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Idaho Department of Water Resources changing the 'dam rules': Reducing requirements for new dams and actually eliminating dam release capacity safety requirements for existing dams (and mine tailings impoundment structures)

The May 4, 2022 Idaho Administrative Bulletin identified the mine tailings and the safety of dams rulemaking and announced a May 27 meeting. [1] Only the mining companies and a few dam owners seem to have noticed the rulemaking meeting based on the meeting (virtual or live) attendance.

Very little has been said about the substance of the rule changes being proposed except that the current Safety of Dams Rule (IDAPA 37.03.06) and the current Mine Tailings Impoundment Structures Rule (IDAPA 37.03.05) are being combined into one chapter (or rule). Idaho laws pertaining to the safety of dams are set forth in Idaho Code, Section 42-1709-1721. [2]

The "strawman" proposed new rule was not made available until the Monday before the Friday meeting at the rulemaking webpage. [3] Comments will be accepted until June 17. The next meeting is scheduled for July 7. The rule changes are expected to be completed this year and approved by the legislature.

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[1] The May 4, 2022, Idaho Administrative Rules Bulletin, Volume 22-5, available in May 2022 at https://adminrules/idaho.gov/bulletin/2022/05.pdf

[2] See laws pertaining to dams at https://legislature.idaho.gov/statuesreules/idstat/title42/t45ch17 and archives at Department of Water Resources (look to the right side of the webpage): https://adminrules.idaho.gov/rules/current/37/index.html. A new administrative rule approval procedure was introduced in 2019 and 2020. A copy of Executive Order 2020-01 can be found on the IDWR rulemaking webpage. The way administrative rules are now approved makes it very difficult to know what changed and when. The date stamp line-by-line is the date the legislature approval occurred and is not necessarily a change from the previous rule. In accordance with I.C. 67-5292, each year administrative rules must be approved by the legislature, see the Idaho Legislature status page at https://legislature.idaho.gov/sessioninfo/2022/legislation/scr123 for Senate Concurrent Resolution 123 (2022) for a copy of the resolution authorizing the continuation of the rules.

[3] Idaho Department of Water Resources rulemaking information page for IDAPA 37.03.05 (Mine Tailings Impoundment Structures) and 37.03.06 (Safety of Dams) is at https://idwr.idaho.gov/legal-actions/rules/idwr-rulemaking-2022-2023/mine-tailings-impoundment-structures-safety-of-dams-rules/ and general web address www.idwr.idaho.gov There is an Idaho Executive Order 2020-01, called Zero-Based Regulation that calls for Idaho agencies such as the Idaho Department of Water Resources to, for no other reason, to gut their laws and start anew. This negotiated rulemaking is authorized pursuant to Section(s) 42-1710 and 42-1714, Idaho Code. Public comment was sought prior to the formal rule making; however, almost no one of the public heard about it.

The rules had not been changed since at least 1993 and nobody seems to know when these rules were last modified. While there is some general updating of requirements, there appear to be many significant changes to the safety requirements for dams and mine tailings impoundments in the "strawman" proposed draft changes. And no explanation of the rationale or the implications of the sweeping changes has been provided.

The current rules and the proposed rules are challenging to compare, and require a line by line, section by section review.

The overall thrust of the rule changes is certainly not about improving dam safety or the safety of mine tailings impoundments. Combining the dam safety and mine tailings impoundment rules complicates the rules. This is proved by the botched draft rule changes for the strange case on the last page for dams containing water and mine tailings.

I noted that the proposed draft rules made the bonding requirement for mine tailings impoundment structures something that the IDWR Director could waive. **Upon questioning by email, IDWR responded that this was an error in the draft.**

This proposed rule section had four rules for 'dams containing tailings' [whatever on earth that means] that needed to be met or waived by the Director. They included the bonding requirement which should not be allowed to be waived. And the proposed rule for 'dams containing tailings' left out rules for existing dams (or mine tailings impoundments). While some rules kept the original rule number, other rules had their numbering changed. The whole thing is complicated and the experts botched it in more ways than one. What hope has a judge or anyone outside of the tribal knowledge group of the IDWR got?

I have noted other errors in the proposed draft, yet no one other than myself gave comment at the meeting, other than to say that some of the attendees did plan to submit written comments. Obviously the 4 days upon which to review the proposed draft meant that few people actually had any idea what the proposed changes were.

If the secrecy is not intentional, it is still effectively keeping the public in the dark despite the public meeting.

The draft rule combining the "safety of dams" and "mine tailings impoundment structures rules," was apparently were never about improving safety, as it **reduces the stated the design requirements for new dams and mine tailings impoundment structures.** It significantly reduces the required release capability, specified as the "Inflow Design Flood" for all but the smallest dams.

For existing dams and mine tailings impoundment structures, there no longer is any "Inflow Design Flood" design criteria whatsoever! It was simply deleted.

The issue of what the standard is when significant maintenance or modifications are made to existing dams is even muddier than before. But its probably safe to assume that there is no

requirement for maintenance or modifications to existing dams or mine tailings impoundment structures.

The requirements for new dams have been reduced. And the requirements for existing dams that are large in size and significant or high hazard level has also been reduced or eliminated!

In practical terms, having a rule that says to be able to release "Inflow Design Flood" flows for a Probable Maximum Flood (PMF) but not enforcing and never meeting this capacity doesn't provide much safety. But the IDWR seems to be reducing the requirements on the basis of the past difficulty and the inability to meet the requirements, rather than the need to protect citizens.

For new dams and mine tailings impoundment structures, a range of lower to higher "Inflow Design Flood" values are proposed which means that the Director may select a lower value than the previous law. No technical explanation has been provided for the reduced design requirements. We all know that the lowest capability will be the most affordable for the owner and the pressure will be on the Director to select the design requirement with the lowest cost. Hinting that the Director may select the higher of the two options is nothing but window dressing to make it seem that the safety requirements might not be so substantially reduced from the previous rule.

