From:	Joel Geier
To:	Benton Public Comment
Subject:	LU-24-027: Leachate and arsenic issues
Date:	Monday, May 5, 2025 7:36:23 PM
Attachments:	LandfillRelatedWaterQualityIssues.pdf

Dear Planning Department staff and members of the Planning Commission:

Please enter the attached presentation into the record for this land-use decisions.

This is a presentation that I developed for local United States Geological Survey (USGS) water quality scientists, for a meeting in January of 2025. Unfortunately due to current disruptions in funding for federal agencies, which have impacted the USGS office in Corvallis, we haven't been able to follow up on this discussion.

Please note Slide 16, "Shifting explanations." These were compiled from past minutes of Benton County's Solid Waste Advisory Committee (SWAC) and from the applicant's "Annual Environmental Monitoring Report."

SWAC volunteers expressed concern about the observed high arsenic levels more than 20 years ago. In response, the landfill's representatives gave them a shifting set of explanations, none of which have stood up to the test of time.

In the applicant's testimony last Thursday, their consultant Jeff Shepherd raised yet another hypothesis for the observed high levels of arsenic in groundwater at the landfill site.

As a scientist, I see hypotheses as a good thing. But hypotheses need to be tested, in order to see if they hold water.

Despite 30 years of anomalously high arsenic levels at this landfill site, the applicant has yet to present a scientific plan to test any of their various arm-waving explanations for the observed high levels of arsenic. That includes their most recent attempt at an explanation, as presented to you last Thursday.

Yours sincerely,

Joel Geier, Ph.D.
38566 Hwy 99W
Corvallis, OR 97330-9320

Water contamination concerns arising from landfills in Oregon

Joel Geier
Mark Yeager
(with contributions from Mason Leavitt)

Main Topics

Contaminants from landfill leachate passed through wastewater treatment plants into Oregon rivers

Sewage sludge (“biosolids”) from same wastewater treatment plants

Arsenic plume apparently forming from Coffin Butte landfill

What's in landfill leachate?

Dissolved metals (major):

Calcium	160 mg/L	
Iron	0.91 mg/L	– exceeds MCL for drinking water
Manganese	1 mg/L	– exceeds MCL for drinking water
Magnesium	160 mg/L	
Silicon	37 mg/L	

Dissolved metals (trace):

Antimony	16 µg/L	– exceeds MCL for drinking water
Arsenic	120 µg/L	– exceeds MCL for drinking water
Barium	570 µg/L	
Chromium	180 µg/L	– exceeds MCL for drinking water
Cobalt	38 µg/L	
Copper	5.3 µg/L	
Lead	1.2 µg/L	– goal for drinking water is zero
Mercury	???	– data missing from reports for Coffin Butte
Nickel	140 µg/L	
Selenium	1.6 µg/L	
Silver	0.1 µg/L	
Thallium	0.1 µg/L	
Vanadium	140 µg/L	
Zinc	37 µg/L	

What's in landfill leachate?

Organic chemicals above detectable limits in 2021 at Coffin Butte:

Acetone	460 µg/L
Benzene	3.8 µg/L
2-Butanone	490 µg/L
Carbon Disulfide	3.7 µg/L
1,4 Dichlorobenzene	2.1 µg/L
Ethylbenzene	5.2 µg/L
p-Isopropyl toluene	1.8 µg/L
Naphtalene	5.2 µg/L
Toluene	37 µg/L
1,2,4-Trimethylbenzene	1.7 µg/L
m,p-Xylene	7 µg/L
o-Xylene	4.3 µg/L

Past years:

cis-1,2-Cichloroethene
Isopropyl benzene
4-Methyl-2-Pentatone

Substances still found in local fields that were "irrigated" with leachate before 1998:

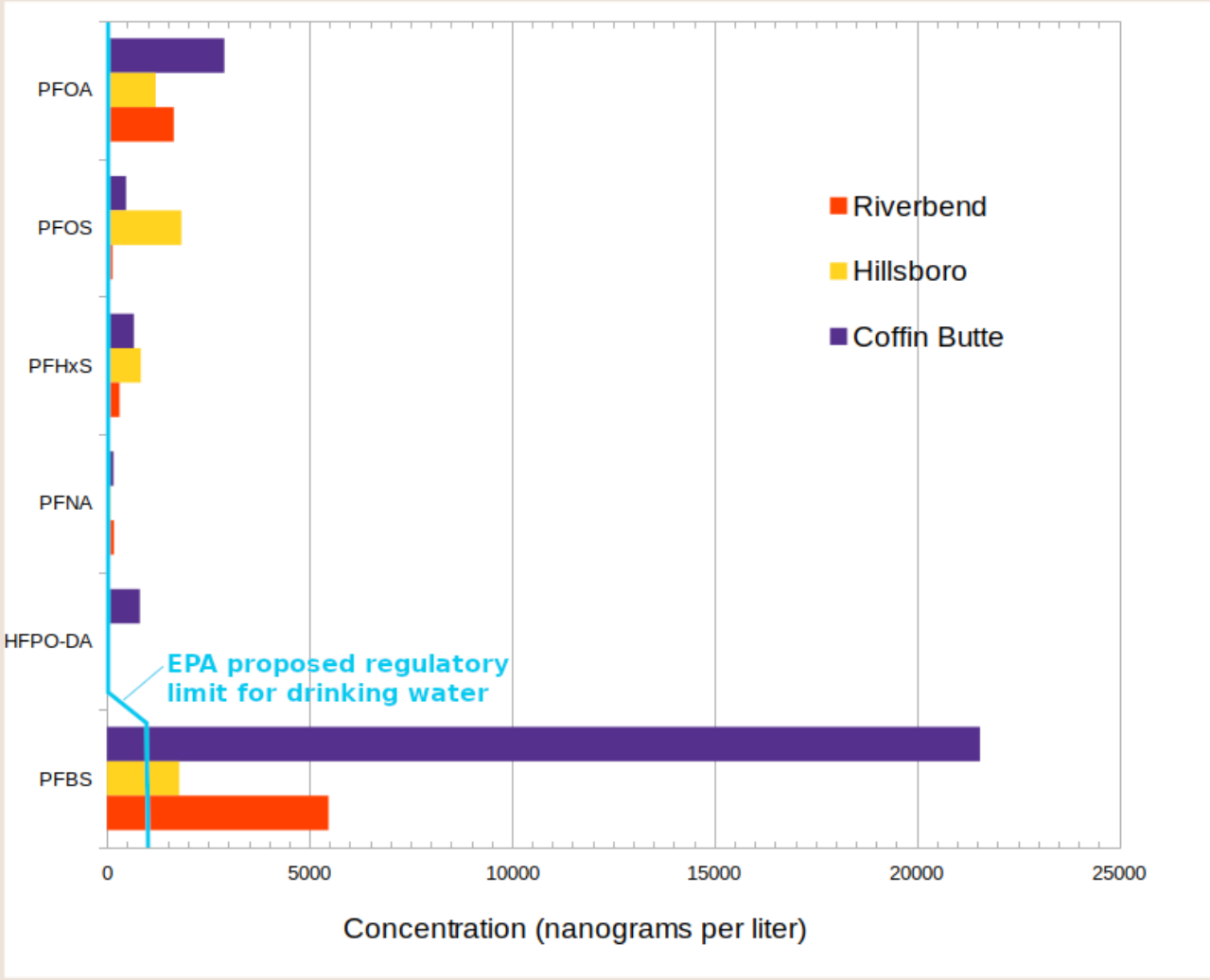
tetrachloroethylene (PCE)
trichloroethylene (TCE)
1,1-dichloroethylene

