



Bob Ferguson  
**ATTORNEY GENERAL OF WASHINGTON**  
1125 Washington Street SE • PO Box 40100 • Olympia WA 98504-0100

November 19, 2014

The Honorable Ernest J. Moniz  
Secretary of Energy  
U.S. Department of Energy  
1000 Independence Avenue S.W.  
Washington, D.C. 20585

L. David Olson, President  
Washington River Protection Solutions  
2425 Stevens Center Place  
Richland, WA 99352

The Honorable Gina McCarthy  
Administrator  
U.S. Environmental Protection Agency  
Office of the Administrator (1101A)  
1200 Pennsylvania Avenue N.W.  
Washington, D.C. 20460

RE: **Notice of Endangerment and Intent to File Suit Pursuant to 42 U.S.C.  
§ 6972(a)(1)(B) (Resource Conservation and Recovery Act § 7002(a)(1)(B))**

Dear Secretary Moniz, Mr. Olson, and Administrator McCarthy:

The Washington State Attorney General's Office (State) hereby provides the United States Department of Energy (Energy) and Washington River Protection Solutions (WRPS) with this Notice of Endangerment and Intent to File Suit pursuant to the Resource Conservation and Recovery Act (RCRA) § 7002(a)(1)(B), 42 U.S.C. § 6972(a)(1)(B). The State intends to file suit, on behalf of the people of the State of Washington, against Energy and WRPS due to releases of vapors from hazardous waste being stored and treated in underground tanks and tank systems at the Hanford tank farms. These escaping vapors present an imminent and substantial endangerment to health and the environment.



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For many years, workers have been exposed to episodic and sometimes unpredictable releases of toxic chemical vapors from tanks at Hanford. Despite workers' complaints, Energy and its contractors have not recognized, acknowledged, and adequately addressed the problem. Many studies and assessments have been done over the years, but despite these many studies, workers are still being exposed to vapors that present an imminent and substantial endangerment to their health.

The State recognizes that Energy recently assembled a Tank Vapor Assessment Team (TVAT) to determine the adequacy of programs and practices to protect workers from exposure to harmful chemical vapors at the Hanford tank farms and that the TVAT issued its report on October 30, 2014. While the State is hopeful that this latest report will lead to effective and lasting solutions, history cautions otherwise. There have been numerous reports and assessments of the tank vapor problem over the last two decades, but the problem persists. Without effective enforcement mechanisms, the current TVAT report may wind up being merely the latest in a series of reports and assessments which focus short-term attention, but fail to deliver long-term solutions. The primary object of this Notice is to secure, by agreement or order, an effective enforcement mechanism to assure a lasting abatement of the imminent and substantial endangerment to health and the environment which the escaping vapors present.

### **Introduction/Background**

The Hanford Site includes 177 underground storage tanks holding approximately 56 million gallons of mixed high-level radioactive and hazardous waste. One hundred forty-nine of these tanks are single-shell tanks (SSTs), which are located in 12 tank farms. There are 28 double-shell tanks (DSTs) located in 6 tank farms. In 2009, WRPS took over as Energy's prime contractor responsible for safely managing the waste at the tank farms until it is prepared for disposal.

The waste in these tanks was generated from the reprocessing of spent fuel rods to extract weapons-grade plutonium. All of this waste is "mixed waste" containing a mixture of hazardous waste and radioactive material. The hazardous waste component of the tank waste is regulated under RCRA and Washington's Hazardous Waste Management Act (HWMA) (RCW 70.105).

In addition to waste being stored at the Hanford tank farms, treatment activities have also taken place in the tanks. Treatment under RCRA means any method, technique, or process designed to change the physical character or composition of any hazardous waste so as to make such waste amenable for recovery or amenable for storage. 42 U.S.C. § 6903(34); *see also* WAC 173-303-200. For the SSTs, this treatment involved the use of sodium hydroxide and sluicing to remove hardened materials in the tanks so that those materials could be pumped out. These treatment methods were used in the 1990s, 2007, and by WRPS in 2011.

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### Chemical Reactions in Tanks

Approximately 3,000 different types of hazardous waste constituents are found in Hanford's tanks. The waste in each tank is made up of varying mixtures of liquids, solids (including saltcake and sludge), and vapors. Due to the complex and dynamic nature of the chemical composition of the waste in the tanks, the waste undergoes continuous chemical reactions. These reactions result in the production and build up of gases/vapors in the tanks' head space. Sampling of the tank space has demonstrated there may be over 1,200 chemicals in the vapor head space alone. Those gases include, but are not limited to, hydrogen and vapors, such as ammonia and volatile organic compounds (e.g., benzene, nitrous oxide, hydrazine, butanol, methylamine, acetone, hexane, and xylene). When released, these gases may present a threat to human health.