"Inflow Design Flood" requirements are a Matter of Life and Death and the proposed draft reduces these requirements for new dams and mine tailings impoundment structures and with no explanation whatsoever. The proposed draft eliminates all design criteria for the "Inflow Design Flood" for existing dams and mine tailings impoundment structures with no explanation whatsoever.

Dams fail when overtopped and so estimation of the maximum inflow to the dam called the "Inflow Design Flood" and the dam's release capability is very important to dam safety – especially during high water years. To change the design requirements in place for decades and not to even call out the changes or explain the technical basis for the changes exemplifies serious flaws in this Idaho Department of Water Resources rulemaking effort.

Dam gates that won't open, for example, reduce the release capacity of the dam and could allow dam failure due to dam overtopping despite stated design capacity of the dam to release water to prevent overtopping in high water conditions. Dam inspections and descriptions of release capacity historically rarely even describe the position of the outflow gates. Dam spillways that collapse, are blocked, or fail would also reduce the dams release capacity. Failure to prevent overtopping the dam during high runoff will cause catastrophic failure of the dam.

In the proposed rules, for example, where the requirement for an existing large low hazard dam had, since at least 1993, been Q500, the 500-year return period flooding, this was reduced to Q100, the 100-year return period flooding. See Table 1 for more examples of the reduction in design requirements.

Table 1. Reduced "Inflow Design Flood" requirements for new dams in 2022 rulemaking.

Risk Category or Hazard Classification	Size Classification	Inflow Design Flood, rules since at least 1993	New Proposed Inflow Design Flood. Reduced requirement shown in Bold
Low	Small	Q50	Q100
Low	Intermediate	Q100	Q100
Low	Large	Q500	**Q100**
Significant	Small	Q100	Q100
Significant	Intermediate	Q500	**Q100**
Significant	Large	0.5 PMF	**Q500**
High	Small	Q100	Q100
High	Intermediate	0.5 PMF	**Q100**
High	Large	PMF	**Q500**

Note: Q50 is a 50-year flood. Q100 is a 100-year flood. Q500 is a 500-year flood. The flow waters of a 500-year flooding event exceed those of a 100-year flooding event. The Probable Maximum Flood exceeds that of a 500-year flood. See draft rule under "Emergency Spillway Flow Capacity." See existing rule under "Release Capability."

IDWR reduced the safety standards for new dams (and mine tailings impoundments), as shown in Table 1 above.

IDWR's proposed rule changes also reduced the safety standards for existing dams and for improvements to those dams because it basically only requires the 100-year flood (Q100) to be met for existing dams for the spillway, unless waived by the Director. **Specifically, rule 055.01(a) of the current rules was deleted from the new rules and this eliminates all requirements for the release capacity of existing dams and mine tailings impoundment structures.**

The lowered safety standards were put into the draft rule without any statement that that's what they were doing and without any rationale or technical support for the reduction in safety requirements. There may be reasonable arguments for the expense of meeting Probable Maximum Flood requirements, but citizens ought to know about the reduce standards. Their property will not be protected from dam failure to the extent long thought wise for siting a nuclear reactor facility. Mine owners, on the other hand, may be thrilled at the reduced design standards as this would reduce their costs. But this comes at the expense of damage to the environment when mine tailings are accidentally released.

And while the Probable Maximum Flood may be a rare event, the proposed rule for existing dams (and mine tailings impoundment structures) allows the IDWR to waive meeting 1 in 100-year "Inflow Design Floods" for spillway capacity and there is no longer any requirement for the release capacity, even for a large high hazard dam, we are not talking about such rare events here.

The problem of existing dams not able to meet stringent requirements should NOT have caused IDWR to reduce the design requirements for new dams or impoundments and certainly not without explanation.

The reality is that despite the existing rules requiring dams to be capable of releasing the Probable Maximum Flood (PMF) levels, these flood inflows to the dam are so large that in reality, the IDWR is not currently requiring this capability for existing dams, even for large, high hazard dams such as the Mackay dam.

But effectively eliminating the 'Inflow Design Flood' requirements for existing dams and mine tailings impoundment structures is irresponsible and is not protective of Idaho citizens and environment.

What does changing the 'dam rules' mean for the Mackay Dam?

The Mackay dam, in operation since about 1917, has never met design or safety requirements of the Idaho regulations for dams. Mackay dam is a large dam, with dam height of 75 feet and reservoir storage of 45,000 acre-feet. It is also a high hazard dam based on the potential damage to downflow communities.

Dams fail if overtopped. Dams overtop if the flow inflows exceed the release capacity. The release capacity is provided by the outlet gates and piping under the embankment and by the emergency spillway.

The Mackay dam's condition continues to degrade and although the embankment is rated as being in fair condition, the primary outlet and the spillway are rated as "poor." Specifically, the inspection report states "The existing concrete spillway is judged to exist in poor condition, due both to the physical deterioration of the concrete training [sic] walls and slab, and its undersized design capacity." [4]

Outlet gates are not fully functional but the outlet works performance at peak flows in the past has generally not described the position of gates during recorded peak flows.

Importantly, a failure-mode analysis performed by McMillen-Jacobs in September 2020 in conjunction with a FEMA sponsored Hazard Mitigation Grant found that the spillway capacity is actually far less than has usually been assumed, see Appendix F of the study. [5] The spillway capacity was calculated to be limited by the chute of the spillway rather than the entrance to the spillway and was limited to 2,200 cubic feet per second (cfs). The outlet works capacity was estimated as about 3000 cfs. The total release capacity is then about 5,200 cfs.

[4] Based on the Mackay Dam, Idaho Department of Water Resources Dam Safety Record of Inspection, Idaho Department of Water Resources (IDWR) File Number 34-2225, Dated May 12, 2021. The dam inspection was conducted on May 12, 2021 based on photograph dates and text.

[5] McMillen-Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F of 2021 FEMA report.) The study was performed in September 2020 according to the May 12, 2021 inspection report.

