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STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

P.O. Box 1386 • Richland, Washington 99352 • (509) 735-7581

October 14, 1994

Mr. Steven H. Wisness  
Hanford Project Manager  
U.S. Department of Energy  
Richland Operations Office  
P.O. Box 550  
Richland, WA 99352



Dear Mr. Wisness:

Re: Tritiated Wastewater Treatment and Disposal Evaluation for 1994  
(DOE/RL-94-77) Milestone M-26-05A

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Enclosed are Washington State Department of Ecology's (Ecology) comments on the above referenced document, received September 1, 1994. These comments are provided within the 45 day comment period required by the Tri-Party Agreement (TPA).

We realize this is the first annual report and it is intended to serve as a foundation for future reports. However, we do not believe this report meets the intent of the TPA Milestone M-26-05A for the following reasons. Insufficient information is provided regarding available treatment technologies. The report emphasizes tritium decay, tritium separation, and the disposal of tritiated wastewater instead of the development status of tritium contaminated water treatment and control technologies (see the enclosed comments for specific areas which need improvement).

However, in order to make wise use of limited resources, it is not necessary to revise the existing report. Instead, incorporate these comments into the annual report due in August 1995, and provide a draft report to Ecology three months in advance for review. This will

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focus future reports on the intent of the milestone, which is to provide the information needed to make reasonable decisions regarding tritiated wastewater treatment and disposal at the Hanford Site.

If you have any questions regarding this letter, please call Melodie Selby at (509) 736-3021 or Alex Stone at (509) 736-3018.

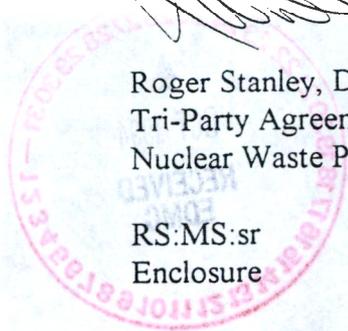
Sincerely,



Roger Stanley, Director  
Tri-Party Agreement Implementation  
Nuclear Waste Program

RS:MS:sr  
Enclosure

- cc: J. E. Wilkinson, CTUIR  
Donna Powauke, Nez Perce  
Russell Jim, YIN  
Lloyd Allen, WHC  
Becky Austin, WHC  
Tony Diliberto, WHC  
Don Flyckt, WHC  
Timothy Veneziano, WHC  
Janice Williams, WHC  
Doug Sherwood, EPA



## GENERAL COMMENTS

The focus of this report is inappropriate. The report is to focus on available technology and technology in the development stage. It should answer questions such as: What technologies are being used? What works? What is being developed? At what stage is it? What is planned to continue technology development? Chapter 6 should be the largest part of the report. It should focus on what works or may work rather than on justifying past decisions.

In general, this report did not provide sufficient references. In addition, the milestone calls for a bibliography of literature on the subject. The bibliography is not provided, only the references in the report.

Provide more recent information from primary sources (i.e., regulatory agencies, contractors, and tritium discharges) rather than relying on published reports which generally have a lag of at least 2 years.

The following items listed in the milestone were not covered in the report:

- Speed of tritium plumes in the groundwater
- Rough order of magnitude cost estimates
- Bibliography

The membrane separation technology appears to be the most promising of those being developed at the Hanford Site. We look forward to a detailed report in the next annual report of the tests performed this year. This technology development should be fully funded.

The multiphoton laser excitation technology also appears promising. Provide a description of the development work currently being done. If the USDOE complex is not currently working on development of this technology, provide justification for this action.

Section 1.0, Page 1-1

*"This report emphasizes the topics of tritium decay, tritium separation, and the disposal of tritiated wastewater . . . "*

The milestone was established " . . . to provide a comprehensive annual review of the development status of tritium contaminated water treatment and control technologies." (emphasis supplied) The report should focus on the treatment and control technologies.

Section 3.3.3, Page 3-3  
and Table 3-3, Page 3-5

Include the Hanford site emissions in the emissions inventory from USDOE tritium facilities.

Section 4.0, Page 4-1

Provide references for the toxicity and metabolism information presented.

Table 5-1, Page 5-2

10<sup>6</sup> pCi should be 10<sup>6</sup> pCi/L.

Section 5.4.1, Page 5-4

More recent information than the "late 1980's" should be available from the regulatory agencies.

Section 6.0, Page 6-1,  
last paragraph

This paragraph provides sweeping conclusions without references and does not describe the conclusions reached or the information contained in the reports referenced. It also states that these conclusions are discussed in the following section. This report is to provide new information so that new conclusions can be drawn. Its purpose is not to discuss conclusions based on outdated data.

Section 6.1.1, Page 6-2

*"No single unit process step by itself is capable of making isotopic separations that would result in an isotopically pure product."*

No reference is given for this sweeping statement. It is out of place in this document, as the purpose is not to create an isotopically pure product, but to remove sufficient tritium so that disposal is practical.

*"Some processes, such as distillation or hydrogen exchange, may be designed to run in a column, as opposed to the pyramidal cell structure in a cascade."*

The need for a cascade process is presented throughout the document as a significant impediment to an economic process. This makes the column processes very important. Yet they are relegated to a single sentence at the end of a paragraph. The advantages and disadvantages of cascade an column processes should be clearly presented and compared.

