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Via Electronic Mail

Ms. Jennifer Colborn
U.S. Department of Energy, Office of River Protection
Mail Stop H6-60 2440 Stevens Drive
Richland, WA 99354

Submitted via email to: *TBIWIR@rl.gov*

RE: Columbia Riverkeeper Comments on the Draft Waste Incidental to Reprocessing Evaluation for the Test Bed Initiative Demonstration

Dear Ms. Jennifer Colborn,

On behalf of Columbia Riverkeeper, our members, and supporters, we submit the following comments regarding the Draft Waste Incidental to Reprocessing (WIR) Evaluation For the Test Bed Initiative Demonstration (TBI). The proposal would move 2,000 gallons of high-level waste (HLW) originating from Hanford's tank farms, specifically 2,000 gallons of supernatant from Tank SY-101 (SY 101), to Richland. There, Perma-Fix NW would conduct a test of grouting tank waste. Moving tank waste off of the Hanford site in a liquid form poses significant health and safety concerns, as well as environmental risks. The waste would be moved closer to Richland residents. Furthermore, the WIR offers inadequate information to conclude that the process will remove key radionuclides, that the waste will be appropriately managed and accepted, and that the grout can be relied upon to immobilize the waste.

1. Introduction

Columbia Riverkeeper (Riverkeeper) is a 501(c)(3) nonprofit organization with a mission to protect and restore the Columbia River, from its headwaters to the Pacific Ocean. Since 1989, Riverkeeper and its predecessor organizations have played an active role in educating the public about Hanford, increasing public participation in cleanup decisions, and monitoring and improving cleanup activities at Hanford. Columbia Riverkeeper and its 16,000 members in Oregon and Washington have a strong interest in protecting the Columbia River, people, fish,

and wildlife from contamination at Hanford, including pollution originating in Hanford's tank farms.

Columbia Riverkeeper supports effective cleanup at Hanford, and we are grateful for those who help to make it happen, as much as possible. We support the effort underway to address some of Hanford's most harmful pollution, including the treatment of groundwater pollution that results from waste in the Central Plateau. The U.S. Dept. of Energy (Energy) has successfully removed source material in the River Corridor in addition to pumping and treating groundwater adjacent to the Columbia River. Projects undertaken to immobilize Hanford's most dangerous wastes benefit the region by addressing the pollution legacy of producing plutonium for nuclear weapons. However, the TBI raises serious red flags as a potential detour in the effort to vitrify tank waste, and the WIR does not adequately address questions about WIR approval criteria, including: the removal of key radionuclides, the performance of waste throughout the process and disposition, and the consequences if grout does not form in the manner expected or fails to fully immobilize the liquid supernatant waste in a solid form.

2. The TBI could have significant impacts to groundwater and public safety.

Despite previous and ongoing cleanup efforts, I-129, Tc-99, and other radionuclides and toxins are present in groundwater above standards at Hanford, and these contaminants are present in SY-101 material proposed for use in the TBI. According to page 4-10 of the Draft WIR, the TBI will handle material that could negatively impact groundwater and nearby communities if released.[1]

Table 4-4. BBI Estimate of Key Radionuclides in Tank SY-101 Waste (Ci)

(1) Key Radionuclide	(2) Supernate (Ci) (891,000 gallons)	(3) Saltcake (Ci) (204,000 gallons)	(4) Total (Ci) (1,100,000 gallons)
H-3	2.80E-01	7.91E+00	8.19E+00
C-14	1.77E+00	5.32E-01	2.30E+00
Co-60	2.93E-01	3.21E+00	3.50E+00
Ni-63	7.42E+00	9.11E+01	9.85E+01
Sr-90	2.85E+02	5.50E+04	5.53E+04
Tc-99	8.94E+01	2.27E+02	3.16E+02
I-129	9.89E-02	1.29E-01	2.28E-01
Cs-137	8.63E+04	1.44E+05	2.30E+05
Np-237	3.30E-03	5.02E-01	5.05E-01
Pu-238	1.83E-02	1.09E+01	1.09E+01
Pu-239/240	1.69E-01	6.72E+01	6.73E+01
Pu-241	7.49E-02	4.49E+01	4.50E+01
Pu-242	1.24E-06	7.41E-04	7.42E-04
Am-241	1.69E-02	6.22E+02	6.22E+02
Am-243	5.21E-06	3.66E-01	3.66E-01
Cm-242	1.96E-04	1.54E+00	1.54E+00
Cm-243/244	1.21E-03	8.76E-01	8.77E-01
Key Radionuclide Totals	8.67E+04	2.00E+05	2.86E+05
Other Radionuclides*	5.19E+02	3.01E+03	3.53E+03
Tank Totals	8.72E+04	2.03E+05	2.90E+05

