

Technical Support Document (TSD)
Notice of Construction Approval Order No. DE02NWP-002, Revision 4
United States Department of Energy (DOE)
Hanford Site
Richland, WA

Prepared by: Matt Williams, Professional Engineer

1. Project Summary

The Hanford Site (the source) is a historical nuclear research, development, and production site classified as a major source for the Title V and Prevention of Significant Deterioration (PSD) programs with numerous emission units. Currently, the primary focus of the Hanford Site is continued management and treatment of waste which was produced while the site was fully operational. This review is for an increase in the number of samples to be processed in the analytical laboratory (LAB) section of the Waste Treatment and Immobilization Plant (WTP), replacement of burners for three of the six diesel fuel-fired boilers at WTP, and general updates necessary to ensure that Approval Order DE02NWP-002, Revision 4, is consistent with current air permitting practices.

An initial Notice of Construction (NOC) application dated August 5, 2025, was submitted by DOE for the project. The final piece of this application was submitted September 9, 2025. The Washington State Department of Ecology (Ecology) reviewed the initial application and found it complete per Washington Administrative Code (WAC) 173-400-111 on October 23, 2025.

2. Application Processing

a. Public Notice

Due to anticipated public interest, Ecology scheduled a 30-day comment period February 20 through March 22, 2026. If comments are received, Ecology will publish the comments, Ecology responses, and any revisions between the draft and final versions of the Approval Order as a separate Response to Comments document issued with the final Approval Order.

b. State Environmental Policy Act (SEPA)

The Tank Closure & Waste Management Environmental Impact Statement (TC&WM EIS) <https://www.hanford.gov/page.cfm/FinalTCWMEIS> evaluated the potential impacts of infrastructure projects on Air Quality, Land/Visual Resources, Geology and Soils, Water Resources, Ecological Resources, Cultural Resources, and Waste Management.

For more information on Ecology adoption of portions of the TC&WM EIS for SEPA, see <https://apps.ecology.wa.gov/separ/Main/SEPA/Search.aspx>.

3. Applicable Regulations

a. State Regulations

i. Minor New Source Review Applicability

Per WAC 173-400-110, an NOC application and an order of approval must be issued by the permitting authority prior to the establishment of a new source or modification.

A “modification” means any physical change in, or change in the method of operation of, a stationary source that increases the amount of any air contaminant emitted by such source or that results in the emissions of any air contaminant not previously emitted. The term modification must be construed consistent with the definition of modification in 42 U.S.C. 7411, and with the rules implementing that section.

As stated in the NOC application and consistent with Ecology’s review, the WTP LAB is being modified by this project and therefore is subject to minor new source review (NSR). Additionally, Ecology considers replacement burners in a boiler to be new emission units, even if their potential emissions are identical to those which were removed. For consistency, Ecology is directly addressing the replacement burners to ensure that Boilers A, B, and C continue to be covered by fuel use, opacity, and other limits which were previously established with the original burners.

A. Exempt Equipment

No NSR-exempt equipment related to this project has been identified. The increase in LAB samples does not require new equipment and the replacement boiler burners are specifically being addressed by Approval Order DE02NWP-002, Revision 4.

NSR-exempt equipment associated with WTP has been identified previously, notably small stationary engines at the Material Handling Facility (MHF). The MHF stores components and equipment for construction of WTP. It is in a separate location and has no direct functional connection to the main WTP facilities, but was addressed by DE02NWP-002, Revision 1, Amendment 4, on November 13, 2006. This amendment added the requirement to develop and follow a Fugitive Dust Control Plan (FDCP) at the MHF. The FDCP requirement has been maintained through Revision 4 of DE02NWP-002.