Only recently tested for: **Per- and polyfluorakyl substances (PFAS)**

PFAS in landfill leachate:

Data for six types now regulated by US EPA as human carcinogens.

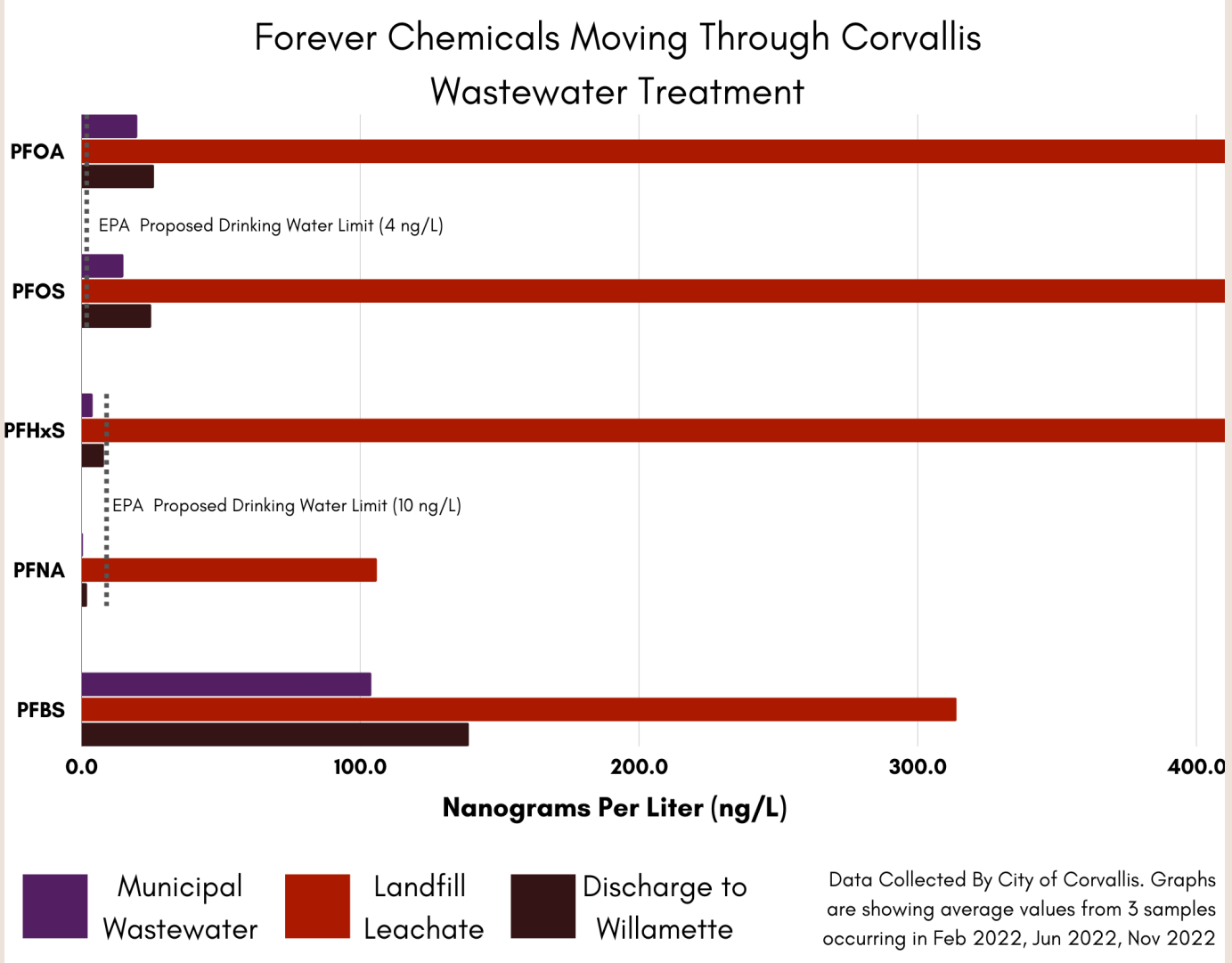
Differences among landfills may reflect different average age of waste, as well as different materials accepted (such as incinerator ash)



