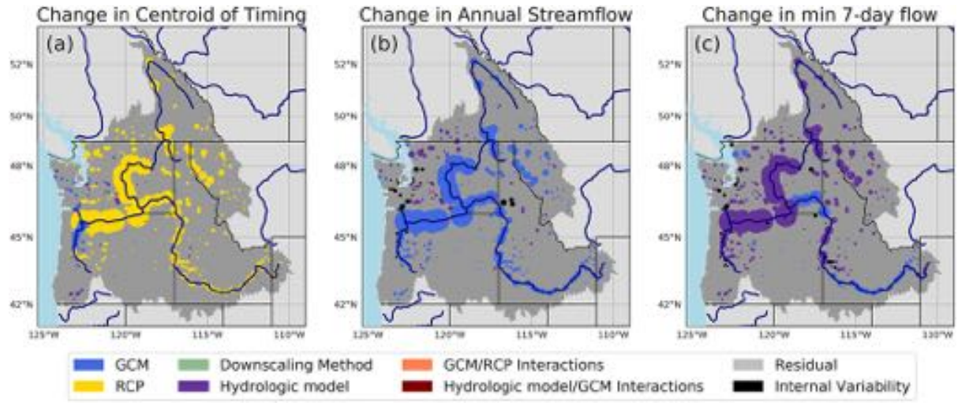

Figure 8. The dominant source of uncertainty in projected changes in the (a) timing and (b) volume of annual runoff and (c) low flows from the 1980s through the 2080s. Marker sizes are scaled by the mean annual historic flows without regulation or irrigation. Source: Chegwidden et al. 2019.

Stream Temperature

Stream temperature is sensitive to changes in air temperature, but also is affected by vegetation cover and water source. In open water, a 1.8°F (1.0°C) increase in air temperature generally leads to 1.1–1.4°F (0.6–0.8°C) increase in water temperature (Morrill et al. 2005), although the sensitivity of stream temperature to air temperature varies on the basis of factors such as water depth, mixing of surface and shallow subsurface water, wind, humidity, and cloud cover. Additionally, riparian vegetation can provide shade that reduces stream temperature. Groundwater input also affects stream temperature because the temperature of groundwater is fairly constant throughout the year, whereas the temperature of surface water fluctuates seasonally. For example, in the upper Middle Fork John Day River in northeast Oregon, a mature riparian forest with 79% effective shade—the percentage of direct solar radiation attenuated and scattered by riparian vegetation before reaching the stream surface—can decrease the seven-day average daily maximum stream temperature (a measure commonly applied in regulation of water temperatures) by ~12.6°F (7.0°C) via changes in air temperature and discharge (Wondzell et al. 2019).

Stream temperature generally is projected to increase across Oregon. Assuming the A1B emissions scenario (an older scenario that falls between RCP 4.5 and RCP 8.5), by the 2080s (2070–2099), relative to the 2000s (1993–2011), August average stream temperature was projected to increase by about 4°F (2.2°C) in most parts of Oregon (Isaak et al. 2017). The increase in stream temperature was projected to be slightly lower in southeastern Oregon.

In the Willamette River Basin, stream temperature was projected to increase by 1.8–7.2°F (1.0–4.0°C) by the 2080s according to three representative climate change scenarios that were based on three global climate models and RCP 8.5. The magnitude of change depended on the climate scenarios and local geology. With the same climate change scenario, the temperature increase was minimal in groundwater-fed streams at high elevations in the Cascade Range, whereas the increase was greatest in low-elevation streams that are fed by surface water (Chang et al. 2018).

In a central Oregon Coast watershed, maximum stream temperature was projected to increase by 5.4°F (3°C) in the mainstem of the North Fork of the Siletz River by the 2080s (2070–2099) under RCP 8.5 as simulated by one global climate model (HadGEM2-ES365) (Lee et al. 2020).

Recent Advances in Climate Science

Three of the areas of climate science that are developing rapidly are simulations of the future climate, prediction of weather conditions three to four weeks into the future (subseasonal-to-seasonal forecasting), and attribution of extreme weather events.

Simulations of Future Climate

For decades, the assessments of the Intergovernmental Panel on Climate Change (IPCC) have been supported by the Coupled Model Intercomparison Project (CMIP). New simulations from CMIP6 (Eyring et al. 2016) have been distributed since 2019 to support development of the IPCC's Sixth Assessment Report, currently scheduled for release in April 2021. In the aggregate, the CMIP6 models estimate a higher equilibrium climate sensitivity (ECS)—the increase in temperature after the climate system reaches equilibrium following a doubling of atmospheric carbon dioxide concentrations—than the CMIP5 models (Fig. 9, Forster et al. 2020). Cloud feedbacks and cloud-aerosol interactions most likely are the primary contributors to the increased ECS (Meehl et al.

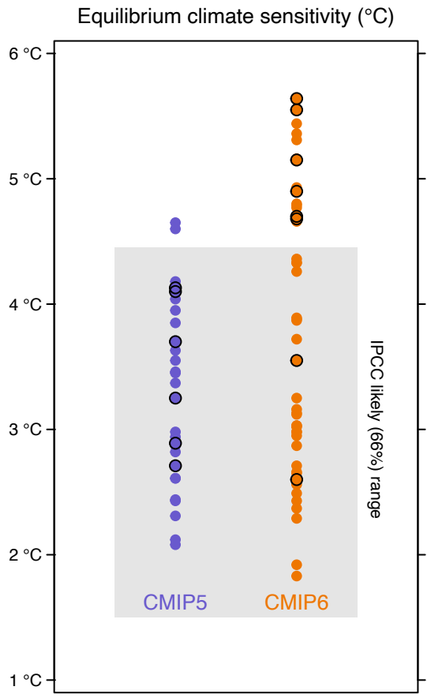

Figure 9. The equilibrium climate sensitivity (ECS) from 30 CMIP5 and 47 CMIP6 global climate models. Black open circles correspond to the models listed in Table 3, except CMCC-CM and HadGEM2-CC, for which ECS values were not found in the literature. Figure adapted from Forster et al. (2020). ECS values from Meehl et al. (2013) and Zelinka et al. (2020).

2020, Zelinka et al. 2020). As of December 2020, a vigorous scientific debate continues about the plausibility of the higher ECS values in the new CMIP6 models. Some scientists argue that the higher ECS values (or the related transient climate response) exceed observational constraints (e.g., Nijsse et al. 2020). Others critique the observational constraint, noting that the warming during 1975–2013 ended with the so-called hiatus, which may have caused the CMIP6 models to overestimate the warming during that period. Regardless, the IPCC long has assessed ECS with a probability distribution. For instance, the grey "likely" range in Fig. 9 means that there is a 66% probability that ECS is within the range of about 1.5–4.5°C, and a 34% probability that ECS is outside that range. The probability that ECS exceeds 4.5°C was not quantified explicitly by the IPCC, but is physically possible. However, it is "very unlikely"—probability less than 10%—that ECS is greater than 6°C (IPCC 2007).

The potential changes in ECS do not affect the scenarios of greenhouse gas concentrations. In the CMIP6 models, the representative concentration pathways (RCPs) that provided estimates of greenhouse gas emissions for CMIP5 have been augmented by shared socioeconomic pathways (SSPs) that describe more explicitly the social and economic scenarios corresponding to each RCP. Here, RCP 4.5 corresponds to SSP2-45, and RCP 8.5 to SSP5-85.

For this Assessment, CMIP6 outputs were obtained from global climate models that most clearly corresponded to those used in the CMIP5-based analysis for the Northwest (Rupp et al. 2017; Fig. 1a). The CMIP5 models within the selected pairs (Table 3) were among the 10 best-performing models as evaluated by Rupp et al. (2013a), or frequently were used in related studies (e.g., the IPSL-CM5A-LR and MIROC5 models). Also, data for both the historical period and the twenty-first century were available for the selected CMIP6 models. Where multiple versions of a model were available, the version that seemed most similar to the CMIP5 version, given readily available documentation, was chosen. The eight CMIP6 models were used to analyze past and future annual mean temperature in Oregon (Fig. 10), similar to Figure 1a. The CMIP5 versions of these models have a somewhat higher rate of warming than the 35-member average of Rupp et al. (2017).

CMIP5	CMIP6
CanESM2	CanESM5
CESM1-BGC	CESM2
CESM1-CAM5	CESM2-WACCM
CMCC-CM	CMCC-CM2-SR5
CNRM-CM5	CNRM-CM6-1
HadGEM2-CC	HadGEM3-GC31-LL
IPSL-CM5A-LR	IPSL-CM6-LR
MIROC5	MIROC6

Table 3. Model pairs from the fifth and sixth phases of the Coupled Model Intercomparison Projects (CMIP5, CMIP6) that were used to create Figure 10.

Another way to parse the CMIP6 data is to draw a direct statistical connection between ECS and temperature change in Oregon (Fig. 11). The CMIP5 projected temperature change for Oregon (Rupp et al 2017) was regressed on each model's ECS value for each RCP and future period. The regression equations then were applied to the ECS values of the CMIP6 models from Zelinka et al. (2020).

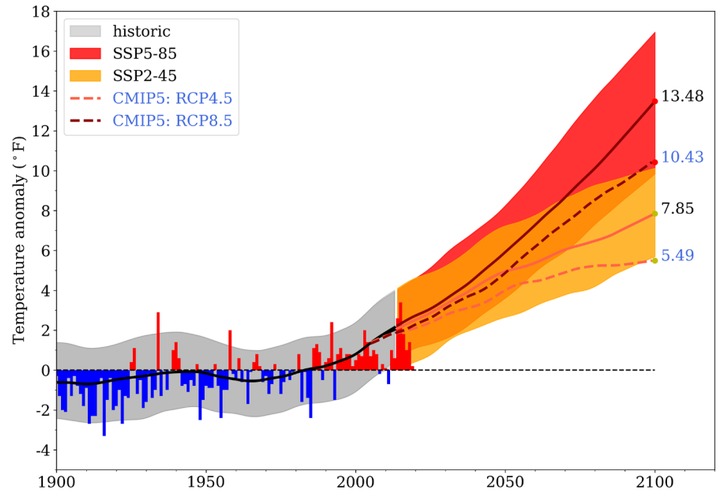

Figure 10. Annual mean temperature in Oregon as observed (blue and red bars; relative to the 1970–1999 average, from NOAA Climate at a Glance) and as simulated by the CMIP6 models for the past (heavy black curve and grey shading). The colored bands and solid curves indicate the average of the two CMIP6 scenarios for 2015–2100, and the dashed curve indicates the corresponding results for CMIP5 (2006–2100). Shaded regions denote the range between the smoothed minimum and maximum annual mean temperature for the eight models. The modeled time series were smoothed with a lowess filter. Mean values for the eight models are printed to the right of the curves and represent the warming relative to 1970–1999.

Consistent with the increase in ECS (Fig. 9), the CMIP6 models suggested higher rates of warming, given either emissions scenario, than their predecessors. Under the RCP 8.5 scenario, the eight CMIP6 models used here, which coincidentally included a disproportionate number with high ECS, led to a 3°F (~1.7°C) greater warming by the end of the twenty-first century than the CMIP5 models. Preliminary estimates that were based on a much larger set of models generally indicated smaller differences in warming between the CMIP5 and CMIP6 models (Fig. 11). Nevertheless, for Oregon and globally, the CMIP6 models suggest that the climate may warm more than expected under the CMIP5 models, if the high ECS values are accurate.

Subseasonal-to-Seasonal Forecasting

Skillful weather forecasts require one to obtain an accurate and thorough estimate of the current state of the atmosphere by assimilating as many observations as possible. Small errors in the initial state of weather propagate, eventually (usually around 10 days) leading to a forecast that is no better than random chance. Seasonal climate prediction, by contrast, aims at a statistical description of the next few months, and rests in large part on the evolving state of the tropical ocean, especially the central and western Pacific Ocean. Between the time scales of skillful weather forecasts and skillful seasonal forecasts are the subseasonal-to-seasonal scales. Recent progress on probabilistic forecasts with some skill on these time scales for the Northwest builds on the work of Bond and Vecchi (2003), who were the first to demonstrate a link between the tropical weather variability known

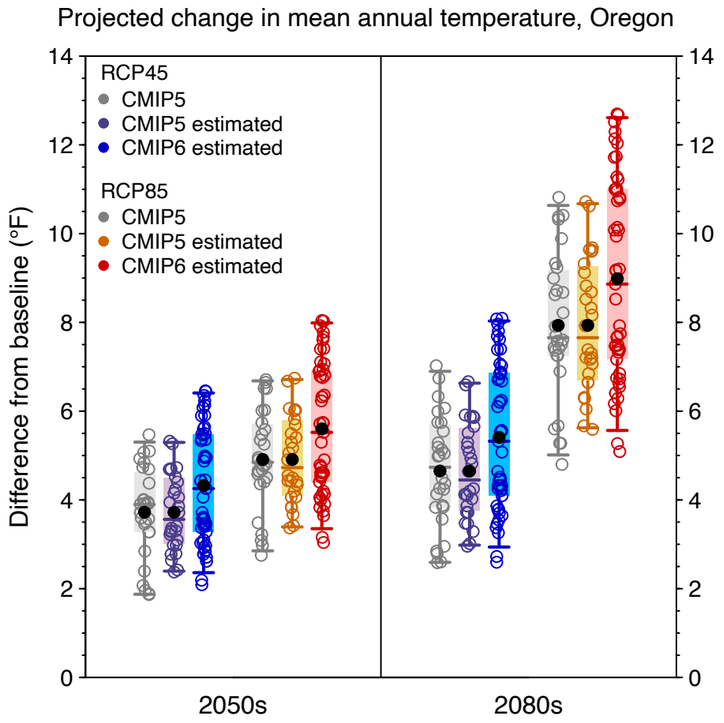

Figure 11. Projected change in Oregon mean annual temperature as the difference between a baseline period (1970–1999) and two future periods (2040–2069, or the 2050s; and 2069–2098, or the 2080s). Estimates were based on direct climate model outputs (gray symbols) or estimates derived from ECS (colored symbols) from CMIP5 (28 models) and CMIP6 (47 models) under RCP 4.5 and RCP 8.5, as described in the text.

as the Madden-Julian oscillation and weather in the Northwest. They discovered that certain phases of the Madden-Julian oscillation corresponded to a heightened risk of flooding in the Northwest. Given the inherent 40- to 50-day duration of the oscillation, their results suggested potential predictability of flooding of at least a few weeks.

Advances in research, observations, and modeling are propelling improvements in the predictability of climate at temporal extents between one week and one month. Perhaps the most comprehensive analysis of subseasonal modeling included seven global atmospheric models (some of which are used in operational weather forecasts) and 17 years of retrospective forecasts. This analysis evaluated forecasts for the third week (the average of days 15 through 21) after the forecasts were made (Pegion et al. 2019). Each of the models made skillful forecasts of Northwest temperature, and the model average was even more skillful. Although similar analysis of precipitation forecast skill was not presented, the models appeared to be capable of forecasting large precipitation anomalies. Pegion et al. (2019) provided an example in which the third week of forecasts of precipitation in October 2018 indicated large wet anomalies. These anomalies coincided with the formation and landfall of Hurricane Michael in the southeastern United States.

Seasonal-to-subseasonal forecasting has the potential to improve climate adaptation. Increasing the advance warning of weather anomalies, such as rapidly developing droughts (Pendergrass et al. 2020) or heat waves, floods, or windstorms, increases preparation time and may improve outcomes. As an example, federal management of reservoirs throughout the year is determined by seasonally dependent reservoir rule curves. These curves describe the desired elevation (amount of water) in each reservoir, and typically are quite low during flood season. However, the rule curves

were developed decades ago, when weather forecasts were accurate only a few days in advance. Incorporating a modern understanding of forecast skill in the 7–10 day (or 15–21 day) time horizon would allow reservoirs to be maintained at higher elevation and avoid a situation in which reservoirs cannot be refilled at the end of flood season (as was the case throughout Oregon in 2015). Such adjustments would help mitigate the stresses of droughts and floods in a changing climate.

Attribution of Climate Events

Attribution of climate phenomena "is defined as the process of evaluating the relative contributions of multiple causal factors to a change or event with formal assessment of confidence" (IPCC 2018). Increases in global average temperature since the mid-twentieth century were attributed to human activity by the mid-1990s (e.g., Hegerl et al. 1997). Attribution of seasonal temperature and precipitation in the Northwest suggested that only human activity could account for the warming in each season, but did not indicate that changes in precipitation were attributable to human activity (Abatzoglou et al. 2014). Armal et al. (2018) investigated trends in extreme daily precipitation across the United States. They detected a trend at 35% of Northwest weather stations, and found that most trends could be explained by anthropogenic forcing and natural modes of climate variability.

During the past decade, the focus of attribution research shifted from annual and seasonal means over large areas to human influences on the magnitude or likelihood of specific extreme events or classes of extreme events (e.g., Herring et al. 2020, Swain et al. 2020). NASEM (2016) made highly relevant points about framing questions of attribution, the capabilities for attribution of different types of events, and the fact that basic principles of physics suggest that as climate changes, many types of extreme events will become more likely. Two of these points are discussed here.

First, asking whether climate change caused a certain event is less useful than asking about the change in the likelihood of the event as a result of human activities. Some studies have focused on an individual event and simulated that event under specific meteorological conditions, then created a counterfactual—an alternate simulation or simulations—in which the meteorological conditions were changed to reflect understanding of the physical influence of elevated greenhouse gases. For instance, to study human influence on rainfall intensity in Hurricane Harvey, which deposited as much as 52 inches (1.3 m) of rain over part of Texas, including Houston, in August 2017, van Oldenborgh et al. (2017) subtracted the warming of the ocean surface estimated with the EC-Earth2.3 climate model from the observed ocean temperatures, and ran simulated weather forecasts with a moderately high-resolution atmospheric model. Another approach is to define an extreme event, run numerous simulations, and then compare how often the event occurred with and without greenhouse gas forcing. This approach was applied to the attribution of warm and dry conditions during the 2011 Texas drought (Rupp et al. 2012, 2015), low precipitation in the central United States in 2012 (Rupp et al. 2013b), changes in Northern Hemisphere snow cover in spring (Rupp et al. 2013c), extreme heat in central California (Mera et al. 2015), and exceptionally low spring snowpack in the Northwest in 2015 (Mote et al. 2016).

Second, by considering both the physical effects of climate change on the event type and the confidence in attribution of specific events, NASEM (2016) delineated the capacity for attribution of different types of events on the basis of the expected magnitude of change and the confidence with which models can simulate those events. Attribution is most feasible for cold events, which are becoming less common as concentrations of greenhouse gases increase, followed by heat events, which are becoming more common. Attribution of droughts and extreme rainfall is moderately

feasible, and somewhat less feasible for extreme snow and ice storms and tropical cyclones. Attribution of extratropical cyclones, fire, and severe convective storms is difficult.

Previous Oregon Climate Assessments (e.g., Dalton et al. 2017) reported on formal attribution studies in the Northwest, including average and seasonal temperature and precipitation (Abataoglou et al. 2014), fuel aridity related to area burned by wildfire in the western United States (Abatzoglou and Williams 2016), low snowpack in 2015 (Mote et al. 2016), and acidity of coastal ocean water (Feely et al. 2016). Williams et al. (2020) analyzed the contribution of anthropogenic climate change to the particularly dry conditions of the early twenty-first century in an area covering the southwestern United States and most of Oregon. The period 2000–2018 in this geographic region was the second-driest 19 years since 800 CE, and climate model simulations suggested that 47% of the observed dryness in soil moisture was driven by the effect of anthropogenic climate change on temperature, humidity, and precipitation (Williams et al. 2020).

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Extreme Heat

Meghan Dalton and Paul Loikith

Influence of Climate Change on Extreme Heat Events

Warming temperatures are increasing the frequency and intensity of extreme heat events. Extreme heat can include days with maximum temperatures over a threshold, seasons with temperatures well above average, and heat waves, or multiple days with temperature above a threshold. Heat waves occur periodically as a result of natural variability, but human-caused climate change is increasing their severity (Vose et al. 2017). Additionally, 82% of the increase in the frequency of hot summers—average June, July, and August temperatures more than two standard deviations above a baseline—over the western United States from 2000–2010 relative to 1978–1999 may be attributable to anthropogenic climate change (Kamae et al. 2017). Changes in extreme temperatures due to climate change can result directly from increases in temperature. Changes in extreme temperatures also can be an indirect result of changes in the weather patterns that lead to temperature extremes. Atmospheric conditions that drive extreme heat events in Oregon include upper-level ridges of high pressure and offshore flows; the specific atmospheric patterns conducive to heat events vary among the western, central, and eastern portions of the state (Loikith et al. 2017). Previous Oregon Climate Assessments reported on research that projected a weakening of summer atmospheric ridges and fewer days with strong offshore flow events, particularly in western Oregon (Brewer and Mass 2016a, b; Dalton et al. 2017). This suggested that although increases in average temperatures will lead to a larger number of heat events, and more severe extreme heat events, across the state, the increase may be greater in eastern Oregon than in western Oregon (Dalton et al. 2017). However, the degree to which future changes in warm temperature extremes in Oregon and the Northwest will be affected by changes in these weather patterns is still an active area of research.

Observed Trends in Extreme Heat

The frequency and magnitude of very hot days is increasing across Oregon. Very hot temperatures can be defined on the basis of relative thresholds, such as days on which the maximum temperature is above the 90th percentile of some reference period, or absolute thresholds, such as days on which the maximum temperature is above 90°F (32°C). Medford, Pendleton, and Portland, Oregon, have different climates, but annual variability in temperature has been considerable in all three, and the number of days exceeding

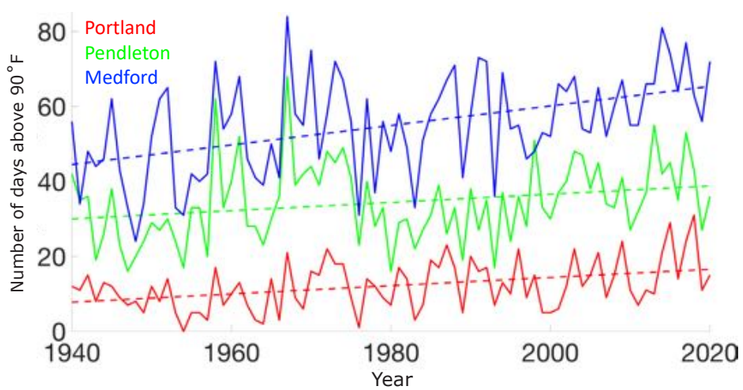

Figure 1. Number of days per year on which the daily high temperature exceeded 90°F at Medford, Pendleton, and Portland. Data source: NOAA National Centers for Environmental Information, www.ncdc.noaa.gov/ghcnd-data-access.

90°F increased markedly since the mid-twentieth century (Fig. 1). Since 1940, the number of days exceeding 90°F increased by over eight days per year in Portland and Pendleton, and 21 days per year in Medford. The number of 90°F days in Portland in 2015 (29) and 2018 (31) broke records. These increases are representative of other cities across the state, with the exception of those at the immediate coast and relatively high elevations, where the number of days above 90°F is too small to observe a trend.

Previous Oregon Climate Assessments reported increasing trends in the number of summer extreme heat events as defined by minimum temperature thresholds (Bumbaco et al. 2013, Mote et al. 2013, Oswald and Rood 2014, Dalton et al. 2017). Recent publications are consistent, indicating that trends in summer extreme heat events as defined by nighttime minimum temperatures are stronger than those based on daytime maximum temperatures (Oswald 2018, Thomas et al. 2020). Over the period 1978–2015, the number of summer minimum temperature heat waves increased significantly over most of Oregon, except parts of eastern Oregon (Oswald 2018). The number of summer maximum temperature heat waves over southeastern Oregon also increased significantly (Oswald 2018).

Projections of Future Extreme Heat

Hot summer days are projected to become more frequent in Oregon under continued global emissions of greenhouse gases, and overnight lows will continue to become warmer (Dalton et al. 2017, Mote et al. 2019). The frequency, duration, and intensity of extreme heat events is expected to increase. Not only are summers expected to warm more than annual average temperatures, but the hottest days in summer are projected to warm more than the mean summer temperature over the Pacific Northwest (Dalton et al. 2017). The hot summers of 2015 and 2018 are salient examples of summer temperatures that are expected to become relatively common by the middle of the twenty-first century.

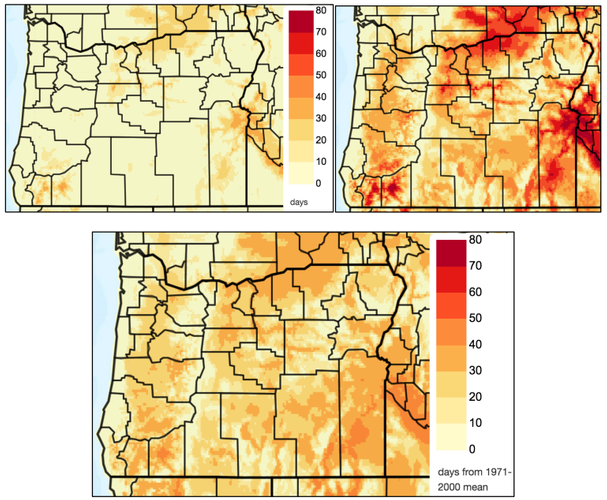

Figure 2. Number of days from April through October with a heat index ≥90°F in historic (1971–2000, top left) and future (2040–2069, top right) periods under RCP 8.5, and the change between those periods (bottom). Data are means of 18 downscaled models from the Coupled Model Intercomparison Project Phase 5. Source: Climate Toolbox, climatetoolbox.org/tool/climate-mapper (Dahl et al. 2019).

The fourth Oregon Climate Assessment reported that by the mid-twenty-first century under RCP 8.5 (a scenario that represents a continuation of current levels of greenhouse gas emissions throughout the twenty-first century, or a relatively high amount of warming), the number of days per year with temperatures above 86°F (30°C) would increase by at least 30 at most locations in Oregon, except at high elevations and the coast (Mote et al. 2019). New research on projected increases in heat index days (Dahl et al. 2019) provides insight on the human health impacts of extreme heat. The heat index is a measure of perceived heat that reflects both temperature and relative humidity. The National Weather Service issues heat warnings when the heat index exceeds given local thresholds. As relative humidity increases, a given temperature can feel hotter. Across Oregon, heat waves rarely are humid (Rastogi et al. 2020), and the heat index generally is similar to the actual temperature. By the mid-twenty-first century under RCP 8.5, the number of days per year with a heat index greater than or equal to 90°F is projected to increase by at least 15 days across the majority of counties in Oregon (Fig. 2, Table 1).

Effects of Extreme Heat on Public Health and the Built Environment

Increases in the frequency of extreme heat events, and even small increases in average summer temperatures, are expected to increase the incidence of heat-related illnesses and deaths, particularly among the elderly; children; people with chronic illnesses; people with low incomes; Black, Indigenous, and People of Color; and outdoor workers (Ebi et al. 2018; *Public Health*, this volume). Excess mortality from heat waves is likely in cities and countries around the world (Guo et al. 2018). In the United States, without any adaptation, excess heatwave-related deaths were projected to increase by an average of 422% by 2031–2080 relative to 1971–2020 under RCP 8.5 and a median population scenario. With full adaptation measures, including a spectrum of interventions from individual to public policy, excess heatwave-related deaths were projected to increase by 57% (Guo et al. 2018). Increases in projected excess heatwave-related deaths in Portland, Oregon were slightly less than the United States average (Guo et al. 2018).

County	Historical baseline (1971–2000)	Mid-twenty-first century RCP 8.5 (2040–2069)	Change	County	Historical baseline (1971–2000)	Mid-twenty-first century RCP 8.5 (2040–2069)	Change
Baker	5	27	22	Lake	3	24	21
Benton	4	25	21	Lane	4	24	20
Clackamas	2	15	13	Lincoln	1	6	5
Clatsop	1	6	5	Linn	3	22	19
Columbia	2	16	14	Malheur	12	45	33
Coos	1	7	6	Marion	3	20	17
Crook	4	26	22	Morrow	12	38	26
Curry	3	15	12	Multnomah	4	23	20
Deschutes	3	21	18	Polk	4	23	19
Douglas	6	28	22	Sherman	13	42	29
Gilliam	14	43	29	Tillamook	0	4	4
Grant	3	21	18	Umatilla	10	35	24
Harney	4	30	26	Union	3	20	17
Hood River	2	12	10	Wallowa	4	21	18
Jackson	9	33	24	Wasco	9	34	24
Jefferson	9	33	24	Washington	4	21	17
Josephine	13	40	26	Wheeler	7	28	22
Klamath	2	20	17	Yamhill	5	24	19

Table 1. Averaged multiple-model mean values of and changes in the number of days from April through October with a heat index ≥90°F in historical (1971–2000) and future (2040–2069) periods under RCP 8.5. All changes are increases. Data derived from 18 downscaled climate models from the Coupled Model Intercomparison Project Phase 5. Source: Climate Toolbox, climatetoolbox.org/tool/climate-mapper (Dahl et al. 2019).

Increasing access to air conditioning often is touted as a means of increasing resilience to extreme heat events. At present, about 68% of single-family homes and manufactured homes in Oregon have cooling systems, and about 25% of multifamily residences have cooling systems (NEEA 2019). The areas in which extreme heat historically was most common, such as southern and eastern Oregon,

have a larger proportion of homes with cooling systems. However, heat also can be extreme in western Oregon, and such extreme heat is becoming more frequent as climate changes. The number of residences in Oregon with air conditioning is increasing, which can improve health outcomes. However, air conditioning also can increase emissions of greenhouse gases that contribute to climate change. Passive survivability in building design can be an alternative to increasing air conditioning (*Built Environmen*t, this volume). Additionally, heat waves can increase the demands on electric power for cooling, increasing the risk of cascading failures within the electric power network (Clarke et al. 2018). *Built Environment* (this volume) discusses an extreme heat event in summer 2020 that challenged the West Coast's electricity supply. Urban heat islands are addressed in *Built Environment*, *Public Health*, and *Social Systems* (this volume).

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Drought

Larry O'Neill, Benjamin Hatchett, and Meghan Dalton

Introduction

Drought is a natural hazard with significant social, economic, and ecological impacts. Persistent drought is common in the Northwest (Gedalof et al. 2004, Knapp et al. 2004, Bumbaco and Mote 2010, Xiao et al. 2016), and Oregon is among the more drought-prone states (e.g., Cook et al. 1999). Over the last 20 years, the incidence, extent, and severity of drought has increased in both the western United States in general and the Northwest in particular compared with the twentieth century (e.g., Dalton et al. 2017, Williams et al. 2020). These droughts have had numerous adverse impacts on agriculture, water availability, recreation, ecosystems, and wildfire risk. The likelihood of continued increases in drought severity and duration in the twenty-first century raises questions about how best to prepare for and mitigate the impacts of drought and how to better understand drought and its causes. This chapter highlights recent advances in the understanding of drought in Oregon and discusses how climate change is projected to influence drought.

The simplest conceptual definition of drought is "insufficient water to meet needs" (Redmond 2002). Drought broadly may be defined as a sustained imbalance of moisture supply and demand at the surface relative to long-term average conditions. Precipitation supplies moisture, whereas evapotranspiration creates a moisture demand. Drought severity depends on the magnitude and duration of moisture deficiency and the size of the affected area. Four primary classes of drought used widely in monitoring and research distinguish between impacts and physical causes: meteorological, hydrological, agricultural, and socioeconomic (Wilhite and Glantz 1985, Rasmussen et al. 1993). Meteorological drought typically is defined by lack of precipitation, or by evaporative demand that exceeds precipitation. For Oregon, the minimum period of time for consideration of meteorological drought operationally is about 90 days. Hydrological drought occurs when prolonged meteorological drought affects surface or subsurface water supply, such as streamflow, reservoir and lake levels, or groundwater levels. Hydrological drought tends to evolve more slowly than meteorological drought, with extents longer than six months. Agricultural drought occurs when meteorological and hydrological drought impacts agricultural production, and usually reflects precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and reduced availability of irrigation water.

The latter three drought classes largely reflect physical phenomena. Socioeconomic drought, by contrast, occurs when meteorological, hydrological, or agricultural drought reduces the supply of some economic or social good or service. Examples include lower crop yields or reductions in outdoor recreation. Socioeconomic drought often affects state and federal drought declarations. In addition to these primary drought designations, three other drought designations—ecological, flash, and snow—were proposed more recently to reflect more-specific drivers and impacts of drought. Ecological drought is defined as "[a]n episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and/or human systems" (Crausbay et al. 2017). Like agricultural drought, ecological drought usually is caused by meteorological and hydrological drought. Vegetation and soil types affect likelihood of ecological drought.

Flash drought refers to relatively short periods of warm surface temperatures, low relative humidities and precipitation deficits, and rapidly declining soil moisture. These droughts tend to develop and

intensify rapidly within a few weeks (e.g., Otkin et al. 2018, Pendergrass et al. 2020), and may be generated or magnified by prolonged heat waves (e.g., Mo and Lettenmaier 2015, Rupp et al. 2017, Chen et al. 2019).

Snow droughts are defined when snowpack—or snow water equivalent (SWE)—is below average for a given point in the water year, traditionally 1 April (Harpold et al. 2017, Hatchett and McEvoy 2018). Years with low SWE on 1 April often are followed by summers with low river and stream flows. The low flows sometimes lead to or exacerbate water supply deficiencies, especially in snowmelt-dominated basins. Although the idea of snow drought has existed for many years (e.g., Wiesnet 1981), it was further developed in Oregon (Sproles et al. 2017) and the Northwest following the 2015 water year, in which below-average snowpack counterintuitively corresponded with above-average precipitation (Mote et al. 2018). This type of snow drought is classified as warm snow drought. Dry snow drought is classified on the basis of below-average snowpack and precipitation (Harpold et al. 2017).

The dimensionless Standardized Precipitation-Evapotranspiration Index (SPEI) is a key quantitative metric for assessing the occurrence and severity of meteorological and hydrological drought. The SPEI compares the net water balance between precipitation and potential evapotranspiration (evapotranspiration from a large area with uniform vegetation and unlimited soil water) between a recent period of time and a historical period (Vicente-Serrano et al. 2010). The SPEI allows for comparison of drought severity in different locations and times and for identification of different drought types (e.g., Ahmadalipour et al. 2017), including consideration of the role of temperature in drought assessment (Vicente-Serrano et al. 2010). The 12-month SPEI is a reliable predictor of annual streamflow in the Northwest (e.g., Abatzoglou et al. 2014, Peña-Gallardo et al. 2019) and water levels in lakes and reservoirs (e.g., McEvoy et al. 2012).

Meteorological droughts generally build over seasonal or longer periods of time in the Northwest, but they often end relatively abruptly. Precipitation from atmospheric rivers terminates an estimated 60–74% of persistent droughts in the Northwest (Dettinger 2013). Some colloquially refer to atmospheric rivers as drought busters in recognition of their ability to erase large precipitation deficits over a period of time as short as a few days. Along the west coast of the United States, atmospheric rivers are considered critical in terminating droughts. However, atmospheric rivers can create another natural hazard—floods (*Floods*, this volume).

Historical Trends in Drought Severity and Extent

From 2000 through 2020, an average of 37% of Oregon experienced drought of at least moderate intensity, as classified by the U.S. Drought Monitor (USDM), and extreme drought affected nearly 7% of the state (Fig. 1). The USDM provides a consistent overview of drought conditions in the United States. It combines multiple indicators of dryness, including precipitation, snowpack, streamflow, soil moisture, groundwater, and evapotranspiration, at multiple temporal extents, into a single drought severity classification (Svoboda et al. 2002). The total area of Oregon affected by drought varied significantly over the last 20 years, and multiple-year droughts were common (Fig. 1). The impacts of conditions consistent with the USDM's most intense drought categories, extreme (D3) and exceptional (D4), often are widespread and severe across multiple sectors. Major impacts observed in Oregon during these most intense droughts included widespread losses of major crops and pastures, loss of snow- and water-based outdoor recreation, and shortages of water in reservoirs, streams, and wells. In the last 20 years, Oregon experienced exceptional drought only once, from July 2003 through January 2004 in southeast Oregon. This drought affected an average of 5% of the state. Extreme drought occurred during five distinct episodes: portions of 2001, 2004–2005, 2014–2015, 2018, and 2020 (see Box 1).

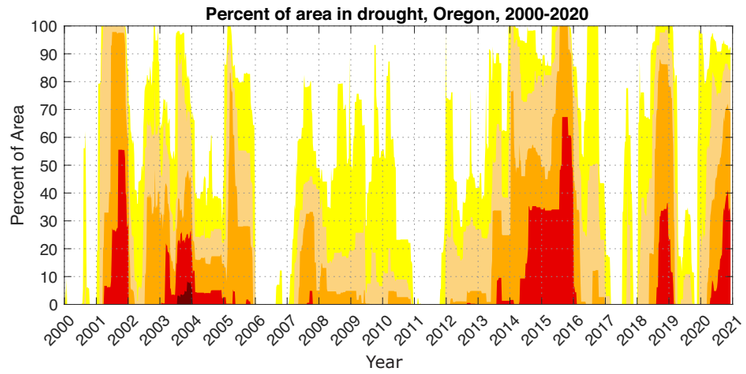

Figure 1. Percentage of Oregon's area in drought according to the U.S. Drought Monitor (droughtmonitor.unl.edu). The five drought classifications are abnormally dry (D0, light yellow), moderate drought (D1, tan), severe drought (D2, orange), extreme drought (D3, red), and exceptional drought (D4, dark red). White corresponds to neutral conditions.

The USDM drought categorization has many uses, but is not suitable as an objective definition of drought when analyzing long-term historical conditions or future climate projections. A better metric for the latter applications is the SPEI, which is a key indicator of water supply and demand as reflected in the USDM. In 14 of the last 20 years, the statewide annual SPEI was negative, indicating dry conditions (Fig. 2). In six of these years, SPEI was less than -0.8, indicating widespread, moderate-to-severe meteorological and hydrological drought (Fig. 2). In Oregon and the southwestern United States, the period 2000–2018 was the second-driest 19 years since 800 CE (Williams et al. 2020). Climate model simulations also suggested that 47% of the dryness in soil moisture observed from 2000 through 2018 was driven by the effect of anthropogenic climate change on temperature, humidity, and precipitation (Williams et al. 2020).

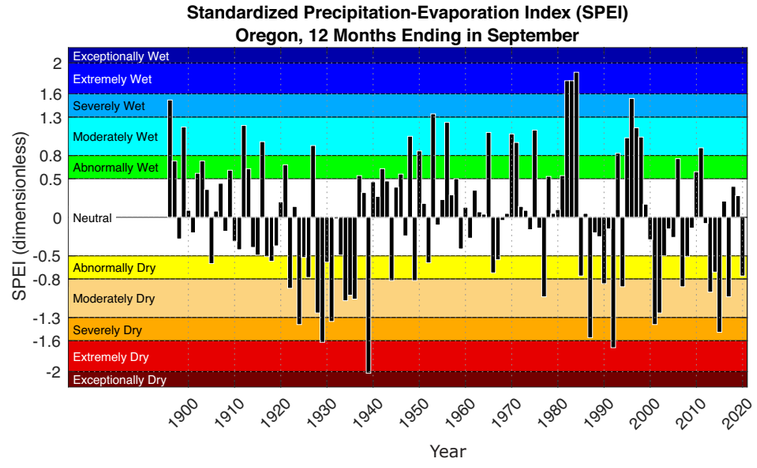

Figure 2. Time series of water year Standard Precipitation-Evapotranspiration Index (SPEI) for Oregon. Negative values follow the U.S. Drought Monitor's drought classifications, and positive values follow the Climate Toolbox U.S. Water Watcher tool (climatetoolbox.org/tool/US-Water-Watcher). Data Source: West Wide Drought Tracker, wrcc.dri.edu/wwdt/time/, with the following selections: Oregon, SPEI, 1895–2020, September, 12-month; accessed 19 December 2020.

Persistent and severe drought has been a feature of Oregon's climate over the past 20 years (Fig. 1, 2). These droughts were caused by different conditions, such as low winter precipitation and snowpack (2001), low summer precipitation and high winter temperature (2003), and low snowpack and low winter precipitation (2005) (Bumbaco and Mote 2010). Low

Box 1. Oregon drought during water year 2020

During water year 2020, most of Oregon was in the midst of a historically significant drought (Fig. B1). The exception was northeast Oregon, which received well above average precipitation and flooding associated with a powerful atmospheric river event (*Floods*, this volume). Statewide, water year 2020 was the 13th driest and 10th warmest among the 125 years of record (1895–2020; NCEI 2020).

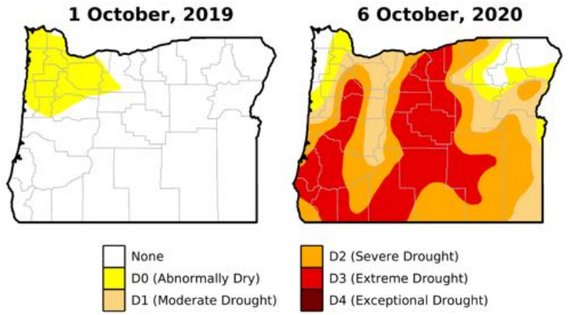

Figure B1. Progression of drought severity throughout water year 2020 as depicted by the weekly U.S. Drought Monitor for (left) 1 October, 2019 and (right) 6 October, 2020.

Fifteen counties in southwest and central Oregon, in which the water year was the 11th driest on record, were granted state-level drought declarations (Fig. B2) due to impacts on surface water availability and agricultural and livestock production.

Although precipitation across much of the state was well below average, snow water equivalent (SWE) in the north and central Cascade Range was only slightly below normal on 1 April. In southern Oregon, by contrast, precipitation and 1 April SWE were well below normal, and therefore the drought in that region had a significant snow drought component. The snowpack melted out one to three weeks early in the Klamath and Rogue River Basins, which elevated streamflows to near normal for a few weeks. Early meltout also occurred in the Willamette River Basin as a result of anomalously high temperatures throughout Oregon from mid-April through mid-May.

County Drought Declarations During Water Year 2020

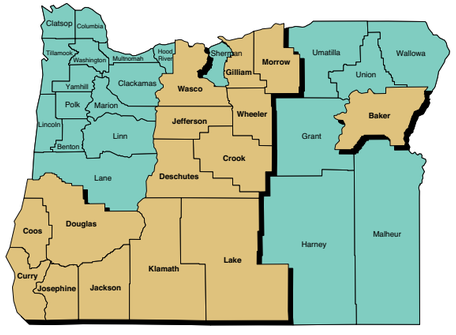

Figure B2. Counties with state-level drought declarations in September 2020 (tan shading). Fifteen counties had governor-approved drought declarations during water year 2020.

see **Water Year 2020**, page 42

precipitation contributed to each drought, but temperature and snowpack also affected drought severity and impacts, including the propagation of meteorological drought to hydrological and agricultural drought (Bumbaco and Mote 2010). Multiple studies have associated cooler sea surface temperatures in the eastern Pacific Ocean during La Niña with the 1998–2004 drought in the western United States (e.g., Hoerling and Kumar 2003, Seager 2007), and with other historical droughts in that region (e.g., Herweijer et al. 2006, Cook et al. 2007).

A number of severe droughts, with different causes, occurred in Oregon since 2010. The most severe of these droughts occurred from 2013–2015 and reflected very low winter precipitation (2014 water year) and snowpack (2015 water year). During water year 2014, SWE was near normal at high elevations and slightly above normal at low elevations (Fig. 3a). During the warm snow drought in water year 2015, precipitation was above normal (Sproles et al. 2016), but SWE was well below normal throughout the state (Fig. 3b), driven by warm temperatures that caused precipitation to fall primarily as rain (Mote et al. 2016) and earlier snowmelt. The water year 2015 drought possibly was accelerated by a snow albedo feedback whereby more sunlight is absorbed by bare ground than by snow, which further increases the surface air temperature and melts the snow (Walton et al. 2017). Water years 2014 and 2015 illustrate two types of snow droughts that may become more common in a warmer climate. First, the snow season may begin later and end earlier, with below-normal peak SWE (e.g., 2014 [Fig. 3a] and, to a lesser extent, 2020). Second, warm temperatures may cause more precipitation to fall as rain and less as snow, resulting in shorter snow-covered durations with smaller peak snowpacks (e.g., 2015, with greater negative SWE anomalies than 2014; Fig. 3b).

Anticipated Impacts of Climate Change on Drought

Climate models project warmer and drier summers for Oregon, and decreases in mountain snowpack due to warmer winter temperatures (*State of Climate Science*, this volume). These factors increase the likelihood of one or more types of drought. Snow drought, for instance, is projected to occur more frequently under a warmer climate as the proportion of precipitation falling as snow decreases. These conditions are projected to increase winter runoff and decrease runoff during spring and summer (e.g., Vano et al. 2015b).

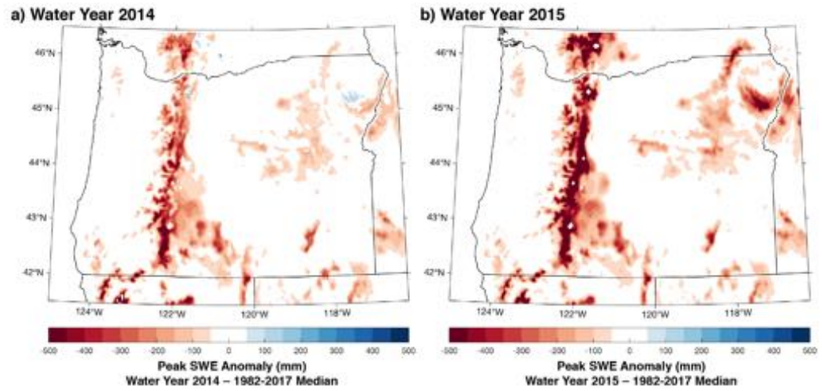

Figure 3. Peak snow water equivalent (SWE) anomalies calculated as differences from the water years 1982–2017 median peak SWE for two recent water years with notable snow drought: (a) water year 2014 and (b) water year 2015. Figure created by Benjamin Hatchett from a 4 km resolution reanalysis of daily SWE from Broxton et al. 2016.

It is still an open question whether conditions similar to the 2015 snow drought may become common by the middle of the twenty-first century (Cooper et al. 2016, Dalton et al. 2017). A sensitivity analysis of historical climate data suggested that for every 1.8°F (1°C) of warming, peak SWE decreases up to 30% (Cooper et al. 2016). Recent work also suggested that effects of anthropogenic forcing on spring snowpack trends since 1980 may have been mitigated by natural variability forced by large-scale changes in atmospheric circulation, which were driven by Pacific sea surface temperatures (Siler et al. 2019). The latter study noted that declines in the snowpack of the western United States may accelerate once the cycle of natural variability shifts from its current mode. Ultimately, projections suggest a decrease in winter snowpack of upwards of 60% by 2050 under RCP 8.5 (a scenario that represents a continuation of current levels of greenhouse gas emissions throughout the twenty-first century, or a relatively high amount of warming) (Fyfe et al. 2017). As climate change reduces mountain snowpack, seasonal drought will become less predictable in the western United States, including Oregon (Livneh and Badger 2020), and snow droughts will increase the likelihood of hydrological or agricultural drought during the following spring and summer (e.g., Koster et al. 2010, Wood et al. 2016).

Water Year 2020, from page 40

Southwest Oregon was first region to experience significant impacts from the drought. Irrigation allocations at the beginning of March were about one-third of normal, leading many producers in the Klamath Basin, for instance, to curtail planting or to rotate to less water-intensive crops. The Oregon Department of Forestry announced an early start of the wildfire season in southwest Oregon due to elevated wildfire risk from dry and warm conditions.

Late spring rainfall was insufficient to alleviate large precipitation deficits across the state, although it delayed drought impacts until mid to late summer across much of western Oregon. Compounding the low winter precipitation east of the Cascade Range was the lack of rainfall during the typical North American monsoon season (July–September). On average, eastern Oregon receives 10–30% of its annual precipitation during these months. The South Central Oregon Climate Division (Fig. B3, CD7) received 0.42 inches (1 cm) of rain from July–September 2020 compared with an average of 1.6 inches (4 cm); this ranks as the fifth driest July–September in the 125-year period of record (NCEI 2020). Additionally, the two-month period August–September 2020 was the third warmest on record for CD7, where average temperatures were 5.0°F (2.8°C) warmer than normal. The low precipitation and high temperatures resulted in extremely dry soil, consistent with flash drought. The most acute impacts were reported in Malheur County. The lack of monsoonal thunderstorms minimized summer lightning activity in eastern Oregon, and lightning did not spark wildfires in the dry vegetation.

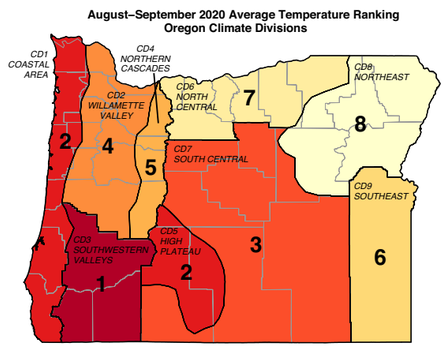

Figure B3. Rank of August–September average temperature over the past 125 years by state climate division (CD). A rank of 1 indicates the warmest average on record. Official rankings from the NOAA National Centers for Environmental Information published December 2020 and retrieved on 19 December 2020.

Conditions consistent with flash drought, driven by near record-high temperatures and dryness, also affected western Oregon during late summer (Fig. B3). The Southwest Oregon Climate Division (CD3) recorded its warmest August–September on record, the Willamette Valley Climate Division (CD4) its fourth warmest, and the Coastal Climate Division (CD1) its second warmest. These conditions contributed to the rapid expansion of wildfires throughout western Oregon during September.

The drought led to a number of very low reservoir levels. Wickiup Reservoir in the central Cascade Range, for instance, was at 1% of capacity by mid-September, a historical low. Delivery of irrigation water from Prineville Reservoir was curtailed in late August due to low water levels and the need to maintain minimum flow requirements on the Deschutes River. Even with irrigation curtailments, reservoirs in southwest Oregon ended water year 2020 at less than 15% of capacity, meaning essentially no carryover into water year 2021.

The social and economic impacts of snow drought may be considerable in basins that rely more heavily on irrigation water derived from snowmelt runoff. In the Columbia River Basin, for example, snowmelt runoff accounts for about 25% of total surface water allocated to irrigation (Qin et al. 2020). The Willamette River Basin also is vulnerable to projected decreases in Cascade Range snowpack and snowmelt runoff, with increased incidence of short-term agricultural drought during summer (Jung and Chang 2012). Short-term drought during the growing season may have major effects on agricultural productivity if water for irrigation becomes limited. Watersheds in the Northwest that receive both rain and snow, and in which snowmelt contributes substantially to streamflow during sprng and summer, are the most sensitive to projected winter warming (Vano et al. 2015a). The frequency of hydrological drought is projected to increase in such watersheds.

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Wildfire

Andrés Holz, Jessica Halofsky, William Nanavati, Laura Platt, and Kelly Gleason

Fire is a natural and recurring ecological disturbance that affects and responds to changes in climate, atmospheric chemistry, vegetation, and human activities, from recreation to industry to housing (Bowman et al. 2009, Flannigan et al. 2009, Archibald et al. 2018). As an ecological process and evolutionary driver, fire affects vegetation structure, plant communities, and species' identities or traits that allow plants to better survive or adapt to different types of fire over time (Agee 1993, McKenzie et al. 2004, Walsh et al. 2015, He et al. 2019, McLauchlan et al. 2020). The total area burned in Oregon during summer and autumn 2020 was among the largest in recorded history. During the 2020 fire season, five wildfires over 100,000 acres (~400 km^2), ignited by lightning and human activity, burned in wildlands and the wildland-urban interface. These and other fires across the western United States led to the displacement of thousands of people and loss of structures and infrastructure, and contributed to hazardous air quality in many parts of Oregon and the Northwest. Given these recent extreme events, this chapter provides historical and scientific context for wildfires in the state and region, and explore projections of wildfire under likely future climate conditions.

Wildfire Regimes in Oregon

Wildfire is driven by nested controls that vary across spatial and temporal scales (Fig. 1). At the finest resolutions, fuel, oxygen, and heat control an ignition or flame. Winds and other weather conditions, fuels, and topography affect expansion of fire and fire intensity (amount of heat; Rothermel 1972, Pyne 1996). Over decades to centuries, fire regimes (attributes of fires over space and time, such as frequency, size, and severity) are influenced by climate, which affects the weight (biomass) and dryness of fuel; vegetation type or species identities of plants; and the frequency, type, and timing of ignitions (Moritz et al. 2005, Parisien and Moritz 2009) (Box 1). This chapter introduces some foundational terms and concepts in wildfire science and reviews fire trends in Oregon.

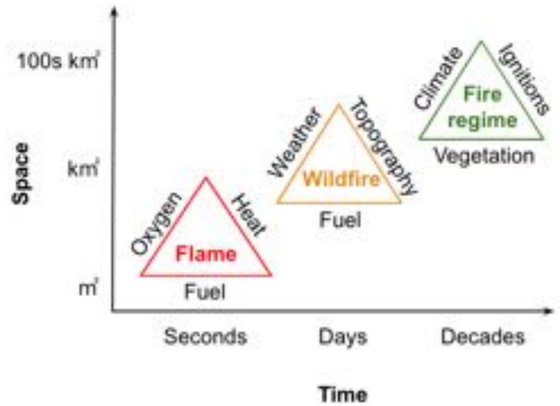

Figure 1. Nested controls on wildfires. Adapted from Moritiz et al. 2005.

Individual wildfires are produced by interactions between fine-scale flame dynamics and larger-scale fire regime dynamics, and are enabled by four factors that are synchronized (Bradstock 2010): sufficient fuel biomass, dry fuels, weather that is conducive to fire expansion, and ignitions. Understanding the interactions among these four factors is necessary to project how wildfires may respond to climate change and to consider whether and where fuels management may be effective.

Across the western United States, a steady increase in fire activity has been observed and linked to climate change (e.g., Westerling et al 2006, Abatzoglou and Williams 2016) and management legacies,

such as fire suppression (Haugo et al. 2019) and the introduction of invasive grasses (Kerns et al. 2020). In this region, the number of wildfires ignited by lightning has increased rapidly, whereas human-set fires have increased moderately since the early 1990s (Balch et al. 2017). From 1984 through 2018, annual area burned in Oregon increased (Fig. 2), and projected climate change is expected to greatly increase the occurrence and future risk of large wildfires throughout Oregon, the Northwest, and the western United States (Littell et al. 2010, Stavros et al. 2014, Ager et al. 2017).

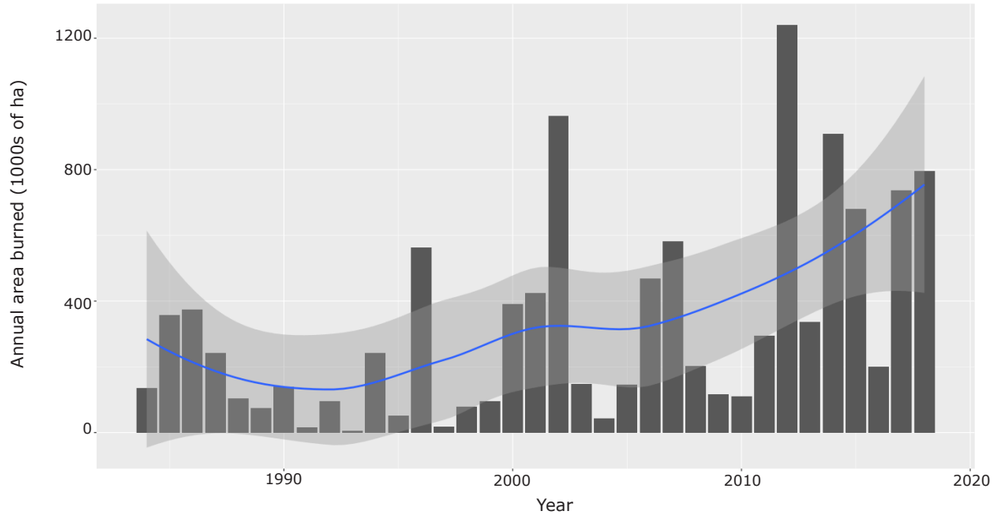

Figure 2. Annual area burned in Oregon from 1984–2018. Fires smaller than 988 acres (400 ha) were omitted. Data source: Monitoring Trends in Burn Severity (Eidenshink et al. 2007).

The concept of fire regimes is useful for characterizing how fire activity varies as precipitation or plant productivity varies along a gradient from low to high. At one end of the gradient are fuel-limited fire regimes, or those in which fire activity is constrained by the amount of contiguous biomass. Fires often are fuel-limited in regions that are dry and have low productivity. For example, fuels usually are limited in sparse shrublands (and some very dry, scattered, and unproductive low-elevation forests) east of the Cascade Range. In contrast, the dense forests of the Coast Range and intermediate to high elevations in the western Cascade Range are flammability-limited: fuels are abundant, but conditions usually are too wet for fire. Forests at intermediate and low elevations in western and southwestern Oregon (e.g., the Willamette Valley), and at intermediate elevations in the Blue Mountains east of the Cascade Range, are characterized by abundant fuels, seasonal aridity, and mixed fire regimes (Perry et al. 2011, Stine et al. 2014, Spies et al. 2018) (Fig. 3).

Limitations to fire activity in both fuel- and flammability-limited ecosystems can be overcome by short-term variability in climate (conditions over a month or longer) and weather (conditions over less than a month). For example, numerous studies in fuel-limited ecosystems have reported that years with above-average precipitation can lead to increased biomass and contiguity of fine fuels and an unusually active fire season. By contrast, in flammability-limited ecosystems, high fire activity often corresponds to extreme heat, spring and summer drought conditions, or strong and dry winds (Littell et al. 2009, Holz et al. 2012, McKenzie et al. 2019).

Conceptually, it is sensible to assume a negative linear relation between fire frequency and severity: as more fires occur in an area, less fuel is available for future fires. Conversely, as the fire-free period becomes longer, fuels can accumulate. However, this assumption ignores nonlinear variation in flammability following fire events. For instance, in the aftermath of a fire, fuel amount might increase rapidly until canopy closure, after which fuel accumulation continues but flammability decreases (Agee and Huff 1987, Spies et al. 1988). Alternatively, succession (long-term development of a plant community) can be interrupted by new and frequent fires (Whitlock et al. 2014, Busby et al. 2020). In dry montane forests, in which the majority of trees that do not require fire for reproduction germinate from seeds, succession can be limited by aridity, and relatively flammable grasses and shrubs can dominate in the early years or decades following wildfire (Davis et al. 2019).

Different ecosystems in Oregon have different fire regimes, which can be summarized on the basis of mean fire frequency, size, or seasonality, or other criteria. Below is a summary of Oregon's fire regimes on the basis of burn severity, or the percentage of trees killed by wildfire (Agee 1998): low (less than about 20%), high (more than about 70%), or mixed (about 20–70%). This chapter does not aim to characterize fire regimes in different regions of Oregon in great detail.

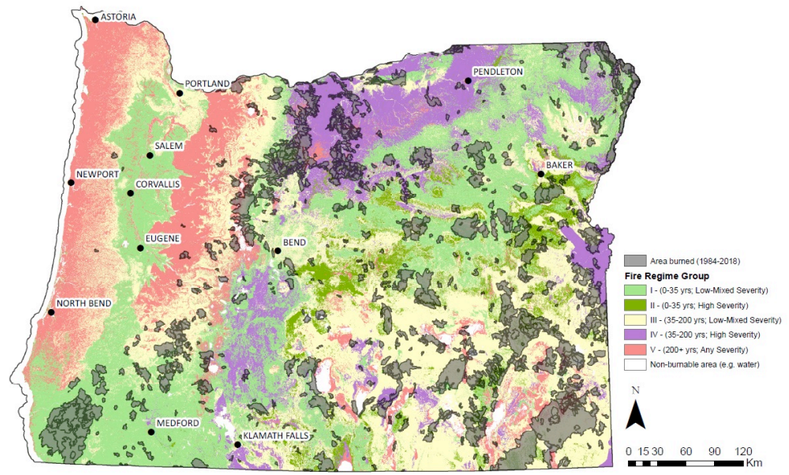

Figure 3. Total area burned in Oregon from 1984–2018 and fire regime groups. Fires smaller than 988 acres (400 ha) were omitted. Data sources: Monitoring Trends in Burn Severity (Eidenshink et al. 2007), LANDFIRE (2010).

Low-severity fires are common at both ends of the precipitation gradient—in both fuel-limited and flammability-limited systems. In fuel-limited ecosystems, fires generally have low severity, cover large areas, and are fairly frequent (Heyerdahl et al. 2019). Years in Oregon in which the area burned was relatively high followed autumns and winters with above-average precipitation, which enabled accumulation of fine fuels, thereby connecting formerly fragmented vegetation and facilitating fire spread. Such climate-vegetation-fire dynamics sometimes are related to the El Niño–Southern Oscillation, as explained below (Heyerdahl et al. 2002, Johnston et al. 2017). Low-severity fires also occur in some moist forests in the Oregon Coast Range (Impara 1997) and western Cascade Range (Reilly and Spies 2016), where only fine fuels in the understory and small trees become dry enough to burn (Keeton and Franklin 2004, Tepley et al. 2013, Meigs et al. 2020).

Following decades of fire suppression that coincided with a relatively cool and wet climate (Higuera et al. 2015), the density and flammability of many low- to mid-elevation dry forests and woodlands in Oregon has increased (Haugo et al. 2019). For example, fire suppression in low elevation,

Box 1. Climate-wildfire relations in Oregon

Characteristics of fire and its ecological effects reflect relations among climate, people, and fire (Whitlock et al. 2010). Paleoecological and dendrological data, ethnographic accounts, and historical observations help elucidate these relations (Table B1). Indirect evidence does not explicitly describe ecological or climate change. Direct evidence includes qualitative and quantitative historical data and remotely sensed observations.

	Spatial resolution	Spatial extent	Temporal resolution	Temporal extent	Ecological inference	Effort needed
Paleoecology	Low	Low	Moderate	Very high	Indirect	High
Ethnographic & historical accounts	Variable	Moderate	Very high	Variable	Variable	Variable
Dendrology	Variable	Low	High	High	Direct	High
Aerial photographs	High	High	Low	Moderate	Indirect	Low
Satellite images	Very high	Very high	Very high	Very low	Indirect	Very low
Historical surveys	Low	High	Low	Low	Indirect	Moderate

Table B1. Forest structure and fire regime reconstruction methods. Adapted from Yokom-Kent 2014, Daniel et al. 2017, and Naficy 2019.

Paleoecological records

Sedimentary pollen and charcoal indicate changes in vegetation and fire activity over tens of thousands of years in the Northwest (Whitlock 1992, Walsh et al. 2015). Following the Pleistocene, about 12,000 years before present (BP), fire activity increased greatly as temperatures increased and forests established. Fire activity was high from 10,000–8000 BP as summer insolation (incoming solar radiation) peaked. Decreases in tree density from 9500–7500 BP may reflect increased fire activity and warm, dry summers. From 8000–4000 years BP, fire activity greatly decreased during a period of lower summer insolation and increased precipitation or lower evapotranspiration. By the end of this period, forest composition was similar to contemporary composition. Fire activity increased after 4000 years BP as a result of continued moisture variability, higher fuel loads, and Indigenous use of fire (Whitlock 1992, Walsh et al. 2015).

Tree-ring records

Tree-ring (dendrological) records can be used to reconstruct the past several hundred years of forest structure and composition, and of wildfires and climate, at seasonal to annual resolution (Table B1). These records suggest that fires were widespread west of the Cascade Range between the 1400s and 1650, possibly associated with warm, dry conditions and Indigenous fire use. Area burned decreased from 1650–1800, likely related to cool, wet conditions and reduction in population sizes of Native Americans, and then increased from 1800–1910, coincident with Euro-American settlement. Then, through the early 2000s, displacement of Native Americans and discontinuation of Indigenous fire use, fire suppression, and cool, wet conditions reduced fire activity (Boyd 1999, Weisberg and Swanson 2003, Noorgard 2014). Exceptions were the large fires during the twentieth century (e.g. Yacolt, 1902; Tillamook, 1933) that resulted from logging operations and extreme easterly winds. Increases in fire incidence since the early 2000s coincided with decreases in fuel moisture (Abatzoglou and Williams 2016).

Most dendrological reconstruction in the eastern Cascade Range has focused on dry, mixed-conifer forests within the Blue Mountains and relatively wet forests at the margins of drier forests. This work assessed variability in fire frequency among forest types and effects of fire suppression on forest structure. Results indicated that fire frequency was about 10–50 years in mixed-conifer forests

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historically open ponderosa pine (*Pinus ponderosa*) forests led to dense fuels and establishment of shade-tolerant tree species, such as grand fir (*Abies grandis*) and white fir (*A. concolor*), throughout the tree canopy, connecting fuels vertically from the ground to the crown. As a result, the intensity and severity of fires in the last three to four decades has increased (Hessburg et al. 2015, Haugo et al. 2019). Due to changes in climate and fire severity (Marlon et al. 2012), some dry forests and woodlands at low to intermediate elevations in eastern Oregon may not be able to reestablish naturally, and could transition to more-flammable shrublands or grasslands (Davis et al. 2019, 2020; Rodman et al. 2020). Fire suppression in wet ecosystems in the western Cascade Range has played a relatively minor role in driving fire patterns in these ecosystems (Spies et al. 2018).

Increases in fire severity also have been observed in arid shrubsteppe in central and eastern Oregon. In these ecosystems, the rapid expansion of non-native invasive grasses, such as cheatgrass (*Bromus tectorum*) and ventenata grass (*Ventenata dubia*), has increased fine-fuel biomass and spatial continuity of fuels (Balch et al. 2013, Kerns et al. 2020, Tortorelli et al. 2020). Formerly sparse sagebrush ecosystems continue to be colonized by cheatgrass, which has resulted in increases in area burned of up to 200% since 1980 (Bradley et al. 2018). Expansion of cheatgrass leads to a positive feedback loop in which increases in fire frequency and extent facilitate further increases in the distribution and density of cheatgrass. Any ground disturbance, whether from livestock grazing (Williamson et al. 2020), tree thinning, or fire, can facilitate the colonization and increase in abundance of cheatgrass. Expansion of the shade-intolerant cheatgrass tends to be more likely in areas in which native grasses and forbs are sparse, which sometimes reflects a history of intensive livestock grazing (e.g., Kerns and Day 2017). *Ventenata dubia* can colonize relatively bare or open areas in ponderosa pine and mixed conifer forests.

High-severity fires dominate wet, cool forests, including remnant old-growth forests, in Oregon's Coast Range and western Cascade Range. Some shrublands and grasslands in central, eastern, and southwest Oregon also burn at high severity, but more frequently than forests (Fig. 3). High-severity wildfires in wet, cool forests

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(Heyerdahl et al. 2001, 2019; Merschel et al. 2014, 2018; Johnston 2016; Platt 2020). It appears that all dendrological reconstructions of fire history at low to intermediate elevations are consistent with other evidence that fire frequency decreased after 1910–1930 coincident with the federal implementation of fire suppression (Hessburg et al. 1999).

The high temporal resolution of dendrological records also allows for better understanding of the interactions between annual and decadal climate variability and fire activity. Annual variation in the El Niño-Southern Oscillation and decadal variation in the Pacific Decadal Oscillation cause similar changes in climate throughout the Northwest. Relatively warm winters and low snowpack are likely during the positive phases of these oscillations, as are increases in fire activity (Heyerdahl et al. 2002), whereas relatively cool, wet winters and high snowpack are likely during the negative phases (La Niña and PDO-) (Heyerdahl et al. 2008, Littell et al. 2016).

Comparisons to other records

Comparison of paleoecological and dendrological records to past land surveys (e.g., Public Land Surveys); historical and ethnographic records; and time-series of satellite, aerial, and land-based images allows for better understanding of interactions among climate, vegetation, fire, and humans. Fire has been a consistent, major disturbance process in the Northwest. Although changes in vegetation and fire activity following the Pleistocene likely were driven by a warming climate and increased atmospheric concentrations of carbon dioxide, Indigenous fire use likely influenced fire dyamics and vegetation during the past 4000 years. Archaeological, ethnographic, and historical records suggest that Indigenous use of fire led to frequent (less than about 5–35 years), low-severity surface fires in shrubsteppe, grassland, and dry low- to intermediate-elevation forests in central and eastern Oregon, and across the Willamette and Klamath-Siskiyou Basins (Boyd 1999, Steen-Adams et al. 2019).

The reduction in intentional ignition following the displacement of Tribes and fire suppression coincided with cool conditions, resulting in a marked decrease in fire activity and increases in the density of trees and shrubs (Whitlock 1992, Weisberg and Swanson 2003, Hessburg et al. 2007, Walsh et al. 2015). These interpretations and observations are consistent with the hypothesis that the absence of fire from much of the Northwest altered vegetation composition and structure and reduced the frequency of wildfires (Marlon et al. 2012).

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typically are infrequent and large, facilitated by extremely dry and warm springs and summers or high winds (Hemstrom and Franklin 1982, Spies et al. 2018). East of the Cascade Range, most wildfires are ignited by lightning, whereas west of the Cascade Range, most are ignited by human activity (Balch et al. 2017). Dry, cloud-to-ground lightning strikes are rare on the west side of the Cascade Range because of the strong maritime effect of the Pacific Ocean (Spies et al. 2018, Kalashnikov et al. 2020).

In western Oregon (western Cascade Range and Coast Range), extensive clearcutting followed by the planting of Douglas-fir (*Pseudotsuga menziesii*) plantations has reduced the spatial heterogeneity and overall variability in forest structure (Tyler and Peterson 2004, Donato et al. 2020). In older, more-complex stands, the sizes of trees usually are diverse and the understory is shady. In young plantations, by contrast, trees tend to be denser and to have more branches, which allows for greater horizontal and vertical spread of fire (Agee 1993, Stephens et al. 2005). Although the canopies of young plantations are not fully closed, the small-diameter trees readily become dry, which increases their ability to carry fires and elevates the risk of high-severity fires (Thompson et al. 2007, Zald and Dunn 2018). Logging and the post-fire planting of trees have reduced the extent of both mature or old-growth forest and early successional

vegetation in forests west of the Cascade Range in Oregon and Washington (Franklin and Johnson 2013, Swanson et al. 2014). Consequently, the extensive, homogenous patches of young tree plantation and closed-canopy, mid-successional Douglas-fir and western hemlock (*Tsuga heterophylla*) currently present in western Washington and Oregon occupy a larger area than in the past (Davis et al. 2015, DeMeo et al. 2018, Donato et al. 2020). In these historically more heterogeneous forests, the suppression of active fires may be ineffective and considerably more hazardous for fire crews during extremely hot and dry conditions that often are associated with strong easterly winds, such as those that fueled much of the 2020 fire season (Higuera and Abatzoglou 2021).

Mixed-severity fire regimes are the most complex and least understood across the western United States (Agee 1993, 2005; Tepley et al. 2013). These fire regimes are characterized by local differences in burn intensity and plant mortality (Agee 2005, Naficy 2016). The life histories of the plants that occur in regions with mixed-severity regimes are distinct in terms of fire resistance (Stevens et al. 2020) and vary as a function of water availability, which is affected by topography (Tepley et al. 2015). Fire histories in these systems are difficult to determine because most fire-history reconstruction techniques were developed for low- or high-severity regimes (Agee 2005; but see Hagman et al. 2019, Platt 2020). For example, in systems with infrequent, high-severity fires, the dates of past fires are estimated by pairing individual fire events with data on the ages of trees that colonized and established following that fire (Box 1). In systems with frequent, low-severity fires, fire occurrences typically are evident by scars on individuals of fire-resistant tree species. In contrast, in systems with mixed-severity fire regimes, species with traits that enable resistance or recovery are not uniformly distributed, leaving researchers unable to reconstruct fire activity on the basis of one method alone, and therefore reducing the number of samples from a given site. Additionally, dominant tree species in many areas characterized by mixed-severity fires decay relatively rapidly, limiting the potential use of dendroecology to reconstruct fire histories (Tepley and Veblen 2015). Novel research approaches aim to overcome challenges to reconstruction of fire frequency and severity in dry and cold (Hagman et al. 2019) or moist (Platt 2020) mixed-conifer forests.

Projections of Future Fire Dynamics

Empirical Models

Different types of models are being applied to project future fire dynamics in Oregon. Many empirical models, some reported in previous Oregon Climate Assessments, use the statistical relation between observed climate and area burned over the past 100 years to predict future area burned on the basis of projected temperature and precipitation, which usually are derived from global climate models. Empirical models can be applied at either global (Krawchuk et al. 2009, Moritz et al. 2012) or regional extents, such as the western United States (McKenzie et al. 2004, Littell et al. 2010, Yue et al. 2013, Kitzberger et al. 2017). Empirical models at all extents consistently project that the area burned in Oregon will increase. For example, McKenzie et al. (2004) projected that, with a mean temperature increase of 3.6°F (2°C), the area burned in Oregon will increase more than 200%. Assuming the A1B emissions scenario (medium emission levels), Kitzberger et al. (2017) also projected a 200% increase in median annual area burned in Oregon, including the Cascade Range, from 2010–2039 compared to 1961–2004. Other empirical models for Idaho, Montana, Oregon, and Washington, which were based on projections from two global climate models and the A1B scenario, suggested that area burned will double or triple by the 2080s (Littell et al. 2010).

Results of different empirical models also consistently suggest that the incidence of very large fires, often defined as the largest 5–10% of fires or fires that burn more than 12,350 acres (5000 ha), will

Impact of wildfires on runoff

Wildfires affect water balance, water quality, fluvial and riparian systems, and water infrastructure. Reduction in the extent of the vegetation canopy reduces water interception and storage by the canopy, allowing more precipitation to fall on the soil. In conjunction with reductions in the volume and extent of litter and live vegetation, and therefore evapotranspiration, the additional precipitation increases direct runoff for at least the first few years following a wildfire. In subalpine and alpine watersheds, less canopy interception may lead to greater snow accumulation.

After a wildfire, increased light transmission through the canopy and decreased reflectivity of the snow, a result of deposition of light-absorbing particles such as black carbon and burned debris, increases net shortwave radiation, which drives earlier snowmelt. This is somewhat offset by the decreased net longwave radiation due to the loss of canopy, but overall, wildfire increases the net snowpack energy balance and warms the snowpack (Gleason et al. 2019). In burned forested areas across 11 western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming), snow disappeared five days earlier on average, and this shift in snowmelt persisted for more than ten years following fire (Gleason et al. 2019).

Soil hydrophobicity (repelling rather than absorption of water by soil) also is likely to increase after a wildfire, resulting in less infiltration and more direct runoff. Changes in hydrophobicity depend on burn severity and vegetation composition, but overall reduce the lag from snowmelt to streamflow, increase overland flow, and increase peak streamflow. These changes are likely to increase erosion and contribute to earlier drying of soils and vegetation and reductions in late-season flows. As a result, water shortages in the dry season, and differences in seasonal flows in many parts of Oregon, may be exacerbated.

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increase in the future (Barbero et al. 2015). For example, empirical models developed by Barbero et al. (2015) under RCP 8.5 (a scenario that represents a continuation of current levels of greenhouse gas emissions throughout the twenty-first century, or a relatively high amount of warming) suggested that across the western United States, including Oregon, the annual probability of very large fires will increase by 200–400% by 2041–2070 compared to 1971–2000. Models by Davis et al. (2017) suggested that under RCP 4.5 (a lower-emissions and warming scenario), the proportion of forests in which conditions are consistent with large wildfires (more than 100 acres, or 40 ha) will increase by over 20% during the twenty-first century for nearly all major regions in Oregon, although less so for the Coast Range. The largest projected increases were in the Blue Mountains, Klamath Mountains, and eastern Cascade Range.

Future fire severity will depend partly on vegetation composition and structure. In the near term, high tree density may increase fire severity in dry forests (Cassell et al. 2019). Over the long term, fire severity in dry forests may remain similar or increase slightly (Parks et al. 2016).

Mechanistic Models

Mechanistic models use knowledge of physical and biological processes and their interactions to simulate future ecosystem attributes, such as vegetation composition and structure, vegetation productivity, fire frequency and severity, and carbon storage. These models account for potential interactions between vegetation and fire as the climate changes to conditions for which there is no past analog. Thus, they incorporate negative and positive feedbacks between fuel levels and fire frequency, and potential changes in the relation between climate and fire in the future, which are phenomena not captured by the empirical models described above. These models also integrate the potential increase in primary productivity, and in turn fuel loads, as a result of increased atmospheric carbon dioxide concentrations. Examples of process-based models that simulate fire are LANDIS-II (Scheller and Mladenoff 2008) and MC1 (Bachelet et al. 2001) and MC2 (Bachelet et al. 2015).

In an application of the LANDIS-II model to the Oregon Coast Range, area burned over the twenty-first century did not increase substantially relative to historical area as climate changed, but fire severity and the incidence of extreme fire weather increased (Creutzburg et al. 2017). By contrast, LANDIS-II suggested a large increase in fire frequency, size, and severity in dry forests in the southern Blue Mountains of central Oregon (Cassell et al. 2019).

An application of MC1 to the western three-quarters of Oregon and Washington, which assumed an A2 emissions scenario (high emissions), projected a 76–310% increase in annual area burned and a 29–41% increase in burn severity (measured as aboveground carbon released by fire) by 2100, with the degree of increase depending on the climate model used as input (Rogers et al. 2011). As reported in the third Oregon Climate Assessment (Dalton et al. 2017), more-recent simulations with the MC2 model, which incorporated climate scenarios from the fifth phase of the Coupled Model Intercomparison Project, also projected increases in fire frequency across all forest-dominated ecosystems in Oregon, with or without fire suppression (Sheehan et al. 2015).

At the subregional level, MC1 projected increases in fire frequency and extent over approximately 250,000 acres (1 million ha) of forests in central Oregon (Halofsky et al. 2013, 2014). The latter work projected that more than three-quarters of those forests will burn repeatedly from 2070–2100, particularly given hot and dry climate scenarios. The projected fire regime for central Oregon would be a significant change from that of the last century, and likely would result in substantial changes in vegetation. Similarly, MC2 simulations suggested that across south-central Oregon, fire will become more frequent in most vegetation types, especially dry and wet forests, and that fire severity in forests will be similar to or increase slightly compared to historical fire severity (Case et al. 2019).

Turner et al. (2015) projected increased fire frequency in the Willamette Valley under RCP 8.5. Average annual area burned was projected to increase 900% by 2100 relative to 1986–2010, but during the latter period, the total area burned was small (0.2% of the Willamette Valley per year). With smaller temperature increases, average area burned was slightly above historical levels. Mechanistic models consistently suggest that fire frequency and area burned in Oregon will increase. Fire severity also may increase, depending in part on forest composition, structure, and productivity over time. In highly productive ecosystems such as forests west of the Cascade Crest, both fire frequency and severity may increase (Rogers et al. 2011, Halofsky et al. 2018a, McEvoy et al. 2020).

Potential Interactions between Wildfire and Other Disturbances

Fire interacts with other stressors to trees, including drought, insect outbreaks, and pathogens, that can lead to substantial ecological changes (McKenzie et al. 2008). For example, water and vapor-pressure deficits are expected to increase as the climate becomes warmer, indirectly mediating increases in the frequency, extent, and severity of fire (McKenzie et al. 2004, McKenzie and Littell 2017) and insect outbreaks (Logan and Powell 2009). Effects on trees of colonization and herbivory by some insects, such as bark beetles, tend to increase among species during prolonged droughts or warm winters (Logan and Bentz 1999, Carroll et al. 2004, Hicke et al. 2006). Nevertheless, there is little evidence that fire occurrence or severity increases following bark beetle outbreaks in Oregon's forests (especially if trees are needleless when burned) (Agne et al. 2016, Meigs et al. 2016).

Options for Adapting to Fire

Many current management practices, such as manipulation of stand density and efforts to control non-native invasive species, can decrease the magnitude of ecological change following wildfire and

Floods

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Anticipated Effects of Climate Change on Flood Magnitude

Several factors suggest that flood magnitudes in Oregon will increase in a warmer climate. One is that large precipitation events are expected to become more intense (Allen and Ingram 2002, Westra et al. 2014, Warner and Mass 2017). The primary reason for the increase in intensity is simply that warmer air can hold more water, so there may be more moisture in the air available to fall out as rain or snow in a warmer climate. Atmospheric rivers, in particular, often bring heavy precipitation and, consequently, flooding in Oregon (e.g., Konrad and Dettinger 2017). A statewide flood in April 2019 and a flood in northeast Oregon in February 2020 illustrate the manner in which strong atmospheric rivers can result in extensive flooding and damages (Box 1). Atmospheric rivers are projected to bring more water vapor to the Pacific Northwest in the future, again because warmer air can hold more water (*State of Climate Science*, this volume). In general, the intensity of heavy precipitation events over the twenty-first century in Oregon is projected to increase, although not uniformly across the state (e.g., Cooley and Chang 2020; *State of Climate Science*, this volume).

A second factor suggesting that flood magnitudes will increase is that rainfall-driven floods tend to have larger flood peaks than snowmelt-driven floods given the same amount of precipitation (Davenport et al. 2020). Therefore, as rising temperatures cause the proportion of precipitation falling as rain relative to snow to increase, flood magnitudes are projected to increase (Chegwidden et al. 2020).

A third factor is that total wet-season (November–April) precipitation is projected to increase in the Pacific Northwest (Dalton et al. 2017, Easterling et al. 2017, Rupp et al. 2017a, b). Greater precipitation, even after accounting for increases in evaporation (Seager et al. 2014), implies a higher likelihood of wetter soil and reduced depth to ground water—both of which are enabling conditions for flooding—prior to the arrival of heavy precipitation events. Chegwidden et al. (2020) also concluded that rainfall-driven floods are more sensitive to increases in precipitation than snowmelt-driven floods, so the projected increases in total precipitation, and in rain relative to snow, likely will increase flood magnitudes in the region.

Historical Trends in Precipitation Intensity and Extreme River Flows

Relatively small sample sizes and high variability in extreme streamflow events make it difficult to detect long-term trends. Therefore, only large changes in the observational record are detectable. Consistent with the challenges to such analyses, a study of annual maximum daily flows (peak flows) from 1941 through 2015, recorded at 58 gauges in Oregon, found no statistically significant ($p < 0.05$) trends at sites that have little to no reservoir storage upstream (Hodgkins et al. 2019). Statistically significant trends—all decreasing and in western Oregon—only were detected at sites with substantial upstream reservoir storage, suggesting that these decreases could be attributable to reservoir and dam operations since the 1940s.

Projected Changes in Naturalized Extreme Flows

It is standard practice to consider the impact of climate change on naturalized river flows (defined as observed flows that have been adjusted for human regulation and withdrawals). This practice allows for removal of the complicating factor of human activity when assessing effects of climate change

on hydrology. Additionally, naturalized flows can be used as inputs when assessing management of the same river systems.

Queen et al. (2021) projected changes in the 10-year and 100-year annual maximum naturalized daily flows at multiple locations in the Columbia River Basin, comparing flows in the second half of the twentieth century (1951–2000) to those in second half of the twenty-first century (2050–2099). The 10-year flow had a 10% likelihood of being exceeded in a given year, whereas the 100-year flow had a 1% likelihood of being exceeded in a given year. They considered 40 hydroclimate scenarios, all assuming RCP 8.5 (a scenario that represents a continuation of current levels of greenhouse gas emissions throughout the twenty-first century, or a relatively high amount of warming), and statistically downscaled meteorological data from ten global climate models as inputs to four hydrological model configurations. The range in changes among the 40 individual scenarios was large, but the average of the 40 scenarios is considered the best estimate of the effect of climate change on these probabilistic flood magnitudes (Table 1). Similar to an earlier study (Maurer et al. 2018), increases of 5% or less in the average of the 10-year and 100-year peak flows were projected along the Columbia River upstream from Vancouver. Much larger increases were projected for other rivers within and adjacent to Oregon. Projected increases for the Willamette River and its tributaries from the Cascades were particularly high, ranging from 39% at Willamette Falls to 63% at Hills Creek Dam on the Middle Fork Willamette for 100-year flows. Changes in flows assuming RCP 4.5 (a scenario that represents moderate reductions in global greenhouse gas emissions, with a peak near the middle of the twenty-first century, or a relatively low amount of warming) were about two-thirds the magnitude of those that assumed RCP 8.5.

River	Location	Projected increase (%)	
		10-year	100-year
Willamette Basin rivers			
Willamette	Willamette Falls to Harrisburg	33–45	39–50
McKenzie	Walterville to Vida	54–56	55–58
Willamette	Eugene	50	54
Middle Fork Willamette	Jasper to Hills Creek Dam	50–57	57–63
Row	Cottage Grove	25	39
Other rivers			
Columbia	Vancouver to McNary Dam	2–3	5
Snake	Ice Harbor Dam to Anatone	19–24	25–29
Snake	Hells Canyon Dam to Nyssa	39–41	52–56
Grande Ronde	Troy	48	68

Table 1. Projected impact of climate change on the magnitude of 10-year and 100-year annual maximum daily flows from 1950–1999 to 2050–2099, assuming RCP 8.5 and averaging over 40 scenarios. Projected changes over a range of locations generally increase from downstream to upstream. Adapted from Queen et al. (2021).

Sampling from the same 40 hydrologic and climate scenarios as Queen et al. (2021), the River Management Joint Operating Committee (RMJOC) analyzed changes in peak 10-day naturalized runoff volumes from large drainage areas of the Columbia Basin, including the Willamette Basin. They considered 10-day runoff volumes because it takes approximately 10 days for water to travel through the Columbia River reservoir system. The RMJOC examined 10-day naturalized runoff volumes preceding the five greatest peak flows at the drainage area outlet in winter (November through March) in each of three 30-year periods: 1976–2005 (historical), 2020–2049 (the 2030s), and 2060–2089 (the 2070s) (RMJOC 2020). The median of 10-day runoff volumes preceding the peak flow events in the Willamette Basin was projected to increase by 11% and 43% by the 2030s and 2070s, respectively, under RCP 8.5. Under RCP 4.5, projected increases were 19% and 37% by the 2030s and 2070s, respectively. In winter, the increases in peak flows from the Willamette River, combined with the shift to more frequent and higher peak flows on the Columbia mainstem, caused projected 10-day runoff volumes at the confluence of the Columbia and Willamette River to increase 15% by the 2030s and 65% by the 2070s under RCP 8.5. Under RCP 4.5, 10-day runoff volumes increased by 22% by the 2030s and 37% by 2070s.

The RMJOC (2020) conducted a similar analysis for large, system-wide spring floods, identifying the five greatest total April–August naturalized runoff volumes in each 30-year period. At the confluence of the Columbia and Willamette Rivers, these runoff volumes were projected to change little under RCP 4.5. Under RCP 8.5, the median of the five greatest runoff volumes decreased by about 5% by the 2070s.

Projected Changes in Flood Risk in Managed River Systems

The heavy management of the Columbia River substantially can impact the magnitude and timing of peak flows and, consequently, flood risk. Two recent studies examined the consequences of climate change on flood risk under the current operations of the Federal Columbia River Power System. In one study, the 13 reservoirs in the Willamette Basin operated by the Willamette Project were characterized as "highly effective at reducing flood risk" under two RCP 8.5 scenarios. Simulated flow at Salem, Oregon, a key control point for the Willamette Project, reached flood stage only once by the year 2099 (Tullos et al. 2020) despite increases in reservoir inflows

Box 1. Two recent flood events in Oregon

Atmospheric rivers in April 2019 and February 2020 illustrated the effects of these storms on Oregon's climate, water supply, and flood risk. The Northwest receives about 25–30% of its total winter precipitation from atmospheric river events (Slinskey et al. 2020; *State of Climate Science*, this volume). The two atmospheric river events in April 2019 and February 2020 also had a significant rain-on-snow component, which contributed to downstream flooding and damage. Runoff from snowmelt during rain-on-snow events compounds runoff from precipitation, amplifying a storm's potential to cause high-impact flooding, landslides, and avalanches.
One study of the Santiam River Basin suggested that 74% of peak daily streamflows with a return interval greater than one year were associated with rain-on-snow events (Surfleet and Tullos 2013). This association was highest within the transient rain and snow elevational band, between 1150 feet (350 m) and 3600 feet (1100 m). Recent climate model simulations projected a decreased frequency of high peak flow rain-on-snow events at low to intermediate elevations and an increased frequency of such events at high elevations (e.g., Musselman et al. 2018). The decrease in low to mid-elevation rain-on-snow peak flows is due to projected decreases in snowfall at these elevations. These results were consistent with earlier studies that demonstrated an increased occurrence of rain-on-snow events at high elevations, and decreased occurrence at low elevations, over the last 35 years, which was attributable to the warming climate (McCabe et al. 2007, Ye et al. 2008).

The apparent importance of rain-on-snow to peak flows, however, can depend on how rain-on-snow-affected flows are defined. Although Surfleet and Tullos (2013) considered a peak flow event to be associated with rain-on-snow if any of the existing snowpack melted, Chegwidden et al. (2020) used hydrological modeling to isolate events with a substantial rain-on-snow contribution: more than ~2.5 inches (10 mm) of basin-average soil water equivalent in the existing snowpack and a snowmelt contribution greater than 20% of the total precipitation plus snowmelt. Chegwidden et al. (2020) found that for the North Santiam Basin, and other basins like it in the vicinity, rain-on-snow was an important factor in about 10% of peak daily streamflows with a return interval greater than one year, but may be important in less than 1% of such events by 2100.

April 2019 statewide flood

An unseasonably strong atmospheric river that made landfall in Oregon on 7 April 2019 produced one of the state's historically significant floods. Precipitation and runoff from this event exceeded a number of daily precipitation and streamflow records across Oregon. Due mainly to the rainfall from this event, April 2019 was Oregon's third wettest April on record. The timing of the atmospheric river coincided with the winter maximum snowpack, with snow water equivalent on 1 April at or well above normal for all Oregon mountain basins. Heavy rain and rain-on-snow conditions produced near-record runoff volume and streamflows throughout much of the state (e.g., Fig. B1a). The total April runoff volume set maximum monthly records at 58 streamflow stations across Oregon, and was second-highest at 10 other stations.

At the time of the storm, many reservoirs were drafting higher as operations were switching from flood control to spring and summer filling. The exceptionally high runoff filled many reservoirs, leading operators with no choice but to release water into already full river channels. Widespread flooding ensued across much of the state for the next week, and federal disaster declarations were approved in six

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implied by the projected increases in naturalized flows (Table 1). The resilience of the system was attributed to the current emphasis on flood-risk management in the operating rules and the relatively large volume of storage in the reservoirs compared to projected changes in streamflow (Tullos et al. 2020). However, the study's authors acknowledged that their hydrological model underpredicted peak daily runoff during winter, which could have led to an underestimation of flood risk.

The RMJOC (2020) examined the entire Columbia River reservoir system and determined that the greatest change in flood risk would result from an increase in regulated flows from the Columbia mainstem during winter. Current system operations for minimizing flood risk along the Columbia River largely are designed to manage spring runoff rather than winter runoff, and adaptive management of reservoir operating policies is not anticipated to fully offset potential increases in winter flood risk. As a result, the five largest regulated winter flood events on the lower Columbia River (below the confluence with the Willamette River) occurred when the contribution from the Columbia mainstem, averaged over the five events and relative to the 1976–2005 baseline period, was 44% and 151% larger by the 2030s and 2070s, respectively, under RCP 8.5. Under RCP 4.5, the Columbia contribution increased by 36% and 72% by the 2030s and 2070s, respectively. The substantial projected increase in peak flows from the Willamette River is especially challenging for

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counties as a result of damage associated with the storm. By the end of April, mountain snow water equivalent dwindled to well below average over all Cascade Range basins in Oregon and Washington. The early melt-out of the snowpack preceded below-average summer streamflows on several major rivers draining the Cascades, such as streamflows in May and June along the Willamette (Fig. B1a). Some impacts of this flood were documented in the Oregon Office of Emergency Management's 2019 April Flooding Spotlight: storymaps.arcgis.com/stories/2cfe3ce9706045c585b5f1f3d1c79bb0.