### Venting of Tank Vapors

The tanks are designed to vent in order to prevent excess vapors from over-pressurizing the tank head space and posing potentially serious safety consequences, such as explosions and fires. Thirteen of the SSTs and all of the 28 DSTs were fitted with active ventilation systems. The active ventilation systems have exhausters that actively ventilate the head space and high-efficiency particulate air (HEPA) filters that remove radioactive particulates.

The vapors in the remaining 136 SSTs are passively vented. Many of the SSTs allow gases to vent to the atmosphere through vents that are not equipped with any of the aforementioned exhausters. When waste retrieval is taking place in an SST that does not have an active ventilation system, the SST is actively vented by means of a portable exhauster. These vents include HEPA filters that control radioactive particulates, but allow chemical gases and vapors to pass through. A 2004 report noted that the vent lines for many SSTs are at about 5 feet above ground, which places the vapors in the tank farm workers' breathing zone. Office of Independent Oversight and Performance Assurance, *Investigation of Worker Vapor Exposure and Occupational Medicine Program Allegations at the Hanford Site* at 41 (April 2004) (2004 Report). The passive venting of tank vapors can be influenced by changes to barometric pressure (i.e., tanks have the potential to release vapors whenever atmospheric pressure inside the tank is higher than outside of the tank) and the chemical reactions taking place within the tanks. Neither the SSTs nor DSTs are equipped with systems/filters to capture or remove chemical vapors.

In addition to the release of vapors through active or passive venting, the tanks and tank systems also can leak vapors. The 2004 Report stated that "the SSTs were not designed to preclude vapor leaks and there were a number of places, such as valve stems and electrical cabinets, where fugitive vapors leaked from the tanks at ground level and could cause a vapor exposure event." 2004 Report at 41. Fugitive vapors from these tanks can be released at breaks in containment, breather filters, and other unsealed tank penetrations. Some of those vapors can then find their

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way into concrete-lined pits located above each of the SSTs, and from the pits into the atmosphere.

In October 2014, the TVAT issued its Hanford Tank Vapor Assessment Report. In that report, the team noted that in addition to leaks from the tanks, another potential source of vapor releases is from waste overflow and transfer lines at the tank farms. Hanford Tank Vapor Assessment Team, *Hanford Tank Vapor Assessment Report at 22* (October 2014) (2014 Report). That report stated that these sources of releases “include permanent underground overflow piping to allow liquid to cascade from one tank to another, as well as temporary hoses used to transfer retrieved waste materials from SSTs to DSTs.” *Id.* The 2014 Report also noted that releases of tank vapors can also take place during maintenance and operations activities, “such as replacement of the HEPA filters and opening of cabinets to take readings.” *Id.* at 23.

Various actions have been taken in an attempt to mitigate exposures of tank vapors at the tank farms. For example, the height of SST venting stacks has been extended in an attempt to dilute the concentrations of the chemical vapors. However, as evidenced by the number of recent tank vapor exposures, this measure has failed to adequately protect the health of humans from tank vapors. The 2014 Report concluded that the use of stack extensions does not solve the vapor problem. The Report noted that:

[S]tack controls rely on active venting, and active venting relies on uninterrupted power supply. . . . When power to an exhaustor is interrupted, vapors may escape through alternative pathways, resulting in episodic fugitive emissions. . . .

Another flaw inherent to reliance on stack controls is that certain exposure incidents have been associated with maintenance activities . . . . Exposures due to incidents such as these would not have been prevented by stack controls.

2014 Report at 60.

Injuries to Tank Farm Workers

The 2014 Report concluded that adverse health effects suffered by workers at the Hanford tank farms were the “result of transitory exposures to relatively high concentrations of chemicals” and “not representative of chronic exposures” of tank vapors. 2014 Report at 15. These adverse health effects include nosebleeds, headaches, watery eyes, burning skin, contact dermatitis, increased heart rate, difficulty breathing, coughing, sore throats, expectorating, dizziness, and nausea.<sup>1</sup> One injury suffered by a tank farm worker between 1987 and 1992 resulted in partial

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<sup>1</sup> The 2014 Report stated that “While most of those workers experienced short-term effects and rapidly returned to work, there is concern about potentially more severe short-term effects as well as potential long-term health effects.” 2014 Report at 11.