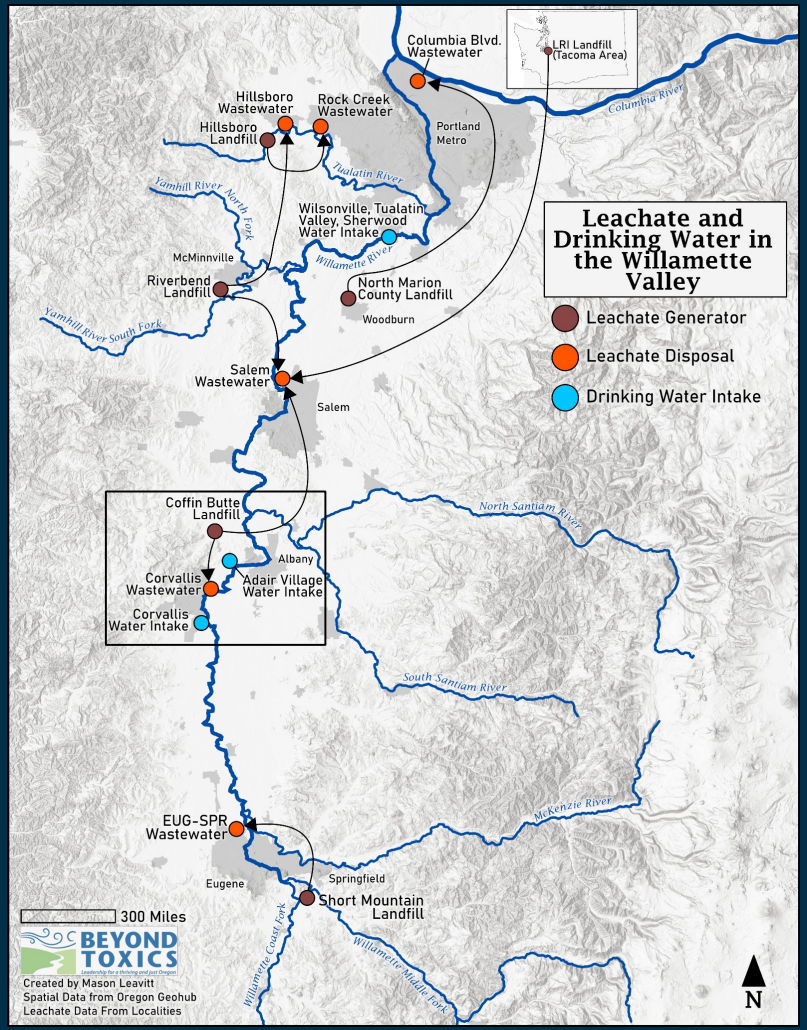
Municipal wastewater plants not effective for removing PFAS

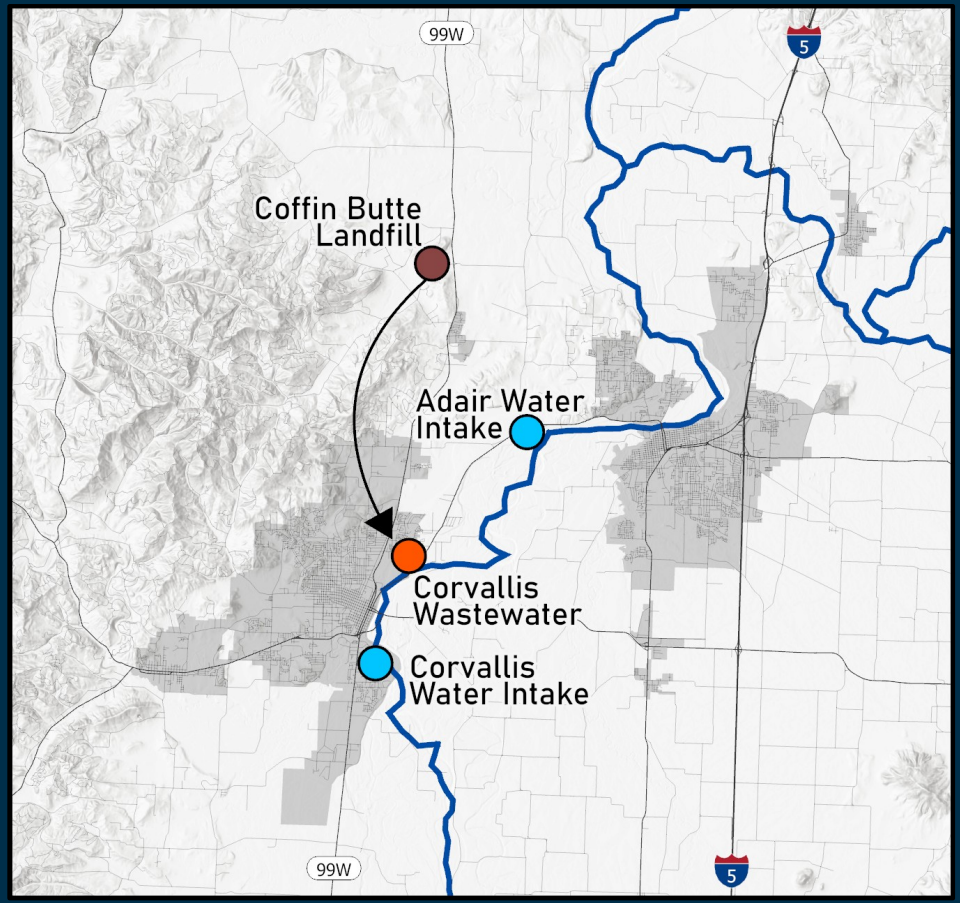
Concentrations in municipal wastewater expected to decline as regulatory changes reduce PFAS in consumer products.