Source: *Derivation of Best-Basis Inventory for Tank 241-SY-101 as of October 1, 2020* (RPP-RPT-48774).

*Cs-137 and Sr-90 equilibrium decay daughter products (Ba-137m and Y-90, respectively) are not included in 10 CFR 61.55, "Waste Classification." Radiological impacts associated with the equilibrium daughters are accounted for by the parent concentration limits. "Other Radionuclides" include Ru-106, mCd-113, Sb-125, Sn-126, Cs-134, Sm-151, Eu-152, Eu-154, Eu-155, Ac-227, Ra-228, Th-229, Pa-231, Th-232, U-232, U-233, U-234, U-235, U-236, U-238, Ni-59, Se-79, mNb-93, and Zr-93. "Other Radionuclides" do not include Ba-137m and Y-90 since daughters are accounted for in the parent.

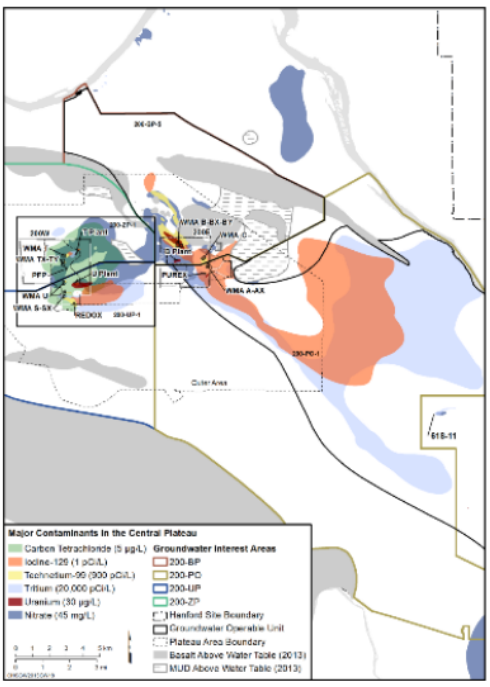
The soluble key radionuclides, to the extent present in the tank, are primarily Tc-99, I-129, C-14, H-3, and Cs-137 (and daughter Ba-137m). The ITPS IX will remove Cs-137 (and daughter Ba-137m) as well Sr-90 (and daughter Y-90), neptunium, and plutonium if present in soluble form.

[1] Draft Waste Incidental to Reprocessing Evaluation for the Test Bed Initiative Demonstration, U.S. Dept. of Energy, p. 4-10 (October 2021).

The tank waste pumped in SY-101 and gathered for shipment in totes for shipping offsite to Perma-Fix will contain a variety of the contaminants above. Energy states, “In general…70% of the curies attributed to key radionuclides will remain in tank saltcake, which is roughly 19% of the tank waste by volume; the supernatant, which is roughly 81% by volume of the tank waste, contains only 30% of the curies from key radionuclides.”[2] If these expectations are not met, what are the consequences? Failure to remove key radionuclides could exacerbate risks as Energy moves the waste around the area. What happens if the grout doesn’t form correctly?