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disability of 40 percent reduction in lung capacity. Another tank vapor exposure incident in 2003 led to a worker being granted permanent long-term disability for reactive airway dysfunction syndrome, neuropathy.

The following are the reported numbers of tank vapor exposures suffered by tank farm workers from 1987 to 2014:<sup>2</sup>

- Between July 1987 and January 1992 – there were 16 incidents where tank farm workers were exposed to chemical vapors and required medical attention;
- 2001 – 9 reported tank vapor exposures;
- 2002 – 21 reported tank vapor exposures;
- 2003 – 30 reported tank vapor exposures;
- 2004 – 10 reported tank vapor exposures from January 1 to March 19, 2004; and
- 2014 – 44 workers received medical evaluations due to possible exposure to tank vapors.

### Hanford Tank Vapor Investigations/Studies' Findings and Conclusions

Over the last 22 years, a number of reports and studies have been conducted addressing health and safety issues related to worker exposure to vapors at the Hanford tank farms.

A 1992 investigation of Hanford tank farm vapor exposures by Energy examined the technical and management problems related to the exposure of workers to potentially hazardous vapors from the radioactive waste tank farms. U.S. Department of Energy, *Type B Investigation of Hanford Tank Farms Vapor Exposures* (April 1992) (1992 Report). In that report, Energy concluded that the “root cause of the recurring exposures is that implementation of management systems was less than adequate.” 1992 Report at 2-1. That 1992 Report pointed out a number of failures and shortcomings at the tank farms, which included in part:

- There was not a properly developed industrial hygiene program (1992 Report at 2-1);
- The design control system did not assure that a technically adequate filtration system was installed on one of the SSTs (1992 Report at 2-1 to 2-2);
- A technically adequate vapor space characterization had not been completed, even though the need for such characterization had been identified in 1987 (1992 Report at 2-3); and
- The need for technically adequate characterization of the work space, which must include characterization of tank emissions for both organic and inorganic constituents (1992 Report at 2-5).

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<sup>2</sup> These numbers may not be a complete tally of workers who have been exposed to tank vapors between 1987 and 2014. For instance, the Attorney General's Office does not have access to data for workers who may have suffered exposures to tank vapors between 2005 and 2013.

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In March 1997, a health risk assessment was issued for Energy that addressed health risks from worker inhalation of tank vapors. A. D. Maughan et al., *Health Risk Assessment for Short- and Long-term Worker Inhalation Exposure to Vapor-phase Chemicals from the Single-shell Tank 241-C-103* (March 1997) (1997 Assessment). That assessment found that a tank worker performing normal operations in the vicinity of tank C-103 without respiratory protection “would be at risk of developing cancer, or other chronic disease, from the exposure.” 1997 Assessment at 8-1.

A 2001 report recommended the development of a foundation “to manage the exposure, toxicological, and clinical data, so it would be readily available for both planning and responding to worker exposure . . . .” Pacific Northwest National Laboratory and Hanford Environmental Health Foundation, *Exposure-Based Health Issues Project Report: Phase I of High-Level Waste Tank Operations, Retrieval, Pretreatment, and Vitrification Exposure-Based Health Issues Analysis* at 9.1 (November 2001). It is unclear if this was ever developed.

The 2004 Report by the Office of Independent Oversight and Performance Assurance of its investigation of worker vapor exposure found that the tank vapor characterization at the tank farms was insufficient, and that chemical vapor exposure data were in some cases unreliable. 2004 Report at 5, 15. That report stated that the “strategy for protecting workers against vapor exposures starts with a characterization of the types and quantities of hazardous materials in the tanks that could be released in gaseous or vapor form.” 2004 Report at 17. The report also noted that the tanks were not equipped with systems to capture or remove chemical vapors. 2004 Report at 21.

A 2010 review concluded that the WRPS sampling strategy for evaluating tank vent emissions should be reassessed and strengthened to consider variability in emissions in the tank farms. Patrick N. Breysse and Mark R. Stenzel, *Independent Review Panel Report on Chemical Vapors Industrial Hygiene Strategy* (September 2010).