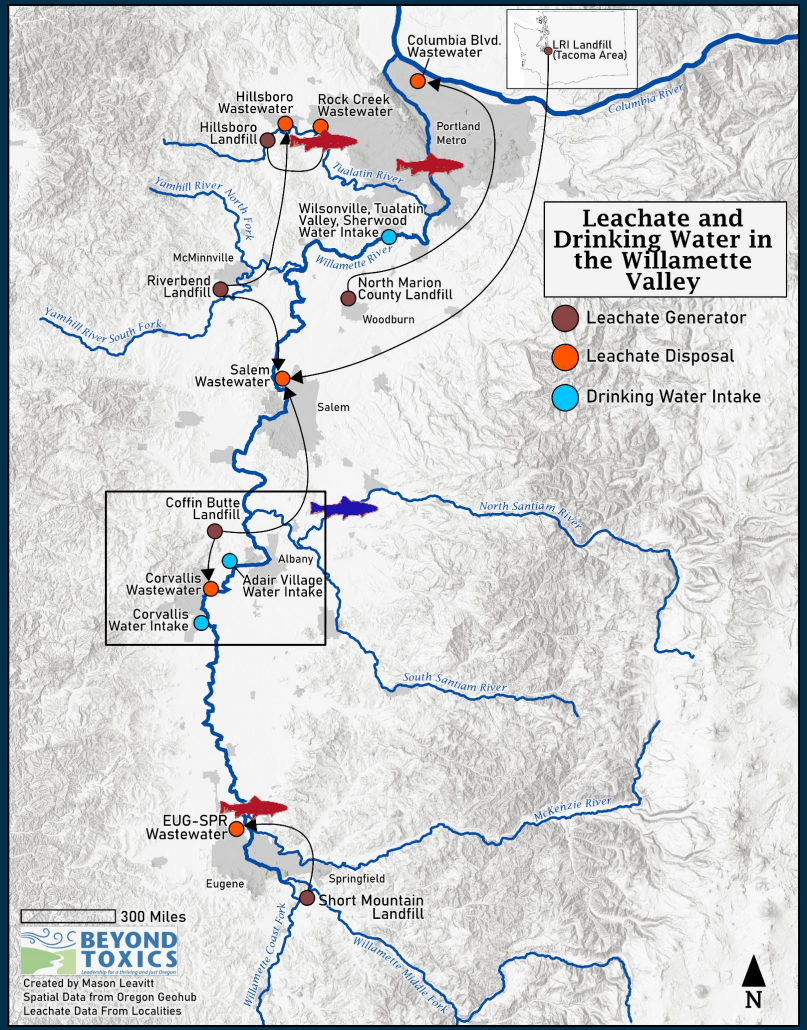
Landfills will continue to produce indefinitely from “legacy” waste.



Leachate Inputs to Willamette







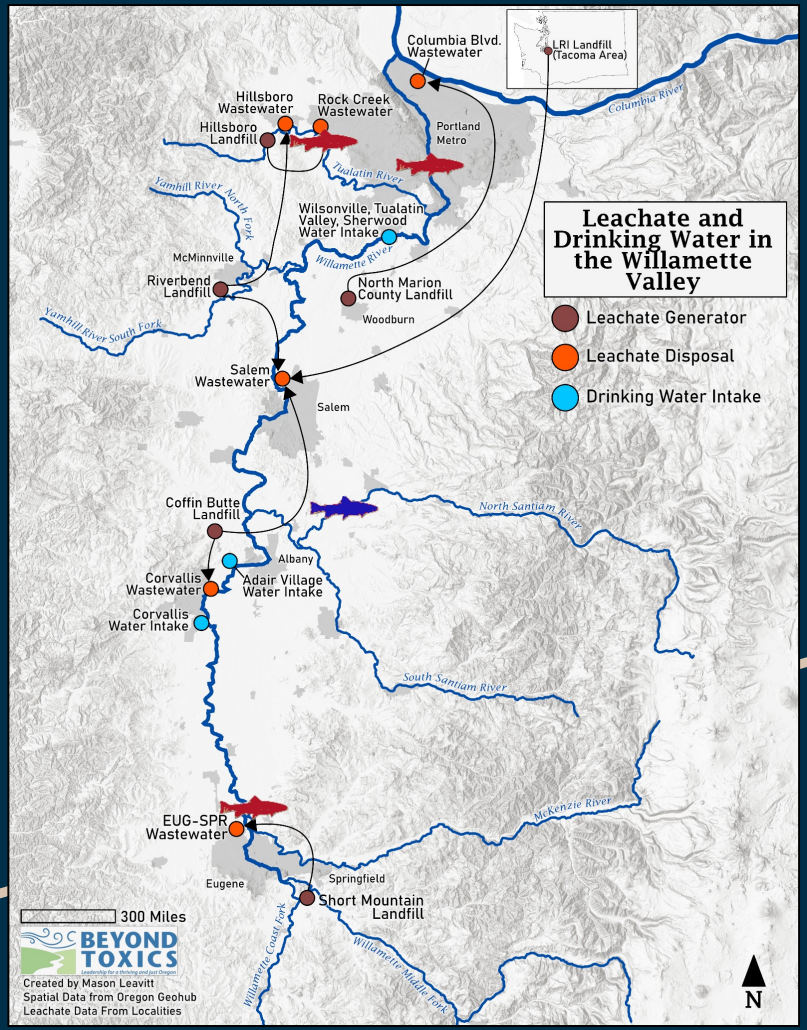
Evidence of bioaccumulation

2008 NRSA fish tissue study: PFAS found at detectable levels in fish in all Willamette Valley locations sampled downstream of WWTPs accepting landfill leachate.

Also found in Rogue River fish sampled below White City WWTP where leachate is piped directly from Dry Creek landfill.

Only “clean” sample was from North Santiam River below Stayton WWTP (which processes municipal wastewater but no landfill leachate).

Fish species: Northern pikeminnow (Eugene), mountain whitefish (Stayton), carp (Oregon City and Hillsboro), cutthroat trout (Rogue Valley)



Discussion?

Any recent efforts to sample PFAS in Oregon rivers?

Any new information about accumulation in biota, river sediments or hyporheic zone?

How much PFAS and heavy metals end up in sludge (“biosolids”)?

Any efforts to understand fate & transport of contaminants from sludge in the environment?