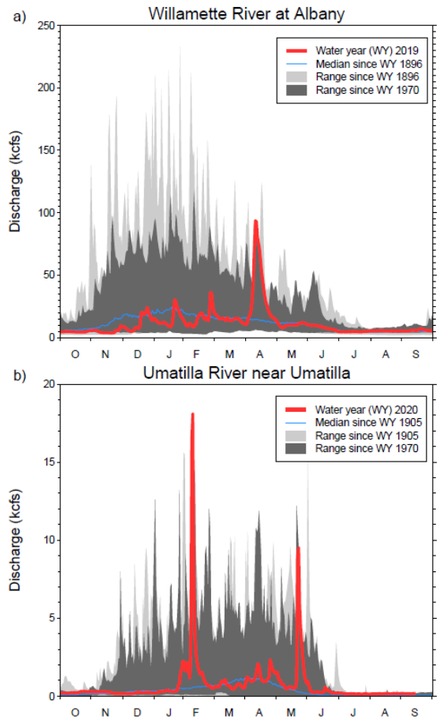

Figure B1. Daily flow (red line) during the water year (1 October–30 September) measured in (a) 2019 at the Willamette River at Albany (USGS gauge 14174000) and (b) 2020 at the Umatilla River near Umatilla (USGS gauge 14033500). The light blue line indicates the median daily flow over the period of record (1896–2020 for the Willamette River, 1905–2020 for the Umatilla River), and the gray shading indicates the full range of daily flows. The darker gray shading includes the water years since 1970, by which nearly all existing flood management infrastructure was completed. The lighter shading covers all years in the period of record.

February 2020 northeast Oregon flood

In early February 2020, while much of Oregon was in drought, a strong atmospheric river affected northeast Oregon. This atmospheric river was extremely unusual: its flow was not the

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flood management on the lower Columbia River, where flow from the Willamette River into the Columbia River further increases water levels on the Columbia above the confluence. For the same five largest winter flood events, the average contributions from the Willamette River were 29% and 39% larger by the 2030s and 2070s, respectively, under RCP 8.5. Under RCP 4.5, the increases in the Willamette contribution area were similar: 29% by the 2030s and 40% by the 2070s.

In the set of simulations conducted by the RMJOC (2020), no major floods (water level greater than 25 feet [7.6 m]) occurred along the Columbia River at Portland and Vancouver during the historical period (1976–2005). However, RMJOC (2020) projected that during 2060–2089, this location would reach major flood stage three times under RCP 4.5 and five times under RCP 8.5. At least one major flood was projected during the 2030s. Moderate flood stage (greater than 20 feet or 6.1 m) was projected to occur in nine and twelve years from 2060–2089 under RCP 4.5 and RCP 8.5, respectively, but only in one to three years (depending on hydrological model used) during 1976–2005. Flood stage (greater than 16 feet [4.9 m]) occurred in at least 20 of those 30 years under either RCP, compared to four to nine years from 1976–2005.

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typical southerly or westerly, but curved around an eastern Pacific high and streamed subtropical moisture from the northwest. Due to the unusual orientation of the upstream moisture transport, heavy precipitation began on the cold side of the atmospheric river as snow down to an elevation of 2000 feet (610 m), then transitioned to heavy rain to an elevation of about 5000 feet (1500 m) as the atmospheric river's warm front moved north. As a result, precipitation along the northern Blue and Wallowa Mountains was exceptionally heavy, and quickly drained into the Middle Columbia and Lower Snake River Basins. Similar to the April 2019 event, this atmospheric river featured a fairly significant rain-on-snow component that contributed to the observed high runoff volume.

The peak flow on the Umatilla River at Pendleton set a record high on 6 February at about 19,000 cubic feet per second, surpassing previous high flows from 1965 and 1996 (Fig. B1b). At a number of stations along the Umatilla River, recorded monthly runoff volumes were the second highest on record for February. Some impacts of this flood were documented in the Oregon Office of Emergency Management's 2020 February Flooding Spotlight: oregon-oem-geo.hub.arcgis.com/app/cb570e3df4e14e03a096b0b920534db9.

Given the potential for a substantial increase in flood risk on the lower Columbia River, two recent investigations used two-dimensional hydraulic modeling to simulate peak water levels from the mouth of the Columbia River upstream to Bonneville Dam on the Columbia River and Willamette Falls on the Willamette River during plausible future flood events. Helaire et al. (2020) projected flood hazards with the 1996 and 1923 floods (the largest and third largest Willamette River floods since 1900) as baseline events while adjusting runoff and sea level rise to be consistent with climate change projections. A 10% increase in runoff to both the Willamette River and Columbia mainstem was assumed. This change is small relative to the increases even by 2030s given in the RMJOC (2020) study, suggesting that potential changes of this magnitude already may be occurring. With this 10% increase in runoff, water levels in the Portland and Vancouver area increased by 2.56 and 2.69 feet (0.78 and 0.82 m) relative to the 1996 and 1923 floods, respectively. Sea level rise of 2 and 4.9 feet (0.6 and 1.5 m) added 0.3 and 1 feet (0.1 and 0.3 m), respectively, to these water levels. The upper end of the projected range of sea level rise (4.9 feet) is considered very large, with a 1.3% probability of being exceeded by 2100 under RCP 8.5 (*Coastal Hazards*, this volume). The effects of runoff and sea level rise on flood risk varied spatially. Areas near the confluence of the Columbia and Willamette Rivers were most sensitive to runoff changes, whereas coastal regions were most sensitive to sea level rise.

Wherry et al. (2019) also used the 1996 winter flood as a baseline. Roughly consistent with the changes by the 2030s reported in RMJOC (2020), they increased the Willamette River runoff by

20% and Columbia River runoff by 40%, assuming that extremely high water levels in the Portland and Vancouver areas are most likely under a scenario in which a major atmospheric river affects western Oregon when winter flows on the Columbia River are moderately high. With this increase in runoff, they modeled two scenarios of sea level rise: 0.8 and 3.3 feet (0.25 and 1.0 m) by 2040 and 2090, respectively. Sea level rise of 3.3 feet has a 17% probability of being exceeded by 2100 under RCP 8.5 (*Coastal Hazards*, this volume) Under such conditions, peak water level increased by 4.1 to 5.4 feet (1.3 to 1.7 m) above the 1996 flood. Wherry et al. (2019) concluded that while critical levees would not be overtopped with these scenarios, most levees along the Columbia Corridor Levee System at Portland (north Portland along the Columbia River) would be "subject to prolonged exposure from water levels that exceed the safe levee height, which is defined by the U.S. Army Corps of Engineers as the highest flood level for which reasonable flood protection is provided."

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From: **Ken Eklund** futureeverything@writerguy.com
Subject: Odor complaint form on the Coffin Butte Landfill site? (Archive of Email chain)
Date: July 13, 2025 at 5:18 AM
To: Public Record for LU-24-027

KE

[chain begins]

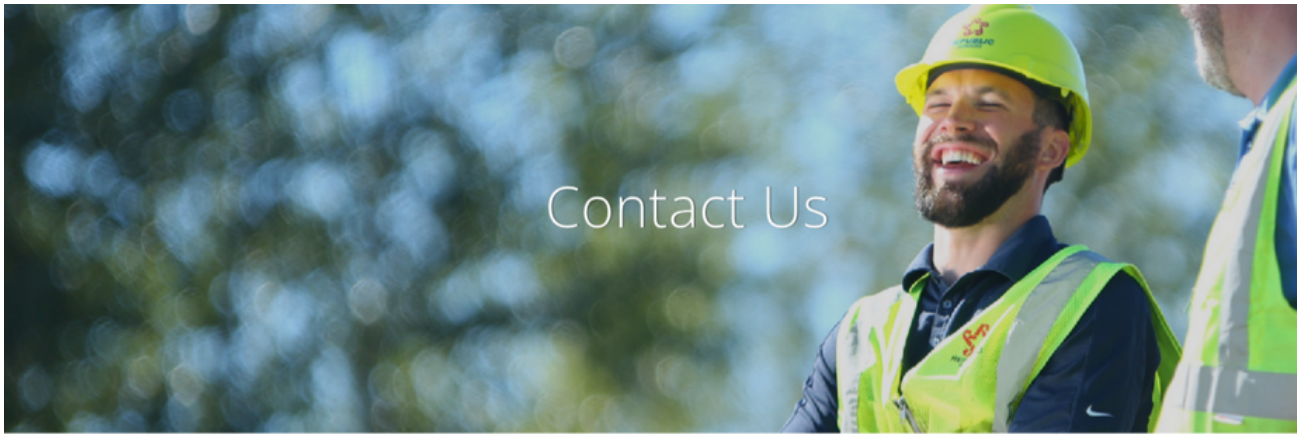
From: Ken Eklund <futureeverything@writerguy.com>
Subject: Odor complaint form on the Coffin Butte Landfill site?
Date: February 28, 2024 at 2:27:21 PM PST
To: Ian Macnab <IMacnab@republicservices.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Good afternoon Ian,

I heard a report that Coffin Butte Landfill now has an online odor complaint form – which would be exciting news, as I don't believe the landfill has ever had a channel for complaints before. But looking at coffinbuttelandfill.com, I don't find any odor complaint form. I looked on the Contact Us page (see attached) and on the FAQ page (see attached) as well as the home page and several other pages, and found nothing. I also used the website search engine and it came up empty (see attached). Maybe my source was talking about the ODEQ complaint form? I thought I'd check with you.

All best,

Ken



Location

Coffin Butte Landfill 29175 Coffin Butte Road
Corvallis, OR 97330 (541) 745-5792
coffinbutte@republicservices.com

Hours of Operation

8:00 am – 5:00 PM, Monday-Saturday Closed
Sundays and Major Holidays

*If unloading by hand, load must be on scales by 4:30pm on Monday-Saturday.

Drop-off Requirements

Coffin Butte Landfill has a public drop off area on site. Residents may bring loads of trash and clean up debris for disposal. Residents may also bring recyclables such as appliances, e-waste, wood, metals, used motor oil, yard debris, tires, glass, automotive batteries, and cardboard. A fee is charged for disposal based on tonnage and waste type. Call the Landfill at (541) 745-5792 for details and a list of rates. Acceptable forms of payment taken: All major credit cards (Visa, MasterCard, Discover & American Express).

Sign up for updates

How do you control odors?

The Coffin Butte Landfill team takes multiple steps to control odors. We apply a daily cover over the garbage, we have an extensive landfill gas collection and treatment system, and we use geo synthetic covers to help the gas system operate more efficiently. At our Pacific Region Compost site, we use a dry vapor system that neutralizes odors on site.

COFFIN BUTTE *Landfill*

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About What We Do Safety News Visiting Us Landfill Tours

Nothing Found

Sorry, but nothing matched your search terms. Please try again with some different keywords.

odor complaint Search

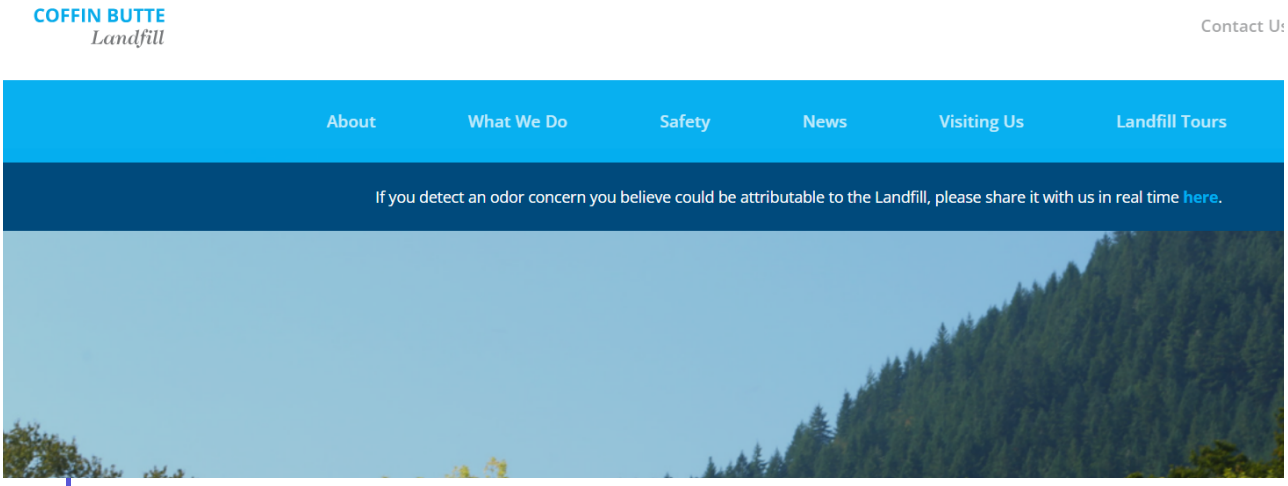
Ken Eklund, writerguy

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

From: "Macnab, Ian" <IMacnab@republicservices.com>
Subject: **RE: Odor complaint form on the Coffin Butte Landfill site?**
Date: February 28, 2024 at 3:34:13 PM PST
To: Ken Eklund <futureeverything@writerguy.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Hi Ken,

There is a link on the top of the home page on the website:



Let me know if you have any trouble with it. You may need to clear your browser cache if you're unable to see it.

Ian Macnab
Environmental Manager - Oregon

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c 541-230-4022
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REPUBLIC

SERVICES

Sustainability in Action

From: Ken Eklund <futureeverything@writerguy.com>
Subject: Re: Odor complaint form on the Coffin Butte Landfill site?
Date: February 28, 2024 at 6:32:18 PM PST
To: "Macnab, Ian" <IMacnab@republicservices.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Hi Ian,

Thanks for the pointing that out. Excellent to see it. The dark blue bar did appear for me when I entered the coffinbuttelandfill.com URL just now, but it wasn't there earlier today or the day before. When did that dark blue bar/ link go live? And when did that complaint page appear in its current form? Thanks!

All best,

Ken

Ken Eklund, writerguy

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

From: "Macnab, Ian" <IMacnab@republicservices.com>
Subject: RE: Odor complaint form on the Coffin Butte Landfill site?
Date: February 29, 2024 at 8:15:59 AM PST
To: Ken Eklund <futureeverything@writerguy.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Ken,

I don't know the exact date, but we added it at the end of last year/beginning of this year.

Thanks

Thanks,

Ian Macnab
Environmental Manager - Oregon

28972 Coffin Butte Road
Corvallis, OR 97330
e imacnab@republicservices.com
o 541-230-5543
c 541-230-4022
w RepublicServices.com

Sustainability in Action

From: Ken Eklund <futureeverything@writerguy.com>
Subject: Re: Odor complaint form on the Coffin Butte Landfill site?
Date: February 29, 2024 at 10:58:27 AM PST
To: "Macnab, Ian" <IMacnab@republicservices.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Thanks, Ian. It's confusing, though, what you mean by "it." Does that late '23/early '24 timeline apply to the landfill odor complaint form, and to its link on the home page, or are they on separate timelines? When was the first time the form was used by someone "in the wild," i.e. not connected to Republic/the landfill or Benton County? – Ken

Ken Eklund, writerguy

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

From: "Macnab, Ian" <IMacnab@republicservices.com>
Subject: RE: Odor complaint form on the Coffin Butte Landfill site?
Date: February 29, 2024 at 12:49:24 PM PST
To: Ken Eklund <futureeverything@writerguy.com>

To: Ken Eklund <futureeverything@writerguy.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>

Ken,

I reached out to Ginger about this since she was the one in charge of adding it to the website. This is what she sent:

Hi Ken –
Thanks for asking about the odor reporting portal at coffinbuttelandfill.com. The odor link, and the form it links to, were made live on the website morning of January 24. In fairness, we haven't communicated this new function to the public yet, although we did reference it in our recently submitted annual report. Our intent to be more transparent and communicative stems from the BCTT process – you can expect to see more from us on this as we go forward.

I'm happy to talk to you offline/directly about this website feature or other community engagement opportunities. You're always welcome to email me directly atgrough@republicservices.com.

I hope you're well – and look forward to talking again soon,
Ginger

Ian Macnab
Environmental Manager - Oregon

28972 Coffin Butte Road
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e imacnab@republicservices.com
o 541-230-5543
c 541-230-4022
w RepublicServices.com

Sustainability in Action

From: Ken Eklund <futureeverything@writerguy.com>
Subject: Re: Odor complaint form on the Coffin Butte Landfill site?
Date: March 4, 2024 at 2:18:59 PM PST
To: "Rough, Ginger" <GRough@republicservices.com>
Cc: Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY <rachel.mceneny@bentoncountyor.gov>, "Macnab, Ian" <IMacnab@republicservices.com>

Hi Ginger,

Good to hear from you. We're all well here, my mother just celebrated her 93rd birthday last Friday.

First, I'd like to continue with the question about when Republic received its first authentic public response on this form? I'm acknowledging that you haven't communicated this new function to the public, and by now the public doesn't expect to find a landfill odor complaint form at coffinbuttelandfill.com, but the dark blue box on the home page should have caught someone's eye. There's been a lot of chatter on social media about smelly days these past months, and questions raised as to how to report it. I think if anyone had found the odor complaint form at coffinbuttelandfill.com that would have appeared in those discussions.

I presume that the reports you get via this form come to the Disposal Site Advisory Committee, to be included in its Community Concerns Annual Report for the year?

I'll just talk briefly on Ian's suggestion that the dark blue bar not appearing for me was a caching issue. This is not a viable scenario, for two reasons. One: it would pose tremendous problems for the Internet if people regularly saw old cached versions of websites instead of updated ones, and so there is a robust system in place to prevent that from happening – etags and so on. Two: If it were a caching issue, it seems odd that after persisting for 35 days it resolved itself a short time after I sent my first email about it.

So some strong pushback from me on the representation that the link on the home page went live on January 24. I would like further evidence about it.

> Our intent to be more transparent and communicative stems from the BCTT process – you can expect to see more from us on this as we go forward.

This is of course very welcome, as I'm sure there is going to be an upswing in demand for transparency and honest answers as this year progresses!

All best,

Ken

Ken Eklund, writerguy

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

> **From:** "Rough, Ginger" <GRough@republicservices.com>
> **Subject:** **RE: Odor complaint form on the Coffin Butte Landfill site?**
> **Date:** March 4, 2024 at 7:03:40 PM PST
> **To:** Ken Eklund <futureeverything@writerguy.com>
> **Cc:** Xan Augerot <xanthippe.augerot@co.benton.or.us>, Nancy Wyse <nancy.wyse@co.benton.or.us>, Pat Malone <pat.malone@co.benton.or.us>, Rachel MCENENY

<rachel.mceneny@bentoncountyor.gov>; "Machab, Ian" <IMachab@republicservices.com>; NICHOLS Darren <darren.nichols@bentoncountyor.gov>

Good evening Ken –
Congratulations to your mother on another milestone birthday! I hope you were all able to celebrate together. I apologize for the slow response – my mother was in the hospital yesterday, and my sister and I are caring for her today.

I'll do my best to answer your questions, although I am not an IT or technical guru by any means! We've used this odor reporting tool successfully in other communities – and I thought that it might be beneficial in Benton County, following our many discussions during the BCTT process about communication and transparency.

As I mentioned before, we have not announced this tool to the public yet, although we intend to do soon. As such, we not been contacted by anyone in the community via the portal. As for timing – I created the form in December, we did some internal testing, and I requested that it appear on the website beginning the morning of January 24.

Your question about DSAC is a good one. The portal on Coffin Butte website is designed to notify us of a potential concern via email once the individual filling out the form hits "submit." It is designed to be responsive to both mobile and web browsers.

I anticipate there will be discussions in the near future about how to seamlessly share information between all key parties – DEQ, the County, Republic Services and the community. I know during the BCTT process everyone expressed a desire to have greater, and more frequent access to key data. Given DSAC's key role, I welcome input from you and your colleagues on the committee about how best to achieve this.

It is my hope and intent that this portal will be beneficial to this community. I hope you'll understand that its still in its "soft launch" phase. But the goal is driven by the feedback we received during BCTT – and our pledge to be responsive to our customers in Benton County.

I look forward to seeing you again in person – hopefully sooner and not later!

Ginger

Sunshine landfill ordered to step up actions to address odors

NEWS RELEASE(HTTPS://SIGNALSCV.COM/AUTHOR/PRESSRELEASE/) MARCH 26, 2025 10:52 AM

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News release

The South Coast Air Quality Management District has issued an order for abatement requiring Sunshine Canyon Landfill to implement stricter and innovative measures to reduce odors that have been impacting the community, the AQMD announced in a news release.

Landfill operations can cause odors, particularly as waste decomposes and if not well controlled, the release said. Since January 2023, South Coast AQMD has received over 4,000 odor complaints from nearby residents and an elementary school regarding Sunshine Canyon Landfill, which is in the Newhall Pass, just west of the Interstate 5 and State Route 14 interchange.

During this period, South Coast AQMD has issued more than 150 notices of violation against the landfill for public nuisance, citing violations of the agency's Rule 402 and California Health & Safety Code Section 41700. Sunshine Canyon Landfill has worked cooperatively with South Coast AQMD to incorporate additional measures and practices to minimize odor impacts, the release said.

The release said the new order, issued this month, requires Sunshine Canyon Landfill to take additional actions including:

• Odor prevention with microbiology: Use aerobic microbiology solutions during waste operations to reduce odors like "fresh trash" and methane.

• Closure turf feasibility: Explore installing gas and leachate systems without disturbing existing closure turfs designed to prevent erosion and emissions.

• Enhanced emissions data: Pilot advanced methods like drones and robotic vehicles to identify potential problem areas and collect more real-time data, including in the evening.

• Odor neutralization: Apply odor neutralizers and microbiology-based solutions at transfer stations to control odors before disposal.

• Gas movement: Test using larger granular materials such as gravel and crushed rock around landfill gas wells to improve gas flow. These larger size materials create more space between particles, allowing gas to move more freely and reducing pressure buildup.

• Daily odor patrols: Perform and document twice-daily patrols to identify odor sources and leachate seeps.

Sunshine Canyon Landfill is owned and operated by Browning Ferris Industries of California Inc. and Republic Services Inc. It is classified as a Class III landfill and can only accept municipal solid waste. No hazardous waste can be accepted at the landfill. Sunshine Canyon Landfill's Solid Waste Facility Permit limit is 12,100 tons per day and the landfill receives roughly 9,000 tons of waste per day, handling approximately one-third of the daily waste of all

of Los Angeles County.

In January, Sunshine Canyon Landfill's tonnage limits have been temporarily increased to 15,000 tons per day following approvals and emergency waivers issued by the Sunshine Canyon Landfill Local Enforcement Agency, the Regional Water Quality Control Board and the Los Angeles County Board of Supervisors to address the removal and disposal of fire debris.

More information can be found at: www.aqmd.gov/nav/about/hearing-board/hearing-board/hearing-board-case-documents.

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JULY 7, 2025

LOCAL

Many say landfill emits ‘invasive’ odor into Harrisburg neighborhood

By **Hannah Goetz, wsoctv.com**

June 29, 2023 at 5:55 pm EDT

NOW PLAYING ABOVE

Many say landfill emits ‘invasive’ odor into Harrisburg neighborhood

By **Hannah Goetz, wsoctv.com**

June 29, 2023 at 5:55 pm EDT

unbearable smell, and they're getting fed up.

> **ALSO READ: What's that smell? Rare 'corpse flower' blooming at NC State →**

"I can't go for a walk," said Luisa Ribeiro, a resident.

"We are worried about our health," said Diane Borkowski.

"It doesn't make us happy. No one wants to be the stinky neighborhood," said December Courtwright.

The residents said the mountain of trash has been releasing a horrific smell for years, and it's not getting any better.

"The odors were so invasive that they would permeate through the houses, where we couldn't even sit in our living rooms, sit in our bedrooms, without being assaulted by the terrible odors," Ribeiro said.

The group said they have filed complaints but they haven't seen any changes made.

"This is our last resort, besides seeking legal," Borkowski said.

> **ALSO READ: 'Chemical smell' triggers early dismissal for Mooresville HS students →**

"The smell was extreme. I couldn't even sit outside with my granddaughter," she added.

In an inspection report from February by the North Carolina Division of Air Quality, both the DAQ and waste management noted receiving several odor complaints about the situation.

Later that month, the DAQ issued a notice requiring an odor management plan, citing the number of complaints and "concerning odorous emissions originating from the solid waste landfill." It gave the owner 60 days to identify the sources and a submit plan to fix the issue.

But neighbors say nothing's changed and they feel like they're being ignored.

New-Indy paper mill says it has reduced foul odor around state line

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Hannah Goetz, wsoctv.com

Hannah is a reporter for WSOC-TV.

LOCAL

Neighbors say landfill smell hasn't improved after state-approved action plan

By **Hannah Goetz, wsoctv.com**
February 20, 2024 at 11:27 am EST

NOW PLAYING ABOVE

Neighbors say landfill smell hasn't improved after state-approved action plan

By **Hannah Goetz, wsoctv.com**
February 20, 2024 at 11:27 am EST

CABARRUS COUNTY, N.C. — A strong smell coming from a landfill is tormenting people in a Cabarrus County neighborhood.

It's not the first time Channel 9 has heard complaints. Neighbors first brought their concerns to us **last summer**, but now, they say it's getting worse.

The landfill is located near the Rocky River Crossing community. It's by the Charlotte Motor Speedway just off of Morehead Road.

PREVIOUS: Many say landfill emits 'invasive' odor into Harrisburg neighborhood →

“My daughter and I went outside to play,” Casey Burke said. “And we just had to turn around and go back inside because we were both kind of gagging from the smell.”

Burke said she is fed up with the unbearable smell.

“It’s just gross,” she said.

Her neighbors had similar complaints about the same issue back in June.

“I can’t go for a walk,” Luisa Ribeiro said then.

“We are worried about our health,” said Diane Borkowski.

> **ALSO READ: Cabarrus County company to pursue putting landfill on property →**

“It doesn’t make us happy. No one wants to be the stinky neighborhood,” said December Courtwright.

Channel 9 was told then that the North Carolina Division of Air Quality issued a notice to the

“I think it’s gotten worse,” she said. “I think everybody feels a bit defeated.”

Burke said it’s not just the smell, but the sights and sounds of the landfill she gets from her back windows.

“You can actually see like bags and bags and bags of trash coming out from the dump trucks going into the ground. Just all day,” she said.

She’s begging for help to make a change.

“If there’s anyone out there who can help us or can respond to this, or can help us just sort of deal with what feels like a constant intrusion, we would welcome to help,” she said. “Because it feels like there’s nobody there.”

The last documented smell complaint was from November. The Division of Air Quality did a site visit, but found no violations and noted the landfill appeared to be following the approved odor plan.

Republic Services shared the following statement with Channel 9:

“Charlotte Motor Speedway Landfill investigates all reports of potential off-site odor and conducts daily odor patrols in areas surrounding the landfill. We are utilizing odor misters and have added additional ground cover to the site. We are also in the process of completing more than $1 million in enhancements to the landfill’s infrastructure, including installing new gas collection wells and horizontal gas collection piping.

“Charlotte Motor Speedway is proud to have served this community for more than 30 years, and we continue to work closely with our regulatory partners on the odor management plan and all other aspects of our landfill operations. If residents detect an odor concern they believe can be attributed to the landfill, they can reach out to us in real time at our new odor reporting portal at charlottemotorspeedwaylandfill.com.”

(WATCH BELOW: Neighbors in Anson County upset over plans to expand landfill)

Neighbors in Anson County upset over plans to expand landfill

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Hannah Goetz, wsoctv.com

Hannah is a reporter for WSOC-TV.

Read Next

‘Full of life’: Rock Hill rescue helps

Forecast from Chief Meteorologist

John Ahrens

AMS CERTIFIED

NOW	1 AM	4 AM
79°	78°	76°

From: Ken Eklund
To: Benton Public Comment
Subject: Testimony in response to Republic-County-Pawlowski written material July 8-9 on dump odor
Date: Wednesday, July 16, 2025 1:35:00 PM
Attachments: A1 OCAS-abridged-reduced.pdf
A3 Odor complaint form on the Coffin Butte Landfill site Archive of Email chain.pdf
A4 NWvoe odor complaint 20240228.png
A5 Sunshine landfill ordered to step up actions to address odors .pdf
A6 Many say landfill emits 'invasive' odor into Harrisburg neighborhood – WSOC TV.pdf
A7 Neighbors say landfill smell hasn't improved after state-approved action plan – WSOC TV-reduced.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Document ID: This is Part A, Odor.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

I'm submitting this letter in response to information in four items in the in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs:

1. Republic's slide deck ("25RS1067 Coffin Butte Deck_FINAL")
2. County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8")
3. Brent Pawlowski's testimony ("07092025 PAWLOWSKI_Brent")
4. Jeff Kleinman's testimony ("07092025 KLEINMAN_Jeff")

Before you begin, please note: my letter has attached evidence A1 through A7. To view these attachments using the County's **Munidocs record** system, look to the Attachments section in this email's header, and double-click to view each one.

Also: for verification of statements made, this letter refers to testimonies in the Munidocs record that relate to the information in the above four items; I've linked to them so that you can quickly and easily refer to them. (And any attachments to *those* must also be double-clicked in their header, respectively, to open.)

I intend to be as succinct as possible here, however fair warning: this letter is only Part A (Odor).

ODOR

Republic presentation, p. 8-9
Staff presentation, p. 17
Pawlowski, p. 3
also
Kleinman p. 2, 8-11, Planning Commission Findings for Denial 2021

Brent Pawlowski brings up the issue of dump odor levels and public experience and expectations about odors and smells in his letter. Republic's presentation cites its odor modeling (odor study) and proposed mitigation. The County presentation also cites the odor study and the County's proposed Conditions of Approval.

The results of the odor study are not sufficient proof that the odor impacts of an expanded landfill will not seriously impact uses adjacent to the landfill (and in its effective "adjacent" impact zone). This is due to the large number of both quantitative and qualitative flaws in the model, omissions, and the readily apparent disconnect between the odor study's theoretical results and the available real-world data. ***Simply put, the odor study fails to explain what's currently happening around the landfill, much less what will happen if the landfill were to expand.***

1. **The odor study is a mishmash of snapshot inputs from 2004 (weather), 2024 (complaints) and 2023 (estimates of landfill gas emissions levels), etc., and results from such a mishmash are clearly insufficient to prove landfill odor impacts from now throughout the proposed life of the expansion.**
   a. The study uses *weather data* from 2004-5 (Munidocs **link** p. 127)
   b. Yet the study is keyed to *complaints* from its odor complaint portal, *which launched sometime after March 4, 2024* (see below), thus rendering the majority of complaints "inconclusive."
   c. The study also uses self-generated emissions estimates (see Munidocs **link** p. 127)
2. **The odor study asserts that its scientific rigor invalidates almost all community odor complaints, but it uses a cherry-picked subset of complaints, obsolete weather data, and self-determined gas emissions levels whose validity is currently being investigated by regulatory authorities, and which are contradicted by real-world data on Coffin Butte's landfill gas emissions. These shortcomings undermine its narrative of being scientifically rigorous.**
   a. Although the study purports to use "all available complaints" from 2022-2024, in fact it does not include the complaints received and compiled each year by the Benton County Disposal Site Advisory Committee in its annual Community Concerns Annual Report (CCAR), which the County then publishes to Oregon DEQ as required by state law. Republic Services has a representative on that committee, who voted on each year's CCAR. Republic's DSAC representative should have then entered those complaints into the study pool, but did not.
      The study has thus knowingly excluded from consideration several hundred community complaints about odor. Those Reports are in the record (see the attachments to p. 102 of this Munidocs **link**).
   b. Objections to the study not using CCAR complaints were made early in the public comment period, but were not acted on by Republic.
   c. As established above, the study uses weather data from 2004-5, but Oregon weather has changed significantly since then, due to climate change (see my attachment **A1**). In any case, as noted in this attachment, Oregon weather varies significantly from year to year, so using any one year as a baseline is a recipe for error.
   d. The study uses Republic's reported emissions levels, but these reports are currently being audited by the EPA, after two EPA inspections revealed large-scale leaks. See my EPA timeline-explainer (the attachment to this Munidocs **link**).
   e. Both Republic's presentation and the County's presentation are based on the odor study's conclusion that dump odor at the landfill property line is detectable (D/T 0.5) but does not rise above the level of nuisance (defined as D/T 7). This conclusion is called into question by actual observations of landfill gas plumes in 2023, such as one that shows a plume spilling southward and surrounding homes at concentrations of from 2,000 to 4,000 ppm-m of methane (see my attachment **A2**, a July 2023 plume image). Methane is the primary component in Coffin Butte's landfill gas (52%) and is used to track the plume; the odorifics are a host of other organic compounds which landfilling creates along with methane, and which piggyback on methane into the environment.
      i. If a 4,000 ppm concentration of methane were observed at the dump's surface, it would be 8 times the reportable level and trigger a requirement for immediate remedial action.
      ii. According to Table 1 in Republic's odor study, which is reproduced in the **County's Staff Presentation** on p. 17, the D/T value of "anaerobic digester gases" is 100,000 D/T. Anaerobic digester gas is an analogue to landfill gas, which is also largely a product of anaerobic digestion of organic matter, but landfill gas also includes odorifics that result from the breakdown of plastics, construction materials (especially gypsum wallboard), and a host of others generated by the interaction of organic and inorganic materials in the landfill. Since this data visualization shows the landfill gas emerging at somewhere over 6,000 ppm-m methane at its source, and then decreasing to concentrations of around 4,000 to 2,000 ppm-m (only decreasing 33% to 67%) before entering the property of others, we can back-of-envelope estimate that the D/T is in the neighborhood of 33,000 D/T and up when it crosses the property line. This is well above the nuisance threshold of 7, and maps well to the documented community experience, which is that the odor is powerful even miles away from the dump.
   f. Both Republic's presentation and the County's presentation characterize odor with the D/T values catalogued in Table 1. This Table of Odor Index Examples is *from an entirely different industry than landfilling* (the wastewater industry).
      i. The table is useful only to wastewater treatment professionals, who may be familiar with what "primary clarifier weir cover exhaust" smells like.
      ii. The odorifics produced by wastewater treatment are only a subset of the odorifics produced by landfilling, as explained above. The quantity of odorifics such as VOCs are generally much lower in wastewater treatment, because that industry has effective odor abatement measures.
      iii. This information is old (2006). Why?
      iv. Why does this table, from another industry entirely, appear in this study, instead of a recent one that's directly relevant to landfills? The use of this table brings up questions about manipulation of the narrative of this study, such as: did the odor consultant cherry-pick this table so as to obscure the D/T of landfill gas, which may be high (higher than 100,000 D/T?)?
3. **Republic has misrepresented its complaint data for the odor study.** The presentation cites the data as coming from its "comprehensive odor management plan, 2022-2024." Ginger Richardson of Republic Services, however, informed the Benton County Board of Commissioners and staff by email on March 4, 2024, that Republic's real-time portal for complaints (a web form) *had not yet been announced publicly*, "but would be soon" (email thread attached, see attachment **A3**). This was after Commissioner Wyse encountered landfill odor driving with her family on 99W (February 22, 2024) and sought a way to notify Republic of it, but found it notably difficult to do so (see attachment **A4**).
4. **The results of the odor study cited in Republic and County presentations are called into question by a documented real-world case where landfill odor disrupted a sale of land (a vineyard) in 2023.** That case is detailed in a local press article (see Munidocs **link**, p. 8).
5. **The results of the odor study cited in Republic and County presentations are called into question by documented cases where odor from landfills similar to Coffin Butte have caused widespread impacts over their area.** There are many examples; one such case is detailed in recent press articles from California (see Munidocs **link** and attachment **A5**) and another in news reports from North Carolina (see attachments **A6** and **A7**).
6. **The mitigation efforts listed in the Republic presentation** ***do not actually include any provisos for odor mitigation***. They attempt only to prolong Republic's fiction that odors might not actually be happening at Coffin Butte Landfill.
7. **Republic has had ample opportunity to voluntarily reduce odors, but has failed to act on them.** There are well-established protocols for landfills to follow to reduce odors, but Republic has not followed any such protocol at Coffin Butte. Such actions would have been, or should have been, supplied to you as evidence – increased monitoring efforts, for example.
   In particular, Republic should have acted on the information provided to them by Carbon Mapper, the climate science nonprofit which is creating the images and data of landfill gas plumes coming off the landfill. Carbon Mapper open-sources this data *specifically so that facility operators such as Coffin Butte's can access it and act on it*. The plume images show the origin points of the plumes, to aid facility operators in locating these mega-leaks and remediating them. Republic has not acted on these remediation aids; in fact, one mega-leak that Carbon Mapper pinpointed in July 2023 was still there in September 2024.
   If Republic did not undertake voluntary remediations in order to clean up its act and put on a good face for this expansion application, it's exceedingly unlikely to begin once the company already has what it wants.
8. **The Conditions of Approval for odor listed in the County presentation do not actually include any provisos for controlling odor**.
   a. OP-5, limiting the height of the expanded landfill does not control odor: it is no different than the status quo.
   b. OP-7(A) and (B) also only attempt to prolong the fiction that serious odors might not be actually happening at Coffin Butte Landfill; neither contain any actual mitigation. For example, OP-7B: "Odor complaints which are verified by site personnel shall be remediated where possible" is no different from the status quo.
   c. OP-7(C) appears to be an attempt to derive a real-world operational limit from a mathematical model, which will not actually prevent any odor from occurring.
      i. A quantity of "organic waste" may be assumed in a generalized mathematical model, but there is no reliable operational way on a day-to-day basis to determine how much of incoming waste is "organic."
      ii. OP-7(C)'s supposed annual limit of 930,000 tons of organic waste seems to be the result of mathematical misunderstanding or error by the County. Never in the dump's history has it ever taken even half of this amount of organic waste in a year.
      A quick back-of-envelope calculation shows this: "organic" is tricky to define, but if you use the EPA guidance that a typical municipal solid waste stream is roughly 33% "organic," then Coffin Butte's current annual intake is roughly 0.36M tons of organic (33% of 1.05M tons). Allowing the annual intake of organic waste to escalate from 0.36M tons to 0.934M tons, which is what this Condition of Approval would do, is allowing a 250% increase in annual organic waste. This would lead to a corresponding sharp increase in landfill gas emissions, leading to landfill gas emissions that are 250% higher than where we are now. At no time is there any kind of "throttling" effect on landfill gas emissions as a result of OP-7(C).
      iii. OP-7(C)'s so-called "limit" of 934,000 tons of organic waste annually also seems to be the result of misunderstanding or error by the County, because the County seems unaware of the drastic change that would have to have occurred for it to be triggered. As shown above, for the 934K/yr limit to come into play, the yearly waste intake would have increased 250%, which means Coffin Butte would have filled its quarry and expansion volumes much more rapidly and the landfill would be closing in the 2030–2035 timeframe.
      iv. A simple use case for this Condition would be: the County discovers that Republic has exceeded its organic waste allotment (however "organic" is defined). The County has not identified any realistic mechanism by which it can enforce this Condition, i.e., how it can compel Republic to place less organic waste going forward to make up for its overage, especially since to achieve a one-ton reduction in organic waste, Republic would have to forego two additional tons of non-organic waste.
      v. In terms of odor, OP-7(C) is much worse than the status quo: up to 2.5x worse.
   d. OP-7(D) just furthers the narrative that the problem is detection and quantification of odors, rather than actual mitigation of them. It continues the current policy of raising procedural obstacles that must be overcome before mitigation will even be attempted, and its mitigation mandate – "Applicant shall immediately take steps to mitigate the odor" – might as well specify the use of a magic wand.
   e. OP-11(A-F) – Republic is already subject to these requirements at its existing landfill. Since the County adds no monitoring or enforcement, these Conditions make no effective change to the status quo, and do not mitigate odor.
9. **Qualitative discrepancy: the odor study asserts the qualitative result of "no nuisance," but pays no attention to how the** ***quality*** **of an odor affects its** ***qualitative result.*** Simply put, there are dangerous odors and non-dangerous odors, and numerous testimonies establish that Coffin Butte odor is dangerous-smelling (Munidocs **link1** **link2** **link3** **link4** etc.). "It's OK for me to keep breathing this odor," said no one, ever, upon encountering the smell. This is a fatal flaw in the odor study.
10. **Landfill odors DO actually signal danger.** Landfill gas is known to contain many toxics. The nose knows.
    a. "Nearly 30 organic hazardous air pollutants have been identified in uncontrolled landfill gas, including benzene, toluene, ethyl benzene, and vinyl chloride. Exposure to these pollutants can lead to adverse health effects." – EPA. As an example, Coffin Butte's 2020 Air Toxics Emissions Inventory (the most recent I could find) shows that the landfill is calculated to have emitted over 2 tons of toluene gas that year. Toluene has a sweet or sharp odor, which is how I would describe what landfill gas smells like.
    b. PFAS is a focus of current concern, because the EPA has established that these chemicals are present in landfill gas, and they are known to have a wide range of health impacts even at small concentrations, but these impacts are not yet well known, especially for "non-legacy PFAS" (PFAS variants that are being used to replace the "legacy" PFAS types, which have been phased out due to health impacts). The science on PFAS is emerging, and that has been well documented in prior testimonies to the Planning Commission (see this Munidocs **link and its attachments**).
       The current lack of clarity from the EPA about safe levels of PFAS only increases concern and avoidance. *It's prudent to be alert to, and shield yourself and your family from, a toxic smell if you have no assurance that it's safe to breathe.*
11. **Odor quantification does not equal proof of non-seriousness.** Republic Services and the County both admit this. According to them, a D/T of 1 means that on the average, half the people encountering it will smell it. Since approximately 8,400 people live within 5 miles of the landfill, there are 4,200 who will smell it regularly at that level.
    Let's put "D/T" in plain language, in the experience of a person who has a reasonably good sense of smell. They will no longer be able to make use of the E.E. Wilson Wildlife Area – you have testimony to this effect. They will no longer be able to drive 99W with their windows open or the air system not on RECIRC – there's testimony about this as well. They will no longer be able to freely visit friends or family in the area of the landfill. And if they happen to live within a certain radius of the landfill, they will need to sell and move, but of course they won't be able to sell if buyers also have a good sense of smell. You have testimony about all this as well.
    Republic's odor quantification of the number of people involved in this situation is suspect, given the disparity between what the numbers say and what the people say, but the *precise* number is irrelevant, because it is clearly nowhere close to zero.
    We know that **x** number of people are already suffering serious interference **i** from the odor impact of the landfill – so the harm is **x times i**. An expanded landfill would increase this impact on **x**, because as Republic admits, it would extend their time suffering the impact **i** – so, it's now **x times (i+j)**, where **j** is that impact during that extended time. If the landfill persists for longer, it's also growing **x**, because now there's more time for more people to suffer the impact. So an expanded landfill means we no longer have **x times i**, we have **(x+y) times (i+j)**, where **y** are the new people suffering the odor impacts. We also have an increase in odor impacts because they are a function of landfill surface area, which an expansion would increase by roughly 33%. So now, where we have **x times i** with no expansion, we have **((x+y) times (i+j)) times 1.33.** Has Republic *convinced* you that **((x+y) times (i+j)) times 1.33** is a small enough number that your criteria can safely ignore it? On the contrary, I would say: you have received no proof of that. Without proof, you cannot find that serious interference will not occur.

Conclusion. As explained in verbal testimony (see Munidocs **link**), a Burden of Proof must both produce *evidence* and create a *convincing narrative*, or it fails. Let's look at how Republic itself characterizes its evidence, quoting the Supplemental Staff Report:

> "Staff engineering consultants have reviewed and determined the applicant's odor study follows reasonable assumptions and modeling protocols." (p. 8)

This is weak tea, narratively speaking. It is damning with faint praise. Any number of studies may be constructed that follow "reasonable assumptions and modeling protocols," but which *fail to adequately and convincingly model reality*.

The numbered Arguments above create a number of narratives about odor that more than countervail the stories put forward in Republic's presentation and by Pawlowski in his letter. Here is one such narrative, assembled from the above Arguments:

> *The dump has an odor problem, and has had one for many years;*
> *Republic has been unwilling or unable to remedy it;*
> *Republic has chosen instead to try to discount community concerns about odor;*
> *Landfill proponents support this by characterizing complainants as NIMBYs;*
> *Republic belatedly realized odor would be a key issue in early 2024, and created an odor complaint portal shortly before filing the expansion application;*
> *The purpose of the portal was to collect data they could use to discount odor as an issue;*
> *Most community members intuited this, and did not use the portal (myself included);*
> *The data did not lend itself to the conclusion Republic wanted, and so it took approximately nine months and many attempts to engineer an odor study that could pass muster as "following reasonable assumptions and modeling protocols" and still have the conclusion that Republic wanted;*
> *Republic knows the odor study is riddled with flaws, but is hoping the public will not be able to bring those forward;*
> *Republic hopes to overcome the weight of hundreds of community concerns about odor by trying to assert, through the gravitas of credentialed consultants, that the action that's needed is monitoring, not mitigation.*

I am not under a Burden of Proof, but I believe the evidence available to you, Commissioners, supports this narrative more than Republic's "reasonable assumptions," which is under a Burden of Proof.

I'll close with rebuttal of a point of view which Pawlowski summarizes very well:

> "Many opponents to the landfill are those that live near the landfill site… One should not expect customers of several counties to yield to the few who had the option to buy property elsewhere. The responsibility of having one's property value affected should be pushed back to those who decided to buy residential land nearby. What were they thinking?" (p. 2-3)

I think you Commissioners are aware of the shortcomings of this reasoning from a land-use perspective, so I won't belabor them. Your decision criteria focus on serious interference to other land uses and to the character of the area, not on the interests of customers or the business that serves them. What I focus on here is how this reasoning attempts to divert responsibility for environmental hazards away from the entity causing them and onto the entities suffering them – *victim blaming*, in modern parlance.

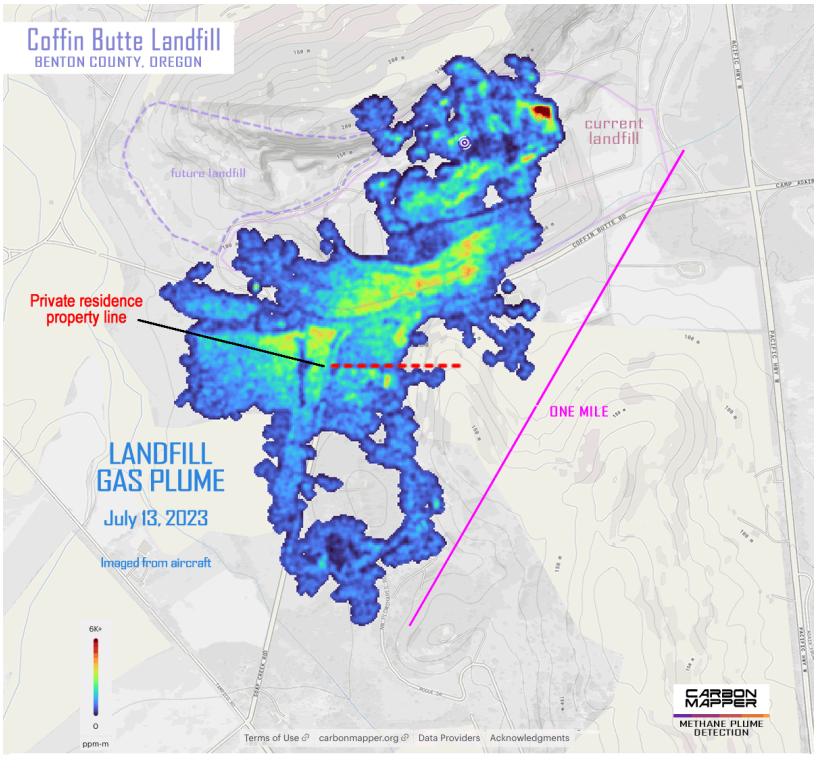
As you have heard in many testimonies, victims of dump odor did not buy, but inherited their land, or bought land when the landfill and its future were much different, or bought land many miles away from Coffin Butte Landfill, never imagining landfill stench could travel that far. Or they don't live here, they just try to visit, or pass through on Highway 99W. No matter: however they came to be where they are, your decision criteria focus on whether or not an expanded landfill will pose serious interference to their enjoyment of their land, or to the character of the area.

Pawlowski is in effect promoting the idea that the area around the landfill should become a *sacrifice zone* – or, I should say, to *continue* becoming a sacrifice zone, because that has been a dark thread in its history so far. The landfill has driven away farms and farmers with well contamination, bought up and deplatted neighborhoods-to-be, degraded wetlands and natural areas, and so on. Attorney Kleinman articulated this process and its future very well in his July 9 testimony, when he evoked an image of the landfill expanding into a new location, which blights surrounding uses, so that it has a new area to expand into, and so on, without end. –Or should I say, instead of landfill, the *Landfill Complex*, because LU-24-027 would establish a precedent of creating new landfills that no longer even physically touch the existing ones.

Every sacrifice zone has an associated *abundance zone* – somebody who profits from the sacrifice zone – and Pawlowski touches on this as well, with his opinion that the needs of Republic's customers and Republic outweigh those of the people in the sacrifice zone. Pawlowski is saying the quiet part out loud.

Commissioners, an Approve decision on this land use application would be a de facto declaration of Sacrifice Zone status, and would have a huge and irrevocable impact on the character of the area that I and many others call home.

And it may have a wider impact, as well. What we're finding in VNEQS is that many Oregonians don't want to benefit from the victimization of others. They'd vote against it, if they could. They'd object to being characterized as customers who are only concerned with low garbage rates. They may not be here to speak for themselves – many don't even know what is being proposed in their name – through no fault of their own, I may add. They're voiceless in this proceeding, but I'll speak up on their behalf, and urge you to deny the application to expand Coffin Butte Landfill. "Not in our names," is what they are saying.



☆ **Nancy Wyse** February 28, 2024 at 8:53 PM

RE: Odor complaint form on the Coffin Butte Landfill site?

To: Ken Eklund

NW

Ken,

I don't recall if the link/online feature was ever formally shared with us (Benton County/Board of Commissioners)… it could have been, but I don't remember. I do remember seeing reports of complaints about the landfill, which included odors. Since I experienced the odors last week it made me think about that report and wonder if others were reporting. I saw your email come in and went to their website to look. It took me a few minutes to find it. I couldn't find a link. I had to do 3 or 4 searches to find it. I *think* the keyword that finally found it was "odor".

We (my family and I) were driving hwy 99W northbound on the 22nd around 5:30/5:45pm-ish. I had a respiratory infection at the time which affected my sense of smell, but just before Adair Village I noticed a "weird" smell and it got stronger right as we passed the landfill.

p.s. not to diminish the focus of your email, but I've not seen a golden eagle in Benton County before… but I'd like to! I'll keep my eyes peeled!

Benton County OREGON

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Commissioner
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Creator of
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Est Zed Omega
FutureCoast
and other storymaking games

From:	Ken Eklund <futureeverything@writerguy.com>
Sent:	Wednesday, July 16, 2025 2:38 PM
To:	Benton Public Comment
Subject:	Testimony in response to Republic-County-Pawlowski written material July 8-9 on Republic compliance
Attachments:	B2 Teamsters declare 'war' with Republic Services, escalating strikes _ Waste Dive.pdf; B3 Coffin Butte mechanics on strike rally with union leaders.pdf; B5 Committee says county staff is stonewalling communications.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Document ID: This is Part B, Compliance.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

I'm submitting this letter in response to information in four items in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs:

1. Republic's slide deck ("25RS1067 Coffin Butte Deck_FINAL")
2. County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8")
3. Brent Pawlowski's testimony ("07092025 PAWLOWSKI_Brent")
4. Jeff Kleinman's testimony ("07092025 KLEINMAN_Jeff")

Note: my letter has attached evidence A1 through A5. To view these attachments using the County's **Munidocs record** system, look to the Attachments section in this email's header, and double-click to view each one.

Also: for verification of statements made, this letter refers to testimonies in the Munidocs record that relate to the information in the above four items; I've linked to them so that you can quickly and easily refer to them. (And any attachments to *those* must also be double-clicked in their header, respectively, to open.)

I'm *trying* to be succinct, but there'a a lot to respond to. This is Part B: Compliance.

COMPLIANCE
Pawlowski, pp. 1-4
Republic presentation, pp. 2, 8-9, 13-15, 21
Staff presentation, pp. 4, 16-24, 27-28, 38, 40, 44-50
also
Kleinman pp. 3, 8, 11-12, 21, Planning Commission Findings for Denial 2021

Brent Pawlowski brings up the issue of Republic's compliance record, and its narratives about that record, in his letter. He voices representations about Republic's corporate responsibility, environmental stewardship, history of following protocols, responsiveness and adherence to regulatory requests and enforcement, adoption of new methodologies and technologies, quality of operations, management track record, and so on, which echo those made by Republic in verbal and written testimony. Republic's slide deck also makes representations about Republic's compliance history and responsiveness – "we will continue to work with regulatory partners to assure compliance" – as a necessary element of its promises ("pledges") for mitigation measures and Conditions of Approval. The County slide deck likewise represents in text and by subtext that Republic has been and will follow state and federal regulation and be responsive to the County's Conditions of Approval.

The Pawlowski letter and the Republic and County presentations all admit that adherence to regulation, proposed mitigation and proposed Conditions of Approval are necessary to prevent an expanded landfill from seriously impacting uses adjacent to the landfill or in the lands which are *effectively* adjacent, given the landfill's oversized impacts. Pawlowski, the Republic presentation, and the Staff presentation all go on to say that environmental compliance entirely depends on adherence to, or enforcement of, *state and federal regulations*. In other words, being toothless, the proposed mitigations and Conditions of Approval are inconsequential and might as well not exist (*should* not exist, Pawlowski says).

The proposed mitigations and Conditions of Approval are attempts to create an illusion that *something new is being created* in regards to compliance. Their tone is as if Republic and the County have suddenly been alerted for the first time of all these measures they could have been taking all along to protect the public – "…and surely, now that you've woken us up to them, we will act!" As much as I would like to believe that's true, I pragmatically know it's not.

The fact that Republic has felt compelled to create multiple slates of promised mitigations, and the County has felt it necessary to create 85 or more Conditions of Approval, is eloquent testimony that Republic has not been responsive to either regulatory requirements, or past Conditions of Approval, or present community concerns – and neither has the County. And there is no scaffolding being introduced to induce any organizational change – Commissioners, there's no rudder there that could even start to turn these bureaucratic juggernauts around.

So County Staff is effectively recommending Approval based on the creation of some undefined County-Republic-Community kumbayah cooperative mechanism that will now (waves magic wand) engage other regulatory entities, even though one of the parties involved is vocally and vehemently opposed to this plan.

Compliance-wise, nothing substantial would be changed by approval of the application. Compliance-wise, the ineffectual status quo would be maintained, and Republic would continue to be a burden upon regulators, an obstacle to cleaner disposal alternatives, and a creator of long-term liabilities, while Coffin Butte Landfill would continue to be a growing hazard to its neighbors, a blight upon its neighborhood, and a ruination to its environment – but an even bigger one, for longer, if it is given the green light to expand.

1. **Pawlowski asserts on p. 1 that "The owner-operator, Republic Services, has shown to be a responsible company both on operations and compliance" but offers no evidence. There is considerable evidence to the contrary.**

a. As a company, Republic Services has paid over $162,000,000 in environment-related (EPA) offenses since 2000, according to Violation Tracker, and another $13,000,000 in employment-related offenses (**attachment B1**).

b. Four days ago, the International Brotherhood of Teamsters launched a strike of Republic Services by over 2,000 workers represented by the union around the country, a rapid escalation of a dispute that kicked off in the Boston area last week. The union is accusing Republic, the second largest waste company in the country, of mistreating and underpaying its workers (**attachment B2**).

c. Republic at Coffin Butte Landfill incurred its own strike in 2023, amid worker accusations of unsafe working conditions (**attachment B3**).

d. Republic's operations and compliance at Coffin Butte Landfill has generated hundreds of community complaints and concerns in the last four years, as documented in the 2021, 2022, 2023 and 2024 Community Concerns Annual Reports (**attached to a testimony** in Munidocs on p. 102) that the County filed with Oregon DEQ. There has been no follow-up by Republic about these concerns.

e. After two recent fires at the landfill that required the community volunteers at Adair Rural Fire to put out, there was an examination of fire risk at the landfill. Republic's representatives resisted all talk of upgrading their system, asserting that their workers were highly trained and followed all protocols, and that fire danger was minimal in any case because Republic limited the landfill's working face to half an acre.

   i. One of the fires was on the landfill's working face. It broke out, and Republic workers covered it in dirt. Thinking they had extinguished it, they went home, after which the fire re-emerged and spread in the landfill, catching fire to equipment until Adair Rural arrived. *Leaving such a situation unwatched is against the most basic principles of fire training.*

   ii. Republic did not follow all protocols. Republic is required to report all fires to their permit holder at DEQ – but they haven't done this for years (verified by public records request at DEQ). As noted on page 19 of their presentation, Republic pledges to *begin* taking such fundamental steps as keeping a log and properly reporting to authorities.

   iii. A survey of GIS records by Beyond Toxics (see **#1746** in Munidocs) established that the landfill's working face has not in fact been limited to half an acre, but instead was usually 1.5 - 2.5 acres. Faced with photographic evidence, Republic has abandoned its "half-acre" narrative.

f. I could go on like this for quite a while, but Commissioners, I think you get the idea.

2. **Pawlowski asserts on p. 1 that "Records show Republic Services has not had an environmental compliance violation." This is not true, and misrepresentative.**

   a. A year ago now, Oregon DEQ issued Coffin Butte Landfill a Notice of Violation for Republic's slow walk towards compliance for 2021 emissions regulations regarding its landfill gas flares. That violation was not fixed until November 2024. (A **full explainer** is attached to testimony #1993 in Munidocs.)

   b. "Environmental compliance violation" is a very specific subset of the much larger set of non-compliances. It's this much larger set that should be used to judge whether the company's behavior "both in operations and compliance" has been responsible or not. Referencing (a) just above: a company that's non-compliant and sloooow-walks its way toward compliance can sustain violation-level infractions of environmental law for years, to the detriment of the community, yet never push things so far as to get an actual Notice of Violation.

c. Environmental compliance depends on accurate self-monitoring. For at least the last four years, Coffin Butte Landfill has never had a quarterly Surface Emissions Monitoring inspection that has not turned up multiple sites that are non-compliant – in plain terms, there are always leaks emitting violation-level amounts of landfill gas. September 2022 is a standout, as over 100 such leaks were found in areas all across the landfill (**attachment B4**), as compared with 6 earlier that year. What had happened is that, after a July EPA inspection revealed a similarly high number of leaks, Republic stopped doing the monitoring themselves. In other words, this high number of leaks had existed all along, Republic self-monitoring had just failed to find them. Discussion on this continues below.

3. **Continuing from the above, Pawlowski asserts further on p. 1 that "The contentious methane 'exceedances' are not violations. Republic Services has followed protocol for measuring and correcting exceedances per testing and correction protocol. This is well documented." Pawlowski glosses over the reality.**
   a. Pawlowski is referring to leaks emitting violation-level amounts of landfill gas. The protocol for those leaks is: each is to be remediated within ten days and retested; if not fixed, each is to be remediated within 30 days and retested; this process repeats more times; if still not fixed, a new gas well is to be installed at that location, within 120 days. Coffin Butte Landfill now has approximately 200 more wells than you would expect for its size (300, not 100), because *so many of its violation-level leaks never get remediated*, and instead a new well is drilled to try to divert landfill gas from reaching the open leak.
   b. The documentation Pawlowski refers to here is Republic's self-monitoring, and cannot be relied on. For cause, that documentation and other self-monitoring reports were effectively subpoenaed by EPA Air Quality Enforcement in January, with an EPA Clean Air Act enforcement mechanism called a Section 114 Information Request. The EPA has not been able to audit the records yet, because Republic filed for multiple extensions to their deadline for providing them. They're sloooow-walking it, in other words. So whether or not Republic has <u>actually</u> followed protocol regarding these methane leaks is actively being questioned by regulators, and we will not know the answer until probably sometime later this year.

4. **In both the Republic and County presentations, they assert that each has been "responsive to the community" in the past, and have incorporated public comment into their analyses and findings. This is a mischaracterization of reality that in itself calls into question their assertions about compliance (See Kleinman in Munidocs, pp. 3 and 21).**
   a. Throughout these proceedings, Republic has represented itself as responsive, but this has not been the community's experience, as presented to the Planning Commission in too many testimonies to list. The community's bad experience is documented in Republic's proposed mitigations and in the County's proposed Conditions of Approval, which are all community issues that Republic has not in fact responded to, but which it now admits are key to mitigating the harms of the landfill.
   b. Likewise, the County has its history of suppressing public comment that documents the harms of the dump or is critical of the landfill. Key example: for years the public could not get the County to release the Community Concerns Annual Reports about the dump, compiled by the Disposal Site Advisory Committee, until its suppression efforts were made public (attachment **B5**) and the County's Community Development Director

resigned. Those Reports are **attached here** in Munidocs, p. 102. You will see they were all released in late 2024-early 2025.

c. The Republic presentation cherry-picks public comment to respond to, in a process that seems to have written the responses first and then hunted for public comments they could plausibly be linked to. Some sections skip responding to public comment entirely.

d. The County presentation refers to its Supplemental Staff Report, which "includes and evaluates public testimony," but this report also filters public comment – largely limiting their evaluation to *public comment that Republic chose to respond to in its Application.* In his testimony, Attorney Kleinman refers to the County as "complicit" in engineering a recommendation to Approve.

5. **In both the Republic and County presentations, they assert that Conditions of Approval (COAs) are viable, but there is no history of this, nor any of the necessary structure in place to enable viability, nor any plan to create that necessary structure.**

   a. A Key Finding of the **BCTT**, CUP F-2, states, "Benton County has not and does not actively monitor compliance with many Conditions of Approval, nor does it proactively act to enforce compliance." (p. 98)

   b. Numerous testimonies to this effect have been made (here's **one example** in Munidocs) but no structure has been identified, nor any plan for structure been presented.

6. **Throughout its July 8 presentation, the County asserts that various harms "can be mitigated through COAs." On page 20, it's asserted that "COAs monitor and ensure compliance." Commissioners, who is it exactly that's doing this monitoring, to 'ensure compliance'? Those COAs aren't going to monitor themselves!**

   It's the community that's being tasked with the monitoring, isn't it? Will we have to prepare documents like this one into the indefinite future?

Conclusion. As put forth in law (Munidocs, **Kleinman New Evidence July 9**) and reinforced by common sense, the scheme for compliance laid out for you with the proposed mitigations and Conditions of Approval has to be "possible, likely and reasonably certain to succeed." There is no indications that is the case here. You have no prior examples to look at, because compliance with Conditions of Approval have not been demonstrated to have ever occurred. There's plenty of evidence that they've failed, however. There was (still is, actually) a requirement for Republic to plant trees to screen the landfill from view from Highway 99W, for example. And there are in fact no such trees there.

So the County failed to press for compliance, or Republic failed to comply, or both, or maybe Republic is just slow-walking its way toward compliance and will get there any year now. Any way you look at it, odds are very slim that the County Team will ever win a game of Compliance that the Republic Team doesn't want to lose. And that's only if, by raising their frustrated voices, the community can get them to play ball at all.

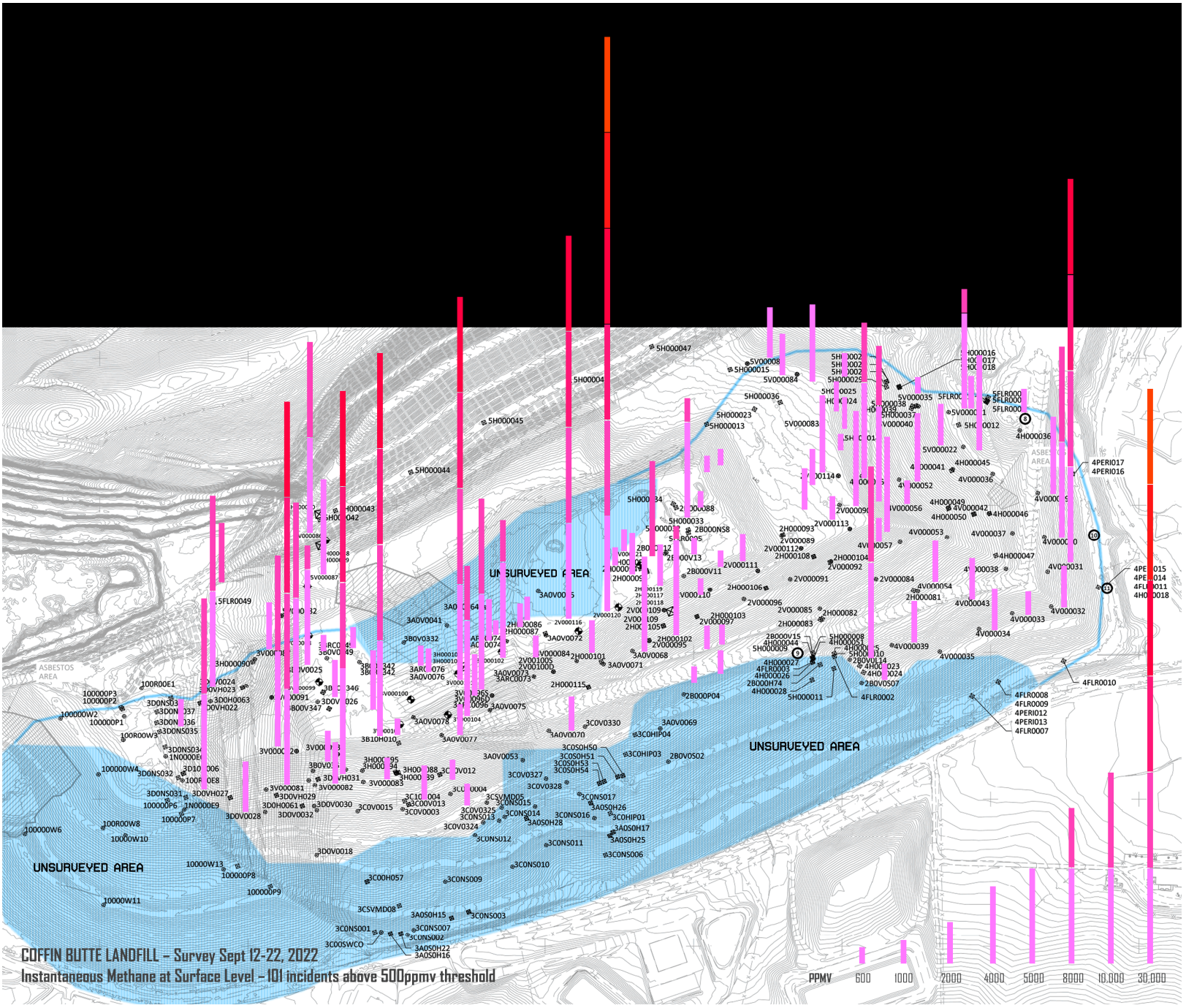
Commissioners, this is unworkable, and cruel. Deny LU-24-027.

Violation Tracker Current Parent Company Summary

Current Parent Company Name: Republic Services
Ownership Structure: publicly traded (ticker symbol RSG)
Headquartered in: Arizona
Major Industry: waste management and environmental services
Specific Industry: waste management
Penalty total since 2000: **$177,241,441**
Number of records: 283

TOP 5 OFFENSE GROUPS (GROUPS DEFINED)	PENALTY TOTAL	NUMBER OF RECORDS
environment-related offenses	$161,522,584	166
employment-related offenses	$12,813,803	48
miscellaneous offenses	$1,625,000	2
safety-related offenses	$786,808	64
competition-related offenses	$250,000	1

TOP 5 PRIMARY OFFENSE TYPES	PENALTY TOTAL	NUMBER OF RECORDS
environmental violation	$114,414,837	84
water pollution violation	$37,050,000	2
air pollution violation	$6,675,723	29
employment discrimination	$3,769,000	3
work visa violations	$3,000,000	1


UNSURVEYED AREA
UNSURVEYED AREA
UNSURVEYED AREA
ASBESTOS AREA
ASBESTOS AREA
COFFIN BUTTE LANDFILL – Survey Sept 12-22, 2022
Instantaneous Methane at Surface Level – 101 incidents above 500ppmv threshold
PPMV
500
1000
2000
4000
5000
8000
10,000
30,000

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Teamsters declare ‘war’ with Republic Services, escalating strikes

The escalation comes a week after Local 25 went on strike against Republic Services in the Boston area. The national union claims Republic has not negotiated in good faith.

Published July 10, 2025

Jacob Wallace
Reporter

International Brotherhood of Teamsters Local 25 went on strike against Republic Services on July 1. The union claims Republic Services' proposed compensation package does not match that of other haulers in the area. *Permission granted by Teamsters Local 25*

Listen to the article 4 min

The International Brotherhood of Teamsters says more than 2,000 Republic Services workers represented by the union are either striking or honoring picket lines around the country, a rapid escalation of a dispute that kicked off in the Boston area last week.

The union is accusing Republic, the second largest waste company in the country, of

Services."

"Republic Services has been threatening a war with American workers for years — and now, they've got one," Teamsters General President Sean M. O'Brien said in a statement. "The Teamsters have had it with Republic. We will flood the streets and shut down garbage collection in state after state. Workers are uniting nationwide, and we will get the wages and benefits we've earned, come hell or high water."

The escalation comes after Teamsters Local 25, which serves the greater Boston area, announced it would go on strike on July 1. Since then, other chapters in California, Illinois, Georgia and Washington have announced they are on strike, while picket lines have extended to Seattle and the Bay Area in California.

Twenty-two percent of Republic Services' workers are unionized, the highest rate among large, publicly traded waste companies. Republic has maintained in statements that it is offering workers competitive labor contracts. For the Boston area contract, the company said its most recent contract offer would have included a 39% increase over five years and a 14% increase in the first year.

The company has also claimed striking workers damaged trucks brought in to replace service in the Boston area, a claim the union denies. In a release published Wednesday night, Republic said it was "ready to meet at any time with the Teamsters."

"We call on Teamsters' leadership to immediately stop the instigation, intimidation and criminal acts, and resolve this situation," the company said in a release.

Local 25 has said in statements that wages and benefits for the roughly 450 Republic Services workers it represents don't match those of other haulers in the Boston region, like Capitol Waste Services and Star Waste Systems. The union also claims that Republic has not offered to return to the table since the two sides' last meeting on July 3, nor has the company contacted the federal mediator both sides agreed to bring in to settle the dispute.

The two sides have had a series of disputes in recent years, though this is the largest conflict between Republic and the Teamsters, said Victor Mineros, Teamsters' director of the solid waste and recycling division and Western Region vice president.

"This is such a massive strike and the extensions are constantly growing and are going

Last year, Republic Services and Teamsters Local 104 in the Phoenix area — where the company's corporate headquarters is located — reached a contract agreement after a monthslong dispute. The chapter's members had authorized a strike there, though local leaders ultimately opted not to call one. Republic also paid nearly $300,000 last year to settle a separate dispute with workers represented by Teamsters in California.

The company reported revenue that topped $16 billion last year, up more than 7% year over year. It reported returning $1.18 billion in cash to shareholders in fiscal year 2024, including $490 million of share repurchases.

The Teamsters represent roughly 8,000 Republic Services workers nationwide, and have said the picket line could extend to about 3,500 workers if Republic does not agree to negotiate on the union's terms.

"They're fed up," Mineros said. "This can all end if Republic comes to the table and negotiates."

RECOMMENDED READING
Teamsters expand strike over Republic Services contracts
By Jacob Wallace • Updated July 2, 2025

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ALERT FEATURED TOP STORY

Union leaders, House Speaker show support for Coffin Butte mechanics at rally

Mechanics, fellow employees, and community members lined the sidewalk in front of Republic Services in support of

Jess Hume-Pantuso, Mid-Valley Media

Kosiso Ugwuede

Striking Coffin Butte mechanics were joined by several union leaders, elected officials and concerned community members at a rally on Thursday, Sept. 12, in front of the Corvallis Republic Services office.

Carrying placards, with an inflatable "Scabby the Rat" mascot standing guard, a small group came out in support of the seven heavy duty mechanics **who have been striking**

since Sept. 11 at various locations around the Coffin Butte Landfill.

A Place to Sleep, episode 2: Albany, part II
Mid-Valley Media

The mechanics — who operate and maintain machinery used in moving and compacting the landfill — are protesting alleged unfair labor practices and unsafe work environment by Valley Landfills Inc. a subsidiary of the waste management company, Republic Services, which operates the Benton County-owned facility.

[illegible]

[illegible]

Since November 2022, the mechanics, who unanimously voted to join the International Union of Operating Engineers Local 701, have been in negotiations with the company to review their working conditions and wages.

According to one mechanic, Troy Paul, the negotiations were productive until conversations shifted into economic benefits, including pensions, wages and health insurance, which remains the knottiest issue on the table.

Jacob Stallings, attorney for Local 701, said last month that the company is rejecting the mechanics' proposal which

would allow them to access insurance provided by the union. The plan offers them and their families more benefits for less money, an obvious win-win, he said.

So far, Valley Landfills has responded to the demands of the mechanics with union-busting behavior, including intimidation, retaliation and canceled bargaining sessions, Stallings said last month.

An inflatable rat wielding a large banner highlighting the differences between the EPO900 United Healthcare Family Plan and I.U.O.E Family Healthcare Plan

Jess Hume-Pantuso, Mid-Valley Media

"These workers have been demanding adequate and affordable health care, while being exposed to toxic chemical and dangerous machinery," Graham Trainor, Oregon chapter president of the AFL-CIO, said at the Thursday rally.

"It is our duty as Oregon labor to stand strong, shoulder-to-shoulder with them in this fight for however long it takes," Trainor said. "Whether it's a group of seven workers or 7,000, their fight matters."

. ...

Republic Services, when contacted repeated its earlier statement to Mid-Valley Media, saying via email: "Republic Services is in contract negotiations with the union representing six maintenance technicians at our landfill in Benton County.

"We respect the rights of our employees to engage in collective bargaining and look forward to reaching a fair and competitive contract that is beneficial for our employees, our customers, and our company."

Graham Trainor, Oregon chapter president of the AFL-CIO, speaks at a rally for striking mechanics was held outside of the Republic Service office building, 110 NE Walnut Blvd. in Corvallis on Thursday, Oct. 12, 2023.

Jess Hume-Pantuso, Mid-Valley Media

Questions about the tenuous health insurance negotiations went unanswered.

Ed Eby, another mechanic who has been with the company for three years and on the maintenance unit for a year, said that so far, it has felt like the company wants to look the other way and ignore the mechanics.

"Stuff we're exposed to is just terrible, and then we take it home to our families who then get sick," said Lorne Nash, another mechanic who joined the company about a half-month before the strike began.

Rob Perdue gives a quick interview about the rally regarding Republic Services and what comes next for the mechanics on strike.

Jess Hume-Pantuso, Mid-Valley Media

"We don't have the compensation to be able to afford to go to the doctor and when we have to go, it'll just cripple us," Nash said.

He said he believes the pushback from the company stems from a lack of appreciation as well as a show of power. Without the backing of the union, Valley Landfills can exert control over the mechanics and keep them working in unsafe conditions, he added.

"We all understand that there is risk involved with our job, but some of that risk can be mitigated. But they refuse to," Nash said.

"Whether we're breathing it in or laying down in it, we're always exposed to something," said Logan Carter, who has been at the company for a year.

The mechanics, who work 10-hour shifts, said that they were exposed to all kinds of contaminants one might imagine results from a dump. Without a decontamination facility, the mechanics work only with basic personal protective equipment.

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Paul accused the company of valuing profits over people and being solely focused on attracting more trash to the landfill.

"As long as the money is flowing in then they don't really care, and that needs to change," Paul said at the Thursday rally.

Oregon House Speaker Dan Rayfield, who was at the rally, expressed his support for the striking mechanics.

"It can feel alone being on the picket line," Rayfield, D-Corvallis, said during brief remarks. "As someone who lives in this community, we appreciate what you do for this community, and we appreciate what you're fighting for."

Rayfield and a few colleagues have written to Republic Services in support of the mechanics' demands.

"Because having a fair contract is not an option and having safe workplace conditions especially in Oregon is not an option," Rayfield said.

Other elected officials at the event included state Sens. James Manning, D-Eugene, and Deb Patterson, D-Salem. Representatives and leaders from local chapters of the AFL-CIO and United Auto Workers were also at the rally.

"It's incredible to see the support that we have," Carter said about the turnout.

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"Labor has to support labor, that’s what it's all about," Rob Perdue, UAW Local 492 president, said. "An injury to one is an injury to all."

Perdue and Local 492 have been striking in Beaverton for 21 days after UAW President Shawn Fain asked the unit to join the ongoing auto worker strike against Detroit car makers Stellantis, Ford and GM.

"It’s kind of sad but it seems to be the norm over the last 20 or 30 years," Perdue said of the manner in which billion-dollar companies treat their workers.

"We’ve seen that companies have their investors and interests in mind more than their workers," Perdue said.

- **Coffin Butte landfill mechanics on strike**
- **Who repressed speech at Coffin Butte event?**
- **Benton County commission unanimously rejects Coffin Butte landfill expansion plan**
- **Republic Services appeals county decision on Coffin Butte landfill expansion**

- **Republic Services pulls appeal on Coffin Butte landfill expansion**
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Kosisochukwu Ugwuede (she/her) covers the cities of Corvallis, Philomath & Millersburg. She can be reached via e-mail at [redacted] or by phone at 541-812-6091

[redacted]

ALERT FEATURED TOP STORY

Disposal site advisory committee says county staff is stonewalling communications

Birds surround the peak of Coffin Butte Landfill, looking for food scraps, while machinery works to compact the curre
Jess Hume-Pantuso, Mid-Valley Media

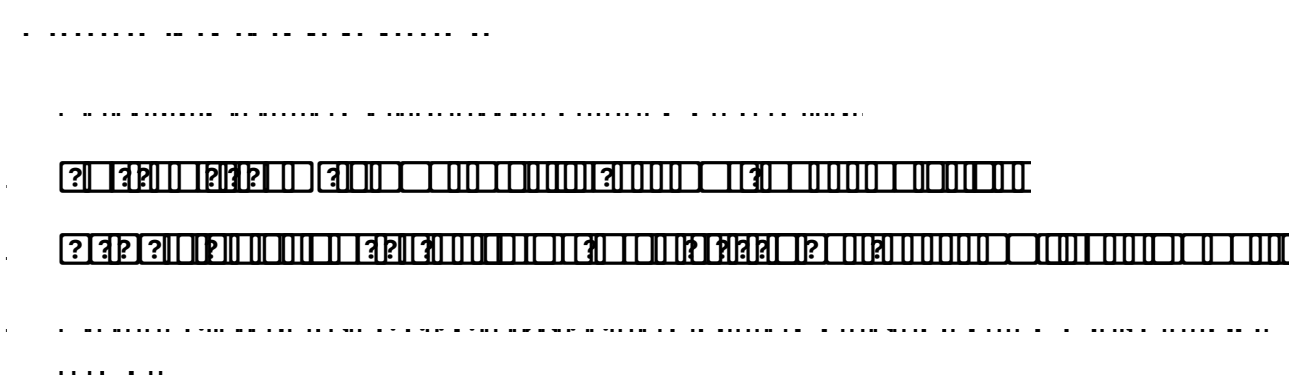
Kosiso Ugwuede

About a month after its resumption, several members of the Benton County Disposal Site Advisory Committee are concerned by what chair Ken Eklund has called a "stonewall" with the county's community development department staff.

The advisory board resumed meeting in October after two long breaks, first between September 2022 and May 2023 as a result of the **then-ongoing Benton County Trash**

Talks, and again from June to October 2023 for no clear reasons, according to Eklund.

Eklund says the committee is concerned that its recent interactions with county staff have stalled its advisory role as required by state law and impeded it from addressing important landfill issues.



But community development director Darren Nichols says the committee "has not been effectively gathering public insights for the past two years" adding, via email, that "the conversation has dwindled to a handful of passionate committee members operating with a narrower agenda."

To **"keep discussions at one table"** in relation to the Coffin Butte Landfill, the activities of the Disposal Site Advisory Committee as well as the Solid Waste Advisory Council were paused as the county turned all **of its attention to the Trash Talks taskforce**.

According to Nichols, the county's one-table policy was instituted upon the advice of Oregon Consensus (whose principal is Sam Imperati), the county's facilitator for the task force's fact-finding activities, because it is a typical feature of consensus building processes.

The goal, Nichols said, was to provide "one supported and coordinated space to share information and address the full range of issues around solid waste."

With the plan in place, the county will then "establish a new governance structure around

solid waste and sustainable materials," according to Nichols, and the state's Department of Environmental Quality was in support of this policy.

The advisory committee fought its way into meeting for an hour during that time, according to Eklund, although they could only discuss issues that pertained to the taskforce and **the report it was compiling** on the Coffin Butte Landfill. It was in no way like its regular meetings — which, according to state law, must be held at least four times in a calendar year — and the committee did not set its own agenda.

Then SWAC was dissolved.

According to Nichols, SWAC's dissolution simply had to do with the county's long-term and wide-ranging trash plans.

"Benton County is replacing the earlier version of the Solid Waste Advisory Council (SWAC) with a more appropriate regional advisory committee during the development of a sustainable materials management plan," Nichols said via email.

At the committee's meeting on Oct. 25, Nichols said an ad-hoc committee was being formed in the interim to fill in for the dissolved council pending the development of the county's sustainable materials management plan.

Members of the disposal site advisory committee are not buying these reasons.

Joel Geier, also a member of the dissolved council, said he found the county's one-table policy "absurd."

In an email to county commissioners dated Nov. 2, Geier said this was especially so because the county "has systematically excluded and removed voices from the 'one table,' ever since the start of the BCTT process."

Regarding the long-term trash plans, Geier said it was concerning that pertinent issues like the **EPA'S methane gas emission warning**, **leachate being sent to treatment plans not designed to remove hazardous chemicals** and recorded groundwater contamination captured in the Trash Talks report were not being captured in what ought to be a long-term waste management plan.

"These are disposal site issues, and thus are appropriate topics for the Disposal Site Advisory Committee," Geier wrote.

"Recent actions by county staff to restrict the scope of meetings and to schedule meetings arbitrarily, without consulting DSAC members, have been a step in the opposite direction," the email further said.

Mark Yeager, another member of the committee, said during the Oct. 25 meeting that SWAC's dissolution was **in violation of county code** and there were still unanswered questions about what responsibilities this proposed interim committee could handle to fill in for the dissolved council. If a conditional use permit request arose, for instance, before the sustainable material plan process was completed and a new advisory body instituted, could the interim committee make standing decisions on it?

It was also concerning, according to Yeager, that members of the disposal site committee had not been asked to be on the interim council being formed.

Nichols said at the meeting that the committee could nominate a member, a topic the group agreed to discuss at the next meeting that was to be held Nov. 16.

On Nov. 9, Nichols emailed the committee to announce the meeting was cancelled. The email said the meeting date was not suitable for multiple members and no comment was made about rescheduling it to a later date in November.

The disposal site advisory committee exists based on state law.

The law (ORS 495.320) mandates every county where a regional landfill is proposed or exists to institute a disposal advisory committee comprising the disposal site's neighbors, property owners as well as employees of the operator. The committee's role is to review the siting, operation, closure and long-term monitoring of said site.

According to the county's 2020 DSAC by-laws, the chair of the committee develops the agenda for the meeting with assistance from the community development director or their designee.

Nichols says the state law does "give the Board of Commissioners authority to schedule committee meetings, set committee agenda topics, appoint ex-officio members and amend the committee bylaws."

One such amendment, which came after a Sept. 5 board of commissioners meeting, was a motion moved by Commissioner Nancy Wyse and seconded by Xan Augerot "to direct staff to schedule monthly DSAC meetings and create meeting agendas to fulfill Benton County's statutory responsibilities in October, November and December 2023."

Nichols said the chair and committee were informed of this revision.

Eklund said that after he'd received the staff's agenda, which he considered preliminary, he prepared one as chair of the committee incorporating the staff's agenda as dictated by the by-laws and shared with staff a week ahead of the meeting. He received no response.

But at the Oct. 25 meeting, both staff and committee members spent more than half an hour in a tense exchange trying to determine which agenda will guide the deliberations. A non-committee member who joined the meeting made a threatening remark to one of the community development staff, exacerbating the already tense meeting.

The staff's agenda for the Oct. 25 meeting listed six items, key of which were (in time allotment): the community concerns about the annual report for 2021, community comments and review of minutes for nine meetings prior.

Eklund's agenda included items he believed were more important to the committee, like setting a regular meeting schedule and reviewing language on the DSAC's web page. He also reallotted time frames to the county staff's agenda.

In his agenda, Eklund allotted the first 25 minutes to "regrounding the committee" since this was the first regular meeting to be held in over a year and, according to the agenda, the meeting was "reconvening in an environment that is much different in terms of staff support."

"For some reason, the agenda prepared by staff had basically an hour allotted for an item where, where we're at with the item is waiting for staff to supply us with documents and so there's nothing to report, there's nothing to do," Eklund said on a call.

According to Eklund, this control over the agenda is a key struggle about the sovereignty of the committee and who decides what they can or can't discuss at the meetings.

Another committee member, Marge Popp, **who participated in the Trash Talks workgroup**, said she "encountered similar tendencies to control subcommittee process and output by the same staff responsible for liaison with DSAC."

As soon as the committee was directed to resume its meetings, Eklund said he made a public request to the community development staff on Sept. 15 to better understand SWAC'S dissolution. By Oct. 6, the request had not been acknowledged, causing Eklund to flag the request to Nichols citing the Freedom of Information Act as governing the request, which seemed to move it along.

Other records requests he'd made that were not yet responded to at the time of this interview included requests for public comments reports to assist in the compilation of the community concerns annual report for 2021 and 2022.

Every year, county staff collect community concerns and comments regarding the landfill and compile it into a report that is then presented to the committee for review and editing before it is sent off to the state's Department of Environmental Quality, as required by law.

"The prior reports are posted and publicly accessible on the committee's website, so they don't require a public request," Nichols said.

Solid waste and water quality program coordinator Daniel Redick developed a draft of the 2021 report and brought it to the committee last July. But Eklund said they'd failed to include material related to the landfill expansion which the committee believed was a significant omission.

Conversations about the landfill's expansion began in late 2021. Following an approval recommendation by the solid waste advisory council, the application went to the Planning Commission who held public hearings in November where an overwhelming amount of opposition to its expansion was received.

Eklund said all of that feedback was supposed to be in the 2021 community concerns

report. Before the committee could reconvene in October (meetings are held once every quarter), their activities were paused for the Trash Talks taskforce.

Eklund says that in his interpretation of the state law, the committee may not make the four regular meetings per year required of them.

However, Nichols said the committee refuses to acknowledge the staff's community comments report.

The staff report acknowledges that it "does not detail each of the community member concerns received throughout that public hearing process," but it listed concerns culled from the process in a table which included concerns about out-of-county waste, groundwater quality, air quality, odor and greenhouse gas emissions, among other concerns.

"Some members have repeatedly resisted the Board's direction to complete the committee's basic responsibilities, which are to read and approve the 2021 and 2022 reports which then needs to be filed with the Oregon DEQ," Nichols said.

In retrospect, Eklund says he wishes he had put his foot down regarding control over the committee's schedule and agenda before they were suspended last year.

"I believe it is surprisingly difficult for county staff to appreciate the harm a landfill exacts on the environment, and balance that cost against the revenue generated by the franchise fee," Popp said via email.

Eklund thinks the stonewalling goes beyond current or potential franchise fee revenue.

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"It seems like there's something else also that has to do with discouraging essentially very active participation in the process from my point of view so far," Eklund said.

Popp said she understands the task of the county staff is tough, but she wishes "they would at least try to do it. And elicit help from residents, not waste time fighting them."

In spite of staff's cancelation of the scheduled November meeting, Eklund has called for a committee meeting on Nov. 27 standing on state and county law, set an agenda which

includes discussing a steadier meeting schedule, and has asked the community development staff to respond if it has any concerns.

Related stories:

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Kosisochukwu Ugwuede (she/her) covers the cities of Corvallis, Philomath & Millersburg. She can be reached via e-mail at . ... or by phone via 541-812-6091

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From: Gary Hilyard
To: Deschutes Public Commented
Subject: Comment on Planning Commission Republic County Pawlowski written material July 8-9 on Republic compliance
Date: Wednesday, July 16, 2025 2:28:26 PM
Attachments: 01 Pawlowski re Republic's Written Material.docx
01 Coffin Butte overhang on public rds with arrow labeling.pdf
02 Coffin Butte overhang on public rds with arrow labeling.pdf
04 Commission may modify staff's stonewalling communications.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Document ID: This is Part II, Compliance.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Strathern, and Wilson:

I'm submitting this letter in response to information in four items in the "8. New Evidence from July 8-9 Hearings" folder on Munideos:

1. Republic's slide deck ("25RS1067 Coffin Butte Dock_FINAL")
2. County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8")
3. Brent Pawlowski's testimony ("07092025 PAWLOWSKI_Brent")
4. Jeff Kleinman's testimony ("07092025 KLEINMAN_Jeff")

Note: my letter has attached evidence A1 through A5. To view these attachments using the County's Munideos record system, look to the Attachments section in this email's header, and double-click to view each one.

Also: for verification of statements made, this letter refers to testimonies in the Munideos record that relate to the information in the above four items; I've linked to them so that you can quickly and easily refer to them. (And any attachments to *those* must also be double-clicked in their header, respectively, to open.)

I'm *trying* to be succinct, but there's a lot to respond to. This is Part II: Compliance.

COMPLIANCE
Pawlowski: pp. 1-4
Republic presentation: pp. 2, 8-9, 13-15, 21
Staff presentation: pp. 4, 16-24, 27-28, 38, 40, 44-50
also
Kleinman pp. 3, 8, 11-12, 21, Planning Commission Findings for Denial 2021

Brent Pawlowski brings up the issue of Republic's compliance record, and its narratives about that record, in his letter. He voices representations about Republic's corporate responsibility, environmental stewardship, history of following protocols, responsiveness and adherence to regulatory requests and enforcement, adoption of new methodologies and technologies, quality of operations, management track record, and so on, which echo those made by Republic in verbal and written testimony. Republic's slide deck also makes representations about Republic's compliance history and responsiveness – "we will continue to work with regulatory partners to assure compliance" – as a necessary element of its promises ("pledges") for mitigation measures and Conditions of Approval. The County slide deck likewise represents in text and by subtext that Republic has been and will follow state and federal regulation and be responsive to the County's Conditions of Approval.

The Pawlowski letter and the Republic and County presentations all admit that adherence to regulation, proposed mitigation and proposed Conditions of Approval are necessary to prevent an expanded landfill from seriously impacting uses adjacent to the landfill or in the lands which are *effectively* adjacent, given the landfill's oversized impacts. Pawlowski, the Republic presentation, and the Staff presentation all go on to say that environmental compliance entirely depends on adherence to, or enforcement of, *state and federal regulations*. In other words, being toothless, the proposed mitigations and Conditions of Approval are inconsequential and might as well not exist (*should* not exist, Pawlowski says).

The proposed mitigations and Conditions of Approval are attempts to create an illusion that *something new is being created* is regards to compliance. Their tone is as if Republic and the County have suddenly been alerted for the first time of all these measures they could have been taking all along to protect the public – "...and surely, now that you've woken us up to them, we will act!" As much as I would like to believe that's true, I pragmatically know it's not.

