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Oregon Department of Energy
550 Capitol St. NE
Salem, OR 97031

Submitted via email to ODOE.Comments@Oregon.gov

RE: Chemical Waste Management of the Northwest Risk Assessment and Corrective Action Plan

Dear Mr. Woods,

On behalf of Columbia Riverkeeper, I am writing to urge the Oregon Department of Energy to conduct its own independent analysis of the risks associated with leaving radioactive fracking waste buried in Chemical Waste Management's ("Chem Waste") Arlington, OR facility. As the entity responsible for correcting the illegal waste disposal, Chem Waste has a strong incentive to submit a risk assessment and Corrective Action Plan (CAP) that is drafted as favorably as possible to the company's own financial interests. Short of an independent analysis, ODOE must take a hard look at the documents submitted by Chem Waste and not simply accept them as written.

Nationwide, the oil and gas industry has hidden the costs associated with the disposal of waste generated from hydraulic fracturing ("fracking")—often by disposing of toxic and radioactive waste in unsuspecting or underregulated landfills.[1] [2] This practice has been lucrative for the fossil fuel industry, saving fracking operators and waste haulers millions of dollars in

[1] Gaffney. 2019. "A Small Town's Battle Against Radioactive Fracking Waste." (Note: The story from Kentucky is very similar to what happened in Arlington.)
https://www.nrdc.org/onearth/small-towns-battle-against-radioactive-fracking-waste
Also see: Western Organization of Resource Councils (WORC). 2015. "No Time to Waste."
http://www.worc.org/media/notimetowaste1.pdf
[2] Nobel. 2020. "America's Radioactive Secret." Rolling Stone Magazine.
https://www.rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/

disposal fees. Chem Waste has participated in and profited from this pattern of illegal dumping by illegally accepting a staggering 2.5 million pounds of radioactive fracking waste, mostly consisting of filter socks. Oregonians expect and deserve protection from dangerous pollution of this kind. Columbia Riverkeeper appreciates the work that ODOE is undertaking to strengthen and clarify Oregon's rules to address radioactive waste. However, ODOE needs to use the authorities it has available to it now to ensure the waste does not create a long term risk for the region and also to ensure this never happens again. By asking tough questions about how Chem Waste has impacted Oregon, we hope that Oregon can set an example that can be followed by other communities who find themselves similarly impacted by sloppy and illegal handling of radioactive fracking waste.

We appreciate the effort the ODOE staff have given to providing public participation materials and a public meeting in Arlington. And we were glad to hear ODOE staff acknowledge during the September public meeting that community members in Arlington and beyond have been frustrated and angered by Chem Waste's illegal acceptance and dumping of radioactive fracking waste in Arlington and the relatively mild enforcement consequences for their actions. Even with DEQ's $60,000 fine, Chem Waste will pay only a few cents in penalties for every pound of radioactive fracking waste they dumped in Arlington. Going forward, ODOE has a duty to protect the public from the risks associated with Chem Waste's actions. To that end, ODOE's review of the risks associated with the waste disposal and the most protective corrective action must be independent and robust. Riverkeeper continues to have serious concerns regarding many of the assumptions Chem Waste makes in its risk assessment document and CAP—specifically with respect to the leachate.

I. ODOE Should Complete Its Own Independent Risk Analysis.

As a private, for-profit company, Chem Waste has a clear motivation to produce a risk assessment and CAP that is most favorable to its own financial interests. When the public first learned of the illegal dumping at Chem Waste's facility, Columbia Riverkeeper and others urged ODOE and the State of Oregon to independently investigate the facility and the risks to human health and the environment associated with Chem Waste's acceptance of the waste. In some respects, ODOE did investigate Chem Waste. According to ODOE, with Chem Waste's cooperation, the agency worked to determine the volume and nature of the waste that came to Arlington and some of the circumstances that led to its illegal disposal in Oregon. However, we remain concerned that ODOE's assessment of the impacts of the pollution that Chem Waste proposes to leave in its Arlington landfill rely largely, or even exclusively, on information developed and put forward by Chem Waste and its consultants. In addressing the impacts of the pollution, ODOE has put Chem Waste in the driver's seat with respect to developing a Corrective Action Plan. In reality, the onus is on the agency to ensure that the public is adequately protected.