The 2021 inspection report states the assumed "Inflow Design Flood (Q=cfs)" as the hundred-year flooding inflow of Q100 = 4870 cfs. The Probable Maximum Flood is identified as 82,100 cfs based on a report prepared for the Idaho National Laboratory in 1986 by Koslow and Van Haaften. [6] The inspection report states that "Note that potential damage of measurable significance to downstream life and property will likely have already occurred at much lower flood-flow rates; i.e., 20,000 cfs (estimated)."

By 1978, the IDWR required spillway for large dams to have sufficient size to pass the 100-year frequency flood occurrence or greater spillway capacity. [7] A variety of flood inflow values have been assumed over time. The values for predicted surface inflows to the Mackay reservoir from a 1986 study are shown in Table 2.

Table 2. Predicted surface inflows to the Mackay reservoir from the 1986 report by Koslow and Van Haaften.

Recurrence Interval (Years)	Peak Flow (cfs)
25	4,030
100	4,870
500	5,760
1000	6,800
Probable Maximum Flood	82,100

Table notes: Table notes: Source: K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam*, EGG-EP-7184, June 1986. Note that flood inflow estimates and the PMF estimate evolve over time and a variety of values have been used. I provide these values as examples, not as preferred values.

The most recent assessment of outlet flow capacity (3000 cfs) and spillway capacity (2,200 cfs) indicate a total release capacity of about 5,200 cfs. [8] This would indicate that the Mackay Dam could survive a 100-year flood, but would not survive a 500-year flood. It would probably not survive a 300-year flood either.

The flood inflow values that may cause failure of the dam depend on the release capacity of the dam. The estimated release capacity of the Mackay dam has varied significantly in different studies. The historical maximum known outflow of 2,990 cfs occurred on June 10, 1921. The

[6] K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam*, EGG-EP-7184, June 1986.

[7] State of Idaho, Department of Water Resources, *Phase I Inspection Report, National Dam Safety Program, Mackay Dam*, September 1978. (See page 14.)

[8] McMillen-Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F of 2021 FEMA report.)

maximum known inflow to the reservoir occurred recently, in 2017. The resulting maximum outflow at the dam was 2,200 cfs occurring in early June 2017. [9]

Any argument about incremental damage from flooding must consider not only the flood inflow to the reservoir **but must also consider the flood wave caused by failure of the dam.**

Dam failure will be caused should the inflow exceed the release capacity (outlet works and spillway) and could also be caused by a seismic event or by aging failure of the outlet piping no matter the inflows at the time.

There were four cases considered in the 1986 report by Koslow and Van Haaften. These cases were intended to be representative of serious events and are shown in Table 3. The purpose of the 1986 study was to characterize possible flooding inundation to the Idaho National Laboratory, not assess the risk of dam failure or adequacy of the dam. But it must be emphasized that flood inflows and **the flood wave due to the failure of the dam must be considered** when discussing release capacity and design requirements of the dam.

Table 3. Four cases of peak flood flow from the 1986 report by Koslow and Van Haaften.

Dam Failure Case	Breach Type	Estimated Peak Reservoir Inflow, cfs	Estimated Peak Flow Below Dam, cfs (Total Reservoir Release, acre-feet)
No failure, maximum flow from Mackay Dam in 2017	No breach	Howell Gage, 3,160 to 4,200 cfs reported	2,200 cfs
Seismic failure (characterized by assuming during 25-year flood inflow)	Trapezoid	4,030 cfs	107,480 cfs (44,830 acre-feet release)
Internal piping failure (characterized by assuming 100-year flood inflow)	Triangle	4,870 cfs	57,740 cfs (41,850 acre-feet)
Internal piping failure (characterized by assuming 500-year flood inflow)	Trapezoid	5,760 cfs	106,680 cfs (44,710 acre-feet)
Probable Maximum Flood (PMF) with dam overtopping	Trapezoid	82,100 cfs	306,700 cfs (142,330 acre-feet)

Table notes: Source: K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam*, EGG-EP-7184, June 1986. Time to failure is assumed 1 hour. Probable Maximum Flood as estimated by Dr. David L. Schreiber, P.E., Schreiber Consultants, Inc., in 1986 and included in Appendix B of the 1986 Koslow and Van Haaften report. The previous PMF was 41,000 cfs as estimated from US Bureau of Reclamation (USBR) experience curves (see State of Idaho, Department of Water Resources, *Phase I Inspection Report, National Dam Safety Program, Mackay Dam*, September 1978).

[9] McMillen-Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F of 2021 FEMA report.)

In the development of the four cases of dam failure in Table 3, it had assumed that the Mackay dam would not overtop from the 100-year of the 500-year flood inflows. In fact, the 1986 study wrongly concluded that the Mackay Dam had sufficient release capacity to release 1000-year flood inflows to the reservoir.

The Probable Maximum Flood (PMF) estimated in 1978 was 41,000 cfs based on US Bureau of Reclamation (USBR) experience curves. [10] The PMF value estimated in 1986 was 82,100 cfs as noted above. (See Table 4.) The design value recommended by McMillen-Jacobs in conjunction with a FEMA sponsored Hazard Mitigation Grant is reduced to 20,000 cfs on the basis of an argument that allows using Procedures outlined in the Federal Energy Regulatory Commission Chapter 2 Guidelines that state that "an IDF [Inflow Design Flow] may be selected by evaluating the point where incremental flood damage no longer results in an additional impact to downstream life or property." [11]

Table 4. A variety of Mackay Dam Probable Maximum Flood (PMF) estimates for Mackay Dam.