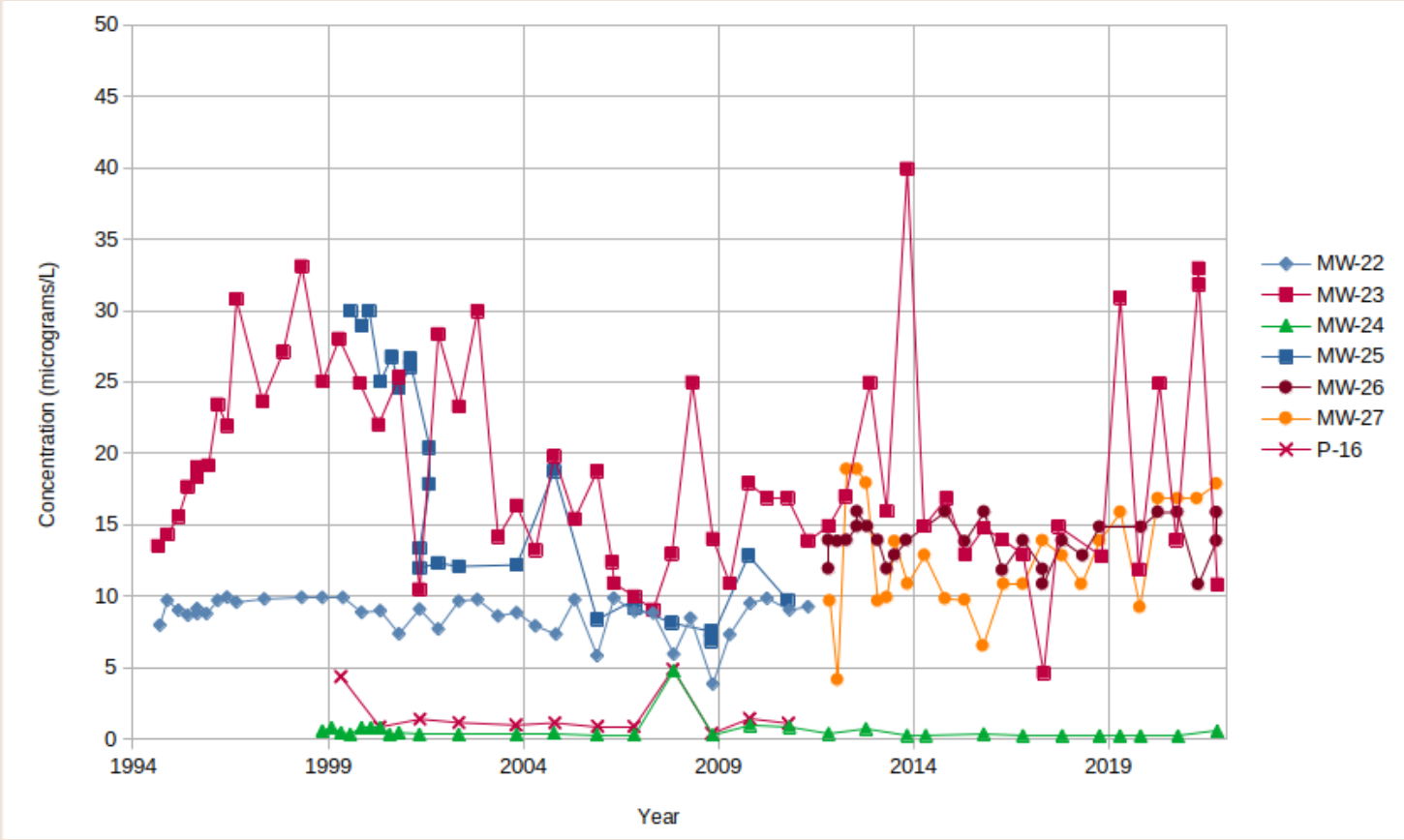
Arsenic issue: Anomalously high concentrations in monitoring wells on south/east side of landfill, fluctuating over time

First noted in mid-1990s after acknowledged seepage event.

Arsenic Concentrations East-side wells 1994-2021

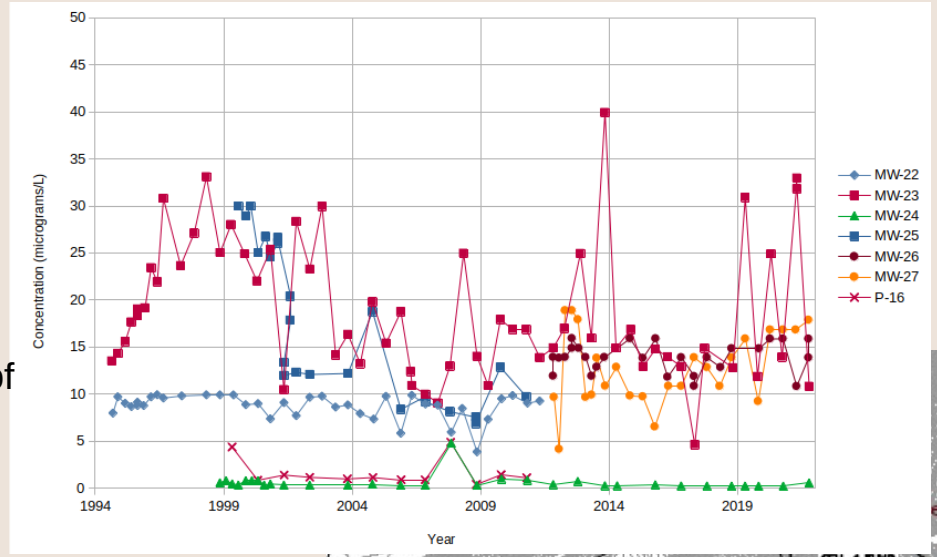
Data from 2021 Annual Environmental Monitoring Report