In its 2014 Report, the TVAT made the following conclusions concerning tank vapor releases and exposure:

- There is a causal link between tank vapor releases and subsequent adverse worker health effects. 2014 Report at 9.
- Vapor exposure incidents are caused by transient bolus exposures lasting seconds to minutes; they are not caused by long-term exposure (8-hour work day). As a result, the current focus on applying long-term exposure limits to the exclusion of considering peak exposure limits is inappropriate. 2014 Report at 24, 47-48.
- The vapor hazard zone for a bolus exposure is much larger than a radius of 5 feet. 2014 Report at 24.
- The current list of 59 contaminants of potential concern in Hanford tank waste is inadequate because it is based on improper assumptions. 2014 Report at 25.

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- Making a determination of exposure intensity based on a perceived odor is unreliable. 2014 Report at 40.
- Reports of exposure/dosimetry results are inconsistent with reported worker acute symptoms, suggesting that transient vapor/gas exposure is substantially greater than what is currently measured. 2014 Report at 51.

The 2014 Report made over 40 specific recommendations and 10 overarching recommendations. The first overarching recommendation is for Energy management and WRPS to “actively demonstrate commitment to improve the current program and ultimately resolve the vapor exposure concerns.” 2014 Report at 10. Consistent with this recommendation, the second overarching recommendation is to put chemical vapor concerns on par with radiological safety. Other overarching recommendations from the 2014 Report include:

- Establishing a program to sample proactively the head space of tanks to validate and enhance chemical characterization. 2014 Report at 10.
- Accelerating development and implementation of a revised industrial hygiene exposure assessment strategy that is protective of worker health and establishes stakeholder confidence in the results for acute as well as chronic exposures. *Id.*
- To reduce the impacts of bolus exposures, utilizing real-time personal detection and protective equipment technologies specifically designed to protect individual employees. *Id.*
- Accelerating implementation of tailored engineering technologies to detect and control vapor emissions and exposures experienced in the Hanford tank farms. *Id.*
- Proactively and effectively communicating vapor exposure issues and actions. *Id.*
- Revising a strategy to increase the probability of capturing and evaluating sporadic high concentration (bolus) exposures. 2014 Report at 36.

That report also found two major deficiencies in vapor control policies:

- The vapor emission points at the tank farm have neither vapor treatment equipment nor chemical monitoring equipment. 2014 Report at 24.
- There is a lack of real-time chemical monitoring of stack and vent emissions at the tank farm. *Id.* Such monitoring would provide an opportunity for a local alarm if conditions deteriorated rapidly. At present, workers only become aware of vapor emissions after “they detect a sudden odor, or worse, suffer sudden significant physiological response to an unseen and undetected plume.” 2014 Report at 27.

### Remedies/Actions Energy Must Undertake to Address Imminent and Substantial Endangerment

Energy and its contractors have a 20-year history of continually studying the tank vapors problem, but never solving it. This is despite the fact that since 2007, Energy and its contractors have been subject to the worker safety and health program requirements of 10 C.F.R. § 851 (and

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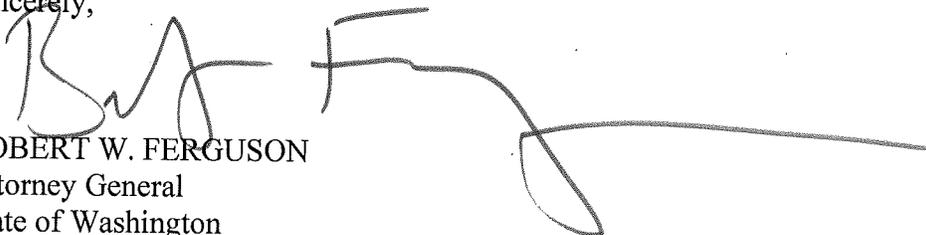
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prior to 2007, to DOE Order 440.1A), which are designed to ensure that Energy contractors and their workers operate a safe workplace. Unfortunately, these provisions have also not been sufficient to protect worker safety.

With the issuance of the 2014 Hanford Tank Vapor Assessment Report, the time has come to finally address worker exposures to vapor releases from Hanford's tanks in a meaningful, institutionalized manner. To encourage that effort, Washington is prepared to seek injunctive relief requiring Energy and WRPS to timely abate the conditions presenting the actual or potential imminent and substantial endangerment and such other relief as may be appropriate. The primary object of this Notice is to secure, by agreement or order, an effective enforcement mechanism to assure a lasting abatement of the imminent and substantial endangerment to health and the environment that the escaping vapors present, consistent with the recommendations of the Hanford Tank Vapor Assessment Report.

Sincerely,



ROBERT W. FERGUSON  
Attorney General  
State of Washington

RWF/jlg  
By certified mail