Source of Probable Maximum Flood (PMF) Estimate	PMF, cfs	PMF release capacity met?
1978 Estimate using USBR curves	41,000 cfs	No
1986 Estimate by Schreiber in Koslow and Van Haaften INEL report	82,100 cfs	No
2020 Adjusted "Inflow Design Flow" (IDF) value recommended by McMillen-Jacobs Associates which is really not a PMF estimate but could be used in state dam safety design requirements.	Not a PMF but recommended IDF, 20,000 cfs	No
Implied flood inflow with dam overtopping (when the dam where full)	Dam overtopping, 5,200 cfs	Overtopping of dam by 0.5 feet may fail the dam*

Table notes: Source: The 1978 PMF was 41,000 cfs as estimated from US Bureau of Reclamation (USBR) experience curves (see State of Idaho, Department of Water Resources, *Phase I Inspection Report, National Dam Safety Program, Mackay Dam,* September 1978). The 1986 PMF is reported in Appendix B of the report by K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam,* EGG-EP-7184, June 1986. Time to failure is assumed 1 hour. Probable Maximum Flood as estimated by Dr. David L. Schreiber, P.E., Schreiber Consultants, Inc., in 1986 and included in Appendix B of the 1986 Koslow and Van Haaften report. The 2021 IDF recommendation is by McMillen-Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam,* State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F of 2021 FEMA report.) The Mackay dam release capacity, outlet works (3000 cfs) and spillway chute (2,200 cfs) for a total release capacity of 5,200 cfs is based on the McMillen-Jacobs Associates values

[10] State of Idaho, Department of Water Resources, *Phase I Inspection Report, National Dam Safety Program, Mackay Dam,* September 1978. (See page 14.)

[11] McMillen-Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam,* State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F of 2021 FEMA report.) See page 7.

described in the 2021 FEMA report. The water height about the dam for overtopping is based on D. H. Van Haaften et al., EG&G Idaho, Inc., *Hydrologic Analysis of a Mackay Dam Failure During a Probable Maximum Flood on Big Lost River*, Idaho, SE-A-84-018, May 1984. This EG&G report was performed for the proposed Department of Energy plutonium production reactor which was not built, called the "New Production Reactor." Selection of appropriate reactor siting sought to avoid any area flooded by a Probable Maximum Flood event.

The recommended value of 20,000 cfs release capacity is far below the Probable Maximum Flood value of 82,100 cfs, but above the apparent existing 5,200 cfs release capacity.

Looking at the proposed draft rules changes to the Idaho Department of Resources "Safety of Dams Rules," with regard to the Mackay Dam, the issue is what rule changes are made with regard to existing large, high hazard dams. The issues are what is acceptable for existing large, high hazard dams and what are the requirements for repairs or modifications or upgrades to existing dams.

Where the current rules would invoke meeting the Probable Maximum Flood for dam release capacity, the proposed new rules suggest meeting the 100-year flood inflows for the spillway, unless waived by the Director. In other words, there are no release capacity requirements for existing dams in the proposed draft rules.

Specifically, the current "Safety of Dams Rules" IDAPA 37.03.06, for existing dams states, Rule 055.01(a): "For large, significant or high risk dams, the release capability required by Rule Subsection 050.11 shall be evaluated and applied to the structure." For a high hazard dam, of large size, the stated "Inflow Design Flood" in Rule Subsection 050.11 was the PMF.

Now we look at the proposed dam safety rule changes in 2022 and what had been Rule 55 becomes Rule 60. **The requirement noted above for large, significant or high hazard dams which are existing dams has been removed.** Effectively, for a high hazard dam of large size, the stated "Inflow Design Flood" requirement is only the requirement to have a spillway that can pass the 100-year flood (the Q100), that is, unless the Director reduces of waives the spillway requirement. The overall release capacity requirement for existing dams and now also for mine tailings impoundment structures has been deleted.

If effect, the proposed rule change allows existing dams and mine tailings impoundment structures to not have any stated "Inflow Design Flood" capacity.

New dams or mine tailings impoundment structures, that are high hazard, large size, according to the proposed draft rules, would need to meet the Inflow Design Flood of the range from Q500 to PMF. This effectively allows the 500-year flood to be the Inflow Design Flood for new dams or mine tailings impoundment structures.

The current rule for the Mackay Dam would require, for upgrades to the dam, a dam release capacity that meets the Probable Maximum Flood (and apparently the PMF of their choice (perhaps from 20,000 to 82,100 cfs release capacity). The proposed draft rule

effectively allows no specific release capacity for existing dams or apparently for their modification.

Is it any wonder why the IDWR explanation of the proposed rule changes on May 27 was so incredibly brief and there is no explanation of any of this!

More background on the Mackay Dam is that the design drawings were never available for the Mackay Dam and many safety shortcomings were cause for concern long before the dam was operational. For the Mackay dam, available records are inadequate for the original construction as well as various modifications of the dam, spillway and outlet works. The Mackay Dam is located in seismic zone 3, yet a seismic stability analysis has not been made. This may be due to the lack of design and construction documentation.

It cannot be assumed that the best design and construction practices of the era were used. Citizens were concerned early on, before 1917, about the safety of the dam and reviewers were concerned about the design and construction practices used during construction of the dam. Many design changes were made including reducing the originally planned size of the dam. A design change prior to completion of the dam also led to the existence of an abandoned stretch of piping under the dam that connects to the existing outlet piping.

The Mackay dam embankment has been stable and despite leakage which has always emerged from the dam, the seepage has been stable. Efforts have been made to a greater or lesser extent over the years to monitor the seepage.

Vegetation has been cleared from the dam embankment and the removal of fallen rocks from the spillway is conducted. Inspections of the outlet tower and gates cannot be performed, typically, because what is visible depends on water level in the reservoir.

The fact that the Mackay dam survived the 1983 Mt. Borah earthquake is often given as proof of its capability. However, the Mt. Borah earthquake was a close call for the Mackay dam and caused significant rockfall into the spillway and an unknown amount of rockfall to the base of the outlet tower housing the outlet gates. When rock was identified that could block the spillway, a project was performed to remove the rock by blasting. With the reservoir at a very low level of water, work was conducted to remove significant rockfall from near the outlet tower. Was the rockfall to the area of the outlet tower from the rock blasting nearby or from the Mt. Borah earthquake? This work done in 1985 reveals an outlet tower in very poor concrete condition and located where the outlet tower and gates are located near to rock cliffs susceptible to rock fall.