The fact that Republic has felt compelled to create multiple slates of promised mitigations, and the County has felt it necessary to create 85 or more Conditions of Approval, is eloquent testimony that Republic has not been responsive to either regulatory requirements, or past Conditions of Approval, or present community concerns – and neither has the County. And there is no scaffolding being introduced to induce any organizational change – Commissioners, there's no rudder there that could even start to turn these bureaucratic juggernauts around.

So County Staff is effectively recommending Approval based on the creation of some undefined County-Republic-Community kumbayah cooperative mechanism that will now (waves magic wand) engage other regulatory entities, even though one of the parties involved is vocally and vehemently opposed to this plan.

Compliance-wise, nothing substantial would be changed by approval of the application. Compliance-wise, the ineffectual status quo would be maintained, and Republic would continue to be a burden upon regulators, an obstacle to cleaner disposal alternatives, and a creator of long-term liabilities, while Coffin Butte Landfill would continue to be a growing hazard to its neighbors, a blight upon its neighborhood, and a ruination to its environment – but an even bigger one, for longer, if it is given the green light to expand.

1. **Pawlowski asserts on p. 1 that "The owner-operator, Republic Services, has shown to be a responsible company both on operations and compliance" but offers no evidence. There is considerable evidence to the contrary.**
   a. As a company, Republic Services has paid over $182,000,000 in environment-related (EPA) offenses since 2000, according to Violation Tracker, and another $131,000,000 in employment-related offenses (**attachment B1**).
   b. Four days ago, the International Brotherhood of Teamsters launched a strike of Republic Services by over 2,000 workers represented by the union around the country, a rapid escalation of a dispute that kicked off in the Boston area last week. The union is accusing Republic, the second largest waste company in the country, of mistreating and underpaying its workers (**attachment B2**).
   c. Republic at Coffin Butte Landfill incurred its own strike in 2023, amid worker accusations of unsafe working conditions (**attachment B3**).
   d. Republic's operations and compliance at Coffin Butte Landfill has generated hundreds of community complaints and concerns in the last four years, as documented in the 2021, 2022, 2023 and 2024 Community Concerns Annual Reports (attached to a testimony in Munideos on p. 102) that the County filed with Oregon DEQ. There has been no follow-up by Republic about these concerns.
   e. After two recent fires at the landfill that required the community volunteers at Adair Rural Fire to put out, there was an examination of fire risk at the landfill. Republic's representatives resisted all talk of upgrading their system, asserting that their workers were highly trained and followed all protocols, and that fire danger was minimal in any case because Republic limited the landfill's working face to half an acre.
      i. One of the fires was on the landfill's working face. It broke out, and Republic workers covered it in dirt. Thinking they had extinguished it, they went home, after which the fire re-emerged and spread in the landfill, catching fire to equipment until Adair Rural arrived. *Leaving such a situation unwatched is against the most basic principles of fire training.*
      ii. Republic did not follow all protocols. Republic is required to report all fires to their permit holder at DEQ – but they haven't done this for years (verified by public records request at DEQ). As noted on page 19 of their presentation, Republic pledges to *begin* taking such fundamental steps as keeping a log and properly reporting to authorities.
      iii. A survey of GIS records by Beyond Toxics (see #1746 in Munideos) established that the landfill's working face has not in fact been limited to half an acre, but instead was usually 1.5 - 2.5 acres. Faced with photographic evidence, Republic has abandoned its "half-acre" narrative.
   f. I could go on like this for quite a while, but Commissioners, I think you get the idea.
2. **Pawlowski asserts on p. 1 that "Records show Republic Services has not had an environmental compliance violation." This is not true, and misrepresentative.**
   a. A year ago now, Oregon DEQ issued Coffin Butte Landfill a Notice of Violation for Republic's slow walk towards compliance for 2021 emissions regulations regarding its landfill gas flares. That violation was not fixed until November 2024. (A full explainer is attached to testimony #1993 in Munideos.)
   b. "Environmental compliance violation" is a very specific subset of the much larger set of non-compliances. It's this much larger set that should be used to judge whether the company's behavior "both in operations and compliance" has been responsible or not. Referencing (a) just above: a company that's non-compliant and slooooow-walks its way toward compliance can sustain violation-level infractions of environmental law for years, to the detriment of the community, yet never push things so far as to get an actual Notice of Violation.
   c. Environmental compliance depends on accurate self-monitoring. For at least the last four years, Coffin Butte Landfill has never had a quarterly Surface Emissions Monitoring inspection that has not turned up multiple sites that are non-compliant – in plain terms, there are always leaks emitting violation-level amounts of landfill gas. September 2022 is a standout, as over 100 such leaks were found in areas all across the landfill (**attachment B4**), as compared with 6 earlier that year. What had happened is that, after a July EPA inspection revealed a similarly high number of leaks, Republic stopped doing the monitoring themselves. In other words, this high number of leaks had existed all along, Republic self-monitoring had just failed to find them. Discussion on this continues below.
3. **Continuing from the above, Pawlowski asserts further on p. 1 that "The contentious methane 'exceedances' are not violations. Republic Services has followed protocol for measuring and correcting exceedances per testing and correction protocol. This is well documented." Pawlowski glosses over the reality.**
   a. Pawlowski is referring to leaks emitting violation-level amounts of landfill gas. The protocol for those leaks is: each is to be remediated within ten days and retested; if not fixed, each is to be remediated within 30 days and retested; this process repeats more times; if still not fixed, a new gas well is to be installed at that location, within 120 days. Coffin Butte Landfill now has approximately 200 more wells than you would expect for its size (300, not 100), because *so many of its violation-level leaks never get remediated*, and instead a new well is drilled to try to divert landfill gas from reaching the open leak.
   b. The documentation Pawlowski refers to here is Republic's self-monitoring, and cannot be relied on. For cause, that documentation and other self-monitoring reports were effectively subpoenaed by EPA Air Quality Enforcement in January, with an EPA Clean Air Act enforcement mechanism called a Section 114 Information Request. The EPA has not been able to audit the records yet, because Republic filed for multiple extensions to their deadline for providing them. They're slooooow-walking it, in other words. So whether or not Republic has actually followed protocol regarding these methane leaks is actively being questioned by regulators, and we will not know the answer until probably sometime later this year.
4. **In both the Republic and County presentations, they assert that each has been "responsive to the community" in the past, and have incorporated public comment into their analyses and findings. This is a mischaracterization of reality that in itself calls into question their assertions about compliance (See Kleinman in Munideos, pp. 3 and 21).**
   a. Throughout these proceedings, Republic has represented itself as responsive, but this has not been the community's experience, as presented to the Planning Commission in too many testimonies to list. The community's bad experience is documented in Republic's proposed mitigations and in the County's proposed Conditions of Approval, which are all community issues that Republic has not in fact responded to, but which it now admits are key to mitigating the harms of the landfill.
   b. Likewise, the County has in history of suppressing public comment that documents the harms of the dump or is critical of the landfill. Key example: for years the public could not get the County to release the Community Concerns Annual Reports about the dump, compiled by the Disposal Site Advisory Committee, until its suppression efforts were made public (attachment **B5**) and the County's Community Development Director resigned. Those Reports are attached here in Munideos, p. 102. You will see they were all released in late 2024-early 2025.
   c. The Republic presentation cherry-picks public comment to respond to, in a process that seems to have written the responses first and then hunted for public comments they could plausibly be linked to. Some sections skip responding to public comment entirely.
   d. The County presentation refers to its Supplemental Staff Report, which "includes and evaluates public testimony," but this report also filters public comment – largely limiting their evaluation to public *comment that Republic chose to respond to in its Application*. In his testimony, Attorney Kleinman refers to the County as "complicit" in engineering a recommendation to Approve.
5. **In both the Republic and County presentations, they assert that Conditions of Approval (COAs) are viable, but there is no history of this, nor any of the necessary structure in place to enable viability, nor any plan to create that necessary structure.**
   a. A Key Finding of the BCTT, CUP F-2, states, "Benton County has not and does not actively monitor compliance with many Conditions of Approval, nor does it proactively act to enforce compliance." (p. 98)
   b. Numerous testimonies to this effect have been made (here's one example in Munideos) but no structure has been identified, nor any plan for structure been presented.
6. **Throughout its July 8 presentation, the County asserts that various harms "can be mitigated through COAs." On page 28, it's asserted that "COAs monitor and ensure compliance." Commissioners, who is it exactly that's doing this monitoring, to 'ensure compliance'? Those COAs aren't going to monitor themselves!**
   It's the community that's being tasked with the monitoring, isn't it? Will we have to prepare documents like this one into the indefinite future?

Conclusion. As put forth in law (Munideos, Kleinman Non Evidence July 8) and reinforced by common sense, the scheme for compliance laid out for you with the proposed mitigations and Conditions of Approval has to be "possible, likely and reasonably certain to succeed." There is no indications that is the case here. You have no prior examples to look at, because compliance with Conditions of Approval have not been demonstrated to have ever occurred. There's plenty of evidence that they've failed, however. There was (still is, actually) a requirement for Republic to plant trees to screen the landfill from view from Highway 99W, for example. And there are in fact no such trees there.

So the County failed to press for compliance, or Republic failed to comply, or both, or maybe Republic is just slow-walking its way toward compliance and will get there any year now. Any way you look at it, odds are very slim that the County Team will ever win a game of Compliance that the Republic Team doesn't want to lose. And that's only if, by raising their frustrated voices, the community can get them to play ball at all.

Commissioners, this is unworkable, and cruel. Deny LU-24-027.

GOOD JOBS FIRST VIOLATION TRACKER

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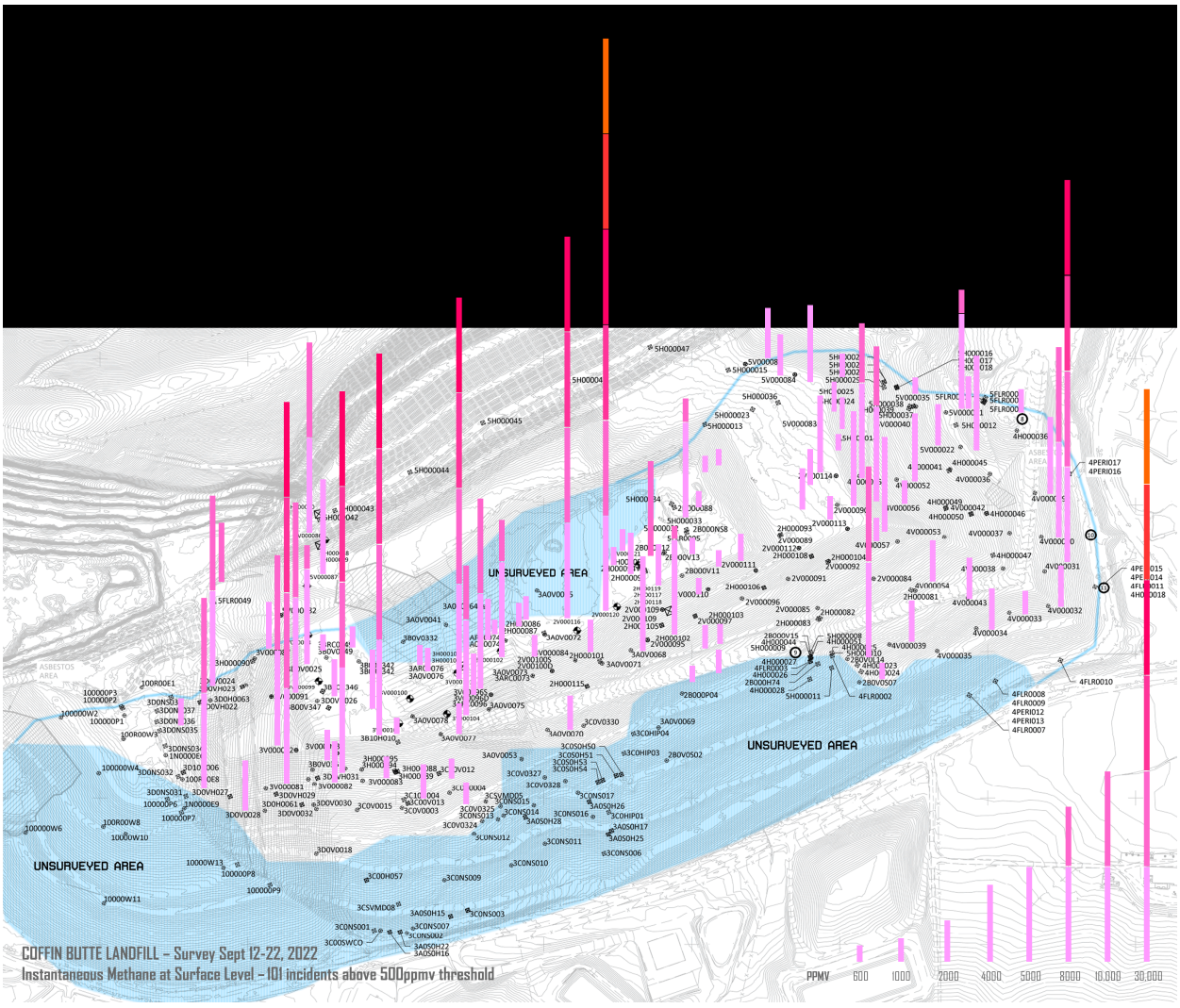
Violation Tracker Current Parent Company Summary

Current Parent Company Name: Republic Services
Ownership Structure: publicly traded (ticker symbol RSG)
Headquartered in: Arizona
Major Industry: waste management and environmental services
Specific Industry: waste management
Penalty total since 2000: $177,241,441
Number of records: 283

TOP 5 OFFENSE GROUPS (GROUPS DEFINED)	PENALTY TOTAL	NUMBER OF RECORDS
environment-related offenses	$161,522,584	166
employment-related offenses	$12,813,803	48
miscellaneous offenses	$1,625,000	2
safety-related offenses	$786,808	64
competition-related offenses	$250,000	1

TOP 5 PRIMARY OFFENSE TYPES	PENALTY TOTAL	NUMBER OF RECORDS
environmental violation	$114,414,837	84
water pollution violation	$37,050,000	2
air pollution violation	$6,675,723	29
employment discrimination	$3,769,000	3
work visa violations	$3,000,000	1



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Creator of
World Without Oil
Go Zed Omega
FutureCoast
and other storymaking games

From: Ken Eklund
To: Benton Public Comment
Subject: Testimony in response to Republic-County-Pawlowski written material July 8-9: Odor addendum
Date: Wednesday, July 16, 2025 4:19:47 PM
Attachments: 5_001-condensed KE.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Document ID: This is a late-breaking Addendum to Part A, Odor (submitted previously).

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

I'm submitting this Addendum in response to information in three items in the in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs, on the subject of dump odor:

1. Republic's slide deck ("25RS1067 Coffin Butte Deck_FINAL") Republic presentation
2. County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8") Staff presentation
3. Brent Pawlowski's testimony ("07092025 PAWLOWSKI_Brent") Pawlowski

Please note: my letter has evidence attached as a PDF. To view this attachment using the County's **Munidocs record** system, look to the Attachments section in this email's header, and double-click to view the PDF.

To be brief: I've just now received a response to a Freedom Of Information Act request submitted to the EPA, for documents related to EPA Enforcement's Section 114 Information Request filed in January. I thus have a new document relevant to my Part A: Odor testimony, filed earlier today. That document is attached.

The Section 114 IR asked Republic to:

5. Provide information regarding citizen complaints that the Landfill has knowledge of between January 1, 2022, and the date of this request. The information should include:

a. *Date and time;*
b. *Location at or near the Landfill which.is the subject of the complaint;*
c. *Copy or description of complaint;*
d. *Corrective action or monitoring done as a result; and*

e. *Name and contact information for the person who submitted the complaint.*

Republic responded:

> *The PDF provided in Folder 5 includes the information that the site has regarding citizen complaints from January 2022 to January 2025. Persons who responded to this request include Paul Koster, Environmental Manager.*

I've attached "the PDF provided in Folder 5" with blank pages removed for file size/conciseness. **I thought you might appreciate receiving Republic's raw data, which you can compare to how it is portrayed in the Applicant's Odor Study. You can now read actual comments about the odor made by the community members, for example, and where they were relative to the landfill when they smelled the odor.**

You'll also note that Republic apparently does not receive or retain complaints expressed to Benton County, including those expressed to the Disposal Site Advisory Committee.

Note: the gray "(B) (6)" blocks are EPA redacting personal information – i.e., they are instances when a community member contacted Republic directly. (Most people contacted DEQ rather than Republic. I'm not sure Republic *ever* publicized their complaint portal?)

Thank you all for your diligence and contribution to our community!

Ken Eklund

Ken Eklund, writerguy

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and other storymaking games

	Month:	Feb-2022							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
	2/22		DEQ informed us of 25 odor complaints they had received between 11/18/21 and 2/7/22. No additional details provided	N/A					N/A

	Month:	Aug-2022							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	8/17	N/A	DEQ	assorted via DEQ					
	7/1	10am	via DEQ	n/a	"The usual stench from the landfill. Once again occuring at my location as the marine clouds lift and the day warms.				N/A
	7/26	8am	via DEQ	n/a	"odors from the Coffin Butte Landfill. Quite noticeable this morning while we had a high pressure system and no wind", complex toxic chemical slew				N/A
	7/30	8am	via DEQ	n/a	Coffin Butte Landfill by Republic. Sulfur, dump odor				N/A
	8/15	9:13 AM	via DEQ	n/a	"the Coffin Butte Dump smell is noticeable on occasion. Today it is really bad. To the point of making me sick to my stomach when I walk around outside", methane				N/A

	Month: Sep-2023								
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	9/28		N/A (forwarded from DEQ) 2/7/24		"overpowering and pervasive to my nostrils and eyes"				

	Month:	Nov-2023							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	11/21	N/A	(b) (6)	Writsman Creek Dr	"dump smell"				
2	11/29	12:40pm	(b) (6)	Writsman Creek Dr					

	Month:	Dec-2023							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	12/1	3:36pm	(b) (6)	Writsman Creek Dr					
2	12/12	1:35pm	(b) (6)	Writsman Creek Dr					
3	12/16	2:00pm		Writsman Creek Dr	"overwelming stench this morning"				
4	12/14		N/A (forwarded from DEQ) 2/7/24		"particularly nasty"	N/A	N/A	N/A	N/A
5	12/15	12:00 PM	N/A (forwarded from DEQ) 2/7/24	highway 20 at independence highway	"absolutely overpowering"				
6	12/25		N/A (forwarded from DEQ) 2/7/24		"like rotten garbage, some sort of gas"				

#	Month: Jan-2024 Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	1/12	12:15pm	N/A (forwarded from DEQ)	"apx 3 miles from Cof	"horrible smell of the landfill"	6-Apr	NE	41	
2	1/18	12:00 PM	N/A (forwarded from DEQ) 2/7/24						
3	1/18	1:30 PM	N/A (forwarded from DEQ) 2/7/24	"several miles south of Coffin Butte landfill"	"incredibly intense"				
4	1/18	12:00 PM	N/A (forwarded from DEQ) 2/7/24		"odor was very obvious"				
5	1/18	4:00 PM	N/A (forwarded from DEQ) 2/7/24	"town of Corvallis"	"hits you like a wet blanket and permeates into the home as well"				
6	1/18	3:30 PM	N/A (forwarded from DEQ) 2/7/24		"really bad"				
7	1/19	8:00 AM	N/A (forwarded from DEQ) 2/7/24		"very apparent"				

	Month:	Feb-2024							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	2/3	3:00 PM	N/A (forwarded from DEQ) 2/7/24		"Chemical type smell, Horrible"				
2	2/3	10:00 AM	N/A (forwarded from DEQ) 2/7/24		"Strong smell of methane"				
3	2/3	9:00 AM	N/A (forwarded from DEQ) 2/7/24		"foul chemical odor"				
4	2/3	1:00 PM	N/A (forwarded from DEQ) 2/7/24	"apx 3 miles from the landfill"	"nasty, horrible and probably not good for anyone to breathe"				
5	2/3		N/A (forwarded from DEQ) 2/16/24	"south end Tampico Rd"	"so strong"				
6	2/8	12:46 PM	N/A (forwarded from DEQ) 2/16/24		"strong"				
7	2/10	7:30 AM	N/A (forwarded from DEQ) 2/16/24	"soap creek rd"	"awful stench"				
8	2/10	8:30 AM	N/A (forwarded from DEQ) 2/16/24	"soap creek valley"	"stinky air" "especially bad"				
9	2/10	9:29 AM	N/A (forwarded from DEQ) 2/16/24	"by the landfill"					
10	2/13		N/A (forwarded from DEQ) 2/16/24	"above 800ft elevation, along Vineyard Mountain Ridge"	"the usual Coffin Butte stench"				
11	2/14	8:30 AM	N/A (forwarded from DEQ) 2/16/24		"very bad"				
12	2/14	11:00 AM	N/A (forwarded from DEQ) 2/23/24	"my home, Soap creek rd, Tampico rd, Adair Village"	"usual rotting garbage odor"				
13	2/15	10:51 PM	N/A (forwarded from DEQ) 2/23/24		"extremely strong"				
14	2/20	3:37 PM	N/A (forwarded from DEQ) 2/23/24		"malodorous chemical smell"				
15	2/20	9:00 AM	N/A (forwarded from DEQ) 2/23/24		"rotting garbage"				
16	2/20	3:00 PM	N/A (forwarded from DEQ) 2/23/24	700-800 ft elevation	"usual landfill stench"				
17	2/22	10:48 AM	N/A (forwarded from DEQ) 3/1/24	7 miles south of the landfill					
18	2/24	1:00 PM	N/A (forwarded from DEQ) 3/1/24		"Rotting stench"				
19	2/24		N/A (forwarded from DEQ) 3/1/24	3 miles south of landfill	"sour, reeking stench"				

#	Month: Mar-2024 Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	3/6	7:30 AM	forwarded from DEQ	"South of Landfill"	"Reeking Stench"	0	SSE	27.6	unknown
2	3/8	1:00 PM	(b) (6)	(b) (6)	"5"	3	W	45	unknown
3	3/8	8:30 AM	(b) (6)		"rotting garbage plus acrid chemical smell", level 8	0	SSE	32	unknown
4	3/12	2:30 PM	forwarded from DEQ	E.E. Wilson State Wildlife Area	"landfill odor with a noxious chemical component"	9	SSW	50	unknown
5	3/23	8:00 AM	(b) (6)	White Fir and Trillium Lane, also Robison road	"foul/gassy, for two hours"	0-6	SSW	45	unknown

	Month:	Apr-2024							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	4/1	8:00 AM	(b) (6)		10	0	SSW	40	N/A
2	4/1	9:00 AM	(b) (6)		"incredibly bad", 10	0	SSW	42	N/A
3	4/1	11:30 PM	(b) (6)		10, "smells like rotten eggs. But worse. More chemically."	0	SE	51	N/A
4	4/12	7:00 AM	forwarded from DEQ	"my house"	"overpowering landfill stench"	0	SSW	38	N/A

	Month:	May-2024							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	5/2	7:00 PM	forwarded from DEQ		"Strong odors"	7	NE	76.6	
2	5/23	7:30 AM	forwarded from DEQ		"smell of Garbage" overwhelming	4	SW	55	
3	5/23	7:50 AM	forwarded from DEQ	5 miles from the dump	smell the dump	3	SW	56	
4	5/23	9:30 AM	forwarded from DEQ	5 miles south, adair	"coffin Butte's effluence"	5	SW	42	
5	5/23	6:00 PM	forwarded from DEQ	"near coffin Butte"	"trash and rotten egg"	5	NE	85	

	Month:	Jul-2024							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	7/12	12:06am	forwarded from DEQ	"south of the landfill"	"landfill smell"				
2	7/24	1:00 PM	forwarded from DEQ	near SE corner of Landfill buffer property	Noticeable unpleasant methane odor	6	S	78.3	
3	7/30	5:30 PM	forwarded from DEQ	4 miles SE of landfill	"landfill dump smell"				

#	Month: Aug-2024 Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	8/8	7:40 AM	(b) (6)	Oak Grove Drive & Powers	"dump smell, like driving by", "10"	0		58.6	N/A
2	8/8	7:45 AM	(b) (6)	Palestine & Oak Grove	"9"	0		58.6	
3	8/18	7:30am	(b) (6)	Oak Grove Drive & Powers	"smells like driving by the dump", 8	0	S	57.8	
	8/9	3:15 PM	forwarded from DEQ		Piercing garbage smell				
	8/9	5:53 PM	forwarded from DEQ	"miles away"	"terrible smell"				
	8/4	8:30 AM	forwarded from DEQ (8/26)	SW of Landfill or driving by	dump stench				
	8/23	6:30 PM	forwarded from DEQ	South of Landfill	"landfill chemical stink"				

#	Month: Nov-2024 Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	11/26	11:30 AM	forwarded from DEQ	N/A	"Coffin Butte dump stench"				
2	11/27	7:15 AM	forwarded from DEQ	N/A	"went outside with my cup of coffee. Hit with the smell of the landfill"				
3	11/30	10:00 AM	forwarded from DEQ	7 miles S of landfill	"sitting at my dest, when I stared to smell it. It lasted for a about 3 hours"				
4	11/30	12:00 PM	forwarded from DEQ	"passing by the… landfill"	"a terrible odor that we could smell from our car for about a mile north				

	Month:	Dec-2024							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	12/1	10:00 AM	forwarded from DEQ	"near Coffin Butte"	"odor is so bad"	1	SSW	30.3	
2	12/1	10:00 AM	forwarded from DEQ	n/a	"sometimes unbearable"	1	SSW	30.3	
3	12/1	11:52 AM	forwarded from DEQ	"soap creek valley"	"toxic landfill gases"	3	N	33.2	
4	12/1	8:30 AM	forwarded from DEQ	Soap Creek/Writsman Brook	"some sort of chemical", "rotten garbage"	0	SSW	28.2	
5	12/6	9:45 AM	forwarded from DEQ	n/a	"landfill stench"	0	NNE	30	
6	12/14	1:30 PM	forwarded from DEQ	Coffin Butte Road	“like a cross between a putrid low tide and an auto repair garage”.	3	SSW	47	
7	12/20	3:00 PM	forwarded from DEQ	4 miles SSE of the Landfill	"odor" "far worse than usual"	0	W	50.2	
8	12/23	2:00 PM	(b) (6)		landfill smell, 5	0	NE	44.9	
9	12/23	9:30 AM	forwarded from DEQ	6.3 miles away	"stench very noticeable"				
10	12/29	9:29 AM	(b) (6) (also received forwarded from DEQ)	"driving past dump"	"stench", "not one type of aroma"	2	SSE	46.4	
11	12/29	4:45 PM	forwarded from DEQ	n/a	"strong methane odor"	2	S	44.1	
12	12/31	3:45 PM	forwarded from DEQ	n/a	"stink"	3	S	38.3	

	Month:	Jan-2025							
#	Date	Time	Complainant	Location of Odor	Description/ Rating Scale	Wind Speed	Wind Direction	Temp	Odor Source
1	1/1	12:00 AM	forwarded from DEQ	5 miles from landfill	very strong odor				
2	1/5	11:50 AM	forwarded from DEQ	n/a	"to much methane and garbage"				
3	1/7	3:30 PM	forwarded from DEQ	n/a	"methane odor"				
4	1/9	1:30 PM	forwarded from DEQ	south of landfill	"somewhat sulfurous and sickening"				
5	1/9	6:00 PM	forwarded from DEQ	SE side of Vineyard Mtn	"smell the landfill"				
6	1/9	all day	forwarded from DEQ	"south of Landfill"	garbage-landfill odor				
7	1/11	n/a	forwarded from DEQ	n/a	"very overwhelming"				
8	1/12	11:00 AM	forwarded from DEQ	n/a	"Very Potent"				
9	1/14	n/a	forwarded from DEQ	Tampico Road	"odor of landfill gas"				
10	1/21	10:30 AM	forwarded from DEQ						
	1/21	10:30 AM	forwarded from DEQ	Soap Creek Valley					
	1/21		forwarded from DEQ						
	1/21	4:00 PM	forwarded from DEQ		Unpleasant smell, overpowering stench				
	1/29	10:30 AM	(b) (6)		"smells bad outside", level 5				

From: Ken Eklund
To: Benton Public Comment
Subject: Testimony in response to Republic-County-Pawlowski written material July 8-9: PFAS
Date: Wednesday, July 16, 2025 4:58:25 PM
Attachments: writerguy-cube2.png

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application
ID: This is Part C: Concentrating PFAS.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

This is testimony in response to the July 8, 2025, slide presentation made by Republic Services. It also refers to evidence and testimonies previously submitted, and provides links to articles of evidence and testimonies in the Munidocs record, to help you locate them.

CONCENTRATING PFAS
Republic (RS) presentation, p. 26
Staff presentation by reference
Pawlowski by reference

Slide 16 of the RS presentation addresses the comment "*Coffin Butte landfill leachate contains PFAS***".**

RS comment - *PFAS concentrations measured in Coffin Butte Landfill leachate samples are similar to PFAS concentrations measured in a study of landfill leachate and leachate samples collected from California MSW landfills.*

- I notice that RS carefully doesn't say what the PFAS load is – so we can't actually verify their assertion. Why is that?
- Landfill leachate is known for its PFAS load. Saying that the PFAS levels in Coffin Butte Landfill (CBL) leachate are no worse than that of other landfills is not helpful in addressing the seriousness of the concern. Other landfills are concerned too: even low levels of PFAS are of great concern.
- How leachate is treated and where those PFAS (and other toxic components) end up is critical to completing the picture. So, let's talk about that:
    - Somewhere around 35 million gallons of CBL leachate is processed with municipal wastewater at municipal wastewater treatment plants (WWTPs) every year. Currently, those are WWTPs in Corvallis and Salem.
    - As described in Pam Castle's 6/11/2025 written testimony (https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8135d7834e2c8), **municipal wastewater treatment plants (WWTPs) do not treat PFAS**. PFAS removal requires specific processes that are not

included in WWTP process, so the PFAS entering the municipal wastewater plant with leachate are not removed during treatment. Instead, they are:
    - Released into the Willamette River with WWTP effluent
    - Distributed into the air as aerosolized droplets generated during aeration steps of wastewater treatment. PFAS levels are higher around WWTPs.
    - Spread with biosolids onto soils in the region.
  - **Aeration at WWTPs converts precursor molecules in landfill leachate into PFAS.** In other words, treatment at WWTPs makes the landfill leachate PFAS problem worse.
- A comparison of PFAS concentrations (provided by Clean Water Services) in leachate from three western Oregon landfills – Riverbend, Hillsboro and Coffin Butte – refutes the applicant's statement claiming that the PFAS concentrations in CBL leachate are similar to those of other landfills. Of the six PFAS compared in a plot of this data (submitted to the record by Dr. Joel Geier) **three were present in much higher concentrations in CBL leachate**. The PFBS concentration in CBL leachate was approximately **4 times** that of Riverbend landfill leachate and over **10 times** that of Hillsboro landfill leachate.
  - This is particularly concerning given the findings in the recently released Waterkeepers PFAS Phase II study of sites downstream from 22 U.S. WWTPs nationwide. The Rock Creek WRRF receives Hillsboro landfill leachate and releases its effluent into the Tualatin River. This waterway was in the top 6 for number of PFAS found to be elevated downstream of the effluent release. It tied for 4th place with two other landfills.
  - In addition, the increase in total PFAS concentration in the Tualatin River downstream from where the Rock Creek WRRF effluent is released was the 5th highest increase of the 22 waterways studied.

RS comment – *No PFAS have ben detected in City drinking water.*

- It is important to note that the intake for the city of Corvallis' drinking water is UPSTREAM of the City of Corvallis' WWTP effluent discharge into the Willamette River. Because of this, we would wouldn't expect the PFAS in WWTP effluent to affect the Corvallis drinking water.
  - It could, however, affect the Adair Village drinking water supply since their intake is downstream of the release of the Corvallis WWTP effluent. And it could affect other communities further downstream.
- A more appropriate measure of the effect of PFAS on the area would be the PFAS concentration in Corvallis WWTP effluent. Those PFAS are released into the Willamette River.

RS comment – *Currently there is no formal requirement to monitor PFAS in leachate or groundwater.*

- This does not lessen the concern about or the need for monitoring PFAS. Government agencies are slow to adopt and enforce rules. Waiting until CBL is forced to stop

spreading PFAS in the environment does not fit with their "good community member" descriptor.

- As very recently reported by The Guardian newspaper, the U.S. government has pulled $15 million in funding earmarked to study the effects of PFAS contamination of agricultural land, contamination primarily due to spreading of biosolids from WWTPs. These studies were designed to determine how PFAS move into and accumulate in crops and livestock and enter our food supply.
    - This is an example of why we cannot wait on agencies to police this issue. They aren't going to be able to do that for a long time. Meanwhile, PFAS-laden WWTP biosolids continue to be spread onto our fields. A good neighbor would monitor their leachate's PFAS and stop sending it to the WWTP where those PFAS go on to contaminate our environment.

RS comment – *The amount of leachate treated at the City of Corvallis' WWTP represents 0.0058% of the water treated by the WWTP.*

- This is a 100-fold underestimate. If the WWTP processed 4 billion gallons total and 23 million gallons of that was landfill leachate, the leachate accounted for 0.0058 of total. Multiply that by 100 and you get a total percentage of 0.58%, rather than the 0.0058% reported.
- Trace quantities of PFAS are of concern for human and environmental health.
- PFAS are persistent in the environment, landfill leachate has an outsized PFAS load compared to municipal wastewater, and repeated, long-term exposure to PFAS cause harm making seemingly small volumes of leachate of importance.

Please deny LU-24-027, for findings that it has not been proven not to risk the health of its neighbors and area.

Ken Eklund, writerguy

37340 Moss Rock Dr
Corvallis OR 97330
408.623.8372

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (construction impacts)
Date:	Wednesday, July 16, 2025 12:37:24 PM
Attachments:	Geier_01_ConstructionImpacts.pdf Geier_02_MapOfCommenters.pdf Geier_03_AirborneTrash.pdf Geier_03_AirborneTrash Annex1.pdf Geier_03_AirborneTrash Annex2.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Thank you for your continuing attention to the complex issues surrounding this application.

The attached documents will be the first 3 of 8 submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

These cover the following topics:

1) impacts of landfill construction as inseparable from landfill operations
2) map of land uses pertaining to comments in opposition
3) airborne trash and ineffectiveness of applicant's proposed measures for control.

For the third of these topics, I also include two numbered annexes. Annex 1 is the contract between the applicant and the Benton County sheriff's department for roadside cleanup services, 2023-2025. Annex 2 is an addendum to that contract, executed in January/February of 2025, by which the applicant agreed to pay for an increased frequency of clean-up during the CUP application period, through June 30th of this year.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

Impacts of landfill development, including site preparation (excavation and construction or relocation of infrastructure) must be considered as part of the impact of the overall development. Due to the ongoing and intermittent nature of landfill development, the ongoing impacts of landfill development must be considered in relation to the conditional use criteria.

This is relevant in particular for your consideration of noise and seismic disturbance from blasting, and risk of reduced groundwater availability (wells and springs), but may also apply to other impacts arising from site development such as traffic. These issues have been identified in prior testimony by opponents (both written and verbal). That prior testimony must be considered in light of the unique nature of the proposed development, as recognized by Oregon statute.

New evidence:

Republic's slide deck for July 8th, slide 20 proposes a revision to county staff's proposed Condition of Approval OP-14: the following**:**

> Revised: Applicant shall not dispose of waste north of Coffin Butte Road during the Development Area's operation. Only one working face shall operate at a time. However, Applicant will be allowed to utilize two working faces during a short-term, three-month-or-less "transition period" ... Applicant shall proactively notify the county of the date the transition period is scheduled to begin, and again when it ends.

This is new information, introduced in the July 8th portion of the hearing. It suggests a staged process for operation of the proposed new landfill, concurrent with operation of the existing landfill. Applicant's presentation on July 8th further clarified that the initial disposal area referenced above will only be a portion of the proposed new landfill area, and that construction (including blasting and excavation) on other portions of the area will take place intermittently over a 3 to 4 year period. The intermittent, staged nature of development is relevant for assessing impacts, as we will discuss below.

Republic's slide deck for July 8th, slide 27 states the following**:**

> ***CONSTRUCTION SEQUENCING***
> *Coffin Butte Landfill estimates that work will proceed in this general order:*
> - ....
> - Leachate storage pond construction will follow with intermittent blasting between the hours of 12 p.m. and 5 p.m.
> - ...
> - Relocation of building in the expansion area footprint.
> - Removal of soil from expansion area to use as daily cover.

This differs in at least two significant respects from how the construction sequence was outlined in applicant's Exhibit 47, and thus constitutes new information.

First, the blasting for leachate pond construction is stated to be **intermittent**, which means "stopping and starting at intervals"[1] This was not mentioned in Exhibit 47, which implied a single phase of excavation and blasting. The difference is significant as intermittent disturbance at irregular intervals may affect use of neighboring properties and public roads differently from if activities causing disturbance are carried out within a well-defined period, with definite start and stop dates.

Second, the building in the expansion area footprint will be **relocated** rather than simple removed (as stated in Exhibit 47). Removal (whether by demolition or deconstruction) is a relatively simple process, whereas relocation means that the building will be shifted to or re-erected on another part of the site.

As an aside, applicant's site drawings (for example Exhibit 50) do not show where this building is to be relocated. The building is currently located near the leachate ponds and is used to support leachate handling operations, so we might speculate that it will be moved to an equivalent location with the new site configuration. That would mean locating it on Forest Conservation land, which would presumably require a separate permit if it is not covered by the permit sought in LU-24-027.

We also note that blasting and other excavation as part of landfill cell preparation are not mentioned in this sequence as presented on this slide, although this was given attention in Exhibit 47. Potential for blasting impacts during landfill construction to affect groundwater is discussed on two other slides presented by the applicant on July 8th.

In oral statements responding to questions by the Planning Commission on July 8th, the applicant clarified that excavation to prepare the base of the new landfill cells would not be distinct from the operating period. Instead blasting and excavation would occur during 6- to 8-month portions of the year, over a period of up to four years, first for the leachate ponds and then the new disposal areas as these are developed in stages.

Staff Slides to Planning Commission LU24027 July 8, slide 41 states**:**

> ***P2-2 Construction Phase.***
>
> *During construction of the expansion area for commercial use (construction of the leachate ponds, haul road, new landfill cell, and employee building), Applicant shall:*
>
> *(A) Limit construction to the hours of 6 a.m. to 6 p.m.*
>
> *(B) Limit any required blasting to the hours of 12 p.m. to 5 p.m.*
>
> *(C) Conduct all blasting pursuant to its approved permit issue by the Oregon Department of Geology and Mineral Industries (DOGAMI).*

In the same slide, staff assert that this pertains to *"construction conditions – not responding to CU criteria"* and BCC *"99.110 Sensitive Land consideration."*

1 American Heritage Dictionary of the English Language, 5th Edition.

Response:

Impacts of landfill development, including site preparation (excavation and construction of infrastructure) must be considered as part of the impact of the overall development.

In new evidence presented during the July 8-9 hearing, the applicant was unable to delineate between the construction sequence and operation of the proposed new landfill. Applicant stated that construction activities could be spread over as many as four (4) years, for a facility that is expected to provide airspace for as few as six (6) years' worth of garbage.

Landfill operations are defined by statute. ORS 517.750(16)(b)(F) states:

> *(b) "Surface mining" does not include:*
> *(F) Excavation or movement of materials on site at a landfill, as defined in ORS 459.005, for the primary purpose of construction, reconstruction or maintenance of access roads or for landfill operations, including but not limited to landfill cell construction and daily, interim and final cover operations, if the excavation or movement of materials is covered by a permit issued by the Department of Environmental Quality under ORS 459.205 to 459.385;*

Parsing clause (16)(b)(F), we note that it mentions two separate things, separated by an "or":

- *for the primary purpose of construction, reconstruction or maintenance of access roads,* or
- ***for landfill operations, including but not limited to landfill cell construction*** *and daily, interim and final cover operations*

This recognizes the unique character of landfill operations, as an ongoing construction process in which the economic use is synonymous and concurrent with building a complex structure – the landfill – as layers of various types of waste, geological materials (rock or soil), and synthetic materials (liners, geotextiles etc.).

The landfill industry, including VLI's current operations at Coffin Butte Landfill, takes advantage of this unique status under Oregon statute. They freely and intermittently conduct blasting operations that, if not for the above clause, would be regulated by DOGAMI as "surface mining."

Blasting as part of the current operation of Cell 6, north of Coffin Butte Road, was mentioned by witness testimony during the July 9th portion of the hearing. This activity has also been acknowledged by the applicant in previous written testimony. The applicant has asserted a right to conduct blasting intermittently in the footprint of the proposed new landfill, as part of a phased development that will overlap in time with the proposed economic use of the new landfill.

Along with the specific treatment of landfill construction as part of landfill operations in ORS 517, as Planning Commissioners you can also apply **common sense**: When a proposed use is expected to last only 50% longer than the duration of construction, and these two overlap, it is only reasonable to consider the various construction stages in assessing impacts on adjacent properties and public facilities.

Issue:

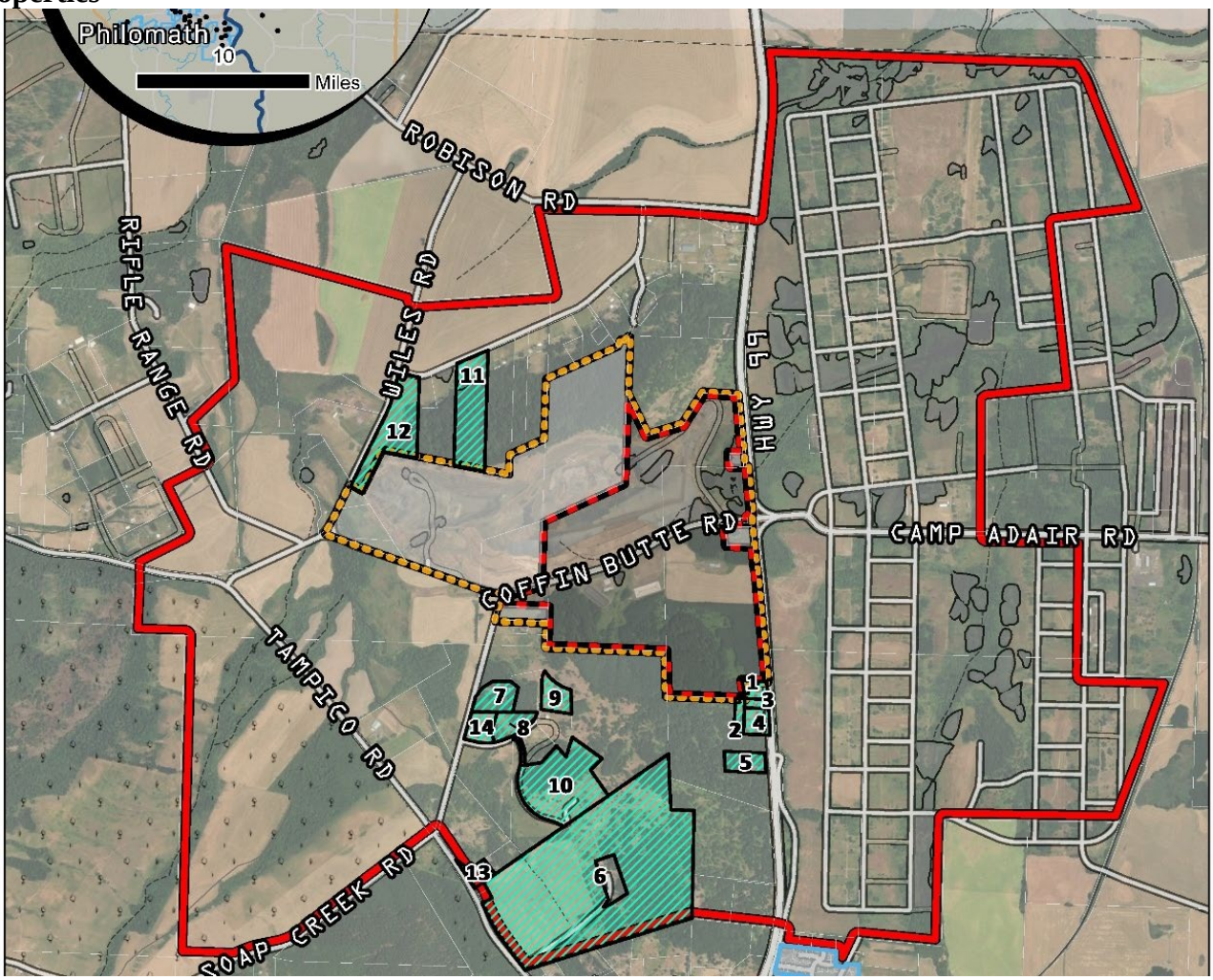
The map of responses relating to uses on adjacent property, as presented by Staff on July 8th, does not include all private property lots for which owners submitted comments in opposition to the proposed CUP. The map also omits adjacent properties owned by public institutions of the State of Oregon, which were cited by many members of the public, in reference to both their direct use of those properties for recreation, and their indirect use as beneficiaries of cultural and conservation resources on those lands.

A significantly different picture of impacts on uses of adjacent properties emerges, when those private and public properties are properly accounted for. A revised map is provided here to aid in your assessment of this issue.

New evidence:

Benton County STAFF REPORT PRESENTATION titled “Staff Slides to Planning Comm LU24027 July 8” (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, “Staff Slides to Planning Comm LU24027 July 8”);

Slide 14: KEY FINDINGS BCC 53.215 (1) – uses on adjacent property: Testimony from 14 properties



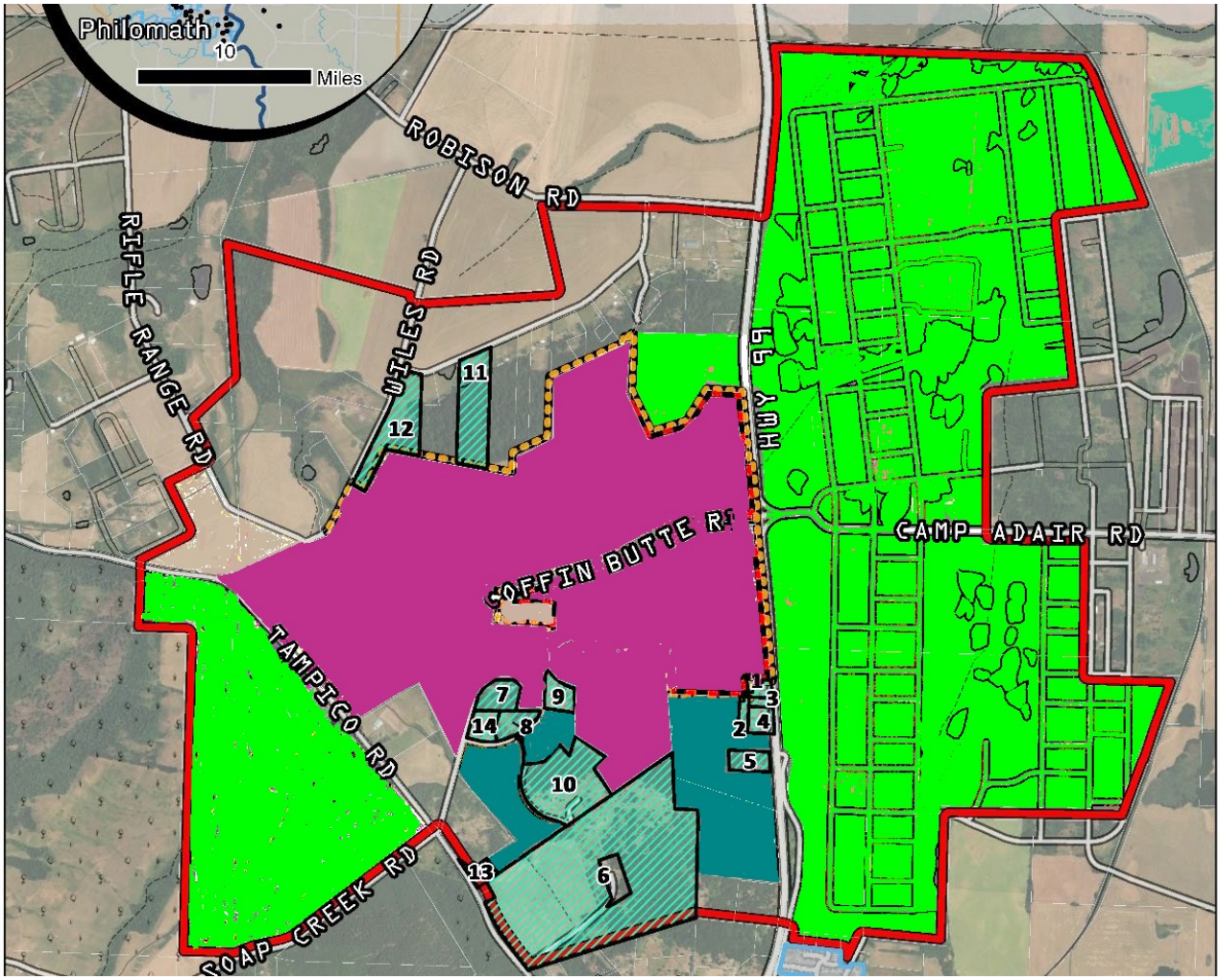
Response:

The map provided by Staff inaccurately omits testimony from the (Ted) Carlson, (Rick) Kipper, (Norm and Debra) Johnson and (Ken and Sarah) Edwardsson families which is on the record, and perhaps others.

This map also fails to represent the comments of many Benton County residents as well as non-profit organizations (including Mid-Willamette Bird Alliance and Sierra Club) who cited recreational use of E.E. Wilson Wildlife Area and Dunn Forest. The latter includes the OSU Soap Creek Beef Ranch, which in turn is home to the Letitia Carson Legacy Project on the historical Carson homestead.

These state-owned or state university-owned lands belong in common to the people of Oregon. Comments by Oregon residents who value these lands for recreational, cultural, and conservation purposes should be respected and represented.

Below is a map that more accurately represents ownership of properties for which comments have been submitted to the record in opposition to the proposed new landfill. Dark bluish green areas are private lands belonging to the Kipper, Carlson, Edwardsson and Johnson families as mentioned above. Bright green areas represent E.E. Wilson Wildlife Area (to the east and north) and OSU's Dunn Forest/Soap Creek Ranch (to the west). Magenta areas show land owned by the applicant.



This map, though more accurate than the one supplied by Benton County staff, might still be missing some properties whose owners oppose this CUP. We are aware of at least three more property owners within the red-bounded area who have been supportive of VNEQS efforts and/or submitted comments in opposition to the 2021 CUP, and many more who reside or own property just outside.

We also note that the area enclosed by red does not include many residential properties that abut the applicant's "buffer lands," particularly to the west. If the arbitrary boundary represented by the red area were extended just slightly west to include residential properties impacted by the landfill along Rifle Range Rd. and Trillium Lane, you would see even more areas colored in.

It has been noted in oral testimony that Polk County residents (just north of the dotted line in this map) did not receive timely notification from Benton County of this proposed land-use action.

We understand that Planning Staff were overwhelmed by the huge amount of testimony by the multitude of Benton County residents who oppose this landfill. Perhaps they didn't have time to correlate all of the addresses on testimony to property ownership, so that they could provide you with a more accurate map.

This provides another illustration of how the scope of the landfill operation's impacts far outstrips the capacity of the County to assess and regulate. If they can't even provide you with a proper map of properties corresponding to testimony received, we cannot expect that they will be able to enforce their proposed 84+ Conditions of Approval with respect to impacts on those properties.

AN AGREEMENT BETWEEN
BENTON COUNTY, OREGON
AND
VALLEY LANDFILLS, INC.

This is an agreement by and between BENTON COUNTY, OREGON, called COUNTY and VALLEY LANDFILLS, INC. ("Franchisee"), a wholly owned subsidiary of WASTE CONTROL SYSTEMS, INC., called REPUBLIC SERVICES, both corporations duly authorized to do business in the State of Oregon.

Whereas REPUBLIC SERVICES has the need for litter pickup within Benton County and the COUNTY is willing and able to perform such services by the Benton County Sheriff's Work Crew.

This agreement shall become effective July 1, 2023, and terminate on June 30, 2025. No work shall be performed under this contract until it has been signed by all parties

This agreement is effective for this period of time unless amended or canceled in writing and signed by both parties as described in the Termination Section of this agreement.

COUNTY, its employees, and agents are performing services under this Agreement as independent contractors and not as officers, employees, or agents of REPUBLIC SERVICES, supplying all equipment, tools, materials, and/or supplies to accomplish the work contemplated by this agreement at its own expense. COUNTY and REPUBLIC SERVICES shall perform the services described in this Agreement's Services Section.

LIABILITY

Each party, upon request, shall furnish the other with evidence of general liability insurance within the limits of tort liability required by the State of Oregon.

STATUTORY AND REGULATORY COMPLIANCE

Both parties agree to comply with all federal, state and local laws, ordinances and regulations applicable to the work under this contract, including, without limitation, the applicable provisions of ORS chapters 279A, B and C, particularly 279C.500, 279C.510, 279C.515, 279C.520 and 279C.530, as amended. In addition, both parties agrees to comply with Title VI of the CIVIL RIGHTS ACT of 1964 and comparable state and local laws. Both parties shall also comply with Section V of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (Pub. Law No. 101-336), ORS 659A.142, ORS 659A.145, ORS 659A.400 to ORS 659A.406 and all regulations and administrative rules established pursuant to those laws.

WORKERS COMPENSATION

Both parties are employers under ORS Chapter 656, employing workers as defined in ORS 656.027. Both parties shall maintain currently valid worker's compensation insurance covering all workers, as required by ORS 656.017. Both parties shall maintain this insurance throughout the period of this agreement.

NONDISCRIMINATION

Both parties shall comply with all applicable federal, state, and local laws, rules, and regulations on nondiscrimination in employment because of race, color, ancestry, national origin, religion, sex, marital status, age, medical condition, disability, sexual orientation, gender identity or source of income.

PAYMENT OF SERVICES:

The total cost per day of services listed under this contract's services section will be one thousand one hundred and twenty dollars ($1,120.00). Contracted services will be for a minimum of two days per month, totaling six thousand dollars ($6,720.00) per quarter. COUNTY shall submit billing to REPUBLIC SERVICES quarterly by the 15th of the month following each quarter for services performed. The first quarter begins on July 1, 2023, when the contract is signed, and ends on September 31, 2023. Payment will be due thirty (30) days from receipt.

ASSIGNMENT/DELEGATION

Neither party shall assign, subcontract or transfer any interest in or duty under this agreement without the prior written consent of the other, and no assignment shall be of any force or effect whatsoever unless and until the other party has so consented.

TERMINATION

If either party fails to perform any of its obligations under this contract, within the time and in the manner provided, or otherwise violates any of the terms of this agreement, the other party may terminate the agreement by giving a ten day written notice to the violating party. Terminating party must state the reason for the termination. Either party may terminate the agreement due to a loss of funding to support the terms of the agreement. If REPUBLIC SERVICES terminates pursuant to this paragraph, COUNTY shall be entitled to receive full payment for all services satisfactorily rendered and expenses incurred; provided that there shall be deducted from such amount the amount of damage, if any, sustained by REPUBLIC SERVICES due to the breach of agreement by COUNTY. If COUNTY terminates this agreement pursuant to this paragraph; REPUBLIC SERVICES shall make full payment to COUNTY for all services satisfactorily rendered and expenses incurred.

IDEMNIFICATION

Both parties mutually agreed to indemnify, and shall hold harmless, indemnify, and defend its officers, agents, and employees from any and all liability, actions, claims, losses, damages or other costs including attorney's fees and witness costs (at both trial and appeal level, whether or not a trial or appeal ever takes place) that may be asserted by any person or entity arising from, during or in connection with the performance of the work described in this contract, except liability arising out of the sole negligence of either party and its employees. Such indemnification shall also cover claims brought against either party under state or federal workers' compensation laws. If any aspect of this indemnity or the above warranty shall be found to be illegal or invalid for any reason whatsoever, such illegality or invalidity shall not affect the validity of the remainder of this indemnification or the above warranty.

SERVICES

1. REPUBLIC SERVICES agrees to provide:
    a. Payment in the contracted amount as specified above.
    b. Mutually agreed upon days, totaling a minimum of two a month for services performed.
    c. No cost to COUNTY for trash dumped at Coffin Butte Landfill when performing services, as outlined in this contract.

2. COUNTY agrees to provide:
   a. COUNTY agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew for a period of two days a month at a minimum of 8 hour work days, that is mutually agreed upon to perform litter pick-up among agreed upon locations within Benton County Limits.
   b. To submit invoice to REPUBLIC SERVICES by 15th of month following the quarter of services performed as outlined in this agreement.

TORT CLAIMS

Within the limits of the Oregon Tort Claims Act, ORS 30.260 through 30.300, both parties and their employees or officers or agents are insured against any claim or claims for damages arising by; reason of personal injuries or death occasioned directly or indirectly in connection with the performance of, or failure to perform, any service provided hereunder, the use of any property and facilities provided by either party and activities performed by either party in connection with this Agreement.

GOVERNING LAW

This contract shall be governed and construed by the laws of the State of Oregon.

SEVERABILITY

If any term or provision of this contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected.

MERGER

This writing constitute the entire and final contract between the parties. No modification of this agreement shall be effective unless and until it is made in writing and signed by both parties.

METHOD AND PLACE OF GIVING NOTICE, SUBMITTING BILLS, AND MAKING PAYMENTS

All notices, bills and payments shall be made in writing and may be given by personal delivery, by mail or email, receipt requested. Notices, bills, and payments sent by mail should be addressed as follows:

COUNTY: Benton County Sheriff's Office
180 NW 5th St.
Corvallis, OR 97330

REPUBLIC SERVICES: Republic Services
Attn: Kevin Planalp, BU Finance Mgr. Hauling
110 NE Walnut Blvd
Corvallis, OR 97330

When so addressed, shall be deemed given upon deposit in the United States Mail, postage prepaid. In all other instances, notices, bills, and payments shall be deemed given at the time of actual delivery. Changes may be made in the names and addresses of the persons to whom notices, bills, and payments are to be given by giving notice pursuant to this paragraph.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their officers thereunto duly authorized.

DATED this 8th day of June, 2023.

Republic Services

Printed Name Brett J. Davis

Title General Manager

Benton County Sheriff's Office

Jeff Van Arsdall, Sheriff

Approved as to form:

County Counsel/Date 6-7-23

Issue:

VLI has not been able to prevent plastic trash from becoming airborne and traveling off the site, to land landing in farm fields and pastures up to a mile south of the landfill, posing an ingestion threat to livestock as well as a fouling hazard for agricultural equipment. VLI's proposal is to just deploy more of the same ineffective fencing measures and occasional cleanups which have failed to eliminate the problem of airborne trash.

These methods have been ineffective for reasons which should be obvious. 4-ft high snow fencing along haul roads will not catch trash from trucks that are higher than the fence. Taller "bull fences" around the tipping area do not catch trash that is lifted above them by thermally generated dust devils or wind turbulence. Paying temporary employees or contracting for inmate crews to pick up roadside trash does not address trash that has already been carried out into fields and pastures on private land.

New evidence:

Written testimony submitted by McKenna Bradley on July 9th includes the following statement:

> I want to share with you my lived experience of living by the land fill for 17 years of my life. and present you with bags of trash collected from our property. This trash doesn't belong to us but it still ends up scattered along my fields! This trash belongs to Republic landfill. This trash has been gathered after falling down from the sky, onto my property or flying into my pastures from republic trucks.

Republic's slide deck for July 8th, slide 11 states the following**:**

> **LITTER**
> This topic was added to the supplemental staff report and was addressed by Coffin Butte Landfill after concerns were raised during public testimony.
> WHAT'S NEW
> • Clarified that portable "bull fencing" is used to catch litter before it becomes airborne. In addition, wire fencing is utilized along the main haul road.
> • Provided additional information about temporary labor force used to collect and dispose of litter.
> • Added details regarding landfill contract with the Benton County Sheriff's Department to pick up litter along Highway 99 and Camp Adair Road, from the landfill to Independence Hwy, 4x per month.
> MITIGATION EFFORTS
> • Maintain at least the same level of litter control measures as part of the expansion process.
> • Add a secondary line of bull fencing behind the existing line.
> • Install a third layer of fencing ('defender fencing'), 12 feet in height, around active and high-impact areas of the landfill.
> • Expand litter collection activities to include Tampico and Soap Creek Roads.

Republic's slide deck for July 8th, slide 12 shows figures of a new proposal by the applicant to install 8-ft high chain-link fencing around the perimeter of the proposed new landfill, where it borders lots zoned as Forest Conservation or Rural Residential.

Response:

Ms. Bradley's testimony regarding wind-blown trash originating from the landfill is affirmed by farmers and ranchers as far south as Brenneman x Tampico Road. Erin Bradley has also photographed plastic bags floating high overhead, heading southward from the landfill (Figure 1). In response to a complaint filed with DEQ, the landfill environmental manager at the time attributed this event to "dust devils" lifting plastic aloft from the working face.

Notably none of the photos supplied by VLI, showing measures that they promise to use, come from their existing operation at Coffin Butte. They claim that they will "add a secondary line of bull fencing behind the existing line." However recent photos of fencing near the current working face (Figures 2 and 3) shows that VLI hasn't even deployed a full line of "bull fencing." They have only deployed a few sections of this type of fencing, supplemented by a mish-mash of other types of fencing, some of which appears to be in poor condition, with wire mesh separating from the metal frames.

Applicant states that they utilize "wire fencing" along the haul road, but this is mainly orange plastic "snow fence" which appears to be the standard 4-ft high type used around construction sites. This fencing is ineffective due to its low height relative to trucks using the haul road. It also adds to the eyesore (visual impact).

Republic/VLI's contract with the Benton County Sheriff's Department was obtained through a public records request on May 14, 2025, and is included as Annex 1. This contract originally only called for the sheriff's department to provide inmate crews of at least 4 individuals for <u>two</u> days per month, not "4x per month":

2. COUNTY agrees to provide:
   a. COUNTY agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew for a period of two days a month at a minimum of 8 hour work days, that is mutually agreed upon to perform litter pick-up among agreed upon locations within Benton County Limits.
   b. To submit invoice to REPUBLIC SERVICES by 15th of month following the quarter of services performed as outlined in this agreement.

This was amended on January 30, 2025, two weeks after VLI submitted their revised Burden of Proof for LU-24-027, to bump up the frequency to 4 times per month. Both that contract and the addendum expired on June 30, 2025. Contrary to Applicant's statements, the contract did not specifically call for crews to pick up trash both along Highway 99 and Camp Adair Road, but only "agreed upon locations within Benton County limits." In practice, the crews rarely pick up trash along Camp Adair Road as Hwy 99W requires almost continual cleanup.

The lack of cleanup along Camp Adair Rd. has been noted by Benton County residents and confirmed in conversation by sheriff's deputies. Figure 4 (from January 16, 2025, the day after VLI submitted their revised BOP) shows a typical situation where Camp Adair Road passes through E.E. Wilson Wildlife Area. VLI's proposal also does nothing to address trash blowing out into agricultural fields in Polk County and along Independence Hwy, which has been documented in prior written testimony.

In any case, the methods listed above have not succeeded in eliminating the problem of airborne trash landing in farm fields and pastures up to a mile south of the landfill. Simply deploying more of the same ineffective measures will not eliminate the problem.

Figure 1. Thin-film plastic bag floating in air high over adjacent property at N 44.691764, W123.221039 at 13:30 on July 24, 2024, photographed by Erin Bradley. A plastic bag is visible just as a white dot (circled for clarity) above the the rightward of two tall Douglas-fir trees known to be 80 to 100 ft high, on forest land belonging to Mr. Richard Kipper. This was one of numerous plastic bags seen floating southward on that date, high above trees on Tampico Ridge. This bag when photographed was already over 2/3 mile south of the existing landfill, and was observed with binoculars as it continued for at least another 1/4 mile to the south.

Figure 2. Photo of VLI's ineffective measures for limiting wind-blown trash around the current working face in Cell 6, taken from along Soap Creek Road about 1/4 mile south of the current working face at 07:15 on July 12, 2025 by Joel Geier. At this distance fugitive plastic debris is visible mainly as white dots (circled for clarity). At full resolution, white flecks of trash are visible all the way down the slope to the area just right of the haystack in the foreground. The top of a dilapidated 8-ft-high chain-link fence is barely visible, just to the right of the haystack, and overgrown by vegetation to the left.

Figure 3: Detail of the photo in Figure 2, showing a large strip of plastic sheeting about 10 to 15 ft long at the base of the dark slope below the "bull fence," as well as other fugitive plastic debris caught in the weeds and grass. Note that the "bull fence" is discontinuous with gaps filled by some other type of fencing.

Figure 4. Photo showing roadside plastic trash along Camp Adair Road, E.E. Wilson Wildlife Area on January 16, 2025, one or two days after VLI submitted their revised Burden of Proof.

BENTON COUNTY

ADDENDUM TO CONTRACT WITH

VALLEY LANDFILLS, INC.

("Franchisee"), a wholly owned subsidiary of Waste Control Systems, Inc., called Republic Services referred to as CONTRACTOR, is made and entered into this 1st day of July 2023.

1. Addendum number 1 to original agreement number 503603 between Benton County and Valley Landfills, Inc, a wholly owned subsidiary of Waste Control Systems, Inc., called Republic Services.

2. The contract entered into on July 1, 2023, between COUNTY and CONTRACTOR shall be amended as follows:

    A. **PAYMENT OF SERVICES:** Contracted services will be for a minimum of four days per month totaling thirteen thousand four hundred and forty dollars ($13,440.00) per quarter. The amount may be prorated based on start date of added services.

    B. **SERVICES:** 1. B. Mutually agreed upon days, totaling a minimum of four a month for services performed. 2 a. County agrees to provide a number not less than 4 individuals from the Benton County Sheriff's Work Crew, when possible, for a period of four days a month at a minimum of 8-hour work days, that is mutually agreed upon to perform litter pick-up upon locations within Benton County limits.

It is understood by the parties that all conditions and agreements in the original contract, except those specifically referred to in this contract extension, shall remain in force during the entire contract extension period.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their officers thereunto duly authorized.

CONTRACTOR

Signature Date

1/3/25

Printed Name Brent J. Davis

Title General Manager

COUNTY

Signature Date

Jef Van Arsdall, Sheriff

Approved as to form:

Vance M. Croney 2-6-2025

County Counsel/Date

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (expectations and commitments)
Date:	Wednesday, July 16, 2025 12:44:02 PM
Attachments:	Geier_04_PurchaserExpectations.pdf Geier_05_RepublicEmployeeCommitments.pdf

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Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Thank you for your continuing attention to the complex issues surrounding this application.

The attached documents will be the 4th and 5th of 8 submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

These cover the following topics:

4) reasonable expectations for land owners when purchasing property in the impacted area
5) unreliability of applicant's "employee commitments" to reduce noise impacts on neighboring properties

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

A proponent of this application suggested in written testimony that adjacent landowners likely to be impacted by this development "should not be surprised at the expansion proposal." This is plainly contradicted by other evidence on the record, including a historical summary in the Benton County Talks Trash (BCTT) report as well as by written testimony submitted by a better-informed resident who has been engaged on landfill issues as a county volunteer for decades.

New evidence offered by proponent:

Mr. Brent Pawlowski (07092025_PAWLOWSKI_Brent" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #15) includes this personal recollection:

> *I toured the landfill over 35 years ago and it was communicated even back then that the long-term plan was to expand the landfill. This was no secret to the public or to any real estate buyer. Those who bought property near the landfill should not be surprised at the expansion proposal.*

Response:

"Over 35 years ago" would mean before July of 1990. Thus Mr. Pawlowski's recollection is from before VLI's 1994 CUP application to expand Coffin Butte Landfill. The Benton County Talks Trash report, which has been previously entered into the record, states on p. 33:

> *[I]n 1994, Valley Landfills filed another CUP, seeking to rezone 26 acres it owned from rural residential for use as a landfill, as part of its long-term planning efforts. ... As reported in the Gazette Times on November 3, 1994, this request encountered stiff opposition when local landowners cited concerned over smell, noise, groundwater contamination while other county residents wondered how large the county would let the landfill grow and whether increased capacity would affect the incentives to reduce consumption or recycle. About 50 people attended a Board of Commissioners' meeting in early November.*
> *The residents' perspectives in 1994 are similar to those in the 2020s. Community members argued that approval of the expansion by the County Commission after the extensive negative public testimony would show a lack of concern about what the community thinks. Specific concerns focused on the potential impact on springs and water supplies, that the change would be an exception to our state land-use goals, and how it could set precedent for even more massive change in waste disposal in the future.*
> *Newspaper archives indicate that numerous residents wrote letters to the editor, authored op-eds or said they were concerned that: 1) eventually the county would have to close Coffin Butte Road, a critical emergency route; 2) they had existing concerns about traffic, noise, smells, and roadside litter; and 3) that potential earthquake damage to landfill liners could cause contaminants to seep into the underground water supply.*
> *After delaying the vote at an earlier date, in a December 14, 1994 hearing, the Board of Commissioners unanimously denied the expansion. An article in the Albany Democrat-Herald reported that Commissioner Pam Folts said the Willamette Valley is not a good place for landfills because the high amount of rainfall can cause leachate to reach groundwater.*

From this account (which is supported in the BCTT report by contemporary newspaper accounts), it's clear that residents who lived near the landfill in 1994 did not accept the plan to expand the landfill.

They, along with any residents who purchased property in the area after 1994, would have had reasonable grounds to believe that this matter had been settled by the County's 1994 decision.

A more reasonable assumption would be that the County would stand by its decision. The concern voiced by Commissioner Folts, that a landfill in this area could put groundwater at risk from leachate, remains an issue of concern.

Dr. Jeffrey Morrell, who served on the served on the Solid Waste Advisory Committee (SWAC) and the Disposal Site Advisory Committee (DSAC) for more than 16 years, has previously testified as part of the record for LU-24-027:

> *... for the entire time I served on the SWAC and DSAC, we were continually told that the landfill had decades of capacity and had no intention to cross the road. We were also told that the land to the south was purchased as buffer, not destined to be active landfill*

Dr. Morrell has a significantly longer demonstrated record of informed engagement with landfill issues than Mr. Pawlowksi. Mr. Pawlowski only joined SWAC and DSAC in November 2022 and did not attend a regular meeting of either body until late 2023 (because regular meetings of DSAC and SWAC were suspended in favor of the BCTT process for most of a year).

Mr. Pawlowski's assertions on this topic should therefore be disregarded as poorly informed.

Issue:

VLI asserts that they have received a "commitment from Republic employees," as part of their proposed method to reduce noise impacts on adjacent properties.

VLI has not provided any evidence of such a commitment, nor can this be considered credible in view of their parent company's record of recent and ongoing labor disputes.

New evidence:

Republic's slide deck for July 8th, slide 7 (Republic slide deck): "This Application Reflects: ... A commitment from Republic employees ... to operate responsibly and respectfully."

Response:

VLI/Republic Services offers this "commitment" as assurance regarding noise, as part of their assurance that they can reduce noise levels and their impact on use of adjacent properties.

Neither VLI nor Republic Services have not provided any documentation of such a commitment from their employees, as part of the evidentiary record. If any of their employees have voluntarily submitted statements affirming such a commitment to the record, we are unaware of it.

We note that VLI is the applicant, but they only have a small number of employees, only a few of whom are operating equipment that is likely to produce noise on the site. Republic Services, which owns VLI, is not formally the applicant. Their operations include many trucks who haul garbage and other waste to Coffin Butte, from near and far, but the operators of those trucks are not employed by the formal applicant for this CUP.

VLI has a long-running and unresolved labor dispute with Operating Engineers Local 701, the members of which are responsible for maintenance of heavy equipment on the landfill (including upkeep the machinery identified as the most noisy, by VLI's noise consultants). The following headlines with links give a quick overview of the issue:

Oct 13, 2023: **Union leaders, House Speaker show support for Coffin Butte mechanics at rally**
https://gazettetimes.com/news/local/business/employment/article_abb4c5f2-6951-11ee-b1de-e7cb9266d4ca.html

Dec 15, 2023: **Still no deal after Local 701 ends strike at Corvallis landfill**
https://nwlaborpress.org/2023/12/still-no-deal-after-local-701-ends-strike-at-corvallis-landfill/

Apr 16, 2024: **Coffin Butte Landfill given citations after worker complaints**
https://www.statesmanjournal.com/story/news/local/oregon/2024/04/16/coffin-butte-landfill-worker-complaints/73205605007/

You've received testimony from a local whistleblower, Mr. Robert Orton, based on his experiences related to that dispute. In contrast, not a single VLI or Republic employee, other than company executives, managerial staff, and paid consultants, showed up to testify in support of this application. Even in the written record, support from employees is conspicuously lacking.

Regarding the parent company, Republic Services, which employs many of the truck drivers who haul garbage to Coffin Butte, we note that the International Brotherhood of Teamsters have just launched a nationwide strike:
https://teamster.org/2025/07/teamsters-to-republic-services-end-subpar-compensation-to-resolve-strike/

The Teamsters website quotes their General President Sean M. O'Brien as saying:

> *"Republic Services has been threatening a war with American workers for years — and now, they've got one. Republic abuses and underpays workers across the country. They burn massive profits and funnel money to undeserving, corrupt executives."*

Teamsters General Secretary-Treasurer Fred Zuckerman adds:

> *"This company is one of the most depraved employers we've ever come across. Republic has lied, stalled, and broken the law to try to squeeze every last dime out of workers."*

(source: https://teamster.org/2025/07/teamsters-go-to-war-against-republic-services/)

These are obviously strong and provocative statements, emerging from a nationwide labor dispute. But they align with local whistleblower testimony, as you have heard.

In the context of this land-use decision, the relevant question is this:

> ***Is Republic Services' assurance of a "commitment" from their employees, to help them meet Conditions of Approval regarding noise, at all credible?***

Republic's current nationwide labor problems indicate that this claimed "commitment" is not at all credible. This is a company that clearly doesn't have its own house in order, with regard to their employees.

Given the lack of evidence in support, and significant evidence to the contrary, you shouldn't believe the company's statements regarding any employee "commitments" which they've completely failed to demonstrate. This also reflects poorly on their other commitments to our community.

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (heron buffers)
Date:	Wednesday, July 16, 2025 1:51:57 PM
Attachments:	Geier_6_HeronBuffer.pdf

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Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 6th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

6) Buffers for protecting sensitive Great Blue Heron nesting areas

Although the applicant has lately acknowledged a new active nesting area less than 1/4 mile from areas where they propose substantial excavation and various infrastructure development on Forest Conservation Land, they have failed to revise their plans accordingly. This follows a long-standing pattern by the applicant (as documented in previous testimony) of failing to avoid disturbance to these nesting birds, as required by both state and county.

Thank you once again for your careful consideration of the issues.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

The applicant's submittals, together with Conditions of Approval recommended by staff as presented on July 8th, do not take any account of protections required for Great Blue Heron in their currently active nesting area in an ash grove adjacent to Forest Conservation lands on which applicant proposes substantial excavation including blasting. Development sequence plans as presented on July 8th are not compatible with the required protections for this species, which is recognized as sensitive by both state and county statute.

New evidence:

Staff slides to Planning Commission LU24027 July 8, slide 30 refers to construction in reference to known Great Blue Heron Nesting areas:

> *COAs P2-3(A-C) and OP16(A-C) require annual monitoring active rookeries, identification of 300-foot buffer, and prohibit construction during critical nesting period.*

The slide includes a map of the expected 300-foot buffer area, reproduced here as Figure 1. Based on Staff's presentation July 8th, this map is being endorsed by Staff for adoption as part of this Condition of Approval.

Figure 1: Proposed 300-ft buffer for protection of east rookery (poplar grove).

Staff slide 41 further states:

> ***P2-3 Active Rookery Protection.***
>
> *(B) Applicant shall identify a buffer of 300 feet around the primary nest zone of active rookeries and limit activities to maintain alternate nest trees, allow for growth of the colony, protect against windthrow, and prevent harassment.*
>
> *(C) Applicant shall not engage in major construction within a quarter mile of an active rookery during the critical nesting period from February 15 through July 31.*

Response:

Figure 1 shows only a 300 ft buffer extending west and south of the heron nesting area in the poplars (Heron Rookery #2716, also referred to in application documents as the "east rookery), but truncated to the east and north.

The corresponding quarter-mile zone, within which the applicant "shall not engage in major construction" during the critical nesting season identified as February 15 through July 31, is not shown on this map. If shown, it would clearly impinge on the footprint of the proposed new landfill (just west of the N-S running road in the map).

Applicant's map, as adopted by county staff, also ignores the new heron nesting area which has been documented just across Hwy 99W, at the east edge of this map.

This nesting area (referred to as the "ash grove nesting area" or rookery) has been thoroughly documented in written testimony submitted by Joel Geier and affirmed by Oregon Department of Fish and Wildlife (e-mail from Gregory Reed submitted to public comments for this application).

Lately the applicant has also acknowledged this nesting area, but they have not incorporated any buffers for its protection into their development plan or the description of their construction sequence.

Figure 2 shows a sketch of the area extending a quarter mile from the currently active heron "ash grove" nest area, compared to approximate locations of leachate ponds and a new sump (shaded in orange) and associated excavations, as well as proposed new truck scales and new entrance.

Note that the excavation area for both of the proposed new leachate ponds lies within a quarter mile of the new "ash grove" nesting area.

Applicant's presentation regarding construction sequence (see my separate submission on Construction Impacts) stated that pond construction would happen early in the site development process. Applicant's verbal testimony indicated that this would take place during a 6- to 8-month interval, apparently in the dry part of the year.

In order to avoid blasting and other "major construction activity" (note this is poorly defined in the Conditions of Approval), this activity would need to be restricted to the period from August 1 through December 31, which would be reduced to a 2-month period (August-September) if the rainy season is to be avoided. Applicant has not given any indication of how they plan to handle this constraint.

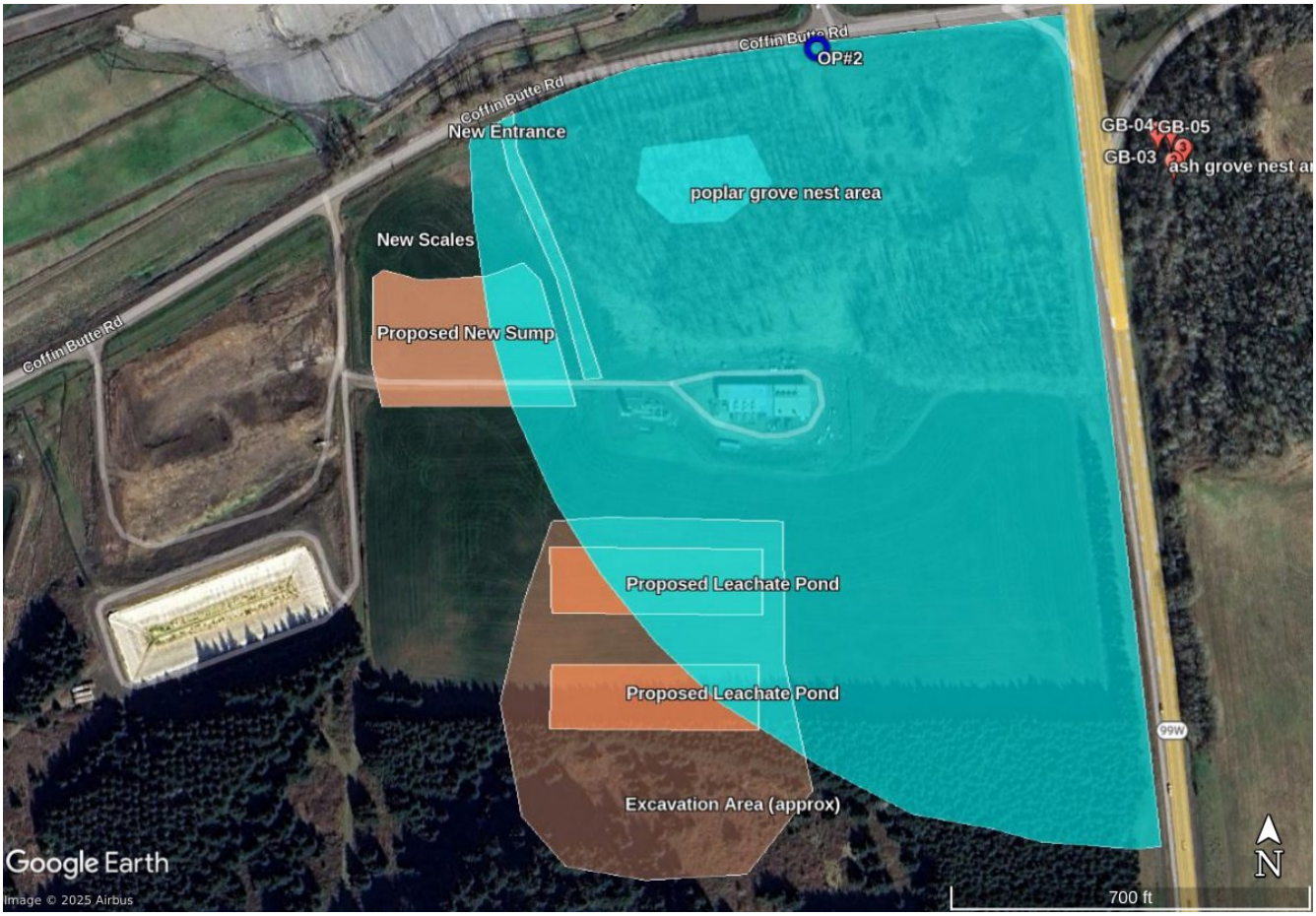

Figure 2: Quarter-mile buffer from currently active heron "ash grove" nest area (still active as of July 15, 2025), shaded in blue, compared to approximate locations of leachate ponds and a new sump (shaded in orange) and associated excavations, as well as proposed new truck scales and new entrance.

Note also that the proposed new entrance is also within the 300-ft buffer proposed by the applicant, as well as a new utility corridor which might require tree removal for maintenance, contrary to the proposed Condition of Approval.

From all of the above, it is clear that the applicant has not given serious consideration or presented any clear plan for how their development plans will prevent disturbance to this sensitive and state-protected species in their new nesting locations. This is one more reason to deny this application.

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (PFAS to WWTP)
Date:	Wednesday, July 16, 2025 3:41:38 PM
Attachments:	Geier_7_PFAStoWWTP.pdf Geier_7_PFAStoWWTP Annex 1 PFAS Phase II Report_FINAL_6.26.25.pdf

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Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 7th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

6) PFAS a.k.a. "forever chemicals" in leachate shipments to wastewater treatment plants (WWTPs)

There appears to be a math error close to a factor of 100, in the information that was provided to you by the applicant. As an annex, I've included the full Riverkeeper report which I also mentioned in my testimony on July 9th.

I do hope that the following will make the numbers and proportions easier to comprehend in real-life terms:

Imagine that, every other day, you go out to your front porch to find that the applicant has delivered 3 gallon jugs (like milk jugs) to your front porch, filled with a murky-looking liquid, with a note asking you to kindly pour the contents down your kitchen sink or your toilet, whichever you prefer.

That, in effect, is what the applicant has been asking the City of Corvallis to do for years. The applicant has hinted that they might find some other town willing to do that for them, but they haven't said who.

Thank you once again for your careful consideration of the issues. Again, I urge you to deny this application.

Yours sincerely,
Joel Geier
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

VLI has presented inaccurate information on leachate as a fraction of wastewater treated in Corvallis. The stated percentage is too low, by roughly a factor of one hundred. This gives a false impression of the significance of leachate being effectively passed through to the Willamette River, particularly in regard to the high concentrations of PFAS and heavy metals.

Statements by VLI that concentrations of these pollutants are "similar to other landfills" are cause for concern rather than cause for comfort.

In simple terms explained below, leachate shipments to Corvallis amount to roughly one and a half gallon jugs of highly contaminated water, per household per day. That shouldn't be downplayed.

New evidence:

Republic's slide deck for July 8th, slide 16 includes the following bulleted statements:

> *• PFAS concentrations measured in Coffin Butte Landfill leachate samples are similar to PFAS concentrations measured in a USEPA study of landfill leachate and in leachate samples collected from California MSW landfills.*
>
> *• Currently there is no formal requirement to monitor PFAS in leachate or groundwater.*
>
> *• The amount of leachate treated at the City of Corvallis' WWTP* ***represents 0.0058% of water treated by the WWTP****.*
>
> *• Metals concentrations in Coffin Butte leachate are similar to those at other MSW landfills, according to data published by USEPA.*

Response:

There is a major (nearly a factor of 100) error in the applicant's assertion that landfill leachate represents just 0.0058% of the wastewater treated by the City of Corvallis's wastewater treatment plant (WWTP).

> *• The amount of leachate treated at the City of Corvallis' WWTP* ***represents 0.0058% of water treated by the WWTP****.*

The City of Corvallis website (Figure 1) states that the WWTP processes "over 4 billion gallons of wastewater a year."

Table 4-11 of the 2024 Annual Environmental Monitoring Report (AEMR) for Coffin Butte, as submitted to DEQ, states that for the 12-month period from October 2023 through September 2024, VLI shipped 20,301,148 gallons of leachate to the Corvallis WWTP.

Using round numbers:

(20 million gallons leachate) / (4 billion gallons wastewater) = 0.50%

PUBLIC WORKS

Wastewater Treatment

The City of Corvallis operates one wastewater treatment plant, maintains over 200 miles of wastewater collection pipes, and treats over 4 billion gallons of wastewater a year. The sanitary sewer system is a gravity system, which uses eight pump stations to move the wastewater from lower elevation portions of the system to the treatment plant located at NE 2nd Street. The treated wastewater goes through a rigorous series of tests to assure water quality is not compromised as it is discharged back to the Willamette River. Biosolids (or sludge), a byproduct of the treatment process, are stored and recycled each summer as a soil amendment to agricultural fields. For a tour of the wastewater treatment plant, call 541-766-6934.

Figure 1: Screen shot of the City of Corvallis wastewater treatment plant web page as of July 12, 2025, documenting the amount of wastewater treated annually as "over 4 billion gallons per year."

If they shipped 23 million gallons to Corvallis last year (possibly not yet reported to DEQ) , that would be:

(23 million gallons leachate) / (4 billion gallons wastewater) = 0.58%

We suspect that the error in the applicant's slide is the result of a simple mathematical error by their consultants, or perhaps a misunderstanding of the difference between decimal fractions and percentages, rather than willful deception.

Either way, it doesn't give great confidence in the level of care that goes into their methods of handling, interpreting, and presenting data that are highly relevant for assessing risks to human health and the environment.

To put this into simple terms, a typical US household uses about 300 gallons of water per day. 0.50% of that would be 1.5 gallons of leachate per household, per day.

Imagine if, every other day, this company delivered three gallon jugs of leachate to your doorstep and asked you to kindly pour it down your toilet. That's effectively what they've been asking the City of Corvallis to do, on their behalf.

We agree with the applicant that PFAS concentrations in leachate from Coffin Butte Landfill are similar to other MSW landfills. We obtained leachate PFAS data by public records requests from the City of Corvallis and Clean Water Services (original data available in spreadsheet form on request), to compare Coffin Butte with two other landfills in western Oregon (Hillsboro and Riverbend).

For three of the six categories of regulated PFAS, Coffin Butte leachate appears to be worse than both Riverbend and Hillsboro, but lies near the middle of the range for the other three categories. All of them are far above the EPA's regulatory standards for drinking water, by factors of up to several orders of magnitude.

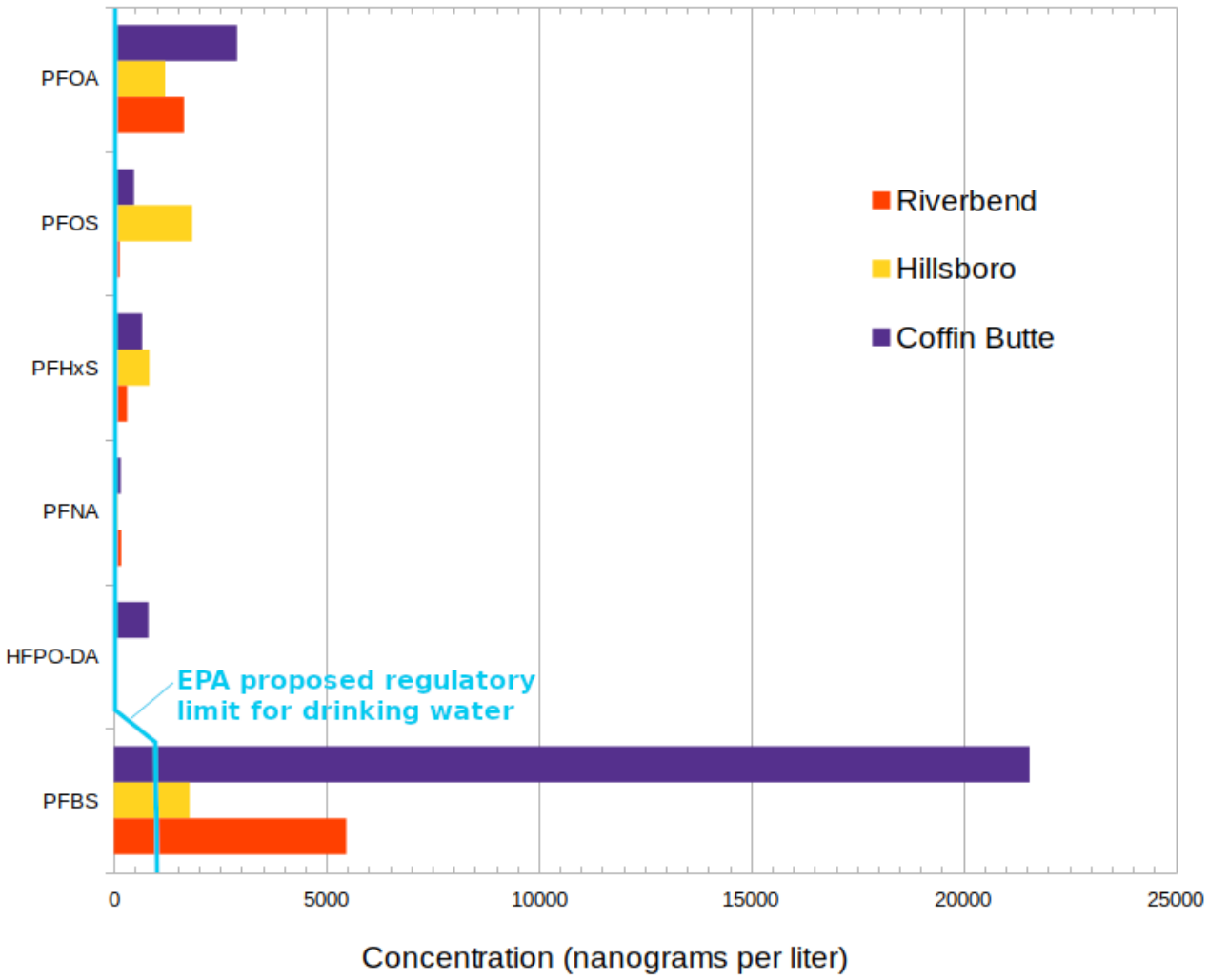

Figure 2: PFAS in leachate from three landfills in western Oregon (averages calculated over multiple samples for each of the three landfills, for the six types of PFAS now regulated by the USEPA (the "proposed" regulatory limits shown in the figure were adopted last year).

The implications of these high concentrations in leachate are just beginning to be understood. In my verbal testimony on July 9th, I included a handout from the recently released Riverkeeper report on PFAS inputs to rivers (included here as Annex 1). Data from the Tualatin River upstream and downstream of the Hillsboro WWTP show that this is a major point source of PFAS inputs to that river. At least two other WWTPs that accept landfill leachate, in other states, were found to be among the 10 worst WWTPs for PFAS pollution in the country.