We concur with the concerns raised by Hanford Challenge about the Draft Environmental Assessment (EA) for the TBI. Likewise, the WIR provides inadequate information about travel routes and potential areas of impact for the radionuclides and toxins that will remain in the supernatant, regardless of the level of success for pretreatment. Regarding the EA, Hanford Challenge commented:

> The fact that discussion of grout treatment at facilities like Perma-Fix Northwest does not include or evaluate the relative risks to groundwater, air, and local populations makes this draft EA incomplete. The Perma-Fix NW Annual Environment Report for 2020 states that “the area water table varies from approximately 10 feet at the west well to 21 feet at the east well.” Contrast this with the hundreds of feet to the water table in the Hanford 200 Areas. A spill during the handling or transportation of wastes at PFNW would quickly contaminate water that flows towards intakes and wells used by the City of Richland for drinking and irrigation.[3]



The TBI proposes to move dangerous pollution much closer to people and groundwater in Richland. In an airborne release from a process upset, the community of Richland is clearly at greater risk from a problem at Perma-Fix than a test at the Hanford site. Already, pollution from the 200 West Area where SY-101 is located impacts the Columbia River.[4] Moving waste creates new groundwater risks that may not have been adequately addressed.

The escalation in the volume being treated in Phase II of the TBI (3 gallons to 2,000 gallons)

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[2] Id. at 45

[3] Comments on Draft Environmental Assessment for the Test Bed Initiative, Hanford Challenge, p. 7 (Sep. 1, 2021) https://www.columbiariverkeeper.org/sites/default/files/2021-09/2021.09.01%20HC%20TBI%20EA%20Comment.pdf?eType=EmailBlastContent&eId=7bd4aa43-f7ac-4f0f-a8ca-783f65fa15b9.

[4] Ken Niles, Overview of Hanford’s 200 Areas Presentation, Oregon Department of Energy, (https://www.hanford.gov/files.cfm/Attachment_1_Overview_of_Central_Plateau.pdf.

represents a significant leap. Comments submitted by the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) on the EA for the TBI[5] expressed some questions about the specifics of waste transport and other significant issues. Hanford Challenge and its technical expert[6] have also raised issues that must be resolved before the WIR would meet the criteria regarding removing key radionuclides and ensuring that the grout performs as hoped. Additionally, comments submitted previously from tribes and agencies regarding the Vitrified Low Activity Waste (VLAW) WIR and Waste Management Area C (WMA C) WIR processes also raise unresolved questions about the characterization and disposal of tank waste more broadly. Comments identified chemical contamination that could interfere with grout formation. Has this issue been resolved?

In summary, groundwater risks and unplanned releases pose two major areas of question and concern. Uncertainty about how grout will form, perform, and whether key radionuclides can be removed present risks to people and the environment. If these factors change, the human health and environmental consequences could be significant over the long term because of the long-lived radionuclides involved.

Like other commenters, we are also concerned about the impacts of the test itself. Handling waste produces vapors that are dangerous to people nearby, including workers involved at every stage of moving HLW. The test has to be worth these risks. If the process is upset or a product of the process is inadequate, there could be a risk of generating a new set of policy disagreements, potentially orphaning waste. Energy's conclusions rely heavily on the expectations from Table 4-6.[7] We support previous commenters on the EA who questioned the thoroughness of characterization of the tank waste involved once it is disturbed in the tank, and the plans for assessing the contents of treated supernatant once it is removed for shipment to Perma-Fix.

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[5] Test Bed Initiative NEPA Agency Review, Confederated Tribes and Bands of the Yakama Nation (Sep. 1, 2021)
https://www.columbiariverkeeper.org/sites/default/files/2021-09/YN%20Hanford%20TBI%20EA%20YN%20Comments.pdf.

[6] Why Gout Failed at Hanford, Hanford Challenge (June 2021)
https://static1.squarespace.com/static/568adf4125981deb769d96b2/t/60f9b2bdb9480b7aeb6cbe15/1626976958173/2021+06.15+Why+Grout+Failed+at+Hanford.pdf.

[7] Draft Waste Incidental to Reprocessing Evaluation for the Test Bed Initiative Demonstration, U.S. Dept. of Energy, p. 4-12, 4-13 (October 2021).