Help has been sought in obtaining funding for the poorly designed and hundred-year-old-plus Mackay dam. Failure of the Mackay dam when the dam is full results in rapidly wiping out the town of Mackay. And, a Mackay dam failure would cause flooding of a variety of nuclear facilities and buried waste at the Idaho National Laboratory, in particular the INL's INTEC facility were spent nuclear fuel, soluble high-level waste calcine and liquid high-level waste are stored and vulnerable. Flooding could result in a radiological release that will never be

remediated. The Department of Energy built facilities before knowing the Mackay Dam flooding risk and has based its studies of the Mackay Dam on overly optimistic capability of the dam.

In summary, a 2021 study of the Mackay dam reveals that the release capacity of the dam, the outlet works and spillway capacities combined, is far less than the Department of Energy has previously assumed in its various studies. Specifically, the spillway capacity downstream of the entrance is restrictive and far less than previously assumed.

This means that the Mackay dam would overtop and fail due to a much more likely, less severe flooding event, perhaps a 200-year flooding event. It would not require the larger and far less likely 'Probable Maximum Flood' in order for the dam to fail. [12]

Problem waste where WIPP discovered liquid in TRUPACT-II container returned to Idaho

The Defense Nuclear Facilities Board (DNFSB) Flammable Gas and Reactive Metal Hazards of Solid Waste Review Team held a closeout meeting with the Department of Energy on April 5 apparently intended to put transuranic waste issues at the Idaho cleanup project to bed (see dnfsb.gov). Then on April 9, prohibited liquid was found in the TRUPACT-II container that held drums shipped from Idaho to the Waste Isolation Pilot Plant (WIPP).

The liquid found in the TRUPACT-II caused the evacuation of the WIPP CH-Bay and activation of the emergency center at WIPP. The problem transuranic waste came from the cleanup project at the Idaho National Laboratory and shipments from the INL were paused.

The Idaho Environmental Coalition that took over the Department of Energy cleanup contract from exiting Fluor Idaho in January 2022 had sent the waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The discovery of liquid in the TRUPACT-II shipping container holding the waste drums required an evacuation at WIPP. [13] The radioactive liquid is prohibited in the transuranic waste accepted by WIPP and it required an evacuation because chemicals like polychlorinated biphenyls (PCBs) as well as radionuclides can be harmful, yet difficult to detect.

The problem drums are said to not appear to have leaked but there has not been any documented inspection conducted. The drums were shipped back to the Idaho National Laboratory where the drums and their contents are be inspected the second week of June.

TRUPACT-II containers are used to ship contact-handled drums of transuranic waste to WIPP. One TRUPACT-II holds about six waste drums, depending on drum size. The drums

[12] McMillen Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, Revision 1, June 25, 2021. Part of the FEMA Hazard Management application dated June 11, 2021.

[13] Maire O'Neill, *Los Alamos Reporter*, "Discovery of Radioactive Liquid in TRUPACT-II Container At WIPP Causes Evacuation of Contact-Handled Waste Bay," April 11, 2022. https://losalamosreporter.com/2022/04/11/discovery-of-radioactive-liquid-in-trupact-ii-container-at-wipp-causes-evacuation-of-contact-handling-bay/

holding transuranic waste have vents to allow gases to escape and prevent overpressurizing the drum under normal, expected conditions.

Sludge wastes in transuranic waste can appear dry, but are also known to hold liquids, which can separate from the sludge material during freeze-thaw cycles. Liquid in waste drums that has separated from the sludge matrix is treated by adding a liquid absorbent before shipping the waste to WIPP.

The facility and waste stream of the problem waste have not been disclosed. In fact, as of May 31, the Department of Energy and its cleanup contractor, the Idaho Environmental Coalition, have been completely silent about the April 9 liquid discovery in a TRUPACT-II from Idaho at WIPP.

The Advanced Mixed Waste Treatment Project (AMWTP) had problems that led to a Stand Down in March. [14] [15] There was no mention at the April 26 Citizens Advisory Board meeting of the Stand Down at the Advanced Mixed Waste Treatment Project (AMWTP) which had stopped all waste handling and processing work so that operations management could review whether current procedures were adequate. Maintenance activities were also discontinued on March 7, 2022 due to misunderstandings of maintenance procedures among supervisory and craft personnel at AMWTP, according to the Defense Nuclear Facilities Safety Board memo.

The Department of Energy Occurrence Report for the Idaho Environmental Coalition's AMWTP facility stated that there were two waste handling events in January and February and the operators failed to execute steps correctly and the procedure steps were unclear and would not work as written. Drums or waste boxes were knocked over in the events.

During the timeframe of extensive conduct of operations problems at the transuranic waste facilities operated by the Idaho Environmental Coalition (IEC), they were handling RF-762 Pyrophoric Sludge, meaning high quantities of uranium metal. And IEC was not taking the safety measures required by the Resource Conservation and Recovery Act (RCRA) hazardous waste permit with the State of Idaho which required special fire protection configurations, a special "drop test" to check for pyrophoric reaction, and for thermal monitoring of the waste packaged in drums. **In January and February of this year, Idaho Environmental Coalition was not performing numerous required safety requirements for treating transuranic waste containing high levels of uranium metal that were specified in their RCRA permit.**

On March 30, 2022, the U.S. Environmental Protection Agency (EPA) Region 10 office issued a Notice of Deficiency to the Idaho Environmental Coalition Advanced Mixed Waste Treatment Facility and the Department of Energy Idaho Office. That notice states that "…The

[14] Department of Energy Occurrence Report, "Less Than Adequate Conduct of Operations for Multiple Procedure Violations," Advanced Mixed Waste Treatment Facility, EM-ID—IEC-AMWTF-2022-0001. Notification date: February 24, 2022.