No WWTPs on the Willamette River were included in that study, but it should be anticipated that the high PFAS load from Coffin Butte Landfill could affect the Willamette River below both the Corvallis WWTP and the Willow Creek WWTP in Keizer/Salem.

Similarly we agree that heavy metals concentrations in leachate from Coffin Butte are similar to other MSW landfills. That is not a favorable comparison. We also note that Coffin Butte has not presented data for mercury in leachate, at least since 2021.

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PFAS Report Phase II

UNCOVERING PFAS CONTAMINATION IN FRONTLINE COMMUNITIES

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ABOUT WATERKEEPER ALLIANCE

Waterkeeper Alliance is a global movement uniting more than 300 community-based Waterkeeper groups around the world, focusing citizen action on issues that affect our waterways, from pollution to climate change. The Waterkeeper movement patrols and protects nearly six million square miles of rivers, lakes, and coastlines in the Americas, Europe, Australia, Asia, and Africa.

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EXECUTIVE SUMMARY

This report presents novel, targeted data from a monitoring project focused on locations near wastewater treatment plants (WWTPs) and permitted biosolids land application sites—suspected contributing sources of per- and polyfluoroalkyl substances (PFAS) to waterway contamination. The findings confirm that PFAS contamination is both widespread and persistent, reinforcing the urgent need for stronger regulations, expanded research, increased funding, and improved treatment technologies. This work adds timely, critical insight to the growing understanding of PFAS pollution, especially in frontline communities already facing disproportionate environmental and health burdens.

PFAS are a class of manufactured organic chemicals pervasive in the environment and linked to harmful public health and ecosystem impacts. Often referred to as "forever chemicals" because they do not break down or do so very slowly,[1] PFAS have been widely used in various industrial and consumer products since at least the 1950s. As a class of chemicals, there are approximately 15,000 different derivatives[2] that share similar molecular structures, environmental characteristics, and biological hazards. These toxic compounds are biopersistent, bioaccumulative, and pose serious health risks, including cancer, reproductive and developmental effects, immune system dysfunction, and hormonal disruption.[3]

Largely unregulated by EPA and many state agencies, PFAS are widely released from sources such as industrial wastewater, landfill leachate, and effluent, sewage sludge, and biosolids from wastewater treatment processes. As a result, PFAS have contaminated the environment, including both groundwater and surface water used for drinking.[4] When sewage sludge is treated to meet EPA regulatory standards and is intended to be land applied as a soil conditioner or fertilizer on agricultural, forested, and other lands, the agency typically refers to it as biosolids (Class A or B). Untreated or partially treated sewage sludge may be incinerated or disposed of in landfills—in dedicated monofills or co-disposed with municipal solid waste sites.[5] Biosolids often contain PFAS but the federal regulatory standards and treatment process are not sufficient to control these pollutants.

The pervasiveness of this contamination intensifies the potential harm to the environment and human health when facilities do not adequately contain, treat, and dispose of PFAS-contaminated wastewater and sewage sludge. These facilities[6] can receive PFAS in wastewater from residential, commercial, and industrial sources that produce, manufacture, or use products that contain PFAS.[7] As centralized collectors, WWTPs face significant challenges due to underfunding and the limitations of traditional treatment technologies. These technologies are not designed to remove or destroy compounds characterized by strong carbon-fluorine bonds and resistance to degradation. As a result, these substances are discharged into receiving surface waters through effluent or transferred through contaminated sewage sludge and biosolids. While PFAS are found in waterways across the country, their impacts are not equally distributed. Communities of color, low-income, and rural areas, which are often closer to sources of industrial pollution and have limited resources for water testing and treatment, face higher exposure risks and greater health vulnerabilities.

Despite decades of releasing PFAS into the environment, "few industrial facilities have PFAS monitoring requirements, effluent limitations,[8] or pretreatment standards[9] for wastewater discharges" because EPA has not adopted national requirements.[10]

Because industrial wastewater is not adequately regulated for PFAS, these chemicals often end up in sewage sludge, which is then processed into biosolids used on land. In 2022, EPA estimated that 56% of biosolids were land-applied for agriculture, reclamation, or other uses.[11] By 2023, that figure had risen to 60%, with 31% applied to U.S. agricultural land—an 11% increase from the previous year.[12] As a result, PFAS that are often present in biosolids have contaminated, and continue to contaminate, lands, livestock, waterways, and agricultural products across the country.[13]

The extent of PFAS contamination in U.S. surface waters was exposed in Waterkeeper Alliance's 2022 Phase I monitoring project, in which 113 Waterkeeper groups collected a total of 228 PFAS samples in waterways from 34 states and the District of Columbia (D.C.).[14] The results were striking: PFAS were present in 83% of the waterways tested, with at least one compound found in 95 out of 114 sites sampled. Of the 55 compounds analyzed, 35 were detected in 63.6% of the sites. Overall, measurable concentrations were found in waterways across 29 states and D.C., often at levels far exceeding EPA drinking water health advisory limits.[15]

Waterkeeper Alliance developed this Phase II water quality monitoring project to test surface waters for the presence of PFAS upstream and downstream from 22 WWTP sites and 10 biosolids land application fields in partnership with Hispanic Access Foundation and Waterkeeper groups in 19 states.[16] This project utilized cutting-edge SiREM PFASsive™ sampling techniques and state-of-the-art analytical methods at Eurofins Environment Testing Calscience laboratory in Sacramento, Calif. (EPA Method 1633[17]). The monitoring evaluated and quantified PFAS contamination from municipal wastewater and biosolids land application fields over time, with a focus on disproportionately impacted communities. To our knowledge, this is the first monitoring project that employed passive sampling devices at WWTP-associated sites in multiple states, producing more representative data on PFAS equilibrium concentrations.[18] By quantifying only dissolved PFAS contaminants, it provides a more accurate basis for bioavailability, toxicity, and risk assessment than conventional grab samples, which reflect total concentrations at a single timepoint. The resulting data enhances our understanding of PFAS migration pathways, bioavailability, and impacts in U.S. surface waters. It further demonstrates that treatment processes and land application methods play a critical role in the release of these contaminants into surface waters, highlighting both limitations in current practices and areas where contamination is occurring.[19]

This evaluation also helped identify sites across the country where stronger measures are needed to control source pollution from industrial dischargers as well as subsequent passthrough discharges from WWTPs and biosolids land application fields.

Our evaluation of the PFAS sampling results also makes clear that existing laws, regulations, and conventional wastewater treatment technologies are not adequately controlling, preventing, or remediating PFAS pollution in surface waters, exposing people and ecosystems to serious health risks.

PFAS are synthetic chemicals that have contaminated nearly every part of the environment and many aspects of daily life. These compounds were deliberately engineered to resist heat, water, and oil, making them extremely difficult to break down under natural conditions. As a result, they persist in the environment, bioaccumulate in humans and wildlife, and cycle through air, water, soil, and living organisms, threatening public health and ecosystems. Their widespread use and remarkable persistence have led to global contamination and an urgent need for regulatory action and cleanup.

CURRENT POLICY LANDSCAPE

The core federal law designed to control discharges of PFAS to surface waters is the Clean Water Act (CWA).[20] However, EPA has not adopted adequate regulations under the CWA to implement the law effectively and prevent this pollution.[21] For example, the agency has yet to adopt national PFAS water quality criteria to protect human health in surface waters[22] or establish Effluent Limitation Guidelines (ELGs), including pretreatment standards for industrial dischargers to wastewater treatment systems.[23] These regulations are central to placing limits on PFAS discharges through National Pollutant Discharge Elimination System (NPDES)[24] and industrial pretreatment permits.[25]

In October 2021, EPA released its PFAS Strategic Roadmap, outlining a whole-of-agency approach to addressing the toxic contaminants.[26] While progress on the development of federal PFAS actions and standards stalls, states across the country are grappling with this "contamination crisis,"[27] but state policies to address PFAS contamination are also limited and vary widely. Currently, at least 23 states have taken steps to address the problem through regulations, funding, and public health initiatives, though these measures are not yet comprehensive and vary widely in scope."[28]

In April 2024, EPA established legally enforceable Maximum Contaminant Levels (MCLs)—primary standards that apply to public water systems—for six PFAS compounds in drinking water under the Safe Drinking Water Act (SDWA).[29] In May 2024, the agency designated PFOA and PFOS as hazardous substances under CERCLA[30] (the Superfund law), enabling it to take cleanup actions and hold polluters accountable for costs.[31] The following December, EPA proposed draft human health water quality criteria (HHWQC) to limit PFOA, PFOS, and PFBS in surface waters.[32] While not yet finalized, these criteria represent concentrations which, if not exceeded, will protect the general population from adverse health effects due to ingesting water, fish, and shellfish. There is currently no proposed human health water quality criteria for other PFAS compounds.

In May 2025, EPA announced its intent to extend compliance deadlines for the PFOA and PFOS MCLs, establish a federal exemption framework, and rescind regulatory determinations for PFHxS, PFNA, HFPO-DA (GenX), as well as the Hazard Index mixture that includes PFBS.[33] These proposed changes do not have immediate legal effect and would require formal rulemaking, which could take years and likely face legal challenges.

Additionally, the agency has yet to establish numeric limits or monitoring requirements for PFAS in biosolids under Section 405(d) of the CWA,[34] despite being alerted to biosolids contamination by a major PFAS manufacturer as early as 2003.[35] Instead of taking regulatory action to address PFAS, EPA encouraged the use of biosolids as fertilizer, resulting in the widespread dispersal of the contaminants over millions of acres. The fertilizer industry estimates that farmers currently hold permits authorizing biosolid applications on approximately 70 million acres—about one-fifth of all U.S. agricultural land.[36]

Federal, state, and tribal governments must urgently monitor waterways, adopt enforceable standards to eliminate PFAS pollution sources, mitigate existing contamination, and, where authorized to regulate discharges, ensure compliance through permitting and enforcement. They must also prioritize funding for PFAS monitoring and the installation of advanced treatment technologies to protect impacted communities—especially those disproportionately affected by PFAS and other toxic pollutants. The scale of this contamination and its risks to public and environmental health demand strong and immediate regulatory action.

KEY FINDINGS

1. **The U.S. surface waters tested are widely contaminated by many different types of regulated and unregulated PFAS.**
   a. 98% of all surface water sampling sites tested upstream and downstream from WWTPs and biosolids land application fields in 19 states had one or more PFAS type detected, except for a single site downstream from a biosolids land application field in Wisconsin.
   b. More than half of the 40 PFAS chemicals that can be identified by EPA Method 1633 were detected in surface water samples upstream or downstream from WWTPs and biosolids land application fields.

2. **Wastewater treatment plants and biosolids land application field discharges can be significant contributors of multiple types of PFAS to U.S. surface waters.**
   a. The overwhelming majority of WWTPs evaluated lack enforceable PFAS limits in their CWA NPDES and other permits–both for discharges to surface waters and for biosolids applied to land application fields–underscoring the urgent need for regulatory standards to control these releases.
   b. 95% of downstream WWTPs sampling sites and 80% of downstream biosolids land application sites had elevated concentrations of multiple types of PFAS.
   c. Out of 40 types of PFAS that can be detected by EPA Method 1633, in comparison to PFAS levels detected at upstream sampling sites,[37] the sampling detected 19 types of PFAS at elevated levels downstream from WWTPs and 14 types of PFAS at elevated levels downstream from biosolids land application sites.

Elevated PFAS Levels	Detections Downstream from:	
	Wastewater Treatment Plants[38]	Biosolids Land Application Sites
PFHxA	19	6
PFOA	18	4
PFBS	17	7
PFPeA	17	6
PFHpA	14	6
PFHxS	14	3
PFOS	14	4
PFBA	12	7
PFNA	10	4

   d. Multiple types of PFAS were also frequently detected at high concentrations downstream from WWTPs located in areas with multiple indicators of environmental and health burdens on disproportionately impacted communities. For example:
      i. PFOA and PFOS were detected at the following concentrations in U.S. surface waters:

State	Waterbody	Concentration (ppt)	
		PFOA	PFOS
California	Santa Ana River	13	12
Florida	East Canal	7.1	11
Michigan	Rouge River	44	–
North Carolina	Haw River	10	23
	Cape Fear River	8.3	13
South Carolina	Pocotaligo River	28	30
Texas	Hunting Bayou	4	12

      ii. PFPeA was responsible for the greatest increases in PFAS concentrations downstream from nine WWTPs and five biosolids land application fields.
      iii. PFHxA was also responsible for the greatest increases in PFAS concentrations downstream from five WWTPs.

3. **Widespread detection of multiple PFAS types at upstream and downstream sampling sites confirms the need to regulate PFAS as a class to effectively limit exposure and address cumulative risks in U.S. surface waters.**
   a. Certain types of PFAS were frequently detected at multiple upstream and downstream sampling sites.
      i. The most commonly detected PFAS at sites associated with WWTPs were PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, and PFOS, which were all detected in 40 or more samples.
      ii. Some types of PFAS were often found to co-occur at individual sampling sites near WWTPs leading to higher overall exposures to total PFAS at those locations. For example, PFOS, PFHxA, PFOA, PFHxS, PFBS, PFHpA, PFPeA, PFBA, and PFNA were found to co-occur in 32 samples near WWTPs (and additional types of PFAS were often found at these locations as well).
      iii. Similarly, the most commonly detected PFAS at sites associated with biosolids land application fields were PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS, each of which were detected in 19 or more samples.
      iv. Some types of PFAS were often found to co-occur at individual sampling sites near biosolids land application sites leading to higher overall exposures to total PFAS at those locations. For example, PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxA were found to co-occur in 16 samples near biosolids land application fields (additional types of PFAS were often found at these locations as well).
   b. The total downstream PFAS concentrations exceeded Environmental Working Group's (EWG) health-based criteria for protecting against human health harm caused by total concentrations of PFAS (1 ppt) at all 22 WWTP sites and at 9 of 10 biosolids land application sites.[39]
   c. The total PFAS concentration downstream from 17 WWTP sites and six biosolids land application sites increased, sometimes significantly, above total upstream PFAS concentrations. For example:
      i. In Oregon's Tualatin River, the total PFAS concentration increased from 0.97 ppt upstream to 30.02 ppt immediately downstream from the Rock Creek Water Resource Recovery Facility (WRRF)—a 2,994.85% increase.
      ii. In Washington's Dragoon Creek, the total PFAS concentration increased from 0.63 ppt upstream to 32.89 ppt immediately downstream from Spokane Riverside Park WRF's biosolids land application fields—a 5,120.63% increase.

4. **Current regulations fail to control PFAS pollution of U.S. surface waters, leaving communities at risk for toxic chemical exposure.**
   There are currently no federal surface water quality criteria or wastewater discharge limits for PFAS, and very few industrial dischargers are required to monitor or limit PFAS discharges into wastewater treatment systems—even though many industries contributing wastewater are likely handling, manufacturing, or using PFAS. At the time of sampling, PFAS concentrations downstream from WWTPs and biosolids land application fields often exceeded the current federal standards, including Safe Drinking Water Act (SDWA) MCLs, the draft HHWQC, and the EWG health-based standards referenced in this report.
      i. The elevated downstream samples were equal to or exceeded the PFOA MCLs at 12 downstream WWTP sites and two downstream biosolids land application sites.
      ii. The elevated downstream samples exceeded the PFOS MCL at nine downstream WWTP sites and two downstream biosolids land application sites.
      iii. An elevated downstream sample exceeded the PFHxS MCL at one downstream WWTP site. EPA has not developed MCLs for most PFAS.
      iv. The elevated downstream samples exceeded the draft HHWQC (Water + Organism) for PFOA at 18 downstream WWTP sites and four downstream biosolids land application sites and the draft HHWQC (Water + Organism) for PFOS at 14 downstream WWTP sites and four downstream biosolids land application sites. EPA has not developed HHWQC for most PFAS.
      v. Numerous EWG health-based criteria were exceeded in elevated samples from 29 locations downstream from WWTP sites and biosolids land application sites. PFOA, PFOS, PFHxS, and PFNA exceeded the criteria at the largest number of sites.

5. **SiREM PFASsive™ samplers provide an accurate method for conducting fresh surface water sampling for PFAS in locations that are impacted by discharges from wastewater treatment plants and biosolids land application fields.**
   These passive samples provide time-integrated data, giving a clearer picture of long-term contamination and PFAS bioavailability, toxicity, and risk–without the high cost and variability of daily or weekly grab samples. Waterkeeper groups successfully utilized the samplers across 19 states–producing results that are consistent and scientifically valid using EPA Method 1633.

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II

METHODOLOGY

In April 2024, Waterkeeper Alliance, in collaboration with the Hispanic Access Foundation, initiated an extensive evaluation of selected watersheds previously sampled in the 2022 Phase I report. The goal was to identify WWTPs and biosolids land application sites that discharge near communities disproportionately impacted by environmental burdens, for more in-depth study. To determine these sites, the team utilized EPA's EJScreen—a publicly available tool that integrates demographic and environmental indicators to assess environmental justice concerns across communities nationwide.[40]

Watershed Selection

We initially identified 25 watersheds as high priority for participation in the PFAS Phase II monitoring project based on evaluations of the following criteria:

- Waterkeeper group participation in the Phase I project Reporting of a Phase I PFAS result greater than 10 ppt and reporting multiple PFAS detections greater than 3 ppt
- The presence of wastewater treatment facilities in proximity to the Phase I sampling site(s)
- The existence of a Phase I sampling site upstream or downstream from the WWTP
- The existence of approved industrial pretreatment and biosolids programs at the WWTP
- Multiple EPA EJScreen Indicators greater than the 80th percentile within 1 mile of the WWTP[41]
- The compliance history of the WWTP
- The inclusion of the WWTP in EPA's PFAS Influent Study[42]

Facility Selection

We then worked with Waterkeeper groups and Hispanic Access Foundation to finalize our selection of WWTPs and biosolids land application fields for sampling. Ultimately, we sampled 22 WWTP sites (25 WWTPs total) and 10 biosolids land application sites in 19 states. These sites were located in, or discharged upstream from, areas within the Waterkeeper group's watershed that, with limited exceptions, had multiple industrial users and where EPA EJScreen indicators were at or above the 80th percentile. The WWTP also had to discharge into a waterbody that could be sampled both upstream and downstream from publicly accessible locations or locations where access permission could be obtained. The selected biosolids land application fields were those that were associated with one of the selected WWTPs and either bordered a surface water or had ditches, streams, or other surface flow pathways to a nearby surface water that had accessible, representative upstream and downstream sampling locations.

Sampling Site Selection

Given the ubiquity of PFAS and the importance of isolating these compounds associated with the WWTP or biosolids land application field in the sample results for this project, particular attention was given to defining and locating upstream and downstream sample sites.

For the purposes of this project:

"Biosolids" are treated sewage sludge, the solid byproduct of the wastewater treatment process. They must meet EPA standards for land application or other beneficial uses, as outlined in 40 CFR Part 503. EPA classifies biosolids into two categories: Class A and Class B. Class A biosolids undergo treatment to eliminate pathogens and vector attraction, making them eligible for unrestricted land use under EPA standards, including for agriculture and landscaping. Class B biosolids are treated to reduce pathogens but may still contain detectable levels and are subject to restrictions, such as limiting public access and getting a permit to land apply. Both classes must meet requirements to address certain pollutants, including heavy metals, before being applied to land. At the time of publication, EPA has no standards or regulations for PFAS in biosolids.[43]

"Upstream" means a location on a waterbody that was above and not impacted by a pollution discharge from a targeted WWTP outfall or that was above a targeted biosolids application field. Upstream locations were generally placed at least 100 feet, but no more than one mile upstream above the outfall discharge point or biosolids application field. Waterkeeper Alliance and Waterkeeper groups conducted site-specific evaluations of sampling locations to identify representative locations and consider making modifications to the distance restrictions as necessary to ensure a sampling location was representative of conditions upstream from a WWTP or biosolids application field. Reasonable efforts were made to select accessible locations close enough to the outfall discharge point or biosolids application field to avoid as many other potential sources of PFAS pollution as possible.

"Downstream" means a location on a waterbody that was below a targeted WWTP outfall or below a targeted biosolids land application field and was designed to be representative of surface water quality downstream from the discharge, as opposed to directly capturing a sample of the WWTP effluent or biosolids application runoff. The downstream location was generally placed at least 100 feet, but no more than one mile below the outfall discharge point or biosolids application field. Waterkeeper Alliance and Waterkeeper groups conducted site-specific evaluations of sampling locations to identify representative locations and consider making modifications to the distance restrictions as necessary to ensure a sampling location was representative of conditions downstream from a WWTP or biosolids application field. Reasonable efforts were made to select accessible locations close enough to the outfall discharge point or biosolids application field to avoid as many other potential sources of PFAS pollution as possible.

The **discharge point for WWTP sampling locations** was determined based on the GPS coordinates for the location of the WWTP outfall. To select sampling site locations, Waterkeeper Alliance and Waterkeeper groups evaluated publicly available information to identify outfall discharge points to waterbodies. Using ArcGIS mapping and data analysis, field investigations, and other mapping tools, Waterkeeper Alliance and Waterkeeper groups then identified potential sampling sites on the waterbody that were located upstream and downstream of the WWTP outfall that were representative of waterbody conditions above and below the discharge.

The **discharge point for biosolids application sites** was the downstream boundary of the field or ditch, whichever was the furthest downstream, where it intersected the waterbody. To select sampling sites for biosolids application fields, Waterkeeper Alliance and Waterkeeper groups evaluated publicly available information to identify the field boundaries and any ditches, streams, or surface water flow paths on or near the field. Using ArcGIS, field investigations, and other mapping tools, Waterkeeper Alliance and Waterkeeper groups then identified potential sampling sites on the receiving waterbody that were located upstream and downstream of the biosolids application field, that were representative of waterbody conditions above and below the biosolids application field.

Sampling Method

Waterkeeper Alliance developed a Sampling and Analysis Plan for Phase II that includes a description of the project, criteria for selecting participating Waterkeepers and sampling sites, details for collecting and managing information and data, requirements for training personnel, details on project management, standards and protocols for the collection and analysis of surface water samples using SiREM PFASsive™ passive samplers, and a Quality Assurance Project Plan (QAPP) to ensure the collection of reliable and representative water quality data that meet the project's overall objectives and goals. Every effort was made to procure PFAS-free sampling equipment and supplies for the project and to avoid cross-contamination in the shipping and handling of passive sampling devices, equipment, and supplies. Waterkeeper groups also received training regarding best practices for avoiding cross-contamination while handling sampling devices, equipment, and supplies and during deployment, retrieval, transfer, and shipment of samples.

PFASsive™ passive samplers were used for quantification of the freely dissolved concentration (Cfree) of targeted PFAS analytes in sediment pore water, surface water, and stormwater. The PFASsive™ samplers are used to quantify the Cfree of dissolved PFAS in surface water via an in-situ deployment near WWTPs and biosolids land application fields. PFASsive™ samplers use a volume of laboratory-supplied clean water in a sampling device separated from water by a permeable membrane. Freely dissolved PFAS analytes in the water diffuse across the membrane until the concentration of PFAS inside equilibrates with concentrations of freely dissolved PFAS in the water. The sampling device is then removed from the deployment location. The water inside the PFASsive™ sampler is collected and analyzed like any other water sample using EPA methods.

Water Quality Data Collection

Waterkeeper Alliance conducted two training sessions for participating Waterkeeper groups in June 2024. The webinars included an overview of SiREM PFASsive™ technology, instruction on PFASsive™ sampling methodology and procedures, and equipment handling and shipping protocols. Upon completion of site selection and training, each Waterkeeper group received a box of sampling devices, equipment, and supplies from Waterkeeper Alliance via U.S. mail. Inside the box was a cooler with two or four sealed bags containing four PFASsive™ vials within each bag, two or four PFASsive™ frames, multiple

Table 1 | Sampled Watersheds and Wastewater Treatment Facility Sites

State	City or County	Waterkeeper	Facility	Receiving Waterbody	NPDES Permit No.	NPDES PFAS Effluent Limit		
AL	Hoover	Cahaba Riverkeeper	Cahaba River Water Reclamation Facility (WRF)	Cahaba River	AL0023027	None		
	Rainbow City	Coosa Riverkeeper	Rainbow City WWTP	Big Wills Creek	AL0056839	None		
CA	Los Angeles	LA Waterkeeper	LA-Glendale Water Reclamation Plant	Los Angeles River	CA0053953	None		
	Riverside	Inland Empire Waterkeeper	Riverside Regional Water Quality Control Plant	Santa Ana River	CA0105350	None		
CT	Waterbury	Long Island Soundkeeper	Waterbury Water Pollution Control Facility	Naugatuck River	CT0100625	None		
FL	Plant City	Tampa Bay Waterkeeper	Plant City WRF	East Canal	FL0026557	None		
GA	Atlanta, Smyrna	Chattahoochee Riverkeeper	City of Atlanta's R.M Clayton WRC	Chattahoochee River	GA0039012	None		
			Cobb County's R.L. Sutton WRF		GA0026140			
			West Area Water Quality Control Facility (WQCF)		GA0038644			
MD	Frederick	Potomac Riverkeeper	City of Frederick WWTP	Lower Monocacy River	MD0021610	None		
MI	Detroit	Detroit Riverkeeper	Great Lakes Water Authority Water Resource Recovery Facility	Rouge River	MI0022802	Goal	PFOS	11 ppt
							PFOA WQBEL	8,040 ppt
MS	Jackson, Richland	Pearl Riverkeeper	Jackson Publicly Owned Treatment Works (POTW), Savanna Street	Pearl River	MS0024295	None		
			West Rankin Utility Authority WWTF		MS0061743			
NY/NJ	Rockland County, Hillburn	Hackensack Riverkeeper	Western Ramapo Advanced WWTP	Ramapo River	NY0270598	None		
	Suffern		Suffern (V) Sewage Treatment Plant (STP)		NY0022748	None		
NC	Fayetteville	Cape Fear Riverkeeper	Cross Creek WRF	Cape Fear River	NC0023957	None		
	Graham	Haw Riverkeeper	Graham WWTP	Haw River	NC0021211	None		
OR	Hillsboro	Tualatin Riverkeepers	Rock Creek WRRF	Tualatin River	OR0029777	None		
RI	Cranston	Narragansett Bay Riverkeeper	Cranston WPCF	Pawtuxet River	RI0100013	None		
SC	Sumter	Black-Sampit Riverkeeper	Sumter Pocotaligo River WWTP	Pocotaligo River, East Branch	SC0027707	None		
TX	Houston	Bayou City Waterkeeper	Homestead WWTP	Hunting Bayou	TX0063029	None		
VA	Petersburg	James Riverkeeper	South Central Wastewater Treatment Facility	Appomattox River	VA0025437	None		
WA	Spokane	Spokane Riverkeeper	Spokane Riverside Park WRF	Spokane River	WA0024473	None		
WI	Waukesha	Milwaukee Riverkeeper	City Of Waukesha WWTP	Root River	WI0029971	None		
WV	Parkersburg	West Virginia Headwaters Waterkeeper	Parkersburg Utility Board	Ohio River	WV0023213	None		
	Inwood Area	Upper Potomac Riverkeeper	Berkeley County PSSD—Inwood WWTP	Opequon Creek	WV0082759	None		

Table 2 | Sampled Watersheds and Biosolids Land Application Fields

State	Waterkeeper	Facility	Biosolids Site Watershed	PFAS Limit
AL	Cahaba Riverkeeper	Cahaba River WRF (combined with Valley Creek WRF)	Cane Creek	None
	Coosa Riverkeeper	Rainbow City WWTP	Whippoorwill Creek	None
MD	Potomac Riverkeeper	Synagro Multi-WWTP Site *(inc. City of Frederick WWTP)* ◆	Monocacy River	Recommended Limits
MS	Pearl Riverkeeper	Jackson POTW, Savanna Street ◆◆	Big Creek and Pearl River	None
NC	Cape Fear Riverkeeper	Cross Creek WRF	South River	None
	Haw Riverkeeper	Graham WWTP	Haw Creek	None
VA	James Riverkeeper	Synagro Multi-WWTP Site *(inc. South Central Wastewater Authority WWTF)* ◆	Old Town Creek	None
WA	Spokane Riverkeeper	Spokane Riverside Park WRF	Dragoon Creek	None
WI	Milwaukee Riverkeeper	City of Waukesha WWTP	Spring Creek (Fox River Watershed)	None – Statewide Interim Strategy
WV	Upper Potomac Riverkeeper	Berkeley County PSSD	Back Creek	None

◆ Synagro obtains biosolids from multiple WWTPs and, as a result, land application events may contain biosolids from one or more of those facilities.
◆◆ Jackson POTW, Trahon and Big Creek WWTF also discharges to Big Creek above the confluence with Pearl River.

Eurofins 125 ml HDPE sample bottles, laboratory-provided labels, PFAS-free gloves, and PFAS-free storage bags. Waterkeeper groups designated to conduct duplicate or field blank sampling received additional vial bags and bottles. Sampling personnel conducting field blanks received two additional laboratory bottles. Sampling personnel conducting duplicates received two additional full sets of sampling supplies—vial bags, sample bottles, frames, ice packs, and other equipment.

One sampler was placed upstream of a WWTP and another was placed downstream from the same facility to evaluate discharges into the waterways.[44] In situations where the WWTP land-applied biosolids from its wastewater treatment process, and it was selected for sampling, the Waterkeeper group also placed one device upstream and another downstream from a biosolids land application field to evaluate PFAS discharged into the waterway as a result of this waste management practice.[45] Some Waterkeeper groups were also selected to collect duplicate samples or field blanks for quality control purposes. At the end of a deployment period of at least 20 days,[46] Waterkeeper groups were responsible for retrieving the device, completing field data sheets and chain of custody forms, and transferring the sample to Eurofins.

Laboratory Analysis and Equilibrium Calculations

Upon retrieval, samples, including laboratory, duplicates, and field blanks, were sent to Eurofins Sacramento for analysis using EPA Method 1633, including an M2PFOA tracer. Three sets of four vials (without frames) were also used as tracer blanks and sent directly to the analytical laboratory from SiREM for analysis. The tracer blanks are analyzed using EPA Method 1633 to confirm that the source PFASsive™ water is PFAS-free and to determine the initial tracer concentration for the samplers (required for equilibrium calculations).

Eurofins Sacramento's analytical results were reported first to SiREM Lab, which then completed equilibrium calculations prior to reporting the final results to Waterkeeper Alliance for further analysis and development of this report. Quantification of Cfree is dependent on the site-specific conditions surrounding each sampler that affect the sampling rates for each analyte. PFASsive™ uses an inert 13-C labeled PFOA (M2PFOA) tracer to evaluate the diffusion kinetics of the samplers during the exposure period. Cfree estimates of analytes that do not reach at least 10% of steady state concentrations in the sampler during deployment are reported with a qualifier. PFAS analytes were not expected to be qualified.

Data Quality

All of the data collected in this project were evaluated in accordance with a QAPP to evaluate whether the sampling produced quality data that is accurate, precise, complete, and representative, including:

1. adherence to consistent and reliable methods,
2. the analytical data meets data quality objectives (DQOs), and
3. the analytical data generated was reviewed, validated, and verified.

Although PFAS concentrations in surface water can be influenced by various factors—such as other discharges, atmospheric deposition, weather, and sampling timing—the upstream and downstream sites in this report were selected based on protocols designed to ensure representative sampling and minimize outside influences. Sites were placed near the discharge point or biosolids application area, and passive sampling over multiple days was used to reduce the impact of environmental variability. As a result, the findings are considered representative of PFAS impacts from wastewater treatment plant discharges and biosolids land application. While other influences cannot be entirely ruled out, there are no indications that they significantly affected the results given the study design. Other potential influences that we identified for a location, if any, are noted separately for each individual Waterkeeper group in the Evaluation of Facilities and Watersheds section of this report below.

As part of the review process, a Ph.D. scientist from SiREM evaluated all submitted data before modeling was performed and no abnormalities or flags reflecting on the reliability of the data were observed. The data evaluation and usability determination required by the QAPP confirmed that the data collected during this project accurately measured PFAS levels associated with the wastewater treatment facility and biosolids application field discharges identified for assessment and are suitable for use in the Project Report. The data evaluation, including any deviations from the Sampling and Analysis Plan, the assessment of Quality Control sample results, data assessment and laboratory qualifiers, and site condition impacts, is documented in the Data Evaluation and Usability Report. All Eurofins laboratory Result Qualifiers are shown in the Qualifier column next to the Results column in Appendix A; however, none of the qualifiers adversely impact the usability of the results for the purposes of this report.

Third Party Review

This report was submitted for third-party review with two experts to obtain an evaluation of the accuracy of the data and data analysis.

Table 3 | EPA Method 1633 Target Analytes

Analyte Description		CAS Number
ADONA	4,8-Dioxa-3H-perfluorononanoic acid	919005-14-4
FOSA	perfluorooctanesulfonamide	754-91-6
HFPO-DA (GenX)	Hexafluoropropylene oxide-dimer acid	13252-13-6
NEtFOSAA	N-ethyl perfluorooctane sulfonamido acetic acid	2991-50-6
NEtFOSE	N-ethyl perfluorooctane sulfonamido ethanol	1691-99-2
NEtFOSA	N-ethylperfluorooctane-1-sulfonamide	4151-50-2
NFDHA	perfluoro-3,6-dioxaheptanoic acid	151772-58-6
NMeFOSA	N-methylperfluoro-1-octanesulfonamide	31506-32-8
NMeFOSAA	N-methyl perfluorooctane sulfonamido acetic acid	2355-31-9
NMeFOSE	N-methyl perfluorooctane sulfonamido ethanol	24448-09-7
PFBA	perfluorobutanoic acid	375-22-4
PFBS	perfluorobutanesulfonic acid	375-73-5
PFDA	perfluorodecanoic acid	335-76-2
PFDoA	perfluorododecanoic acid	307-55-1
PFDoS	perfluorododecanesulfonic acid	79780-39-5
PFDS	perfluorodecanesulfonic acid	335-77-3
PFEESA	perfluoro(2-ethoxyethane)sulphonic acid	113507-82-7
PFHpA	perfluoroheptanoic acid	375-85-9
PFHpS	perfluoroheptanesulfonic acid	375-92-8
PFHxA	perfluorohexanoic acid	307-24-4
PFHxS	perfluorohexanesulfonic acid	355-46-4
PFMBA	perfluoro-4-methoxybutanoic acid	863090-89-5
PFMPA	perfluoro-3-methoxypropanoic acid	377-73-1
PFNA	perfluorononanoic acid	375-95-1
PFNS	perfluorononanesulfonic acid	68259-12-1
PFOA	perfluorooctanoic acid	335-67-1
PFOS	perfluorooctanesulfonic acid	1763-23-1
PFPeA	perfluoropentanoic acid	2706-90-3
PFPeS	perfluoropentanesulfonic acid	2706-91-4
PFTeA	perfluorotetradecanoic acid	376-06-7
PFTriA	perfluorotridecanoic acid	72629-94-8
PFUnA	perfluoroundecanoic acid	2058-94-8
9Cl-PF3ONS	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53B major)	756426-58-1
11Cl-PF3OUdS	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B minor)	763051-92-9
3:3 FTCA	3-perfluoropropyl propanoic acid	356-02-5
4:2 FTSA	4:2 fluorotelomer sulfonic acid	757124-72-4
5:3 FTCA	2H, 2H, 3H, 3H-perfluorooctanoic acid	914637-49-3
6:2 FTSA	6:2 fluorotelomer sulfonic acid	27619-97-2
7:3 FTCA	2H, 2H, 3H, 3H-perfluorodecanoic acid	812-70-4
8:2 FTSA	6:2 fluorotelomer sulfonic acid	39108-34-4

ANALYSIS AND FINDINGS

The Phase I PFAS monitoring project, undertaken with 113 U.S. Waterkeepers from across the country, was a first-of-its-kind nationwide survey of surface waters[47] that unequivocally demonstrated that dangerous PFAS pollution is widespread in surface waters across the country. In some locations, PFAS concentrations were thousands to hundreds of thousands times higher than what EPA experts say is safe for drinking water.

PFAS must be controlled and removed at their source in order to protect human health from these dangerous toxic chemicals, but this is not happening due to the lack of federal and state requirements for industrial dischargers and passive receivers like WWTPs and, particularly in disproportionately-impacted communities, the lack of funding to install advanced treatment systems to remove PFAS. Additionally, there are no state, tribal, and federal surface water quality or drinking water standards for most PFAS.

In 2024, EPA established legally enforceable limits for just six types of PFAS in drinking water, known as Maximum Contaminant Levels (MCLs) and proposed draft Human Health Water Quality Criteria (HHWQC) to limit three types of PFAS in surface waters.[48] At the time of publication of this report, EPA has not proposed drinking water or surface water limits for any other types of PFAS or any regulatory standards to address PFAS in biosolids.[49] Although EPA appears to have been aware of PFAS in biosolids since at least 2003, it has been reported that the agency actively encouraged the use of biosolids as fertilizer and it is estimated that farmers have obtained permits authorizing biosolids application on nearly 70 million acres of farmland, or about a fifth of all agricultural land in the U.S.[50] At the same time, states across the country are grappling with this "contamination crisis,"[51] but state policies to address PFAS contamination vary widely throughout the country.[52]

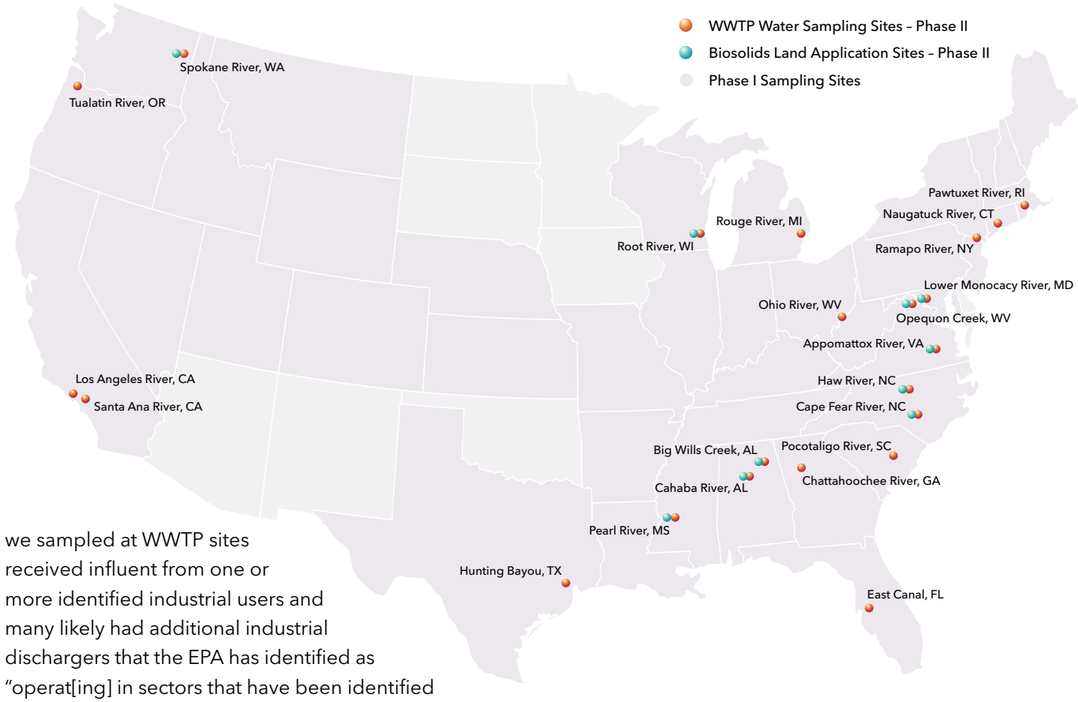
To address the urgent need for additional policy reform and scientifically sound data on PFAS sources and surface water contamination, Waterkeeper Alliance and Hispanic Access Foundation designed this Phase II PFAS monitoring project to work with U.S. Waterkeepers and partners. The project aims to evaluate and quantify PFAS contamination over time in surface waters using passive samplers placed near identified municipal wastewater treatment systems and biosolids application fields, with a focus on areas that appear to be disproportionately impacted based on the identification of EJScreen indicators above the 80th percentile. SiREM PFASsive™ samplers were selected for the project to provide an accurate representation of PFAS contamination present in the sampled surface waters and to be more reflective of bioavailability, toxicity, and risk than the data that would have been obtained through collection of a traditional single-day grab sample at each location.

Discharges from WWTPs and biosolids land application fields were indicated as a source of PFAS contamination in U.S. surface waters at nearly every downstream location we tested in 19 states, but we identified only one wastewater treatment system that has a limit on the amount of PFAS they could discharge into surface waters in their Clean Water Act NPDES permit, and we identified only seven facilities had a requirement to monitor their discharges for PFAS. *See Table 1 (p. 16)* and *Table 2 (p. 17)*. At least 22 of the 25 WWTPs where we sampled at WWTP sites received influent from one or more identified industrial users and many likely had additional industrial dischargers that the EPA has identified as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals,"[53] but only one wastewater treatment system had a pretreatment program to place limits on the amount of certain PFAS that industrial users could discharge into its treatment plant.[54]

Table 4 | PFAS Types Detected at One or More Sites

	Analyte	Site Type
1	PFOS	WWTP and Biosolids
2	PFHxA	WWTP and Biosolids
3	PFHpS	Biosolids Site
4	PFOA	WWTP and Biosolids
5	PFHxS	WWTP and Biosolids
6	PFBS	WWTP and Biosolids
7	PFPeA	WWTP and Biosolids
8	PFHpA	WWTP and Biosolids
9	PFBA	WWTP and Biosolids
10	PFNA	WWTP and Biosolids
11	PFDA	WWTP and Biosolids
12	PFPeS	WWTP and Biosolids
13	6:2 FTS	WWTP
14	FOSA	WWTP and Biosolids
15	PFUnA	WWTP
16	HFPO-DA (Gen-X)	WWTP and Biosolids
17	PFMPA	WWTP
18	PFDoA	WWTP
19	8:2 FTS	WWTP
20	NMeFOSAA	WWTP
21	NEtFOSAA	WWTP
22	PFTeA	WWTP
23	PFMBA	WWTP

Figure 1 | Phase II PFAS Sampling Sites
Figure 2 | Phase I Sampling Sites



According to EPA, statewide surveys have found PFOS and PFOA in biosolids originating from industrial and non-industrial sources discharging to WWTPs across the country.[55] To the best of our knowledge, none of the WWTPs identified in this report have installed treatment technologies to remove PFAS from either their wastewater discharged to surface waters or their biosolids. Furthermore, the majority of the facilities we evaluated are not required to monitor or limit PFAS levels in biosolids prior to land application or other disposal methods for treated or untreated sewage sludge. Traditional wastewater treatment technology does not remove or destroy PFOS and PFOA, and, as a result, a portion of the PFAS will accumulate in biosolids generated during the treatment process.[56]

Controlling PFAS at the source is essential. CWA permitting authorities and industrial pretreatment programs must be utilized to require industrial dischargers to remove PFAS before releasing effluent into the environment or sending it to WWTPs.[57] The data collected in this monitoring project and discussed below provide strong evidence of the immediate need for EPA, states, and tribes to take those actions. The data also highlight the urgent need to direct federal infrastructure funding to municipal wastewater treatment systems in areas with multiple indicators of environmental and health burdens on disproportionately impacted communities, to support treatment upgrades and safe biosolids management that protect human health and the environment.

Method Evaluation

SiREM PFASsive™ samplers provide an effective method for conducting fresh surface water PFAS sampling that produce scientifically valid data in locations that are impacted by discharges from WWTPs and biosolids land application fields. With proper training provided by the SiREM PFASsive™ manufacturer, the devices were successfully deployed and retrieved by Waterkeeper groups in a wide variety of locations across the U.S.

SiREM PFASsive™ devices produced water samples that were analyzed by Eurofins Sacramento using the current approved EPA Method 1633 without any limitations attributable to the passive sampling device. A comparative analysis of the data demonstrated that SiREM PFASsive™ samplers produced reliable, consistent water quality data that was comparable between all sites despite the geographic, geomorphic, and hydrologic differences in watersheds.

The SiREM PFASsive™ passive sampling methodology captured time-integrated measurements of PFAS levels over periods of at least 20 days. Such measurements provide a more accurate representation of PFAS contamination and risk than traditional grab sample methods, which reflect PFAS concentrations that represent the entire mass of PFAS present at a single point in time and may result in an overestimation of the bioavailable PFAS exposure to human and ecological receptors. By collecting PFAS data over a longer period, understanding of PFAS migration, bioavailability, and impacts is enhanced, while also shedding light on the effectiveness of WWTP processes and land application methods in controlling or contributing to PFAS release into surface waters. The time-integrated measurements of PFAS concentrations over periods of at least 14 days is more practical and cost-effective than the alternative of collecting multiple samples on a daily or even weekly or monthly basis. This would require additional time and expenditures to collect multiple samples in the field, analyze those samples in a laboratory, and analyze multiple results for a single location.

The equilibrium concentrations generated through the use of SiREM PFASsive™ samplers provide a more accurate representation of PFAS contamination present in the sampled surface waters, and are more reflective of bioavailability, toxicity, and risk, than traditional single-day grab sample methods that may capture higher or lower values depending on the time of collection. Because PFAS are persistent, bioaccumulative, and toxic, it is critical to understand their migration pathways and bioavailability for proper delineation and risk characterization. Passive sampling in surface water is an accepted approach to assess bioavailability and risk.[58] The SiREM PFASsive™ passive sampler "is a diffusion-based equilibrium passive sampler that was developed and validated for relevant PFAS (EPA 537, EPA 1633) in porewater and surface water."[59] After retrieving the SiREM PFASsive™ device, the water collected in the sampler is treated like any other water sample allowing the PFAS to be concentrated and measured using EPA analysis methods "without the additional extraction steps required for sorbents" and the "results are presented as concentrations in nanograms per liter (ng/L)."[60] A reverse tracer in the devices also "allows the extent of equilibrium to be determined during deployment and used to estimate the freely dissolved equilibrium concentration in the environment. The freely dissolved equilibrium concentration has been shown to relate better to bioavailability, toxicity, and risk assessment models than concentrations measured from conventional grab samples."[61]

ELEVATED DOWNSTREAM WWTP SITE RESULTS as shown in Table 5 *(p. 23)*:

PFOA DETECTION
- 44 ppt Rouge River, MI
- 28 ppt Pocotaligo River, SC
- 13 ppt Santa Ana River, CA
- 10 ppt Haw River, NC

PFPeA DETECTION
- 43 ppt Santa Ana River, CA
- 38 ppt Pocotaligo River, SC
- 36 ppt Haw River, NC
- 22 ppt Monocacy River, MD
- 20 ppt Los Angeles River, CA
- 18 ppt Root River, WI

PFHxA DETECTION
- 49 ppt Pocotaligo River, SC
- 27 ppt Santa Ana River, CA
- 27 ppt Haw River, NC
- 20 ppt Los Angeles River, CA

PFOS DETECTION
- 30 ppt Pocotaligo River, SC
- 23 ppt Haw River, NC
- 13 ppt Cape Fear River, NC
- 12 ppt Santa Ana River, CA
- 12 ppt Hunting Bayou, TX
- 11 ppt East Canal, FL

Table 5 | Elevated Sample Values Downstream from WWTPs (ppt)

State	Waterkeeper/ Waterbody	Wastewater Treatment Plant		PFAS Analyte (ppt)																		
				PFOA	PFHxA	PFBS	PFPeA	PFHpA	PFHxS	PFOS	PFBA	PFNA	PFDA	PFPeS	FOSA	PFUnA	PFDoA	6:2 FTS	PFMPA	PFTeA	NMeFOSAA	PFMBA
AL	**Cahaba Riverkeeper** Cahaba River	Cahaba River WRF		4.9	6.4	6.4	10.0	1.9	1.5													
	Coosa Riverkeeper Big Wills Creek	Rainbow City WWTP		2.2					0.6		1.9				1.6							
CA	**Inland Empire Waterkeeper** Santa Ana River	Riverside RWQCP	Nov.		27.0		43.0															
			Aug. ▾	13.0	20.0	21.0	24.0	3.6		12.0		2.1										6.1
	LA Waterkeeper Los Angeles River	LA-Glendale WRP			20.0		20.0	3.3			9.8		2.1									
CT	**Long Island Soundkeeper** Naugatuck River	Waterbury WPCF			8.9	3.1	8.1	2.6	1.7	8.3	4.8											
FL	**Tampa Bay Waterkeeper** East Canal	Plant City WRF ▾		7.1	6.3	6.0	9.9	3.7	3.9	11.0	9.0	1.3		0.71								
GA	**Chattahoochee Riverkeeper** Chattahoochee River	Clayton, Sutton, West Area ◆		2.8	4.6	4.3	6.1	1.5			2.1						1.2		2.1	4.1		
MD	**Potomac Riverkeeper** Monocacy River	City of Frederick WWTP		6.8	13.0	5.0	22.0	2.5	2.5		4.4				0.62							
MI	**Detroit Riverkeeper** Rouge River	Great Lakes Water Authority Water Resource Recovery Facility (GLWA WRRF)		44.0	9.2				16.0	3.1			5.0									
MS	**Pearl Riverkeeper** Pearl River	Jackson POTW, Savanna Street / West Rankin Utility Authority WWTF ▾		2.9	4.4	3.0		1.3	1.3	3.5	3.6	0.71										
NC	**Cape Fear Riverkeeper** Cape Fear River	Cross Creek WRF		8.3	6.7	4.7	8.6	3.7	5.3	13.0	5.4			0.94								
	Haw Riverkeeper Haw River	Graham WWTP		10.0	27.0	17.0	36.0	8.8	4.5	23.0	9.2	2.2	2.6			0.87	0.59	1.1	0.88			
NJ	**Hackensack Riverkeeper** Ramapo River	Western Ramapo Advanced WWTP / Suffern (V) STP	Nov.	6.7	10.0	2.5			3.5	4.7												
OR	**Tualatin Riverkeepers** Tualatin River	Rock Creek WRRF		3.3	7.1	3.5	4.4	1.7	0.73	2.5	6.2	0.59										
RI	**Narragansett Bay Riverkeeper** Pawtuxet River	Cranston WPCF ©					5.7	4.9	2.3			2.1										
SC	**Black-Sampit Riverkeeper** Pocotaligo River	Sumter Pocotaligo River WWTP		28.0	49.0	5.5	38.0	21.0		30.0	12.0	2.3	2.1		1.7	0.79		22.0			1.1	
TX	**Bayou City Waterkeeper** Hunting Bayou	Homestead WWTP		4.0	11.0	11.0	9.3			12.0		1.3	0.64									
VA	**James Riverkeeper** Appomattox River	South Central Wastewater Authority WWTF		2.6		2.3	4.4			2.6		0.75										
WA	**Spokane Riverkeeper** Spokane River	Spokane Riverside Park WRF		1.1	2.0				0.8	2.1												
WI	**Milwaukee Riverkeeper** Root River	City of Waukesha WWTP ©		8.0	7.6	4.8	18.0	1.9	2.1	5.0	6.5	1.3	0.83									
WV	**Upper Potomac Riverkeeper** Opequon Creek	Berkeley County PSSD – Inwood WWTP		4.1	7.2	9.3	9.3															
	West Virginia Headwaters Waterkeeper Ohio River	Parkersburg Utility Board				1.6																

Includes all downstream sample results where the downstream value exceeded the upstream value except where as noted with an ▾ did not have upstream samples.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
◆ City of Atlanta's R.M Clayton WRC, Cobb County's R.L. Sutton WRF, and West Area Water Quality Control Facility (WQCF)

Overview of Results for WWTPs and Biosolids Land Application Fields

The sampling data collected through this project confirmed, consistent with the results of our Phase I sampling, that U.S. surface waters are widely contaminated by many different types of PFAS. Although we sampled fewer waterways in this project than in the previous monitoring project, we found that one or more PFAS were detected at all surface water sampling sites tested both upstream and downstream from WWTPs and biosolids land application fields in 19 states, with the exception of a single site downstream from a biosolids land application field in Wisconsin. See Appendix A.

The sampling results also indicated the widespread presence of multiple types of PFAS in U.S. surface waters. Out of 40 types of PFAS detected by EPA Method 1633, 23 types of PFAS were detected in upstream or downstream surface water sampling sites.

PFAS Surface Water Contamination from WWTPs and Biosolids Land Application Fields

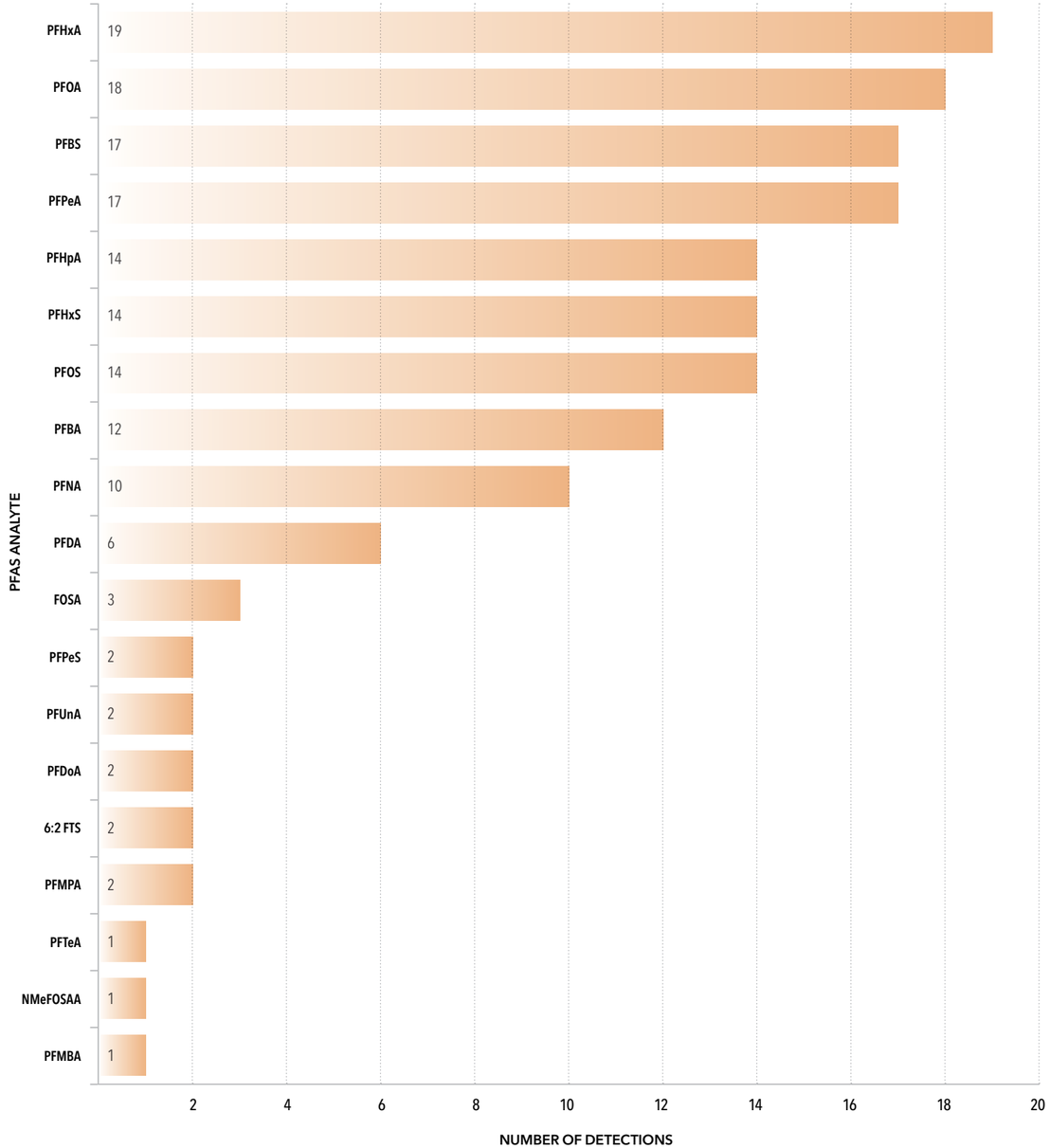
The sampling data collected in the project clearly demonstrate that discharges of PFAS from multiple WWTPs and biosolids land application fields that we evaluated are contributing multiple types of PFAS to U.S. surface waters. By comparing upstream and downstream results, we determined that elevated concentrations of multiple types of PFAS were detected at 21 of 22 downstream WWTP sampling sites[62] and at 8 of the 10 downstream biosolids land application sampling sites. *See Table 5*[63] *(p. 23) and Table 6 (below).* Pearl River biosolids site sampling results reported and analyzed below include any PFAS contributed by Jackson POTW's biosolids land application fields and the Trahon and Big Creek WWTF to Big Creek above its confluence with the Pearl River.

Table 6 | Elevated Sample Values Downstream from Biosolids Land Application Fields[64]

State	Waterbody	PFAS Analyte (ppt)													
		PFBA	PFBS	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFOS	PFHxS	PFDA	FOSA	PFPeS	PFHpS	HFPO-DA (GenX)
AL	Cane Creek ©	11.00	2.70	11.00	4.20	1.70	4.10	0.68	5.80						
MD	Monocacy River	6.20	3.90		4.90	2.20		0.77							
MS	Pearl River ◆			13.00					3.60		0.73				
NC	Haw Creek	3.90	5.30					1.90			0.81		2.20	1.30	
	South River ©	6.70	5.50	4.80	3.20	2.80	5.80	1.40	7.50	2.40		0.86			0.94
VA	Old Town Creek ▼	1.30	1.30	1.70	1.70	0.81	3.90		3.10	1.50					
WA	Dragoon Creek	3.10	5.80	12.00	7.40	1.50	1.50			0.71		0.88			
WV	Back Creek ©	2.50	2.50	1.40	3.10	1.00									

Includes all downstream sample results where the downstream value exceeded the upstream value except where as noted with an ▼ did not have upstream samples.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
◆ Jackson POTW, Trahon, and Big Creek WWTF also discharges to the sampled waterway through Big Creek and could have contributed PFAS to the downstream sample results.

Figure 3 | Number of Elevated Downstream PFAS Detections at WWTP Sites, by Analyte



Wastewater Treatment Plants

Out of 40 types of PFAS detected by EPA Method 1633, 19 types of PFAS at elevated levels were detected downstream from WWTPs. The most frequently detected PFAS at elevated levels downstream from wastewater treatment plants include PFHxA (19 detections), PFOA (18 detections), PFBS and PFPeA (17 detections), PFHpA, PFHxS, and PFOS (14 detections), PFBA (12 detections), and PFNA (10 detections). *See Figure 3 (p. 25).*

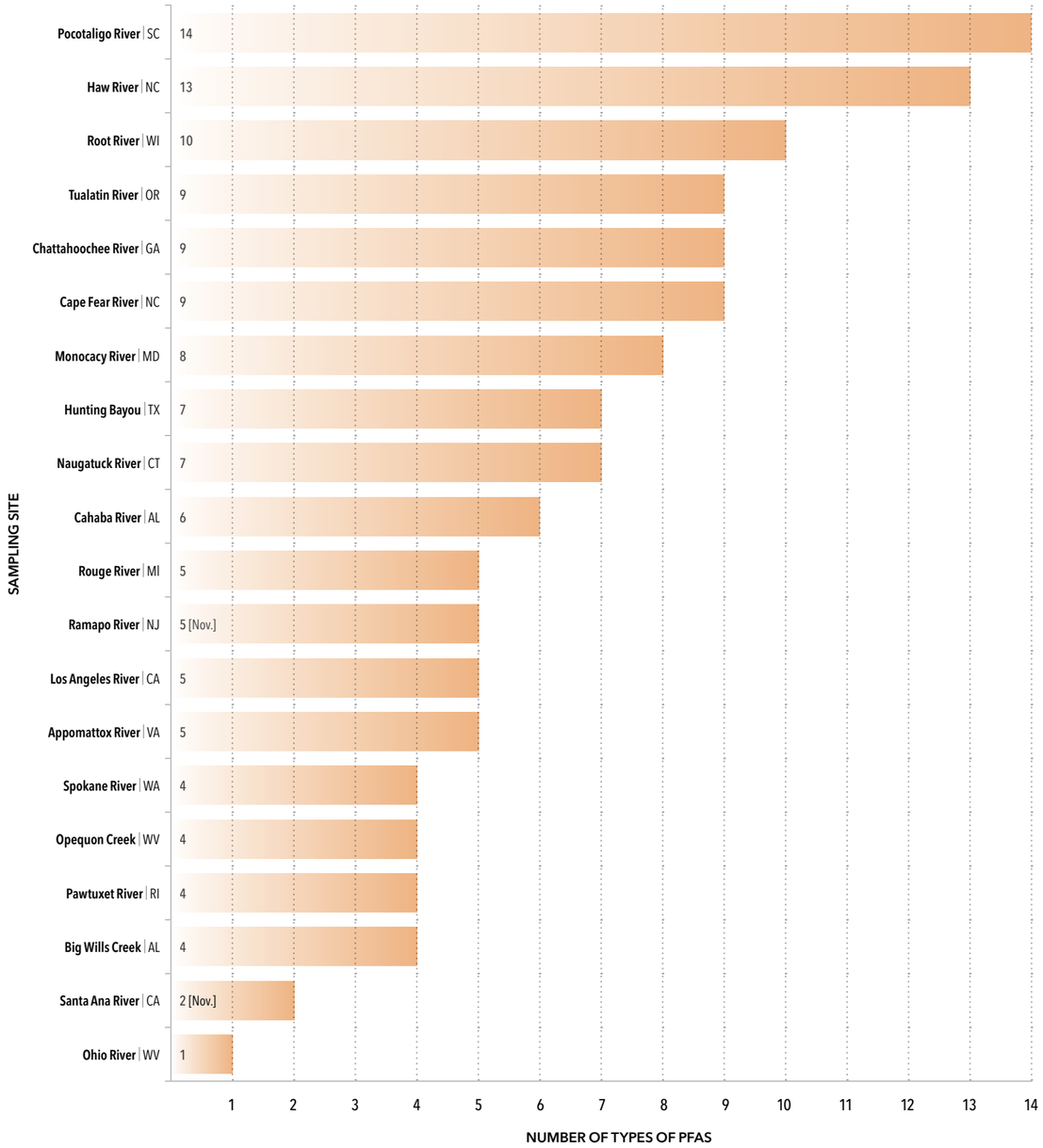
The highest elevated concentration of PFAS downstream from a WWTP was PFHxA at 49 ppt in the Pocotaligo River below the Sumter Pocotaligo River WWTP in South Carolina. PFHxA was detected in 19 samples downstream from WWTPs and the mean concentration of all values combined was 13.02 ppt. PFOA was also detected in 18 samples taken downstream from WWTPs, with a mean concentration of 8.88 ppt for all sites and the highest elevated concentration, 44 ppt, was found in the Rouge River below the GLWA WRRF in Michigan. *See Table 7 (below).*

Multiple types of PFAS were also frequently detected, often at high concentrations, at elevated levels at a single sampling site downstream from each WWTP, presenting unacceptable, cumulative risks to communities with multiple EJScreen Indexes that exceed the 80th percentile. For example, 14 types of PFAS were detected at the sampling site in the Haw River downstream from a Graham WWTP outfall in North Carolina, 13 types of PFAS were detected at the sampling site in the Pocotaligo River downstream from a Sumter Pocotaligo River WWTP outfall in South Carolina, and 10 types of PFAS were detected at the sampling site in the Root River downstream from a Waukesha WWTP outfall in Wisconsin. *See Figure 4 (p. 27).*

Table 7 | PFAS Concentrations and Watersheds with Highest Detection for Each Analyte Downstream from WWTPs
Maximum, Minimum, and Mean

Analyte	Watershed with Highest Elevated Detection	Elevated Downstream Detection (ppt)			
		Number of Detections	Mean	Minimum	Maximum
PFHxA	Pocotaligo River	19	13.02	2	49
PFOA	Rouge River	18	8.88	1.1	44
PFPeA	Santa Ana River	17	16.28	4.4	43
PFOS	Pocotaligo River	14	9.49	2.1	30
6:2 FTS	Pocotaligo River	2	11.55	1.1	22
PFBS	Santa Ana River	17	6.53	1.6	21
PFHpA	Pocotaligo River	14	4.46	1.3	21
PFHxS	Rouge River	14	0.64	0.64	16
PFBA	Pocotaligo River	12	6.24	1.9	12
PFMBA	Santa Ana River	1	6.1	6.1	6.1
PFDA	Rouge River	6	2.21	0.64	5
PFTeA	Chattahoochee River	1	4.1	4.1	4.1
PFNA	Pocotaligo River	10	1.47	0.59	2.3
PFMPA	Chattahoochee River	2	1.49	0.88	2.1
FOSA	Pocotaligo River	3	1.31	0.62	1.7
PFDoA	Chattahoochee River	2	0.9	0.59	1.2
PFPeS	Cape Fear River	2	0.83	0.71	0.94
NMeFOSAA	Pocotaligo River	1	1.1	1.1	1.1
PFUnA	Haw River	2	0.83	0.79	0.87

Figure 4 | Number of Different PFAS Types Elevated Downstream from WWTPs
Comparing Upstream/Downstream Sample Results



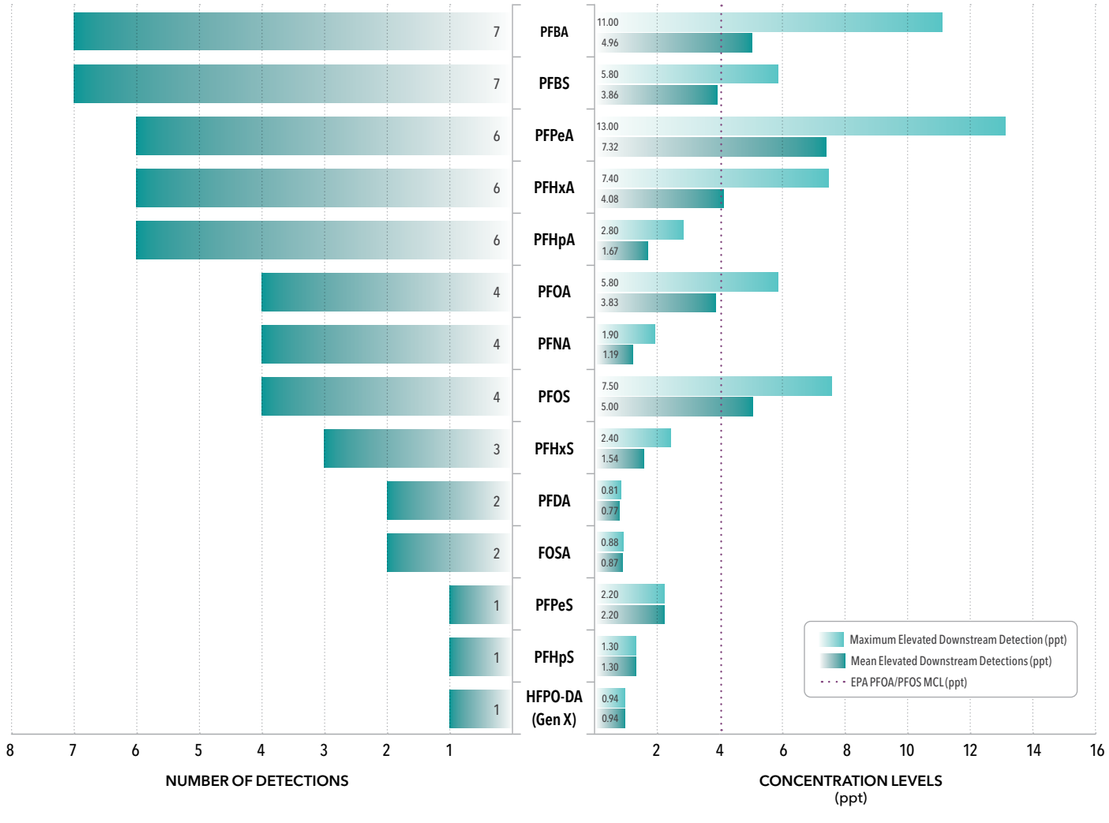
Biosolids Land Application Fields

Out of 40 types of PFAS detected by EPA Method 1633, in comparison to PFAS levels detected at upstream sampling sites, the sampling detected 14 types of PFAS at elevated levels downstream from biosolids land application sites. The most frequently detected PFAS at elevated levels downstream from biosolids land application sites include PFBA and PFBS (7 detections), PFPeA, PFHxA, and PFHpA (6 detections), and PFOA, PFNA, and PFOS (4 detections). *See Figure 5 (below).*

PFPeA was detected at elevated levels at six of the 10 biosolids land application sites, with a mean concentration of 7.32 ppt for all sites. PFBA was detected at elevated levels downstream from seven biosolids land application sites with a mean concentration of 4.96 ppt for all sites and the highest elevated concentration, 11 ppt, was found in Cane Creek below the Beltona Mine Land Reclamation Site in Alabama. *See Figure 6 (below).*

Figure 5 | Number of Elevated Downstream PFAS Detections at Biosolid Sampling Sites by Analyte

Figure 6 | Biosolids Application Fields
Maximum and Mean Concentrations of Elevated PFAS Downstream from All Sites



Specific PFAS Types

As shown in Figure 7 [WWTP Sites] and Figure 8 [Biosolids Sites], PFPeA was responsible for the greatest increases in PFAS concentrations downstream from nine WWTPs and five biosolids land application fields. PFHxA was responsible for the greatest increases in PFAS concentrations downstream from five WWTPs. Notably, these types of PFAS are neither regulated by EPA nor included in the draft HHWQC.[65] These two compounds are also not regulated as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[66] or the SDWA.[67] As for the other PFAS responsible for the greatest increases at other WWTPs, EPA has only established MCLs for PFOA, PFOS, and PFHxS and a Hazard Index value for a mixture containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS. EPA has also proposed draft HHWQC for PFOA, PFOS, and PFBS.[68]

Figure 7 | PFAS Analytes with Greatest Downstream Concentration Increase by Number of Watersheds
Upstream and Downstream Comparison at Wastewater Treatment Plants

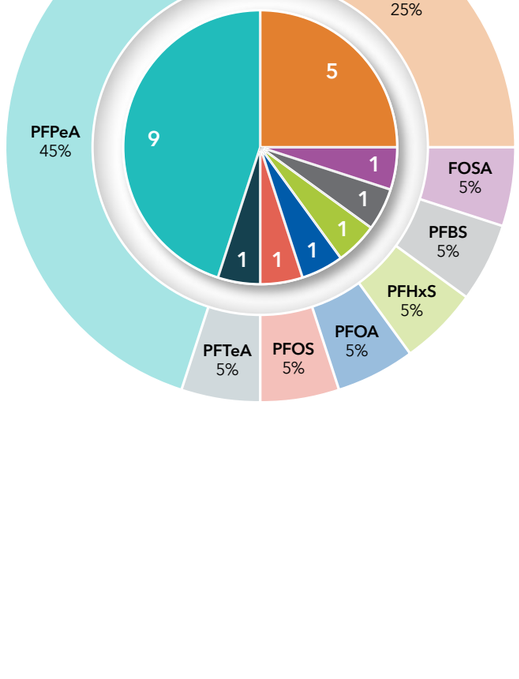


Figure 8 | PFAS Analytes with Greatest Downstream Increase in Concentration by Number of Watersheds
Upstream and Downstream Comparison at Biosolids Land Application Fields

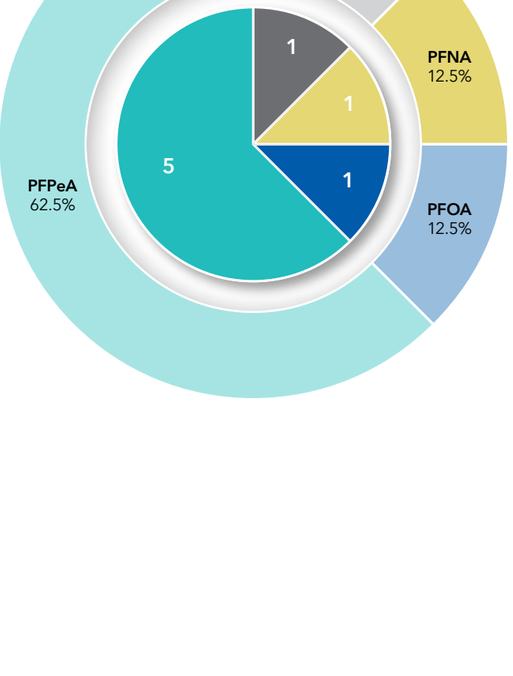


Table 8 | PFAS Analytes with Greatest Concentration Increase in Downstream WWTP Site Samples

State	Waterbody	Waterkeeper	PFAS Analyte with Greatest Increase	Amount of Increase (ppt)	Total # of PFAS Analytes Elevated
AL	Cahaba River	Cahaba Riverkeeper	PFPeA	2.7	6
	Big Wills Creek	Coosa Riverkeeper	FOSA	1.6	4
CA	Santa Ana River [Nov.]	Inland Empire Waterkeeper	PFPeA	31	2
	Los Angeles River	LA Waterkeeper	PFPeA	8	5
CT	Naugatuck River	Long Island Soundkeeper	PFHxA	1.8	7
FL	East Canal	Tampa Bay Waterkeeper	No Upstream Sample		
GA	Chattahoochee River	Chattahoochee Riverkeeper	PFTeA	4.1	9
MD	Monocacy River	Potomac Riverkeeper	PFPeA	17.8	8
MI	Rouge River	Detroit Riverkeeper	PFOA	40.2	5
MS	Pearl River	Pearl Riverkeeper	No Upstream Sample		
NC	Cape Fear River	Cape Fear Riverkeeper	PFOS	2	9
	Haw River	Haw Riverkeeper	PFPeA	22	14
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	PFHxS	3.5	5
OR	Tualatin River	Tualatin Riverkeepers	PFHxA	7.1	9
RI	Pawtuxet River ©	Narragansett Bay Riverkeeper	PFPeA	0.2	4
SC	Pocotaligo River	Black-Sampit Riverkeeper	PFHxA	39.4	13
TX	Hunting Bayou	Bayou City Waterkeeper	PFHxA	4.2	7
VA	Appomattox River	James Riverkeeper	PFPeA	0.9	5
WA	Spokane River	Spokane Riverkeeper	PFHxA	1.46	4
WI	Root River ©	Milwaukee Riverkeeper	PFPeA	12.3	10
WV	Opequon Creek	Upper Potomac Riverkeeper	PFPeA	1.4	4
	Ohio River	West Virginia Headwaters Waterkeeper	PFBS	0.1	1

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

As shown in Table 8 *(above)*, downstream from WWTPs:

CALIFORNIA

In Inland Empire Waterkeeper's watershed, PFPeA increased by 31 ppt in the Santa Ana River below the Riverside RWQCP's outfall in California.

NORTH CAROLINA

In Haw Riverkeeper's watershed, PFPeA increased by 22 ppt in the Haw River below the City of Graham WWTP's outfall in North Carolina.

SOUTH CAROLINA

In Black-Sampit Riverkeeper's watershed, PFHxA increased by 39.4 ppt in the Pocotaligo River below the Sumter Pocotaligo River Plant outfall in South Carolina.

Table 9 | PFAS Analytes with Greatest Concentration Increase in Downstream Biosolids Site Samples

State	Waterbody	Waterkeeper	PFAS Analyte wth Greatest Increase	Amount of Increase (ppt)
AL	Cane Creek ©	Cahaba Riverkeeper and Black Warrior Riverkeeper	PFPeA	11
	Whippoorwill Creek	Coosa Riverkeeper	No Increase	
MD	Monocacy River	Potomac Riverkeeper	PFNA	0.77
MS	Pearl River	Pearl Riverkeeper	PFPeA	1
NC	South River ©	Cape Fear Riverkeeper	PFPeA	4.8
	Haw Creek	Haw Riverkeeper	PFBS	5.3
VA	Old Town Creek ▼	James Riverkeeper	PFOA	3.9
WA	Dragoon Creek	Spokane Riverkeeper	PFPeA	12
WI	Spring Creek	Milwaukee Riverkeeper	No Increase	
WV	Back Creek ©	Upper Potomac Riverkeeper	PFPeA	1.4

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.
▼ James Riverkeeper location has no upstream site.

As shown in Table 9 *(left)*, downstream from biosolids land application fields:

ALABAMA

In Black Warrior Riverkeeper's watershed, PFPeA increased by 11 ppt in the Cane Creek below the Jefferson County Commission WWTPs' biosolids application site in Alabama.

WASHINGTON

In Spokane Riverkeeper's watershed, PFPeA increased by 12 ppt in the Dragoon Creek below the Spokane Riverside Park WRF's biosolids application fields in Washington.

Total PFAS Concentrations

The data collected in this project demonstrates that it is imperative for PFAS to be regulated as a class, as opposed to solely as individual chemicals, in order to effectively control widespread exposure and address the risks posed by combined exposures to multiple PFAS chemicals in U.S. surface waters.[69] Regulating PFAS on a compound-by-compound basis has left thousands of PFAS chemicals completely unregulated. As our data demonstrate, multiple types of PFAS often co-occur at a single location and unregulated PFAS are often present at high concentrations. The presence of multiple types of PFAS heightens human exposure risk since PFAS mixtures may have additive and synergistic effects."[70]

Moreover, the harmful effects of PFAS exposure may be "more related to total PFAS levels, rather than individual PFAS compounds."[71]

In this project, the most frequently detected PFAS in upstream and downstream samples tended to co-occur at multiple locations leading to high overall exposure to total PFAS at those locations. For example, as shown in Figure 9 *(p. 32),* PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, and PFOS were detected in 40 or more samples near WWTPs. In 32 samples, the sampling detected PFOS, PFHxA, PFOA, PFHxS, PFBS, PFPeA, PFHpA, PFBA, and PFNA (often as well as other PFAS) at that single location. See Appendix A.

Figure 9 | PFAS Types Detected Upstream and Downstream from WWTPs

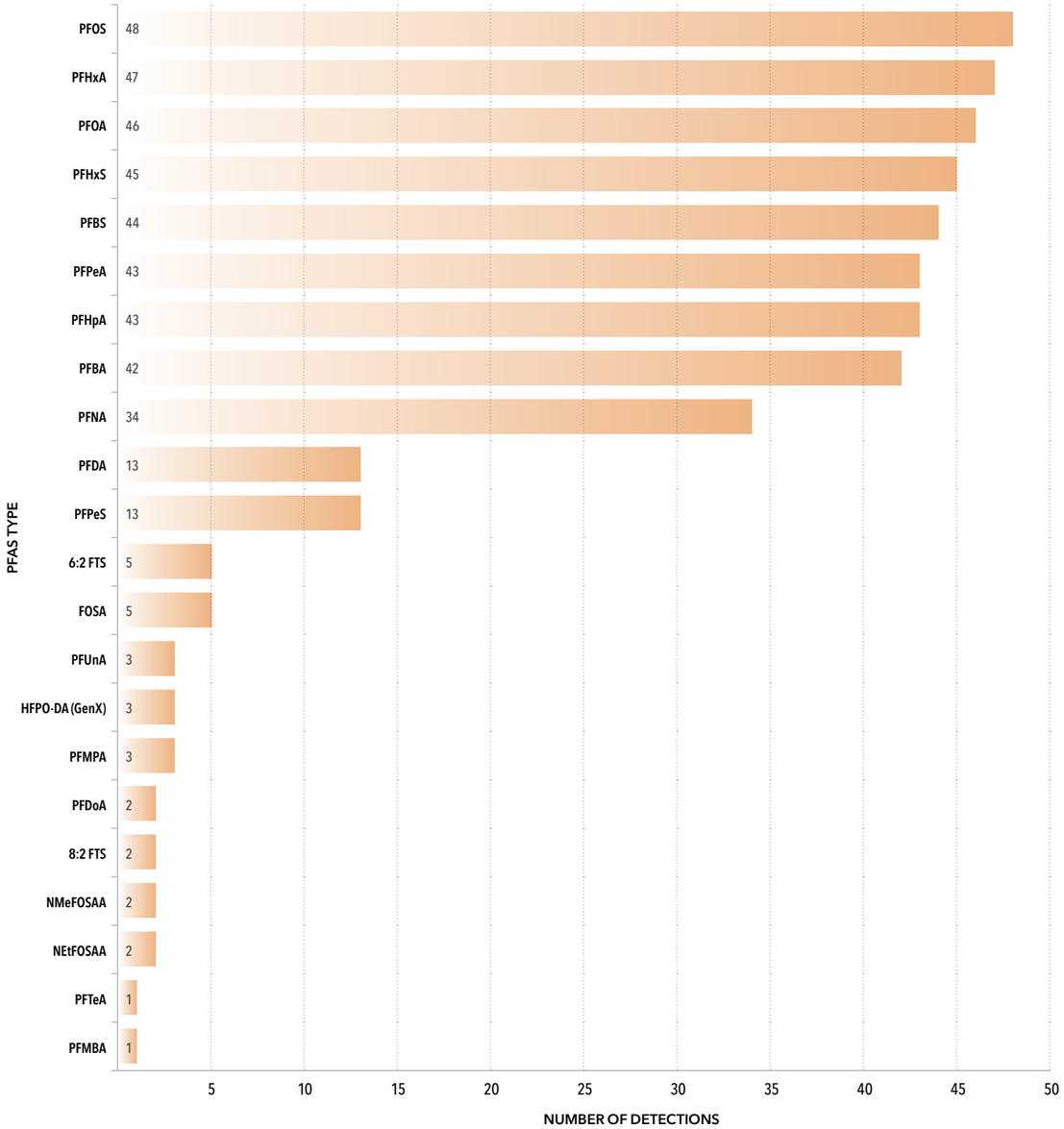
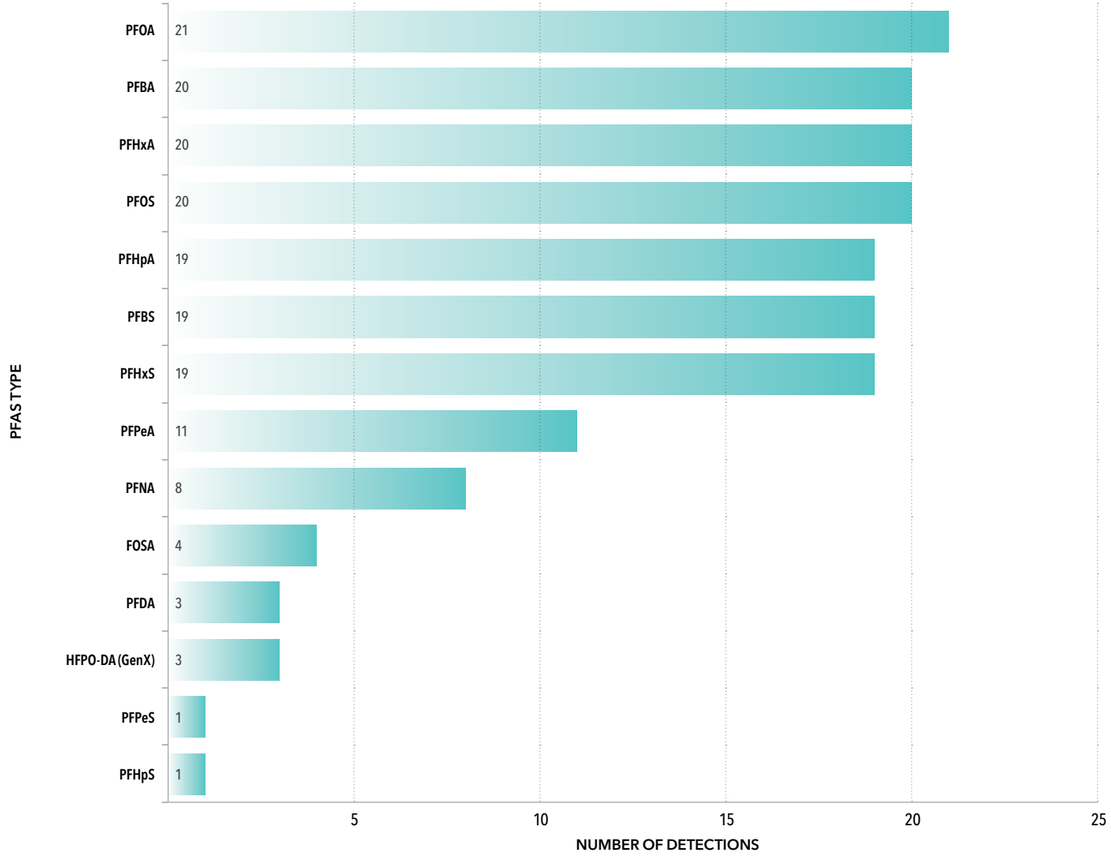


Figure 10 | PFAS Types Detected Upstream and Downstream from Biosolids Land Application Fields



Similarly, near biosolids land application sites, as shown in Figure 10 *(above)*, the most frequently detected PFAS include PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS, occurring in 19 or more samples. In 16 samples, the sampling detected PFOA, PFBA, PFHxA, PFOS, PFHpA, PFBS, and PFHxS (often as well as other PFAS) at that single location. See Appendix A.

By contrast, PFUnA, PFDoA, PFTeA, 8:2 FTS, NMeFOSAA, NEtFOSAA, HFPO-DA (Gen-X), PFMBA, and PFMPA were detected at 3 or fewer sampling sites near WWTPs, and PFDA, PFPeS, PFHpS, and HFPO-DA (Gen-X) were detected in 3 or fewer samples near biosolids land application sites.

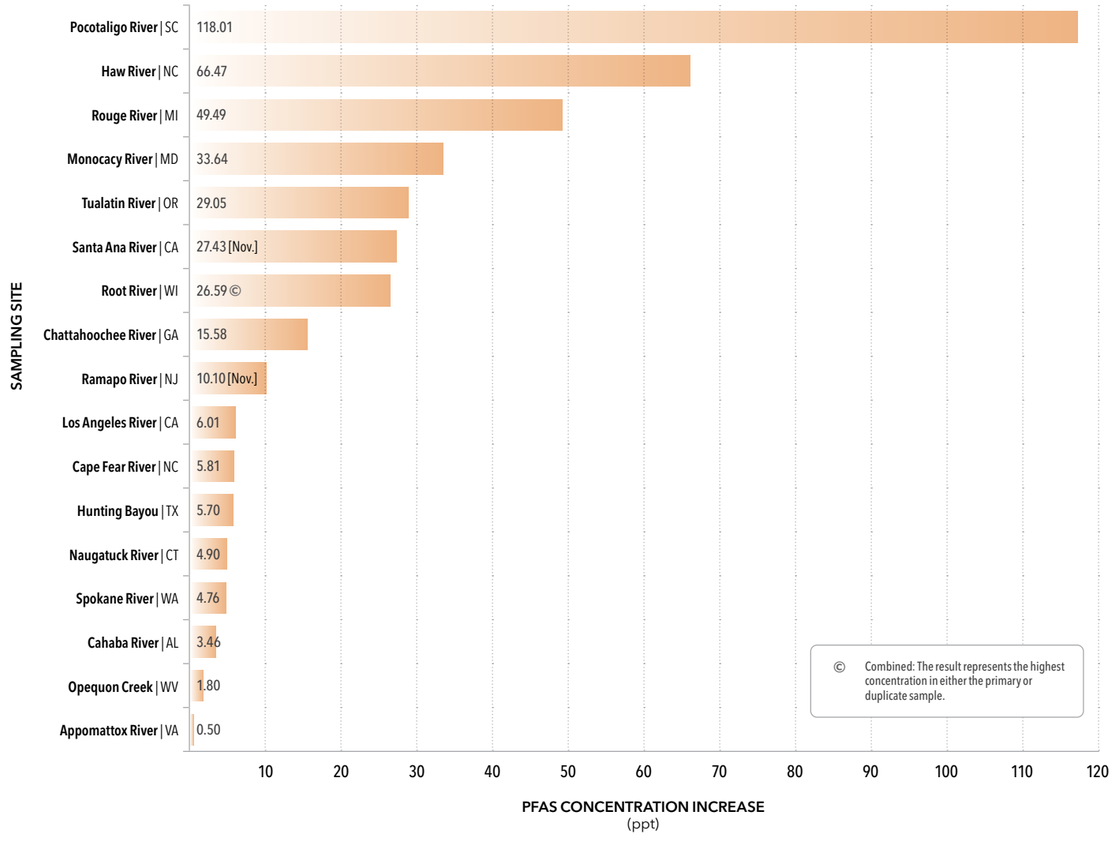
Additionally, as shown in Tables 10 *(p. 34)* and Table 11 *(p. 36)*, as a result of the presence of multiple PFAS chemicals, the total PFAS concentration downstream from 17 WWTPs and six biosolids land application sites increased, sometimes very significantly, above total upstream PFAS concentrations. Significant total PFAS concentrations were also detected at the downstream sites for two WWTPs and one biosolids land application field that did not have upstream sampling sites.

Table 10 | Total PFAS Concentrations Upstream and Downstream from WWTPs

State	Waterbody	Waterkeeper	Total PFAS (ppt)		Increase or Decrease (ppt)	Percent Increase or Decrease
			Upstream	Downstream		
AL	Cahaba River	Cahaba Riverkeeper	38.07	41.53	3.46	9.09%
	Big Wills Creek	Coosa Riverkeeper	15.04	12.71	-2.33	-15.49%
CA	Santa Ana River [Nov.]	Inland Empire Waterkeeper	89.70	117.13	27.43	30.58%
	Los Angeles River	LA Waterkeeper	69.79	75.80	6.01	8.61%
CT	Naugatuck River	Long Island Soundkeeper	41.60	46.50	4.90	11.78%
FL	East Canal	Tampa Bay Waterkeeper	No Sample	58.91		
GA	Chattahoochee River	Chattahoochee Riverkeeper	17.52	33.10	15.58	88.93%
MD	Monocacy River	Potomac Riverkeeper	26.28	59.92	33.64	128.01%
MI	Rouge River	Detroit Riverkeeper	33.71	83.20	49.49	146.81%
MS	Pearl River	Pearl Riverkeeper	No Sample	20.71		
NC	Haw River	Haw Riverkeeper	78.07	144.54	66.47	85.14%
	Cape Fear River	Cape Fear Riverkeeper	51.93	57.74	5.81	11.19%
NY/NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	22.10	32.20	10.10	45.70%
OR	Tualatin River	Tualatin Riverkeepers	0.97	30.02	29.05	2994.85%
RI	Pawtuxet River ©	Narragansett Bay Riverkeeper	39.40	39.00	-0.40	-1.02%
SC	Pocotaligo River	Black-Sampit Riverkeeper	110.38	228.39	118.01	106.91%
TX	Hunting Bayou	Bayou City Waterkeeper	57.77	63.47	5.70	9.87%
VA	Appomattox River	James Riverkeeper	21.11	21.61	0.50	2.37%
WA	Spokane River	Spokane Riverkeeper	1.24	6.00	4.76	383.87%
WI	Root River ©	Milwaukee Riverkeeper	29.44	56.03	26.59	90.32%
WV	Opequon Creek	Upper Potomac Riverkeeper	45.10	46.90	1.80	3.99%
	Ohio River	West Virginia Headwaters Waterkeeper	21.95	18.86	-3.09	-14.08%

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Figure 11 | Amount of Total PFAS Increase Downstream from WWTPs



As shown in Table 10 *(p. 34)* and Figure 11 *(above)*, at WWTPs:

MICHIGAN

The Rouge River's total PFAS concentration increased from 33.71 ppt upstream to 83.20 ppt downstream from the GLWA WRRF—an increase of 49.49 ppt or 146.81%.

OREGON

The Tualatin River's total PFAS concentration increased from 0.97 ppt upstream to 30.02 ppt immediately downstream from the Rock Creek WRRF—an increase of 29.05 ppt or 2,994.85%.