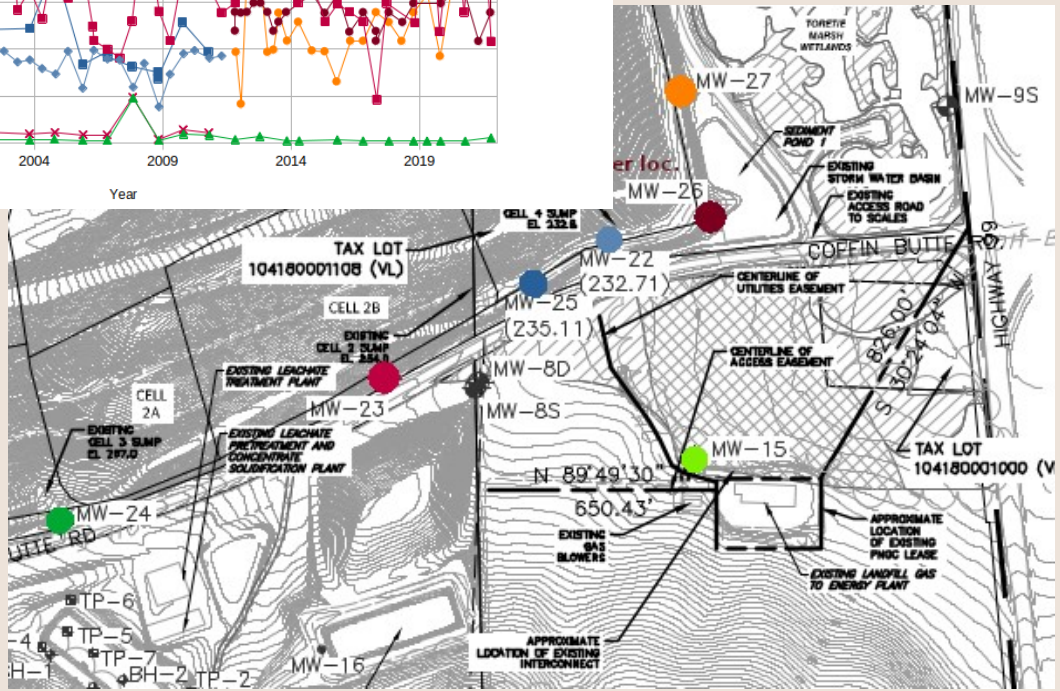
Compliance boundary wells MW-26 and -27 have regularly exceeded MCL of 10 µg/L since installed in 2013.



High arsenic in MW-23 and all wells down-gradient of early/mid 1990s seepage incident.

No problems in:
MW-24 (higher up drainage)
MW-15 (across gradient)
P-16 (across gradient)

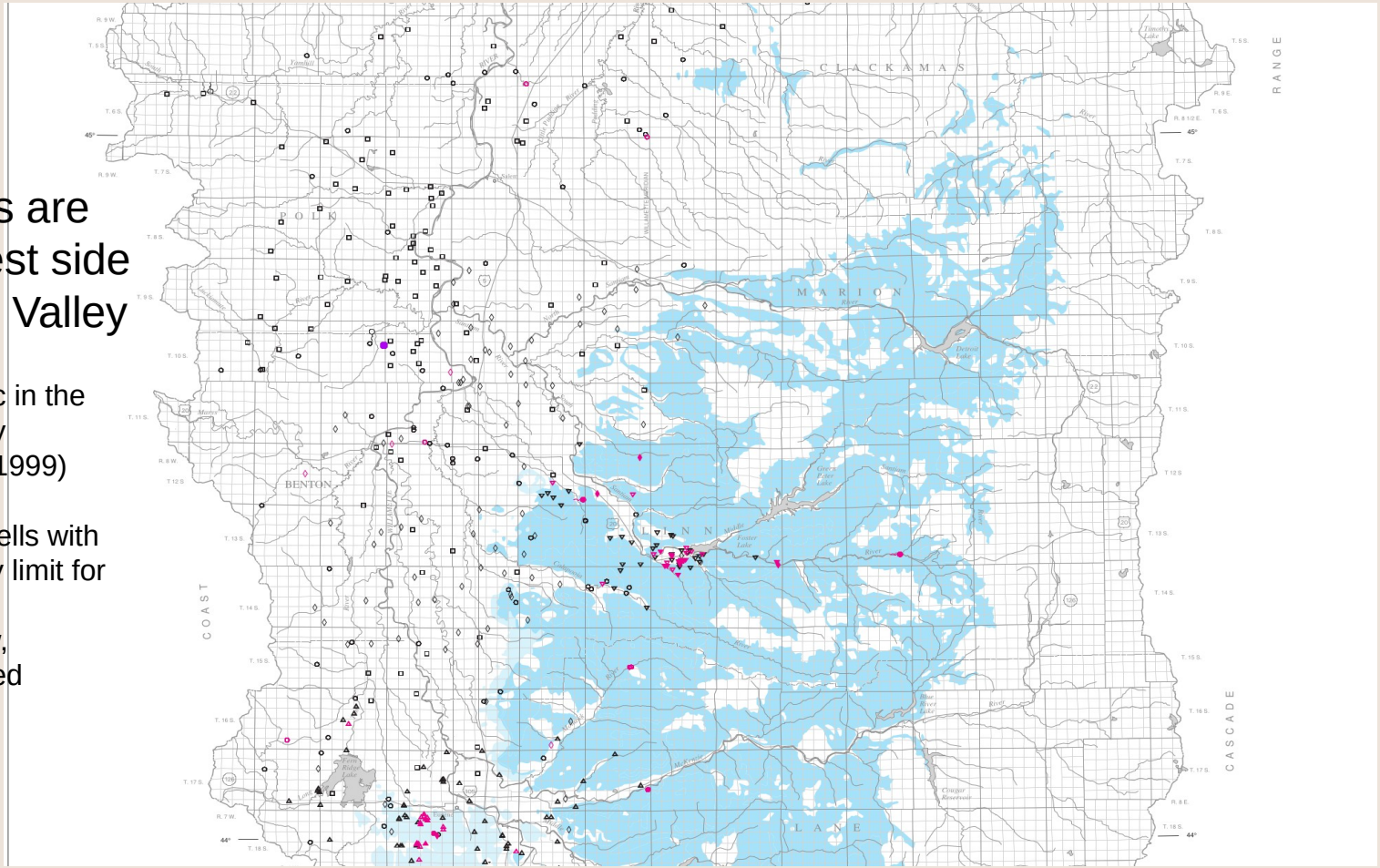




Observed levels are anomalous for west side of mid-Willamette Valley

USGS Study of Arsenic in the Willamette Valley
(Hinkle and Pollette, 1999)