Section 6.1.2, Page 6-4

*"Although unit operating costs for physical separation processes can be relatively low, the capital cost for a plant using multiple stages of physical separation is exceedingly high."*

Provide references or data showing how this conclusion was reached.

Section 6.1.3, Page 6-4

*"A recent publication describes the tritium enrichment processes."*

Which processes are referred to here? It is not clear that the items which followed were a summary of the contents of this report. If so, this needs to be made clear.

Section 6.1.3.1, Page 6-5

Comparing the power requirements to the output of the Supply System plant gives a rough comparison between options. A better comparison would be to the current electric usage of the Hanford Site. That comparison would allow better judgement of the practicality for the Hanford Site.

*"Electrolysis of a million gallons of wastewater six times over to remove a few milligrams of tritium would be a very costly operation and is not deemed an appropriate option for removing tritium from wastewater at the Hanford Site."*

Why is removing a few milligrams of tritium from a million gallons of wastewater used only in this example? If these are actually the numbers, they will be the same for each option.

Section 6.1.3.2, Page 6-5

The other chemical processes are considered to be cost-prohibitive because they are staged systems. This system is not a staged system, however, rough order of magnitude costs are not provided so the feasibility of the system can be evaluated.

Section 6.1.5, Page 6-5

The only information provided for this process is the name and the fact that hydrogen is converted to trifluoromethane. Provide additional information regarding the steps of the process, the level of technology development, who is working on this technology development, whether sufficient funding is available, any successes achieved, and any cost projections.

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Section 6.2, Page 6-6

*"It is assumed that before any attempt is made to remove tritium, it may be necessary to remove materials that might interfere with the process for separating tritium or would be required to be removed before final disposition of the stream."*

This should not be made an issue in choosing a tritium treatment technology because these materials would have to be removed anyway to meet disposal criteria.

Column processes are not discussed in this section. The conclusion seems to be that no process is acceptable because of the need for staging, so the exclusion of the column processes is not appropriate.

Section 6.2, Page 6-7,  
Fig. 6-2

Both in this figure and in the text, the choice of  $10^{10}$  pCi/L for the concentrated output is not explained. The concentration of the output is a key factor in determining the cost effectiveness of separation options. Therefore, the choice of this number should be carefully explained and justified.

Section 6.3, Page 6-8

Provide information regarding the development of the membrane separation technology. Specifically, what testing is planned during the next year? Is adequate funding available? Have lab scale, bench scale, or pilot scale tests been performed?

*"No other scientific reports on tritium separations were found; however, two other companies have shown interest in tritium separation, but it is not known if they are conducting any research at this time."*

Information regarding future development of tritium technologies is key to meeting the objectives of this milestone. Provide the company names, what types of technology they are using, what experience and successes they have had, existing and planned applications of their techniques.

Section 7.1.2, Page 7-1  
and Fig. 7-1, Page 7-2

Text states that tritium levels near PUREX are as high as 4,000,000 pCi/L. This is not reflected in the figure.

Section 7.1.2, Page 7-3

Has the increase in the concentrations of tritium in the river along the Hanford Site increased or decreased over time? What are the trends?

Section 7.2, Page 7-5  
to 7-8

This section contains more information about the 200 Area ETF than is appropriate. The ETF does not treat or remove tritium. Therefore, detailed information about its treatment processes is inappropriate.

*" . . . will provide a clean water effluent . . . "*

It is not accurate to describe the effluent as clean water when it will have tritium at levels far in excess of the groundwater quality standards.

Section 7.2.1, Page 7-5

*"Ecology has determined that the plan design using these treatment systems is consistent with . . . AKART and . . . BAT for low level aqueous waste stream processing."*

This statement is not correct. Ecology has determined that the treatment system is BAT/AKART for evaporator process condensate only. If the 200 Area ETF is used for other low-level aqueous waste streams, the BAT/AKART determination must be redone. In addition, the discharge must meet groundwater quality standards even if the treatment system has been determined to be BAT/AKART.

Section 7.2.2, Page 7-6

*"Tritium, present as HTO in the 242-A Evaporator feed . . ."*

Tritium is present mainly as HTO.

Section 7.3.1, Page 7-9

Provide the unpublished Ebasco report to Ecology and the USDOE reading rooms.

Disposal of the 200 Area ETF effluent to the soil is not an ideal option. Maintaining consistency with this disposal option should not be a consideration if better alternatives can be found.

Section 7.3.2, Page 7-11

Note that the modelling has not yet been validated by actual discharge.

Section 9.0, Page 9-1

*"Discharge of tritiated waste effluent into the soil column has been approved at the Hanford Site (SERA) [sic] 1993). Residence time in the ground is sufficient for the tritium to decay to levels below the Drinking Water Standard."*

Final approval for the discharge of tritiated water effluent into the soil column has not been granted until the state waste discharge permit is issued. Modelling predicts that the residence time is sufficient to allow for tritium decay, but these models have not been validated by monitoring of the actual discharge.

Section 10, Page 10-1  
to 10-4

In general, this report did not provide sufficient references. In addition, the milestone calls for a bibliography of literature on the subject. The bibliography is not provided, only the references used in the report.

Appendix A

The following items listed in the milestone were not covered in the report:

- Speed of tritium plumes in the groundwater
- Rough order of magnitude cost estimates
- Bibliography

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## CORRESPONDENCE DISTRIBUTION COVERSHEET

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(DOE/RL-94-77) MILESTONE M-26-05A

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