SOUTH CAROLINA

The Pocotaligo River's total PFAS concentration increased from 110.38 ppt upstream to 228.39 ppt downstream from the Sumter Pocotalio River Plant—an increase of 118.01 ppt or 106.91%.

NORTH CAROLINA

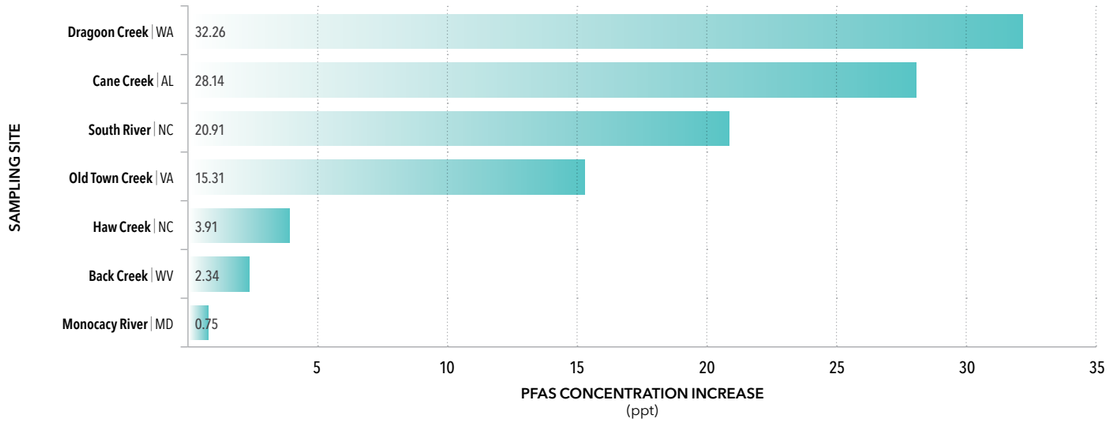
The Haw River's total PFAS concentration increased from 78.07 ppt upstream to 144.54 ppt downstream from the Graham WWTP—an increase of 66.47 ppt or 85.14%.

Table 11 | Total PFAS Concentrations Upstream and Downstream from Biosolids Land Application Fields

State	Waterbody	Waterkeeper	Total PFAS (ppt)		Increase or Decrease (ppt)	Percent Increase or Decrease
			Upstream	Downstream		
AL	Cane Creek ©	Cahaba Riverkeeper	15.04	43.18	28.14	187.10%
	Whippoorwill Creek	Coosa Riverkeeper	14.02	2.27	-11.75	-83.81%
MD	Monocacy River	Potomac Riverkeeper	27.27	28.02	0.75	2.75%
MS	Pearl River	Pearl Riverkeeper	32.67	30.78	-1.89	-5.79%
NC	South River ©	Cape Fear Riverkeeper	20.99	41.90	20.91	99.62%
	Haw Creek	Haw Riverkeeper	102.60	106.51	3.91	3.81%
VA	Old Town Creek	James Riverkeeper	No Sample	15.31		
WA	Dragoon Creek	Spokane Riverkeeper	0.63	32.89	32.26	5120.63%
WI	Spring Creek	Milwaukee Riverkeeper	1.10	0	-1.10	-100.00%
WV	Back Creek ©	Upper Potomac Riverkeeper	15.26	17.60	2.34	15.33%

© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Figure 12 | Amount of Total PFAS Increase Downstream from Biosolids Land Application Fields



As shown in Table 11 and Figure 12 *(above)*, downstream from biosolids land application sites:

ALABAMA

Cane Creek's total PFAS concentration increased from 15.04 ppt upstream to 43.18 ppt downstream from Jefferson County Commission WWTPs' biosolids application site—an increase of 28.14 ppt or 187.10%.

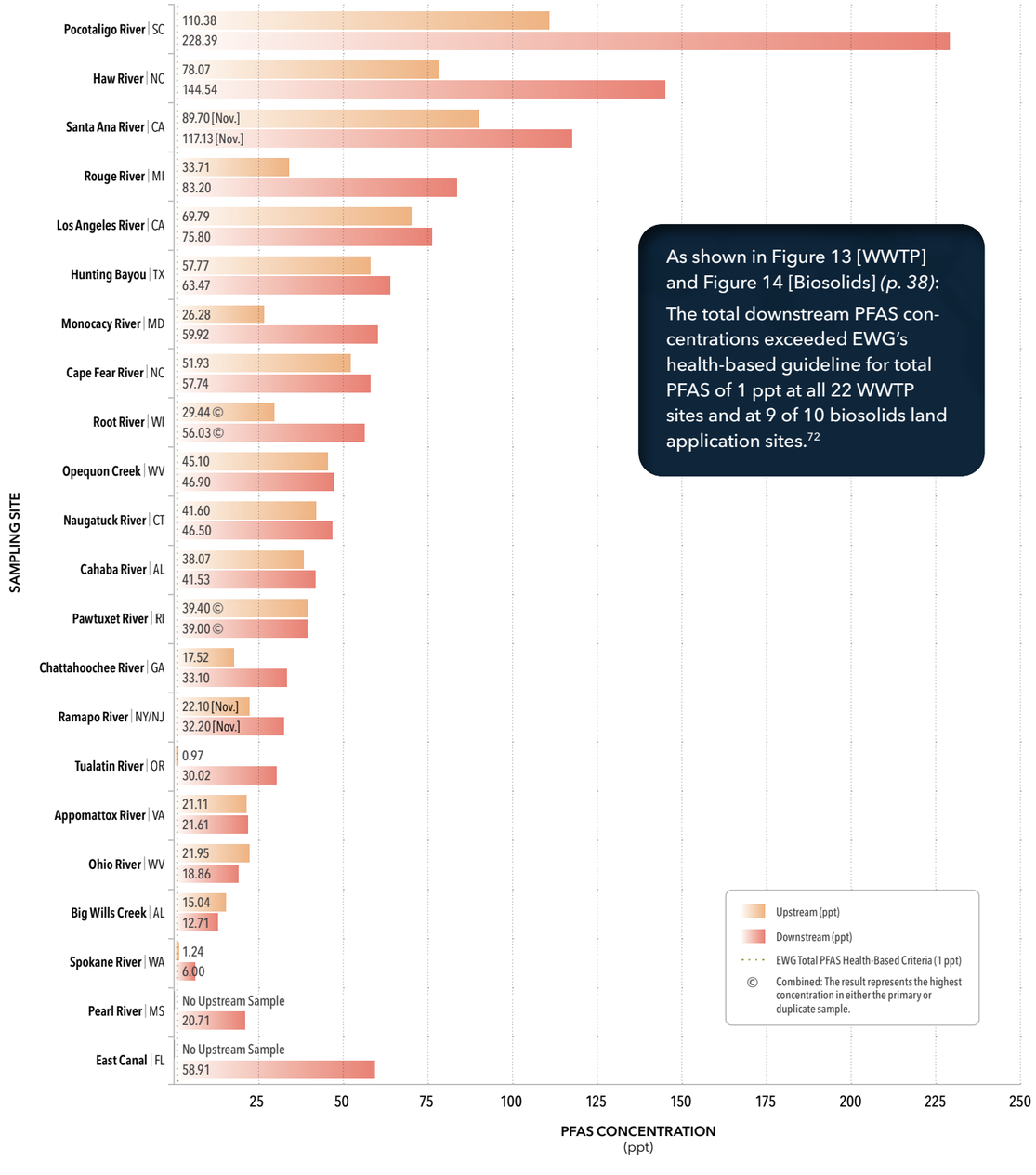
NORTH CAROLINA

South River's total PFAS concentration increased from 20.99 ppt upstream to 41.9 ppt downstream from Fayetteville Cross Creek WRF's biosolids application fields—an increase of 20.91 ppt or 99.62%.

WASHINGTON

Dragoon Creek's total PFAS concentration increased from 0.63 ppt upstream to 32.89 ppt immediately downstream from Spokane Riverside Park WRF's biosolids land application fields—an increase of 32.26 ppt or 5,120.63%.

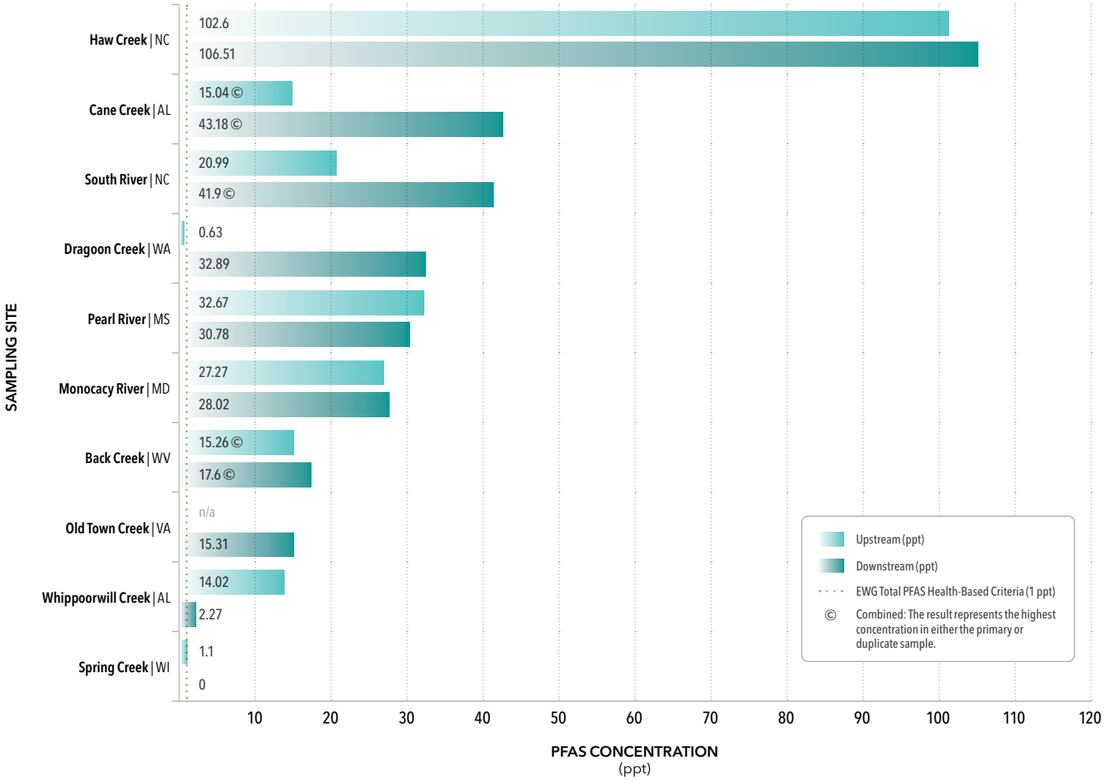
Figure 13 | Total PFAS Concentrations Upstream and Downstream from WWTPs



As shown in Figure 13 [WWTP] and Figure 14 [Biosolids] *(p. 38)*:

The total downstream PFAS concentrations exceeded EWG's health-based guideline for total PFAS of 1 ppt at all 22 WWTP sites and at 9 of 10 biosolids land application sites.[72]

Figure 14 | Total PFAS Upstream and Downstream from Biosolids Application Sites



PFAS Criteria

While there is no safe level of PFAS in drinking water, there are a limited number of state and/or federal health-based criteria applicable to water for some PFAS. EWG has developed health-based criteria applicable to water for most PFAS[73] that can also be utilized to evaluate the levels of PFAS we detected in this sampling project. *See Table 12 (p. 39).*

EPA has finalized MCLs under the federal SDWA[74] for only five PFAS–PFOA, PFOS, PFNA, PFHxS, and HFPO-DA (Gen-X)–and a Hazard Index for mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS.[75] EPA has also published draft HHWQC under the Clean Water Act for PFOA, PFOS, and PFBS that apply to surface waters and "reflect the latest available scientific information including final human health toxicity values, draft bioaccumulation factors, draft relative source contributions, and updated drinking water ingestion rates."[76] Additionally, some states have adopted criteria for certain types of PFAS in surface waters. *See Table 12 (p. 39).*

The sampling data we collected detected elevated PFAS concentrations downstream from the WWTPs and biosolids land application sites that often exceeded SDWA MCLs for PFOA, PFOS, and/or PFHxS, and draft HHWQC (Water + Organism) for PFOA and PFOS and/or EWG's guidelines for multiple PFAS. *See Tables 13–15 (pp. 42–44).*

Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFBA	1000	EWG	Health Guideline	
	1800	CT	DW Action Level	
PFPeA	1000	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFHxA	1000	EWG	Health Guideline	
	240	CT	DW Action Level	
	400,000	MI	MCL	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFHpA	1000	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFOA	0.09	EWG	Health Guideline	
	4	EPA	MCL	
	0.0009	EPA	SW HH Water + Organism	
	0.007	CA	Public Health Goal	
	16	CT	DW Action Level	
	500	FL	HH SW Screening Level	
	8	MI	MCL	
	66	MI	SW Noncancer (DW)	
	10	NY	MCL	
	6.7	NY	Ambient WQ for HH (DW)	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	10	WA	DW Action Level	
	70	WI	MCL	Alone or +PFOS
	20	WI	SW Quality (DW)	
PFNA	0.006	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	12	CT	DW Action Level	
	6	MI	MCL	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	9	WA	DW Action Level	
PFDA	0.006	EWG	Health Guideline	
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
PFUnA	0.006	EWG	Health Guideline	
PFDoA	0.006	EWG	Health Guideline	
PFTrDA	0.006	EWG	Health Guideline	
PFTeA	0.006	EWG	Health Guideline	

Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFBS	2000	EWG	Health Guideline	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	400	EPA	SW HH Water + Organism	
	500	CA	Health Notification Level	
	760	CT	DW Action Level	
	420	MI	MCL	
	345	WA	DW Action Level	
PFPeS	1	EWG	Health Guideline	
PFHxS	0.001	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	3	CA	Health Notification Level	
	49	CT	DW Action Level	
	140	MD	DW Health Advisory Level	
	51	MI	MCL	
	59	MI	SW Noncancer (DW)	
	30	OR	DW Health Advisory Level	=> Sum of 4 PFAS
	1	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	65	WA	DW Action Level	
PFHpS	0.001	EWG	Health Guideline	
PFOS	0.3	EWG	Health Guideline	
	4	EPA	MCL	
	0.06	EPA	SW HH Water + Organism	
	1	CA	Public Health Goal	
	10	CT	DW Action Level	
	10	FL	HH SW Screening Level	
	16	MI	MCL	
	11	MI	SW Noncancer (DW)	
	10	NY	MCL	
	2.7	NY	Ambient WQ for HH (DW)	
	30	OR	DW Level	=> Sum of 4 PFAS
	70	RI	SW Quality Action Level	=> Sum of 8 PFAS
	20	RI	MCL	
	15	WA	DW Action Level	
	70	WI	MCL	Alone or +PFOS
	8	WI	SW Quality (All Waters)	

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Table 12 | State, Federal, and EWG PFAS Criteria Applicable to Sampled Watersheds[77]

PFAS Analyte	Value (ppt)	Source[78]	Type	Note[79]
PFNS	1	EWG	Health Guideline	
PFDS	0.001	EWG	Health Guideline	
PFDoS	1	EWG	Health Guideline	
FOSA	0.3	EWG	Health Guideline	
NMeFOSAA	1	EWG	Health Guideline	
NEtFOSAA	1	EWG	Health Guideline	
4:2 FTS	1	EWG	Health Guideline	
6:2 FTS	1	EWG	Health Guideline	
8:2 FTS	1	EWG	Health Guideline	
NEtFOSA	1	EWG	Health Guideline	
NMeFOSA	1	EWG	Health Guideline	
NMeFOSE	1	EWG	Health Guideline	
NEtFOSE	1	EWG	Health Guideline	
9Cl-PF3ONS	1	EWG	Health Guideline	
	2	CT	DW Action Level	
GenX	9	EWG	Health Guideline	
	10	EPA	MCL	
	n/a	EPA	Hazard Index of 1 (unitless)	PFHxS, PFNA, HFPO-DA, and PFBS
	19	CT	DW Action Level	
	370	MI	MCL	
11Cl-PF3OUdS	1	EWG	Health Guideline	
	5	CT	DW Action Level	
ADONA	1	EWG	Health Guideline	
3:3 FTCA				
5:3 FTCA				
7:3 FTCA				
NFDHA				
PFMBA	1	EWG	Health Guideline	
PFMPA	1	EWG	Health Guideline	
PFEESA		EWG	Health Guideline	

Table 13 | Exceedances of MCLs in Elevated Samples Downstream from WWTPs and Biosolids Land Application Sites

State	Waterbody	Waterkeeper	Analyte Amounts(ppt)			EPA MCL		
			PFOA	PFOS	PFHxS	PFOA	PFOS	PFHxS
Wastewater Treatment Sites								
AL	Cahaba River	Cahaba Riverkeeper	4.90			4	4	10
CA	Santa Ana River [Aug.] ▾	Inland Empire Waterkeeper	13.00	12.00		4	4	10
CT	Naugatuck River	Long Island Soundkeeper		8.30		4	4	10
FL	East Canal ▾	Tampa Bay Waterkeeper	7.10	11.00		4	4	10
MD	Monocacy River	Potomac Riverkeeper	6.80			4	4	10
MI	Rouge River	Detroit Riverkeeper	44.00		16.00	4	4	10
NC	Cape Fear River	Cape Fear Riverkeeper	8.30	13.00		4	4	10
	Haw River	Haw Riverkeeper	10.00	23.00		4	4	10
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	6.70	4.70		4	4	10
SC	Pocotaligo River	Black-Sampit Riverkeeper	28.00	30.00		4	4	10
TX	Hunting Bayou	Bayou City Waterkeeper	4.00	12.00		4	4	10
WI	Root River ©	Milwaukee Riverkeeper	8.00	5.00		4	4	10
WV	Opequon Creek	Upper Potomac Riverkeeper	4.10			4	4	10
Biosolids Application Sites								
AL	Cane Creek ©	Cahaba Riverkeeper Black Warrior Riverkeeper	4.10	5.80		4	4	10
NC	South River ©	Cape Fear Riverkeeper	5.80	7.50		4	4	10

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Samples upstream from WWTPs and biosolids land application fields also frequently exceeded these criteria. For example, the concentration of PFOS (11 ppt) and PFHxS (15 ppt) exceeded the MCL upstream from the Riverside RWQCP in the Santa Ana River (CA) [Nov.] and the concentration of PFOA (32 ppt) and PFOS (36 ppt) exceeded the MCL upstream from the Graham WWTP biosolids land application site in Haw Creek (NC). See Appendix A.

However, except where otherwise noted, the evaluation in Table 13 *(above)* and Table 14 *(p. 43)* only assesses downstream results where the downstream concentration exceeded the upstream concentration. These results are particularly concerning given the fact that the values are equilibrium concentrations that are more reflective of bioavailability, toxicity, and risk.

Table 14 | Exceedances of EPA HHWQC (Water + Organism) in Elevated Samples Downstream from WWTP and Biosolids Sites

State	Waterbody	Waterkeeper	PFOA Amounts (ppt)			PFOS Amounts (ppt)		
			Sample Results	EPA Criteria	Excess Amount	Sample Results	EPA Criteria	Excess Amount
Wastewater Treatment Sites								
AL	Cahaba River	Cahaba Riverkeeper	4.90	0.0009	4.8991			
	Big Wills Creek	Coosa Riverkeeper	2.20	0.0009	2.1991			
CA	Santa Ana River [Aug.] ▾	Inland Empire Waterkeeper	13.00	0.0009	12.9991	12.00	0.06	11.94
CT	Naugatuck River	Long Island Soundkeeper				8.30	0.06	8.24
FL	East Canal ▾	Tampa Bay Waterkeeper	7.10	0.0009	7.0991	11.00	0.06	10.94
GA	Chattahoochee River	Chattahoochee Riverkeeper	2.80	0.0009	2.7991			
MD	Monocacy River	Potomac Riverkeeper	6.80	0.0009	6.7991			
MI	Rouge River	Detroit Riverkeeper	44.00	0.0009	43.9991	3.10	0.06	3.04
MS	Pearl River ▾	Pearl Riverkeeper	2.90	0.0009	2.8991	3.50	0.06	3.44
NC	Cape Fear River	Cape Fear Riverkeeper	8.30	0.0009	8.2991	13.00	0.06	12.94
	Haw River	Haw Riverkeeper	10.00	0.0009	9.9991	23.00	0.06	22.94
NJ	Ramapo River [Nov.]	Hackensack Riverkeeper	6.70	0.0009	6.6991	4.70	0.06	4.64
OR	Tualatin River	Tualatin Riverkeepers	3.30	0.0009	3.2991	2.50	0.06	2.44
SC	Pocotaligo River	Black-Sampit Riverkeeper	28.00	0.0009	27.9991	30.00	0.06	29.94
TX	Hunting Bayou	Bayou City Waterkeeper	4.00	0.0009	3.9991	12.00	0.06	11.94
VA	Appomattox River	James Riverkeeper	2.60	0.0009	2.5991	2.60	0.06	2.54
WA	Spokane River	Spokane Riverkeeper	1.10	0.0009	1.0991	2.10	0.06	2.04
WI	Root River ©	Milwaukee Riverkeeper	8.00	0.0009	7.9991	5.00	0.06	4.94
WV	Opequon Creek	Upper Potomac Riverkeeper	4.10	0.0009	4.0991			
Biosolids Application Sites								
AL	Cane Creek ©	Cahaba Riverkeeper/ Black Warrior Riverkeeper	4.10	0.0009	4.0991	5.80	0.06	5.74
MS	Pearl River	Pearl Riverkeeper				3.60	0.06	3.54
NC	South River ©	Cape Fear Riverkeeper	5.80	0.0009	5.7991	7.50	0.06	7.44
VA	Old Town Creek ▾	James Riverkeeper	3.90	0.0009	3.8991	3.10	0.06	3.04
WA	Dragoon Creek	Spokane Riverkeeper	1.50	0.0009	1.4991			

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

Table 15 | Exceedances of EWG Criteria in Elevated Samples Downstream from WWTPs and Biosolids Land Application Sites

State	Waterbody	Amounts by Analyte (ppt)														
		PFOA	PFOS	PFHxS	PFNA	PFDA	FOSA	PFDoA	6:2 FTS	PFUnA	PFTeA	PFPeS	NMeFOSAA	PFMPA	PFMBA	PFHpS
EWG Criteria Amount		0.09	0.3	0.001	0.006	0.006	0.3	0.006	1.00	0.006	0.006	1.00	1.00	1.00	1.00	0.001
Wastewater Treatment Sites																
AL	Cahaba River	4.90		1.50												
	Big Wills Creek	2.20		0.64			1.60									
CA	Santa Ana River [Aug.] ▾	13.00	12.00		2.10										6.10	
	Los Angeles River					2.10										
CT	Naugatuck River		8.30	1.70												
FL	East Canal ▾	7.10	11.00	3.90	1.30											
GA	Chattahoochee River	2.80						1.20			4.10			2.10		
MD	Monocacy River	6.80		2.50			0.62									
MI	Rouge River	44.00	3.10	16.00		5.00										
MS	Pearl River ▾	2.90	3.50	1.30	0.71											
NC	Haw River	10.00	23.00	4.50	2.20	2.60		0.59	1.10	0.87						
	Cape Fear River	8.30	13.00	5.30												
NJ	Ramapo River [Nov.]	6.70	4.70	3.50												
OR	Tualatin River	3.30	2.50	0.73	0.59											
RI	Pawtuxet River ©			2.30	2.10											
SC	Pocotaligo River	28.00	30.00		2.30	2.10	1.70		22.00	0.79			1.10			
TX	Hunting Bayou	4.00	12.00		1.30	0.64										
VA	Appomattox River	2.60	2.60		0.75											
WA	Spokane River	1.10	2.10	0.80												
WI	Root River ©	8.00	5.00	2.10	1.30	0.83										
WV	Opequon Creek	4.10														
	Ohio River															
Biosolids Application Sites																
AL	Cane Creek ©	4.10	5.80		0.68											
NC	Haw Creek				1.90	0.81						2.20				1.30
	South River ©	5.80	7.50	2.40	1.40		0.86									
MD	Monocacy River				0.77											
MS	Pearl River		3.60			0.73										
VA	Old Town Creek ▾	3.90	3.10	1.50												
WA	Dragoon Creek	1.50		0.71			0.88									

Note: Only includes values that were elevated in comparison to upstream sites, except where as noted with an ▾ there was no upstream site.
© **Combined:** The result represents the highest concentration in either the primary or duplicate sample.

As shown in Table 13 *(p. 42)* and Figure 15 [WWTPs] *(p. 46)*:

1. The MCL for PFOA was exceeded at 12 downstream WWTP sites and two downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOA exceeded the MCL of 4 ppt by 24 ppt.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFOA exceeded the MCL of 4 ppt by 40 ppt.
   - ↳ In the Santa Ana River [Aug.] downstream from the Riverside RWQCP in California, PFOA exceeded the MCL of 4 ppt by 9 ppt.

2. The MCL for PFOS was exceeded at nine downstream WWTP sites and two downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOS exceeded the MCL of 4 ppt by 26 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, PFOS exceeded the MCL of 4 ppt by 19 ppt.
   - ↳ In the Cape Fear River downstream from the Fayetteville Cross Creek WRF, PFOS exceeded the MCL of 4 ppt by 9 ppt.

3. The MCL for PFHxS was exceeded at one downstream WWTP site.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFHxS exceeded the MCL of 10 ppt by 6 ppt.

As shown in Table 14 *(p. 43)* and Figure 16 [WWTPs] *(p. 47)*:

1. The draft HHWQC (Water + Organism) for PFOA was exceeded at 18 downstream WWTP sites and 4 downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOA exceeded the draft HHWQC of 0.0009 ppt by 27.9991 ppt.
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, PFOA exceeded the draft HHWQC of 0.0009 ppt by 43.9991 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, PFOA exceeded the draft HHWQC of 0.0009 ppt by 5.7991 ppt.

2. The draft HHWQC (Water + Organism) for PFOS was exceeded at 14 downstream WWTP sites and 4 downstream biosolids land application sites.
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, PFOS exceeded the draft HHWQC of 0.06 by 29.94 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, PFOS exceeded the draft HHWQC of 0.06 by 22.94 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, PFOS exceeded the draft HHWQC of 0.06 by 7.44 ppt.

Figure 15 | Exceedances of EPA PFAS MCLs Downstream from WWTP Outfalls
Includes Only Sites Where Downstream PFAS Concentrations Exceeded Upstream PFAS Concentrations ⬩

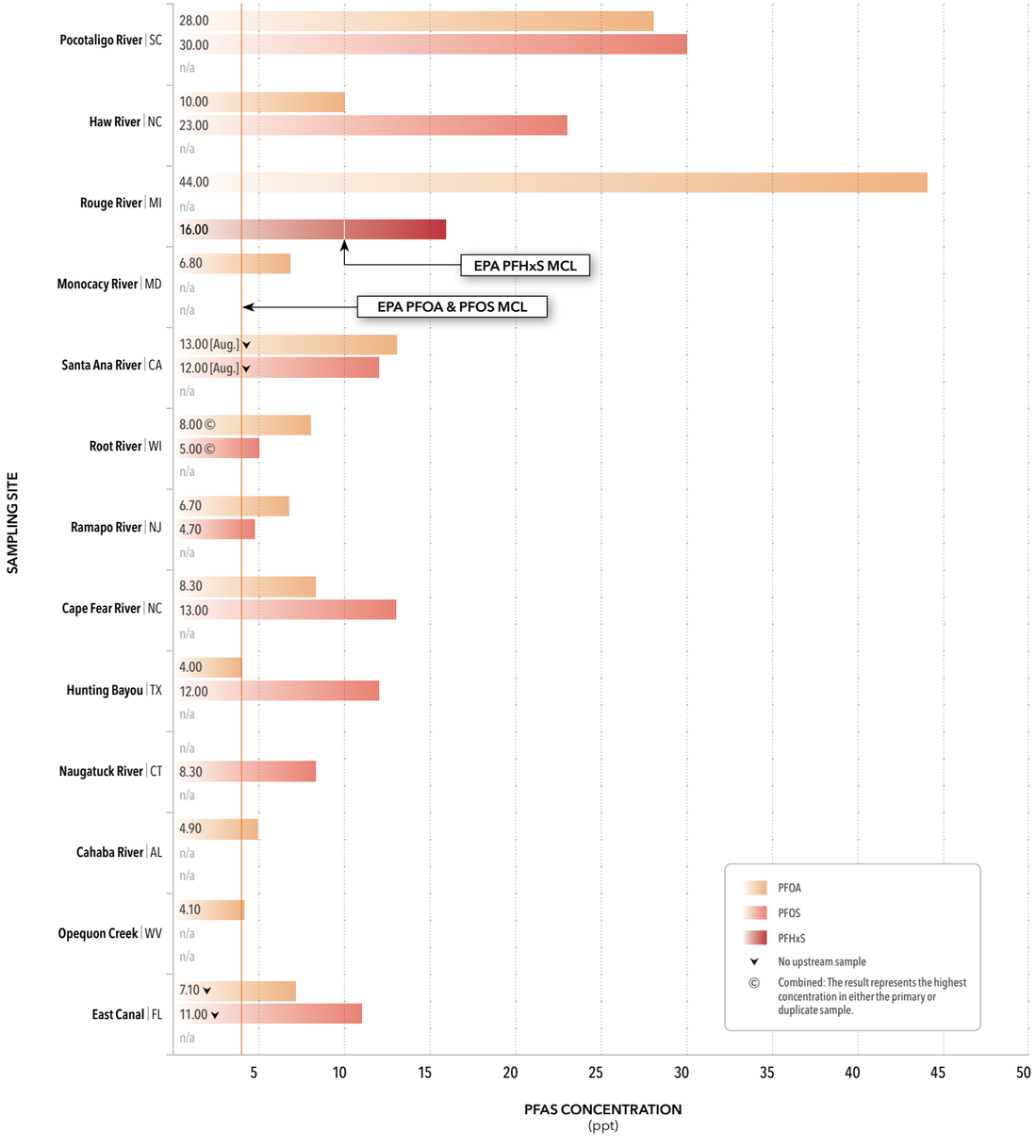
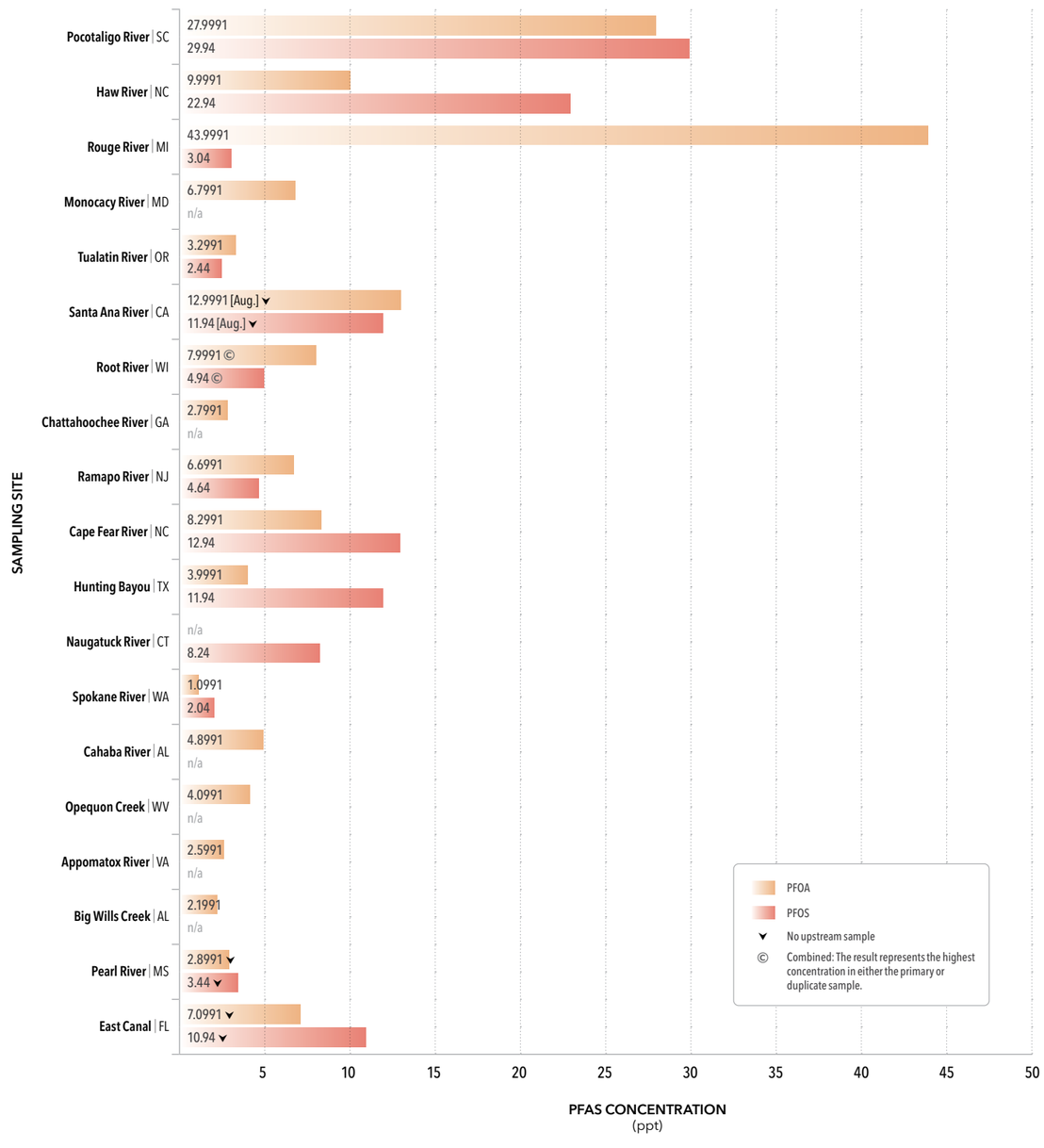


Figure 16 | Exceedances of Draft HHWQC (Water + Organism) Downstream from WWTPs
Includes Only Sites Where Downstream Concentrations Exceeded Upstream PFAS Concentrations

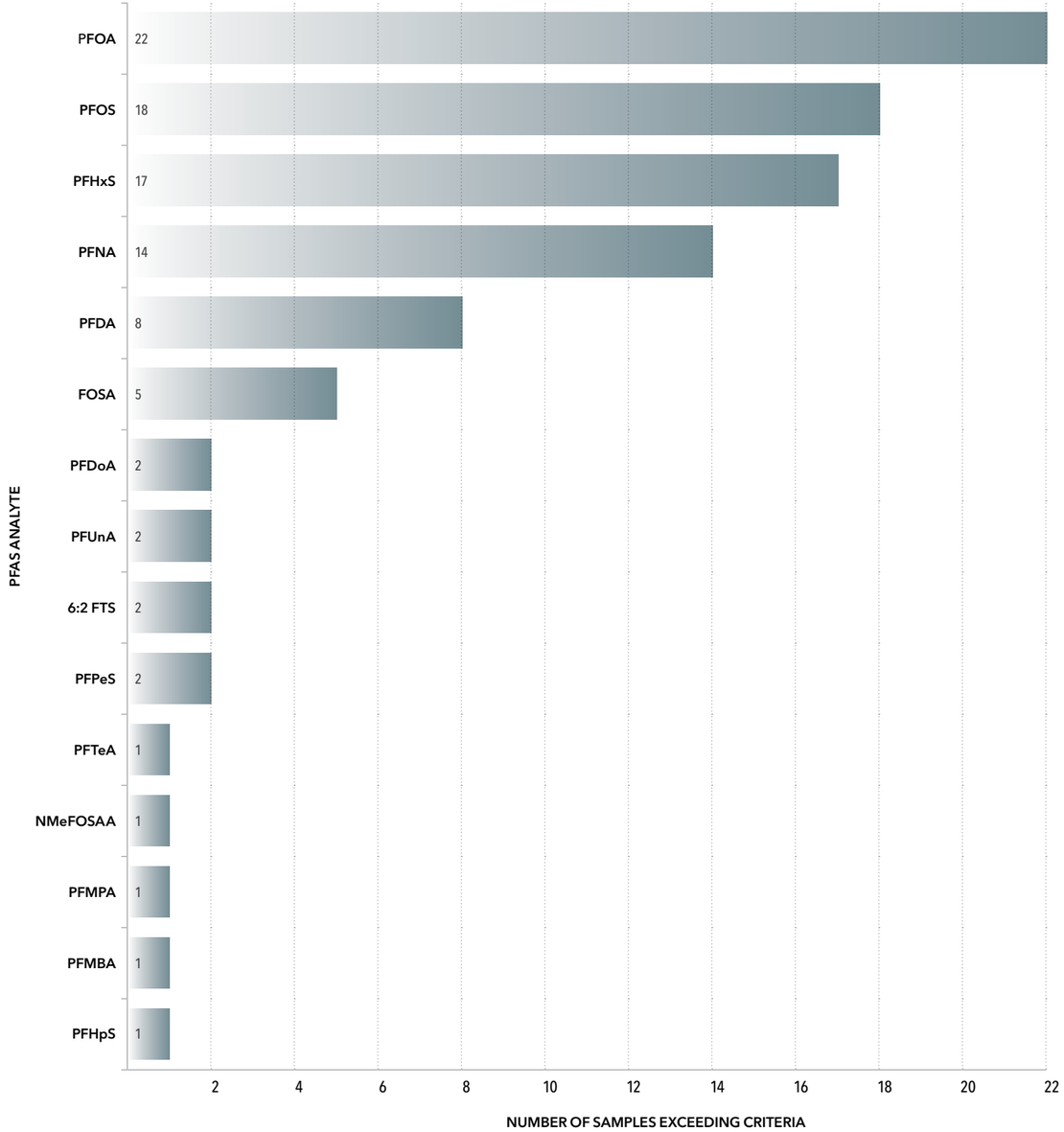


As shown in Table *15 (p. 44)* and *Figure 17 [WWTPs and Biosolids] (p. 49)*, EWG's health-based criteria were exceeded at 29 locations downstream from WWTP sites and biosolids land application sites. The PFAS types that most frequently exceeded EWG's criteria at the greatest number of elevated downstream sites were:

- PFOA (22 sites)
- PFOS (18 sites)
- PFHxS (17 sites)
- PFNA (14 sites)

1. There are no federal standards for PFDA, which is a "[b]reakdown product of stain- and grease-proof coatings on food packaging, couches, carpets."[80] It was detected at higher concentrations in sampling sites downstream from six WWTPs and two biosolids land application fields at levels that exceed EWG's health-based criteria. Based on "EPA's toxicity value published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFDA is 0.006 ppt to protect against developmental and immune harm in humans.[81]
   - ↳ In the Rouge River downstream from the GLWA WRRF in Michigan, the PFDA concentration was 5 ppt.
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, the PFDA concentration was 2.6 ppt.
   - ↳ In the Los Angeles River downstream from the LA-Glendale WRP in California, the PFDA concentration was 2.1 ppt.
   - ↳ In Haw Creek downstream from the Graham WWTP biosolids land application field in North Carolina, the PFDA concentration was 0.81 ppt.
2. There are no federal standards for FOSA, which is widely used in industrial processes.[82] It was detected at higher concentrations in sampling sites downstream from three WWTPs and two biosolids land application fields at levels that exceed EWG's health-based criteria. Based on "EPA's final toxicity value for PFOS from the Office of Water's Final Human Health Toxicity Assessment," the EWG criteria for FOSA is 0.3 ppt to protect against cardiovascular harm and harm to fetal growth in humans.[83]
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, the FOSA concentration was 1.7 ppt.
   - ↳ In Big Wills Creek downstream from the Rainbow City WWTP in Alabama, the FOSA concentration was 1.6 ppt.
   - ↳ In the Monocacy River downstream from the City of Frederick WWTP in Maryland, the FOSA concentration was 0.62 ppt.
   - ↳ In Dragoon Creek downstream from the Spokane Riverside Park WRF's biosolids land application fields in Washington, the FOSA concentration was 0.88 ppt.
   - ↳ In the South River downstream from Fayetteville Cross Creek's biosolids land application fields in North Carolina, the FOSA concentration was 0.86 ppt.

Figure 17 | Number of Elevated Downstream Samples Exceeding EWG Criteria
Downstream from Wastewater Treatment Plants and Biosolids Land Application Sites



Note: Santa Ana, CA [Aug.] and East Canal, FL did not obtain upstream samples.

3. There are no federal standards for 6:2 FTS, which is used as a replacement for PFOS in aqueous film-forming foam and in the chromium electroplating industry.[84] It was detected at higher concentrations in sampling sites downstream from two WWTPs at levels that exceed EWG's health-based criteria. "[B]ased on studies by Phillipe Grandjean of Harvard University and many other independent researchers," the EWG criteria for 6:2 FTS is 1 ppt to protect against adverse human health effects.[85]
   - ↳ In the Pocotaligo River downstream from the Sumter Pocotaligo River Plant in South Carolina, the 6:2 FTS concentration was 22 ppt.[86]
   - ↳ In the Haw River downstream from the Graham WWTP in North Carolina, the 6:2 FTS concentration was 1.1 ppt.

4. There are no federal standards for PFTeA, which is used in a wide variety of consumer products.[87] It was detected at higher concentrations in sampling sites downstream from one WWTP at levels that exceed EWG's health-based criteria. "[B]ased on EPA's recommended application of the toxicity value for PFDA published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFTeA is 0.006 ppt to protect against harm to the immune system and harm to fetal growth and child development.[88]
   - ↳ In the Chattahoochee River downstream from the City of Atlanta's R.M. Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF in Georgia, the PFTeA concentration was 4.1 ppt.

5. There are no federal standards for PFHpS, which is used in many consumer products. It was detected at higher concentrations in sampling sites downstream from one biosolids land application site at levels that exceed EWG's health-based criteria. Based on "EPA's recommended application of the PFHxS toxicity value published in the Integrated Risk Information System's toxicological review," the EWG criteria for PFHpS is 0.001 ppt to protect against cancer, endocrine disruption, accelerated puberty, liver and immune system damage, and thyroid changes.[89]
   - ↳ In Haw Creek downstream from the Graham WWTP biosolids land application field in North Carolina, the PFHpS concentration was 1.3 ppt.

6. There are no federal standards for PFMBA, which is used in many consumer products. It was detected at higher concentrations in sampling sites downstream from one WWTP at levels that exceed EWG's health-based criteria. "[B]ased on studies by Phillipe Grandjean of Harvard University and many other independent researchers," the EWG criteria for PFMBA is 1 ppt to protect against adverse human health effects.[90]
   - ↳ In the Santa Ana River [Aug.] downstream from the Riverside RWQCP in California, the concentration of PFMBA was 6.1 ppt.

EVALUATION OF FACILITIES AND WATERSHEDS

To further evaluate the contribution of PFAS to the sampled watersheds, we conducted a comparative analysis of upstream and downstream results for each of the WWTPs and biosolids land application fields, and we assessed the results in relation to the available criteria for evaluating human health risks. Additionally, we reviewed information about the facilities from publicly available sources and EJScreen data to better understand the potential sources and environmental justice implications of PFAS contamination. This information was obtained from state agencies, EPA, the facilities' webpages, public information requests, and other online resources. Statements made herein about the facilities and industrial users rely on the accuracy and completeness of these sources. While we undertook a thorough review of available, but often limited information, we make no independent representation of these facts. The results of our evaluation are set forth below. EPA EJScreen Enforcement and Compliance History Online (ECHO) and Community Reports discussed for each facility can be found in Appendix B.

Nearly all of the WWTPs evaluated in this project accept discharges into their treatment systems from industrial users. Yet, based on our review of public records, it appears the overwhelming majority of the WWTPs do not place any PFAS limits on these users. This is concerning given the fact that a significant number of these industrial users operate in sectors known for producing and/or utilizing PFAS. Based on information taken from EPA's PFAS Analytic Tools, which is a publicly available online repository of PFAS data collected by the agency, we determined that most WWTPs are likely receiving discharges from at least one permitted industrial user that is "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." Frequently, the data indicates that there may be additional unpermitted industrial users of these systems that have been identified in the database.

To effectively stem the tide of PFAS contamination in U.S. waterways, federal and state governments must prioritize regulation of the industrial sources from which it originates. Industry, which profits from the use of these toxic chemicals, must also be required to share the financial burden of cleaning up its PFAS pollution. Otherwise, WWTPs, and the communities that rely on them, will be forced to shoulder that burden alone. This is not only a matter of fairness; it also makes financial sense given that controlling PFAS at the source is significantly less costly than trying to remove it at the wastewater or drinking water utility level.[91]

EPA's own investigations have confirmed both the extent of PFAS contamination in industrial wastewater and the need for pretreatment solutions to sufficiently address the problem. In 2021, EPA studied industrial discharges of PFAS from five industrial categories, including: Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing; Metal Finishing; Pulp, Paper and Paperboard Manufacturing; Textile Mills; and Commercial Airports. The Agency found that "[f]ew facilities in these industries currently have monitoring requirements, effluent limitations, or pretreatment standards for PFAS in their wastewater discharge permits."[92] It then "identified available wastewater treatment technologies, such as activated carbon, ion exchange, and membrane filtration, that may reduce PFAS in wastewater discharges from facilities in these industrial point source categories."[93] Pretreatment technologies such as these currently exist and have been found to be both cost-effective and successful in reducing concentrations of PFOA and PFOS.[94] Given the apparent extent of industry's contribution to PFAS pollution in WWTPs, it is imperative that federal and state governments incorporate pretreatment technologies into their strategies to protect public health in their communities.

WATERSHEDS WITH THE GREATEST DOWNSTREAM TOTAL PFAS CONCENTRATION INCREASES

We generated more detailed evaluations for watersheds where the WWTPs and biosolids land application fields had the greatest increases in total PFAS concentrations between upstream and downstream sampling sites. These evaluations are presented below by Waterkeeper group watershed.

Black-Sampit Riverkeeper, Pocotaligo River, South Carolina

Wastewater Treatment Plant Site

According to its 2017 NPDES permit application, the Sumter Pocotaligo River WWTP is a municipal wastewater treatment system that is owned and operated by the City of Sumter's Wastewater Division of the Utilities Department and serves 51,000 people. In addition, the facility handles wastewater from numerous industrial dischargers, including four permitted Significant Industrial Users and 20 permitted Categorical Industrial Users. The WWTP discharges treated wastewater into the East Branch of the Pocotaligo River at an average design flow of 15 MGD. The Pocotaligo River Watershed makes up 171,780 acres of the Upper Coastal Plain region of South Carolina. According to ECHO, Sumter is located in an area with four State EJ Indexes and six Federal EJ Indexes greater than the state's 80th percentile within one mile of the facility, including wastewater discharges at 87 (State).[95] According to the EPA EJScreen, of people living within one mile of Sumter WWTP, 65% are people of color and 42% are low income.[96]

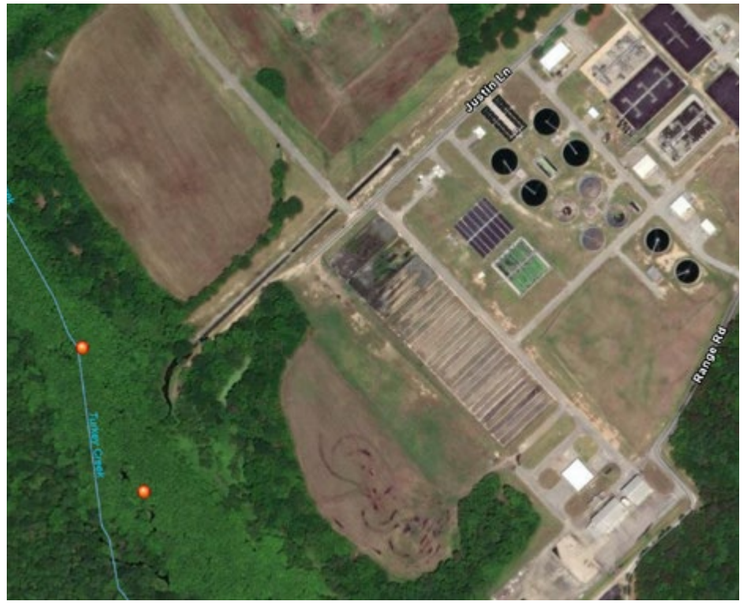
The NPDES permit for Sumter WWTP does not include any limits on the amount of PFAS the facility discharges into the Pocotaligo River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers. Of the 24 permitted industrial users discharging wastewater to Sumter Pocotaligo River WWTP, EPA's PFAS Analytic Tools[97] lists the following 11 as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Apex Tools (Metal Coating)
- Armoloy Southeast (Metal Coating)
- Continental Tire (Consumer Products)
- EMS – chemie (Plastics and Resins)
- Enersys – Sumter Metals (Metal Machinery Mfg.)
- GRR (Waste Management)
- Interlake Mecalux (Metal Machinery Mfg.)
- Metal Finishing Services, Inc. (Metal Coating)
- Metokote Corporation (Metal Coating)
- Phibro – Tech, Inc. (Chemical Mfg.)
- Santee Print Works (Textiles and Leather)

There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Sumter that operate in PFAS-related sectors, including:

- Airports
- Chemical Mfg.
- Consumer Products
- Electronics Industry
- Glass Products
- Metal Coating
- Metal Machinery Mfg.
- National Defense
- Paints and Coatings
- Plastics and Resins
- Textiles and Leathers
- Waste Management

Sumter Pocotaligo WWTP | Pocotaligo River



PFAS Phase II Sampling Site

From 2022 to 2023, as part of the state's Ambient Surface Water PFAS Project,[98] the South Carolina Department of Environmental Services tested for a series of 26 PFAS or precursor compounds in ambient surface water at locations upstream and downstream from Sumter Pocotaligo River WWTP's outfall. The results show significant increases in the average concentrations of multiple types of PFAS between the upstream monitoring location and the closest downstream monitoring location, for example:

- PFOS (12.1 ppt to 62.93 ppt)
- PFHxA (5.69 ppt to 84.67 ppt)
- PFPeA (5.29 ppt to 69.03 ppt)
- 6:2 FTS (N.D. to 53.95 ppt)

Sampling conducted by Black-Sampit Riverkeeper in December 2023 also detected significant increases in PFAS downstream from the Sumter Pocotaligo River WWTP's outfall, particularly PFPeA (<1 ppt to 110.9 ppt) and PFHxA (2 ppt to 194.7 ppt).

For Phase II, Black-Sampit Riverkeeper deployed PFASsive™ passive sampling devices upstream and downstream from the WWTP's outfall to the East Branch of the Pocotaligo River from August 23, 2024 to September 25, 2024. Both upstream and downstream sampling sites detected multiple types of regulated and unregulated PFAS.[99] However, the concentrations of multiple types of PFAS increased significantly at the downstream site, resulting in a total PFAS concentration of 228.39 ppt. With an increase of 118.01 ppt (106.91%), this site became the most contaminated location detected in this monitoring project.

For example, the concentration of PFHxA increased from 9.6 ppt to 49 ppt (410.42%), the concentration of PFPeA increased from 9.7 ppt to 38 ppt (291.75%), and the concentration of PFHpA increased from 4 ppt to 21 ppt (425%). Multiple other types of PFAS increased in downstream samples at levels ranging from 21.74% to 144.9%, including 6:2 FTS, which increased from non-detect to 22 ppt. These results are consistent with the findings of previous sampling, and indicate that the Sumter Pocotaligo River WWTP's outfall is likely a significant source of PFAS in the Pocotaligo River.

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 28 ppt, which is 24 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 30 ppt, which is 26 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream samples were also greater than the draft HHWQC (Water + Organism). Specifically, PFOA exceeded the criteria of 0.0009 ppt by 27.9991 ppt, and PFOS exceeded the 0.06 criteria by 29.94 ppt.

Table 16 | Pocotaligo River Upstream and Downstream from Sumter WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	9.60	49.00	39.40	410.42%					1000	
PFPeA	9.70	38.00	28.30	291.75%					1000	
6:2 FTS	0.00	22.00	22.00	n/a					1	21.000
PFHpA	4.00	21.00	17.00	425.00%					1000	
PFOS	22.00	30.00	8.00	36.36%	4	26.00	0.06	29.94	0.3	29.700
PFBA	4.90	12.00	7.10	144.90%					1000	
PFOA	23.00	28.00	5.00	21.74%	4	24.00	0.0009	27.9991	0.09	27.910
PFBS	3.10	5.50	2.40	77.42%			400		2000	
PFDA	0.00	2.10	2.10	n/a					0.006	2.094
FOSA	0.00	1.70	1.70	n/a					0.3	1.400
PFNA	1.50	2.30	0.80	53.33%	10				0.006	2.294
PFUnA	0.00	0.79	0.79	n/a					0.006	0.784
NMeFOSAA	0.66	1.10	0.44	66.67%					1	0.100
PFPeS	1.20	1.10	-0.10	-8.33%					1	0.100
NEtFOSAA	0.72	0.00	-0.72	-100.00%					1	
PFHxS	14.00	6.60	-7.40	-52.86%	10				0.001	6.599
HFPO-DA (GenX)	16.00	7.20	-8.80	-55.00%	10				9	
Total PFAS	110.38	228.39	118.01	106.91%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

There are no national or state Clean Water Act ambient surface water quality criteria for most PFAS detected at elevated levels, such as PFHxA, PFPeA, 6:2 FTS, PFHpA, PFBA, FOSA, PFNA, and PFUnA. However, several PFAS without federal or state standards, including PFDA, PFUnA, PFPeS, 6:2 FTS, FOSA, and NMeFOSAA, exceeded EWG's health-based criteria, as did PFNA. *See Table 16 (above).*

This evaluation indicates that Sumter Pocotaligo River WWTP is contributing a significant amount of PFAS to the Pocotaligo River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to pose significant risks to human health until pretreatment limits are imposed on industrial sources discharging into the WWTP, and a PFAS limit is included in the Sumter Pocotaligo River WWTP's NPDES permit. Implementing these measures will require the installation of advanced treatment technology and a plan to safely manage the contaminants removed during treatment.

Haw Riverkeeper, Haw River and Haw Creek, North Carolina
Wastewater Treatment Plant and Biosolids Sites

The Graham WWTP is a municipal wastewater treatment system that is owned and operated by the City of Graham that serves a population of close to 17,000 residents.[100] In addition, the facility handles wastewater from multiple industrial dischargers, including five permitted Significant Industrial Users, of which three are categorical. The WWTP discharges treated wastewater into the Haw River at an average design flow of 3.5 MGD. The Haw River, which flows 110 miles south to the Cape Fear River and joins the Jordan Lake Reservoir, spans a 1,700-square-mile watershed. The Haw River and its watershed provide drinking water to nearly one million people and supports diverse wildlife, including the endangered Cape Fear shiner.

According to ECHO, Graham WWTP is located in an area with eight State Supplemental EJ Indexes and seven Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 97 (State).[101] According to the EPA EJScreen, of people living within one mile of Graham WWTP, 35% are people of color and 27% are low income.[102] Although Graham WWTP's NPDES permit[103] requires that the facility monitor for PFAS chemicals listed in Table 1 of EPA Method 1633 twice a year, the permit does not include any limits on the amount of PFAS the facility discharges.

EPA's PFAS Analytic Tools[104] identifies seven facilities in the City of Graham that are "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." Specifically, those industry sectors include Chemical Mfg., Clean Product Mfg., Metal Coating, Paper Mills and Products, Plastics and Resins, and Waste Management. EPA's list of facilities does not include any of those that are permitted to discharge into Graham WWTP.

In 2019, North Carolina's Department of Environmental Quality (DEQ) determined that the Graham WWTP's influent was contaminated with PFAS. DEQ's sampling[105] detected the presence of 13 PFAS; three of which were detected at concentrations greater than 10 ppt: PFHxA (max. 11.8 ppt), PFPeA (max. 65.6 ppt), and PFOS (max. 12.8 ppt). That same year, Haw Riverkeeper tested water samples collected upstream and downstream of WWTPs along the Haw, including the Graham WWTP. Water samples taken from upstream and downstream of the facility outfall detected total PFAS concentrations of 33.14 ppt (upstream) and 44.75 ppt (downstream).

For this project, Haw Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from a Graham WWTP's outfall to the Haw River from August 12, 2024 to September 20, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, total PFAS concentrations increased significantly at the downstream site, rising by 66.47 ppt or 85.14%. For example, the concentration of PFPeA increased from 14 ppt to 36 ppt (157.14%), the concentration of PFDA increased from 1.2 ppt to 2.6 ppt

Graham WWTP | Haw River

PFAS Phase II Sampling Site

(116.67%), and the concentration of PFHxA increased from 13 ppt to 27 ppt (107.69%). Multiple other types of PFAS increased in downstream samples at levels ranging from 7.14% to 91.01%, including PFBS which increased from 8.9 ppt to 17 ppt. These results are consistent with the findings of previous sampling and indicate that the Graham WWTP's outfall is likely a significant source of PFAS in the Haw River.

Downstream concentrations of PFAS demonstrate that the surface water is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 10 ppt, which is 6 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 23 ppt, which is 19 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream samples were also greater than the draft HHWQC (Water + Organism). Specifically, PFOA exceeded the criteria of 0.0009 ppt by 9.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 22.94 ppt. There are no national or state CWA surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBA, PFHpA, PFDA, 6:2 FTS, PFMPA, PFUnA, PFNA, PFDoA, and PFHxS.

Additionally, numerous PFAS that do not have any federal or state regulatory standards significantly exceeded EWG's health-based criteria, including PFDA (also detected in 2019 NCDEQ Influent Sampling), PFUnA, PFDoA (also detected in 2019 NCDEQ Influent Sampling), and 6:2 FTS (also detected in 2019 NCDEQ Influent Sampling). PFNA and PFHxS also significantly exceeded EWG's health-based criteria. *See Table 17 (below).*

Table 17 | Haw River Upstream and Downstream from Graham WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	14.00	36.00	22.00	157.14%					1000	
PFHxA	13.00	27.00	14.00	107.69%					1000	
PFBS	8.90	17.00	8.10	91.01%			400		2000	
PFOS	17.00	23.00	6.00	35.29%	4	19.00	0.06	22.94	0.3	22.700
PFBA	5.10	9.20	4.10	80.39%					1000	
PFHpA	5.20	8.80	3.60	69.23%					1000	
PFOA	7.10	10.00	2.90	40.85%	4	6.00	0.0009	9.9991	0.09	9.910
PFDA	1.20	2.60	1.40	116.67%					0.006	2.594
6:2 FTS	0.00	1.10	1.10	n/a					1	0.100
PFMPA	0.00	0.88	0.88	n/a					1	
PFUnA	0.00	0.87	0.87	n/a					0.006	0.864
PFNA	1.50	2.20	0.70	46.67%	10				0.006	2.194
PFDoA	0.00	0.59	0.59	n/a					0.006	0.584
PFHxS	4.20	4.50	0.30	7.14%	10				0.001	4.499
PFPeS	0.87	0.80	-0.07	-8.05%					1	
Total PFAS	78.07	144.54	66.47	85.14%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Graham WWTP Biosolids Fields | Haw Creek

PFAS Phase II Sampling Site Biosolids Land Application Sites

In addition to directly discharging wastewater into the Haw River, Graham WWTP is permitted[106] to operate a Residuals Land Application Program to land apply biosolids at nine fields owned by the City of Graham, all of which are located in the Haw River watershed. Graham WWTP produces Class B biosolids, and in 2023, Graham WWTP generated and land-applied 151.296 dry tons of its biosolids to six of the nine land application fields—a total of 51.6 acres.[107] In 2024, Graham WWTP land-applied 217.703 dry tons of its biosolids.[108]

For this project, Haw Riverkeeper also deployed PFASsive™ passive sampling devices in the Haw Creek immediately upstream and downstream from land application sites receiving biosolids from Graham WWTP. Those sampling devices were deployed from August 12, 2024 to September 20, 2024. Both upstream and downstream sampling sites detected multiple types of regulated and unregulated PFAS. It is notable that the upstream location had very high concentrations of certain types of PFAS, including PFOA and PFOS, as well as elevated concentrations of other PFAS. The concentration of total PFAS increased at the downstream site by 3.91 ppt—an increase of 3.81%. For example, the concentration of PFBS increased from a non-detect to 5.3 ppt, and PFBA increased from a non-detect to 3.9 ppt.

Like the samples taken downstream from Graham WWTP's outfall, the PFAS concentrations downstream from Graham's land application site demonstrate that the surface water is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 29 ppt, which is 25 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 34 ppt, which is 30 ppt greater than the MCL of 4 ppt. The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded draft HHWQC (Water + Organism), indicating that concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 28.9991 ppt, and PFOS exceeded the

Table 18 | Haw Creek Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBS	0	5.3	5.3	n/a			400		2000	
PFBA	0	3.9	3.9	n/a					1000	
PFPeS	0	2.2	2.2	n/a					1	1.2
PFNA	0	1.9	1.9	n/a	10				0.006	1.894
PFHpS	0	1.3	1.3	n/a					0.001	1.299
PFDA	0	0.81	0.81	n/a					0.006	0.804
PFPeA	6.5	6.1	-0.4	-6.15%					1000	
PFHxA	9.5	8.8	-0.7	-7.37%					1000	
PFOS	36	34	-2	-5.56%	4	30	0.06	33.94	0.3	33.7
PFHxS	7.6	5.5	-2.1	-27.63%	10				0.001	5.499
PFOA	32	29	-3	-9.38%	4	25	0.0009	28.9991	0.09	28.91
PFHpA	11	7.7	-3.3	-30.00%					1000	
Total PFAS	102.6	106.51	3.91	3.81%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

0.06 ppt criteria by 33.94 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFBA, PFPeS, PFNA, PFHpS, and PFDA.

Additionally, numerous PFAS that do not have any federal or state regulatory standards significantly exceeded EWG's health-based criteria, including PFDA, PFPeS, and PFHpS. Elevated levels of PFNA also significantly exceeded EWG's health-based criteria. *See Table 18 (above).*

This evaluation indicates that Graham WWTP and its biosolids land application site in Haw Creek are contributing PFAS to the Haw River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and PFAS limits are placed in the Graham WWTP's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Detroit Riverkeeper, Rouge River, Michigan
Wastewater Treatment Plant Site

The Great Lakes Water Authority Water Resource Recovery Facility (GLWA WRRF) is a municipal wastewater treatment system that is owned and operated by the City of Detroit Board of Water Commissioners. This facility serves a population of approximately 2.8 million residents and is considered "the largest single-site treatment facility in North America."[109] GLWA WRFF accepts discharges from 234 permitted industrial users. GLWA WRRF discharges wastewater into the Rouge River and other locations.[110] The Rouge River is a tributary to the Detroit River and contributes to the Great Lakes Basin, one of the largest freshwater ecosystems, and the watershed is home to 1.35 million people in Oakland, Washtenaw, and Wayne counties.

The GLWA Wastewater Master Plan states that "[t]he permitted peak primary treatment capacity is 1,700 MGD (the largest in the nation) and the peak secondary treatment capacity is 930 MGD."[111] According to ECHO, GLWA WRRF is located in an area with 13 State Supplemental EJ Indexes and 13 Federal Supplement EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State).[112] According to the EPA EJScreen, of people living within one mile of GLWA WRRF, 59% are people of color and 65% are low income.[113]

The NPDES permit for GLWA WRRF requires quarterly monitoring and reporting of PFAS in the facility's effluent. The permit also requires that GLWA WRRF submit a Pollutant Minimization and Source Evaluation Program for Perfluorooctane Sulfonate (PFOS) and/or Perfluorooctanoic Acid (PFOA) that will "identify and address sources of [PFOS] and/or [PFOA] and to reduce and maintain the effluent concentrations of PFOS and/or PFOA at or below the water quality standards (WQS) and/or the Water Quality-Based Effluent limit (WQBEL)."[114] The 2019 permit includes a goal of meeting the water quality standard for PFOS of 11 ppt and a WQBEL for PFOA of 8,040 ppt. For comparison, the EPA and MI MCLs are 4 ppt and 8 ppt respectively for PFOA and the National Recommended Ambient Water Quality Criteria for the Protection of Human Health includes a EPA Water + Organism Human Health Criteria of 0.0009 ppt for PFOA. Beyond these requirements, however, the permit does not include any limits on the amount of PFAS the facility discharges. In terms of the facilities' industrial dischargers, GLWA WRRF has adopted a Local Limit for PFOS of 65 ppt (Daily Maximum).[115]

GLWA WRRF conducted PFAS sampling of the influent from these industrial users as part of its Pollutant Minimization and Source Evaluation Program.[116] Based on its sampling, GLWA WRRF classified 48 of these facilities as "Significant Sources" and five as "Potential Sources" of PFOS and/or PFOA.[117]

There are likely additional unpermitted industrial dischargers contributing PFAS to the WRRF given that EPA's PFAS Analytic Tools[118] identifies 217 facilities located within the City of Detroit that are "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals," including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Consumer Products
- Fire Training
- Glass Products
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Oil and Gas
- Paints and Coatings
- Paper Mills and Products
- Petroleum
- Plastics and Resins
- Printing
- Waste Management

Michigan's Department of Environment, Great Lakes, and Energy (EGLE) conducted PFAS sampling of GLWA WRRF's influent and effluent from 2018 to 2020. The results showed significant concentrations of PFOA (6.4 ppt to 12 ppt) and PFOS (5.7 ppt to 30 ppt) in the facility's effluent, and equally high concentrations in the facility's influent, including PFOA concentrations ranging from 4.64 ppt to 9.10 ppt and PFOS concentrations ranging from 7.54 ppt to 15.60 ppt.[119] Further, as part of its Pollutant Minimization and Source Evaluation Program, GLWA WRRF collected quarterly samples of its discharges during 2023 and tested

them for 28 PFAS chemicals. The results showed annual average concentrations of PFOA at 8.5 ppt (max. 11.5 ppt) and PFOS at 13.8 ppt (max. 26.5 ppt).[120] The testing also detected other PFAS chemicals in the facility's effluent, including:

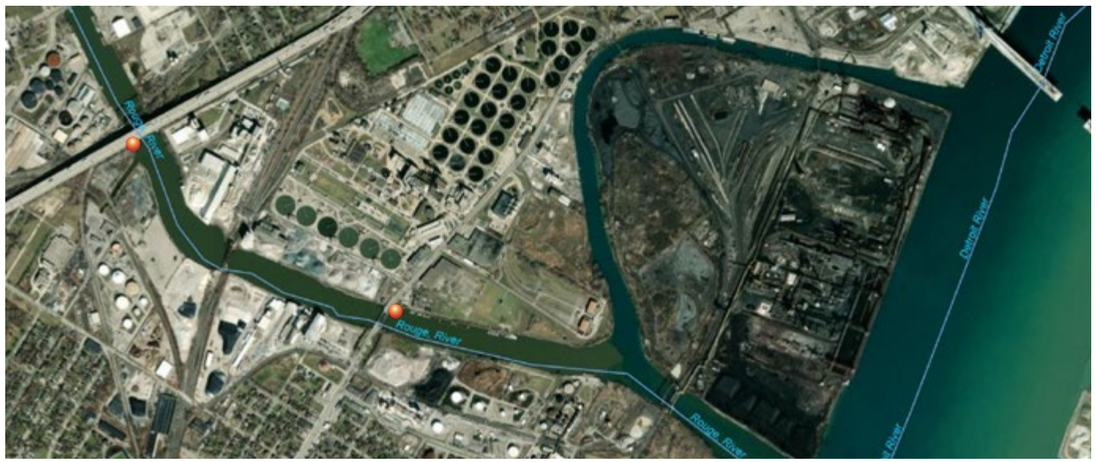
- PFBA (max. 19 ppt)
- PFPeA (max. 13 ppt)
- PFHxA (max. 23 ppt)
- PFBS (max. 26 ppt)
- PFHpA (max. 4.6 ppt)
- 6:2 FTSA (max. 8.5 ppt)
- PFHxS (max. 8.2 ppt)[121]

For this project, Detroit Riverkeeper deployed PFASsive™ passive sampling devices upstream and downstream from one of the GLWA WRRF's outfalls (Outfall 050) and the Oakwood Combined Sewer Overflow Retention Basin channel from August 8, 2024 to September 8, 2024.[122] Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of multiple types of PFAS increased significantly at the downstream site resulting in a total PFAS concentration increase of 49.49 ppt—an increase of 146.81%. For example, the concentration of PFOA increased from 3.8 ppt to 44 ppt (1,057.89%) and the concentration of PFHxS increased from 1.8 ppt to 16 ppt (788.89%). Other types of PFAS increased in downstream samples at levels ranging from 19.23% to 48.39%, including PFHxA which increased from 6.2 ppt to 9.2 ppt. These results are consistent with the findings of previous sampling and indicate that the GLWA WRRF is likely a significant source of PFAS in the Rouge River.

Downstream concentrations of PFAS demonstrate that the surface water as this location is likely unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 44 ppt, which is 40 ppt greater than the MCL of 4 ppt, and the concentration of PFHxS was 16 ppt, which is 6 ppt greater than the MCL of 10 ppt. PFOA also exceeded Michigan's MCL (16 ppt) by 36 ppt.[123]

The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 43.9991 ppt, and PFOS exceeded the 0.06 ppt criteria

GLWA WRRF | Rouge River



PFAS Phase II Sampling Site

Table 19—Rouge River Upstream and Downstream from GLWA WRRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		MI MCL (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFOA	3.80	44.00	40.20	1057.89%	4	40.00	0.0009	43.9991	0.09	43.910	8	36
PFHxS	1.80	16.00	14.20	788.89%	10	6.00			0.001	15.999	51	
PFDA	0.00	5.00	5.00	n/a					0.006	4.994		
PFHxA	6.20	9.20	3.00	48.39%					1000		400,000	
PFOS	2.60	3.10	0.50	19.23%	4		0.06	3.04	0.3	2.800	16	
PFHpA	1.60	1.60	0.00	0.00%					1000			
6:2 FTS	1.50	1.30	-0.20	-13.33%					1	0.300		
PFNA	0.61	0.00	-0.61	-100.00%	10				0.006		6	
FOSA	1.30	0.00	-1.30	-100.00%					0.3			
PFPeA	4.30	1.70	-2.60	-60.47%					1000			
PFBS	4.50	1.30	-3.20	-71.11%			400.00		2000		420	
PFBA	5.50	0.00	-5.50	-100.00%					1000			
Total PFAS	33.71	83.20	49.49	146.81%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

by 3.04 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFHxS, PFDA, and PFHxA.

Other PFAS that do not have any federal or state regulatory standards exceeded EWG's health-based criteria, including PFDA and 6:2 FTS. PFOA, PFHxS, and PFOS also exceeded EWG's health-based criteria. *See Table 19 (above).*

This evaluation indicates that GLWA WRRF appears to be contributing a significant amount of PFAS to the Rouge River and that multiple industrial dischargers are likely contributing to the WRRF's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until additional PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WRRF and more protective, mandatory permit limits are placed in the GLWA WRRF's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process. Assessment of the two outlets contributions of PFAS to the Rouge River is also warranted and may result in the need for additional controls in those areas.

Potomac Riverkeeper, Monocacy River, Maryland
Wastewater Treatment Plant and Biosolids Sites

The City of Frederick WWTP (Frederick WWTP) is a municipal wastewater treatment system that is owned and operated by the City of Frederick and serves a population of 73,000 residents.[124] In addition, the facility handles wastewater from two permitted Significant Industrial Users.[125] The Frederick WWTP discharges wastewater into the Lower Monocacy River at an average design flow of 8 MGD.[126] The Lower Monocacy Watershed covers 194,790 acres and is home to 7,626 residents. According to the EJScreen Community Report for this facility, Frederick WWTP is located in an area with two State Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 80 (State). According to the EPA EJScreen, of people living within one mile of Frederick WWTP, 37% are people of color and 15% are low income.[127]

The NPDES permit for Frederick WWTP does not include any limits on the amount of PFAS the facility discharges into the Monocacy River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers.[128] Neither of Frederick WWTPs permitted industrial users are included in EPA's PFAS Analytic Tools[129] as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals." There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Frederick that operate in related sectors, including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Electronics Industry
- Furniture and Carpet
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and Coatings
- Petroleum
- Printing
- Textiles and Leather
- Waste Management

City of Frederick WWTP | Monocacy River

PFAS Phase II Sampling Site

For this project, Potomac Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from a Frederick WWTP outfall to the Monocacy River from August 13, 2024 to September 6, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of eight types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 33.64 ppt–an increase of 128.01%. For example, the concentration of PFPeA increased from 4.2 ppt to 22 ppt (423.81%), the concentration of PFHxA increased from 3.4 ppt to 13 ppt (282.35%), and the concentration of PFHxS increased from 1.1 ppt to 2.5 ppt (127.27%). Multiple other types of PFAS increased in downstream samples at levels ranging from 18.92% to 83.78%, including PFOA which increased from 3.7 ppt to 6.8 ppt. These results indicate that the Frederick WWTP's outfall is likely a significant source of PFAS in the Monocacy River.

Downstream concentrations of PFAS demonstrate that the surface water is unsafe at this location for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 6.8 ppt, which is 2.8 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 6.7991 ppt, and PFOS exceeded the 0.06 ppt criteria by 3.04 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFHxS, PFHpA, PFBA, and FOSA.

FOSA does not have any federal or state regulatory standards but exceeded EWG's health-based criteria. PFOA, PFHxS, and PFOS also significantly exceeded EWG's health-based criteria. *See Table 20 (below).*

Frederick WWTP contracts with Synagro Central, LLC to haul and land apply the facility's biosolids. Potomac Riverkeeper conducted PFAS sampling upstream and downstream from the biosolids land application site at the Baumgartner & Zack Property, one of Synagro's land application sites, which is located in the Monocacy River watershed that is approved for biosolids application from the Frederick WWTP and other WWTPs.[130]

Samples of the Monocacy River upstream and downstream from the biosolids land application site contained PFAS.[131] However, the concentrations of multiple types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 0.75 ppt–an increase of 2.75%. For example, the concentration of PFBS increased from 3.5 ppt to 3.9 ppt (11.43%), and PFNA increased

Table 20 | Monocacy River Upstream and Downstream from Frederick WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	4.20	22.00	17.80	423.81%					1000	
PFHxA	3.40	13.00	9.60	282.35%					1000	
PFOA	3.70	6.80	3.10	83.78%	4	2.80	0.0009	6.7991	0.09	6.710
PFBS	3.60	5.00	1.40	38.89%			400		2000	
PFHxS	1.10	2.50	1.40	127.27%	10				0.001	2.499
PFHpA	1.70	2.50	0.80	47.06%					1000	
PFBA	3.70	4.40	0.70	18.92%					1000	
FOSA	0.00	0.62	0.62	n/a					0.3	0.320
PFNA	0.68	0.00	-0.68	-100.00%	10				0.006	
PFOS	4.20	3.10	-1.10	-26.19%	4		0.06	3.0400	0.3	2.800
Total PFAS	26.28	59.92	33.64	128.01%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 21 | Monocacy River Upstream and Downstream from Biosolids Land Application Fields

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		MD DW (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.9	6.2	0.30	5.08%					1000			
PFHxA	4.4	4.9	0.50	11.36%					1000			
PFHpA	2.0	2.2	0.20	10.00%					1000			
PFOA	4.6	3.7	-0.90	-19.57%	4		0.0009	3.6991	0.09	3.61		
PFNA	0.00	0.77	0.77	n/a	10				0.006	0.764		
PFBS	3.5	3.9	0.40	11.43%			400		2000			
PFHxS	0.87	0.85	-0.02	-2.30%	10				0.001	0.849	140	
PFOS	6.0	5.5	-0.50	-8.33%	4	1.50	0.06	5.44	0.3	5.20		
Total PFAS	27.27	28.02	0.75	2.75%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

from a non-detect to 0.77 ppt. Other types of PFAS increased in downstream samples at levels ranging from 5.08% to 11.36%.

The concentration of PFOS at the downstream location was 5.5 ppt, which is 1.5 ppt greater than the MCL of 4 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS concentrations also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.6991 ppt, and PFOS exceeded the draft HHWQC (Water + Organism) of 0.06 ppt by 5.44 ppt. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 21 (above).*

This evaluation indicates that Frederick WWTP is contributing PFAS to the Monocacy River and that multiple industrial dischargers to the WWTP are likely contributing to the discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and a PFAS limit is placed in the Frederick WWTP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Synagro Central, LLC Biosolids Application Field | Monocacy River

Biosolids Application Field

Tualatin Riverkeepers, Tualatin River, Oregon
Wastewater Treatment Plant Site

The Tualatin River Watershed spans 712 square miles and is home to over 600,000 Oregon residents. The Tualatin River flows approximately 83 miles from the Coast Mountain Range to the Willamette River. Fed by more than 900 miles of tributary streams, the river serves as a drinking water source for 400,000 people. The Rock Creek WRRF, which discharges into the Tualatin River, is a municipal wastewater treatment system that is owned and operated by Clean Water Services (CWS) and serves a population of approximately 326,488 residents.[132] In addition, the facility handles wastewater from numerous industrial dischargers, including five permitted Significant Industrial Users (SIUs) and 15 permitted Categorical Industrial Users (CIUs).

Clean Water Services also owns and operates three other water resource recovery facilities that receive discharges from an additional seven SIUs and 12 CIUs. Rock Creek WRRF "is designed to treat an average dry season flow of 52.7 MGD (projected for 2025 conditions and with no discharge from the Hillsboro and Forest Grove WRRFs) and a daily maximum wet weather flow of 126 MGD."[133] According to ECHO, Rock Creek WRRF is located in an area with 11 State Supplemental EJ Indexes and 11 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State).[134] According to the EPA EJScreen, of people living within one mile of Rock Creek WRRF, 45% are people of color and 17% are low income.[135]

Clean Water Services' 2022 Annual Report states that CWS monitors for PFAS at its STPs.[136] However, its NPDES permit[137] does not include any limits on the amount of PFAS the Rock Creek WRRF discharges into the Tualatin River, and there are no pretreatment limits to control PFAS discharges to the facility by industrial dischargers. Of Clean Water Services' 39 permitted industrial users, EPA's PFAS Analytic Tools[138] lists the following 11 as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

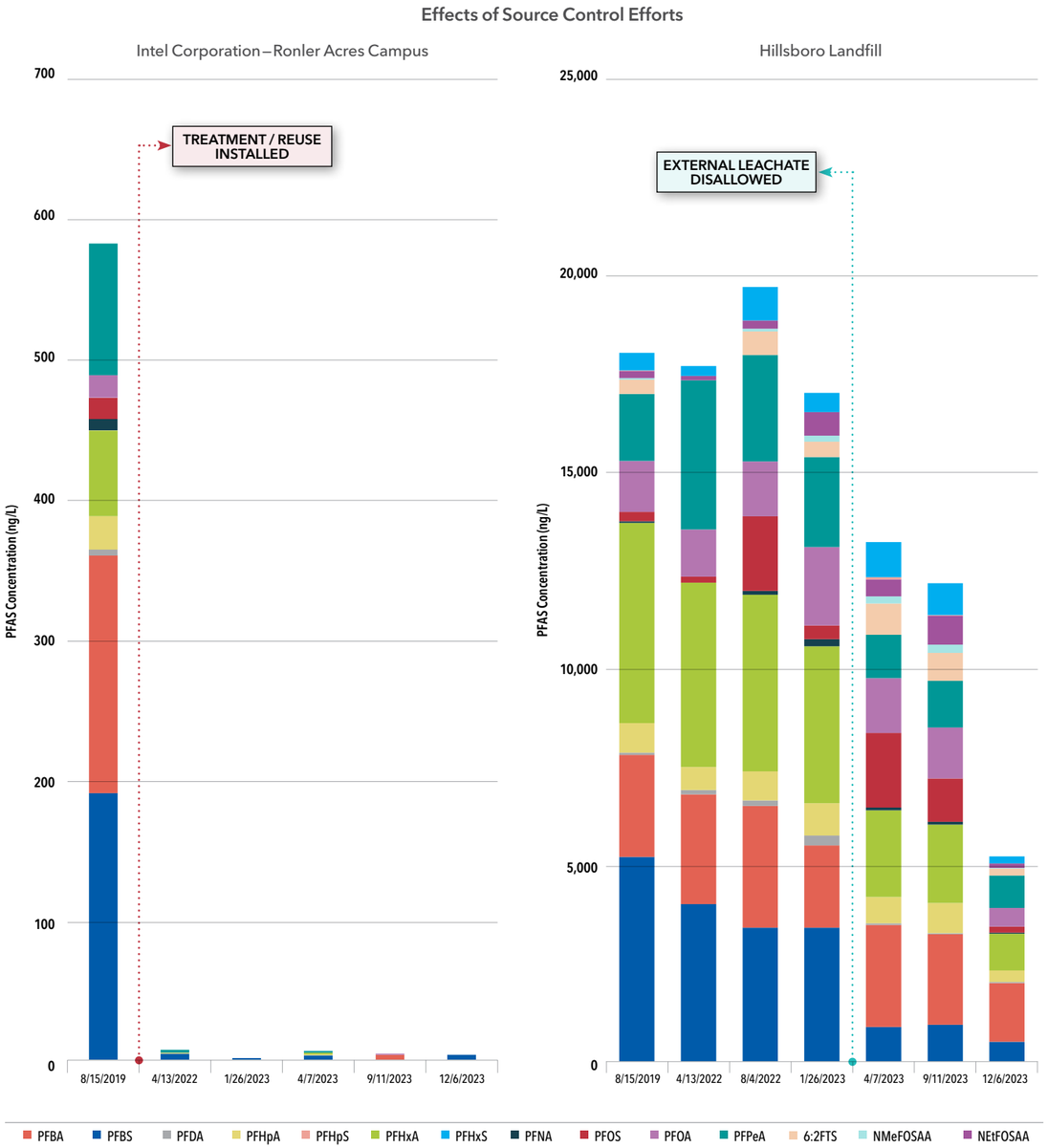
- Linde Inc. (Industrial Gas)
- TOK America (Chemical Mfg.)
- Analog Devices (formerly Maxim Integrated Products) (Electronics Industry)
- BASF Corporation (Chemical Mfg.)
- Hillsboro Landfill, Inc. (Waste Management)
- Intel Corporation – Ronler Acres Campus (Electronics Industry)
- Jireh Semiconductor, Inc. (Electronics Industry)
- KoMiCo Hillsboro, LLC (Metal Coating)
- Qorvo U.S. Inc. (Electronics Industry)
- QuantumClean (Metal Coating)
- Sumitomo Electric Semiconductor Materials, Inc. (Electronics Industry

There are likely additional unpermitted industrial dischargers contributing PFAS to the Rock Creek WRRF given that EPA's PFAS Analytic Tools identifies 51 facilities located within the City of Hillsboro that operate in related sectors, including:

- Airports
- Chemical Mfg.
- Electronics Industry
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Plastics and Resins
- Printing
- Waste Management

Of the 20 permitted industrial users discharging wastewater specifically to Rock Creek WRRF, Clean Water Services has identified Intel Corporation – Ronler Acres Campus and Hillsboro Landfill as being the major industrial sources of PFAS to Rock Creek WRRF.[139] The majority of Intel Corporation's contribution appears to have significantly decreased after 2019, while Hillsboro Landfill continues to contribute significant concentrations of multiple types of PFAS from landfill leachate to Rock Creek WRRF.

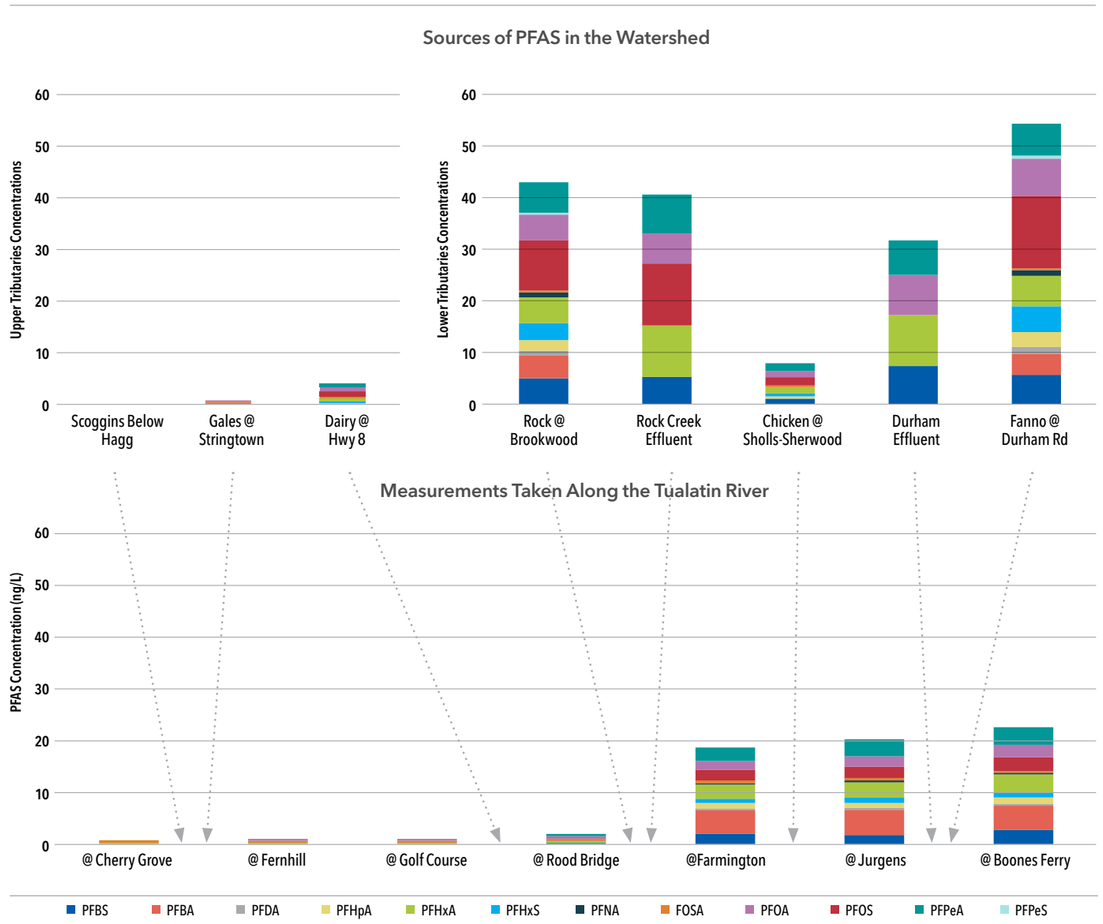
Figure 18 | Clean Water Services Advisory Commission 2024 Meeting[140]



Other than these two facilities, it is unclear how many of EPA's other listed facilities discharge into Rock Creek WRRF, rather than one of CWS' other three facilities. However, according to Clean Water Services' NPDES permit renewal application, Rock Creek WRRF may receive and treat flows from Hillsboro and Forest Grove depending on the season and whether the flows exceed the facilities' capacities.[141] Thus, Rock Creek is likely receiving, either directly or indirectly, discharges from at least some of these industrial users operating in PFAS-related sectors.

Clean Water Services has identified Rock Creek WRRF's summer discharges as a dominant source of PFAS pollution in the Tualatin River.[142] In particular, Clean Water Services has reported that Rock Creek WRRF's effluent contributes PFBS, PFHxA, PFOS, PFOA, and PFPeA to the river.

Figure 19 | Clean Water Services Advisory Commission 2024 Meeting[143]



For this project, Tualatin Riverkeepers deployed PFASsive™ passive sampling devices upstream and downstream from two Rock Creek WRRF outfalls from August 9, 2024 to September 19, 2024. The downstream sampling site detected multiple types of PFAS. However, the upstream sample only showed trace levels of PFOS at 0.97 ppt. The concentrations of multiple types of PFAS increased significantly at the downstream site resulting in a total PFAS concentration increase of 29.05 ppt—an increase of 2,994.85%. For example, the concentration of PFHxA increased from a non-detect to 7.1 ppt, the concentration of PFBA increased from a non-detect to 6.2 ppt, and the concentration of PFOS increased from 0.97 ppt to 2.5 ppt (157.73%). These results are consistent with the findings of previous sampling and indicate that the Rock Creek WRRF's outfall is likely a significant source of PFAS in the Tualatin River.

The concentrations of PFOA and PFOS in the downstream samples greatly exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.2991 ppt, and PFOS exceeded the 0.06 ppt criteria by 2.44 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to the majority of PFAS that were detected at elevated levels, including PFHxA, PFBA,

Rock Creek WRRF | Tualatin River

PFAS Phase II Sampling Site

PFPeA, PFHpA, PFHxS, and PFNA. Additionally, PFOA, PFOS, PFNA and PFHxS exceeded EWG's health guidelines. *See Table 22 (below).*

This evaluation indicates that Rock Creek WRRF is contributing PFAS to the Tualatin River and that multiple industrial dischargers are likely contributing to the WRRF's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the STP and a PFAS limit is placed in the Rock Creek WRRF's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Table 22 | Tualatin River Upstream and Downstream from Rock Creek WRRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	0.00	7.10	7.10	N/A					1000	
PFBA	0.00	6.20	6.20	N/A					1000	
PFPeA	0.00	4.40	4.40	N/A					1000	
PFBS	0.00	3.50	3.50	N/A			400		2000	
PFOA	0.00	3.30	3.30	N/A	4		0.0009	3.2991	0.09	3.210
PFHpA	0.00	1.70	1.70	N/A					1000	
PFOS	0.97	2.50	1.53	157.73%	4		0.06	2.4400	0.3	2.200
PFHxS	0.00	0.73	0.73	N/A	10				0.001	0.729
PFNA	0.00	0.59	0.59	N/A	10				0.006	0.584
Total PFAS	0.97	30.02	29.05	2994.85%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Inland Empire Waterkeeper, Santa Ana River, California
Wastewater Treatment Plant Site

The Riverside RWQCP is a municipal wastewater treatment system that is owned and operated by the City of Riverside's Department of Public Works and serves a population of more than 300,000.[144] In addition, the facility handles wastewater from numerous industrial dischargers, including 10 permitted Class I, Significant Industrial Users and two permitted Categorical Industrial Users. Riverside RWQCP discharges wastewater into the Santa Ana River at an average design flow of 46 MGD. The Santa Ana River Watershed covers 2,630 square miles across San Bernardino, Riverside, Orange, and Los Angeles Counties. According to ECHO, Riverside RWQCP is located in an area with 11 State Supplemental EJ Indexes and 13 Federal Supplement EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 97 (Federal).[145] According to the EPA EJScreen, of people living within one mile of Riverside RWQCP, 80% are people of color and 34% are low income.[146]

The NPDES permit[147] for Riverside RWQCP does not include any limits on the amount of PFAS the facility discharges into the Santa Ana River and there are no pretreatment limits to control PFAS discharges to the RWQCP by industrial dischargers. Of the 12 permitted industrial users discharging wastewater to Riverside RWQCP, EPA's PFAS Analytic Tools[148] lists one facility as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals": Von Zabern Surgical (Waste Management). There are likely additional unpermitted industrial dischargers contributing PFAS to the RWQCP given that EPA's PFAS Analytic Tools identifies 61 active facilities located within the City of Riverside that operate in PFAS-related sectors, including:

- Airports
- Cement Mfg.
- Chemical Mfg.
- Cleaning Product Mfg.
- Electronics
- Fire Protection
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and coatings
- Petroleum
- Plastics and Resins
- Printing
- Textiles and Leather
- Waste Management

Based on 2021 sampling data collected by Riverside RWQCP, the facility's influent,[149] effluent,[150] and biosolids[151] contain significant concentrations of PFAS. The PFAS detected at the highest concentrations in the facility's influent, effluent, and biosolids were PFPeS (46 ppt), PFPeA (63 ppt), and 5:3 FTCA (140 ug/kg), respectively.