Red markers indicate wells with arsenic above regulatory limit for drinking water:
>10 µg/L if hollow,
>50 µg/L if solid red

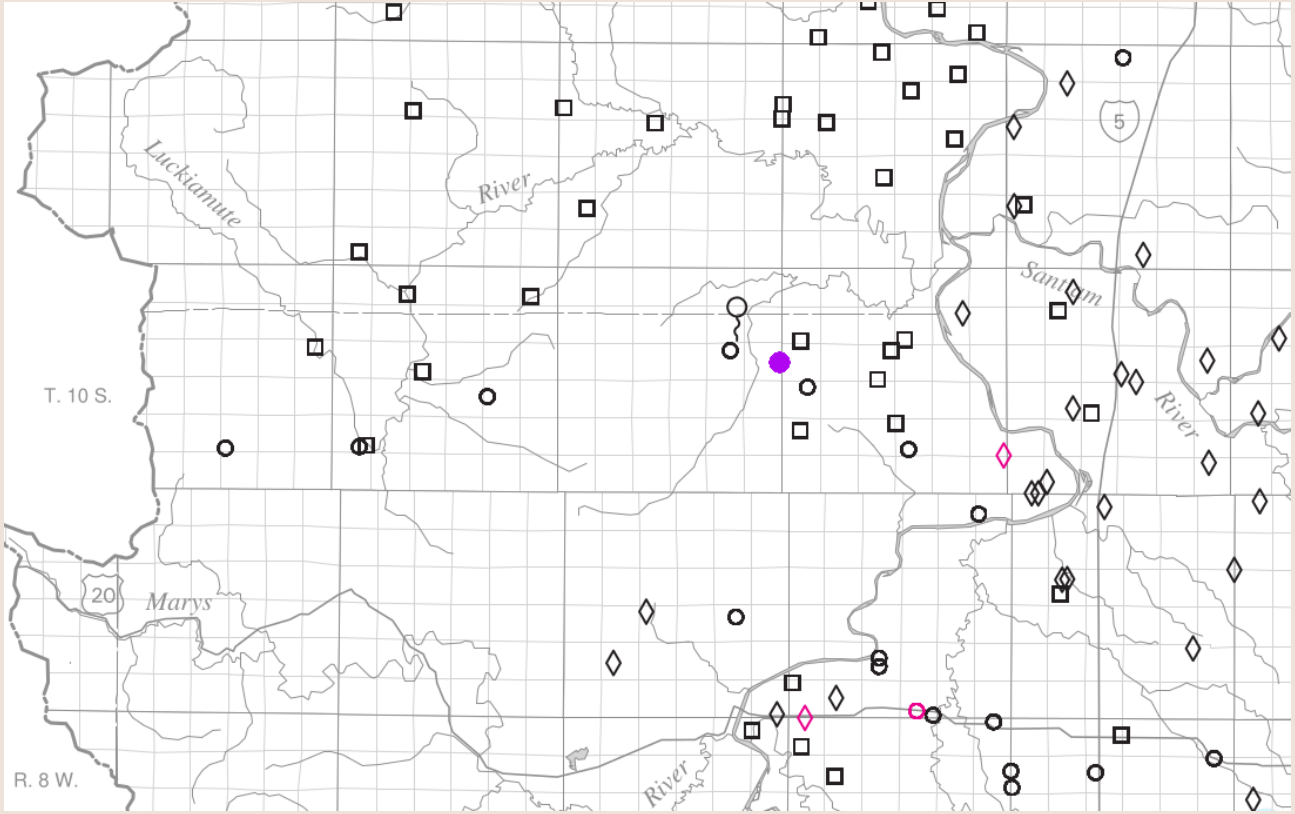


Observed levels are anomalous for west side of mid-Willamette Valley

USGS Study of Arsenic in the Willamette Valley
(Hinkle and Pollette, 1999)