We have reason to be concerned about Chem Waste's conclusions, and ODOE's apparent willingness to defer to Chem Waste. Chem Waste has already made public statements that have proven incorrect. For example, in March 2020, Chem Waste asserted in a public meeting that they did not expect to see increased radioactivity in the leachate because the illegally dumped radioactive fracking waste consisted of filters which the company expected to hold the radioactive pollution in place.[3] However, in May 2020, Chem Waste released a Preliminary Leachate analysis showing that radionuclide levels far exceeded drinking water standards, and radioactive pollution had impacted the leachate.[4] Chem Waste now asserts that leachate management can remain largely unchanged, despite sharply elevated levels of uranium, thorium, and other radionuclides. We remain concerned that the practice of using radioactive leachate for dust suppression may become more risky over time if the leachate becomes more and more radioactive.

Given that Chem Waste's public assurances regarding the leachate have already proven untrue, we strongly urge ODOE to not take the company at its word. We encourage ODOE to conduct its own, independent assessment of whether the leachate could have any long-term natural resource impact, or whether further monitoring might suggest that changes in leachate management practices are warranted. As a paid contractor of Chem Waste, the firm that completed the analysis cannot be considered independent and unbiased. At the very least, ODOE must take its own hard look at the assumptions made in the risk assessment and CAP.

II. If ODOE Accepts Chem Waste's "Preferred Alternative" of In-Place Closure, Additional Monitoring Should Be Required.

Chem Waste asserts that leaving the waste in place ("Alternative 1") presents less risk to workers and the public than exhuming and removing waste to another landfill ("Alternative 2"), presumably in Idaho or elsewhere. In its presentation during the public meeting in September, ODOE indicated that it generally concurred with a preference for Alternative 1. If ODOE finds that the risks associated with disturbance of the other hazardous chemical (non-radioactive) wastes legally disposed of in the landfill would outweigh the risks of leaving the fracking waste in place, ODOE needs to require much more robust monitoring to ensure that this holds true over time.

Our primary concern relates to the leachate and Chem Waste's apparent plan to continue to spray untreated leachate on the surface of the landfill for dust suppression. The CAP states that there is "no direct exposure" to the radioactive fracking waste for workers or the public now that the waste is buried, but this claim is blatantly misleading.[5] Radioactive leachate is pumped to

[3] *See 53 minute mark of this video of the town hall. https://www.youtube.com/watch?v=Zfj8Tb5YzIs&t=3196s*
[4] Chem Waste. May 2020. Preliminary Leachate Analysis. Table 1.
[5] Corrective Action Plan at 32

the surface and used—untreated—for dust suppression. This provides a potential exposure pathway to the radioactivity from the radioactive fracking waste. Chem Waste argues that the risk is minimal. However, it is not accurate to say that there is "zero" exposure to workers or the public. To ensure that the risk remains "minimal", as Chem Waste asserts, ODOE should require frequent monitoring of radioactivity levels in the leachate to determine whether radionuclide levels (some of which, like uranium at 358 pCi/L, are already quite elevated) are increasing.