[15] Defense Nuclear Facilities Safety Board memo from Erin A. McCullough to Christopher J. Roscetti, Subject: Idaho National Laboratory (INL) Report for March 2022, April 1, 2022. See dnfsb.org.

specific violations concern DOE-ID's failure to implement two engineering controls addressing the potential for post-packaging thermal reactions associated with wastes being managed at the AMWTP…"

Note that this is the type of material that caused the four drums to heat up and overpressurize, ejecting their lids and expelling radioactive waste in a fabric enclosure in 2018. Workers had gone home for the day but could have been present when these drums expelled their contents causing a life-threatening inhalation of radioactive material and also beryllium. The blizzard of radioactive powdery waste also made conditions that limited visibility and so it would have been difficult to evacuate.

The causal analysis issued for the four transuranic waste drums that blew off their lids in April 2018 at the U.S. Department of Energy's Radioactive Waste Management Complex states that "Management failed to fully understand, characterize, establish and implement adequate process controls for treating waste which lacked documented origin or process information." [16] Belatedly, the previous cleanup contractor, Fluor Idaho, faced fines over the four drums that exploded in April 2018 [17] [18] and mitigations were put in place to allow continuing to package pyrophoric waste that the facilities were never designed to handle.

It is these mitigations for waste containing large quantities of pyrophoric uranium metal that the Idaho Environmental Coalition ignored and was not performing after taking over the cleanup contract.

As of May 31, the Idaho Environmental Coalition had not issued any press releases about the 'stand down' at AMWTP in March and April, the EPA violations or the shipment of prohibited liquid in discovered at WIPP on April 9.

Shipments from Idaho to WIPP were initially suspended but later resumed. The Carlsbad Current-Argus reported that according to a WIPP spokesman, the TRUPACT-II was sent back to Idaho and it arrived in Idaho on May 9. [19]

[16] Idaho Cleanup Project Core, "Formal Cause Analysis for the ARP V (WFM-1617) Drum Event at the RWMC," October 2018. https://fluor-idaho.com/Portals/0/Documents/04_%20Community/8283498_RPT-1659.pdf

[17] Exchange Monitor, "Fluor Idaho Has 30 Days to Contest $580K Penalty for Drum Blast," November 24, 2020. https://www.exchangemonitor.com/fluor-idaho-30-days-contest-580k-penalty-drum-blast/?printmode=1

[18] U.S. Department of Energy, Letter to Fred Hughes, Fluor Idaho, LLC, November 20, 2020. https://www.energy.gov/sites/prod/files/2020/11/f80/Preliminary%20Notice%20of%20Violation%20for%20Fluor%20Idaho_0.pdf

[19] Adrian Hedden, Carlsbad Current-Argus, "Why are federal watchdogs concerned about nuclear waste site near Carlsbad?" May 27, 2022. https://www.currentargus.com/story/news/2022/05/27/nuclear-waste-repository-near-carlsbad-draws-concerns-feds/9907551002/

Idaho Department of Environmental Quality Public Comment Period on Hazardous Waste Permit at RWMC

The Idaho Department of Environmental Quality has given notification of a public comment opportunity for a 10-year renewal of the hazardous waste permit at the Department of Energy's Radioactive Waste Management Complex. [20] The waste is known as "mixed waste," or waste that may contain both hazardous chemical and radioactive constituents. Much of the waste originally came from the DOE's former Rocky Flats Weapons plant in Colorado.

The permit applies to the Radioactive Waste Management Complex (RWMC) and specifically to the fabric enclosures used or under the Accelerated Retrieval Project (ARP), located at the Idaho National Laboratory (INL). The waste exhumed in the ARPs was regulated under CERCLA [21] due to the environmental contamination which required cleanup under federal Environmental Protection Agencies rules. This is all very confusing, but the facilities are now being used for non-CERCLA waste and require a RCRA permit.

The RWMC ARP is operated by the DOE contractor the Idaho Environmental Coalition, LLC. The Idaho Environmental Coalition (IEC) took over the cleanup contract on January 1, 2022 from exiting Fluor Idaho. The RWMC ARP receives waste from the neighboring AMWTP and returns waste to the AMWTP.

This partial permit renewal is for treatment and storage of mixed waste and the eventual closure of the units. The draft Partial Permit sets forth procedural requirements for treatment and storage of mixed waste and debris.

The Idaho DEQ has acknowledged knowing that the Department of Energy's cleanup contractor Idaho Environmental Coalition sent the waste the WIPP that caused evacuation of the WIPP facility due to liquid discovered in a TRUPACT-II shipping container that holds waste drums.

The Idaho DEQ as of May 31 had not provided requested information such as about the facility involved and the waste stream or type of waste involved or violations status, as I requested May 19. On June 2 and 3, some documents were provided by the Idaho DEQ. However, these documents do not indicate what went wrong to cause of the liquid outside of waste drums in the TRUPACT-II or even to characterize that liquid. It remains undisclosed whether or not it involves permit violations, inadequate waste characterization, inadequate addition of absorbent to drums, unanticipated chemical heating of the waste as the waste was shipped from very cold Idaho temperatures to New Mexico, drum leakage, or other problems.

[20] Notice of Intent to Renew Partial Permit for Hazardous Waste Storage and Treatment at the Idaho National Laboratory. A public comment period begins May 6 and ends on June 20, 2022 for the Draft Hazardous Waste Management Act/Resource Conservation and Recovery Act Storage and Treatment Partial Permit Renewal for the Radioactive Waste Management Complex Accelerated Retrieval Project on the Idaho National Laboratory, EPA ID# ID4890008952. See the permit at https://www.deq.idaho.gov/public-information/public-comment-opportunities Current permits are also at the deq.idaho.gov website.

[21] Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Give the serious RCRA permit violations made by the Idaho Environmental Coalition earlier this year, it cannot be assumed that the RCRA permit or written procedures were followed.

