



Department of Energy  
Richland Operations Office  
P.O. Box 550  
Richland, Washington 99352

1219908

13-AMRP-0135

MAR 22 2013

Mr. D. A. Faulk, Program Manager  
Office of Environmental Cleanup  
Hanford Project Office  
U.S. Environmental Protection Agency  
309 Bradley Boulevard, Suite 115  
Richland, Washington 99352

Ms. J. A. Hedges, Program Manager  
Nuclear Waste Program  
State of Washington  
Department of Ecology  
3100 Port of Benton  
Richland, Washington 99354

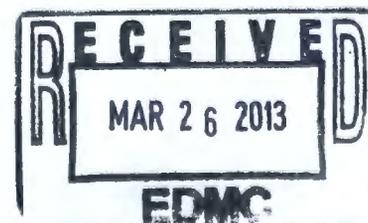
Addressees:

ANNUAL LETTER REPORT FOR TRITIUM TREATMENT TECHNOLOGY  
DEVELOPMENTS - MARCH 2013

This letter transmits the Annual Letter Report for Tritium Treatment Technology Developments for March 2013 which provides an update on the development of treatment technology pertinent to cleanup and management of tritiated wastewater and tritium contaminated groundwater at the Hanford Site.

Tri-Party Agreement Milestone **M-026-07C** requires the submittal of a formal evaluation of the development status of tritium treatment technology every five years. The next formal tritium technology evaluation report is due on March 31, 2014. This letter constitutes completion of the Tri-Party Agreement commitment to submit an annual letter report in years that a formal report is not submitted. The attached table summarizes the technologies discussed in past reports, indicates technology maturity, and defines technology applicability.

Tritium technology reports developed to date conclude that tritium removal technologies were not economically viable for the large volumes of Hanford wastewater and groundwater with relatively low tritium concentrations (less than  $1.0E-05$  Ci/L). A review of the literature produced since the 2012 letter report did not identify any information that would change this conclusion.

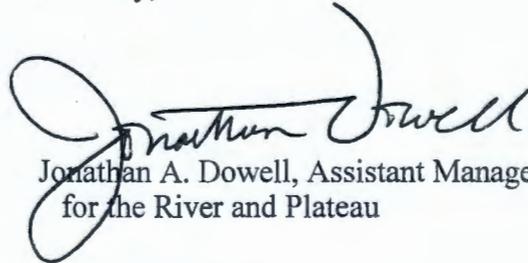


MAR 22 2013

The majority of tritium removal technology has been developed for wastewater containing tritium at levels higher than expected in Hanford Site wastewater or observed in Hanford Site groundwater. However, as can be seen on the attached table, several technologies (designated with an "I") are applicable to Hanford Site wastewaters having less than 1.0E-05 Ci/L of tritium. Of these technologies, both soil column discharge and barrier formation concepts have been implemented via use of the State-Approved Land Disposal Site for treated effluent disposal. Other technologies listed cannot reasonably be applied on the scale required to address Hanford Site groundwater tritium contamination.

If you have any questions, please contact me, or your staff may contact Al Farabee, of my staff, on (509) 376-8089.

Sincerely,



Jonathan A. Dowell, Assistant Manager  
for the River and Plateau

AMRP:MSC

Attachment

cc w/attach:

G. Bohnee, NPT  
R. Buck, Wanapum  
L. M. Dittmer, CHPRC  
R. H. Engelmann, CHPRC  
D. Goswami, Ecology  
S. Harris, CTUIR  
S. Hudson, HAB  
R. Jim, YN  
R. A. Kaldor, MSA  
N. M. Menard, Ecology  
K. Niles, ODOE  
T. W. Noland, MSA  
R. E. Piippo, MSA  
J. B. Price, Ecology  
D. Rowland, YN  
Administrative Record  
Environmental Portal

**TABLE**  
**Summary of Tritium Removal and Mitigation Technologies**

| Technology  | Year Report Prepared |              |              |              |              |              |              |
|---|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|
|   | 1994                 | 1995         | 1997         | 1999         | 2001         | 2004         | 2009         |
| Distillation  | D, h                 |              | D, h         |
| Gaseous diffusion   | D, h                 |              |              |              |              |              |              |
| Laser isotope separation  | T, h                 | T, h         | T, h         |              |              |              |              |
| Electrolysis  | D, h                 | D, h         | D, h         |              |              |              |              |
| Combined electrolysis and catalytic exchange (CECE)                                 | D, h                 | D, h<br>T, l |
| Combined electrolysis catalytic exchange with vapor phase catalytic exchange        |                      |              |              |              | D, h         |              |              |
| Membrane separation process   | T, l                 | T, l         | T, l         |              |              |              |              |
| Cryogenic distillation  | D, h                 | D, h         | D, h         | D, h         | D, h         |              |              |
| Bithermal catalytic exchange  |                      | D, h<br>T, l |              | D, h<br>T, l | D, h<br>T, l | D, h<br>T, l | D, h<br>T, l |
| Isotopic exchange, air sparge   |                      | T, l         |              |              |              |              |              |
| Finely divided nickel catalyst  |                      | O            |              |              |              |              |              |
| Separation by Metanetix Inc.  |                      | O            |              |              |              |              |              |
| Substituted naphthalene   |                      | O            |              |              |              |              |              |
| Crown Ether Complexes   |                      | O            |              |              |              |              |              |
| Girdler-sulfide Process   |                      |              | D, h         |
| Palladium Membrane Reactor  |                      |              |              |              |              |              | D, h         |
| GE Integrated Systems   |                      |              |              |              |              |              | D, h         |
| Liquid phase catalytic exchange with solid oxide electrolyte                        |                      |              | D, h         | D, h<br>T, l | D, h<br>T, l |              |              |
| Liquid phase catalytic exchange with high-temperature steam electrolysis (Hot Elly) |                      |              | D, h         |              |              |              |              |
| Sulfur resin ion exchange   |                      |              | O            |              |              |              |              |
| Metal hydride exchange  |                      |              | T, h         |              |              |              |              |
| Soil column discharge   | D, l, h              |              | D, l, h      |
| Barrier formation   |                      |              | O            | D, l, h      | D, l, h      | D, l, h      | D, l, h      |
| Air sparging  |                      |              | T, l         |              |              |              |              |
| Dual-temperature liquid-phase catalytic exchange                                    |                      |              |              | D, h         |              |              |              |
| Tritium resin separation process  |                      |              |              | T, l         | T, l         | T, l         | T, l         |
| Kinetic-isotope effect for concentrating tritium                                    |                      |              |              | T, l         | T, l         |              |              |
| Pumping and recharging  |                      |              |              | D, l         | D, l         | D, l         | D, l         |
| Phytoremediation  |                      |              |              |              | D, l         | D, l         | D, l         |
| Evaporation   |                      |              |              |              |              | D, l         | D, l         |

## Maturity:

D = Demonstrated or developed technology that has been successfully applied in the field

T = Testing or theoretical stage of development

O = Observation indicates a potential process needing funding to continue

## Applicability:

l = Technology is applicable to larger wastewater volumes having lower levels of tritium (less than 1.0E-05 Ci/L)

h = Technology is applicable to smaller wastewater volumes having higher levels of tritium (greater than 1.0E-05 Ci/L)