For this project, Inland Empire Waterkeeper conducted two rounds of sampling. It first deployed PFASsive™ passive sampling devices immediately downstream from a Riverside RWQCP's outfall to the Santa Ana River from

Riverside RWQCP | Santa Ana River

PFAS Phase II Sampling Site

August 14, 2024 to September 11, 2024. Two months later, Inland Empire Waterkeeper conducted its second round of sampling by deploying sampling devices downstream as well as upstream of a facility outfall to the Santa Ana River from November 11, 2024 to December 18, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS.[152] However, the sampling devices deployed in November detected two PFAS that increased in concentration significantly at the downstream site resulting in a total PFAS concentration increase of 27.43 ppt—an increase of 30.58%. Specifically, the concentration of PFHxA increased from 11 ppt to 27 ppt (145.45%) and the concentration of PFPeA increased from 12 ppt to 43 ppt (258.33%).

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location in November and August was 10 ppt and 13 ppt, respectively, which are 6 ppt and 9 ppt greater than the MCL, and the concentration of PFOS was 6.8 ppt and 12 ppt, respectively, which are 2.8 ppt and 8 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream samples also greatly exceeded the draft HHWQC, indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the November downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) by 0.0009 ppt by 9.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 6.74 ppt. In the August downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) by 12.9991 ppt, and PFOS exceeded the criteria by 11.94 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA and PFHxA.

Additionally, PFOA and PFOS exceeded California's Public Health Goal of 0.007 ppt (PFOA) and 1 ppt (PFOS).[153] The November downstream sample detected PFOA and PFOS concentrations that exceeded the Public Health Goal by 9.993 ppt and 5.8 ppt, respectively, and the August downstream sample detected PFOA and PFOS concentrations that exceeded the Public Health Goal by 12.993 ppt and 11 ppt, respectively. Further, both the November and August downstream samples exceeded California's Notification Level of 3 ppt for PFHxS by 4.7 ppt.[154] Finally, numerous PFAS significantly exceeded EWG's health-based criteria, including PFDA (Aug.), PFPeS (Nov. and Aug.), and PFMBA (Aug.). PFOA (Nov. and Aug.), PFOS (Nov. and Aug.), PFNA (Nov. and Aug.) and PFHxS (Nov. and Aug.) also exceeded EWG's health-based criteria. *See Table 23 (p. 71).*

This evaluation indicates that Riverside RWQCP is contributing PFAS to the Santa Ana River and that multiple industrial dischargers to the RWQCP are likely contributing to the RWQCP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the RWQCP and a PFAS limit is placed in the Riverside RWQCP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Table 23 | Santa Ana River Upstream and Downstream from Riverside RWQCP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		CA Public Health Goal (ppt)		CA Notification Level (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
November														
PFPeA	12.00	43.00	31.00	258.33%										
PFHxA	11.00	27.00	16.00	145.45%					1000					
PFDA	0.00	0.00	0.00	0.00%					0.006					
PFMBA	0.00	0.00	0.00	0.00%					1					
PFNA	1.00	0.73	-0.27	-27.00%	10				0.006	0.724				
PFHpA	3.50	2.70	-0.80	-22.86%					1000					
PFOA	11.00	10.00	-1.00	-9.09%	4	6.00	0.0009	9.9991	0.09	9.910	0.007	9.993		
PFPeS	2.90	1.50	-1.40	-48.28%					1	0.500				
PFBA	13.00	11.00	-2.00	-15.38%					1000					
PFBS	9.30	6.70	-2.60	-27.96%			400		2000				500	
PFOS	11.00	6.80	-4.20	-38.18%	4	2.80	0.06	6.7400	0.3	6.500	1	5.800		
PFHxS	15.00	7.70	-7.30	-48.67%	10				0.001	7.699			3	4.70
Total PFAS	89.70	117.13	27.43	30.58%										
August (no upstream sampling)														
PFPeA	n/a	24.00	n/a	n/a					1000					
PFHxA	n/a	20.00	n/a	n/a					1000					
PFDA	n/a	2.20	n/a	n/a					0.006	2.194				
PFMBA	n/a	6.10	n/a	n/a					1	5.100				
PFNA	n/a	2.10	n/a	n/a	10				0.006	2.094				
PFHpA	n/a	3.60	n/a	n/a					1000					
PFOA	n/a	13.00	n/a	n/a	4	9	0.0009	12.9991	0.09	12.910	0.007	12.993		
PFPeS	n/a	1.20	n/a	n/a					1	0.200				
PFBA	n/a	12.00	n/a	n/a					1000					
PFBS	n/a	21.00	n/a	n/a			400		2000				500	
PFOS	n/a	12.00	n/a	n/a	4	8	0.06	11.9400	0.3	11.700	1	11.000		
PFHxS	n/a	7.70	n/a	n/a	10				0.001	7.699			3	4.7
Total PFAS	–	124.90	–	–										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Milwaukee Riverkeeper, Root River and Spring Creek, Wisconsin
Wastewater Treatment Plant and Biosolids Sites

The Waukesha WWTP is a municipal wastewater treatment system that is owned and operated by the City of Waukesha that serves a population of 73,000 people.[155] In addition, the facility handles wastewater from 30 permitted industrial dischargers, including six Significant Industrial Users and 18 Categorical Industrial Users. Waukesha WWTP's permit was issued in 2019, at that time, Waukesha WWTP was discharging solely to the Fox River at an annual average design flow of 14 MGD. The permit, however, incorporates Waukesha WWTP's plans to start discharging most of its effluent to the Root River sometime "[d]uring the 5-year permit term."[156] This new discharge is based on approval of the first proposed Great Lakes diversion (for a community in a straddling county) under the Great Lakes Compact. In 2023, the upgrades necessary to transfer the majority of its discharges to the Root River were completed.[157] According to the permit, these discharges are allowed an annual average design flow of 9.3 MGD.

The Root River Watershed covers 198 square miles across parts of Waukesha, Milwaukee, and Racine counties in Wisconsin. It includes 117 miles of rivers and streams, including the Root River, which originates in southern Milwaukee County, and flows southeast into Lake Michigan. According to ECHO, Waukesha WWTP is located in an area with 13 State Supplemental EJ Indexes and 10 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 98 (State).[158] According to the EPA EJScreen, of people living within one mile of Waukesha WWTP, 28% are people of color and 28% are low income.[159]

The NPDES permit[160] for Waukesha WWTP does not include any limits on the amount of PFAS the facility discharges into the Root River and there are no pretreatment limits to control PFAS discharges to the WWTP by industrial dischargers. Of the 30 permitted industrial users discharging wastewater to Waukesha WWTP, EPA's PFAS Analytic Tools[161] lists the following five as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals": Gascoigne Co. (Metal Coating), GE Medical Systems, LLC (Electronics Industry), H.O. Bostrom Co. (Metal Coating), Profile Finishing Systems, LLC (Metal Coating), and Waukesha Memorial Hospital Inc. (Airports). There are likely additional unpermitted industrial dischargers contributing PFAS to the WWTP given that EPA's PFAS Analytic Tools identifies 40 facilities located within the City of Waukesha that operate in related sectors, including:

- Airports
- Chemical Mfg.
- Clean Product Mfg.
- Electronics Industry
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Paints and Coatings
- Printing
- Textiles and Leather
- Waste Management

For this project, Milwaukee Riverkeeper deployed PFASsive™ passive sampling devices and duplicate devices immediately upstream and downstream from the Waukesha WWTP's outfall to the Root River from August 14, 2024 to September 18, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of nine types of PFAS increased at the downstream site, in both the primary and duplicate samples, resulting in a total PFAS concentration increase of 25.76 ppt—an increase of 90.26%—in the primary downstream sample, and 25.63 ppt (91.21% increase) in the duplicate downstream sample.

For example, in the primary and duplicate downstream samples, the concentration of PFPeA increased from 5.7 ppt to 18 ppt (215.79%) and 5.6 ppt to 18 ppt (221.43%), respectively. The concentration of PFOA increased in the primary and duplicate downstream samples from 4.2 ppt to 8 ppt (90.48%) and 3.9 ppt to 6.4 ppt (64.10%), respectively. Multiple other types of PFAS increased in downstream samples at levels ranging from 25% to 74.07% in the primary samples and 10.53% to 100% in the duplicate samples. These results indicate that the Waukesha WWTP's outfall is likely a significant source of PFAS in the Root River.

WATERKEEPER ALLIANCE | PFAS REPORT PHASE II
ANALYSIS AND FINDINGS

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the primary downstream location was 8 ppt, which is 4 ppt greater than the MCL, and the concentration of PFOS was 4.4 ppt, which is 0.4 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream samples also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the primary downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) Human Health Criteria of 0.0009 ppt by 7.9991 ppt, and PFOS exceeded the 0.06 ppt criteria by 4.34 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBA, PFHpA, PFHxS, and PFNA.

Waukesha WWTP Outfall | Root River

PFAS Phase II Sampling Site

Additionally, PFDA (duplicate sample) does not have any federal or state regulatory standards but exceeded EWG's health-based criteria. PFOA, PFOS, PFNA and PFHxS (primary sample) also exceeded EWG's health-based criteria. *See Table 24 (below).*

In addition to directly discharging wastewater into the Root River, Waukesha WWTP is permitted[162] to operate a Land Application Program to land apply its wastewater treatment biosolids. In its 2017 permit application,[163] Waukesha WWTP estimated that it would generate and

Table 24 | Root River Upstream and Downstream from Waukesha WWTP

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	5.70	18.00	12.30	215.79%	5.60	18.00	12.40	221.43%					1000	
PFOA	4.20	8.00	3.80	90.48%	3.90	6.40	2.50	64.10%	4	4.00	0.0009	7.9991	0.09	7.910
PFHxA	4.50	7.60	3.10	68.89%	4.70	7.10	2.40	51.06%					1000	
PFBS	2.70	4.70	2.00	74.07%	2.80	4.80	2.00	71.43%			400		2000	
PFOS	2.70	4.40	1.70	62.96%	2.50	5.00	2.50	100.00%	4	0.40	0.06	4.3400	0.3	4.100
PFBA	5.20	6.50	1.30	25.00%	5.70	6.30	0.60	10.53%					1000	
PFHpA	1.30	1.90	0.60	46.15%	1.40	1.90	0.50	35.71%					1000	
PFHxS	1.60	2.10	0.50	31.25%	1.50	2.10	0.60	40.00%	10				0.001	2.099
PFNA	0.64	1.10	0.46	71.88%	0.00	1.30	1.30	n/a	10				0.006	1.094
PFDA	0.00	0.00	0.00	0.00%	0.00	0.83	0.83	n/a					0.006	0.824
Total PFAS	28.54	54.30	25.76	90.26%	28.10	53.73	25.63	91.21%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 25 | Spring Creek Upstream and Downstream from Biosolids Land Application Site

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		WI MCL (ppt)		WI SW Quality–DW (ppt)		WI SW Quality–All Waters (ppt)	
	▲ Upstream	▼ Downstream	Change	%Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.10	0.00	-1.10	-100.00%					1000							
PFPeA	0.00	0.00	0.00	0.00%					1000							
PFHxA	0.00	0.00	0.00	0.00%					1000							
PFHpA	0.00	0.00	0.00	0.00%					1000							
PFOA	0.00	0.00	0.00	0.00%	4		0.0009		0.09		70		20			
PFNA	0.00	0.00	0.00	0.00%	10				0.006							
PFDA	0.00	0.00	0.00	0.00%					0.006							
PFBS	0.00	0.00	0.00	0.00%			400		2000							
PFPeS	0.00	0.00	0.00	0.00%					1							
PFHxS	0.00	0.00	0.00	0.00%	10				0.001							
PFHpS	0.00	0.00	0.00	0.00%					0.001							
PFOS	0.00	0.00	0.00	0.00%	4		0.06		0.3		70				8	
FOSA	0.00	0.00	0.00	0.00%					0.3							
HFPO-DA (GenX)	0.00	0.00	0.00	0.00%					9							
Total PFAS	1.1	0	-1.1	-100.00%												

Non-detect recorded as 0

land apply a total of 1,352 dry tons of Class B, anaerobically digested biosolids annually.

Milwaukee Riverkeeper conducted PFAS sampling in Spring Creek upstream and downstream from multiple land application sites near East Troy, Wisconsin, in the Fox River watershed. In 2024, these fields received roughly 374 metric tons of Waukesha WWTP's biosolids. The only PFAS detected at the sampling sites was PFBA, and it was only detected upstream of the biosolids land application fields at a concentration of 1.1 ppt. The concentration of PFBA decreased to a non-detect–a 100% decrease–at the downstream site. *See Table 25 (above).*

This evaluation indicates that Waukesha WWTP is contributing PFAS to the Root River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the river. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and a PFAS limit is placed in the Waukesha WWTP's NPDES permit, which will require installation of PFAS treatment technology and a plan to safely manage PFAS removed during the treatment process.

Spokane Riverkeeper, Spokane River and Dragoon Creek, Washington

Wastewater Treatment Plant and Biosolids Sites

The Spokane Riverside Park WRF is a municipal wastewater treatment system that is owned and operated by the City of Spokane that serves a population of approximately 255,000 residents.[164] In addition, the facility handles wastewater from numerous industrial dischargers, including six permitted Categorical Industrial Users and eight permitted Significant Industrial Users. Spokane Riverside Park WRF discharges wastewater into the Spokane River at a Maximum Month Average Design Flow of 68.1 MGD during the months of March to October, and 56.4 MGD from November to February.

The Spokane River flows 111 miles west from Lake Coeur d'Alene in Idaho into Washington State, where it empties into the Franklin D. Roosevelt Lake impoundment of the Columbia River. The Spokane Valley-Rathdrum Prairie aquifer, which sits below the watershed, is a primary source of drinking water. According to ECHO, Spokane Riverside Park WRF is located in an area with 10 State EJ Supplemental Indexes and eight Federal Supplemental Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 95 (State).[165] According to the EPA EJScreen, of people living within one mile of Spokane Riverside Park WRF, 14% are people of color and 20% are low income.[166]

The NPDES permit[167] for Spokane Riverside Park WRF does not include any limits on the amount of PFAS the facility discharges into the Spokane River and there are no pretreatment limits to control PFAS discharges to the WRF by industrial dischargers. Of the 14 permitted industrial users discharging wastewater to Spokane Riverside Park WRF, EPA's PFAS Analytic Tools[168] lists two as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals.": Spokane Metal Finishing (Metal Coating) and Fairchild Airforce Base (National Defense). The federal government has identified Fairchild Airforce Base (AFB) as one of the facilities that used aqueous film forming foam (AFFF) containing PFAS for firefighter training.[169] There are likely additional unpermitted industrial dischargers contributing PFAS to the WRF given that EPA's PFAS Analytic Tools identifies 100 facilities located within the City of Spokane that operate in related sectors, including:

- Airports
- Chemical Mfg.
- Electronics Industry
- Fire Training
- Furniture and Carpet
- Industrial Gas
- Metal Coating
- Metal Machinery Mfg.
- Mining and Refining
- National Defense
- Paints and Coatings
- Paper Mills and Products
- Petroleum
- Plastics and Resins
- Printing
- Textiles and Leathers
- Waste Management

Washington Department of Ecology's 2016 sampling study of Spokane Riverside Park WRF's effluent revealed significant concentrations of PFAS. Specifically, the Department's study detected concentration levels of total Perfluoroalkyl acids of 91.8 ppt in the spring samples and 71.4 ppt in the fall samples.[170]

For this project, Spokane Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Spokane Riverside Park WRF's outfall from August 7, 2024 to September 11, 2024. Samples of the Spokane River upstream and downstream from a Spokane Riverside Park WRF outfall contained multiple types of PFAS. However, the concentrations of four types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 4.76 ppt or 383.87%. For example, the concentration of PFHxA increased from 0.54 ppt to 2 ppt (270.37% increase).

Additional PFAS were also detected downstream at increased levels, including PFOA (1.1 ppt), PFOS (2.1 ppt), and PFHxS (0.8 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 26 (p. 76).*

Spokane Riverside Park WRF Biosolids Fields | Dragoon Creek

PFAS Phase II Sampling Site Biosolids Land Application Fields

Spokane Riverside Park WRF land applies biosolids at various locations in the Spokane River watershed. According to Spokane Riverside Park WRF's 2023 Biosolids Facility Report, the facility produced 7,168 dry tons of Class B biosolids, all of which were land-applied in-state at eight agricultural sites in amounts ranging from 1.69 tons/acre to 4.07 tons/acre. The total measured acreage of these sites was 2,613.[171]

For this project, Spokane Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from multiple Spokane Riverside Park WRF land application sites—Eichmeyer Fields 3 and 5, Ingwaldson Fields 1 and 2, and Eckhart Fields 17 and 18—all of which are located along Dragoon Creek. The devices were deployed on August 7, 2024, and retrieved on September 11, 2024. The downstream sampling site detected multiple types of PFAS. However, the upstream location only detected one type of PFAS, FOSA at 0.63 ppt.

At the downstream location, the concentrations of multiple types of PFAS increased significantly resulting in a total PFAS concentration increase of 32.26 ppt—an increase of 5,120.63%. For example, the concentration of PFPeA increased from a non-detect to 12 ppt, and the concentration of PFHxA increased from a non-detect to 7.4 ppt. These results indicate that the Spokane Riverside Park WRF's biosolids land application fields are likely a significant source of PFAS in Dragoon Creek, a tributary to the Little Spokane River.

Additionally, the concentration of PFOA in the downstream sample exceeded the draft HHWQC (Water + Organism), indicating the concentration exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Specifically, in the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 1.4991 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFHxA, PFBS, PFBA, PFHpA, and PFHxS.

FOSA—a type of PFAS that does not have any federal or state regulatory standards—exceeded EWG's health-based criteria by 0.58 ppt. PFOA and PFHxS also exceeded EWG's health-based criteria. *See Table 27 (below).*

This evaluation indicates that Spokane Riverside Park WRF biosolids sites are likely contributing a significant amount of PFAS to Dragoon Creek and that multiple industrial dischargers are likely contributing to the WRF's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WRF and PFAS limits are placed in Spokane Riverside Park WRFF's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Table 26 | Spokane River Upstream and Downstream from Spokane Riverside Park WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		WA DW Action Level (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFHxA	0.54	2.00	1.46	270.37%					1000			
PFOA	0.00	1.10	1.10	n/a	4		0.0009	1.0991	0.09	1.01	10	
PFHxS	0.00	0.80	0.80	n/a	10				0.001	0.799	65	
PFOS	0.70	2.10	1.40	200.00%	4		0.06	2.04	0.3	1.80	15	
Total PFAS	1.24	6.00	4.76	383.87%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Table 27 | Dragoon Creek Upstream and Downstream from Biosolids Sites

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	12	12.00	n/a					1000	
PFHxA	0	7.4	7.40	n/a					1000	
PFBS	0	5.8	5.80	n/a			400		2000	
PFBA	0	3.1	3.10	n/a					1000	
PFHpA	0	1.5	1.50	n/a					1000	
PFOA	0	1.5	1.50	n/a	4		0.0009	1.4991	0.09	1.41
PFHxS	0	0.71	0.71	n/a	10				0.001	0.709
FOSA	0.63	0.88	0.25	39.68%					0.3	0.58
Total PFAS	0.63	32.89	32.26	5120.63%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Cape Fear Riverkeeper, Cape Fear and South Rivers, North Carolina

Wastewater Treatment Plant and Biosolids Sites

The Cross Creek WRF is a municipal wastewater treatment system that is owned and operated by the Fayetteville Public Works Commission and serves a population of approximately 100,500 residents.[172] In addition, the facility handles wastewater from numerous industrial dischargers, including eight permitted Significant Industrial Users, two of which are Categorical Industrial Users.[173] Cross Creek WRF discharges wastewater into the Cape Fear River at a monthly average design flow of 25 MGD.

The Cape Fear River Basin, the largest in North Carolina, spans approximately 9,164 square miles, or about 16.5% of the state's total land area. Nearly one-third of North Carolina's population resides in the basin. According to ECHO, Cross Creek WRF is located in an area with 12 State Supplemental EJ Indexes and 12 Federal Supplemental EJ Indexes greater than the 80th percentile within one mile of the facility, including wastewater discharges at 99 (State and Federal).[174] According to the EPA EJScreen, of people living within one mile of Cross Creek WRF, 89% are people of color, 77% are low income, and 9.78% of households are on public assistance.[175]

The NPDES permit[176] for Cross Creek WRF does not include any limits on the amount of PFAS the facility discharges into the Cape Fear River and no pretreatment limits to limit PFAS discharges to the WRF by industrial dischargers. Of the permitted industrial users discharging wastewater to Cross Creek WRF, EPA's PFAS Analytic Tools[177] lists the following three as facilities "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Hexion Inc.—Fayetteville Facility (Plastics and Resins)
- Goodyear Tire and Rubber Co. (Consumer Products)
- Cumberland County Landfill (Waste Management)

There are likely additional unpermitted industrial dischargers contributing PFAS to the WRF given that EPA's PFAS Analytic Tools identifies 31 facilities located within the City of Fayetteville that operate in PFAS-related sectors including:

- Airports
- Chemical Mfg.
- Consumer Products
- Industrial Gas
- Metal Coating
- National Defense
- Petroleum
- Plastics and Resins
- Waste Management

In 2019, DEQ sampled Cross Creek WRF's influent for PFAS. The sampling results showed the presence of 13 PFAS; five of which were detected at concentrations greater than 20 ppt: PFBA (max. 21.3 ppt), PFHxS (max. 20.4 ppt), PFHxA (max. 35.5 ppt), PFPeA (max. 30 ppt), and PFOS (max. 28.3 ppt).[178]

For this project, Cape Fear Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Cross Creek WRF's outfall from September 5, 2024 to November 8, 2024. Samples of the Cape Fear River upstream and downstream from Cross Creek WRF were contaminated with ten types of PFAS, and nine types of PFAS were detected at increased levels at the downstream site.[179] PFAS were detected downstream at increased levels, including PFOA, PFBS, PFHxS, and PFOS. PFOA (8.3 ppt) and PFOS (13 ppt) exceeded the MCL, rendering the surface water unsafe for drinking without advanced treatment, and exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFOS, PFNA, and PFHxS also exceeded the EWG health-based criteria. *See Table 28 (p. 79).*

In addition to directly discharging wastewater into the Cape Fear River, the Fayetteville Public Works Commission is permitted to operate a Residuals Land Application Program to land apply wastewater treatment Class B residuals at various locations in the Cape Fear and Lumber River Basins.[180] According to its 2023 Annual Report, which includes annual land application data from Cross Creek and Rockfish Creek WWTPs, Fayetteville land-applied 3,651.02 dry tons of Class B residuals on 58 fields totalling 1,443.93 acres during 2023.[181] The permits for these facilities do not contain any monitoring or limits on the amount of PFAS that can be present in the land-applied residuals.

Fayetteville's 2023 Annual Report[182] also identifies the locations where the city land-applied these 3,651.02 dry tons of residuals—of which 1,940.35 dry tons were generated by Cross Creek WRF. Several of Fayetteville's sites with the greatest volumes of land application (exceeding three tons/acre) in 2023[183] are located directly adjacent to the South River, a tributary to the Cape Fear River, near Autryville, North Carolina. These fields are traversed by ditches that channel runoff, shallow groundwater, and any pollutants directly into the South River.

For this project, Cape Fear Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream of Cross Creek WRF's land application sites along the South River. These fields received 672.66 tons of residuals from Cross Creek WRF in 2023 in amounts ranging from 1.10 tons/acre to 5.07 tons/acre. The devices were deployed on August 27, 2024. The downstream device was retrieved on November 8, 2024, and the upstream device was retrieved on January 10, 2025. Cape Fear Riverkeeper also deployed a duplicate sampling device downstream of the land application site from August 27, 2024 to November 8, 2024.

Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of all detected PFAS increased at the downstream site resulting in a total PFAS concentration increase of 20.21 ppt (96.28%). For example, the concentration of PFBS increased from 2.7 ppt to 5.5 ppt (103.7%). Multiple other types of PFAS increased in downstream samples at levels ranging from 31.58% to 86.67%. These results indicate that the Cross Creek WRF's residuals land application fields in the South River watershed are likely a significant source of PFAS in the South River.

Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the concentration of PFOA at the downstream location was 5.8 ppt, which is 1.8 ppt greater than the MCL of 4 ppt, and the concentration of PFOS was 7.5 ppt, which is 3.5 ppt greater than the MCL of 4 ppt.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water +

Table 28 | Cape Fear River Upstream and Downstream from Fayetteville Cross Creek WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.00	5.40	0.40	7.41%					1000	
PFPeA	7.30	8.60	1.30	15.12%					1000	
PFHxA	5.70	6.70	1.00	14.93%					1000	
PFHpA	3.50	3.70	0.20	5.41%					1000	
PFOA	8.10	8.30	0.20	2.41%	4	4.30	0.0009	8.2991	0.09	8.21
PFNA	1.10	1.10	0.00	0.00	10				0.006	1.094
PFBS	4.20	4.70	0.50	10.64%			400		2000	
PFPeS	0.93	0.94	0.01	1.06%					1	
PFHxS	5.10	5.30	0.20	3.77%	10				0.001	5.299
PFOS	11.00	13.00	2.00	15.38%	4	9.00	0.06	12.94	0.3	12.70
Total PFAS	51.93	57.74	5.81	10.06%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Fayetteville Cross Creek Biosolids Fields | South River

PFAS Phase II Sampling Site Biosolids Land Application Fields

Organism), indicating that concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 5.7991 ppt, and PFOS exceeded the 0.06 ppt criteria by 7.44 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFBA, PFHxS, PFHpA, PFHxA, FOSA, PFNA, and HFPO-DA (Gen-X).

Additionally, FOSA—a type of PFAS that does not have any federal or state regulatory standards—exceeded EWG's health-based criteria by 0.56 ppt. PFOA, PFOS, PFNA, and PFHxS also exceeded EWG's health-based criteria. *See Table 29 (below).*

This evaluation indicates that Cross Creek WRF's land application sites are likely contributing a significant amount of PFAS to the South River and that multiple industrial dischargers are likely contributing to the WWTP's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the WWTP and PFAS limits are placed in the Cross Creek WRF's NPDES permit, which will require installation of advanced treatment technology, limits on residuals land application, and a plan to safely manage PFAS removed during the treatment process.

Table 29 | South River Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)					MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Downstream Duplicate	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	4.2	4.8	4.20	n/a					1000	
PFBA	3.9	6.7	6.2	2.80	71.79%					1000	
PFBS	2.7	5.5	5.1	2.80	103.70%			400		2000	
PFOA	3.3	5.8	5.8	2.50	75.76%	4	1.8	0.0009	5.7991	0.09	5.71
PFHxS	0	2.4	2.2	2.40	n/a	10				0.001	2.399
PFOS	5.7	7.5	6.7	1.80	31.58%	4	3.5	0.06	7.44	0.3	7.2
PFHpA	1.5	2.8	2.8	1.30	86.67%					1000	
PFHxA	2.2	3.1	3.2	0.90	40.91%					1000	
FOSA	0	0.86	0.62	0.86	n/a					0.3	0.56
PFNA	1	1.4	1.3	0.40	40.00%	10				0.006	1.394
HFPO-DA (GenX)	0.69	0.94	0.84	0.25	36.23%	10				9	
Total PFAS	20.99	41.2	39.56	20.21	96.28%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Cahaba Riverkeeper and Black Warrior Riverkeeper, Cahaba River and Cane Creek, Alabama

Wastewater Treatment Plant and Biosolids Sites

The Cahaba River WWTP is a municipal wastewater treatment system that is owned and operated by the Jefferson County Commission Environmental Services Department. This facility serves a population of 95,000 people[184] and discharges wastewater into the Cahaba River at an average design flow of 12 MGD.[185] According to ECHO, Cahaba River WWTP is located in an area with 10 State Supplemental EJ Indexes and nine Federal Supplement EJ Indexes greater than the state's 80th percentile within one mile of the facility.[186] According to the EPA EJScreen, of people living within one mile of Cahaba WRF, 65% are people of color and 34% are low income.[187]

The Jefferson County Environmental Services Department is authorized to receive discharges from numerous industrial dischargers pursuant to its Industrial Pretreatment Program, including 53 industrial facilities, of which 25 are permitted under the State Indirect Discharge (SID) program, and nine landfills.[188] Because Jefferson County Environmental Services Department's wastewater treatment and collection system consists of nine wastewater treatment plants, including Cahaba River WWTP, it is unclear whether the facility receives discharges from any of these industrial users and, if so, to what extent. Although Cahaba River WWTP's 2017 NPDES renewal application states that it is subject to an approved pretreatment program, the facility also states that it receives discharges from zero industrial users.[189]

The NPDES permit[190] for Cahaba River WWTP does not include any limits on the amount of PFAS the facility discharges into the Cahaba River, and there are no pretreatment limits to control PFAS discharges to the facility by industrial users. Of the 25 permitted industrial users discharging wastewater to the Jefferson County Environmental Services Department facilities, EPA's PFAS Analytic Tools[191] identifies the following 11 facilities as "operat[ing] in sectors that have been identified as possibly handling, using, or releasing PFAS chemicals":

- Amerex Corporation (Metal Coating and Chemical Mfg.)
- Chevron Bulk Terminal Birmingham (Petroleum)
- CRB (Plastics and Resins, and Textiles and Leather)
- Hanna Steel (Metal Coating)
- Kaiser Industries (Airports)
- Kent Corporation (Metal Machinery Mfg.)
- Max Coating (Metal Coating)
- Nutec Metal Finishing, LLC (Metal Coating)
- Precoat Metals (Metal Coating)
- Progressive Metal Finishers, Inc. (Metal Coating)
- Scholar Craft Products, Inc. (Metal Coating)

EPA also identifies these landfills (Waste Management) as handling, using, or releasing PFAS, including:

- Cedar Hill
- Big Sky Solid Waste Facility
- Eastern Area Landfill
- Green Mountain
- New Georgia Landfill
- Pine View Landfill
- Star Ridge
- Willow Ridge Landfill

In addition, 11 facilities (8 of which have separate NPDES permits) located in the Cities of Hoover, Irondale, and Vestavia Hills, areas serviced by Cahaba River WWTP, are also included on EPA's list as potential PFAS-discharging facilities including:

- TV Alabama (Airport)
- City of Hoover (Waste Management)
- Scholar Craft Products, Inc. (Metal Coating)
- United Chair Irondale Plant (Metal Coating)
- International Oil Corp. (Paints and Coatings)
- Creative Polymer Solutions, LLC (Plastics and Resins)
- Eastwood Mobile Home Village (Waste Management)
- EWTN WWTP (Waste Management)
- Irondale WWTF (Waste Management)
- Liberty Park WRRF (Waste Management)
- Cahaba River WRF (Waste Management), the facility sampled for purposes of this report

For this project, Cahaba Riverkeeper deployed PFASsive™ passive sampling devices immediately upstream and downstream from Cahaba River WWTP's outfall from August 22, 2024 to September 18, 2024. Samples taken upstream and downstream from Cahaba

Table 30 | Cahaba River Upstream and Downstream from Cahaba River WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.20	5.20	0.00	0.00					1000	
PFPeA	7.30	10.00	2.70	36.99%					1000	
PFHxA	5.40	6.40	1.00	18.52%					1000	
PFHpA	1.70	1.90	0.20	11.76%					1000	
PFOA	4.60	4.90	0.30	6.52%	4	0.90	0.0009	4.8991	0.09	4.81
PFNA	0.85	0.73	-0.12	0.14%	10				0.006	0.724
PFDA	0.52	0.00	-0.52	-100.00%					0.006	
PFBS	6.00	6.40	0.40	6.67%			400		2000	
PFHxS	1.30	1.50	0.20	15.38%	10				0.001	1.499
PFOS	5.20	4.50	-0.70	-13.46%	4	0.50	0.06	4.44	0.3	4.20
Total PFAS	38.07	41.53	3.46	9.09%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

River WWTP outfalls were contaminated with multiple types of PFAS, and six types of PFAS were detected at increased concentrations at the downstream site.[192] PFPeA increased most significantly at the downstream site from 7.3 ppt to 10 ppt (36.99%). The total PFAS concentration increased by 3.46 ppt or 9.09%. At the downstream site, PFOA (4.9 ppt) exceeded the MCL, rendering the surface water unsafe for drinking water without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism) at the downstream site, indicating the concentration exceeded the level EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Additionally, numerous PFAS significantly exceeded EWG's health-based criteria, including PFOA, PFNA, PFHxS, and PFOS. *See Table 30 (above).*

In 2024, Cahaba River WWTP generated 4,664 dry tons of biosolids. However, the facility has not produced biosolids for land application since October 2020.[193] Its current process for disposing of biosolids is to pump them, as waste activated biosolids, to the Al Seier Pump Station, where they are mixed with wastewater and sent to the Valley Creek WRF for full treatment. From Valley Creek,[194] the biosolids are authorized to be land-applied at a 241-acre mine reclamation site, called the Flat Top Land Application Site, as well as a 1,000-acre agricultural land application site, called the Beltona Land Reclamation Site. The Beltona Land Reclamation Site, which is located in the Cane Creek watershed (in Black Warrior Riverkeeper's watershed), is used to grow bermuda grass for erosion control.

For this project, Cahaba Riverkeeper and Black Warrior Riverkeeper deployed PFASsive™ passive sampling devices and duplicate sampling devices immediately upstream and downstream of the Beltona Land Reclamation Site in Cane Creek to determine its contribution of PFAS contamination to that waterway. The devices were deployed from August 20, 2024 to September 17, 2024. Both upstream and downstream sampling sites detected multiple types of PFAS. However, the concentrations of eight types of PFAS increased at the downstream sites, resulting in a total PFAS concentration increase of 28.54 ppt—an increase of 201.84%—in the primary samples,[195] and an increase of 18.12 ppt (140.47%) in the duplicate samples. PFPeA and PFBA were detected at the highest concentrations—both 11 ppt.

In the primary and duplicate samples, the concentration of PFHpA increased from 0.54 ppt to 1.7 ppt (214.81%) and a non-detect to 1.4 ppt, respectively. The concentration of PFHxA in the primary and duplicate samples increased from 1.2 ppt to 4.2 ppt (250%) and 1 ppt to 3.1 ppt (210%). Also, the concentration of PFBA in the primary and duplicate samples increased from 3.8 ppt to 11 ppt (189.47%) and 2.7 ppt to 6.4 ppt (137.04%). Multiple other types of

Beltona Land Reclamation Site | Cane Creek

PFAS Phase II Sampling Site Biosolids Land Application Fields

PFAS increased in downstream samples at levels ranging from 52.63% to 127.78% in the primary sample and 34.15% to 126.67% in the duplicate samples. These results indicate that the Cahaba River/Valley Creek WWTPs' biosolids land application site is likely a significant source of PFAS in Cane Creek, a tributary to the Locust Fork, which is a tributary to the Black Warrior River.

The concentration of regulated PFAS increased downstream from the biosolids land application field, including PFOS, PFOA, and PFNA. Downstream concentrations of PFAS demonstrate that the surface water at this location is unsafe for drinking without advanced treatment. For example, the downstream concentration of PFOA was 4.1 ppt, which is 0.1 ppt greater than the MCL, and the concentration of PFOS was 5.8 ppt, which is 1.8 ppt greater than the MCL.

The concentrations of PFOA and PFOS in the downstream sample also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 4.0991 ppt, and PFOS exceeded the 0.06 ppt criteria by 5.74 ppt. There are no national or state Clean Water Act surface water quality criteria for the protection of human health that apply to certain PFAS that were detected at elevated levels, including PFPeA, PFBA, PFHxA, PFHpA, and PFNA. However, PFOA, PFOS, PFNA, and PFHxS exceeded EWG's health-based criteria. *See Table 31 (below).*

This evaluation indicates that Cahaba River WWTP's land application site is likely contributing a significant amount of PFAS to Cane Creek and that multiple industrial dischargers to the facility are likely contributing to the WWTP's discharge of PFAS to the waterway. This pollution will likely continue to create significant risks to human health until PFAS pretreatment limits are placed on industrial sources of PFAS discharging into the facility and PFAS limits are placed in the Cahaba River WWTP's NPDES permit, which will require installation of PFAS treatment technology, limits on biosolids land application, and a plan to safely manage PFAS removed during the treatment process.

Table 31 | Cane Creek Upstream and Downstream from Biosolids Site

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFPeA	0	11	11	n/a	0	6.1	6.1	n/a					1000	
PFBA	3.8	11	7.2	189.47%	2.7	6.4	3.7	137.04%					1000	
PFHxA	1.2	4.2	3	250.00%	1	3.1	2.1	210.00%					1000	
PFOA	1.8	4.1	2.3	127.78%	1.5	3.4	1.9	126.67%	4	0.1	0.0009	4.0991	0.09	4.01
PFOS	3.8	5.8	2	52.63%	4.1	5.5	1.4	34.15%	4	1.8	0.06	5.74	0.3	5.5
PFBS	1.4	2.7	1.3	92.86%	1.4	2.5	1.1	78.57%			400		2000	
PFHpA	0.54	1.7	1.16	214.81%	0	1.4	1.4	n/a					1000	
PFNA	0	0.68	0.68	n/a	0	0.62	0.62	n/a	10				0.006	0.674
PFHxS	1.6	1.5	-0.1	-6.25%	2.2	2	-0.2	-9.09%	10				0.001	1.499
Total PFAS	14.14	42.68	28.54	201.84%	12.9	31.02	18.12	140.47%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

SAMPLING RESULTS BY WATERKEEPER GROUP WATERSHED[196]

Bayou City Waterkeeper, Hunting Bayou, Texas
Wastewater Treatment Plant Site

The Hunting Bayou watershed spans the city limits of Houston, Galena Park, and Jacinto City, with an estimated population of 75,627. The Homestead WWTP, a municipal wastewater treatment facility, serves 7,961 people and discharges treated wastewater to Hunting Bayou.[197] Within one mile of the facility, 97% of residents are people of color, and 68% are low-income. EPA has identified approximately 1,405 potential PFAS-discharging facilities within Houston.[198]

Samples taken upstream and downstream from a WWTP outfall on Hunting Bayou were contaminated with multiple types of PFAS, and seven types of PFAS were detected at increased concentrations at the downstream site. Regulated PFAS were detected downstream from the WWTP, including PFOA, PFNA, PFHxS, and PFOS.[199] While PFAS levels increased downstream from the WWTP, the difference between upstream and downstream concentrations was not significant for most PFAS with the exception of PFHxA, which increased by 4.2 ppt (61.76%). However, the total PFAS concentration increased by 5.7 ppt (9.87%).

The PFAS contamination, both upstream and downstream, has rendered the surface water unsafe for drinking without advanced treatment, with PFOS (4 ppt) at the level of the MCL and PFOS exceeding the MCL by 8 ppt. PFOS and PFOA also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. Multiple PFAS exceeded EWG's health-based criteria. *See Table 32 (below).*

Table 32 | Hunting Bayou Upstream and Downstream from Homestead WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	6.30	6.20	-0.10	-1.59%					1000	
PFPeA	8.70	9.30	0.60	6.90%					1000	
PFHxA	6.80	11.00	4.20	61.76%					1000	
PFHpA	3.70	3.40	-0.30	-8.11%					1000	
PFOA	3.70	4.00	0.30	8.11%	4		0.0009	3.9991	0.09	3.91
PFNA	1.20	1.30	0.10	8.33%	10				0.006	1.29
PFDA	0.55	0.64	0.09	16.36%					0.006	0.63
PFBS	9.40	11.00	1.60	17.02%			400		2000	
PFPeS	0.72	0.63	-0.09	-12.50%					1	
PFHxS	4.70	4.00	-0.70	-14.89%	10				0.001	4.00
PFOS	11.00	12.00	1.00	9.09%	4	8.00	0.06	11.94	0.3	11.70
6:2 FTS	1.00	0.00	-1.00	-100.00%					1	
Total PFAS	57.77	63.47	5.70	9.87%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Chattahoochee Riverkeeper, Chattahoochee River, Georgia
Wastewater Treatment Plant Site

The Chattahoochee River Basin, also known as the Apalachicola-Chattahoochee-Flint basin, covers an area of 8,770 square miles. The Chattahoochee River flows southwest for 434 miles, starting in the southern Appalachian Mountains, passing through the Atlanta metropolitan area, and ending at Lake Seminole. The river provides 70 percent of Atlanta's drinking water. The City of Atlanta's R.M. Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF discharge treated wastewater into the Chattahoochee River.[200] Of the people living within one mile of these facilities, 42% are people of color and 17% are low-income. EPA has identified approximately 290 potential PFAS-discharging facilities within the City of Atlanta, which is served by multiple wastewater treatment plants.[201]

Samples taken upstream and downstream from the facilities' outfalls to the Chattahoochee River were contaminated with multiple types of PFAS. Nine types of PFAS were detected at elevated levels downstream from the discharge points, including PFPeA at 6.1 ppt (74.29% increase) and PFTeA at 4.1 ppt (upstream sample was non-detect). The total PFAS concentration increased by 15.58 ppt (88.93%). Federally regulated PFAS were detected downstream at increased levels, including PFBS and PFOA. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFDoA, PFTeA, PFHxS, PFOS, and PFMPA also exceeded the EWG health-based criteria. *See Table 33 (below).*

Table 33 | Chattahoochee River Upstream and Downstream from The City of Atlanta's R.M Clayton WRC, Cobb County's R.L. Sutton WRF, and the West Area WQCF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.6	2.1	0.5	31.25%					1000	
PFPeA	3.50	6.10	2.60	74.29%					1000	
PFHxA	3.20	4.60	1.40	43.75%					1000	
PFHpA	0.82	1.50	0.68	82.93%					1000	
PFOA	2.70	2.80	0.10	3.70%	4		0.0009	2.7991	0.09	2.71
PFDoA	0.00	1.20	1.20	n/a					0.006	1.194
PFTeA	0.00	4.10	4.10	n/a					0.006	4.094
PFBS	1.30	4.30	3.00	230.77%			400		2000	
PFHxS	1.80	1.70	-0.10	-5.56%	10				0.001	1.699
PFOS	2.60	2.60	0.00	0.00%	4		0.06	2.54	0.3	2.30
PFMPA	0.00	2.10	2.10	n/a					1	1.10
Total PFAS	17.52	33.10	15.58	88.93%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Coosa Riverkeeper, Big Wills Creek and Whippoorwill Creek, Alabama

Wastewater Treatment Plant and Biosolids Sites

The Coosa River Basin spans more than 10,000 square miles and flows over 280 miles from northwestern Georgia to central Alabama. The Lower Coosa River Basin is home to up to 46 federally protected species, and is considered one of the most biodiverse ecosystems in the world. Big Wills Creek is a tributary to the Coosa River and Whippoorwill Creek is a tributary to the Locust Fork River in the Black Warrior River watershed. The Rainbow City WWTP is a municipal facility that discharges treated wastewater to Big Wills Creek.[202] The facility does not receive discharges from significant industrial users. Of the people living within one mile of the Rainbow City WWTP, 24% are people of color and 38% are low-income.

The Rainbow City WWTP is a municipal facility that produces approximately 1,400 lbs/day of Class B biosolids, which is stored in a biosolids lagoon. Since 2023, the plant has contracted with Denali Water Systems to transport biosolids to the Dennis Burton Farm in Altoona, Alabama, where it is land-applied as fertilizer for growing crops in the Whippoorwill Creek watershed.[203] According to Denali's nutrient management plan, about 125 acres of land receive the plant's biosolids each year.

Samples of Big Wills Creek upstream and downstream from a Rainbow City WWTP outfall contained multiple types of PFAS.[204] No significant increases were observed between upstream and downstream samples, with the exception of FOSA (non-detect to 1.6 ppt increase). Numerous PFAS decreased in the downstream sample, as did the total PFAS concentration by 2.33 ppt (15.49%). These results could have been influenced by factors such as backflow from the Coosa River, season, precipitation, discharge schedules, and leachate contributions. At the downstream site, PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, PFOS, and FOSA also exceeded the EWG health-based criteria. *See Table 34 (below).*

Table 34 | Big Wills Creek Upstream and Downstream from Rainbow City WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.80	1.90	0.10	5.56%					1000	
PFPeA	2.70	0.00	-2.70	-100.00%						
PFHxA	2.70	2.60	-0.10	-3.70%					1000	
PFHpA	0.96	0.95	-0.01	-1.04%					1000	
PFOA	2.00	2.20	0.20	10.00%	4		0.0009	2.1991	0.09	2.11
PFNA	0.58	0.54	-0.04	-6.90%	10				0.006	0.534
PFDA	0.65	0.00	-0.65	-100.00%					0.006	
PFBS	0.82	0.58	-0.24	-29.27%			400		2000	
PFHxS	0.63	0.64	0.01	1.59%	10				0.001	0.639
PFOS	2.20	1.70	-0.50	-22.73%	4		0.06	1.64	0.3	1.40
FOSA	0.00	1.60	1.60	n/a					0.3	1.30
Total PFAS	15.04	12.71	-2.33	-15.49%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

The designated upstream and downstream sampling sites in Whippoorwill Creek near the Rainbow City WWTP's biosolids land application site, which is located in the Black Warrior River watershed, also contained PFAS. Due to sampling location constraints, the upstream sampling site was adjacent to one of the biosolids application fields. PFAS decreased significantly between upstream and downstream samples, with many downstream samples showing non-detect for multiple PFAS. The total PFAS concentration also decreased by 11.75 ppt (83.81%). At the upstream site, PFOS (5.6 ppt), exceeded the MCL, rendering the surface water at this location unsafe for drinking without advanced treatment. At the upstream and downstream sites, PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA and PFOS also exceeded the EWG health-based criteria at the downstream site. *See Table 35 (below).*

Table 35 | Whippoorwill Creek Upstream and Downstream from Biosolids Land Application Sites

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.8	0.00	-1.80	-100.00%					1000	
PFHxA	0.86	0.00	-0.86	-100.00%					1000	
PFHpA	0.72	0.00	-0.72	-100.00%					1000	
PFOA	2.4	0.77	-1.63	-67.92%	4		0.0009	0.7691	0.09	0.68
PFBS	1.7	0.00	-1.70	-100.00%			400		2000	
PFHxS	0.94	0.00	-0.94	-100.00%	10				0.001	
PFOS	5.6	1.5	-4.10	-73.21%	4		0.06	1.44	0.3	1.20
Total PFAS	14.02	2.27	-11.75	-83.81%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Hackensack Riverkeeper, Ramapo River, New York/New Jersey
Wastewater Treatment Plant Site

The Ramapo River Basin, located in southeastern New York State and northeastern New Jersey, covers approximately 935 square miles and is a major tributary of the Passaic River. Sampling was conducted on the Ramapo River upstream and downstream from two municipal WWTPs that discharge to the Ramapo River: the Suffern (V) STP and the Western Ramapo WWTP.[205] The Suffern (V) STP serves a population of 13,000 people. Within one mile of the Western Ramapo WWTP, 56% of residents are people of color and 27% are low-income. New York State has also designated this area as a Disadvantaged Community.[206] The EPA has identified eight potential PFAS-discharging facilities within the Cities of Suffern and Hillburn.[207]

Samples of the Ramapo River upstream and downstream from the WWTPs' outfalls contained multiple types of PFAS.[208] At the downstream site in Mahwah, New Jersey just across the border from Suffern, New York, five types of PFAS were detected at elevated levels, including PFHxA at 10 ppt (2.5 ppt increase), PFHxS at 3.5 ppt (non-detect at upstream site), and PFBS at 2.5 ppt (non-detect at upstream site). The total PFAS concentration increased by 10.10 ppt (45.7%). Federally regulated PFAS were detected downstream at increased levels, including PFOA (6.7 ppt), PFBS, PFOS (4.7 ppt), and PFHxS. PFOA and PFOS exceeded the MCLs at the downstream site, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. The PFOS concentration in the downstream sample exceeded New York's water quality guidance values for protection of human health in raw source water[209] and PFOA, PFOS, and PFHxS also exceeded the EWG health-based criteria. *See Table 36 (below).*

Table 36 | Ramapo River Upstream and Downstream from WWTP and STP

Analyte	Sample (ppt)					MCL (ppt)		EPA (ppt)		EWG (ppt)		NY MCL (ppt)		State Ambient WQ for HH (DW) (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Upstream (August)	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	0.00	0.00	0.00	0.00%	3.30					1000					
PFPeA	5.40	4.80	-0.60	-11.11%	9.10					1000					
PFHxA	7.50	10.00	2.50	33.33%	5.90					1000					
PFHpA	0.00	0.00	0.00	0.00%	2.20					1000					
PFOA	6.10	6.70	0.60	9.84%	5.20	4	2.70	0.0009	6.6991	0.09	6.61	10		6.7	
PFNA	0.00	0.00	0.00	0.00%	1.60	10				0.006					
PFUnA	0.00	0.00	0.00	0.00%	0.97					0.006					
PFBS	0.00	2.50	2.50	n/a	1.30			400		2000					
PFHxS	0.00	3.50	3.50	n/a	1.00	10				0.001	3.50				
PFOS	3.10	4.70	1.60	51.61%	3.90	4	0.70	0.06	4.64	0.3	4.40	10		2.7	2.00
FOSA	0.00	0.00	0.00	0.00%	0.56					0.3					
Total PFAS	22.10	32.20	10.10	45.70%	35.03										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

James Riverkeeper, Appomattox River and Old Town Creek, Virginia
Wastewater Treatment Plant and Biosolids Sites

The James River, Virginia's largest river, flows 340 miles and connects to 25,000 miles of tributaries, including the Appomattox River. Its watershed spans approximately 10,000 square miles, making up nearly a quarter of the state. About one-third of Virginians live within this watershed. Within one mile of the South Central WWTP,[210] a wastewater treatment system serving five localities and discharging effluent to the Appomattox River, 56% are people of color and 33% are low income. EPA has identified 29 potential PFAS-discharging facilities in Petersburg.[211]

Samples of the Appomattox River upstream and downstream from a South Central WWTP outfall contained multiple types of PFAS. However, the concentrations of several of PFAS increased slightly at the downstream site resulting in a total PFAS concentration increase of 0.5 ppt–an increase of 2.37%. PFOA (2.6 ppt) and PFOS (2.6 ppt) were detected in downstream samples at levels that exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFOS, PFNA, and PFHxS also exceeded the EWG health-based criteria. *See Table 37 (below).*

South Central WWTP's method for disposing of its biosolids is through land application.[212] The facility produces Class B biosolids, which it prepares for land application through dewatering followed by lime stabilization. According to South Central WWTP's Biosolids Facility Report,[213] the facility produced and land applied 3,426 dry metric tons of biosolids in 2023, however, the land application is handled by Synagro Central, LLC, which sources biosolids for land application from multiple WWTPs.[214] For purposes of this project, James Riverkeeper conducted PFAS sampling downstream from a Synagro biosolids land application field, VA-CH-00004-0-0010, located in the Old Town Creek watershed.[215]

Table 37 | Appomattox River Upstream and Downstream from South Central WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	5.80	4.50	-1.30	-22.41%					1000	
PFPeA	3.50	4.40	0.90	25.71%					1000	
PFHxA	2.90	2.80	-0.10	-3.45%					1000	
PFHpA	1.20	1.10	-0.10	-8.33%					1000	
PFOA	2.40	2.60	0.20	8.33%	4		0.0009	2.5991	0.09	2.51
PFNA	0.00	0.75	0.75	n/a	10				0.006	0.744
PFBS	2.10	2.30	0.20	9.52%			400		2000	
PFHxS	0.57	0.56	-0.01	-1.75%	10				0.001	0.559
PFOS	2.10	2.60	0.50	23.81%	4		0.06	2.54	0.3	2.30
PFMPA	0.54	0.00	-0.54	-100.00%					1	
Total PFAS	21.11	21.61	0.50	2.37%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Samples of Old Town Creek taken downstream from the biosolids land application site detected multiple types of PFAS. The PFAS detected at the highest concentrations were PFOA (3.9 ppt) and PFOS (3.1 ppt). The concentrations of PFOA and PFOS in the sample taken downstream from the land application site also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. In the downstream sample, PFOA exceeded the draft HHWQC (Water + Organism) of 0.0009 ppt by 3.8991 ppt, and PFOS exceeded the 0.06 ppt criteria by 3.04 ppt. Additionally, PFHxS, PFOA, and PFOS exceeded EWG's health-based criteria. *See Table 38 (below).*

Table 38 | Old Town Creek Downstream from Biosolids Land Application Field

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)	
	Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	1.3					1000	
PFPeA	1.7					1000	
PFHxA	1.7					1000	
PFHpA	0.81					1000	
PFOA	3.9	4		0.0009	3.8991	0.09	3.81
PFBS	1.3			400		2000	
PFHxS	1.5	10				0.001	1.499
PFOS	3.1	4		0.06	3.04	0.3	2.80
Total PFAS	15.31						

Non-detect recorded as 0 Exceed criteria levels

Long Island Soundkeeper, Naugatuck River, Connecticut
Wastewater Treatment Plant Site

The Naugatuck River Watershed spans 311 square miles and drains into the Naugatuck River, the only major river entirely within Connecticut and the largest tributary of the Housatonic River. Waterbury WPCF is a wastewater treatment system that serves approximately 125,000 residents of Waterbury and three other communities and handles wastewater from industrial dischargers.[216] Within one mile of the Waterbury WPCF, 44% of residents are people of color and 29% are low-income. The WWTP discharges treated wastewater to the Naugatuck River. EPA has identified 38 active PFAS-discharging facilities within the City of Waterbury.[217]

Samples of the Naugatuck River upstream and downstream from Waterbury WPCF outfalls contained multiple types of PFAS. However, the concentrations of seven types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 4.9 ppt—an increase of 11.78%. For example, the concentration of PFHxA increased from 7.1 ppt to 8.9 ppt (25.35%).

Federally regulated PFAS were also detected downstream at increased levels, including PFOS (8.3 ppt), PFBS (3.1 ppt), and PFHxS (1.7 ppt). However, the concentration of PFOA decreased slightly from 8.1 ppt to 7.8 ppt (3.7% decrease). PFOA exceeded the MCL by 3.8 ppt and PFOS exceeded the MCL by 4.3 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 39 (below).*

Table 39 | Naugatuck River Upstream and Downstream from Waterbury WPCF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		State DW Action Level (ppt)	
	Upstream	Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.60	4.80	1.20	33.33%					1000		1800	
PFPeA	6.90	8.10	1.20	17.39%					1000			
PFHxA	7.10	8.90	1.80	25.35%					1000		240	
PFHpA	2.50	2.60	0.10	4.00%					1000			
PFOA	8.10	7.80	-0.30	-3.70%	4	3.80	0.0009	7.7991	0.09	7.71	16	
PFNA	1.50	1.20	-0.30	-20.00%	10				0.006	1.194	12	
PFBS	2.70	3.10	0.40	14.81%			400		2000		760	
PFHxS	1.60	1.70	0.10	6.25%	10				0.001	1.699	49	
PFOS	7.60	8.30	0.70	9.21%	4	4.30	0.06	8.24	0.3	8.00	10	
Total PFAS	41.60	46.50	4.90	11.78%								

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Los Angeles Waterkeeper, Los Angeles River, California
Wastewater Treatment Plant Site

The Los Angeles (LA) River Watershed spans 834 square miles, with the river stretching 51 miles from its headwaters in the Angeles National Forest to the Pacific Ocean in Long Beach. The LA-Glendale WRP is a municipal wastewater treatment system that is co-owned by the Cities of Los Angeles and Glendale, and operated by LA Sanitation, that serves a population of approximately 434,000 residents and handles wastewater from multiple industrial dischargers.[218] Within one mile of the LA River, there are 17 cities, 23 City of LA neighborhoods, and four unincorporated communities, and nearly 1,000,000 residents.[219] Within one mile of the LA-Glendale WRF, 54% of the population are people of color and 39% are low-income. Data for industrial discharges from the LA-Glendale WRF are aggregated with those from three other reclamation plants. In 2021, these four facilities received discharges from 166 permitted industrial users. EPA has identified 23 facilities in the City of Glendale alone as potential sources of PFAS discharges.[220]

Samples of the LA River upstream and downstream from the LA-Glendale WRF outfall contained multiple types of PFAS. However, the concentrations of five types of PFAS increased at the downstream site resulting in a total PFAS concentration increase of 6.01 ppt—an increase of 8.61%. For example, the concentration of PFPeA increased from 12 ppt to 20 ppt (66.67% increase) and the concentration of PFBA increased from 7.8 ppt to 9.8 ppt (25.64% increase).

Federally regulated PFAS were also detected downstream but at decreased concentrations, including PFOA (1.04% decrease) and PFOS (13.24% decrease). However, in the downstream sample, PFOA (9.5 ppt) exceeded the MCL by 5.5 ppt and PFOS (5.9 ppt) exceeded the MCL by 1.9 ppt, indicating the surface water at this location is unsafe for drinking without advanced treatment. Additionally, PFOA exceeded the California Public Health Goal of 0.007 ppt by 9.493 ppt and PFOS exceeded the California Public Health Goal of 1 ppt by 4.9 ppt.[221] PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFOS, PFDA, and PFHxS exceeded the EWG health-based criteria. *See Table 40 (below).*

Table 40 | Los Angeles River Upstream and Downstream from LA-Glendale WRF

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		CA Public Health Goal (ppt)		CA Notification Level (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	7.80	9.80	2.00	25.64%					1000					
PFPeA	12.00	20.00	8.00	66.67%					1000					
PFHxA	19.00	20.00	1.00	5.26%					1000					
PFHpA	3.10	3.30	0.20	6.45%					1000					
PFOA	9.60	9.50	-0.10	-1.04%	4	5.50	0.0009	9.4991	0.09	9.41	0.007	9.493		
PFNA	1.10	0.00	-1.10	-100.00%	10				0.006					
PFDA	2.00	2.10	0.10	5.00%					0.006	2.094				
PFBS	3.70	2.50	-1.20	-32.43%			400		2000				500	
PFPeS	0.57	0.00	-0.57	-100.00%					1					
PFHxS	3.50	2.70	-0.80	-22.86%	10				0.001	2.699			3	
PFOS	6.80	5.90	-0.90	-13.24%	4	1.90	0.06	5.84	0.3	5.60	1	4.90		
NEtFOSAA	0.62	0.00	-0.62	-100.00%					1					
Total PFAS	69.79	75.80	6.01	8.61%										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Narragansett Bay Riverkeeper, Pawtuxet River, Rhode Island
Wastewater Treatment Plant Site

The Pawtuxet River Watershed is the second largest watershed in Rhode Island, covering 231 square miles and it is home to approximately 235,000 residents. The Cranston WPCF is a municipal wastewater treatment system serving around 73,200 residents.[222] Within one mile of the Cranston WPCF, 25% of residents are people of color and 18% are low-income. The facility discharges treated wastewater to the Pawtuxet River. EPA has identified 42 potential PFAS-discharging facilities within Cranston.[223]

Samples of the Pawtuxet River upstream and downstream from WPCF outfalls contained multiple types of PFAS. The concentrations of five types of PFAS slightly increased at the downstream site. However, there was not a significant difference between the two sites, with the downstream site showing a total PFAS concentration increase of 0.6 ppt—an increase of 1.57%. The PFOS concentration decreased slightly by 0.2 ppt.

Federally regulated PFAS were detected downstream, including PFOA (7.7 ppt), PFBS (1.5 ppt), PFOS (4.3 ppt), PFNA (2.1 ppt), and PFHxS (2.3 ppt). PFOA exceeded the MCL by 3.7 ppt and PFOS exceeded the MCL 0.3 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. However, the PFOA concentration decreased in the downstream duplicate sample and the upstream duplicate concentration was also higher than the downstream primary sample concentration by 0.1 ppt. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFNA, PFHxS, and PFOS exceeded the EWG health-based criteria. *See Table 41 (below).*

Table 41 | Pawtuxet River Upstream and Downstream from Cranston WPCF

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)		RI MCL (ppt)		RI SWQ Action Level (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.20	3.10	-0.10	-3.13%	3.30	3.20	-0.10	-3.03%					1000				Sum of 8 => 70 ppt	
PFPeA	5.50	5.70	0.20	3.64%	5.40	5.30	-0.10	-1.85%					1000					
PFHxA	7.40	7.20	-0.20	-2.70%	6.70	7.30	0.60	8.96%					1000					
PFHpA	4.80	4.90	0.10	2.08%	4.60	4.90	0.30	6.52%					1000					
PFOA	7.10	7.70	0.60	8.45%	7.80	7.50	-0.30	-3.85%	4	3.70	0.0009	7.6991	0.09	7.61				
PFNA	2.00	2.10	0.10	5.00%	2.00	1.90	-0.10	-5.00%	10				0.006	2.094				
PFBS	1.50	1.50	0.00	0.00%	1.70	1.50	-0.20	-11.76%			400		2000					
PFHxS	2.20	2.30	0.10	4.55%	2.20	2.30	0.10	4.55%	10				0.001	2.299				
PFOS	4.50	4.30	-0.20	-4.44%	4.70	4.30	-0.40	-8.51%	4	0.30	0.06	4.24	0.3	4.00				
Total PFAS	38.20	38.80	0.60	1.57%	38.40	38.20	-0.20	-0.52%										

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

Pearl Riverkeeper, Pearl River, Mississippi
Wastewater Treatment Plant and Biosolids Sites

The Pearl River Basin spans 8,760 square miles in Central and Southern Mississippi and three Louisiana parishes, eventually draining in the Mississippi Sound, Lake Borgne, and the Gulf of Mexico. It is home to nearly one million people, more than one-third of Mississippi's population. There are three WWTPs located near one or more of the locations selected for sampling by Pearl Riverkeeper—Jackson POTW, Savannah Street, West Rankin Utility Authority WWTF, and Jackson POTW, Trahon and Big Creek.[224] Within one mile of the Jackson POTW, Savanna Street, 80% of residents are people of color and 60% are low-income. The EPA has identified 50 potential PFAS-discharging facilities within the City of Jackson.[225]

Pearl Riverkeeper sampled upstream and downstream from two separate outfalls into the Pearl River from Jackson POTW, Savannah Street and West Rankin Utility Authority WWTF. These two outfalls are approximately 1.6 river miles apart. A tributary stream also flows into the Pearl River between the upstream and downstream sampling locations. The upstream sampler was not recovered so no results are available for that location. The sample from the downstream location contained eight types of PFAS. Overall, the total PFAS concentration at the downstream location was 20.71 ppt. PFHxA (4.4 ppt) and PFBA (3.6 ppt) were detected at the highest concentrations. The federally regulated PFAS detected downstream included PFOA (2.9 ppt), PFBS (3 ppt), PFOS (3.5 ppt), PFNA (0.71 ppt), and PFHxS (1.3 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody, and PFOA, PFNA, PFHxS, and PFOS exceeded the EWG health-based criteria. *See Table 42 (below)*

Pearl Riverkeeper also collected additional samples at two locations further downstream. One sampling site was located upstream and the other sampling site was

Table 42 | Pearl River Downstream from Jackson POTW, Savanna Street and West Rankin WWTF

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▼ Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.60					1000	
PFHxA	4.40					1000	
PFHpA	1.30					1000	
PFOA	2.90	4		0.0009	2.8991	0.09	2.81
PFNA	0.71					0.006	0.704
PFBS	3.00			400		2000	
PFHxS	1.30	10				0.001	1.299
PFOS	3.50	4		0.06	3.44	0.3	3.20
Total PFAS	20.71						

Non-detect recorded as 0 | Exceed criteria levels

located downstream from where Big Creek enters the Pearl River. One or more of Jackson POTW's biosolids application fields are located in the Big Creek watershed roughly 1.5–2.0 miles from the confluence of Big Creek and the Pearl River. Jackson POTW, Trahon and Big Creek also discharges into Big Creek above the confluence of Big Creek and the Pearl River. Samples of the Pearl River upstream and downstream from the Big Creek confluence contained multiple types of PFAS. The concentrations total PFAS decreased at the downstream site to 30.78 ppt, resulting in a total PFAS concentration decrease of 1.89 ppt (5.79%). However, three types of PFAS increased slightly at the downstream site, including PFPeA at 13 ppt (8.33% increase), PFDA at 0.73 ppt (4.29% increase), and PFOS at 3.6 ppt (9.09% increase).

PFOS (3.6 ppt) was the only federally regulated PFAS detected downstream at a slightly increased concentration. However, PFOA and PFOS both exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFDA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 43 (below).*

Table 43 | Pearl River Upstream and Downstream from the Big Creek Confluence

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	4.2	3.8	-0.40	-9.52%					1000	
PFPeA	12	13	1.00	8.33%					1000	
PFHxA	3.2	3.2	0.00	0.00%					1000	
PFHpA	1.2	1.0	-0.20	-16.67%					1000	
PFOA	3.3	2.8	-0.50	-15.15%	4		0.0009	2.7991	0.09	2.71
PFNA	0.67	0.00	-0.67	-100.00%	10				0.006	
PFDA	0.70	0.73	0.03	4.29%					0.006	0.724
PFBS	3.1	1.7	-1.40	-45.16%	400				2000	
PFHxS	1.0	0.95	-0.05	-5.00%	10				0.001	0.949
PFOS	3.3	3.6	0.30	9.09%	4		0.06	3.54	0.3	3.30
Total PFAS	32.67	30.78	-1.89	-5.79%						

Non-detect recorded as 0 | Downstream Increase | Exceed criteria levels

Tampa Bay Waterkeeper, East Canal, Florida
Wastewater Treatment Plant Site

The Hillsborough River Watershed covers more than 675 square miles, including the City of Tampa. East Canal is a tributary to Itchepackesassa Creek, which flows into the Hillsborough River and, ultimately, into Hillsborough Bay. Plant City WRF, a municipal wastewater treatment system, owned and operated by the City of Plant City, serves a population of approximately 40,000 residents and discharges into the East Canal.[226] EPA has identified 27 potential PFAS-discharging facilities within Plant City.[227] Within one mile of the Plant City WRF, 58% of residents are people of color and 50% are low-income.

Samples of the East Canal taken downstream from a Plant City WRF outfall detected ten types of PFAS. PFBA (9 ppt), PFPeA (9.9 ppt), and PFOS (11 ppt) were detected at the highest concentrations. The downstream site had a total PFAS concentration of 58.91 ppt. Upstream samples were not collected. Federally regulated PFAS were detected at the downstream sampling site, including PFOA, PFNA, PFHxS, PFBS, and PFOS. PFOA (7.1 ppt) exceeded the MCL by 3.1 ppt, and PFOS exceeded the MCL by 7 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 44 (below).*

Table 44 | East Canal Downstream from Plant City WRF

Analyte	Sample (ppt)	MCL (ppt)		EPA (ppt)		EWG (ppt)		State Surface WQ HH Screening (ppt)	
	▼ Downstream	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	9.00					1000			
PFPeA	9.90					1000			
PFHxA	6.30					1000			
PFHpA	3.70					1000			
PFOA	7.10	4	3.10	0.0009	7.0991	0.09	7.01	500	
PFNA	1.30	10				0.006	1.294		
PFBS	6.00			400		2000			
PFPeS	0.71					1			
PFHxS	3.90	10				0.001	3.899		
PFOS	11.00	4	7.00	0.06	10.94	0.3	10.70	10	1.00
Total PFAS	58.91								

Non-detect recorded as 0 | Exceed criteria levels

Upper Potomac Riverkeeper, Opequon Creek and Back Creek, West Virginia
Wastewater Treatment Plant and Biosolids Sites

The Opequon Creek Watershed spans approximately 341 square miles across West Virginia and Virginia, with more than half of its area located in West Virginia. Opequon Creek flows into the Potomac River near Martinsburg, West Virginia. The Back Creek Watershed covers 374 square miles in Virginia and West Virginia, before flowing into the Potomac River near Allensville., West Virginia. Berkeley County operates four sewage treatment and collection systems pursuant to NPDES Permit WV0082759. One of those systems, Berkeley County PSSD – Inwood WWTP (Outlet 002) serves a population of 17,500 residents and discharges to Opequon Creek.[228] Of those living within one mile of Inwood WWTP, 13% are people of color and 20% are low income. EPA has identified 2 potential PFAS-discharging facilities within Inwood involving Chemical Manufacturing, Paints and Coatings, and Cleaning Products Manufacturing industries, however, its appears from the NPDES permit that these facilities discharge into a different Berkeley County PSSD facility.[229]

Samples of Opequon Creek upstream and downstream from an Inwood WWTP outfall contained multiple types of PFAS. While PFPeA, PFHxA, PFOA, and PFBS increased slightly downstream from the WWTP, PFOS slightly decreased, resulting in a total PFAS concentration increase of 1.8 ppt—an increase of 3.99%. Only PFPeA and PFBS increased by more than 1 ppt.

Regulated PFAS were detected in the downstream samples, including PFOA (4.1 ppt), PFHxS (3 ppt), PFBS (9.3 ppt), and PFOS (4.9 ppt). PFOA exceeded the MCL by 0.1 ppt and PFOS exceeded the MCL by 0.9 ppt, rendering the surface water at this location unsafe for drinking without advanced treatment. PFOA and PFOS also exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, PFOS, and 8:2 FTS also exceeded the EWG health-based criteria. *See Table 45 (below).*

Table 45 | Opequon Creek Upstream and Downstream from Berkeley County PSSD – Inwood WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.50	3.40	-0.10	-2.86%					1000	
PFPeA	7.90	9.30	1.40	17.72%					1000	
PFHxA	6.50	7.20	0.70	10.77%					1000	
PFHpA	1.60	1.40	-0.20	-12.50%					1000	
PFOA	3.50	4.10	0.60	17.14%	4	0.10	0.0009	4.0991	0.09	4.01
PFBS	8.00	9.30	1.30	16.25%			400		2000	
PFHxS	3.30	3.00	-0.30	-9.09%	10				0.001	2.999
PFOS	5.30	4.90	-0.40	-7.55%	4	0.90	0.06	4.84	0.3	4.60
8:2 FTS	5.50	4.30	-1.20	-21.82%					1	3.30
Total PFAS	45.10	46.90	1.80	3.99%						

Non-detect recorded as 0 | Downstream Increase | Exceed criteria levels

Berkeley County PSSD is permitted to land-apply biosolids produced at its sewage collection and treatment systems.[230] Specifically, it is permitted to apply biosolids on fields at 11 agricultural sites at a maximum annual loading rate of 1.5 tons/acre. PFAS sampling was conducted upstream and downstream from the Dehaven Farm, one of Berkeley County PSSD's land application sites, located in the Back Creek watershed.

Samples of Back Creek upstream and downstream from the Dehaven biosolids land application site contained multiple types of PFAS. However, the concentrations of four types of PFAS increased slightly at the downstream site resulting in a total PFAS concentration increase of 0.61 ppt–an increase of 4.74%. For example, the concentration of PFPeA increased from a non-detect to 1.4 ppt.

Federally regulated PFAS were also detected in downstream samples, including PFOA (2 ppt), PFBS (1.7 ppt), PFHxS (1.8 ppt), and PFOS (2.1 ppt). PFOS and PFBS concentrations decreased slightly at the downstream site. PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 46 (below).*

Table 46 | Back Creek Upstream and Downstream from Biosolids Land Application Fields

Analyte	Sample (ppt)				Duplicate Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	2.3	1.9	-0.40	-17.39%	1.9	2.5	0.60	31.58%					1000	
PFPeA	0.00	1.4	1.40	n/a	0.00	0.00	0.00	0.00%					1000	
PFHxA	1.8	1.7	-0.10	-5.56%	1.5	3.1	1.60	106.67%					1000	
PFHpA	0.86	0.87	0.01	1.16%	0.83	1.0	0.17	20.48%					1000	
PFOA	1.9	2.0	0.10	5.26%	2.3	2.2	-0.10	-4.35%	4		0.0009	1.9991	0.09	1.91
PFBS	2.3	1.7	-0.60	-26.09%	2.0	2.5	0.50	25.00%			400		2000	
PFHxS	1.4	1.8	0.40	28.57%	2.5	2.2	-0.30	-12.00%	10				0.001	1.799
PFOS	2.3	2.1	-0.20	-8.70%	3.2	2.7	-0.50	-15.63%	4		0.06	2.04	0.3	1.80
Total PFAS	12.86	13.47	0.61	4.74%	14.23	16.2	1.97	13.84%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

West Virginia Headwaters Waterkeeper, Ohio River, West Virginia

Wastewater Treatment Plant Site

The Ohio River's drainage basin covers 204,000 square miles, including most of West Virginia. The river flows 981 miles, providing drinking water to over five million people and handles wastewater from several industrial dischargers. The Parkersburg Utility Board WWTP serves approximately 100,000 residents.[231] Within one mile of the Parkersburg WWTP, 8% of residents are people of color and 56% are low-income. The facility discharges treated wastewater to the Ohio River. The EPA has identified 22 potential PFAS-discharging facilities within Parkersburg.[232]

Samples of the Ohio River upstream and downstream from a Parkersburg WWTP outfall contained multiple types of PFAS. However, only the concentration of PFBS increased slightly in the downstream sample. Federally regulated PFAS were detected downstream, including PFOA (3.4 ppt), PFNA (0.67 ppt), PFBS (1.6 ppt), PFHxS (0.99 ppt), and PFOS (3.1 ppt). PFOA and PFOS exceeded the draft HHWQC (Water + Organism), indicating the concentrations exceeded the levels EPA has identified as being necessary to protect the general population from adverse health effects due to ingesting water, fish, and shellfish from the waterbody. PFOA, PFNA, PFHxS, and PFOS also exceeded the EWG health-based criteria. *See Table 47 (below).*

Table 47 | Ohio River Upstream and Downstream from Parkersburg WWTP

Analyte	Sample (ppt)				MCL (ppt)		EPA (ppt)		EWG (ppt)	
	▲ Upstream	▼ Downstream	Change	% Change	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance	Criteria	Downstream Exceedance
PFBA	3.10	3.00	-0.10	-3.23%					1000	
PFPeA	2.70	2.60	-0.10	-3.70%					1000	
PFHxA	2.60	2.40	-0.20	-7.69%					1000	
PFHpA	1.10	1.10	0.00	0.00%					1000	
PFOA	4.10	3.40	-0.70	-17.07%	4		0.0009	3.3991	0.09	3.31
PFNA	0.85	0.67	-0.18	-21.18%	10				0.006	0.664
PFDA	0.55	0.00	-0.55	-100.00%					0.006	
PFBS	1.50	1.60	0.10	6.67%			400		2000	
PFHxS	1.10	0.99	-0.11	-10.00%	10				0.001	0.989
PFOS	3.90	3.10	-0.80	-20.51%	4		0.06	3.04	0.3	2.80
HFPO-DA (GenX)	0.45	0.00	-0.45	-100.00%	10				9	
Total PFAS	21.95	18.86	-3.09	-14.08%						

Non-detect recorded as 0 Downstream Increase Exceed criteria levels

POLICY RECOMMENDATIONS

PFAS pose significant societal risks, including health issues, environmental contamination, and economic costs, particularly affecting disadvantaged communities. It is essential that PFAS is addressed by the government at both the federal, state, and tribal government levels. The following recommendations propose reforms that policymakers can adopt to prevent or mitigate PFAS pollution.

Federal Administrative Policy Reforms

Absent comprehensive reform, industry accountability, and substantial investment of federal funds to support affected communities, the short- and long-term harms of PFAS pollution will continue to grow. In May 2025, despite the urgent need for federal action, EPA announced plans to weaken existing national drinking water standards for PFAS. Specifically, the agency proposed rescinding standards for PFHxS, PFNA, and GenX (HFPO-DA), as well as the hazard index that includes those chemicals and PFBS. It also signaled delays in compliance deadlines and new industry loopholes for PFOA and PFOS.

Rather than weakening protections, EPA must finalize, adopt, and enforce pending reforms—including the draft HHWQC—to help stem the accumulation of PFAS in the nation's waterways.

Given the well-documented health risks, environmental persistence, and widespread presence of PFAS in surface waters, EPA must regulate these substances as a class rather than individually. This will prevent industries from shifting to unregulated but equally harmful alternatives. Production and use of PFAS should be phased out entirely. The federal government should also ban the land application of biosolids containing PFAS to stop their spread into the food chain.

At a minimum, EPA should lead a coordinated federal response to help state, tribal, and local governments address the public health emergency posed by PFAS. This must include the adoption of effluent limitation guidelines and pretreatment standards for industrial dischargers; enforceable drinking water limits for all PFAS under the SDWA; and national water quality criteria to protect both people and aquatic life under the CWA.

Where effluent guidelines are not yet in place, technology-based discharge limits must be developed using best professional judgment. Funding for wastewater treatment must increase to keep PFAS from being released into surface waters that are used for private and public drinking water, recreation, and fish/shellfish consumption.

Finally, the federal government must expand monitoring of PFAS in surface water, groundwater, and drinking water; strengthen health surveillance; advance scientific research; restore essential monitoring programs; and provide direct assistance to impacted communities—especially in rural areas with high levels of contamination.

Congressional Policy Reforms

Congress must take action to lessen PFAS' current impact on the public and adopt policies that will create a lasting difference. Several measures focused on funding, research, or regulatory oversight have already been introduced in Congress that, if passed, would improve public health outcomes related to PFAS.

Congress must provide increased funding for wastewater treatment facilities to update their systems to prevent PFAS from returning to the water supply. Congress also needs to provide funding for communities and individuals directly impacted by the failure to protect them from PFAS. As one example, H.R.1517, the Relief for Farmers Hit with PFAS Act, directs the Department of Agriculture to create a grant program to support financial assistance for farmers impacted by PFAS.[233] Farmers are especially impacted by the land application of biosolids to their fields.

Measures focused on regulatory improvements would lead to a more comprehensive governmental approach to PFAS. This includes reintroduction of the bipartisan, bicameral Clean Water Standards for PFAS Act, which requires EPA to develop water criteria for PFAS under the Clean Water Act, provides the agency with an achievable roadmap to establish ELGs and standards for eight priority industry categories for all measurable PFAS or classes of PFAS within three years, and includes significant federal support to assist communities in upgrading their municipal water infrastructure in order to safeguard public health and protect ratepayers.[234] S.820, the Protecting Consumers from PFAS Act, which would add the Consumer Product Safety Commission to the list of agencies required to be represented on the PFAS interagency working group, or H.R.5356, the PFAS Act, which would require the Secretary of Transportation to establish a PFAS replacement program at certain airports.

Congress must also fund and implement more strategic and coordinated monitoring of surface waters, groundwater, and drinking water supplies. H.R.5259, the PFAS Exposure Assessment and Documentation Act, shows how the government can invest in testing for PFAS in humans and working with individuals and healthcare systems to educate them and monitor for future risks. More funding is needed for all communities for this kind of health care.

State Policy Reforms

In 2023, at least 23 states passed 50 bills related to PFAS and, in 2024, at least 17 states passed more than 40 bills related to PFAS.[235] Sixteen states have started phasing out or restricting PFAS in various products, including apparel, carpets, cleaning products, cookware, dental floss, fire-fighting foam, food packaging, menstrual products, and personal care items.[236] Maine has enacted legislation to phase out the sale of products containing PFAS, and offers financial support to impacted farmers. Minnesota passed a measure prohibiting the use of PFAS in certain consumer products and food packaging. Michigan and New Jersey have established grants to provide financial assistance for addressing PFAS contamination in drinking water systems, and in 2020, New Jersey set drinking water standards for PFOA and PFOS. Additionally, California has banned the use of PFAS in food packaging and products intended for infants and children. In 2020, New Jersey set drinking water standards for PFOA and PFOS.

Several states have recently adopted prohibitions, strategies, or standards for biosolids testing and/or land application, including, relevant to this report, Connecticut, Maryland, Michigan, New York, and Wisconsin.[237] Numerous states have also adopted regulatory standards to control PFAS in surface waters. *See Table 12 (p. 39).* For example, California has established Public Health Goals (PHGs) for certain classes of PFAS that are more stringent than EPA's MCLs. While PHGs are nonregulatory, the State Water Resources Control Board uses them as a reference when determining the state's primary drinking water standards and MCLs.[238] New Jersey is conducting a study to assess the feasibility of establishing standards, such as MCLs, for the entire class or specific subclasses or mixtures of PFAS in drinking water, rather than for each substance individually.[239]

States should not wait for the federal government to act on PFAS; they can draw on existing solutions and take swift, decisive action on this critical issue.

REFERENCES

1 Carol F. Kwiatkowski et al., *Scientific Basis for Managing PFAS as a Chemical Class*, 7 Env't Sci. & Tech. Letters 532, 533 (2020), doi.org/10.1021/acs.estlett.0c00255.

2 *Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, NIEHS, www.niehs.nih.gov/health/topics/agents/pfc (last visited Mar. 27, 2025) ("PFAS are a group of nearly 15,000 synthetic chemicals, according to a chemicals database (CompTox) maintained by the U.S. Environmental Protection Agency.").

3 See, *e.g.*, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, EPA, www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas (Nov. 26, 2024).

4 See, e.g., Kelly L. Smalling et al., Per- and Polyfluoroalkyl Substances (PFAS) in United States Tapwater: Comparison of Underserved Private-Well and Public-Supply Exposures and Associated Health Implications, 178 Env't Int'l 108033, 108034 (2023) www.sciencedirect.com/science/article/pii/S0160412023003069.

5 Draft Sewage Sludge Risk Assessment for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS), EPA, www.epa.gov/biosolids/draft-sewage-sludge-risk-assessment-perfluorooctanoic-acid-pfoa-and-perfluorooctane (Feb. 21, 2025).

6 This project is focused on WWTPs that collect and treat wastewater from domestic sewage, commercial businesses, and industries. See *Municipal Wastewater*, EPA www.epa.gov/npdes/municipal-wastewater (Apr. 19, 2024). These facilities are commonly referred to as municipal WWTPs (WWTPs), Sewage Treatment Plants (STPs), water resource recovery facilities (WRRF), publicly owned treatment works (POTWs), and similar names.

7 EPA, Information Collection Request 2799.01, Supporting Statement B, Publicly Owned Treatment Works (POTW) Influent Per- and Polyfluoroalkyl Substances (PFAS) Study and National Sewage Sludge Survey (NSSS) 1-2 ("[t]here are over 50 industrial categories regulated by Effluent Limitations Guidelines and Standards (ELGs) that do not have any PFAS requirements and additional industries that the EPA has determined historically or currently use PFAS but for which insufficient PFAS monitoring data has been identified.") (2024) www.epa.gov/system/files/documents/2024-10/pfas_potw-icr-supporting-statement-b.pdf.

8 In National Pollutant Discharge Elimination System (NPDES) permits under the Clean Water Act, 33 U.S.C. §§ 1251 *et seq.*, "[e]ffluent limitations serve as the primary mechanism… for controlling discharges of pollutants to receiving waters. When developing effluent limitations for an NPDES permit, a permit writer must consider limits based on both the technology available to control the pollutants (i.e., technology-based effluent limits) and limits that are protective of the water quality standards of the receiving water (i.e., water quality-based effluent limits)." *NPDES Permit Limits*, EPA, www.epa.gov/npdes/npdes-permit-limits (Sept. 16, 2024).

9 Under the Clean Water Act, "[p]retreatment standards are pollutant discharge limits which apply to industrial users [that discharge into municipal WWTPs]… [and] can be expressed as numeric limits, narrative prohibitions, and best management practices (BMPs)." *Pretreatment Standards and Requirements-Applicability*, EPA, www.epa.gov/npdes/pretreatment-standards-and-requirements-applicability (Sept. 16, 2024).

10 EPA, Information Collection Request 2799.01, Supporting Statement A, POTW Influent Per- and Polyfluoroalkyl Substances (PFAS) Study and National Sewage Sludge Survey (NSSS) 2 (2024) www.epa.gov/system/files/documents/2024-10/pfas_potw-icr-supporting-statement-a.pdf. ("The EPA has not established national technology-based numeric standards for PFAS in wastewater discharges and few states have developed water quality standards for PFAS. Therefore, few industrial facilities have PFAS monitoring requirements, effluent limitations, or pretreatment standards for wastewater discharges.")

11 EPA, Draft Sewage Sludge Risk Assessment for PFOA and PFOS, Public Webinar 4 (2025), www.epa.gov/system/files/documents/2025-01/draft-ra-public-webinar-slides.pdf.

12 U.S. Environmental Protection Agency (EPA), "Basic Information about Sewage Sludge and Biosolids," www.epa.gov/biosolids/basic-information-about-sewage-sludge-and-biosolids#statistics (May 13, 2025)

13 See, *e.g.*, EPA, Draft Sewage Sludge Risk Assessment for Perfluorooctanoic Acid (PFOA) CASRN 335-67-1 and Perfluorooctane Sulfonic Acid (PFOS) CASRN 1763-23-1, at 4 (2025), www.epa.gov/system/files/documents/2025-01/draft-sewage-sludge-risk-assessment-pfoa-pfos.pdf.

14 Kelly Hunter Foster & Daniel E. Estrin, Waterkeeper Alliance, Invisible Unbreakable Unnatural: PFAS Contamination of U.S. Surface Waters 7 (2022), waterkeeper.org/wp-content/uploads/2022/10/Waterkeeper-Alliance-PFAS-Report-FINAL-10.14.22.pdf.

15 *Id.* at 9.

16 We were able to obtain samples upstream and downstream from 20 WWTPs and 9 sludge land application fields. At two WWTPs and one sludge land application field, we were only able to obtain downstream samples.

17 EPA, Method 1633, Revision A, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS (2024), www.epa.gov/system/files/documents/2024-12/method-1633a-december-5-2024-508-compliant.pdf (items previously posted in an errata table are addressed in the December 2024 version of EPA Method 1633A).

18 An equilibrium concentration reflects the point where the amount of PFAS in the sampled medium (here, it is surface water) and the sampler are in balance. See Blessing Medon et. al., *A Field-Validated Equilibrium Passive Sampler for the Monitoring of Per- and Polyfluoroalkyl Substances (PFAS) in Sediment Pore Water and Surface Water*, 25 Env't Sci.: Processes & Impacts 980, 981 (2023) pubs.rsc.org/en/content/articlepdf/2023/em/d2em00483f ("In passive sampling, the amount of analyte accumulated in the sampler increases with time until a dynamic equilibrium is established between the receiving phase and the sampled environment.… [T]he concentration of the analyte in the sampled medium is calculated based on the equilibrium partitioning of the analyte between the receiving phase and the sampled medium."); *see also PFASsive*™, Eurofins, www.eurofinsus.com/environment-testing/pfas-testing/services/passive-sampling/ (last visited Mar. 27, 2025) ("PFASsive™ can be used to provide critical data for fate and risk assessments, toxicity identification and remediation design and/or monitoring that is more representative than conventional grab samples as it quantifies contaminants only in the dissolved form.").

19 All publicly available information from multiple sources was gathered from January 1, 2024, through June 18, 2025. Information may have changed after the time of collection and may not be current at the time of publication.

20 33 U.S.C. §§ 1251 et seq.

21 See, e.g., Laura Gatz, Regulating PFAS Under the Clean Water Act, Cong. Rsch. Serv., www.congress.gov/crs_external_products/IF/PDF/IF12148/IF12148.5.pdf (Jan. 15, 2025).

22 National Recommended Water Quality Criteria - Human Health Criteria Table, EPA, www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table (May 23, 2025).

23 "Effluent Guidelines are national regulatory standards for wastewater discharged to surface waters and municipal sewage treatment plants. EPA issues these regulations for industrial categories, based on the performance of treatment and control technologies." Effluent Guidelines, EPA, https://www.epa.gov/eg (Mar. 21, 2025).

24 "The Clean Water Act prohibits anybody from discharging 'pollutants' through a 'point source' into a 'water of the United States' unless they have an NPDES permit. The permit will contain limits on what you can discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health," NPDES Permit Basics, EPA www.epa.gov/npdes/npdes-permit-basics (May 23, 2025).

25 "The national pretreatment program is designed to: protect POTW infrastructure, and reduce conventional and toxic pollutant levels discharged by industries and other nondomestic wastewater sources into municipal sewer systems and into the environment," National Pretreatment Program, EPA www.epa.gov/npdes/national-pretreatment-program (May 23, 2025).

26 PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024, EPA, www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024 (May 23, 2025).

27 Mapping the PFAS Contamination Crisis: New Data Show 9,323 Sites with PFAS in 50 States, the District of Columbia and Four Territories, EWG, www.ewg.org/interactive-maps/pfas_contamination/ (June 12, 2025); see also EPA, Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Report 3-9 (2021), www.epa.gov/system/files/documents/2021-09/multi-industry-pfas-study_preliminary-2021-report_508_2021.09.08.pdf ("EPA's UCMR3 monitoring indicated that public water systems in 33 states serving 16.5 million residents had detectable levels of long- and short-chain PFAS. Sixty-six public water systems serving more than 6 million people were found to have at least one sample above 70 ng/L, EPA's lifetime health advisory (LHA) value for the sum of PFOA and PFOS in drinking water… .").

28 Per- and Polyfluoroalkyl Substances (PFAS) | State Legislation and Federal Action, Nat'l Conf. of State Legislatures, /www.ncsl.org/environment-and-natural-resources/per-and-polyfluoroalkyl-substances (Jan. 9, 2025).

29 Per- and Polyfluoroalkyl Substances (PFAS): Final PFAS National Primary Drinking Water Regulation, EPA, www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas (Feb. 19, 2025)

30 Designation of PFOA and PFOS as Hazardous Substances Under CERCLA Release Reporting Requirements Factsheet, EPA, www.epa.gov/epcra/designation-pfoa-and-pfos-hazardous-substances-under-cercla-release-reporting-requirements (Aug. 28, 2024).

31 42 U.S.C. §§ 9601 et seq.

32 Human Health Water Quality Criteria for PFAS, EPA,www.epa.gov/wqc/human-health-water-quality-criteria-pfas (Feb. 21, 2025). EPA also published final national recommended water quality criteria for the protection of aquatic life for PFOA and informational benchmarks for 8 types of PFAS (PFBA, PFHxA, PFNA, PFDA, PFBS, PFHxS, 8:2 FTUCA, and 7:3 FTCA) on October 7, 2024, see Final Recommended Aquatic Life Criteria and Benchmarks for Select PFAS, 89 Fed. Reg. 810777 (Oct 7, 2024).

33 EPA Announces It Will Keep Maximum Contaminant Levels for PFOA, PFOS, www.epa.gov/newsreleases/epa-announces-it-will-keep-maximum-contaminant-levels-pfoa-pfos. (May 14, 2025)

34 33 U.S.C. § 1345(d); see also *Gatz, supra* note 21 ("Section 405(d) also requires EPA to review its biosolids regulations at least every two years to identify additional toxic pollutants that may be present in biosolids and promulgate regulations for those pollutants if sufficient scientific evidence shows they may adversely affect public health or the environment.").

35 Hiroko Tabuchi, The EPA Promotes Toxic Fertilizer. 3M told It of Risks Years Ago., N.Y. Times www.nytimes.com/2024/12/27/climate/epa-pfas-fertilizer-3m-forever-chemicals.html?unlocked_article_code=1.104.iE0j.fBMcId1eDgGp&smid=nytcore-ios-share&referringSource=articleShare (Jan. 2, 2025).

36 *Id.*

37 One sludge land application site, Virginia's Old Town Creek, did not have an upstream sample but significant concentrations were detected in the downstream sample. Two WWTP sites did not have upstream samples, Florida's East Canal and Mississippi's Pearl River, but significant concentrations were detected in both of the downstream samples.

38 See "Table 3: U.S. EPA Method 1633 Target Analytes" *(p. 19)*, for the unabbreviated scientific name for each type of PFAS discussed in this report.

39 EWG established a health-based guideline of 1 ppt for total PFAS based on the increased risk of cancer, reduced effectiveness of vaccines, and developmental harm. *PFAS*, Env't Working Grp., Tapwater Database (Feb. 2025), www.ewg.org/tapwater/reviewed-pfcs.php. According to EWG, the guideline was "based on studies by Phillipe Grandjean of Harvard University and many other independent researchers who found reduced effectiveness of vaccines and adverse impacts on mammary gland development from exposure to PFOA and PFOS, the two PFAS most widely detected in drinking water. This health guideline applies to the entire class of PFAS detected in water." *CONTAMINANT: Total Per- and Polyfluoroalkyl Substances*, Env't Working Grp., Tapwater Database www.ewg.org/tapwater/contaminant.php?contamcode=PFAS (last visited Mar. 25, 2025).