Without more frequent monitoring, ODOE and DEQ may not have the information necessary to protect the public if the radioactive makeup of the leachate changes over time. The concentration of radioactivity in the leachate may not be stable, and it may increase over time to levels that present greater risks to workers or the public. A 2017 study evaluated the Environmental Restoration and Disposal Facility (ERDF) at Hanford, as well as three other low-level radioactive waste sites. At ERDF, the study observed: "[i]n addition, the U concentration in ERDF leachate increased from 212 to 3,060 μg/L during the first decade of data, and then leveled off at approximately 1,500 μg/L. In contrast, at the other sites, the U concentration remained relatively constant (OSDF, ICDF) or dropped over time (EMWMF)."[6] As ODOE knows, these are different facilities with different systems, but the possibility certainly exists for radioactivity to increase over time at the Chem Waste facility. In the event that uranium concentrations decrease in leachate, the public will have to wonder where this uranium was ultimately deposited. If it is no longer in the landfill's leachate, has it simply been distributed via dust across the landscape? In either case, the experience of an order-of-magnitude increase of uranium in ERDF leachate should prompt ODOE to consider a much more intensive monitoring regime for the Chem Waste facility, particularly considering the current concentration of U-238 in L-14, cell 1 at 358 pCi/L.

Other states have been forced to deal with leachate monitoring as a result of radioactive fracking waste issues, and some of the lessons from their experiences may be helpful for ODOE to consider. The Western Organization of Resource Councils (WORC) recommended to North Dakota that "leachate [] be analyzed for radionuclides at the same frequency as groundwater samples are collected," and "[i]f radionuclides are detected in the leachate at a concentration greater than drinking water maximum contaminant levels, then the groundwater monitoring network must begin analysis for radionuclide parameters."[7] The same report recommends a much higher frequency of monitoring for leachate and down-gradient groundwater, on a monthly basis when leachate shows radioactivity levels that exceed drinking water standards (which has occurred at the Chem Waste facility).[8] We encourage ODOE to review the recommendations put

[6] Tian et al. 2017. "Chemical Characteristics of Leachate in Low-Level Radioactive Waste Disposal Facilities."J. Hazard. Toxic Radioact. Waste, 2017, 21(4): 04017010.
https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29HZ.2153-5515.0000361
[7] Western Organization of Resource Councils. "No Time to Waste." p. 38.
http://www.worc.org/media/notimetowaste1.pdf
[8] Id at 56.

forward by WORC and to consider how their ideas may deepen the agency's consideration of whether the leachate management system at the Chem Waste facility can safely continue unchanged.

1. **The risks associated with surface exposure remains significant during landfill operation.**

The CAP identifies Alternative 1 as Chem Waste's preferred alternative because it is less expensive and, allegedly, would result in lower risk to current and future workers. However, Chem Waste's assessment sidesteps the potentially changing nature of the radioactive pollution in the leachate that the company sprays on the surface of the landfill for dust suppression purposes. Chem Waste's Preliminary Leachate Analysis shows the following Table (see below), which clearly demonstrates that uranium, thorium, and other radionuclides are present at elevated concentrations in the leachate. For reference, EPA's maximum concentration limit for drinking water for uranium is 30 micrograms/L, which corresponds to roughly 20 pCi/L.[9] Accordingly, the leachate is almost 18 times the drinking water standard at the present time, and we do not yet know if the trend is upward or downward. U-238 is extremely long-lived, and it has the potential to move with groundwater if it escapes containment. As an alpha emitter and a metal that is toxic to kidneys, it is also dangerous to people when it is inhaled or ingested. Other radionuclides present in the leachate carry additional hazards, as well.

Table 1. Radionuclide Concentrations in Leachate Sump Water. Italicized Values Were Less than the Lower Limit of Detection (LLD) and Represent one-half the LLD value

	Radionuclide Concentration (pCi L^{-1})					
Radionuclide	L-14 cell 1	L-14 cell 2	L-14 cell 3	L-14 cell 4	Average	OAR 345-050-0025 Table 1 Value
U-238	358	6.53	73.9	*6.5*	111	1.0E+04
U-234	332	10.8	83	*7.5*	108	1.0E+04
Th-230	50.3	*1.65*	*1.65*	3.6	14.3	1.0E+02
Ra-226	1.2	*0.85*	0.75	*0.35*	0.79	1.0E+02
Pb-210	*13.5*	*6.5*	*6.5*	13	9.88	1.0E+02
Th-232	25.8	*1.35*	1.6	*0.36*	7.28	1.0E+02
Ra-228	24	*10*	*10*	*10.5*	13.6	5.0E+02
Th-228	32.9	0.672	0.573	*8.04*	10.5	1.0E+03
U-235	14.6	1.8	*6.5*	*6.5*	7.35	1.0E+04
K-40	126.4	427	474	474.72	375	5.0E+02
H-3	*250*	*250*	596	*250*	336.5	3.0E+07

Table 1 from Preliminary Leachate Analysis. May 2020. Source: Chem Waste.