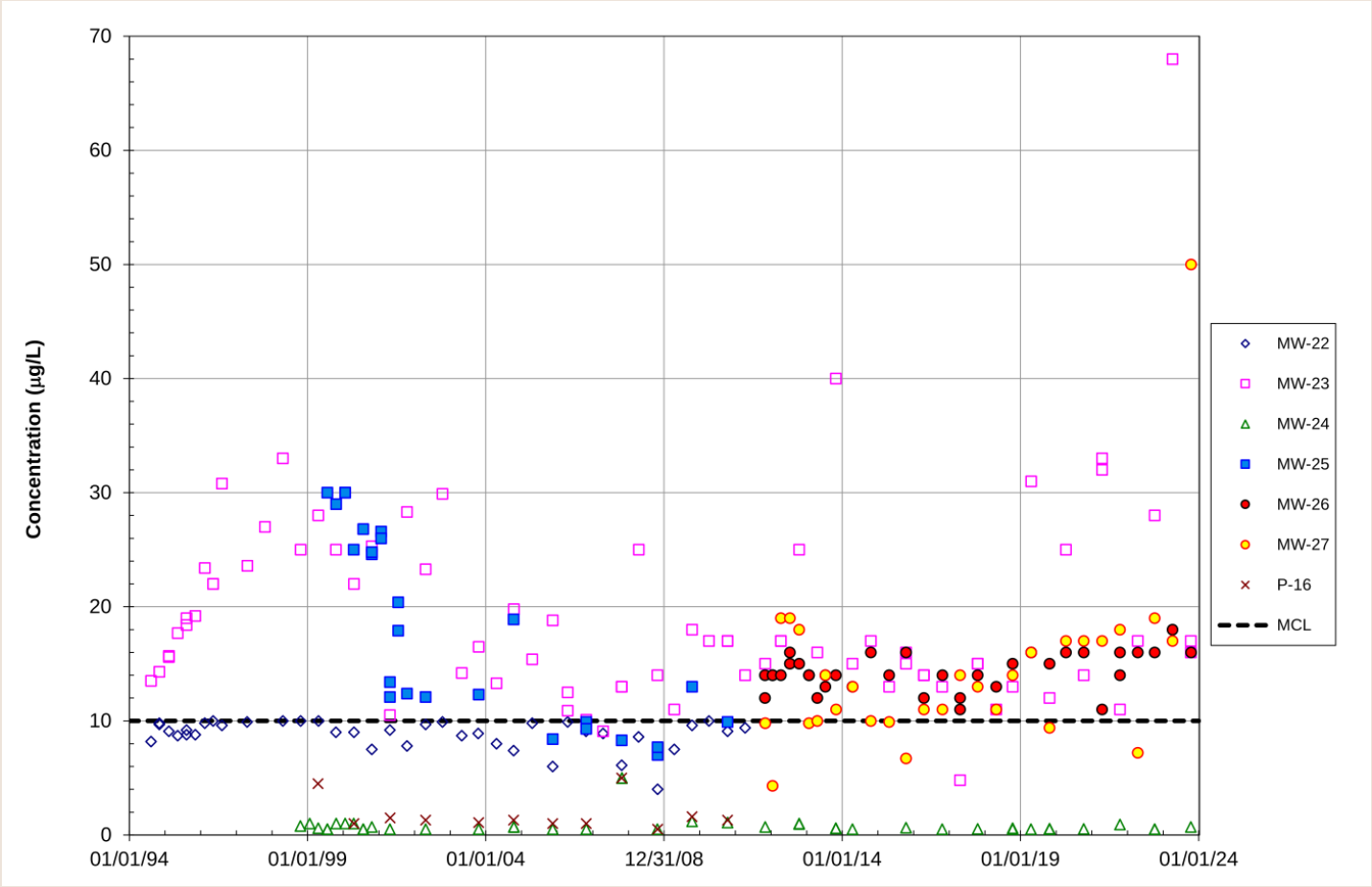
Red markers indicate wells with arsenic above regulatory limit for drinking water (10 µg/L but less than 50 µg/L).

Purple dot shows location of Coffin Butte Landfill.



Most recent data: Arsenic Concentrations East-side wells 1994-**2023**

Data from 2023 Annual Environmental Monitoring Report



Shifting explanations

“These are background levels of arsenic, typical for that part of the site.”
Problem: Values are anomalous for this part of Willamette Valley, and also fluctuate with time.

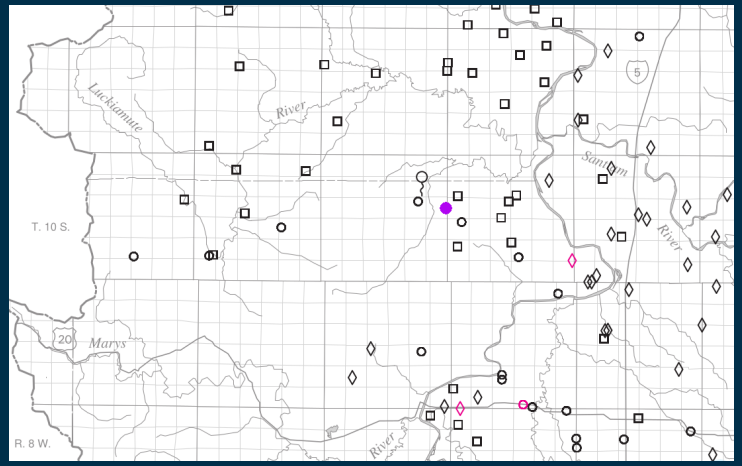
“Arsenic doesn’t normally come out of landfills.”
Problem: Leachate from this landfill has measured As concentrations ~120 µg/L

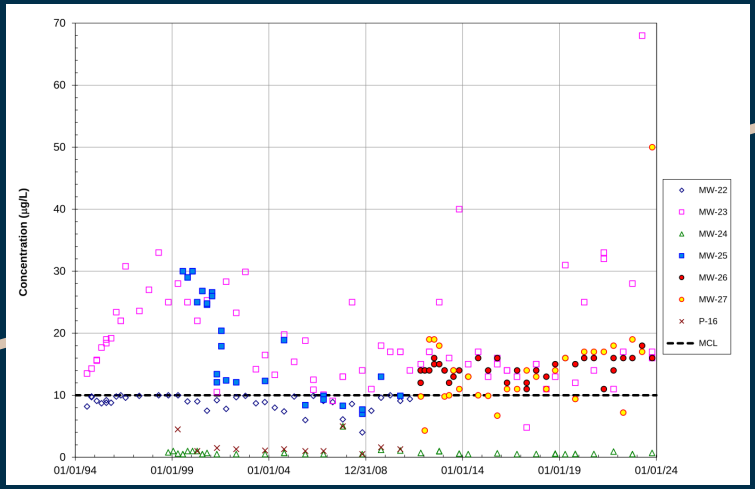
”Higher concentrations are observed in MW-9S near highway”
Problem: MW-9S is in disturbed location (drilled into a former cloverleaf intersection ramp from 1940s), at edge of an artificial wetland that was bulldozed out during the early 1990s seepage event, and filled with runoff from the acknowledged seepage area. So MW-9S was compromised before it was ever sampled for arsenic.
Also new data approaching 70 µg/L in MW-23 exceed highest levels ever measured in MW-9S.

”MW-27 is difficult to sample because it’s screened in a low-permeability layer.”
Problem: This doesn’t explain upward trend in recent years. Might be a good argument for adding another compliance-boundary well.

”Other indicators of leachate (Fe, Mn, and TDS) do not show similar trends.”
Problem: Both Fe and Mn have been trending upward in recent years, and have exceeded the site-specific action limits.

”These are typical values for the southern Willamette Valley”
Problem: Coffin Butte is in the mid-Willamette Valley.





Closing discussion

Alternative hypotheses for high arsenic – direct leakage or mobilization?

Possibilities for off-site measurements?

Precautionary well testing for down-gradient households?

Anything else?