40 See *EJSCREEN: Environmental Justice Screening and Mapping Tool*, FEMA https://www.fema.gov/emergency-managers/practitioners/recovery-resilience-resource-library/ejscreen-environmental (Mar. 25, 2024). EPA removed EJScreen from its website on February 5, 2025. See EDGI_TEAM, *EPA Removes EJScreen from Its Website*, Env't Data & Governance Initiative (Feb. 12, 2025), envirodatagov.org/epa-removes-ejscreen-from-its-website; *EJScreen,* EPA, (last visited Feb. 4, 2025). However, Waterkeeper Alliance sourced and saved the project data. This data has also been preserved by Public Environmental Data Partners. See EJScreen Environmental Justice Screening and Mapping Tool (Version 2.3), Public Environmental Data Partners, https://pedp-ejscreen.azurewebsites.net/ (last visited June 17, 2025).

41 EJScreen includes socioeconomic data, including race and ethnicity, income, unemployment rate, English proficiency, education level, and age. EJScreen also includes data on environmental indicators, including particulate matter 2.5, ozone, nitrogen dioxide, diesel particulate matter, toxic releases to air, traffic proximity, lead paint, superfund proximity, risk management plan facility proximity, hazardous waste proximity, underground storage tanks, wastewater discharge, and drinking water non-compliance.

42 *POTW Influent PFAS Study*, EPA, www.epa.gov/eg/potw-influent-pfas-study (Feb. 5, 2025).

43 Under the Clean Water Act, EPA implements the sewage sludge regulations, 40 CFR Part 503, in 41 states and EPA has authorized nine states (Arizona, Idaho, Michigan, Ohio, Oklahoma, South Dakota, Texas, Utah, and Wisconsin) to administer the Part 503 regulations." Compliance and Annual Biosolids Reporting, EPA www.epa.gov/biosolids/compliance-and-annual-biosolids-reporting#:~:text=The%20U.S.%20Environmental%20Protection%20Agency,NPDES%20State%20Program%20Authorization%20Information (June 2, 2025).

44 Devices upstream from the WWTPs located on Florida's East Canal and Mississippi's Pearl River were not retrieved.

45 An upstream device was not placed above one sludge land application site located on Virginia's Old Town Creek.

46 The deployment period extended over 20 or more days for all samplers. The method requires a deployment date of at least 14 days to reach equilibrium. See *supra* note 18.

47 See *Invisible Unbreakable Unnatural*, Waterkeeper All., waterkeeper.org/pfas/ (last visited Mar. 28, 2025).

48 See *Per- and Polyfluoroalkyl Substances (PFAS)*, *supra* note 29; Human Health Water Quality Criteria for PFAS, *supra* note 32.

49 See *Gatz*, *supra* note 21.

50 See *Tabuchi*, *supra* note 35.

51 See *Mapping the PFAS Contamination Crisis, supra* note 27.

52 See *State Legislation and Federal Action*, *supra* note 28.

53 *PFAS Analytic Tools*, EPA, awsedap.epa.gov/public/extensions/PFAS_Tools/PFAS_Tools.html (last visited Mar. 18, 2025).

54 GLWA WRRF has adopted a Local Limit for PFOS of 65 ppt (Daily Maximum). See Great Lakes Water Auth., IPP Rules_2024, at 16 (2024), glwa.wpenginepowered.com/wp-content/uploads/2025/01/IPP-Rules_2024.pdf.

55 See Public Webinar 4, *supra* note 11, at 6 (discussing findings in reference to PFOA and PFOS).

56 *Id.*

57 *Id.* at 9.

58 See *PFASsive* Eurofins, https://www.eurofinsus.com/environment-testing/pfas-testing/services/passive-sampling/ (last visited Mar. 25, 2025).

59 *PFASsive™: Passive Sampler for PFAS*, SiREM, www.siremlab.com/PFASsive/ (last visited Mar. 25, 2025).

60 *Id.*

61 *Id.*

62 Includes all downstream sample results where the downstream value exceeded the upstream value, with the exception of the Pearl Riverkeeper and Tampa Bay Waterkeeper sites that do not have upstream samples but whose downstream samples detected significant PFAS concentrations. Also includes a downstream sample from Inland Empire Waterkeeper from August 2024 where there was no upstream sample recovered. Only one type of PFAS, PFBS, was detected at an elevated level downstream from Parkersburg Utility Board.

63 Where a duplicate sample was obtained, the highest value for each analyte is reported.

64 Includes all downstream sample results where the downstream value exceeded the upstream value. No upstream sample was taken on Old Town Creek. Where a duplicate sample was obtained, the highest value for each analyte is reported.

65 See *Human Health Water Quality Criteria for PFAS*, EPA, *supra* note 32

66 See *Designation of PFOA and PFOS as Hazardous Substances, supra* note 30

67 See *Per- and Polyfluoroalkyl Substances (PFAS), supra note 29*

68 *Id.*

69 Anna Reade, *The Scientific Basis for Managing PFAS as a Chemical Class*, Nat. Res. Def. Council (June 30, 2020), www.nrdc.org/bio/anna-reade/scientific-basis-managing-pfas-chemical-class; *see generally* Kwiatkowski, *supra* note 1.

70 See, *e.g.*, *Human and Ecological Health Effects of Select PFAS,* Interstate Tech. Regul. Council, § 7.1.5.1, pfas-1.itrcweb.org/7-human-and-ecological-health-effects-of-select-pfas/ (last visited Mar. 25, 2025); Jesse A. Goodrich et al., *Metabolic Signatures of Youth Exposure to Mixtures of Per- and Polyfluoroalkyl Substances: A Multi-Cohort Study,* 131 Env't Health Perspectives 027005-1, 027005-8 (2023), ehp.niehs.nih.gov/doi/epdf/10.1289/EHP11372.

71 *Id.* at 027005-9.

72 *PFAS*, Env't Working Grp., Tapwater Database (Feb. 2025), www.ewg.org/tapwater/reviewed-pfcs.php.

73 EWG developed their health-based criteria for PFOA and PFOS based on EPA's review of toxicity studies and, for numerous other PFAS, based on health assessments published by the EPA and its recommendations for use for similar compounds. See *id.*

74 42 U.S.C. §§ 300f to 300j–9 (1974).

75 See *Per- and Polyfluoroalkyl Substances (PFAS)*, *supra* note 29.

76 See *Human Health Water Quality Criteria*, *supra* note 32.

77 See *Per- and Polyfluoroalkyl Substances (PFAS), supra* note 29; Surface Water Quality, Interstate Tech. Regul. Council, https://pfas-1.itrcweb.org/16-surface-water-quality/ (current as of Nov./Dec. 2024).

78 In this column, the state, EPA, or EWG is identified as the source of the listed criteria.

79 As noted in this column, PFAS criteria for certain types of PFAS in Oregon, Rhode Island, and Wisconsin are based on the sum of concentrations for multiple PFAS. Additionally, as noted in this column, EPA has established a Hazard Index Value for mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS.

80 *PFDA (Perfluorodecanoic Acid)*, Env't Working Grp. Human Toxome Project, www.ewg.org/sites/humantoxome/chemicals/chemical.php?chemid=100301 (last visited Mar. 21, 2025).

81 *Perfluorodecanoic acid (PFDA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E285 (Mar. 25, 2025); *see also id.*

82 See Columbia Env't Rsch. Ctr., *Study Finds PFOSA Can Suppress Immune Function in Developing Zebrafish (Danio rerio)*, U.S. Geological Surv. (Aug. 28, 2024), www.usgs.gov/centers/columbia-environmental-research-center/science/study-finds-pfosa-can-suppress-immune.

83 *Perfluorooctanesulfonamide (PFOSA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E314 (last visited Mar. 21, 2025).

84 See EPA, ORD Human Health Toxicity Value for 6:2 Fluorotelomer Sulfonic Acid (CASRN 27619-97-2 | DTXSID6067331) 3 (2024), cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=363720&Lab=CPHEA.

85 *6:2 Fluorotelomer Sulfonate (6:2 FTS)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E318 (last visited Mar. 21, 2025).

86 It is notable that there are multiple permitted industrial dischargers to the Sumter Pocotaligo River WWTP that EPA has identified as possibly handling, using, or releasing PFAS chemicals in the metals-related industrial categories, including Armoloy Southeast (Metal Coating), Enersys—Sumter Metals (Metal Machinery Mfg.), Interlake Mecalux (Metal Machinery Mfg.), Metal Finishing Services, Inc. (Metal Coating), and Metokote Corporation (Metal Coating).

87 *Perfluorotetradecanoic Acid*, NIH Nat'l Libr. of Med., Nat'l Ctr. for Biotechnology Info., pubchem.ncbi.nlm.nih.gov/compound/Perfluorotetradecanoic-acid (last visited Mar. 21, 2025).

88 *Perfluorotetradecanoic Acid (PFTA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/system-contaminant.php?pws=NC6054001&contamcode=E303 (last visited Mar. 21, 2025).

89 *Perfluoroheptane Sulfonic Acid (PFHpS)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E312 (last visited Mar. 21, 2025).

90 *Perfluoro-4-methoxybutanic Acid (PFMOBA)*, Env't Working Grp., Tapwater Database, www.ewg.org/tapwater/contaminant.php?contamcode=E331 (last visited Mar. 25, 2025).

91 N.C. Dep't Env't Quality, Fiscal Note for Adoption Amendment of 15A NCAC 02B.0200 and 15A NCAC 02B.0400, at 57–58 (2024), www.deq.nc.gov/key-issues/july-2b-pfas-ria/open; Minn. Pollution Control Agency, Evaluation of Current Alternatives and Estimated Cost Curves for PFAS Removal and Destruction from Municipal Wastewater, Biosolids, Landfill Leachate, and Compost Contact Water 157–58 (2023), www.pca.state.mn.us/sites/default/files/c-pfc1-26.pdf.

92 EPA, Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study – 2021 Preliminary Report 1-1 (2021), *supra* note 27

93 *Id.*

94 See *EPA, Draft Sewage Sludge Risk Assessment*, Public Webinar, *supra* note 11, at 6.

95 *Detailed Facility Report: Sumter Pocataligo River WWTP*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110017123496 (last visited Jan. 3, 2025).

96 *Id.* ECHO statistics last reviewed January 3, 2025.

97 See *PFAS Analytic Tools*, *supra* note 53.

98 *Ambient Surface Water PFAS Monitoring Application*, S.C. Dep't of Env't Servs., gis.dhec.sc.gov/gisportal/apps/webappviewer/index.html?id=162b8d1e7fdf459db7ff6b251671651f (last visited Oct. 30, 2024).

99 For purposes of this report, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

100 City of Graham, Fact Sheet NPDES Permit No. NC0021211 2 (2022), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2222173&dbid=0&repo=WaterResources&searchid=d0cb95d5-63ee-4dce-9a87-de8166e04e21.

101 *Detailed Facility Report: Graham WWTP City of*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000761890 (last visited Jan. 3, 2025).

102 *Id.* ECHO statistics last reviewed January 3, 2025.

103 See *generally* N.C. Dep't of Env't Quality, Final NPDES Permit Renewal, Graham WWTP (2022), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2229270&dbid=0&repo=WaterResources&searchid=9ad699aa-ee4a-4ae7-8bef-2aa5458fd591.

104 See *PFAS Analytic Tools*, *supra* note 53.

105 *Emerging Compound Facility Sampling*, N.C. Dep't of Env't Quality, ncdenr.maps.arcgis.com/apps/instant/attachmentviewer/index.html?appid=ed308373c97e4a23a29210fa53a3d404 (last visited Nov. 19, 2024).

106 See *generally* City of Graham, City of Graham Land Application 2023 Annual Report (2023) edocs.deq.nc.gov/WaterResources/DocView.aspx?id=3175263&dbid=0&repo=WaterResources&searchid=68b0599d-be54-455f-82c7-0190f3f48ec0.

107 *Id.* at § 1, at 1.

108 *Biosolids Facility Report: City Of Graham*, EPA ECHO, echo.epa.gov/biosolids-facility-report?id=NCL021211 (last visited Jan. 3, 2025).

109 See *Our Wastewater System*, Great Lakes Water Auth., www.glwater.org/our-system/wastewater-system (last visited Nov. 15, 2024).

110 GLWA WRRFdischarges from three outfalls, only one of which discharges to Rouge River (Outfall 050). According to the facility's NPDES permit, GLWA WRRF may not discharge from Outfall 050 "unless hydraulically or structurally necessary." Mich. Dep't of Env't, Great Lakes, and Energy, NPDES Permit No. MI0022802, at 10 (2019), jeffersonchalmerswaterproject.org/323_m_NPDES%20Permit%20-%20FINAL-GLWA%20WRRF.pdf.

111 Great Lakes Water Auth., Wastewater Master Plan 7-1 (2020), glwa.wpenginepowered.com/wp-content/uploads/2020/12/Full_WWMP_Report_Final_June-2020.pdf.

112 *Detailed Facility Report: GLWA Water Resource Recovery Facility*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000555435&ej_type=sup&ej_compare=US (last visited Jan. 3, 2025).

113 *Id.* ECHO statistics last reviewed January 3, 2025.

114 Mich. Dep't of Env't, Great Lakes, and Energy, NPDES PERMIT NO. MI0022802, at 44 (2019), jeffersonchalmerswaterproject.org/323_m_NPDES%20Permit%20-%20FINAL-GLWA%20WRRF.pdf. As of 2024, the State of Michigan has set a WQS for PFOS at 11 ppt and a WQBEL for PFOA at 8,040 ppt. See Great Lakes Water Auth., Status Report—Pollutant Minimization and Source Evaluation Program for PFOS and PFOA 2 (2024), glwa.wpenginepowered.com/wp-content/uploads/2024/09/PFOA_PFOS-Minimization-Program-May-2024.pdf.

115 Great Lakes Water Auth., IPP Rules_2024, *supra* note 54 at 16

116 See *generally* Great Lakes Water Auth., Status Report—Pollutant Minimization and Source Evaluation Program for PFOS and PFOA, *supra* note 114

117 *Id.* at attach. 1. GLWA WRRF defines a "Significant Source" as one where "PFAS-based compounds were identified or used in their processes, or PFOS and/or PFOA concentrations exceed EGLE's Water Quality Standards (WQS) of 11 [ppt] (PFOS) or 420 [ppt] (PFOA) from one or more sampling events." *Id.* at 5. The facility classifies a facility as a "Potential Source" "where at least one sample result exceeds EGLE's Water Quality Standards." *Id.* at 6.

118 See *PFAS Analytic Tools*, *supra* note 53.

119 Evaluation of PFAS in Influent, Effluent, and Residuals of Wastewater Treatment Plants (WWTPs) in Michigan, EGLE, Project Number: 60588767 (Apr. 2021), https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/IPP/pfas-initiatives-statewide-full-report.pdf?rev=90923004ae6448c9a17f0e1f4b3d90de&hash=AB84F5CFA197AC923AC4F51717F75085.

120 See *Status Report—Pollutant Minimization and Source Evaluation Program*, *supra* note 114, at 7.

121 See *id.* at attach. 2.

122 A cement plant with an average facility flow of 0.0031 MGD in 2024 (St. Marys Cement - Permit No. MI0004243) and a Combined Sewer Overflow outlet with no reported overflow events in 2024 (Wayne Country Rouge River CSO RTB - Permit No. MI0028819) also discharge to this part of the Rouge River. See Pollutant Loading Report (DMR), St. Marys Cement, EPA ECHO, https://echo.epa.gov/trends/loading-tool/reports/dmr-pollutant-loading?permit_id=MI0004243&year=2024 (last visited June 14, 2025); MiEnviro Portal CSO/SSO List, Mich. Env., Great Lakes, and Energy, https://mienviro.michigan.gov/ncore/external/overflow/list (last visited June 14, 2025).

123 MCLs, Mich. PFAS Action Response Team, www.michigan.gov/pfasresponse/drinking-water/mcl (last visited April 7, 2025).

124 Permit Application for 23DP0801, NPDES Permit No. MD0021610, MD Dept. of Env., https://mes-mde.mde.state.md.us/WastewaterPermitPortal/ (last visited June 17, 2025).

125 *Id.*

126 *Id.*

127 *Detailed Facility Report: Frederick WWTP*, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000557166 (last visited June 14, 2025). ECHO statistics last reviewed June 14, 2025.

128 Industrial Pretreatment Ordinance (Amended by Ordinance G-15-08), City of Frederick, MD, https://www.cityoffrederickmd.gov/DocumentCenter/View/4901/G-15-08-Concerning-Industrial-Pretreatment?bidId= (last visited June 14, 2025).

129 See *PFAS Analytic Tools*, *supra* note 53.

130 Map of Land Application Permits for Biosolids in Maryland, Potomac Riverkeeper Network, https://www.potomacriverkeepernetwork.org/md-biosolids-permit-app-map/ (last visited June 17, 2025); Nutrient Management Plan Update, CA 37: Baungartner & Zack Property, Synagro Permit No. 2017-SAG-5979 (Sept. 17, 2021), https://mdedataviewer.mde.state.md.us/OpenDataDocuments?ID=2216012.

131 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

132 Or. Dep't of Env't Quality, NPDES Permit Renewal Fact Sheet Clean Water Services 10 (2022), ormswd2.synergydcs.com/HPRMWebDrawer/RecordView/6369437.

133 *Id.*

134 *Detailed Facility Report: Rock Creek WRRF*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110037740068&ej_type=sup&ej_compare=US (last visited Jan. 16, 2025).

135 *Id.* ECHO statistics last reviewed January 16, 2025.

136 Clean Water Servs., 2022 Annual Report 2, 3 (2022), cleanwaterservices.org/wp-content/uploads/2023/05/2022-NPDES-Annual-Report-Pretreatment-Program.pdf.

137 See *generally* Or. Dep't of Env't Quality, Clean Water Services NPDES Permit (2022), www.oregon.gov/deq/FilterPermitsDocs/MS4CWSPermit.pdf.

138 See *PFAS Analytic Tools*, *supra* note 53.

139 Clean Water Servs., *Introduction to PFAS Efforts at CWS*, *in* Information for March 13, 2024, CWAC Meeting 8 (2024), cleanwaterservices.org/wp-content/uploads/2024/03/CWAC-Agenda-Packet-03_13_2024.pdf.

140 *Id.* at 9.

141 See *NPDES Permit Renewal Fact Sheet Clean Water Services*, *supra* note 132, at 10.

142 See *Introduction to PFAS Efforts at CWS*, *supra* note 139, at 6.

143 See *id.*

144 *Sewer*, City of Riverside, https://riversideca.gov/publicworks/sewer (last visited Nov. 26, 2024).

145 *Detailed Facility Report: Riverside City, Water Quality Control*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110022399956 (last visited Jan. 3, 2025).

146 *Id.* ECHO statistics last reviewed January 3, 2025.

147 See *generally* Cal. Reg'l Water Quality Control Bd., Renewal of Waste Discharge and Producer/User Reclamation Requirements for the Riverside RWQCP (2013), https://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders/orders/2013_orders.html

148 See *PFAS Analytic Tools*, *supra* note 53.

149 *Riverside City WWRF (NPD100051476) Influent*, CA.gov, geotracker.waterboards.ca.gov/profile_report?cmd=MWEDFResults&global_id=NPD100051476&assigned_name=CIC (last visited Nov. 27, 2024).

150 *Riverside City WWRF (NPD100051476) Effluent*, CA.gov, geotracker.waterboards.ca.gov/profile_report?cmd=MWEDFResults&global_id=NPD100051476&assigned_name=FCE (last visited Nov. 27, 2024).

151 *Riverside City WWRF (NPD100051476) Biosolids*, CA.gov, geotracker.waterboards.ca.gov/profile_report?cmd=MWEDFResults&global_id=NPD100051476&assigned_name=BIOSOLIDS (last visited Nov. 27, 2024).

152 The upstream device deployed in August was not recovered.

153 *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, Cal. Off. of Env't Health Hazard Assessment, oehha.ca.gov/water (last visited April 7, 2025).

154 *Notification Level Issuance,* Cal. Water Bds., www.waterboards.ca.gov/drinking_water/programs/documents/PFHxS-issuance.pdf (last visited April 7, 2025).

155 City of Waukesha, Permit Fact Sheet 1 (2019), dnr.wisconsin.gov/sites/default/files/topic/WaterUse/Waukesha/WaukeshaWPDESPermitFactsheet.pdf.

156 Wis. Dep't of Nat. Res., WPDES Permit 14 (2019), dnr.wisconsin.gov/sites/default/files/topic/WaterUse/Waukesha/WaukeshaWPDESPermit.pdf.

157 City of Waukesha, Description of Process 2 (2023), webfile.waukesha-wi.gov/waukesha/Document_Center/Government/Clean%20Water/Description%20of%20Water%20Treatment%20Process%20(PDF).pdf.

158 *Detailed Facility Report: Waukesha WWTP*, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000555097 (last visited Jan. 3, 2025).

159 *Id.* ECHO statistics last reviewed January 3, 2025.

160 *See generally WPDES Permit*, *supra* note 155 and 156.

161 See *PFAS Analytic Tools*, *supra* note 53.

162 See *WPDES Permit*, *supra* note 156, at 17.

163 Waukesha City, WPDES Wastewater Discharge Individual Permit Application 34 (2017), https://dnr.wisconsin.gov/sites/default/files/topic/WaterUse/Waukesha/WaukeshaWPDESpermitApplication.pdf

164 City of Spokane Pub. Works, Application for Renewal of NPDES Municipal Wastewater Discharge Permit 2 (2021), apps.ecology.wa.gov/paris/DownloadDocument.aspx?Id=357285. *Note: This is a Direct Download Link*

165 *Detailed Facility Report: Spokane City Adv Wastewater Treatment*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000562347&ej_type=sup&ej_compare=US (last visited Jan. 10, 2025).

166 *Id.* ECHO statistics last reviewed January 10, 2025.

167 See *generally* Wash. Dep't of Ecology, National Pollutant Discharge Elimination System Waste Discharge Permit No. WA0024473 (2022), https://static.spokanecity.org/documents/publicworks/wastewater/treatmentplant/wa0024473-spokane-rpwrf-permit-2022-09-01.pdf

168 See *PFAS Analytic Tools*, *supra* note 53.

169 See *PFAS Exposure Assessment: Spokane County, Washington*, Agency for Toxic Substances and Disease Registry (Nov. 12, 2024), https://www.atsdr.cdc.gov/pfas/exposure-assessments/spokane-county-washington.html

170 Wash. Dep't of Ecology, Survey of Per- and Poly-fluoroalkyl Substances (PFASs) in Rivers and Lakes, 2016, at 21 (2017), apps.ecology.wa.gov/publications/documents/1703021.pdf.

171 *Biosolids Facility Report: Spokane Riverside Park AWTF AND CSOS*, EPA ECHO, echo.epa.gov/biosolids-facility-report?id=WAL024473 (last visited Jan. 13, 2025).

172 See Fayetteville Pub. Works Comm'n, Fact Sheet NPDES Permit No. NC0023957 1 (2023), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2909340&dbid=0&repo=WaterResources&searchid=d5043036-153d-404e-bc66-81b60946f3e5&cr=1.

173 *Id.*

174 *Detailed Facility Report: Fayetteville-Cross Creek WRF*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110009717002&ej_type=sup&ej_compare=US (last visited Jan. 3, 2025).

175 *Id.* ECHO statistics last reviewed January 3, 2025.

176 See *generally* N.C. Dep't of Env't Quality, Final NPDES Permit Renewal, Permit NC0023957 (2023), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=2909339&dbid=0&repo=WaterResources&searchid=d5043036-153d-404e-bc66-81b60946f3e5.

177 See *PFAS Analytic Tools*, *supra* note 53.

178 See *Emerging Compound Facility Sampling, supra* note 105.

179 For purposes of analysis, "regulated" in the section references federal regulations, and does not address the range of state regulations of PFAS.

180 See *generally* N.C. Dep't of Env't Quality, Land Application of Class B Residuals Permit (2019), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=920822&dbid=0&repo=WaterResources&searchid=d8fc9053-3116-4ce7-a37f-b09cedc5ea75.

181 Fayetteville Pub. Works Comm'n, 2023 Residuals Annual Report § 1, at 1 (2023), edocs.deq.nc.gov/WaterResources/DocView.aspx?id=3175577&dbid=0&repo=WaterResources&searchid=f5b0e17e-63c0-4c4f-a63e-f5f2174afe72.

182 See *generally id.*

183 See *id.* at § 3.

184 Based on data from 2017. See Jefferson Cnty. Comm'n, *NPDES Form 2A Application Overview*, *in* NPDES Permit Application 2 (2017), lf.adem.alabama.gov/WebLink/DocView.aspx?id=28528802&dbid=0&cr=1.

185 See Ala. Dep't of Env't Mgmt., Final Permit Modification 3 (2023),lf.adem.alabama.gov/WebLink/DocView.aspx?id=105201974&dbid=0.

186 *Detailed Facility Report: Cahaba River WWTP*, EPA ECHO, echo.epa.gov/detailed-facility-report?fid=110000513249&ej_type=sup&ej_compare=US (last visited Jan. 3, 2025).

187 *Id.* ECHO statistics last reviewed January 3, 2025.

188 See Jefferson Cnty. Comm'n, *Pretreatment Program Final*, *in* Jefferson County Environmental Services Department Capacity, Management, Operations and Maintenance (CMOM) Program 2 (2022), www.jccal.org/Sites/Jefferson_County/Documents/Environmental%20Services/2022%20CMOM%20Program%20Plan%20Combined-09152023.pdf.

189 See *generally* Jefferson Cnty. Comm'n, NPDES Permit Application (2017), *supra* note 184.

190 See *generally* Final Permit Modification, *supra* note 185; *see also* Ala. Dep't of Env't Mgmt., Draft Permit, Valley Creek WRF (2023), lf.adem.alabama.gov/WebLink/DocView.aspx?id=105000175&dbid=0&cr=1.

191 See *PFAS Analytic Tools*, *supra* note 53.

192 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

193 See Jefferson Cnty. Comm'n, 2021 Beneficial Use of By-Product Material, Annual Reporting and Applications 2 (2022), lf.adem.alabama.gov/WebLink/DocView.aspx?id=104822881&dbid=0.

194 See *Ala. Dep't of Env't Mgmt., Final Permit Modification*, *supra* note 185; Draft Permit, Valley Creek WRF (2023), *supra* note 190.

195 Upon retrieval, the primary downstream sampling device was found to be buried below roughly 4 inches of sediment. The duplicate sample was not buried in sediment at the time of retrieval. This likely accounts for the differences in analytical results between the primary and duplicate downstream samples.

196 Demographic information in this section is sourced from data obtained through EPA EJScreen, see EJScreen *supra* note 40.

197 Detailed Facility Report: Homestead WWTP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110033926278 (last visited June 17, 2025).

198 See *PFAS Analytic Tools*, *supra* note 53.

199 For purposes of analysis, "regulated" in the section references federal regulations and does not address the range of state regulations of PFAS.

200 Detailed Facility Report: R.M. Clayton WRC, EPA, ECHO, https://echo.epa.gov/detailed-facility-report?fid=110011331022&ej_type=sup&ej_compare=US (last visited June 17, 2025).; Detailed Facility Report: City of Atlanta CSO West Area, https://echo.epa.gov/detailed-facility-report?fid=110020834533 (last visited June 17, 2025); Detailed Facility Report: R.L. Sutton WRF, https://echo.epa.gov/detailed-facility-report?fid=110009358015 (last visited June 17, 2025). The sampling sites were also upstream and downstream from two industrial stormwater outfalls associated with an asphalt plant.

201 See *PFAS Analytic Tools*, *supra* note 53.

202 Detailed Facility Report: Rainbow City WWTP, https://echo.epa.gov/detailed-facility-report?fid=110055974147 (last visited June 17, 2025).

203 Nutrient Managment Plan for the Land Application of Municipal Biosolids From: Utilities Board of Rainbow City, AL, Denali Water Solutions, (Aug. 2023), https://lf.adem.alabama.gov/WebLink/DocView.aspx?id=105181103&dbid=0&cr=1

204 A stormwater outfall (Outfall 003) for Gadsden West River WWTP, NPDES Permit No. AL0053201, is also located in the section of Big Wills Creek between the upstream and downstream sampling sites.

205 Detailed Facility Report: Suffern (V) STP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110006621496 (last visited June 17, 2025); Detailed Facility Report: Western Ramapo Advanced WWTP, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110020151253 (last visited June 17, 2025).

206 Disadvantaged Communites Criteria, N.Y. Dep't of Env't Conservation, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria (last visited June 10, 2025).

207 *See PFAS Analytic Tools, supra* note 53.

208 Ramapo Valley Well Field, Permit No. NY0248258, also discharges untreated groundwater to augment river flow seasonally as needed. Env. Notice Bulletin, Ramapo Valley Well Field Discharge, N.Y. Dep't of Env't Conservation, https://dec.ny.gov/news/environmental-notice-bulletin/2023-03-01/completed-application/ramapo-valley-well-field-discharge (last visited June 14, 2025).

209 *Emerging Contaminants in N.Y.'s Waters*, N.Y. Dep't of Env't Conservation, dec.ny.gov/environmental-protection/water/emerging-contaminants (last visited April 7, 2025).

210 South Central Financial Statements, Year Ended June 30, 2024, scwwa.org/wp-content/uploads/2024/11/South-Central-Wastewater-Authority-2024.pdf; Detailed Facility Report: South Central Wastewater Authority WWTF, https://echo.epa.gov/detailed-facility-report?fid=110008192918 (last visited June 17, 2025).

211 See *PFAS Analytic Tools*, *supra* note 53.

212 See *generally* South Central Wastewater Authority, Request For Proposal, RFP #24-0812 – Biosolids Disposal (2024), govtribe.com/file/government-file/24-0812-scwwa-biosolids-rfp-dot-pdf.

213 *Biosolids Facility Report: Petersburg STP*, EPA ECHO, echo.epa.gov/biosolids-facility-report?id=VAL025437 (last visited Dec. 9, 2024).

214 See, e.g, Petersburg Virgina, Sludge Management, http://www.petersburg-va.org/562/Public-Private-Education-Facilities (last visited June 11, 2025); Letter from Carolanne M. Whiteside, Synagro Technical Service Coordinator to Virginia Dept. of Env. Quality, (Mar. 14, 2023), https://www.goochlandva.us/DocumentCenter/View/9390/Synagro---March-14-2023 (last visited June 11, 2025).

215 See Permit No. VPA00836, VA Dept. of Env. Quality, https://www.deq.virginia.gov/permits/public-notices/water/land-application-virginia-pollution-abatement-vpa (last visited June 11, 2025).

216 Detailed Facility Report: Waterbury WPCF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110035779789 (last accessed June 17, 2025).

217 See *PFAS Analytic Tools*, *supra* note 53.

218 LA Sanitation City of Los Angeles, Los Angeles-Glendale Water Reclamation Plant, https://sanitation.lacity.gov/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-cw/s-lsh-wwd-cw-p?_adf.ctrl-state=vdlc0vvep_10&_afrLoop=1540858680529765#! (last visited June 11, 2025); Detailed Facility Report: LA-Glendale WRP, https://echo.epa.gov/detailed-facility-report?fid=110035779789 (last accessed June 17, 2025).

219 See, LA River Master Plan, Existing Conditions Summary, https://larivermasterplan.org/about/existing-conditions-summary/ and Background, https://larivermasterplan.org/about/background/ (last visited June 11, 2025).

220 See *PFAS Analytic Tools*, *supra* note 53.

221 See *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, *supra* note 153.

222 Detailed Facility Report: Cranston WPCF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000735713&ej_type=sup&ej_compare=US (last visited June 17, 2025).

223 See *PFAS Analytic Tools*, *supra* note 53.

224 Detailed Facility Report: Jackson POTW, Savanna Street, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000727394&ej_type=sup&ej_compare=US (last visited June 17, 2025); Detailed Facility Report: West Rankin Utility Authority WWTF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110064616535 (last visited June 17, 2025); Detailed Facility Report: Jackson POTW, Trahon and Big Creek WWTF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110055990726 (last visited June 17, 2025).

225 See *PFAS Analytic Tools*, *supra* note 53.

226 Detailed Facility Report: Plant City WRF, EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110035612539 (last visited June 17, 2025).

227 See *PFAS Analytic Tools*, *supra* note 53.

228 Berkeley Country PSSD - OH/ INW/ BH/ NE 001-004 (Inwood), EPA ECHO, https://echo.epa.gov/detailed-facility-report?fid=110015983328 (last visited June 17, 2025).

229 See *PFAS Analytic Tools*, *supra* note 53.

230 Permit No.WV 0082759, West VA Dept. of Env. Protection, at 76, https://documents.dep.wv.gov/AppXtender/datasources/DEPAX16/applications/38/document/863955?lqid=-1&lqrid=%7B4a55c8f5-63c0-4f64-a610-2d03bfefdc40%7D&lqaid=38&qrid=%7B4a55c8f5-63c0-4f64-a610-2d03bfefdc40%7D&qridx=0 (last visited June 17, 2025).

231 Detailed Facility Report: Parkersburg Utility Board, https://echo.epa.gov/detailed-facility-report?fid=110010868016&ej_type=sup&ej_compare=US (last visited June 17, 2025).

232 See *PFAS Analytic Tools*, *supra* note 53.

233 All bill numbers refer to introductions in the 118th Congress.

234 *Pappas, Gillibrand, Fitzpatrick, Kildee Introduce Bipartisan Legislation to Address PFAS Contamination and Hold Polluters Accountable*, Congressman Chris Pappas (Apr. 18, 2024), pappas.house.gov/media/press-releases/pappas-gillibrand-fitzpatrick-kildee-introduce-bipartisan-legislation-to-address-pfas-contamination-and-hold-polluters-accountable.

235 See *State Legislation and Federal Action*, *supra* note 28.

236 *Our Priorities: PFAS "Forever Chemicals"*, Safer States, www.saferstates.org/priorities/pfas/ (last visited Mar. 7, 2025).

237 See PFAS Land Application Regulations, Most Policy Initiative, https://mostpolicyinitiative.org/science-note/pfas-land-application-regulations/#:~:text=PFAS%20builds%20up%20in%20biosolids%20used%20in%20land%20application.&text=A%20biosolid%20is%20a%20treated,or%20fertilizer%20(EPA%202025). (last visited June 15, 2025).

238 See *Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water*, *supra* note 153.

239 *Gov. Murphy Signs Nation-Leading PFAs Bill Into Law, More Needed for Strongest Protections*, Sierra Club, NJ Chapter (Jan. 22, 2024), www.sierraclub.org/new-jersey/blog/2024/01/gov-murphy-signs-nation-leading-pfas-bill-law-more-needed-strongest.

From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027 Coffin Butte Landfill expansion: Response to new evidence (groundwater impacts)
Date:	Wednesday, July 16, 2025 4:51:22 PM
Attachments:	Geier_8_GroundwaterImpacts.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

The attached document is my 8th of 8 planned submissions which I'm sending in response to new evidence presented at the July 8-9th hearing.

This covers the following topic:

8) Groundwater impacts

As you might guess, I have more to say on this topic. But I see I've run out of time, which might be merciful for you.

Thank you once again for your careful consideration of the issues, your dedication is much appreciated by the community.

Yours sincerely,
Joel Geier, Ph.D.
38566 Hwy 99W
Corvallis OR 97330-9320

Issue:

Applicant's assertion that "Past development of the Coffin Butte Landfill has not measurably affected groundwater in the surrounding community" is not supported by adequate data to justify the word "surrounding."

New evidence:

Republic's slide deck for July 8th, slide 14 states: "Past development of the Coffin Butte Landfill has not measurably affected groundwater in the surrounding community."

Response:

This lacks evidence regarding **groundwater availability** and is plainly false regarding **groundwater quality**.

In terms of groundwater availability, the applicant has not presented any data for water levels in most residential wells on neighboring properties, with the exception of the Helms well (before it was decommissioned) and the Philipps well, plus wells on two other properties that they acquired low down on the slope of Beals Hill (a spur of Tampico Ridge), namely the former Berkland and Merril properties. Outside of that limited area on one limited side of the active landfill site, they lack data to support this statement.

If the applicant had gone around the wider neighborhood, measured water levels and performed pumping tests in private wells earlier in the development of the landfill, that could have given them a baseline for making this assertion. Or if they had set up a wider monitoring network on their own initiative, instead of just installing enough wells to meet DEQ's requirements. But they haven't done so.

Regarding **groundwater quality**, the Benton County Talks Trash report, which has been previously entered into the record, states on p. 32:

> *During the 1980s, the landfill operator purchased several properties surrounding the landfill, some belonging to* ***residents whose water supplies were compromised as a result of landfill operations. A household well west of the landfill, on the former Helms home site, received sufficient contamination from the landfill site and was decommissioned under DEQ supervision.***
>
> *A DEQ report on the situation notes that practices at the landfill were being adjusted to minimize future problems, and the responses included the decommissioning of some wells. "Decommissioning water wells within the LOF ("Location of Facility") or in areas potentially downgradient of impacts removes potential exposure to contaminants in groundwater. Two wells currently proposed for decommissioning include PW-1, which is within the LOF, but currently unused, and the Helms well, which is outside and downgradient of the LOF. The Helms well will be used (with carbon filter unit) until September 2006 at which time it will be disconnected from use and scheduled for decommissioning."*

Record of Decision for Coffin Butte, October 2005. Oregon Department of Environmental Quality, October, 2005, states specifically, under Section 5.2 Elements of Landfill Remedy:

5.2.5 Water Well Removal

Decommissioning water wells within the LOF or in areas potentially downgradient of impacts removes potential exposure to contaminants in groundwater. Two wells currently proposed for decommissioning include PW-1, which is within the LOF, but currently unused, and the Helms well, which is outside and downgradient of the LOF. The Helms well will be used (with carbon filter unit) until September 2006 at which time it will be disconnected from use and scheduled for decommissioning.

5.2.6 Property Purchase

Property purchase near the landfill is an effective means of preventing groundwater use and minimizing land uses not compatible with landfill operations. Such purchases can have a secondary benefit of providing additional buffer area around the landfill and long-term access to groundwater monitoring wells. As property adjacent to the landfill property comes on the market, VLI will pursue negotiations with the owners to buy the property. Properties of current interest to the VLI include the Phillips property south of the landfill and the small rectangular piece of property immediately west of the Closed Landfill, east of Wiles Road.

See also: Wilson, Bob and Gordon Brown, “1993 Coffin Butte Annual Report”, July 19, 1994
https://www.co.benton.or.us/sites/default/files/fileattachments/community_development/page/8139/1993_coffin_butte_landfill_annual_report.pdf
which explains the situation thus:

Helms' Well

In October 1993, volatile organic compounds (VOC's) were detected in a domestic well located near the landfill. A subsequent sample taken in early 1994 confirmed those findings. The well serves the Helms' residence and is downgradient from an area of the landfill which was closed in 1977, prior to most of the environmental controls we have today. So far, Valley Landfills has installed a water treatment system for the Helms. The untreated water could pose a health threat to persons consuming or bathing with it. Also, using the untreated water to irrigate food crops must be avoided as the aerosol from spraying the water and plant uptake of the compounds could pose further threats to human health. No further action is planned at this time except to continue monitoring this and other wells in the area.

In addition to the contamination discovered in the Helms well, Annual Environmental Monitoring Reports (AEMRs) submitted for this site have **repeatedly** acknowledged releases of leachate by seepage from the area of Cell 2, which was identified from high arsenic levels in groundwater, first detected in MW-23 when this was first sampled in 1994-1995, but occurring for an unknown period prior.

In written materials submitted previously by VLI, their consultants have tried to explain away the high arsenic levels seen near that part of the landfill, by claiming that the arsenic is "naturally occurring."

They based this on the speculative idea that arsenic leaches out of "volcanic rocks" when these are contacted by groundwater with low oxygen content. This speculative explanation has a major flaw, as I've pointed out in recent written and verbal testimony:

> **Their proposed mechanism is only scientifically supported for volcanic rocks of rhylotic to intermediate composition, but ....**

The volcanic rocks at Coffin Butte are basaltic (which is at the opposite end of the composition scale from "rhyolitic");

In other words, "Nice idea, but it doesn't work." And VLI has acknowledged seepage from Cell 2 as a source of arsenic contamination in the past.

From: Jim Harlan
To: Benton Public Comment
Subject: Opposed to Coffin Butte Landfill Expansion
Date: Wednesday, July 16, 2025 4:54:20 PM

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

To Benton County Commissioners.

My wife and I oppose the proposed expansion of Coffin Butte Landfill. Many different reasons for expansion have been presented. We'd like to add a further reason to deny Republic forever. We have lived on Rifle Range Rd over 45 years. Republic is not truthful.

"There is a pipe draining leachate from the landfill directly into Soap Creek." It has been there decades!!!!!!! We have seen it!!!!!!
This reason alone should be enough to deny the expansion!!!

Thank you
Jim and Anne Harlan

--
Jim Harlan
harlanjm@gmail.com

To: Chair Fowler and Benton County Planning Commission members

From: Paul Nietfeld, Benton County resident and former member BCTT A.1 Subcommittee
37049 Moss Rock Dr., Corvallis, OR 97330

Subject: LU-24-027: Response to Staff presentation of July 8, 2025: Proposed odor mitigation

Date: July 16, 2025

Chair Fowler and Planning Commissioners:

As presented by the County in testimony of July 8, 2025 [approximately 19:26-22:30 in the video record], the County's proposed conditions for LU-24-027 include several odor mitigation operational conditions: OP-5, OP-7(A-D) and OP-11(A-F).

The landfill odor emissions have been cited by multiple residents as an undue burden, particularly since the significant increase in annual intake volume starting in 2017, and were considered so serious that Staff initially recommended denial of LU-24-027 in part based on the undue burden imposed by landfill odor "expected to "seriously interfere" with adjacent land uses and the character of the area." Subsequently, the Franchisee and the county's consultant have generated a set of proposed conditions that Staff judges will sufficiently mitigate the landfill odor burden. Specifically, the consultant firm Winterbrook stated "With these conditions we felt that this could actually mitigate the odor impacts with a reasonable evaluation of odor" after acknowledging that with the existing landfill "there is odor noticeable at the property boundary of the landfill… the average odor of this is detectable at <the> landfill, as one might expect for a landfill."

Multiple citizens have testified that the current level of landfill odor emissions seriously interferes with adjacent land uses, and even the county's consultant admits to the unsurprising finding that landfill odor is apparent at the property boundary. It is unrealistic to expect that the proposed odor mitigation conditions will correct this situation while adding additional refuse to the total landfill waste in place; many of these conditions (OP-7(A,B,D)) specify monitoring, not preventative or mitigative measures, and others (OP-11(A-F)) specify operational rules very similar to those already in place for the existing landfill cells, which have not prevented harmful odor emissions.

Operational condition OP-7(C) is the only new odor mitigative condition, proposing a limit on annual and total cumulative quantity of "organic waste" intake. In regard to this condition alone, approval of LU-24-027 would require that the Commission accept and endorse at least **three fictions**:

1. **The franchisee is willing and able to measure the quantity and self-enforce the intake limit.**
    a. The term "Solid Waste" itself is undefined, as I personally have discovered in engaging with County Council and the Disposal Site Advisory Committee in an attempt to verify the calculation of the annual Host Fee payment by the Franchisee to Benton County.
    b. The term "organic waste", being a subset of "Solid Waste", is similarly undefined.
    c. What cannot be defined cannot be measured.
    d. As documented by testimony in this matter, Franchisee does not control and does not carefully monitor the contents of the vehicles dumping waste into Coffin Butte.
    e. Franchisee has a long history of withholding information from the county, showing a consistent reluctance to provide data on the operation of the landfill which is needed by the county for proper oversight. Examples include the failure of Franchisee to provide the county with copies of regulatory submissions, as required by contract (2020 Landfill Franchise Agreement, Section 7(c)), the failure of Franchisee to provide the county with a definition of "Solid Waste" at a sufficient level of detail to be able to verify reported intake figures against the intake data

reported to ODEQ, and the failure of Franchisee to yet produce the 2025 Coffin Butte Annual Report, which was due May 30, 2025.

f. Franchisee has a poor record of complying with key regulations such as methane emissions and flare operation, as documented by testimony in this hearing.

2. The county is willing and able to independently verify the quantity and, in the event of violation of the limit, enforce penalties that ensure future compliance to the limit.

a. The County has no legal right to review the raw Coffin Butte intake record data (this right was ceded in the 2000 Landfill Franchise Agreement).

b. The County has produced no evidence that it has ever enforced any condition of approval or zoning requirement for the Coffin Butte landfill.

c. The County failed to take action when the 2000 Landfill Franchise Agreement intake threshold was exceeded for three years (2017-2019), despite having clear contractual recourse to, among other remedies, force a renegotiation of the landfill fees.

d. Given the large revenue and profit values generated by the Coffin Butte Landfill, a fine for a violation would have to be quite large in order to serve as meaningful negative feedback to the Franchisee and compel compliance. At the current intake rate of approximately 1 M Tons annually and at competitive tipping fees of $50-$60/Ton, Coffin Butte currently generates about $50-60M per year of top-line revenue; at a gross profit margin of 88% (landfill operations overall figure per the Republic Services SEC 10-K filing for 2024) this landfill generates a gross profit of approximately $44-53M per year. Therefore, a penalty fine would need to be on the order of millions of dollars to effectuate compliance. The maximum fine currently defined in the Benton County code is $1000 (BCC 31.135).

3. The removal of the intake cap and the resultant unlimited rate of waste emplacement into Cell 6 will at most have no additive impact on the quantity of odor emitted by the landfill as a whole.

a. Citizen testimony documented that the intake volume increase in 2017 yielded an increase in odor to the point of seriously interfering with adjacent property uses.

b. Staff has stipulated that Conditions of Approval associated with LU-24-027 will not apply to existing landfill cells (including the newly-initiated Cell 6); thus, the specified organic waste quantities will not apply to this cell.

c. Franchisee's own documentation for LU-24-027 shows a planned <u>increase</u> in intake volume of 36-69% for the expansion cell alone; with no intake cap the actual intake volume would be limited only by Franchisee's ability to grow the business. In the years 2014-2018 Franchisee demonstrated the ability to double (100% increase) the Coffin Butte annual intake volume.

d. Franchisee, knowing from public engagement on LU-21-047 the sensitivity of the community to adverse harms likely to result from an increased intake rate, could have renegotiated the 2020 Landfill Franchise Agreement to maintain the 1.1M Tons/year intake cap even in the event of approval to place waste in the expansion parcel, prior to submitting the expansion request LU-24-027. The Franchisee did not do this.

Additionally, note that the total organic waste volume of 41,110,068 tons specified in OP-7(C) exceeds the <u>total current waste</u> in place of approximately 24,000,000 tons (calculated from the 2023 Coffin Butte Annual Report) by about 70%. It is quite unreasonable to expect that such a large increase in organic waste volume will reduce odor level relative to the current landfill, which is already imposing an undue burden on adjacent properties per testimony on this application.

The proposed odor mitigation conditions are inadequate to prevent undue odor burdens if LU-24-027 is approved. LU-24-027 should be denied on this basis.

From: Virginia Scott
To: Benton Public Comment
Subject: LU-24-027 - application to expand Coffin Butte Landfill - Fire New Evidence Rebuttal
Date: Wednesday, July 16, 2025 11:56:01 AM
Attachments: Fire New Evidence Rebuttal.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECOMMENDATION: Please deny this application

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Attached please find my response to comments contained in Republic's and County's slide decks in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs. Please remember you need to double-click on the Attachment in the header of this email in order to view my document."

Thank you for your diligent work and herculean effort to review and evaluate the records submitted for this land use consideration.

My attachment is respectfully submitted to respond to new evidence related to fire and fire risk.

Sincerely,

Virginia Scott
37016 Soap Creek Rd.
Corvallis, OR 97330

Virginia Scott ● 37016 Soap Creek Rd ● Corvallis, Oregon 97330

RE: LU-24-027, the application to expand Coffin Butte Landfill
RECCOMENDATION: Please deny this application

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

I'm submitting this letter in response to information in two items in the in the "9. New Evidence from July 8-9 Hearings" folder on Munidocs:

1) Republic's slide deck ("25RS1067 Coffin Butte Deck_FINAL")
2) County staff's slide deck ("Staff Slides to Planning Comm LU24027 July 8")

And for verification/support of statements I make below, I've provided links to items in Munidocs (as they relate to the above two items) so that you can quickly and easily refer to them, if needed. Please note that per the system County uses, any links in emails submitted to Munidocs are found in the "Attachments" section of the email's header, and must be double-clicked to open.)

Topic: FIRE

Below I will be referring to:
<> County staff's slide deck, pages 6, 7, 23, 25 and 28; and
<> Republic's slide deck, pages 17-19

In County staff's slide deck, page 6, under "Agency Comments", under "Responded" Adair Rural Fire Protection District is listed as having "responded" on April 21, 2025.

This listing would seem to suggest that the County had reached out to Adair Rural Fire Protection District to solicit input.

Per Kate Harris in 07092025_HARRIS_Kate Page 4 https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287992bcb718 she confirmed that Adair Rural Fire Protection District was never contacted by the County about the CUP.

On April 21, 2025 Adair Rural Fire Protection District Chief Arron Harris did submit public written testimony urging rejection of the CUP 1819_04212025_HARRIS_Aaron https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696ca0debf7.

> The County never reached out to Adair Rural Fire Protection District for input.

In **Republic's slide deck, page 19**, Republic responds to the Comment that "*Coffin Butte does not record fires or keep incident logs of such events*" as follows:

- Coffin Butte Landfill pledges to maintain a log of fire incidents.
- Coffin Butte Landfill will provide a verbal report of fire events during Benton County Disposal Site Advisory Committee (DSAC) meetings.
- Coffin Butte Landfill will report each fire event to ODEQ.

> Coffin Butte was already required to report all fires to ODEQ as part of their Title V Air Quality Permit.

As documented in 070925_SCOTT_Virginia, page 3 (https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287982fdddfd)

> Despite the existing requirement to report all fires to ODEQ, Republic Services is not reporting them to ODEQ.

Also see 2008_07012025_SCOTT_Virginia01 attachment beginning on page 1 which documents the only 2 ODEQ fire reports since January 1, 2022 of the 13 known fires during that same period (https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=826f5adc57ab5)

Republic Service "pledges" to maintain a log of fire incidents and report each fire event to ODEQ, and this is stated as a mitigating COA per Staff slide deck p. 23.

> "Logging and report fires" after they occur does not mitigate a property owner losing their home, business, or the use of their land.

> As to fire prevention: Reporting of fire events is a reactive measure, it is not pro-active. I did not see mention of measures being taken to monitor the landfill for eruption of fire, monitor "extinguished" fires after hours to make sure that they do not reignite, nor a mention of notifying local fire departments upon the onset of an eruption of fire, only reporting after the fact. We are now in the "fire danger" period of our year and a small fire eruption can quickly move to a major wildfire.

In **Republic's slide deck, page 18**, Republic states that *"Coffin Butte Landfill met with Adair Fire in March 2025, with each pledging a cooperative relationship going forward." and "No concerns about fire department support were expressed during that meeting."*

> The meeting in March 2025 was initiated by Dr. David Hackleman, an adjacent property owner, to discuss what afterhours fire monitoring Republic Services could implement. Dr. Hackleman was concerned that there is no plan for afterhours monitoring either of fires that had started during the

day that had been "treated", but later flared after hours, or of new fires that ignited after closing, and the fact that Republic Services was relying on citizens passing by to report fires.

> Of particular note is that Dr. Hackleman hosts radio communications equipment on his property that among other things would be used for emergency communications between the Soap Creek Valley and the outside world if traditional communications were otherwise unavailable due to power outage, downed cell service, damaged landlines, etc. Fire damage to these communications resources is a significant undue burden. See page 4-5 of Dr. Hackleman's testimony:
(https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166f5dd2f495)

> The meeting was not about "pledging cooperative relationships", or about the "fire department's concerns about being able to provide support", which explains why that was not brought up at the meeting. The fact that it was not brought up in a completely unrelated discussion regarding after hours monitoring is not "proof" that there are no concerns.

Please see 07082025_HIGGINS_Nancy (https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=82879815d004a) for a description of a few of the concerns and undue burdens on the volunteers of Adair Rural Fire Protections District.

In County staff's slide deck, page 28, under "Key Findings", it lists the following:

BCC 60.405 Siting Standards.

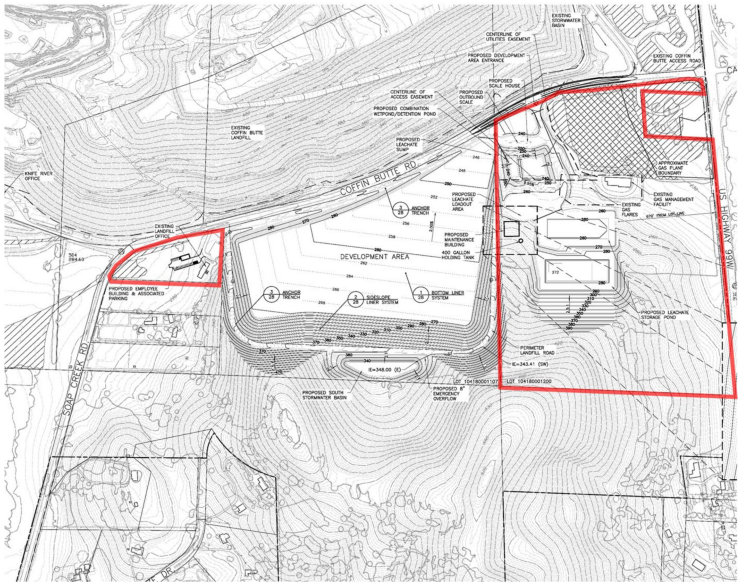
- Proper fire mitigation and minimize fire risks
- Least impact on forest operations and accepted farming practices
- Minimize use of forest lands

County then "Concur(s) with applicant and county engineers, no significant impact, impacts and uses are minimized" and claims "P2-4 (of Applicant's application) ensures consistency with FC zone fire break standards."

Here is what "P2-4" actually says:

Applicant shall maintain a primary and secondary fuel-free fire-break surrounding each structure on land within the FC zone that is owned or controlled by the owner, in accordance with the provisions in "Recommended Fire Siting Standards for Dwellings and Structures and Fire Safety Design Standards for Roads" dated March 1, 1991 and published by the Oregon Department of Forestry (ODF).

And below is the Exhibit showing locations of the proposed fire breaks:



Tax Lot location of proposed structures over the Applicant's Exhibit E2, Sheet 6 in Staff Report

> Placing fire breaks around the structures in the new development, as illustrated in the plans above (outlined in red), will in no way protect or mitigate the risk to the community from a landfill fire in the existing or the new proposed landfill.

> The changing climate is increasing instances of wind events with fire (Lahaina, LA, Paradise, Oregon's Labor Day fires) which are not mitigated by a fire break and especially a fire break that does not surround the primary area(s) of concern.

In <u>County staff's slide deck</u>, page 23, under "Key Findings", BCC 53.215 (1) Fire risk impacts vs. uses on adjacent properties and character of the area,

It states that those fire risks "Can be mitigated through COAs", specifically:

OP-11(F) and OP-12(A-C) limit accepted waste, maintain a working fire truck on site, monitor and log, and provide records relating to fires.

> Approval of this application triggers removal of the intake cap, not only on the NEW SOUTH LANDFILL, but, per the 2020 Franchise Agreement, on the westward quarry expansion that the Applicant has already begun filling.

> No Conditions of Approval on the application before you would constrain the Applicant from disposing of as much waste as the Applicant wishes ("organic" or otherwise) in the 14,000,000 CUYD of airspace in existing landfill airspace, Staff has been very clear on that.

In County staff's slide deck**, page 3, under "Public Comments", Staff shows no Fire or Fire Risk comments on the color wheel of comments.**

> To date, at least 74 records have been received by the county from at least 52 entities (people, services, organizations, and businesses) expressing concern regarding fire risk at the Coffin Butte Landfill. These risks cover volunteer firefighters, ODF responders, citizens, toxic fumes, wildlife, endangered species, property, businesses, emergency communications, forests, historical sites, emergency egress, homes, communities, utilities, services, character of the area, livestock, etc. Appendix A includes the links to these records.

With the approval of LU 24-027, the **existing intake cap** that **currently constrains the Applicant's** maximum yearly volumes **is removed**. The Applicant is then free to increase yearly volumes in the 14,000,000 CUYD of existing permitted landfill space with no constraints.

No constraints include no constraints on flammable material. Think of vape devices or lithium batteries coming in via garbage, and Republic trying to detect or screen for those, or find them in the giant mounds of garbage. These devices are susceptible to thermal runaway, which can be exacerbated by crushing or water, and can burn at extremely hot temperatures in the absence of oxygen.

All of these risks cannot be mitigated by the proposed conditions of approval. None of the conditions prevent a fire from starting, none detect a fire that has started, none monitor a fire that is allegedly extinguished after hours, and none of them will prevent a fire from spreading, and causing undue harm to our ARFPD volunteers, our forests, emergency radio equipment, our communities, our health, or the character of the area.

Please deny this Application for expansion.

Sincerely,

Virginia Scott

Appendix A - Fire Records Received by County as of 7-16-25

(In alphabetical order, retrieved using “fire” search in Munidocs)

Kimberly Bales:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d0a11b0a0

Kathleen Bartee:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696a303b0f5

Beyond Toxics:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=828798b139dcf

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287995ac191c

Mardi Bilsland:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=82b98b4921bce

Bit By Bit Board:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=828797ed725c2

Erin Bradley:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166da5efd29c

McKenna Bradley:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8286bb1eb8929

Pamela Castle:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166a3145a68e

Bethany Dengler-Germain:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696ae475d31

Kiko Denzer:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166a31a06b92

Paris Edwards:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166cd0a35e3e

Ken Eklund:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166ed1970b76

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0e5432b82d

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81670690c51c1

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=82879933c31a5

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816704617dddf

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81670791773ef

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816708dd58af3

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=826f5aa37393c

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166fba5e5b22

Kristina Fauste:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166cf7e2b971

Ian Finn:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166ce60315e1

Rana Foster:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287999900c21

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816705b421ed7

Joel Geier:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=82879a032c3b4

Shean Germain:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816968a3f1998

Victoria Gordon:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166a5b6616df

Pete Gruendike:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166cf7f8803c

Abigail Haberman:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816968e067d97

Dr. David Hackleman:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166f5dd2f495

Stacy Hampton:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8169689cd4eb6

Aaron Harris:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696ca0debf7

Kate Harris:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287992bcb718

Camille Hall:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0ddf2dc9e2

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287983bfe7cf

Mark Henkels:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=826f59ed966ff

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0ddf13881b

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0e4804964b

Nancy Higgins:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8292e331cebba

Duane Jager:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166cdae45a14

Richard Kipper:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d91c41b5d

Robert Kipper:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=816968ec12a76

Jeff Kleinman:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=828799bb1830d

Ken Kupperman:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0c7eb2fdda

Melissa Livingston:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d3db43dcd

Lynne McAllister:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0c9f740b1d

Carol McClelland-Fields PhD:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81697012db6d1

Lois Mellem:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166ebb89d966

Hilary Metz:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166c7274b054

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166c754fad9f

Eliza Murphy:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d2a99b353

Debbie Palmer:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8292e334f8300

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=826f5a0427f12

David Patte:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696b3b0cfcf

Elizabeth Patte:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81696b63dcf5d

Marge Popp:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=82879996cb402

Ken Robertson:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d346d0bee

Jenny Saarloos:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=828797e4c4f6e

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=828797d8a0ef6

Virginia Scott:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8135d6da5a4f1

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8292e33a1d682

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8167098f72d7c

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=826f5adc57ab5

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166eb36b5cdf

Carol Searls:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166d0bf1d05d

Marybetts Sinclair:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8169694bbdd5d

Joanne Patricia Stevenson:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166a315de2b5

Dr. Shelley Su:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81c0db98957e7

Robin Vega:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8166cefed0e36

VNEQS:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8110bba734f94

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=823036bb663ac

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=81da86e0a2d8a

Nancy Yialouris:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8169681e4198e

From:	Benton Permit Check
To:	Benton Public Comment
Subject:	FW: LU-24-027 Extended post-hearing Testimony re:written evidence in the record by Veronica Thompson
Date:	Wednesday, July 16, 2025 4:58:10 PM

From: Veronica Thompson <veronicavaldat@gmail.com>
Sent: Wednesday, July 16, 2025 4:57 PM
To: Benton Permit Check <permitcheck@bentoncountyor.gov>
Subject: Fwd: LU-24-027 Extended post-hearing Testimony re:written evidence in the record by Veronica Thompson

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Sent from my iPhone

Begin forwarded message:

> **From:** Veronica Thompson <veronicavaldat@gmail.com>
> **Date:** July 16, 2025 at 4:38:50 PM PDT
> **To:** permitcheck@bentoncounty.or.gov
> **Subject: LU-24-027 Extended post-hearing Testimony re:written evidence in the record by Veronica Thompson**
>
> To: Benton County Commission
> on LU-24-027
> From: Veronica Thompson
> 3091 NW Greenbriar Place
> Corvallis, OR 97330
> Dear Benton County Commissioners:
> Upon reviewing all 152 pages of the documented testimonies from July 8th and July 9th Public hearing I came to a conclusion that the Republic Services (Applicant) failed to meet its Burden of Proof that the proposed expansion of the Coffin Butte Landfill isn't a "Serious Interference" with the existing adjacent properties use. The Landfill as of now at its present size 600 ft above sea level, thus exceeding 450 ft above sea level limit proposed by existing permit is a dangerous nuisance as it is to the entire Adair Village and North Corvallis areas.
> I refer your attention to the expert testimony by Aaron Harris, Fire Chief of Adair Rural Fire Protection who recommends the denial of the expansion to

the Applicant.
There is another expert testimony on the record from Jason Schindler, Chair Benton County ENRAC who also recommends a denial on the “Applicant’s” application for expansion permit.
I reviewed the Applicant’s expert Dr. Tony Sperling of LFC MFA engineering and found it lacking specific details and being unnecessary broad in its scope. The over-reliance on self-monitoring by the Republic was especially noticeable.
In contrast, well thought and well-supported by presented at the public hearings evidence testimonies by Mark Yeager (07092025) and Ken Eklund (07082025 and 070925) were persuasive and common-sense based.
The exhibit of megaleak on April 28, 2025 documented by satellite survey company Carbon Mapping was never rebutted by the Applicant’s experts.
The written testimony presented by “Beyond Toxics” presents the evidence of Applicant’s multiple failures to comply with applicable EPA’s standards and the ongoing investigation under Section 114.
Exhibit E55 pp.1-5 refers to a “robust monitoring” by the Republic, which is currently avoids it as documented by the record at the July 8th and 9th, 2025 Public Hearings.
In summary, my biggest concerns are with non-compliance by the Republic with its existing permit and the absence of fire safety, which is evident by its usage of a 4,000 gallons watertruck designed for dust control, but not fire extinguishing on a scale of multiple toxic chemicals burning at once. The hazardous and toxic substances burn at extremely high temperatures releasing toxins that travel well beyond in hot summer windy days. The Benton County’s budget is not sufficiently funded to keep up with all necessary monitoring and enforcement of the Landfill’s operations. The proposed conditions for approval list about 83 necessary improvements that somehow will make the 930 mln tons organic waste and uncapped non-organic waste safer to store next to residential communities. The undue burden on Benton County’s taxpayers and all residents and high risk of accidents:
1) leachate leaks through damaged liner, which rarely if ever inspected;
2) groundwater contamination with no adequate way to remediate;
3) dewatering as Landfill uses Adair Village drinking water sources to refill its dust control tanks,
4) excessive noise pollution as of now with levels exceeding the existing permit;
5) danger of underground leachate contaminating water wells of the

adjacent properties; there is according to the written testimony by David Hackleman a persistent lack of transparency with the adjacent properties owners when the Republic never release its tests results from the test wells).
For all the reasons stated above and all documents included into the Benton County's Planning Commission July 8,9 2025 folder I strongly urge this Commission to deny the Applucant its permit application.
Thank you for your service to the Benton County community!
Veronica Thompson

Sent from my iPhone

From:	Mark Yeager
To:	Benton Public Comment
Cc:	Mark Yeager
Subject:	Response to New Evidence LU-24-027 - LITTER
Date:	Wednesday, July 16, 2025 1:56:50 PM
Attachments:	Litter Testimony Response to New Evidence Yeager.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Chair Fowler, Vice Chair Hamann, and Planning Commissioners Biscoe, Cash, Fulford, Lee, Struthers, and Wilson:

Thank you for your continuing attention to the complex issues surrounding this application.

The attached document has been prepared in response to new evidence regarding litter impacts and proposed mitigation efforts submitted by Benton County staff and Republic Services at the July 8th hearing.

Sincerely,

Mark Yeager

Mark Yeager
37269 Helm Drive
Corvallis, OR 97330
July 15, 2025

Chair Fowler, Members of the Planning Commission:

This letter is submitted as a response to the written materials (LU-24-027) presented to the Commission on July 8, 2025, by Republic Services titled "Response to Staff Report and Public Comment" and the written materials submitted by Benton County and their consultants titled "Staff Report Presentation" also dated July 8, 2025.

In addressing LITTER IMPACTS, Republic Services in their materials (page 11) make it clear that they will employ NO NEW MEASURES to control litter. In fact, they state in their July 8th presentation that they will "Maintain at least the same level of litter control measures as part of the expansion process." As shown in the photo below, from Coffin Butte, their existing measures do not actually capture any litter when employed. This method of fencing, whether bull fencing or defender fencing, cannot and does not capture the trash that is picked up by swirling wind that takes it high into the air and deposits it on adjacent and nearby properties.

You have received testimony from the Bradley family:
(https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8286bb1eb8929)

and the Krueger/Wilson family:

https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=8287999ea5bc8

as well as photographic evidence in the record that shows how the trash that rains down on their properties affects their agricultural and therapy operations.

Republic Services proposed "mitigation efforts" are nothing more than window dressing on an issue that they have not previously controlled and cannot control on the expansion parcel. No amount of fencing will capture that litter, particularly given its placement relative to the working face (as shown in the photo above).

A physical aerial net over the entire operation might be the only means capable of capturing the litter that floats hundreds of feet into the air before coming down on adjacent properties. That, of course, is not feasible and Republic is not proposing, nor is the County requiring anything of that nature.

From Republic's proposed mitigation efforts presentation (page 11) on July 8th:

"Expand litter collection activities to include Tampico and Soap Creek Roads."

Republic's proposal to pick up litter along Tampico and Soap Creek Roads will not mitigate the litter that ends up on private properties and seriously interferes with agricultural and residential uses.

BENTON COUNTY PROPOSED CONDITIONS OF APPROVAL – LITTER

The staff's proposed conditions of approval will necessarily be ineffective because they do not control the atmospheric conditions that lift the feather-light trash from the working face and haul roads high into the air and deposit them onto adjacent and nearby properties. From County staff presentation (underlined), page 22:

Litter impacts vs. uses on adjacent properties and character of the area

Can be mitigated through COAs.

OP-5 *limits the final elevation to 450 feet,* ***OP-11(A-F)*** *site operation including daily cover, and* ***OP-15(A)*** *requires litter control measures such as fencing, a collection program, monitoring and reporting*

Analysis and comments:

Limiting the top of the dump to 450 feet will have no effect on the prevalence or distribution of windblown trash. There is no evidence or analysis in the record that reducing the height of the new dump will have any effect on litter ending up on adjacent or nearby properties and seriously interfering with the use of their properties.

Regarding the required daily cover condition of approval (OP-11B), the applicant already supposedly applies daily cover to the working face of the existing dump, and that has not proven effective at controlling airborne litter. The litter that makes its way to adjacent and nearby properties is generated during the active hours of operation when there is no cover on the working face.

Condition of approval OP-11A to limit the size of the working face has so many loopholes you could drive a trash truck through it. Republic has already testified that they will frequently have more than one working face during transitions and cell development (so the total working face will likely be far greater than two acres) and the exceptions in the condition are completely vague and unenforceable.

The additional sub-conditions in OP-11 are similarly vague, unenforceable, or completely unrelated to litter control (e.g., Applicant shall not develop a use, construct any structures, or make any site improvements that are not contained in the approved site plan (11E); Applicant shall keep all landfill infrastructure in good repair, and shall repair as promptly as possible any disabled, damaged, or nonworking infrastructure (11D); Applicant shall not accept regulated hazardous waste as defined in 40 CFR 258.20(b) at the site(11F).) What does hazardous waste have to do with litter?

Condition of approval OP-15 regarding implementing and maintain existing litter control measures has no value at all because their existing litter control measures are not working and the evidence in the record has proven that case.

As far as litter affecting the character of the area, the pictures of the trash in the vicinity of the existing dump and along the main haul routes to and from the facility demonstrate serious interference with the character of the area.

The images below demonstrate serious interference with the character of the area and represent a sampling of the impacts of hosting an expanded landfill on the character of the area.

Soap Creek Valley looking south – character of the area:

Roadside litter

Roadside litter

Roadside litter

Thank you for your time and attention. Please deny LU-24-027.

Sincerely,

Mark Yeager

Re: LU-24-027, Republic Service's application to expand Coffin Butte Landfill

Recommendation: Please deny this application

Chair Fowler, Vice Chair Hamann, members of the Planning Commission -

I wish to rebut some of the comments made by Brent Pawlowski in his July 9 written testimony (see "07092025_PAWLOWSKI_Brent" in the "New Evidence from July 8-9 Hearings" folder on Munidocs). My rebuttals aim to demonstrate that these arguments of Mr. Pawlowski's in support of expansion are inaccurate and therefore his testimony should not be credited with any weight in your decision-making.

Rebuttal 1:

Mr. Pawlowski states, "Republic Services has not had an environmental compliance violation."

Please see attached pdf of letter from DEQ to Valley Landfills (aka Republic Services) dated July 10, 2024 with the following wording highlighted:

> *"**The Department has concluded that Valley Landfill is responsible for the following violations of Oregon environmental law**:*
>
> *(1) Failing to conduct performance tests on gas control devices, Flare 1 and Flare 2, according to OAR 240-239-0110(2)(f)(B). **This is a Class I violation** according to OAR 340-012-0054(1)(qq).*
>
> ***Class I violations are the most serious violations**"*

Rebuttal 2:

Mr. Pawlowski states, "The contentious methane "exceedances" are not violations."

• Putting the word exceedances in quotes does not diminish their seriousness.

• The exceedances are not "contentious" -- they are numerous, and well documented in the two EPA inspections of the landfill in 2022 and 2024 (about which you've heard many times).

• Lastly, the fact that the exceedances have not been classified as violations *yet* does not preclude the very real possibility that they *may still be*. EPA Enforcement still has an "active enforcement" situation going on to this regard. This is verified in two more attached pdfs:

<> transcript of conversation between Sen. Jeff Merkley and Michael Regan, EPA Administrator, at Senate Appropriations hearing 5-1-2024 (key passages highlighted, such as "it's an active case, and we are laser-focused on this case." [Regan])

<> 3-24-25 email from Sara Conley (EPA Air Enforcement Officer) to Bailey Payne, Benton County solid waste program coordinator, confirming Regan's statement as "accurate"

The fact that EPA has an "active enforcement situation" which cannot be discussed "without betraying confidence or legal obligations" -- and that Republic Services continues to gloss over and minimize this situation -- should in and of itself be grounds for denying this application.

Rebuttal 3:

Mr. Pawlowski states, "A website claimed to be "Coffin Butte Facts" has falsely stated that Republic Services is currently "violating environmental laws."

For the record, www.CoffinButteFacts.org is the website of the community group "Valley Neighbors for Environmental Quality and Safety" or "VNEQS" (pronounced 'vee-necks') - this is the group represented by legal counsel Jeffrey Kleinman.

For the record, our website's homepage actually opens with the statement: "The Coffin Butte Landfill is *not safe.* This dump is already polluting air and water and violating environmental laws. **Making it larger will only make all this worse.**" I have attached screen grabs from our Get Up to Speed page, which goes into greater detail to support these claims. (Apologies for bits of overlap and slight cutoff in a few places; did my best to get screen grabs that would fit on an 8.5 x 11 page!)

As to Republic Services violating environmental laws...

A search using the website Violation Tracker -- created by the nonprofit GoodJobsFirst.org to document corporate misconduct across the country [https://violationtracker.goodjobsfirst.org/] -- reveals that Republic Services has incurred penalties of over $161 million for environment-related offenses since 2000. (For comparison, Waste Management Inc., a much larger company, paid less than $50 million for environment-related offenses during the same period.) See attached screen captures of search results for both companies.

So: our website is not making false statements. There's a reason we call it "Coffin Butte Facts"

Rebuttal 4:

Finally, Mr. Pawlowski states, "Opponents to the landfill have purposely passed out misinformation" then goes on to *incorrectly* describe a postcard mailer we sent. (I have attached a copy of the postcard itself, for reference. The postcard is the final attached graphic.)

• It was not sent by Beyond Toxics, it was sent by VNEQS, funded by a grant from CHEJ (Center for Health, Environment & Justice) and the support of Beyond Toxics. And for some inexplicable reason Mr. Pawlowski adds Corvallis Environmental Center as one of the sponsor groups... there was *no involvement by them whatsoever.* He pulled that out of thin air.

• If you read the postcard, we do not say dumped "directly." We *do* use the word "dumped", to get people's attention... but that is qualified in the photo caption which states that "Approximately 20 of these tankers per day currently leave the landfill full of leachate that eventually ends up in the Willamette River." ***The whole point is that millions of gallons of toxic leachate do indeed go into the river.*** That is undisputed. *And not misinformation.*

Once again: I thank you profusely for the monumental amount of thoughtful care and attention you are all putting into this evaluation. I have confidence that you will weigh the evidence and conclude, without a doubt, that Republic Services' burden of proof is not met and therefore their application to expand must be denied.

Respectfully submitted,
Debbie Palmer
37340 Moss Rock Dr
Corvallis, OR 97330

Oregon
Tina Kotek, Governor

Department of Environmental Quality
Western Region Salem Office
4026 Fairview Industrial Dr SE
Salem, OR 97302
(503) 378-8240
FAX (503) 373-7944
TTY 711

July 10, 2024

Ian MacNab
Valley Landfills, Inc.
Coffin Butted Road
Corvallis, OR 97330

Sent via email only (imacnab@republicservices.com)

RE: Pre-Enforcement Notice
Valley Landfill
2024-WLOTC-9427
02-9502-TV-01
Benton County

Dear Ian MacNab:

Valley Landfills, Inc. operates a gas collection and control system at the Coffin Butte landfill that includes shrouded flares.

On October 4, 2021, Division 239 was added to Chapter 340 of the Oregon Administrative Rules. Division 239 includes new requirements to reduce methane emissions from Oregon landfills. OAR 340-239-0110(2)(f)(B) requires that emissions from existing gas control devices, including flares, be tested within 180 days of the date that the Division 239 requirement became applicable to you, which was when the methane generation report was due on October 1, 2022. Therefore, testing of your shrouded flares should have been completed by March 30, 2023.

The design of your current shrouded flare does not easily lend itself to be tested, and testing of the current flare was not completed or attempted. In order to meet the testing requirement described above, the shrouded flare should have been fully enclosed to allow testing or replaced with a new enclosed flare.

In early 2023 during multiple phone calls, DEQ informed you that you would need to install a new enclosed flare. You submitted a Notice of Approval (NOA) and a minor permit modification application to DEQ for the new enclosed flare on August 1, 2023. After some back and forth, DEQ approved the NOA on November 9, 2023. This new flare will be able to accommodate testing but has yet to be installed and operated. Upon startup of the enclosed flare, the existing shrouded flares will be removed.

The Department has concluded that Valley Landfill is responsible for the following violations of Oregon environmental law:

VIOLATIONS:

(1) Failing to conduct performance tests on gas control devices, Flare 1 and Flare 2, according to OAR 240-239-0110(2)(f)(B). This is a Class I violation according to OAR 340-012-0054(1)(qq).

Class I violations are the most serious violations; Class III violations are the least serious.

In order to correct the violation or minimize the impacts of the violation cited above, DEQ requests that you take the following corrective actions:

Corrective Actions Requested

1) Install and operate the enclosed flare that you have construction and operating approval for by 7/31/2024 and test this flare by 10/31/2024; or
2) Enclose the existing flares in such a way that they can be tested and test them by 10/31/2024.

Your timely and responsive action on these items will be taken into consideration in any civil penalty assessment issued by the Department.

If you believe any of the facts in this Warning Letter are in error, you may provide written information to me at the address shown at the top of the letter. The Department will consider new information you submit and take appropriate action.

The Department endeavors to assist you in your compliance efforts. Should you have any questions about the content of this letter, feel free to contact me in writing or by phone at 503-378-5070.

Sincerely,

Michael Eisele

Michael Eisele, PE
Environmental Engineer 3
DEQ Western Region, Salem

Sen. Jeff Merkley to Michael Regan, EPA Administrator
May 1, 2024

https://www.appropriations.senate.gov/hearings/a-review-of-the-presidents-fiscal-year-2025-budget-request-for-the-environmental-protection-agency

1:52:32
JM: [In my] home state: Coffin Butte Landfill. In June of 2022 the EPA sent out a team to measure the methane coming out of it, because of local concerns. The inspection resulted in recording 61 leaks, including three measurements that maxed out the instrumentation that was being used, at 70,000 parts per million. So: can you give me a short version of what action the EPA is taking? This is now 23 months ago that the field inspection occurred. If we need a longer discussion, I'd like to follow up with you to make sure that there is going to be action regarding landfills like this that are out of compliance.

1:53:10
MR: Well, I will say that our enforcement arm has been very aggressive at looking at these methane leaks and opportunities here. This is one that as you said was discovered in 2022. Unfortunately it is an active enforcement situation, so I can't speak to that without betraying the confidence or the legal obligations that I have. But I can tell you that we are coordinating with the State of Oregon – it's an active case, and we are laser-focused on this case.

1:53:43
JM: Great, because if you have a landfill which maxes out the instrumentation – which is I think quite rare? – it should probably rise to the top of the list of places to act on. I'll convey to the folks in Corvallis and nearby that you are on the case.

From: Conley, Sara
To: PAYNE Bailey
Subject: RE: Coffin Butte Landfill
Date: Monday, March 24, 2025 8:51:57 AM
Attachments: image001.png

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Bailey,

Sorry for the delay. Unfortunately I cannot provide any update other than to say that the information you have from former Administrator Regan is accurate. Landfills were part of a National Enforcement and Compliance Initiative (NECI). These NECIs dictate, to some degree, how EPA uses it's enforcement resources. Since these initiatives are national, the focus on Landfills was large in scope and the since it was a focus of compliance efforts there were many landfill inspections nationwide. Sorry for the limited answer. There is no timeline for decision. I did conduct an inspection in June of 2024, report issued late August 2024. Let me know if you have not seen that report.

Sara Conley

Air Enforcement Officer
Air and Toxics Enforcement Section
Enforcement and Compliance Assurance Division
U.S. EPA Region 10
Conley.Sara@epa.gov
206-553-6914

From: PAYNE Bailey <bailey.payne@bentoncountyor.gov>
Sent: Thursday, March 13, 2025 9:40 AM
To: Conley, Sara <Conley.Sara@epa.gov>
Subject: Coffin Butte Landfill

Caution: This email originated from outside EPA, please exercise additional caution when deciding whether to open attachments or click on provided links.

Hi Sara,

My name is Bailey and I am the solid waste program coordinator for Benton County (Oregon). I'm the staff lead of the Benton County Disposal Site Advisory Committee and methane and odor emissions are a focus area for the group. The Coffin Butte Landfill has

applied for an expansion and I think that it would be helpful to know the status of any investigation happening with Coffin Butte's emissions.

In August I saw an article in the Statesman Journal where the former Director Regan said, "But I can tell you that we are coordinating with the state of Oregon. It's an active case and we are laser-focused on this case." I'd appreciate any updates that you can provide about this issue. For example, is there a timeline for a decision? Is Coffin Butte an outlier or are landfills above a certain size all being investigated? Are there any enforcement actions planned?

Thanks for any clarification that you can provide.
-Bailey

Benton County OREGON

Bailey Payne
Solid Waste Program Coordinator
(541) 224-1339
Bailey.Payne@BentonCountyOR.gov

COFFIN BUTTE FACTS

Republic Services wants to try to expand the landfill. Again.

This is NOT A LOCAL ISSUE, and *NOT something the public gets to vote on*— it is NOT decided in an election.

The landfill is NOT OWNED, OPERATED OR CONTROLLED by Benton County.

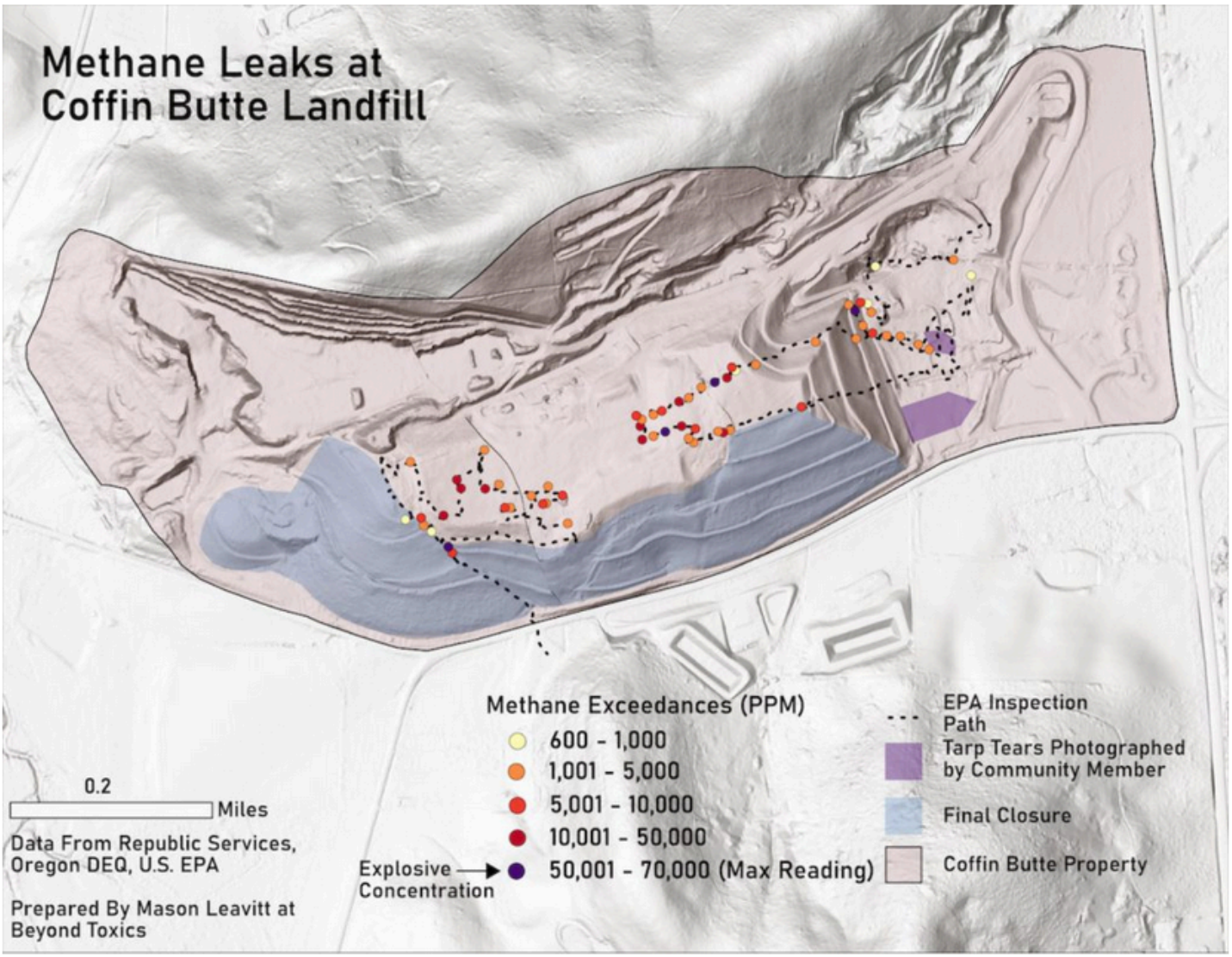
This dump will be an **Environmental LIABILITY** for generations to come:

It already impacts regional air quality and global climate change with massive leaks of **methane** and other toxic gases, and pollutes groundwater and surface water in the Willamette Valley with toxic **leachate**— the "garbage juice" created when rainwater percolates through everything ever buried there since the '40s including heavy metals, carcinogenic industrial solvents and PFAS "forever chemicals."

In 2022 the EPA documented a massive number of **methane** leak violations with some measured methane levels higher than their equipment could register – "explosive levels" in some cases. A subsequent inspection in 2024 revealed *more* leaks... *including an uncapped wellhead.*

toxic **leachate**— the "garbage juice" created when rainwater percolates through everything ever buried there since the '40s including heavy metals, carcinogenic industrial solvents and PFAS "forever chemicals."

In 2022 the EPA documented a massive number of **methane** leak violations with some measured methane levels higher than their equipment could register – "explosive levels" in some cases. A subsequent inspection in 2024 revealed *more* leaks... *including an uncapped wellhead.*



The Elephant in the Room

ANNUAL CLIMATE DAMAGE

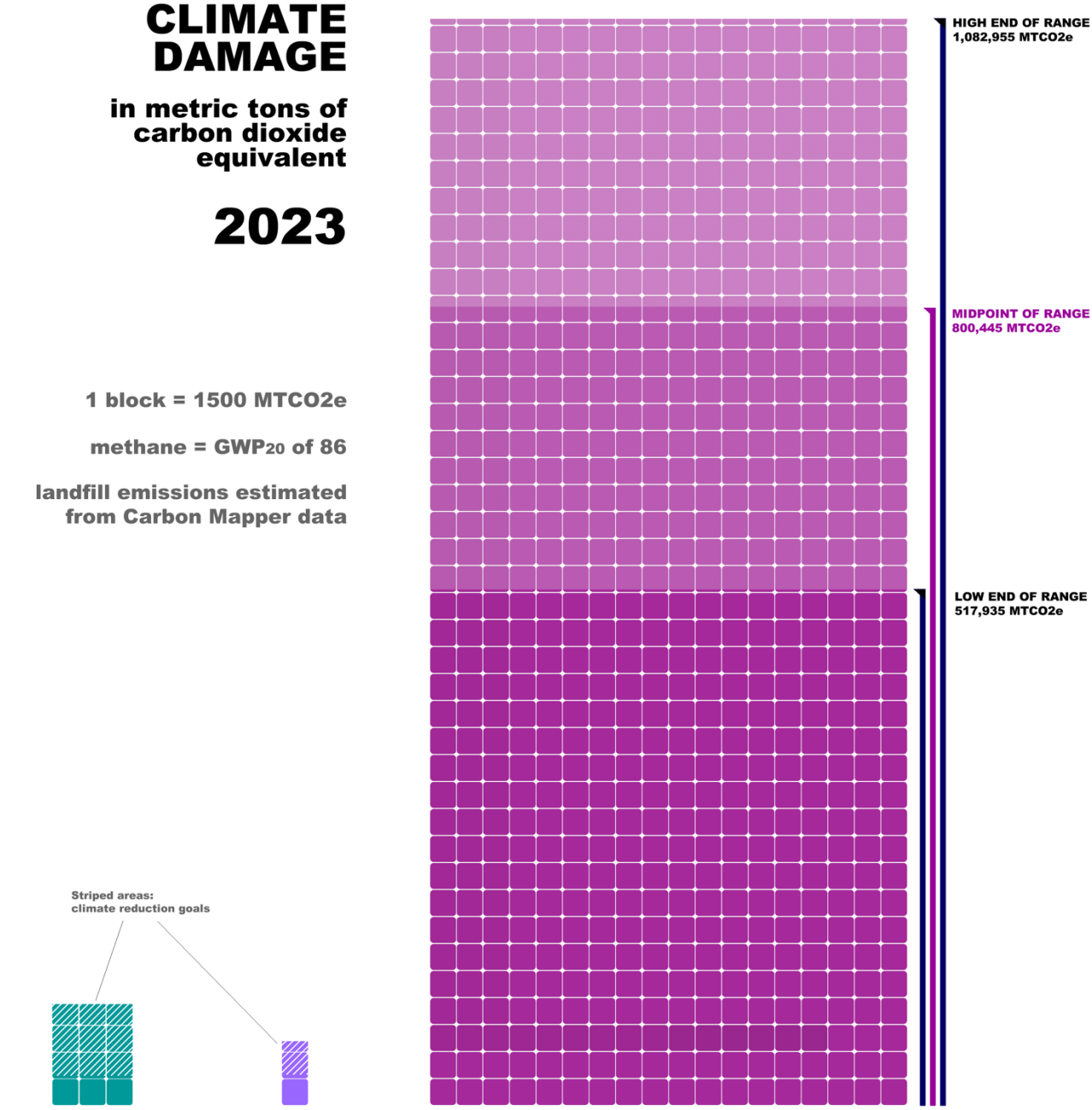
in metric tons of carbon dioxide equivalent

2023

1 block = 1500 MTCO2e

methane = GWP_{20} of 86

landfill emissions estimated from Carbon Mapper data



Corvallis City Government
17,004 MTCO2e (2022)

Benton County Government
3550 MTCO2e (2022)

Coffin Butte Landfill
800,445 MTCO2e, with confidence interval between 517,935 and 1,082,955 MTCO2e (2023)

All figures are approximations from most recent data available. Methane MTCO2e uses GWP_{20} = 86

Data sources: greenhouse gas inventories self-published by City of Corvallis (2022), Benton County (2022); striped areas show climate action reduction goals. Carbon Mapper data from aerial surveys (2023).

Carbon Mapper super-emissions from four point sources derived from six remote sensing surveys of 16 methane plumes over a ten-day period in June 2023. Methane quantification by Carbon Mapper: 1.7 metric tons of methane per hour, plus or minus 0.6 metric tons

For simplicity, scenario assigns equal share in output to each point source and varying durations to each: Point Source 1 = 3 months, PS2 = 6 months, PS3 = 9 months, PS4 = 12 months

(caption: When it comes to reducing its climate damage footprint, Benton County should be looking at the Coffin Butte Landfill - the largest methane emitter by several orders of magnitude.)

30 to 35 million gallons of **leachate** per year (in 2024 ***it was 40 million gallons***) are trucked to Corvallis and Salem wastewater treatment plants where "treatment" primarily consists of dilution. Diluted leachate is dumped into the Willamette River.

Fractured basalt, not clay, underlies the dump. Water moves unpredictably through fractured basalt. Parts of the dump are unlined, and the areas that *are* lined may already be leaking (and *will eventually* leak), so there's *no assurance what direction escaped* ***leachate*** *will travel and whose drinking water and agricultural wells will be affected.*

(caption: Leachate tanker truck filling up at Coffin Butte Landfill. With an estimated capacity of 5500 gallons, these tankers make approximately 20 trips per day to Corvallis and Salem.)