[9] Uranium MCL is 30 micrograms/L, which converts to about 20 pci/L according to the MN Dept of Health - https://data.web.health.state.mn.us/uranium-messaging and the NH Dept of Health - https://www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-3-11.pdf.

To understand the long-term impact of the leachate and its management on workers, nearby members of the public, and the environment, ODOE should require additional monitoring to understand whether the nature of the leachate is fluctuating over time. The system may have the impact of concentrating radioactive contamination by recirculating contaminated water again and again through the same contaminated landfill cells. It is premature to conclude that Alternative 1 is preferable without also considering the impact of the leachate management system. At the very least, ODOE should require regular, long-term monitoring to ensure the risks are well understood going forward.

At a basic level, the facility's leachate system seems like an ill-advised process—to take untreated leachate from the bottom of the landfill (where it may not pose a risk) and spray it untreated on the top of the landfill, where it not only poses a risk to the facility workers but accrues more radioactivity over time. Alternatively, if the radioactive leachate spraying results in the lowering of radioactivity levels in the landfill, this may indicate that the leachate spraying has simply distributed radioactive pollution into the surrounding environment. Again, this seems like a questionable approach when the underlying concentration of radioactivity in the leachate could be a changing factor.

At Hanford, the Pacific Northwest National Labs published an overview of dust suppression approaches used and their varying levels of success and potential pitfalls. The PNNL study does not directly contemplate the use of contaminated leachate for dust suppression. Rather, it considers the use of "freshwater," and it notes that the "over application of water may increase infiltration and cause mobilization of contamination."[10] While Chem Waste is convinced that the high-evaporation environment in Arlington will prevent mobilization of contaminants, the current radioactivity levels in L-14, cell 1 where leachate is used for dust suppression may suggest that any additional liquid will further mobilize contaminants in the system. Additionally, the use of contaminated leachate for dust suppression appears inconsistent with Hanford's typical use of "freshwater" for dust suppression. Practices at another low-level radioactive waste disposal facility, the on-site disposal facility (OSDF) in Fernald, Ohio, also appear not to use leachate for dust suppression, although large volumes of dust suppression water are used. According to a 2008 study of the site, "[t]he function of the OSDF is to isolate impacted material from the environment for up to 1,000 years to the extent reasonably achievable, and, in any case, for 200 years," and to "provide leachate containment and collection within the OSDF to prevent OSDF leachate from entering the environment."[11] Accordingly, our understanding is that this

[10] Yonkofski et al. 2018. Pacific Northwest National Labs. "Water Application for Dust Control in the Central Plateau: Impacts, Alternatives, and Work Strategies." https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28061.pdf

[11] Bonaparte et al. 2008. Design, Construction, and Performance of Low-Level Radioactive Design, Construction, and Performance of Low-Level Radioactive Waste Disposal Facility Waste Disposal Facility https://scholarsmine.mst.edu/cgi/viewcontent.cgi?article=2972&context=icchge

low-level radioactive waste disposal site did not use leachate for dust suppression. Leachate recirculation occurs in some municipal and chemical waste landfills, but it is not clear that this is a common practice in radioactive waste landfills. If the agency has not done so already, ODOE must evaluate whether the use of radioactive leachate is a typical practice in low-level radioactive waste facilities. If not, this may further underscore the potential unadvisability of this approach being used in Arlington.