The Resource Conservation and Recovery Act (RCRA) draft permit documentation includes the permit and a Books 1 and 2 set of attachments. The Books 1 and 2 attachments are out-of-date and permit requirements are now numbered differently in the permit and the attachments.

Why would the Idaho DEQ propose accepting these out-of-date documents and renew the permit for ten years — all without resolution to recent serious permit violations by the same contractor?

The egregiously unsafe behavior of the Department of Energy's contractor, the Idaho Environmental Coalition, is on track to out-perform its predecessor, Fluor Idaho. It was on Fluor Idaho's watch that the what is referred to as "accepted knowledge" of the waste constituents was actively ignored and four drums of waste ejected their lids and expelled their waste contents in a fabric enclosure in 2018. The waste included unusually high amounts of an unusual form of uranium. Rather than the typical oxidized uranium known as "roaster oxide," the waste contained unoxidized uranium metal which is known to be very pyrophoric. The waste also contained beryllium carbide, likely why the uranium was unroasted. Beryllium has special limits for disposal at WIPP. The moisture of treating the waste that rainy day caused methane offgassing as the waste heated up after being packaged. Four drums ejected their lids and contents. One lid penetrated a layer of the fabric enclosure and a serious environmental release could have occurred. Emergency responder arrived at the 2018 accident and had no idea that they were responding to a radiological event inside the facility because the event caused radiological alarms to fail. No personnel familiar with the operations at the facility that day were present after hours when emergency responders responded to a fire alarm. [22]

Department of Energy Oversight report finds worsening safety management problems at the INL's Battelle Energy Alliance

The Department of Energy (DOE) Office of Enterprise Assessment' (EA) Report issued a report on May 16, 2022, *Independent Assessment of the Battelle Energy Alliance, LLC Management of Safety Issues*. [23] The review found that increasingly, workers were not following procedures and that the condition presents an unacceptable risk to workers, public health, and the environment.

[22] Idaho Cleanup Project Core, "Formal Cause Analysis for the ARP V (WFM-1617) Drum Event at the RWMC," October 2018. https://fluor-idaho.com/Portals/0/Documents/04_%20Community/8283498_RPT-1659.pdf

[23] Department of Energy Office of Enterprise Assessment, *Independent Assessment of the Battelle Energy Alliance, LLC Management of Safety Issues*, May 16, 2022, https://www.energy.gov/ea/articles/independent-assessment-battelle-energy-alliance-llc-management-safety-issues-idaho and see more reports at https://www.energy.gov/ea/listings/review-reports

Corrective actions such as suspending qualifications of workers who violate procedures were not taken. Nor was the adequacy of initial qualifications programs or continuing training for maintaining qualifications being assessed.

The worsening trends were apparent over the last several years but were not being trended by Battelle Energy Alliance or the Department of Energy local Idaho field office.

The Department of Energy Idaho Office has also been ignoring this trend at its cleanup project now run by the Idaho Environmental Coalition. See the DOE Occurrence Report issued earlier this year regarding severe conduct of operations problems and ignoring key safety mitigations at the AMWTP. [24]

In a similar report that was not yet available but described by the DNFSB, it was found by DOE's EA assessment of emergency management at the Idaho National Laboratory that the program "did not demonstrate an effective emergency operations system that validates and coordinated incident information to establish and maintain situational awareness and a common operating picture among response components." And that Battelle Energy Alliance "did not demonstrate a reliable and effective information management system to support emergency response operations." [25]

Not following safety procedures for nuclear facilities and not having effective emergency response capability — what could possibly go wrong?

Department of Energy issues Environmental Impact Statement on Versatile Test Reactor

The Department of Energy has released the Environmental Impact Statement (EIS) for the Versatile Test Reactor (VTR). [26] The VTR is a sodium-cooled reactor.

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[24] Department of Energy Occurrence Report, "Less Than Adequate Conduct of Operations for Multiple Procedure Violations," Advanced Mixed Waste Treatment Facility, EM-ID—IEC-AMWTF-2022-0001. Notification date: February 24, 2022.

[25] Defense Nuclear Facilities Safety Board Monthly Report for the Idaho National Laboratory, May 6, 2022. https://www.dnfsb.gov/documents/reports

[26] Department of Energy announcement May 13, 2022. The Final VTR EIS, prepared in accordance with the National Environmental Policy Act (NEPA), analyzes potential impacts of alternatives for the VTR and options for reactor fuel production on various environmental and community resources. The EIS evaluates:

- Construction and operation of the VTR at the Idaho National Laboratory (INL) and the Oak Ridge National Laboratory. This includes operating and performing experiments in the VTR, post-irradiation examination of irradiated test specimens in hot cell facilities and spent fuel conditioning and storage pending shipment for interim storage or permanent disposal.
- Production of fuel for the VTR at the Idaho National Laboratory and/or the Savannah River Site including preparing feedstock for the fuel, fabricating fuel pins, and assembling the fuel pins into reactor fuel.
- A no-action alternative under which DOE will not pursue the construction and operation of a VTR.

The Final VTR EIS identifies the construction and operation of the VTR at the INL Site as DOE's Preferred Alternative. To the extent possible, existing facilities will be used for VTR support facilities. DOE has not identified a preferred option for performing reactor fuel production activities.

The economics of sodium-cooled fast reactors have been awful. The U.S.-built Fast Flux Test Facility operational in 1980 at the Department of Energy's Hanford site, cost over $10,000 per kilowatt. Japan's Monju cost over $20,000 per kilowatt, according to IEER. [27]

Sodium-cooled reactor promotors are touting the low pressure that the reactor runs at but not mentioning that the sodium metal explodes upon contact with air or water. They also don't mention that fast reactors are the most ***inherently unsafe and unreliable reactors*** available. Boil the liquid sodium and the reactor may go prompt critical and explode. "Core disruptive accidents" are a particular problem for fast neutron plutonium fueled reactors. To build electricity generating sodium-cooled reactors, such as the TerraPower's Natrium sodium-cooled reactor, is to invite nuclear disaster.