Table 4-6. Key Radionuclides in Tank SY-101 Prior to and After Pretreatment (and Removal) of 2,000 Gallons of Supernate

(1) Key Radionuclides	(2) BBI SY-101 Total Tank Inventory (Ci)[a]	(3) BBI SY-101 Total Supernate Inventory after Settling (Ci)[b]	(4) Percent Removed from SY-101 Total Supernate by Settling[c]	(5) Inventory in 2,000 gallons of SY-101 Supernate after Settling, Decanting, Filtration, and IX Pretreatment (Ci)[d]	(6) Percent Removed from 2,000 gallons of SY-101 Supernate after Settling, Decanting, Filtration, and IX Pretreatment[e]
H-3	8.19E+00	2.80E-01	96.581	6.29E-04	99.992%
C-14	2.30E+00	1.77E+00	23.043	3.97E-03	99.827%
Ni-63	9.85E+01	7.42E+00	92.467	1.67E-02	99.983%
Co-60	3.50E+00	2.93E-01	91.629	6.58E-04	99.981%
Sr-90[f]	5.53E+04	2.85E+02	99.485	6.40E-01	99.999%
Tc-99	3.16E+02	8.94E+01	71.709	2.01E-01	99.936%
I-129	2.28E-01	9.89E-02	56.623	2.22E-04	99.903%
Cs-137[f]	2.30E+05	8.63E+04	62.478	1.94E+00	99.999%
Np-237	5.05E-01	3.30E-03	99.347	7.41E-06	99.999%
Pu-238	1.09E+01	1.83E-02	99.832	4.11E-05	99.999%
Pu-239/240	6.73E+01	1.69E-01	99.749	3.79E-04	99.999%
Pu-241	4.50E+01	7.49E-02	99.834	1.68E-04	99.999%
Pu-242	7.42E-04	1.24E-06	99.833	2.78E-09	99.999%
Am-241	6.22E+02	1.69E-02	99.997	3.79E-05	99.999%
Am-243	3.66E-01	5.21E-06	99.999	1.17E-08	99.999%
Cm-242	1.54E+00	1.96E-04	99.987	4.40E-07	99.999%
Cm-243/244	8.77E-01	1.21E-03	99.862	2.72E-06	99.999%
Total	**2.86E+05**	**8.67E+04**	**69.685**	**2.80E+00**	**99.999%**

Table 4-6 on pages 4-12 and 4-13 provide the basis for Energy's assumptions about the risks of the supernatant for the TBI. The actual process of measuring the amount of radioactive material leaving the site needs to be specified. Agencies agree that dangerous radioactive elements and chemicals are present in tank waste already, and understanding how the contaminants behave will be an important part of assessing whether the process is working as hoped.

3) Energy should prepare an Environmental Impact Statement.

Given the presence of key radionuclides, and the proposal to move tank waste offsite, Columbia Rivekreeper urges Energy to develop and circulate an Environmental Impact Statement (EIS) for the TBI project. By moving the material closer to the Columbia River, Energy creates a new risk. If the TBI is a test for grouting on a larger scale, then TPA Agencies should carefully think through the worst case impacts at each step. This would require an EIS. If an unexpected event occurred with 2,000 gallons of tank waste, or even a part of that volume, the impacts could be significant. The likelihood may be low, but Perma-Fix's track record suggests that basic human error could be a factor, on a variety of levels.

The 2,000-gallon test creates significant risks on its own, simply by virtue of moving more pollution into Richland. The EA provides inadequate attention to the potential consequences of a spill en route, a spill at the site, and other concerns related to moving tank waste-originating material towards Richland. More information should be provided to the public to make a reasonable determination about taking the drastic step of moving tank waste to Richland for treatment. If the TBI concept has potential, it almost certainly cannot occur in Richland on a large scale for safety and other reasons.

Energy should do more to address vapor impacts that come from the process of moving, handling and treating waste. Waste in SY-101 created vapors in the past. The proposed TBI activities will create vapors that could be harmful to workers or a nearby community in an unexpected event. As others have said already, tank waste vapors will probably occur at every stage in the pretreatment and treatment processes, and by moving the material around. Shipping Hanford's tank waste supernatant to Perma-Fix creates vapor risks offsite and to workers in both places.

Riverkeeper urges Energy to consider the risks of concentrating cesium on a large scale. If the TBI were to scale up, how would cesium removal work? Additionally, cesium is not the only contaminant that complicates grout formation. There are risks at every stage of the grouting process, and Hanford Challenge's "Why Grout Failed at Hanford" report raises serious questions about whether grout can be as protective as vitrified waste for protecting future generations' health and access to clean groundwater.[8] Evidence suggests that grout will not be as protective, even with the measures currently proposed. The performance of grout was a point of contention in the Tank Closure Waste Management EIS between TPA agencies, and public comments strongly supported the most durable ways of immobilizing waste.