The leachate assessment notes that "[l]eachate spraying is not expected to result in a large amount of water infiltration because spraying only occurs when evaporation is high."[12] This environment would seem highly conducive to concentrating radioactivity in both the surface and in the leachate itself over time. As leachate is sprayed, some of the water evaporates and the rest returns to the landfill, becoming more concentrated in radioactivity as it filters back down.[13] It may also slowly mobilize more and more of the radioactive contamination in the filter socks. With the leachate already testing at three times the drinking water level for thorium and 18 times for uranium, the public should expect Chem Waste and ODOE to regularly monitor the situation in the affected cells (particularly L-14, cell 1) to ensure that the leachate levels don't dramatically increase before the landfill is decommissioned and capped.

In addition to risks relating to the leachate itself, we are concerned about potential risks related to the soil in and near the landfill. Chem Waste's own Preliminary Leachate Analysis acknowledges the potential for radioactive contamination to build up in the landfill soil over time. The Leachate Analysis notes that,

> [t]he leachate applied as dust control scenario theoretically results in the build-up of radionuclides in soil over time. This report assumes this material is suspended into air and contributes to external exposure for a person standing on the landfill surface. As discussed earlier, this scenario is considered unlikely as all landfill workers wear respiratory protection while working on the landfill.[14]

The CAP asserts that dust exposure poses a low risk to workers because of the use of respirators, but the study should also consider whether a change in leachate management practices—including not using the leachate for dust suppression—may reduce risks to workers. The risk assessment largely dismisses impacts to neighboring properties, however, the build-up of radioactivity in the soil as a result of leachate spraying will depend on the level of radioactivity in the leachate, which itself may increase over time. It is worth reconsidering whether spraying leachate for dust suppression, and the resultant buildup of radioactivity in soils, is a necessary risk for the ongoing operation of the Chem Waste facility.

[12] Preliminary Leachate Analysis at 3.
[13] Chem Waste's assumption that the radioactivity would remain in the filter socks has already proven false, as evidenced by the high radioactivity of the leachate. See Table 1 in Preliminary Leachate Analysis.
[14] Preliminary Leachate Analysis at 28.

The risk assessment also notes that runoff from the spray operations is collected using the landfill internal stormwater collection system and sent to a separate lined stormwater pond at the north end of the current landfill. The Risk Assessment states, "All stormwater from the facility is moved by on-site stormwater conveyances to on-site stormwater retention ponds that do not discharge to any of the local rivers, streams, or other water bodies."[15] While it is reassuring that on-site ponds will not immediately discharge to any local water bodies, the potential exists for increasingly radioactive leachate to cause the build up of radioactivity in these locations, as well, potentially causing a radioactive risk in the future. Additionally, when the leachate cannot be used for dust suppression, it is placed in one of two on-site evaporation ponds. These are additional locations that could see a build up of radioactivity over time. It also creates the possibility that these areas could generate radioactive dust that could pose a risk to workers or blow onto neighboring areas. While Chem Waste asserts that these risks are minimal, we remain concerned that the leachate management practices may contribute to a worsening concentration of radioactivity in soils, wind-blown dust, and the leachate itself.

We urge ODOE and Chem Waste to reconsider whether the use of radioactive leachate is appropriate for dust suppression, and the overall impact of potentially increasing levels of radioactivity in the leachate. The potential for risks to change over time seems significant. The CAP assumes that the facility will continue to operate for another 30 years following the illegal disposal of the Bakken oilfield waste, after which an engineered cover will be installed.[16] While the CAP proposes some monitoring, the timing of the monitoring may be too spaced out to provide enough information to correct a problem as it arises. Furthermore, the monitoring is not linked to any specific action or re-evaluation process for how the landfill is being managed.