The high plutonium content of the fuel makes safety, transportation and disposal especially problematic.

The DOE wants us to believe its many assumptions and assertions about the accident risks posed by the project. Buried in the EIS document it does admit that if the VTR has a bad day, "the consequences can be in the hundreds or thousands of rem to the public…" [28] But trust us, they say, that is "beyond extremely unlikely."

The VTR will produce spent nuclear fuel beyond the 2035 deadline for removal of spent fuel from Idaho. The EIS says that the Department of Energy would explore possible approaches with Idaho regarding that issue. The fact is that the Department of energy has no program for the disposal of spent nuclear fuel.

There is no place for the spent nuclear fuel already stored at the Idaho National Laboratory to be sent in 2035, the 1995 Idaho Settlement Agreement date for removing spent fuel from the INL. There is not even a repackaging facility for repackaging the existing spent fuel at the INL to meet the 2035 deadline, if a storage or disposal area were available.

A copy of the Final VTR EIS can be downloaded from the DOE website at https://www.energy.gov/nepa and https://www.energy.gov/ne/versatile-test-reactor (or https://www.energy.gov/ne/articles/final-versatile-test-reactor-environmental-impact-statement-doeeis-0542)

The U.S. Environmental Protection Agency [yes, oddly, the EPA] will publish a Notice of Availability of the Final VTR EIS in the *Federal Register* on May 20, 2022. DOE will then issue a Record of Decision no sooner than 30 days after the publication.

[27] Arjun Makhijani, Ph.D., Institute for Energy and Environmental Research, *Traveling Wave Reactors: Sodium-cooled Gold at the End of a Nuclear Rainbow?* September 2013. https://ieer.org/wp/wp-content/uploads/2013/09/TravelingWaveReactor-Sept20131.pdf

[28] Excerpt from VTR EIS, Appendix D, page D-74, Section D.4.9 Versatile Test Reactor Beyond-Design-Basis Reactor Accidents, "By design, the VTR is able to withstand a wide range of accidents. Most events that could affect safe operation of the VTR are mitigated by the VTR design. This section addresses potential beyond-design-basis accidents that have the potential for high consequences even though the probability is very low (1×10^{-6} to 1×10^{-8} per year). These accidents represent events in which the consequences can be in the hundreds or thousands of rem to the public while probabilities are less than one in a million per year. Consideration of these very low-probability but potentially high-consequence accidents provide valuable insight for the public and decision-makers in understanding the overall risks of operation, siting decisions, and the need for emergency preparedness."

The VTR will not generate electricity. The VTR will require tremendous amounts of electricity.

The Idaho Falls Post Register reported that Assistant Department of Energy Secretary Kathryn Huff claims that the VTR will help fight against climate change. [29] But this is completely untrue.

The VTR will not be designed and constructed before it is too late to address climate concerns and so the truth is that VTR siphons money away from real solutions and it far too slow to address climate change. To build enough nuclear reactors to solve climate change would simply poison the entire planet faster, as the amount of spent nuclear fuel created would have to greatly increase over the current rate of creating spent nuclear fuel.

The U.S. Nuclear Regulatory Commission is paving the way toward licensing above ground temporary solutions for storing waste, all without having any disposal solution. And all without addressing the large airborne radiological releases that will occur when the spent nuclear fuel canisters degrade over time. Chloride-induced stress corrosion cracking of canisters can occur within a few decades, as short as 20 years after loading fuel into the canister, and there is currently no way to confine a degraded canister or replace or repair a degraded canister containing spent fuel. [30] [31]

See Environmental Defense Institute comments on the proposed unsafe, hugely expensive Versatile Test Reactor at our website [32] and our newsletters, especially the March 2021 newsletter articles:

- "Buried Deep in the Department of Energy's Environmental Impact Statement, DOE Admits Proposed Versatile Test Reactor Accidents Can Be Catastrophic to Southeast Idaho,"
- "Department of Energy sticking to the misleading characterization that the nation's spent fuel could fit on a football field," and

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[29] Keith Ridler, Associated Press, *The Idaho Falls Post Register*, "US releases environmental study about new test reactor," May 25, 2022.

[30] U.S. Nuclear Regulatory Commission, Email May 27, 2022: SUBJECT: NRC Letter to Holtec International – Revised Review Schedule for Holtec HI-STORE CISF License Application. On May 26, 2022, NRC staff issued a letter notifying Holtec International that it has revised the schedule for the completion of its detailed safety, security, and environmental reviews of Holtec's application for a license to construct and operate the proposed HI-STORE Consolidated Interim Storage Facility (CISF), in Lea County, New Mexico. The NRC staff's letter may be viewed under ADAMS Accession Number ML22126A132, or the following link: https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML22126A132

[31] U.S. Nuclear Regulatory Commission, Email June 1, 2022: Email SUBJECT: "Fwd:ISP's WCS CIS [Interim Storage Partners Waste Control Specialists Consolidated Interim Storage] Licensing Amendment Request." The NRC staff's letter may be viewed under ADAMS Accession Number ML22138A361. The Agency Document Access and Management System (ADAMS) is at http://www.nrc.gov/reading-rm/adams.html

[32] See Versatile Test Reactor (VTR) draft Environmental Impact Statement comments on our home page at http://www.environmental-defense-institute.org (see http://www.environmental-defense-institute.org/publications/EDI.Com.VTR.6.pdf and http://www.environmental-defense-institute.org/publications/CommentVTRdEIS.pdf and http://www.environmental-defense-institute.org/publications/CommentVTRdEIS2.pdf)

- "Department of Energy Already Needs Two Spent Fuel Repositories and Would Need a New One Every Year, If Nuclear Energy Were to Make a Difference for Climate."

Articles by Tami Thatcher for June 2022.