The budget for Hanford faces limitations each year, and grouting on a large scale is a contentious and costly idea that would require extensive additional analysis. Pursuit of grout may undermine trust and distract from the DFLAW effort already underway. We are concerned about the consequences of moving tank waste offsite and closer to communities near Richland. While nuclear material moves through communities frequently, the shipment of tank waste offsite is an exceptional event. The proposed plan leaves us with additional concerns rather than a full resolution of comments raised about the EA, an indication that an EIS would be a better tool to evaluate the whole project and cumulative risks.

Lastly, Riverkeeper expresses serious concerns about the public input that was solicited on the draft EA. In fact, the public was not notified about the draft EA's release, and only a select group, including the Washington Dept. of Ecology (Ecology) and Yakama Nation, were invited to comment. Unfortunately, the public at large was not invited to comment. Energy must give the public every opportunity to understand the gravity and ramifications of the TBI and future of Hanford's tank waste.

4) Riverkeeper reiterates concerns about the WIR process.

Riverkeeper reiterates deep policy concerns related to the use of the WIR process to address Hanford's HLW at this time. Here, the intent is to move the material close to Richland (rather than removing and treating the waste onsite), and then back again to Hanford, hopefully in a very stable grout form. There are many steps that have to go perfectly for the process to succeed. At the end of the TBI process, it is hard to predict whether the material will be disposed of offsite as a surety. Given the risks, it may be preferable to seek other options, such as extending the capacity of the LAW melter already in place (if there is any potential to do so).

[8] Supra note 6.

Additionally, Riverkeeper incorporates by reference our policy and groundwater-related comments on the Draft WIR for Waste Management Area C.[9] Allowing for differences in scale and tanks involved, basic questions remain about the legality of Energy's current approach to the WIR process. It would be concerning to set a precedent that opens the door to much broader use of WIR determinations and lower standards for treatment and disposal of toxic and radioactive tank waste, onsite or offsite, as well as the relocation of tank waste outside of the Inner Area on Hanford's Central Plateau. Energy should remove language in the Draft WIR that suggests that waste in SY-101 may not be HLW (footnote 7 of the WIR). As stated later on page 1-2 in the WIR, "The waste in Tank SY-101 is managed as waste generated, in part, by the prior reprocessing of spent nuclear fuel during the Manhattan Project and Cold War eras for defense-related nuclear research, development, and weapons production." The waste in SY-101 is HLW.

The TBI is pushing towards a potential re-thinking of the state's preferred outcome of the TC/WM EIS, an understanding that treated HLW should be "as good as glass." Rather than deflecting from DFLAW, it might be better to consider the impacts of a test more carefully, before committing to moving waste out of the Hanford site. If the project is only useful on a large scale and within the Hanford site, is the test useful? Litigation or disagreement about these issues may be anticipated already, and if so, do the agencies should factor that into the timelines for implementation? Based on the outcome of disagreements about other WIRs, the TBI WIR may not be workable on the timeline projected.

5) Conclusion

The TPA agencies may accomplish more by focusing on tangible progress at DFLAW and adhering to Ecology's "as good as glass" principle as much as possible in finding solutions for tank waste. The TBI draws cleanup funds at a time when agreed-upon paths for tank waste treatment are reaching a vital phase. The TBI involves policy issues that remain unresolved,

We are concerned about the prospect of moving this pollution both closer to the River and into Richland in the meantime. What happens if pretreatment of 2,000 gallons is not as successful as hoped? Energy's Table 4-6 assumes a high level of success for pretreatment in removing key radionuclides, stating in a footnote "Following pretreatment, most of the long-lived, insoluble and soluble radionuclides will only be present in trace amounts in the tank supernatant

[9] See generally, National Resource Defense Center, Hanford Challenge, & Columbia Riverkeeper, Comments on Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site, Washington. (November 7, 2018). https://static1.squarespace.com/static/568adf4125981deb769d96b2/t/608352e267faf3797471c50a/1619219171924/NRDC+et+al+Draft+WIR+Comment+%26+Attachments+sm.pdf.

and, therefore, would not contribute to worker or public dose during handling, transportation, or disposal activities."[10] This conclusion seems based on a lot of different steps, and we are concerned that the overall TBI proposal has not taken a hard or even adequate look at groundwater risks for the material that remains in the supernatant.