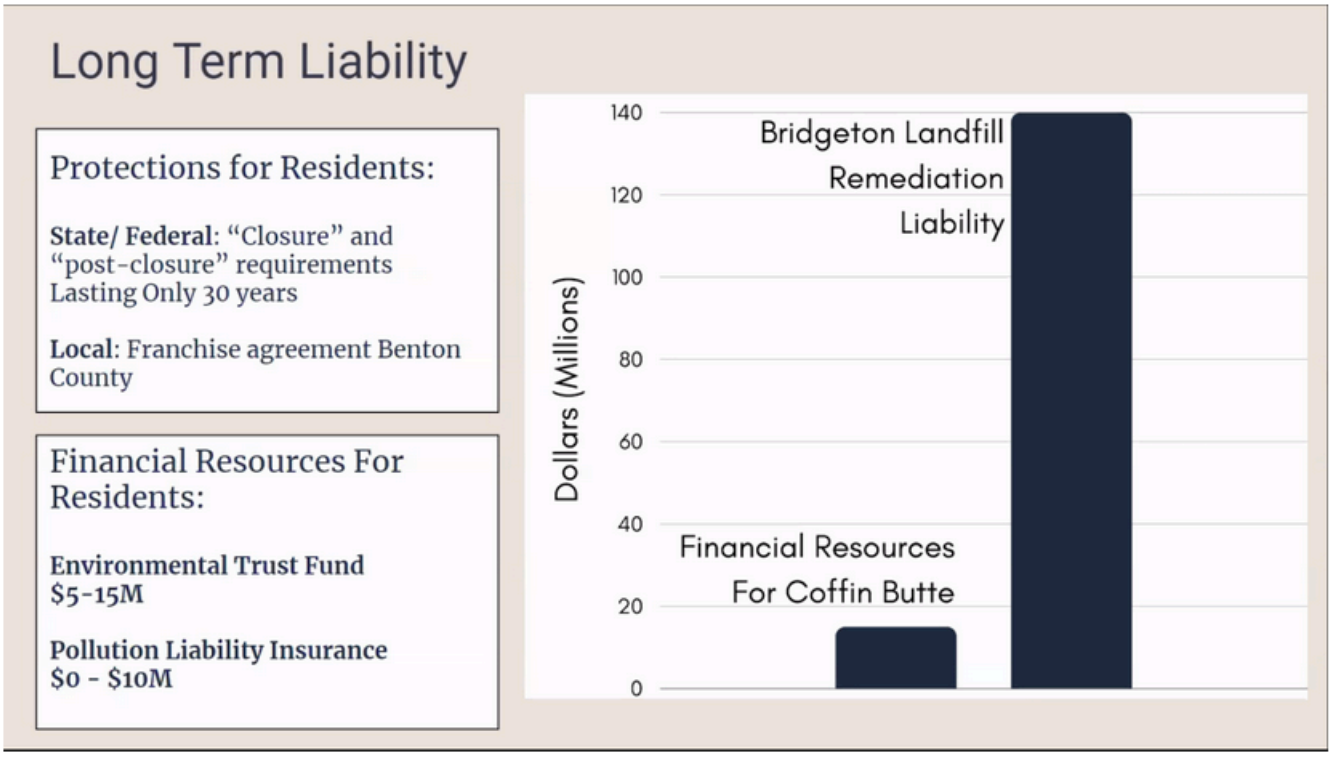
It will also be a long-term Financial LIABILITY.

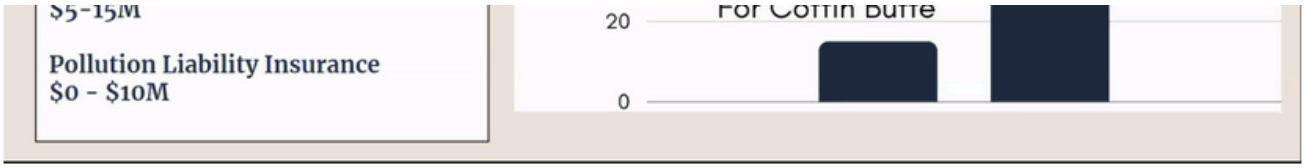
Republic Services created a subsidiary — Valley Landfills, Inc (VLI) — to shield the parent company from liability. One environmental disaster and VLI will likely file for bankruptcy, leaving County taxpayers with the liability legacy. That could be a REALLY big liability: by Republic's own estimates, the liability for its Bridgeton Landfill in Missouri (closed in 2004, the one with an underground fire that's been burning since 2010) is *at least* $140 million dollars. By comparison, Coffin Butte, which is larger than Bridgeton, has an "Environmental Trust Fund" of only around $15 million.

Federal "closure" and "post-closure" rules require landfill operators to provide a mere 30 years of financial assurance to cover ongoing maintenance costs after closure. Two unlined cells of this dump — closed and capped in the '70s — are *still* generating over 2 million gallons of leachate per year... *fifty years later*.

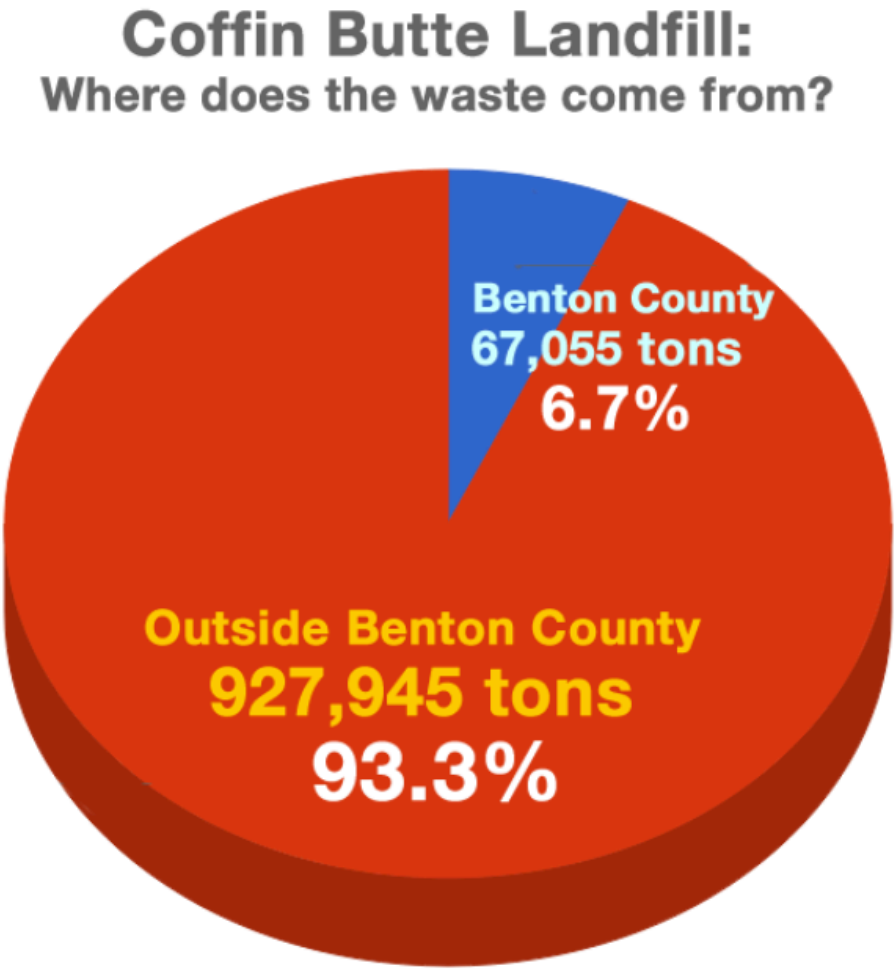
To make matters worse, these rules *allow the operator to estimate* the cost of that 30 years of maintenance... meaning *they get to make up these "cost" numbers themselves and no one looks at them critically to ensure they are realistic.*

So, although Benton County does receive some small compensation for hosting the landfill (via franchise fees), the vast majority of the landfill's profit goes to an Arizona-based corporation, while Benton County will have to deal with the environmental burden in perpetuity.





***Fully one-third of all the garbage in Western Oregon* comes to this dump**. Less than 7% comes from Benton County; and some garbage comes from *out of state*. Haul trucks start lining up as early as 4:30 am and arrive all day, at the average rate of a new truck every ninety seconds, from as far away as Washington State. If Benton County recycled 100% of its waste, this would not slow the flow of trash to Coffin Butte.



Sources: 2021 Oregon Material Recovery and Waste Generation Rates Report, Oregon DEQ; Coffin Butte Landfill Annual Report 2021

Un-planned, accidental, **terrible location for a landfill**. Wet garbage generates LOTS of leachate and methane so if you *must* have a landfill, it should be situated in a *dry climate, away from people, and ideally on a thick clay bed* (to prevent leachate leakage into groundwater). This landfill is none of these things. Originally the burn dump for Camp Adair during WWII (nicknamed "Swamp Adair"), it has somehow been allowed to exist despite consistent opposition. We've written a more detailed explanation of why Coffin Butte is a terrible location for a landfill.

"**Dump days**" (when the stink is so bad it drives people indoors) are a regular occurrence. In addition to the sulfides which cause the smelly air, landfills produce some 30 different hazardous air pollutants including particulate matter, heavy metals and Volatile Organic Compounds (VOCs). Landfills are notorious for compromising the health of their surrounding communities; this landfill is no exception

"Many times each year, particularly in the winter months, we are affected at our house and while attending school in Adair Village by an oppressive stench, one that affects our daily living and activities. It causes headaches, eye irritation, and throat burning - which limits our outdoor activities. I'm concerned for the safety of the children at school."

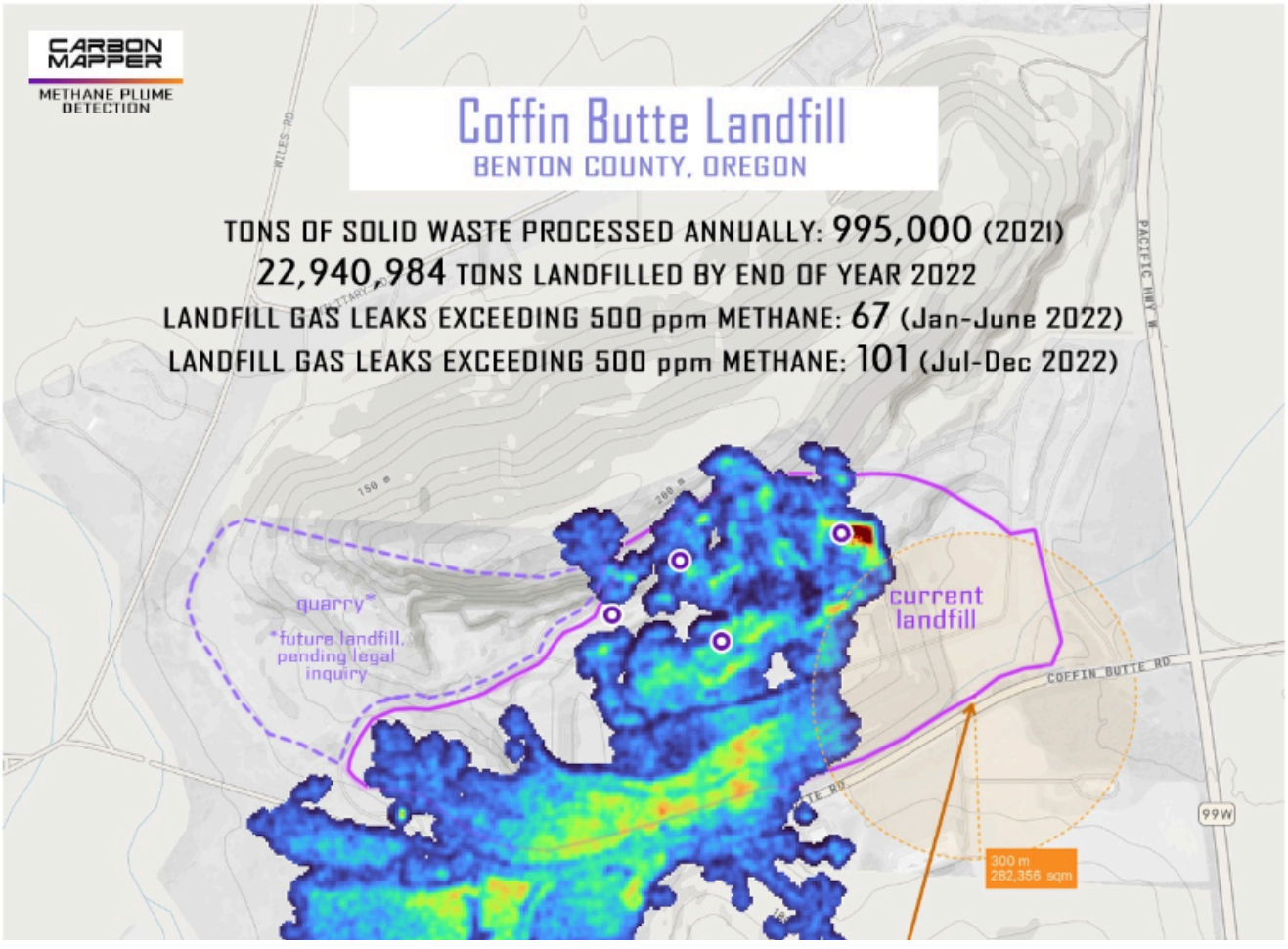
Kate Harris

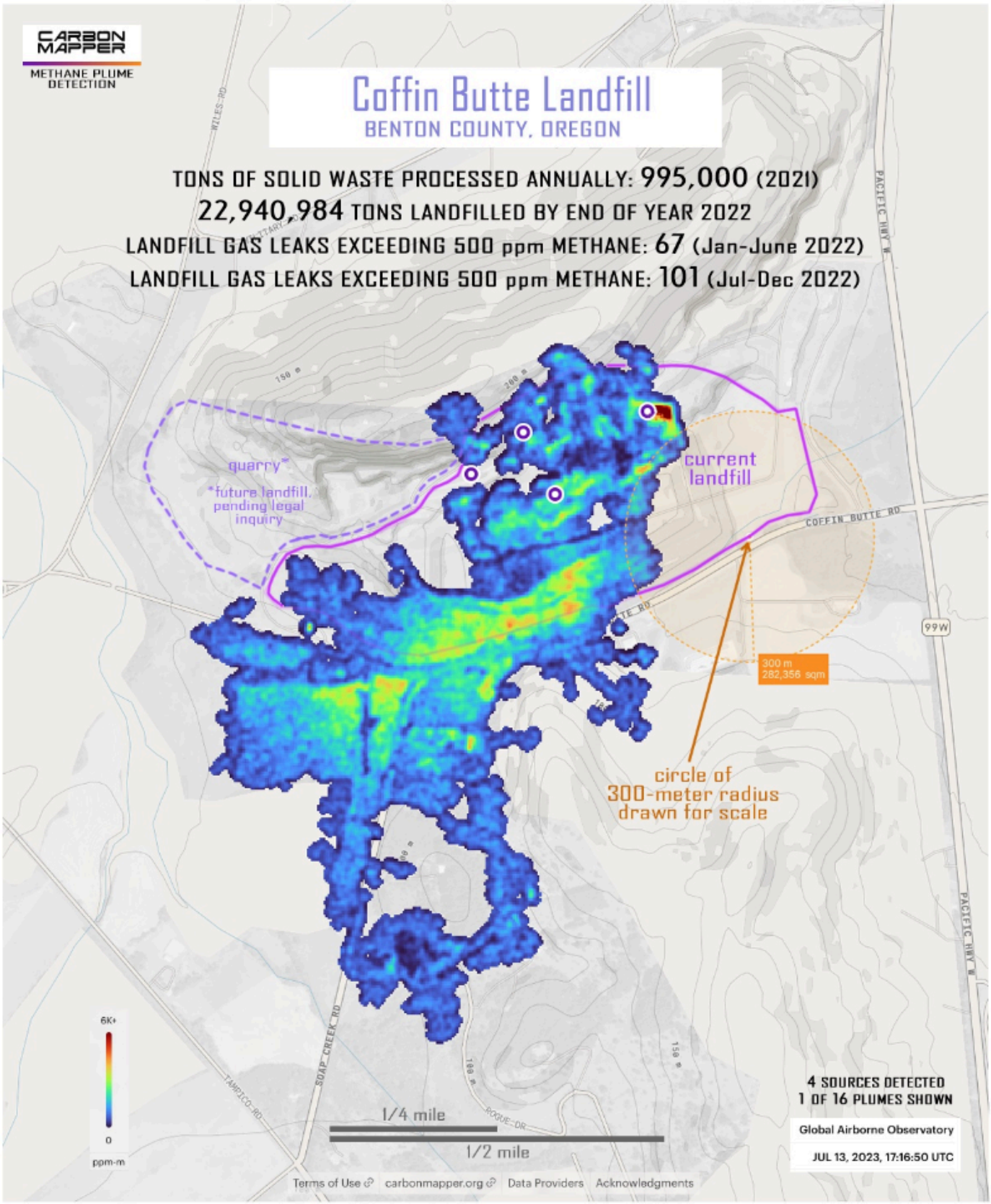
Republic Services is a **bad actor** in our opinion.

Their word is not to be trusted. They market themselves as “Devoted to Our Community” with a “Commitment to Sustainable Practices” and “Safety is a priority throughout our operation”... yet the facts are they have incurred over $160 million in fines for environmental-related offenses. Compare that to $49 million in fines for environmental-related offenses for Waste Management Inc – a significantly larger company in the garbage business.

The entire Coffin Butte Landfill is a super-emitter of greenhouse gases, yet Republic Services has been unwilling to take the actions necessary to eliminate these emissions.

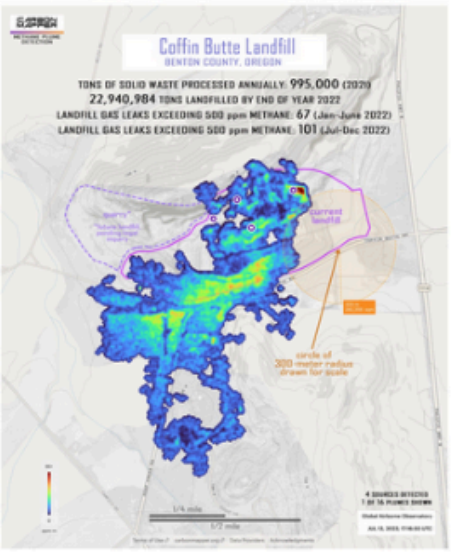
They externalize costs on the environment and the surrounding community and ignore employment and safety offenses.

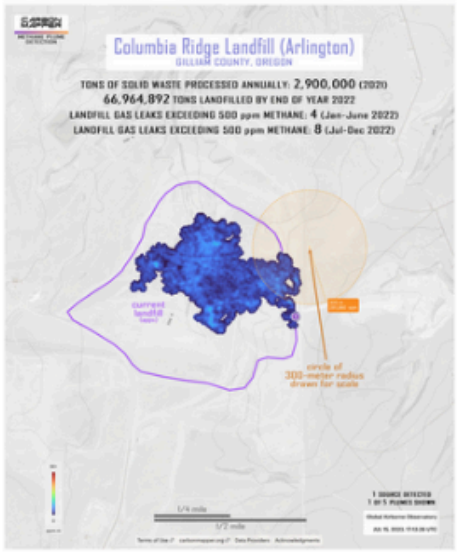


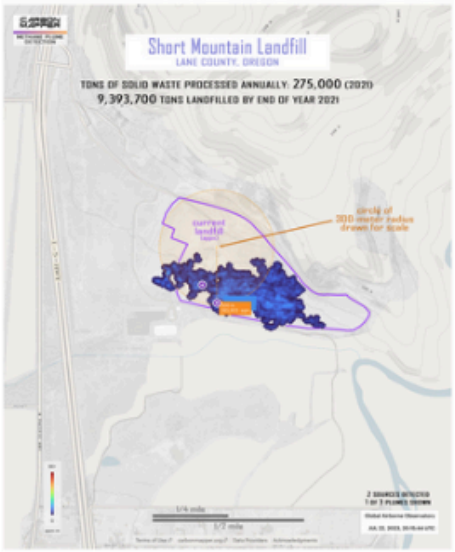


See other landfill methane plume maps for comparison ->

METHANE PLUME MAPS







Plume imaging is from Carbon-Mapper.org. Date and time of imaging are included on each plume image. To show them at the same scale, each plume image includes a circle 300m in radius, drawn using a tool on the Carbon-Mapper site.

Figures for “tons of solid waste processed annually” come from each landfill’s annual report. The annual report for Coffin Butte Landfill lists total volume emplaced, not tons of solid waste, so the figure for Coffin Butte Landfill has been corrected to remove daily cover (the dirt used to cover freshly dumped garbage at the end of each day), which is not solid waste. The annual volume of daily cover was obtained from Oregon Department of Environmental Quality data, and this volume was subtracted from total annual volume to arrive at the figure shown for Coffin Butte Landfill.

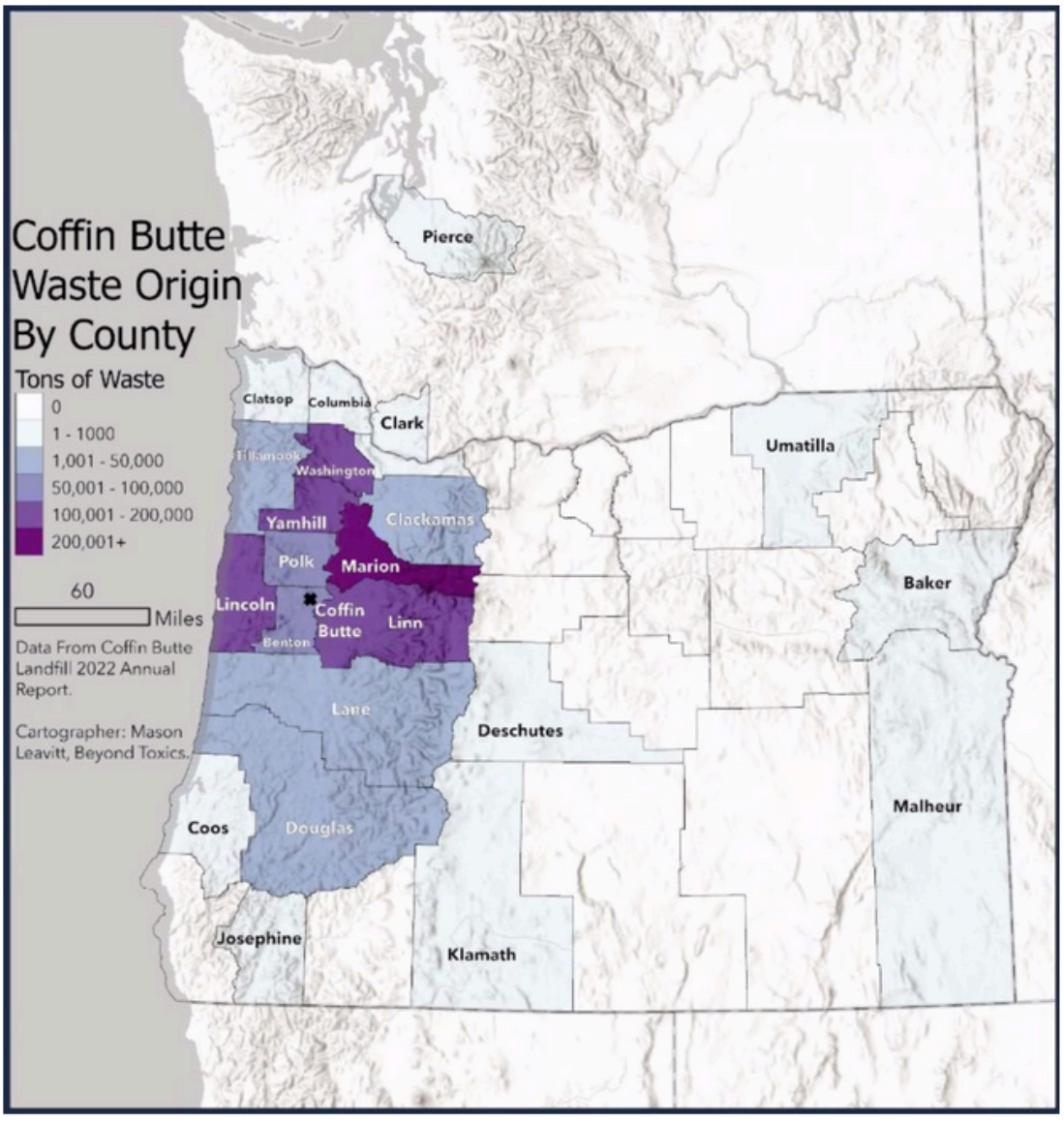
The figures for methane leak detection are taken from the air quality annual reports for Columbia Ridge Landfill and Coffin Butte Landfill. This data hasn’t yet been obtained for Short Mountain Landfill.

Graphics last updated 4-29-24.

County residents have been told there's nothing to worry about with this dump because there are regulators (Oregon DEQ, EPA, Oregon OSHA) that are responsible for ensuring compliance with the laws. The fact is that there is *virtually no enforcement* of environmental and worker safety regulations by these state and federal agencies.

And there is **NO oversight or enforcement** by Benton County *of its own land use requirements* so it doesn't matter how stringent "conditions of approval" are in a Conditional Use Permit. Republic Services can (and does) ignore them because there are effectively no consequences for not complying. THIS HAS GOT TO CHANGE.

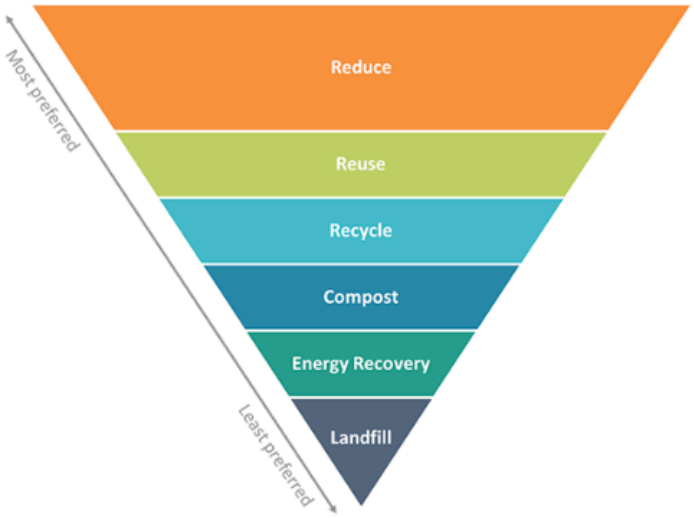
Long ago Benton County gave up any role in controlling dump traffic impacts, limiting which Counties can use our dump, and preventing trash from accumulating along our highways. We have literally become the dumping ground for all of Western Oregon.



If ANY expansion is approved, per a clause in the 2020 Landfill Franchise Agreement the annual intake cap (a limit of 1.1 million tons/yr) will go away and Republic Services will be able to bring in as much garbage as it wants as fast as it can... the landfill will fill up even quicker and then they'll want to expand again.

BE FOREWARNED: Republic Services is going to cry "rate increase!" if they don't get an expansion – but their urgency for space is a self-made crisis caused by their ramped up efforts to bring more and more garbage to this facility. The annual amount of waste disposed has doubled since 2017 and is now bumping up against the intake "cap" of 1.1 million tons/year. Republic Services is required by franchise agreement to take Benton County's waste through 2040, and any rate increases would have to be approved by the County. They cannot unilaterally raise rates.

In summary: *landfills are the worst disposal option.* **Help us prevent the expansion of this one, with the goal of bringing it to a close when its currently-permitted space is filled.** Better alternatives already exist in other countries; let's work towards shifting mindsets *away from landfilling* in this one. In the meantime – there are other, better managed landfills in far better locations in Oregon... so this dump needn't expand ever again.



Valley Neighbors for Environmental Quality and Safety (VNEQS)

Working to prevent any expansion of the Coffin Butte Landfill in Benton County, Oregon

**** End of screen captures from Coffin Butte Facts website "Get Up to Speed" page ****

Violation Tracker Current Parent Company Summary

Current Parent Company Name: Republic Services
Ownership Structure: publicly traded (ticker symbol RSG)
Headquartered in: Arizona
Major Industry: waste management and environmental services
Specific Industry: waste management
Penalty total since 2000: **$177,241,441**
Number of records: 283

TOP 5 OFFENSE GROUPS (GROUPS DEFINED)	PENALTY TOTAL	NUMBER OF RECORDS
environment-related offenses	$161,522,584	166
employment-related offenses	$12,813,803	48
miscellaneous offenses	$1,625,000	2
safety-related offenses	$786,808	64
competition-related offenses	$250,000	1

TOP 5 PRIMARY OFFENSE TYPES	PENALTY TOTAL	NUMBER OF RECORDS
environmental violation	$114,414,837	84
water pollution violation	$37,050,000	2
air pollution violation	$6,675,723	29
employment discrimination	$3,769,000	3
work visa violations	$3,000,000	1

Violation Tracker Current Parent Company Summary

Current Parent Company Name: Waste Management Inc.
Ownership Structure: publicly traded (ticker symbol WM)
Headquartered in: Texas
Major Industry: waste management and environmental services
Specific Industry: waste management
Penalty total since 2000: **$950,185,253**
Number of records: 435

TOP 5 OFFENSE GROUPS (GROUPS DEFINED)	PENALTY TOTAL	NUMBER OF RECORDS
financial offenses	$457,000,000	1
consumer-protection-related offenses	$296,020,299	3
competition-related offenses	$81,650,000	5
environment-related offenses	$49,460,558	217
employment-related offenses	$35,308,792	86

TOP 5 PRIMARY OFFENSE TYPES	PENALTY TOTAL	NUMBER OF RECORDS
investor protection violation	$457,000,000	1
consumer protection violation	$296,020,299	3
Foreign Corrupt Practices Act	$80,700,000	2
False Claims Act and related	$29,150,000	2
wage and hour violation	$27,125,054	29

Dear neighbors,

Republic Services wants to expand the Coffin Butte Landfill, in north Benton County.

IF it expands, these issues - which impact us all - will only get worse:

People's HEALTH may already be at risk

High volumes of methane and other harmful gases leak out. What's all in the odor you smell?

Millions of gallons of toxic leachate per year are dumped in the Willamette River – agricultural and drinking water supply for several downstream cities, as well as recreational destination for many (swimming, kayaking, fishing).

Approximately 20 of these tankers **per day** currently leave the landfill full of leachate that eventually ends up in the Willamette River

CLIMATE and ENVIRONMENT are also impacted

This landfill is a greenhouse gas super-emitter. Dust, noxious gases and toxic leachate affect more than humans.

QUALITY OF LIFE and COMMUNITY will decline

The bigger this dump gets, the more roadside litter, road damage and truck traffic there will be.

IF REPUBLIC SERVICES IS NOT STOPPED, COFFIN BUTTE WILL BE A FOREVER-EXPANDING LANDFILL.

Learn more here: **www.CoffinButteFacts.org**

Credits: this postcard was funded by a grant from CHEJ - The Center for Health, Environment & Justice (www.chej.org) with the support of Beyond Toxics (www.beyondtoxics.org)

July 16, 2025 Lu24-027 Coffin Butte Regional Landfill expansion CUP

Dear Planning Commission,

I am not in favor of this application and request that PC does not pass this application. Thank very much for your diligent and continuous volunteer work to understand, review and make a decision about this expansion. DEQ may say this is a new landfill, in the Solid Waste Mg. Permit 306 for this landfill, and this application may be moot.

This comment is from July 8 and 9 2025 hearing and is limited to what was said or turned in at these hearings. The public hand delivered written testimony as well, that you may or may not have had a chance to read during these dates, for July 8 and 9th, so we all have to spend time reading these written comments together, in the file folder on Munidocs. Good luck making your decision on the same day as the applicant hands in their second rebuttal.

The public was told by BC Planning to hand in written comments only, and to not email in testimony after x date and time for the July 8 and 9th hearing dates. The inability to use email to send in testimony for the July 8 and 9th PC hearing for LU24-027 goes against
HR-2805 Public Meeting Law Section 1 ORS 192.610
(b) uses electric video or telephone technology to be able to communicate…
(c) uses serial electronics(for) written communication among participants...

Goal One insures that the public is able to participate with proper accessibility, or from limitations to participate in public meetings.

Limiting testimony to on paper is an accessibility/inconvenience in time and money to drive to the Kalapya building and pay for printing downtown, or at the Library for the public. Goal One may have been violated by requesting written testimony only.
PFAS:
PFAS is being released at the Republic Service CB Regional Landfill in the jet of the giant gas Flare, and from all the two landfill's 60+ identified by

EPA, leaking gas well head, area ripped/compromised tarps and in leachate drainage that is not collected into the leachate pond, and in leachate that is collected and dumped into the Willamette River at Salem, Corvallis, Adair, Monmouth and any place else that Republic Services selects to send leachate, 365 days a year to. An increase in the total volume of landfill leachate will be created and need to be dealt with from the LU24-027 expansion landfill.

BC and DEQ are allowing Republic Service to release over decades, millions of gallons of landfill leachate into the Willamette River, at Corvallis, Adair, Monmouth and Salem. Leachate is 100% environmentally damaging to human health, animal health and contains PFAS and undisclosed amount and types of Organic, Inorganic, salts, metals, acids, bases, plastic nano scale beads/particles... chemicals from this landfill.

All Municipal water supplies from the Willamette River are health compromising for the millions of Oregon residents who drink and use Willamette River water as their water municiple water supply, from the CBRLandfill's, 365 days a year generation of millions of gallons of landfill leachate that is trucked to water treatment plant xyz, and then being dumped on land in sludge from the waste treatment plant at the Corvallis Airport or into the Willamette River, from multiple water treatment plants by Republic Services.

Benton County as Host, to Republic Services operation of this wrong location landfill, continue to impact the health of the Willamette River, AG and soils where Ag producers irrigate from the Willamette River, and to multiple municipalities citizens, who rely directly on Willamette River for drinking water supply, such as City of Corvallis. PFASin landfill leachate is coming from Short Mountain Landfill in Springfield/Eugene to Corvallis Water Plant for extraction and use by City of Corvallis Residents. PFAS may only be tested for once a year in drinking water at Corvallis Taylor Water Treatment Plant.

With no EPA regulation, for landfill leachate cleaning or for PFAS, and the same with no regulation from the ODEQ, Republic Service should select to be environmentally responsible and work to build a leachate treatment facility at Coffin Butte. This company is allowed to endanger the lives of millions of people, and is damaging forever the environment out to the

Columbia River, and the Pacific Ocean with landfill leachate and PFAS content in this leachate, dumped into our rivers.

This process over time, continues to increase health hazard's to human's/fish and countless other aquatic species, and to affect the total global, regional, and local environments from PFAS and from countless amounts and numbers of: old and new chemicals which are packed into in organic and organic wastes, that make up this landfill over time.

This landfill should be working at closure at this time, and trash should be trucked to Eastern Oregon by rail to save on generating carbon into the environment by transporting uncontrolled amounts by anyone, of unlimited trash/landfill which generates leachate, that is driven to water treatment faculties for millions of miles. Republic Services landfill in Washington would enjoy more business from 23 counties, two Oregon Cities and one Washington City.

Cbutte Rlandfill is in the totally wrong location environmentally, and is not a sanitary landfill when it produces wastes by the tons of PFAS, and million+ more gallons of landfill Leachate per year, trucked 365 days to multiple location in Corvallis and Salem, or to wherever Republic chooses to pay to deposit their toxic liquid leachate waste.

Leachate:

With each new landfill and expansion generation of leachate volume will increase and will continue to place

people, the environment at higher and higher risk for developing cancer and a having shortened life spans due to these specific chemicals as waste from CBRLandfill.

DEQ and EPA are not able to regulated PFAS at this time. A leachate treatment plant contingency to have Republic Service take responsibility for their landfill generated leachate could be developed on site as it was in the early 1990s. Technology for leachate treatment has improved, changed and increased since 1990s, and Republic Service can afford to build a functioning leachate treatment plant on site at Cbutte area, on all the land VLF Inc is always buying.

The end waste product from leachate treatment at CButte can be taken to landfill Republic Ser. runs in the Columbia Gorge for proper interment in a dry climate.

Hydrological Evaluation of Tampico Ridge ground and surface water system:

A ground water Hydrological study should be done before any ground breaking and before this application becomes law. Denial of this application to allow the applicant to complete a professional Third Party ground water hydrology study of the Tampico Ridge area is important to consider.

Residents are under stress from this application currently and when their wells may not function or be poisoned by chemical Trespass on them by LU24-027 CUP. This stress to these residents, directly impact these residents.

LU24-027 does not clearly show factual details about area water tables, or connection to the North slope of Tampico Ridge at the Expansion site.

Future digging and blasting to make the expansion site larger should not be allowed.

Not preforming this type of area hydrological analysis before this application goes into law, allows the applicant to never preform a ground water hydrological evaluation as BC Planning Dept and BOC have no budget to employ someone to enforce conditions of approval over these many decades of doing business with Rep. Ser.

The applicant is stating they will do a ground water study, at an undisclosed time and by an undisclosed party. The LU24-027 applications ground water study lacks key information to area landowners for the safety and longevity of their wells. This application is putting undue pressure on area well water owners on Tampico Ridge area of Rural Residential Zone.

6.4 BC2040 Thriving Community Initiative with Environmental Goals is not being applied to this application.

BC has possibly no way to stop this expansion if Republic Service does pay for a Third Party ground water evaluation of area wells, on Tampico Ridge area and this Third Party Hydrological study, does determine that Tampico Ridge's subsurface storage and movement of ground water has direct connectivity to the North Slope of Tampico Ridge where the giant hole will be blasted.

Losses to subsurface Hydrological Pressure from removing the north face of Tampico Ridge may cause area wells to go dry, or to allow uncaptured landfill leachate to leak down slope, into Tampico Ridges open water tables and into wells on Tampico Ridge. The private well owners came before this expansion so have legal right under Clean Water Act to protect their wells from impacts from development.

Allowing this expansion in this strange area, is staining these landowners mentally and physically at this time. This entire process is an undue burden to area landowners whose wells stand to be dewatered, filled with sediment from changes in water table pressure, or trespassed on by landfill pollutants which where not present in any wells at their current location's in Tampico Ridge area.

LU24-027 should be placed on hold, so that this company can provide assurance to area landowner's for the protection of their wells for the long term from this expansion site by doing a hydrological study, by a third unbiased testing company.

Coffin Butte Road closure:

Closure of Coffin Butte Road as defined in LU24-025in 2022 will occur after passage of LU24-027 when it fills in 4-5 years. CBRoad closure not clearly being stated in LU24-027 puts an extreme undue burden on the citizens of BC and for safety and emergency access to area residents. A condition to limit the landfill height will not be enforceable, as the North Landfill at this time exceeds it's historic Conditioned Height Limit set for this North landfill. Connecting the not vegetated North Landfill to the expansion and burying CBRoad provides continuous free airspace as planned for in 2022 in LU24-025.

Not having a chance to participate in Road closure by the public will occur, on paper as a road vacation form. LU 24-027 application is not sharing of the 4-5 year plan to keep expanding this landfill, to the north, as it did in LU24-25 in 2022. LU24-027 should not be allowed to close Coffin Butte Road, but that this is done on paper, without any hearing, any public input, any public involvement, any warning to the public, by BC Public Works and Republic Services.

No Condition of approval can /will stop Republic Service from closing CBRoad.

Denial of this application and request for an alternative to LU24-027 could be requested. Must development requests to BC call for alternative sites to be looked at to development standards. There is not alternative choice involved in this application.

BC Transportation Dept. will not be able to stop Republic Service from closing CBRoad forever. LU24-027 engineering design, elevation of Tamico Ridge/North Landfill mothballed elevation allows for the applicant to lean trash up against Tampico Ridge, going on up above 430 feet to 650 feet, to match the North Landfill elevation 650+ feet

Trash will be 50-60 feet below the top of Tampico Ridge as stated by the applicant on May 1, 2025. Page 11 #23 Engineering Drawing shows trash elevation at 450 Feet. The Condition of Approval, to hold trash elevation to 450 feet will not be enforced, as North Landfill mothballed elevation exceeds it's Condition of Approval elevation 650Feet, without BC aware of this or having the staff to be able to do anything about this.

Passage of LU24-027 forces the County to have to issue a Road Vacation to Republic Service for the closure of CBR and expansion to the North across CBRoad. Road Vacations will not be fought by the public as they are not involve. Consultation to area Ag, EFU, Forestry, business owners, Adair Rural Fire and Rescue, Polk County Public Works, State Of Oregon, OSU Forestry Dept., landowners, Airlie Fire Dept., ect will not occur and Republic Service will be granted closure of CBRoad on paper, by BC Public Works/Transportation Depts. and possibly the BOC will agree 2 to 1 in favor of CBRoad to close forever.

LU24-027 landfill will be costly to build for it's short life span, and is an extremely valuable location to place trash on CBRoad, and fill the CB Valley, to the North, to connect up to the not closed North Landfill.

The public is forced to spend time to be involved in this process, and PC is unpaid to spend too much time on this decision. Republic Service can afford to build an expansion and BC BOC are paid to make legal decisions. The

cost for this application in Staff Time and Winterbrook Planning time are very costly to BC, and the BC taxpayers who are not hearing much about this landfill expansion application and if passed, will deal forever with this company getting paid to run this landfill and each new expansion, filling it faster and faster with unlimited dumping, (no cap)
and not hearing at all about the one million dollar bonus to BC from Rep. Serv as stated in 2022-2040 Operation Franchise Agreement that underpins legally, LU24-027. Please See the Attached, thanks.

BC BOC agreements with Republic Ser in the '2022-2040 Franchise Operation Agreement' provides the legal foundation for this applications goals, is this companies investment Board's reason for this landfill expansion application.

BC will be responsible for everything about this massive landfill when or if it closes. BC is unable to manage this landfill over the entire time it has been a HOST, for any implementing each CUP over time, Conditions of Approval, for Republic Service to comply to COA. How will BC be able to manage this landfill after it has grown to x 100-1000's of Acres and covers Coffin Butte Valley, until 2053 and beyond?

Republic Service is creating millions of dollars in costs, to BC, PC, the in the valuation of the public's time, BC staff, Winterbrook Planning, applicant specialists costs, for an expansion that will last just 4-5 years. This is not economical for BC or the Public but is not too bad for this New York stock exchange corporation in cost as this landfill makes this company the most money over time then any of the other landfills they own.

The cost in total man hours by BC Staff, Winterbrook Planning Staff, all the consultants that the applicant hires is worth it to Republic Service's share holders, for future expansion to the north from LU24-027 into the tax free airspace, and pack trash onto the surface of the mothballed, not closed, North landfill. Additionally, possibly Rep. Ser does not pay taxes to BC.

Closure of CBRoad because of LU24-027 passage and use of a single piece of paper, A Road Vacation form from BC Transportation Dept. to close CBR, in 6 years, is placing undue burden on the public of Polk,

Benton, Linn… and from continues operation of each new and old expansion/new landfill at this Cbutte area, to continue to negatively impact the local, regional and global environment. The future of CB Road depends on denial of this application.

Please consider denial of LU24-027. Thanks, R.Foster 980 SE Mason Pl Corvallis, OR

Nancy Whitcombe
37049 Moss Rock Drive
Corvallis, Oregon, 97330

To: **Chair Fowler** and Benton County **Planning Commission members**

CC: Anne Thwaits, Benton County Public Information Officer
Petra Schuetz, Benton County Community Development Department
Winterbrook Planning (incl. Maul Foster Alongi, Kellar Engineering)

Date: July 16, 2025

Re: LU-24-027 CUP application

Chair Fowler, Planning Commissioners,

You have read many documents with my signature on them, submitted on behalf of VNEQS.

This letter isn't from VNEQS. It's just from me. It's in response to Benton County's slide presentation from July 8, & the Republic Services slide deck presented July 8.

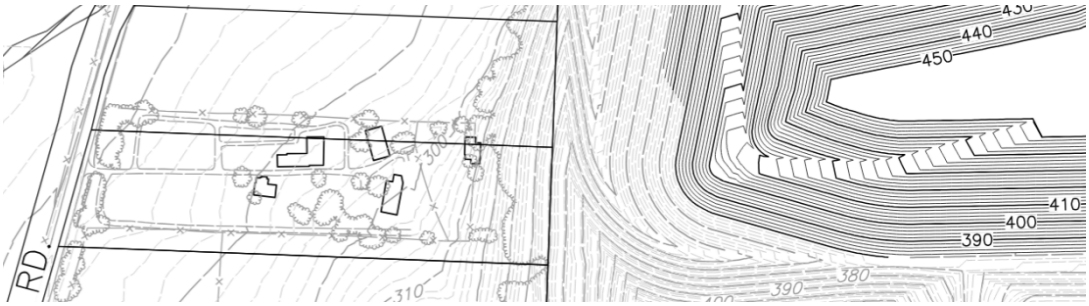
I'm going to talk about the Phillips property. Here is a photograph of the Phillips property from Applicant's January 15, 2025 submittal:

In back of the Phillips property, you see a heavily forested hillside. This hillside, and the trees you can see are, for the most part, all on the Applicant's property. In 1983, the County made a commitment never to dispose of waste on the 59-acre parcel that Applicant is asking to deposit waste on. This was to buffer landfill operations from residential uses. But if this application is approved, all of the trees that currently blanket the hillside will be gone.

The hillside will be gone. First it will be scraped, then it will be blasted, then it will be filled with garbage. The Phillips property is located on about the 300' contour line. As you can see, from this picture, it is fairly far down on the level portion of the parcel.

If this application is approved, instead of backing onto a forested hillside, the Phillips home will back onto a wall of tarp-covered trash

that rises to a maximum 450' elevation, 150' above the level of their home. There will be no screening to protect the Phillipses from this offensive view. The Phillipses will have no trees to buffer them from the noise of garbage trucks grinding their way to the summit (and remember, no noise conditions for garbage trucks hauling garbage). The Phillipses will have landfill stench rolling down the tarps whenever there is a temperature inversion, or a particularly offensive load of trash (animal carcases, sewage sludge), or when the tarps tear.

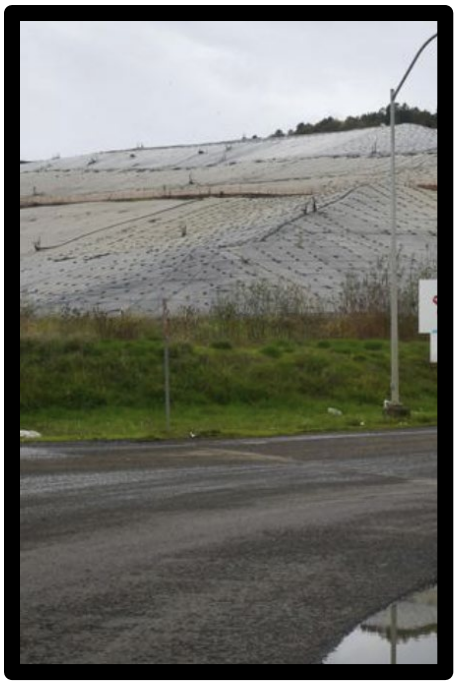


That is the story this contour map tells. As you can see from the Google maps image below (almost the same scale), almost all of the trees are on the Applicant's property.

Can County staff, can Commissioners, really decide in good faith that replacing a forested hillside with a mountain of trash will not have serious adverse impacts for the elderly couple who live in a mobile home on this property?

Replacing this:

With this?



We have heard that the Phillipses are not willing to testify in opposition to this land use action, so I would like to submit testimony on their behalf. Asked what they would do, Cheryl Phillips is reported to have said that it would be their daughter's problem.

Maybe they think the game is rigged against them. Maybe they're just tired. Maybe they don't want to alienate the only remaining potential buyer of their property. I don't know.

If this is approved, the Phillipses, who currently live at the base of a forested hillside, will live at the bottom of a 150' tall pile of garbage. There will be no buffer between their property and the noise, odor, and visual blight of the landfill.

The Phillipses don't have to testify for you to know that to condemn this elderly couple to live out the rest of their lives under such conditions would be wrong. It would be immoral.

Thank you very much,

Nancy Whitcombe

Valley Neighbors for Environmental Quality and Safety (VNEQS)

To: **Chair Fowler** and Benton County **Planning Commission members**

CC: Anne Thwaits, Benton County Public Information Officer
Petra Schuetz, Benton County Community Development Department
Winterbrook Planning (incl. Maul Foster Alongi, Kellar Engineering)

From: Valley Neighbors for Environmental Quality and Safety (VNEQS)
https://coffinbuttefacts.org
North Benton County
Oregon, 97330

Date: July 16, 2025

Re: LU-24-027 CUP application – FINAL ARGUMENTS Part 1 OF 2 **NOISE**

Chair Fowler, Planning Commissioners,

THIS DOCUMENT RESPONDS TO THE FOLLOWING EVIDENCE PRESENTED JULY 8 & 9 on **NOISE**:

RESPONSE: Benton Couty STAFF REPORT PRESENTATION titled "Staff Slides to Planning Comm LU24027 July 8" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, "Staff Slides to Planning Comm LU24027 July 8");

RESPONSE: Republic Services slide deck titled "25RS1067 Coffin Butte Deck FINAL" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #31, "25RS1067 Coffin Butte Deck_FINAL");

RESPONSE: PAWLOWSKI_Brent titled "07092025_PAWLOWSKI_Brent" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #15, "07092025_PAWLOWSKI_Brent")

First, we would like to thank County staff and consultants at Winterbrook Planning who have actually read and attempted to respond to prior criticisms submitted by VNEQS with regard to the errors in the Applicant's submittals.

We applaud the County's attempt to require actual noise impacts resulting from landfill operations to reflect Applicant's noise studies as a valiant (and ingenious!) effort to respond to

discrepancies VNEQS (and perhaps others) have pointed out between what the Applicant says it will be doing and what the Applicant's consultants say Applicant will be doing.

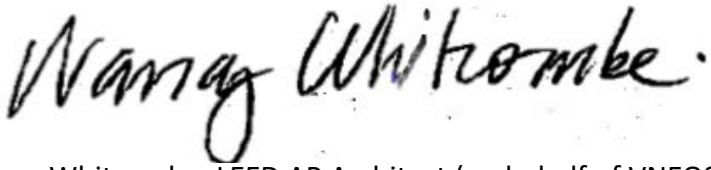
However, this effort will fail, in conditions of approval relating to noise as in conditions of approval of other areas of this application. 1) Conditions of approval require a diminution of noise produced by only a small subset of noise-producing equipment at the landfill, and will do little to reduce the contribution to adverse noise impacts of 97% of equipment used in landfill; and 2) The study does not regulate the extremely disruptive impacts of operations to ready the cell to accept waste; and 3) Furthermore, there is no clear enforcement mechanism. To be effective and **ensure compliance** (a Benton County code requirement), non-compliance must be clearly defined, enforcement mechanisms must be easily understood, and enforcement must be **prompt** and **verifiable**. But here, we are told, enforcement staff has not yet been hired; enforcement regulations have yet to be written. A dream of future enforcement is not enforcement.

Finally, 4) approval of this application will trigger the removal of the volume cap in landfill operations which are not subject to regulation imposed herein, nor, legally can they be. This pertains to the landfill expansion to the north (the "dark blue" quarry expansion). Nothing the County says about this application can have any impact on ongoing landfill operations north of Coffin Butte Road, but approval of this application will result in serious adverse noise impacts as a result of the agreement between the County and the Applicant to remove the intake cap if approval of disposal is granted in this application (2020 Franchise agreement).

This is a fatal flaw.

It is an unquantifiable increase in waste volume in the quarry which cannot be mitigated. First of all, the County is not allowed to place conditions on operations not subject to this application. Second of all, without knowing what the increase is, impacts cannot be quantified, and mitigation is not possible. If this application is approved, and waste intake volumes increase from 1,100,000 tons/year to 1,500,000 tons/year in the quarry expansion (as the Applicant projects to DEQ) or 1,860,000 tons/year (as the Applicant projects in this application), what will noise impacts even be? If the County believes that it is important for the Applicant to dispose of waste within the 1,100,000 tons/year current intake limit, Applicant needs to apply for a permit to dispose of waste on some of Applicants other "many acres".

Thank you again for your hours and hours and hours of hard work,



Nancy Whitcombe, LEED AP Architect (on behalf of VNEQS)

NOISE: SUMMARY OF THE ARGUMENTS, NEW EVIDENCE

Part 1, Conditions of Approval are easily gamed and regulate less than 3% of equipment

This Condition of Approval regulates only so-called "on-site" equipment, which, per Applicant's September Noise study comprises only 3% of noise-producing equipment at landfill operations.

It also does not regulate the noise impacts of site preparation. Testimony submitted by Joel Geier will show cell preparation and excavation is treated in Oregon statute as part of landfill operations, not a distinct construction phase regulated by DOGAMI.

When construction is ongoing, it will be lengthy and disruptive (see testimony submitted by Erin Bradley). Ms. Bradley, who has provided testimony, operates "Bit-By-Bit" a non-profit 501(c)3 recognized as a "service" by the State of Oregon wherein she provides equine therapy to patients. Ms. Bradley has testified that the site preparation operations impacts are so disruptive to her animals and her clients that she may have to sell her property. Nothing in Benton County Code precludes Commissioners from taking site preparation impacts into consideration in their deliberations, especially in a use such as this where the use is unusual and defined by the State of Oregon statute as integral to the use itself, not preparation for the use.

Part 2. OP-5 does not limit the height of the new south landfill at all beyond the height that already received the "deny" staff recommendation.

This condition does not reduce the landfill height. The maximum height of the landfill as shown on the Applicant's topo drawings has consistently shown the landfill topping out at 450'.

Part 3. There is no enforcement mechanism if Applicant does not comply

Proposed Conditions of Approval for **NOISE** do not ensure compliance. CoA's will have no impact on mitigating noise absent Applicant's voluntary compliance. Requiring Applicant to **measure** noise on **3% of noise-producing equipment** to demonstrate that a small number of pieces of equipment are quieter than they were eight years previously does not **ensure compliance**, with the requirement that the proposed use will not seriously impact adjacent uses which is the BCC 53.220 requirement.

> *53.220 Conditions of Approval. The County **may impose** conditions of approval to mitigate negative impacts to adjacent property, to meet the public service demand created by the development activity, or to otherwise **ensure compliance** with the purpose and provisions of this code -- BCC 53.215 Criteria*

Part 4. Approval of this application triggers removal of the intake cap, which will to apply to areas the County cannot condition as part of this process.

The Applicant has "many acres" upon which it could apply for a CUP to expand disposal operations. This is the **only parcel** upon which the County has previously committed that there would be no waste disposal. This is **also** the **only parcel** upon which, if waste disposal is permitted, intake limits are removed on parcels NOT included in this permit application, and which this body has no remit to condition to limit adverse noise impacts when waste volume intakes increase, as the Applicant has projected. Ample testimony has been provided that impacts will be serious and they will be adverse.

VNEQS, Valley Neighbors for Environmental Quality and Safety
North Benton County
Oregon, 97330
https://www.coffinbuttefacts.org

SUMMARY: 07162025 FINAL ARGUMENTS – NEW EVIDENCE

NOISE, DETAIL

RESPONSE: Benton Couty STAFF REPORT PRESENTATION titled "Staff Slides to Planning Comm LU24027 July 8" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, "Staff Slides to Planning Comm LU24027 July 8");

RESPONSE: Republic Services slide deck titled "25RS1067 Coffin Butte Deck FINAL" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #31, "25RS1067 Coffin Butte Deck_FINAL");

RESPONSE: PAWLOWSKI_Brent titled "07092025_PAWLOWSKI_Brent" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #15, "07092025_PAWLOWSKI_Brent")

VNEQS OBJECTIONS TO PROPOSED MITIGATIONS

<u>Part 1, Conditions of Approval are easily gamed and, in any case, regulate less than 3% of adverse-noise-producing landfill equipment</u>

BC STAFF, SLIDE #16:

KEY FINDINGS

BCC 53 - General Review Criteria and Procedures

BCC 53.215 (1)

Noise impacts vs. uses on adjacent properties and character of the area

Can be mitigated through COAs

COAs OP-2(A-B) monitors equipment noise and **OP-5** limits the maximum landfill height to 450 feet

OP-2 (A) Requires Applicant to measure "equipment sound levels," with much detail about how the applicant goes about this.

1. It refers with specificity (i.e. CAT 330 Excavator) to some 10 pieces of landfill equipment that were in use on the working face on October 15, 2021, almost four years ago. Applicant is required to verify that "sound levels of on-site equipment have been reduced by at least 10dB compared to levels in Table 5.3 of the Noise Study dated September 25, 2003 (data was actually collected two years before, on October 15, 2021)". But sound levels of operating equipment vary greatly depending on what the equipment is doing (i.e. moving heavy loads/moving light loads). It would be easy to "game" this condition.

2. This conditions only applies to on-site vehicles.
*"This condition is limited to **on-site** vehicles"*
(pp. 145-146, Coffin Butte Landfill CUP Supplemental Staff Report)

But the lion's share of noise-producing vehicles at the landfill are not so-called "on-site vehicles", they are the enormous, heavily loaded semi-truck trailers that grind up the steep grades of the access roads to the top of the mountain of trash, then loudly dump **up to 15 tons of trash** at one go, using gravity (i.e. raising the back of containers 30'-50' into the air until the trash falls onto the ground far below), and then returning down the steep hillside.

This is actually referred to in the September 25, 2023 Noise report (Exhibit 11, for those of us keeping track, and included in Part 8 of the October 30, 2024 tranche of Applicant documents – here is a link because we at VNEQS are trying not to torture you: https://library.municode.com/or/benton_county/munidocs/munidocs?nodeId=7627e7dcea11b

The noise study starts on page 62). Here is the table from that report:

Equipment types and quantities included in the noise models are shown in Table 6.1.

Table 6.1 Modeled Equipment

Equipment	Quantity	Usage Factor (%)[1]
CAT D9 Dozer	1	40
CAT D6 Dozer	1	40
CAT 836G Compactor	2	50
Columbia Industries Tipper	1	50
CAT 330 Excavator	1	40
Idling Trucks	4	100
Landfill Trucks[2]	47/hour	100

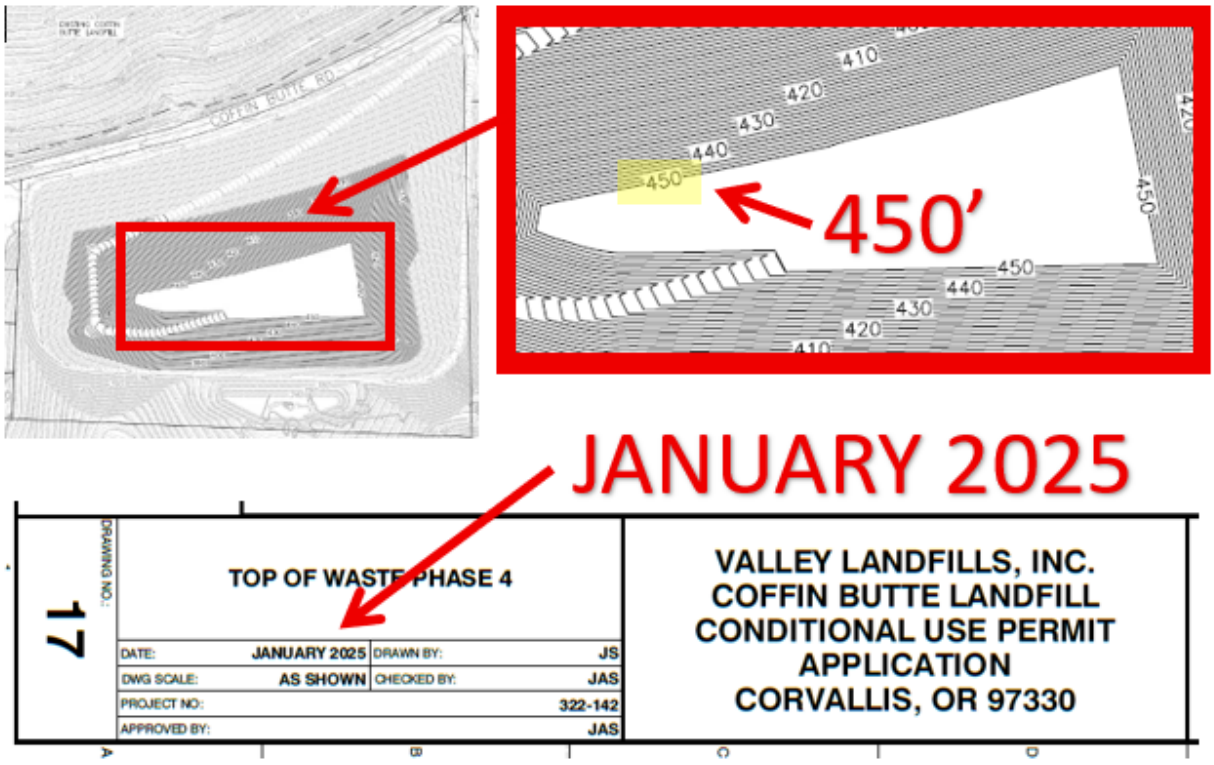
1. Based on information in the FHWA Construction Noise Control Specification 721.560 and operating times noted during on-site measurements.
2. Sound levels from trucks traveling uphill were used in the models.

As you can see, there are 10 pieces of on-site equipment listed that produce adverse noise impacts throughout the day. A landfill employee has disputed these numbers as significantly understating the actual vehicles employed in this massive operation; but even if quantities stated in this table are correct, in addition to "on-site" noise-producing equipment, the landfill sees 47 "Landfill Trucks" – trash trucks -- PER HOUR. Operating hours cited by Applicant are all over the map, but let's stipulate to an 8-hour day. 47 enormous, heavily loaded semi-trucks per hour is about 375 vehicles, grinding up Applicant's maximum allowable grades, loudly dumping trash, then returning down the garbage mountain.

This Condition regulates only 10 out of 385 individual pieces of noise-producing equipment (and unless we're mistaken, it does not regulate the actual tipping of garbage, which can unbelievably loud, especially when it's C&D debris – concrete and metal).

That's less than 3%. The County is requiring measurement and mitigation of less than 3% of noise-producing equipment.

Part 2. OP-5 does not limit the height of the new south landfill at all beyond the height that already received the "deny" staff recommendation.



Part 3. There is no enforcement mechanism if Applicant does not comply with this condition of approval

The County promises to implement more stringent enforcement mechanisms in the future, but to gauge the effectiveness of a potential enforcement mechanism, you have to know what it is, and how likely it is to be carried out. That information is unknowable. The County asserts that at some point in the future staff which the County does not currently employ will be hired to enforce land use regulations which the County plans to rewrite, also at some point in the future. But this is not useful information. Will there be the budget for new staff and rewriting enforcement codes? What will the new code say? What would the enforcement process look like? How long would it take? Would the circuit courts be involved ("adjudication")? Would there be an appeal process? These are all questions germane to whether promised enforcement would be effective, would be prompt, would **ensure compliance**. These are all questions which are not answered.

Part 4. Approval of this application triggers removal of the intake cap, which will to apply to operations the County cannot condition as part of this process.

The following argument is reiterated in the "Odor" comments, submitted under separate cover. See snip below from Applicant's slide presentation submitted on May 1, 2025 (diagram presented for reference only, in order to clarify the argument developed below):

There are three landfill areas:

- There is the (largely full) area rendered in white, the NORTH LANDFILL which has produced all of the landfill noise impacts modeled by the Applicant's consultants, and which forms the basis for Applicant's projections of future impacts.
- We will be referring to the area rendered in dark blue, called the "Quarry" on the above diagram as the "dark blue area" or the "NORTH LANDFILL WESTWARD QUARRY EXPANSION (WITH 14,000,000 CUYD AIRSPACE)" The "dark blue" area operates under a permit the County says was issued in the eighties (but cannot produce). This airspace is mostly empty.
- We will be referring to the area rendered in light blue as the "light blue area" or the "NEW SOUTH LANDFILL (WITH 10,000,000 CUYD AIRSPACE)" This is the current application.

Staff has said that this quasi-judicial procedure can impose conditions of approval only on uses subject to this application, i.e. only landfill operations on the subject parcels applied for, specifically the "light blue area," the NEW SOUTH LANDFILL (WITH 10,000,000 CUYD AIRSPACE). This of course is the application before you. Staff has directed Commissioners that no decisions by this body can constrain prior approvals for parcels not subject to this Application.

But this is a very unusual land use application, in that approval of it will triggers consequences in parcels that are not subject to this application, due to extraneous agreements between the Applicant and the County prior to your deliberations. We refer here to the 2020 Franchise Agreement, which has been submitted into testimony in its entirety.

Per the 2020 Franchise Agreement, approval of "expansion" onto the "light blue" subject parcel of this application **ELIMINATES THE INTAKE CAP** not only on the subject parcel, **BUT ALSO** on the ("dark blue") NORTH LANDFILL **WESTWARD QUARRY EXPANSION WITH 14,000,000** CUYD AIRSPACE.

The 2020 Franchise Agreement, states the following, in "THE PARTIES AGREE:", Paragraph 5. Impact of Solid Waste Volume; Limit on Solid Waste; Tonnage Cap., subparagraph (b), contains the following language:

> *The parties agree that until Franchisee's governmental applications to expand the Landfill onto the Expansion Parcel are granted…the total tonnage of Solid Waste deposited by Franchisee at the Landfill during any calendar year shall not exceed One Million One Hundred Thousand (1,100,000) tons…"*

ANY APPROVAL FOR DISPOSAL ON light blue parcel (this application) WILL TRIGGER REMOVAL OF THE CURRENT INTAKE CAP on the dark blue parcel (not this application).

So, approval of this application will IMMEDIATELY free Applicant from the existing 1,100,000 intake cap that currently constrains waste disposal amounts on the "dark blue" **NORTH LANDFILL WESTWARD QUARRY EXPANSION** (WITH 14,000,000 CUYD AIRSPACE). There will be **no limit** to the amount of waste applicant can haul in and dump in the quarry. At the current intake cap of 1,100,000 tons/year, the Applicant projects about 12.5 remaining years of life for the "dark blue" quarry area, but if waste volumes increase by amounts Applicant has projected to DEQ (1,500,000 CUYD/y), and indicated on drawings on this application (1,500,000 – 1,860,000 CUYD/y), the "dark blue" quarry area would run out of space much more rapidly, from 7.5 to 9.3 years of capacity.

So, approval of this application could result in reducing the life of the existing landfill (and as such would be a public burden).

Additionally, of course, noise could be expected to increase proportionate with volume increases. The Applicant's noise study lists garbage truck trips as a significant contributor to adverse noise impacts, and there is no way to increase waste volume without increasing the number of trucks hauling waste.

APPROVAL OF THIS APPLICATION WILL TRIGGER **UNQUANTIFIABLE NOISE IMPACTS** ON THE WESTWARD QUARRY EXPANSION (dark blue) THAT THIS APPLICATION CAN NOT CONDITION AND THUS CAN NOT MITIGATE

And VNEQS will be stressing the following tautology OVER AND OVER (and we apologize ahead of time for the capital letters and the boldface):

WITH APPROVAL OF LU 24-027, THE **EXISTING INTAKE CAP** THAT **CURRENTLY CONSTRAINS** APPLICANT'S MAXIMUM YEARLY VOLUMES **IS REMOVED**. THE APPLICANT IS THEN FREE TO INCREASE YEARLY VOLUMES IN THE 14,000,000 CUYD OF EXISTING PERMITTED LANDFILL SPACE WITH **NO CONSTRAINTS**.

AN **UNCONSTRAINED INCREASE** IN WASTE VOLUME CANNOT BE **MEASURED**. IT CAUSES **UNQUANTIFIABLE IMPACTS.**

UNQUANTIFIABLE IMPACTS CANNOT BE MITIGATED

Valley Neighbors for Environmental Quality and Safety (VNEQS)

To: **Chair Fowler** and Benton County **Planning Commission members**

CC: Anne Thwaits, Benton County Public Information Officer
Petra Schuetz, Benton County Community Development Department
Winterbrook Planning (incl. Maul Foster Alongi, Kellar Engineering)

From: Valley Neighbors for Environmental Quality and Safety (VNEQS)
https://coffinbuttefacts.org
North Benton County
Oregon, 97330

Date: July 16, 2025

Re: LU-24-027 CUP application – FINAL ARGUMENTS Part 2 of 2 **ODOR**

Chair Fowler, Planning Commissioners,

THIS DOCUMENT RESPONDS TO THE FOLLOWING EVIDENCE PRESENTED JULY 8 & 9 on **ODOR**:

RESPONSE: Benton Couty STAFF REPORT PRESENTATION titled "Staff Slides to Planning Comm LU24027 July 8" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, "Staff Slides to Planning Comm LU24027 July 8");

RESPONSE: Republic Services slide deck titled "25RS1067 Coffin Butte Deck_FINAL" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #31, "25RS1067 Coffin Butte Deck_FINAL");

RESPONSE: PAWLOWSKI_Brent titled "07092025_PAWLOWSKI_Brent" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #15, "07092025_PAWLOWSKI_Brent")

The following document begins with an introductory letter similar to that submitted for "NOISE" So we will try to restate those arguments with brevity (but we have been informed that we do so in order to preserve grounds for appeal). First, we would like to thank County staff and consultants at Winterbrook Planning who have actually read and attempted to respond to prior criticisms submitted by VNEQS with regard to the errors in the Applicant's submittals.

We applaud the County's attempt to require odor impacts to reflect Applicant's odor studies as valiant (and ingenious!) efforts to respond to discrepancies VNEQS (and perhaps others) have pointed out between what the Applicant says it will be doing and what the Applicant's consultants say Applicant will be doing.

However, this effort will fail, in conditions of approval relating to odor as in conditions of approval of other areas of this application. 1) Benton County Code requires that Conditions of Approval are imposed to **ensure compliance**. Future enforcement by staff the County has not yet hired to enforce code that is not yet written is a dream of enforcement, not reliable, prompt, and dependable enforcement; 2) The County's odor consultant has testified that multiple iterations of the odor study were run until they produced a result that predicted odors at the landfill perimeter that rose to the level that the County's odor consultant believed reflected "reality". But that is not the reality that has been submitted as testimony. Real reality is that odor impacts are detectible far beyond the landfill perimeter, and have serious adverse impacts on surrounding uses. Adding more trash to the pile will create more odors.

Finally, 3) approval of this application will trigger the removal of the volume cap in landfill operations which are not subject to regulation imposed herein, nor, legally can they be. This pertains to the landfill expansion to the north (the "dark blue" quarry expansion). Nothing the County says about this application can have any impact on ongoing landfill operations north of Coffin Butte Road, but approval of this application will result in serious adverse odor impacts as a result of the agreement between the County and the Applicant to remove the intake cap if approval of disposal is granted in this application (2020 Franchise agreement).

This is a fatal flaw.

It is an unquantifiable increase in waste volume in the quarry which cannot be mitigated. First of all, the County is not allowed to place conditions on operations not subject to this application. Second of all, without knowing what the increase is, impacts cannot be quantified, and mitigation is not possible. If this application is approved, and waste intake volumes increase from 1,100,000 tons/year to 1,500,000 tons/year in the quarry expansion (as the Applicant projects to DEQ) or 1,860,000 tons/year (as the Applicant projects in this application), what will odor impacts even be? If the County believes that it is important for the Applicant to dispose of waste within the 1,100,000 tons/year current intake limit, Applicant needs to apply for a permit to dispose of waste on some of Applicants other "many acres".

Thank you again for your hard work,

Nancy Whitcombe, LEED AP Architect (on behalf of VNEQS)

SUMMARY OF THE ARGUMENTS - ODOR:

1. Proposed Conditions of Approval for **ODOR** do not ensure compliance. CoA's will have no impact on mitigating odors absent Applicant's voluntary compliance. Requiring Applicant to **measure odor** does not **mitigate odor. It does not ensure compliance**, which is the BCC 53.220 requirement.

> *53.220 Conditions of Approval. The County **may impose** conditions of approval to mitigate negative impacts to adjacent property, to meet the public service demand created by the development activity, or to otherwise **ensure compliance** with the purpose and provisions of this code. BCC 53.215 Criteria*

Do staff Conditions of Approval **ensure compliance**? Is there a reliable enforcement mechanism? The County and the Applicant would not have proposed mitigatory conditions of approval if they did not both agree that unmitigated, the Applicant's proposal will result in negative impacts to adjacent property which are both **serious** and **adverse**. But to work, the conditions would have to be both sufficient and complied with. Historically, zoning has been insufficient and/or not complied with, with the result that incompatibility has been so extreme that on 500 surrounding acres, the uses on those acres have been abandoned by their prior owners, the landfill has purchased that acreage, and what used to be small farms, forest dwellings, and logging acreage now await future land use actions so that that acreage can be utilized for landfill use, just as are the FC parcels considered in the application before you.

What has happened in the past will continue in the future (refer to testimony from Erin Bradley, who, if this application is approved, will have to consider selling her property to preserve her ability to run her 501(c)3 business of providing equine therapy to patients).

2. The County chooses to weigh Applicant's consultant's odor model more heavily than the ample testimony this body has heard about nuisance odors (and odors that rise substantially above that low bar). Benton County itself has submitted Odor complaints to DEQ for the years 2021, 2022, and 2023, but apparently Benton County chooses not to credit even Benton County's own testimony. Benton County similarly discounts reports in the press detailing a terminated vineyard sale due to landfill odors that sickened the potential buyer. Oughtn't the County and County's as a part of this process be required to explain the following:

- how 725 odor complaints submitted to this body could all be wrong (erroneous or falsified), or
- how 141 odor complaints submitted by BENTON COUNTY ITSELF to DEQ could be wrong (erroneous or falsified), or
- how reports in the local press are wrong, in an article that describes how landfill odors were the cause of the termination of a contract to buy a small vineyard 3.84 miles to the northwest of the landfill boundary, sickening the potential buyer and causing that buyer to lose what appears to have been a substantial earnest money deposit.

Applicant has gone through two odor consultants, and numerous iterations of odor studies. This is how County's consultants described this process:

> *"We had the applicant go back and add a significant amount of **realism** to the model, including actual emissions and throughputs and the biggest evidence we have that the model is…is…tracking appropriately at this point is …the model now shows that there are, **at times**, um, **levels of odor** that would be **above detectable levels**…previous iterations of the model showed significantly below 1 D/T, we didn't feel that that, um, reflected reality."*
> ***Chad Darby**, video: "Day 6, Republic Services Conditional Use Permit" timestamp: **19:20***

Let's consider this extraordinary statement. The County's consultants require the Applicant to run iteration after iteration of the "model" until the "model" shows something that County's consultants have already pre-determined will "reflect reality". But why not just use actual reality, instead of a model of reality? Especially when there is so much evidence of real reality?

Here is a good question to ask Applicant's odor consultants, "Does this model predict landfill odor travelling 3.84 miles to the northwest and sickening the potential buyer of a small vineyard?" If so, it's a good model, the landfill currently generates odors that constitute a serious adverse impact, and a good reason to deny the application. If not, it's a bad model, and Commissioners should disregard its predictions as "unrealistic."

Finally, approval of this application triggers removal of the intake cap, not only on the NEW SOUTH LANDFILL, but, per the 2020 Franchise Agreement, on the WESTWARD QUARRY EXPANSION Applicant has currently started filling. As part of this application, the County is not permitted to place constraints on any uses that have received land use approval in the past. Staff has been very clear on that.

WITH APPROVAL OF LU 24-027, THE **EXISTING INTAKE CAP** THAT **CURRENTLY CONSTRAINS** APPLICANT'S MAXIMUM YEARLY VOLUMES **IS REMOVED**. THE APPLICANT IS THEN FREE TO INCREASE YEARLY VOLUMES IN THE 14,000,000 CUYD OF EXISTING PERMITTED LANDFILL SPACE WITH NO CONSTRAINTS.

AN **UNCONSTRAINED INCREASE** CANNOT BE **MEASURED**. IT CAUSES **UNQUANTIFIABLE IMPACTS.**

UNQUANTIFIABLE IMPACTS CANNOT BE MITIGATED.

ERGO, this application **CANNOT BE MITIGATED.**

VNEQS, Valley Neighbors for Environmental Quality and Safety
North Benton County
Oregon, 97330
https://www.coffinbuttefacts.org

SUMMARY: 07162025 FINAL ARGUMENTS – NEW EVIDENCE

ODOR, DETAIL

RESPONSE: Benton Couty STAFF REPORT PRESENTATION titled "Staff Slides to Planning Comm LU24027 July 8" (Munidocs, 9. New Evidence from July 8-9 Hearings, Item #32, "Staff Slides to Planning Comm LU24027 July 8");

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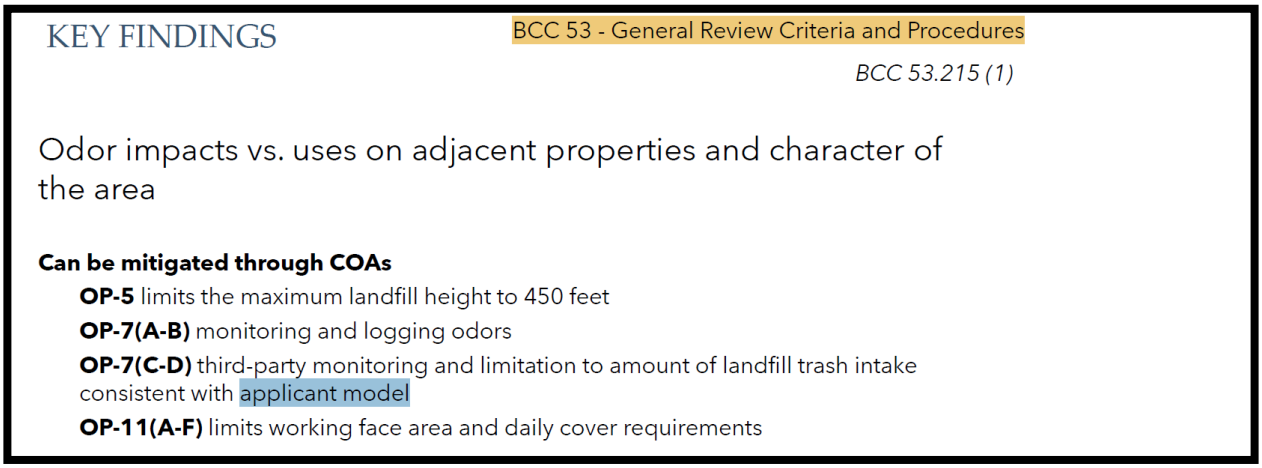
VNEQS OBJECTIONS TO PROPOSED MITIGATIONS

Part 1, Conditions of Approval with no mechanism for **ensuring compliance** (BCC requirement)
Staff Report dated April 22, 2025 recommended denial based on Odor and Noise deficiencies in Applicant's consultant reports (and certain other deficiencies).

BC STAFF, SLIDE #18:



OP-5 OP-5 does not limit the height of the new south landfill at all beyond the height that already received the "deny" staff recommendation (see diagram provided in "NOISE")

OP-7 (A-B) Even if the Applicant miraculously developed the ability to detect nuisance landfill odors, "monitoring" and "logging" odors does nothing to mitigate them.

OP-7 (C-D) (C) See above, having a third party "monitor" and "log" odors does not mitigate them either. Odors have been "logged" and "monitored" by DEQ and by Benton County itself for years, and odors have increased during that time.

That current odor mitigations DO NOT WORK was a FINDING IN LU 21-047

(D) "Limitation to amount of landfill trash intake consistent with applicant model" -- this proposed condition of approval has so many problems that it is unsalvageable.

OP-7 D would work under **all of** the following circumstances:

1. It assumes the applicant's model was correct, i.e. it correctly reflected reality. Unfortunately, it does not. **Reality is reality:**
   - landfill odors wake people up at night,
   - landfill odors cause people to be unable to enjoy their own property,
   - landfill odors cause people to be unable to retain employees on properties near the landfill, and
   - landfill odors prevented the sale of Emerson Vineyard, 3.84 miles away from the landfill, inflicting great economic harm on both the seller and the contractually-obligated buyer of that property.

Reality is that the landfill produces a noxious stench that impacts surrounding uses

2. It assumes that only "organic" waste caused odors (it is embarrassing that the County's consultants characterized C&D waste as non-odor-producing)
3. It assumes that the county could reliably track odor-causing waste
4. It assumes that there is a reliable audit mechanism
5. It assumes that the county would be promptly and reliably informed if more odor-causing waste than was allowed to be deposited was deposited ("prompt" is not an adjective that describes Applicant's responses to regulatory requirements)
6. It assumes that there is a mechanism to enforce compliance, which there isn't
7. It assumes that the County would promptly and reliably employ that mechanism, which it never has (testimony has been provided that in the past, the County has demonstrated reluctance to enforce waste intake limits -- in 2017, 2018, and 2019, when overages were more than 150,000 tons/year).

For OP-7 (D) to be effective, **ALL of these** 1-7 would **have to be true**, when in fact **NONE of them are true.**

We are going to digress here and talk about how you actually get to "adjudicate" a Condition of approval, as referred to by Applicant's attorney, Mr. Condit, at the end of the July 9, 2025 meeting. We are thankful to Mr. Condit for mentioning this case, **Mingo v. Morrow County,** which he argued to LUBA on behalf of out-of-state corporation INVENERGY. This pertained to a Condition of Approval requiring the Applicant for a wind farm to comply with DEQ noise standards, and as such -- we agree with Mr. Condit – it is pertinent here. This was a condition of approval granted with an initial construction completion date of 2008, with noise violations occurring almost immediately thereafter, and residents quickly applying to Morrow County to revoke the CUP issued for the facility on that basis.

This was in litigation until at least 2012, and probably for many years afterward.

Here of some quotes from contemporaneous reporting:

> *"Project developer Invenergy acknowledges the project violates noise standards, but insists the violations are minimal and infrequent"*[1]
>
> *"The county commission…voted 2-1 that although noise from the Willow Creek wind project exceeds state standards at a few homes, the violations did not warrant enforcement action."*[2]
>
> *"We don't have the funds to force compliance," Talman [County Judge Terry Tallman] said. "The State of Oregon says it doesn't have to do it, because it doesn't have the funds. Why are we being forced to live by a higher standard than the state of Oregon."*[3]

In 2013, with the "Chicago-based company's proposed solutions" "inadequate and…untested" and with the local county commission having "done nothing to curb the project's operations" one of the affected residents filed a civil lawsuit alleging $10,000,000 in damages.[4]

This occurs after FIVE YEARS of a resident trying to get a Condition of Approval enforced -- one the Applicant **acknowledged** violates noise standards. Kudos to Mr. Condit for helpfully providing Commissioners with a roadmap on the "adjudication" process (one that he cites as "successful").

OP-7 (C-D) (C) County staff may not be aware, and Applicant is certainly not aware, that the operative site development plan from 1983 regulating the quarry expansion constrains applicant to a working face of 2 acres from October 15 to June 1, and ¾ of an acre during all other periods. Condition OP-7 (C) thus actually relaxes current requirements. (D) Daily cover is already required by DEQ and does not work, was proposed as a mitigation in LU-21-047, and the ineffectiveness of daily cover as a mitigation was stated in LU-21-047 as a reason for denial.

<u>Part 2, The County has no explanation for the discrepancy between the Applicant's Consultant's odor model, and testimony provided by the public, by Benton County itself (to DEQ), and included in press reports about odor caused by the landfill</u>

Applicant has stated that Applicant's odor consultant tested the odor model using actual emissions from 2023 and found that odors did not rise to a level of "nuisance" at the landfill perimeter. If the model is correct, either there should be no odor reports from 2023, or years when waste volumes were similar to those in 2023.

But overwhelming evidence has been presented about odors that clearly rise to the level of "nuisance" far beyond the boundary of the Applicant's property, including the following:

> *"The third odor complaint I mentioned woke us up at 3 AM because the stench was so pervasive."*
> *Munidocs, New Evidence from July 8-9 Hearings, 07082025_Yialouris_Nancy (in OPPOSITION to landfill expansion)*

[1] "Morrow County decides against enforcing state noise requirements", The Oregonian, Aug 27, 2011
[2] ibid
[3] ibid
[4] "Eastern Oregon resident sues over Willow Creek wind project noise level," National Wind Watch, Aug 9, 2013

Even a rare **supporter** of the Applicant acknowledges that odors are offensive beyond the landfill's border:

> *"Shift in wind direction can make a landfill a bad experience to nearby neighbors…"*
> *Munidocs, New Evidence from July 8-9 Hearings, 07092025_Pawlowski_Brent*

Testimony in opposition on July 8-9 included an objective report, reported in the local press, and subject to fact-checking, of an impact reported in 2023, the year of the Applicant's model. This report describes an odor impact that rises significantly above the low bar of "nuisance" that took place 3.84 miles as the crow flies from the landfill boundary. This odor impact resulted in the inability of a small farmer to sell his property in 2023:

> *"The day [the potential buyers of the Emerson Vineyard] decided to quit was the day a south wind blew up from the dump.* ***He was allergic to it and got violent migraines.****"*
> *"Ill Wind sours plans to sell Emerson Vineyards" Polk County Itemizer-Observer: March 2, 2023*
> *Munidocs, New Evidence from July 8-9 Hearings, 07092025_WHITCOMBE_Nancy (in OPPOSITION to landfill expansion)*

Beyond Toxics testimony submitted 7/9/2025 summarizes this aptly:

> *"You have seen and heard numerous testimonies that clearly demonstrate folks smell levels of landfill gas that constitutes a nuisance much farther away than just the fence line at the facility. This means that the applicant's model is still not an adequate reflection of reality and does not meet the burden of proof to demonstrate that a significant burden is not occurring on adjacent properties.* ***Remember, it is their burden of proof****, and if they cannot prove that then the application should be rejected."*
> *Munidocs, New Evidence from July 8-9 Hearings, 07092025_BEYOND TOXICS (in OPPOSITION to landfill expansion)*

Per County's staff report, 37% of public comments cited air quality (13%), odor (7%), or methane (17%). The Staff report cites 1,961 records submitted via written comments. 37% of 1,961 is 725 complaints about the air emissions). It is disappointing that County Staff does not attempt to reconcile the Applicant's consultant's odor model with the 725 complaints received **during this process** that directly contradict that model.

We urge Commissioners to ask County Staff directly: "What is the Applicant's explanation for the 725 odor complaints? Is the Applicant's explanation convincing?"

- In 2021, BENTON COUNTY in the "Coffin Butte Landfill Community Concerns Annual Report" (submitted into testimony) reported to DEQ that there were 60 air quality complaints
- In 2022, BENTON COUNTY in the "Coffin Butte Landfill Community Concerns Annual Report" (submitted into testimony) reported to DEQ that there were 32 air quality complaints
- In 2023, BENTON COUNTY in the "Coffin Butte Landfill Community Concerns Annual Report" (submitted into testimony) reported to DEQ that there were 49 air quality complaints

Surely Benton County would not have submitted to DEQ records of complaints that Benton County itself believed to be false. “What is the explanation by Benton County for Benton County’s reports to DEQ of odor complaints? Does Benton County believe its own reports?”

We urge Commissioners to ask County Staff directly: “What is the Applicant’s explanation of odor complaints that Benton County itself submitted to DEQ (141 complaints)?”

We urge Commissioners to ask County Staff directly: “What is the Applicant’s explanation for the inability of a small farmer to sell his vineyard because of landfill odors sickening the potential buyer?”

It is the **Applicant’s burden** to prove these **725 reports** by the public **false.**

It is the **Applicant’s burden** to prove that **Benton County’s 141 reports** to DEQ are **false**

It is the **Applicant’s burden** to prove that the **report of the small farmer 3.84 miles** away being **unable to sell his farm** is **false**

<u>Part 3, Approval of the application will remove the intake cap from the (dark blue) quarry expansion. The property the quarry expansion is on is not part of this application, so the County cannot impose any conditions on the Applicant regarding that use</u>

The following argument is reiterated in the “Noise” comments, submitted under separate cover. See snip below from Applicant’s slide presentation submitted on May 1, 2025 (diagram presented for reference only, in order to clarify the argument developed below):

There are three landfill areas:

- There is the (largely full) area rendered in white, which has produced all of the landfill odors modeled by the Applicant’s consultants, and which forms the basis for Applicant’s projections of future odor impacts.
- We will be referring to the area rendered in dark blue, called the “Quarry” on the above diagram as the “dark blue area” or the “NORTH LANDFILL WESTWARD QUARRY EXPANSION (WITH 14,000,000 CUYD AIRSPACE)” This airspace is mostly empty.

- We will be referring to the area rendered in light blue as the "light blue area" or the "NEW SOUTH LANDFILL (WITH 10,000,000 CUYD AIRSPACE)" This is the current application.

Staff has said that this quasi-judicial procedure can impose conditions of approval only on uses subject to this application, i.e. only landfill operations on the subject parcels applied for, specifically the "light blue area," the NEW SOUTH LANDFILL (WITH 10,000,000 CUYD AIRSPACE). This of course is the application before you. Staff has directed Commissioners that no decisions by this body can constrain prior approvals for parcels not subject to this Application.

But this is a very unusual land use application, in that approval of it triggers effects in other parcels that are not subject to this application, due to extraneous agreements between the Applicant and the County prior to your deliberations. We refer here to the 2020 Franchise Agreement, which has been submitted into testimony in its entirety.
Per the 2020 Franchise Agreement, approval of "expansion" onto this parcel **ELIMINATES THE INTAKE CAP** on the ("dark blue") NORTH LANDFILL **WESTWARD QUARRY EXPANSION WITH 14,000,000** CUYD AIRSPACE, **AS WELL AS** on the ("light blue") **NEW SOUTH LANDFILL** WITH 10,000,000 CUYD AIRSPACE (the application before you)**.**

The 2020 Franchise Agreement, states the following, in "THE PARTIES AGREE:", Paragraph 5. Impact of Solid Waste Volume; Limit on Solid Waste; Tonnage Cap., subparagraph (b), contains the following language:

> *The parties agree that until Franchisee's governmental applications to expand the Landfill onto the Expansion Parcel are granted…the total tonnage of Solid Waste deposited by Franchisee at the Landfill during any calendar year shall not exceed One Million One Hundred Thousand (1,100,000) tons…"*

ANY APPROVAL FOR DISPOSAL ON light blue parcel (this application) WILL TRIGGER REMOVAL OF THE CURRENT INTAKE CAP on the dark blue parcel (not this application).

So, approval of this application will IMMEDIATELY free Applicant from the existing 1,100,000 intake cap that currently constrains waste disposal amounts on the "dark blue" **NORTH LANDFILL WESTWARD QUARRY EXPANSION** (WITH 14,000,000 CUYD AIRSPACE). There will be **no limit** to the amount of waste applicant can haul in and dump in the quarry. At the current intake cap of 1,100,000 tons/year, the Applicant projects about 12.5 remaining years of life for the "dark blue" quarry area, but if waste volumes increase by amounts Applicant has projected to DEQ (1,500,000 CUYD/y), and indicated on drawings on this application (1,500,000 – 1,860,000 CUYD/y), the "dark blue" quarry area would run out of space much more rapidly, from 7.5 to 9.3 years of capacity.

So approval of this application could result in reducing the life of the existing landfill (and as such would be a public burden).

Additionally, of course, odors could be expected to increase proportionately. There is no way as part of this application, to in any way restrict waste composition on the "dark blue" quarry expansion.

APPROVAL OF THIS APPLICATION WILL TRIGGER **UNQUANTIFIABLE ODOR IMPACTS** ON THE WESTWARD QUARRY EXPANSION (dark blue) THAT THIS APPLICATION CAN NOT MITIGATE

And VNEQS will be stressing the following tautology OVER AND OVER (and we apologize ahead of time for the capital letters and the boldface):

WITH APPROVAL OF LU 24-027, THE **EXISTING INTAKE CAP** THAT **CURRENTLY CONSTRAINS** APPLICANT'S MAXIMUM YEARLY VOLUMES **IS REMOVED**. THE APPLICANT IS THEN FREE TO INCREASE YEARLY VOLUMES IN THE 14,000,000 CUYD OF EXISTING PERMITTED LANDFILL SPACE WITH **NO CONSTRAINTS**.

AN **UNCONSTRAINED INCREASE** IN WASTE VOLUME CANNOT BE **MEASURED**. IT CAUSES **UNQUANTIFIABLE IMPACTS.**

UNQUANTIFIABLE IMPACTS CANNOT BE MITIGATED