2. The risks associated with the leachate will continue after the landfill is capped.

Over the long term, we remain concerned that the radioactivity Chem Waste introduced into Arlington could impact soils, groundwater, and the people and other biological life who may interact with them for hundreds, thousands, or even millions of years. It is difficult to project how the facility may change over time. For example, if the surface barrier fails before the liner, it may result in elevated levels of radioactivity in the vadose zone or even in groundwater if the liner creates a small, perched pool of groundwater. At that point in the future, maybe hundreds of years from now, if an intruder or a nearby resident were to introduce a well into the area, they could become exposed to radioactivity levels dramatically exceeding EPA's drinking water standard. It is difficult to conclude at this point, given the elevated levels of radioactivity in the leachate, and given the absence of information showing whether these levels are increasing or

[15] Risk Assessment at 10.
[16] Risk Assessment at 49.

decreasing, that there is no possibility of future impacts to groundwater and future potential users of the area. ODOE must acknowledge the potential natural resource damage that has resulted from Chem Waste's illegal dumping of radioactive fracking waste in Arlington.

At a minimum, ODOE should seek to implement additional monitoring in place after the landfill is capped to ensure the cap is working and leachate isn't collecting and moving to groundwater. Currently, leachate is approximately 18 times the drinking water standard. Over time, both the cap and the liner could fail, resulting in a vadose zone and ultimately groundwater contamination. As described above, the liner may cause the vadose zone to become more saturated above the liner, and if radioactive contamination remains present and concentrates radioactive pollution in this water, the risk could be greater than Chem Waste has acknowledged.

Chem Waste offers a confident view of the future of the Arlington landfill, asserting that its post-closure impact on the environment will be negligible. In a changing climate, their confidence is misplaced. We remain concerned about the radioactive waste that Chem Waste has illegally accepted and its potential to escape into the environment in ways we do not anticipate due to the effects of climate change. The half-life of U-238 is 4.5 billion years. The half-life of thorium is even longer. These alpha-emitting pollutants pose a particular risk if they are brought to the surface, mixed with soil, and inhaled as dust. Further, as ODOE acknowledged in its presentation in September, the production of radon gas could also pose a long-term risk. All of these risks may change over time as the climate shifts, potentially dramatically. According to Oregon State University's Fourth Oregon Climate Assessment Report, "[e]xtreme precipitation events are likely to increase by 20 percent in eastern Oregon, with heavy rainfall potentially resulting in slope instability, landslides and transportation closures."[17] ODOE and Chem Waste should have done far more to consider how changing, extreme precipitation events may alter the performance and impact of the landfill during operation and after closure of the facility.

Given the significant uncertainty of climate change impacts and the unsure picture of how much radioactivity will concentrate in leachate or future groundwater, we simply cannot agree with Chem Waste's bland assertion that "the groundwater exposure pathway is not a concern for human health or ecological receptors under either remediation alternative, even assuming hypothetical future potable water use drawn from Landfill L-14."[18] Chem Waste is asking us to ignore the currently elevated levels of radioactivity in the leachate and to assume that future risks will never emerge, even in a chaotic and changing environment. This is simply too large a leap to take with dangerous, long-lived contaminants. If Alternative 1 appears to offer less risk than Alternative 2 because Alternative 2 would expose workers and the public to contaminants, then ODOE must be honest about the long-term consequences of the approach it is

[17] Oregon Climate Change Research Institute. 2019. http://www.occri.net/ocar4
[18] Corrective Action Pan at 33.

taking. It may be the case that Chem Waste has created a situation where there are no truly good options.

III. Conclusion

In conclusion, Columbia Riverkeeper urges the Oregon Department of Energy to not accept the Corrective Action Plan (CAP) submitted by Chem Waste as written. The CAP downplays the risks associated with leaving the waste in place and fails to provide adequate monitoring for the leachate, which already shows elevated levels of radioactivity. We appreciate ODOE's willingness to engage with the public, and we urge ODOE to delve more deeply into how to address the risks that may arise from illegal radioactive fracking waste disposal in a changing climate, in a landfill that was not designed for low-level radioactive waste, in a community that did not ask for, anticipate, or deserve this pollution risk.

Sincerely,

Dan Serres

Conservation Director

Columbia Riverkeeper