Additionally, even if phase II is a success, it does not suggest the future success of phase III. Unless the 500,000 gallons in phase III come from tanks with identical contents as SY-101, which is highly unlikely, this experiment does not mean grouting tank waste is a reliable form of clean up. Nor does it demonstrate the longevity of grouted waste. SY-101 has a history of unusual behavior, and its stabilization is considered by some to be a significant landmark in Hanford cleanup history.[11] Disturbing the tank comes with its own consequences, and Energy has yet to explain fully how changes in SY–101's contents may change how it is managed. Will more fluid be added to the tank after 2,000 gallons are removed, or after a larger amount is removed?

Finally, after pretreatment, the TBI seems geared towards a "Perma-Fix or nothing" approach. Current evidence suggests that grout is not as protective as glass, and Perma-Fix is

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[10] Draft Waste Incidental to Reprocessing Evaluation for the Test Bed Initiative Demonstration, U.S. Dept. of Energy, p. 4-12, 4-13 (October 2021).

[11] *See* Stewart, Charles W. 2006. Hanford's Battle with Nuclear Waste Tank SY-101: Bubbles, Toils, and Troubles. Pacific Northwest National Lab. (PNNL), Richland, WA (United States). https://www.osti.gov/biblio/892228-hanford-battle-nuclear-waste-tank-sy-bubbles-toils-troubles (Stating in the abstact, "Radioactive waste tank SY-101 is one of 177 big underground tanks that store waste from decades of plutonium production at the Hanford Nuclear Reservation in central Washington State. The chemical reactions and radioactivity in all the tanks make bubbles of flammable gas, mainly hydrogen along with a little methane and ammonia. But SY-101 was the most potent gas producer of all. Every few months the gas built up in the million gallons of extra-thick slurry until it suddenly came up in great rushing "burps". A few of the tank's larger burps let off enough gas to make the air space at the top of the tank flammable for a few hours. This flammable gas hazard became a dominating force in DOE nuclear waste management politics in the last two decades of the 20th century. It demanded the toil of scientists, managers, and officials from the time it was filled in 1980, until it was finally declared safe in January 2001. The tank seemed almost a personality--acting with violence and apparent malice, hiding information about itself, deceiving us with false indications, and sometimes lulling us into complacency only to attack in a new way. From 1990 through 1993, SY-101's flammable gas troubles were acknowledged as the highest priority safety issue in the entire DOE complex. Uncontrolled crust growth demanded another high-priority remedial effort from 1998 through April 2000. The direct cost of the bubbles, toils, and troubles was high. Overall, the price of dealing with the real and imagined hazards in SY-101 may have reached $250 million. The indirect cost was also high. Spending all this money fighting SY-101's safety issues only stirred radioactive waste up and moved it around, but accomplished no cleanup whatsoever. Worse yet, the flammable gas problem spawned suspicions of a much wider danger that impeded and complicated cleanup in other 176 waste tanks for a decade. The real cleanup job has yet to be done. The SY-101 story is really about the collective experience of people, from pervasive misconception to grand insight, near miss to sweeping success, meddling interference to close teamwork, all on an uncommonly large scale. It was a necessary catharsis that transformed the entire Hanford culture from a closed defense production operation to an open environmental cleanup project. Its tight project discipline and close teamwork became the Hanford standard. The final remediation of SY-101 placed second in an international "project of the year" competition. Many consider SY-101 work the peak of their careers and measure all other experience by it. SY-101 defines some of the worst and the best of Hanford history. This book attempts to narrate and explain the whole vast story.").

not a suitable place to grout HLW. We are concerned that the TBI is gaining momentum without a bigger-picture analysis of the consequences of grouting tank waste material offsite.

Given these unresolved issues and questions, we urge TPA Agencies to provide more analysis to key questions before Energy makes any decisions regarding the WIR determination.

Thank you,

Dan Serres
Conservation Director, Columbia Riverkeeper