B. Actual Emissions Increase

WAC 173-400-110(5) establishes exemption thresholds for: carbon monoxide (CO), lead (Pb), nitrogen oxides (NO_x), particulate matter (PM), PM with an aerodynamic diameter equal to or less than 10 microns (PM₁₀) and 2.5 microns (PM_{2.5}), total suspended particulates (TSP), sulfur dioxide (SO₂), volatile organic compounds (VOC), ozone depleting substances, and toxic air pollutants (TAPs). For equipment and activities which do not have categorical exemptions under WAC 173-400-110(4), project emissions are compared to these thresholds to determine if NSR is triggered. Ecology also generally reviews emissions of greenhouse gases (GHG) because it is potentially a trigger for requirements under the Prevention of Significant Deterioration (PSD) program.

The actual emissions increase of chromium (VI) from the project is greater than the exemption level listed under WAC 173-400-110(5), as shown below in Tables 1 and 2. For Table 2, only chromium (VI) is reported, for brevity, because LAB is a source of several hundred different toxic air pollutants (TAPs) and only chromium (VI) actually exceeded a de minimis emission value. For a complete TAP emissions estimate for this project see Appendix A of 24590-WTP-RPT-ENV-25-001, Revision 1 (Reference 1 in Appendix A of this TSD), submitted with the NOC application for DE02NWP-002, Revision 4.

Table 1. Actual emissions increase for pollutants listed under WAC 173-400-110(5), versus the Minor NSR Exemption Levels

Pollutant	Actual Emissions Increase From Project (tons/year)	Minor NSR Exemption (tons/year)
CO	0	5.0
Pb	4.24E-08	0.005
NO _x	0	2.0
PM ₁₀	0	0.75
PM _{2.5}	0	0.5
TSP	0	1.25
SO ₂	0	2.0
VOC	8.5E-10	2.0
Ozone Depleting Substances, total	1.39E-15	1.0
GHG	Not Calculated, Negligible (See Section 4.a)	N/A

Table 2. Actual TAP emissions increase exceeding de minimis emission values for NSR

Pollutant	Actual Emissions Increase from Project	De Minimis Emission Values	Averaging Period
Chromium (VI) & compounds, NOS	1.77E-04 pounds/year	3.3E-05 pounds/year	Year

ii. Prevention of Significant Deterioration (PSD)

The Hanford Site is not classified as one of the 28 major facilities listed in 40 C.F.R. 52.21(b)(1)(i)(a) and has the potential to emit greater than 250 tons per year for at least one PSD pollutant. The facility is therefore classified as a Title 1 major stationary source under the PSD permitting program, and is, therefore, subject to PSD permitting consideration under WAC 173-400-720 and 40 C.F.R. 52.21, in accordance with 40 C.F.R. 52.21(a)(2)(i).

According to the application, the project does not trigger PSD permitting requirements. DOE did not submit a PSD Applicability Determination application; therefore, Ecology's PSD program did not issue a PSD Applicability Determination for this project. Based upon Ecology review, pollutants for this project do not appear to exceed the significant emission increase (SEI) which triggers the need for PSD permitting, as shown in the table below.

Table 3. Total Project Emissions and Significant Emission Increase (SEI)

Pollutant	Total Project Emissions (tons/year)	SEI (tons/year)
CO	0	100
Pb	4.24E-08	0.6
NO _x	0	40
PM ₁₀	0	15
PM _{2.5}	0	10
TSP	0	N/A
SO ₂	0	40
VOC	8.5E-10	40
Ozone Depleting Substances, total	1.39E-15	N/A
GHG	Negligible (See Section 4.a)	75,000 (as CO ₂ equivalent)

iii. Other Applicable Requirements

In accordance with WAC 173-400-113, the proposed new and modified sources must comply with all applicable emission standards adopted under Chapter 70A.15

RCW. The following applicable emission standards are associated with the proposed project:

A. WAC 173-400-040

This section sets general standards which apply state-wide to all sources, unless a specific emission standard is applicable to an emission unit for that pollutant. WAC 173-400-040(8) also prohibits DOE from concealing or masking emissions of an air contaminant which would otherwise violate any provision of Chapter 173-400 WAC. This project will not change, or impact DOE's ability to comply with, these requirements. The boilers are subject to a 10% opacity limit under Approval Condition 2.g.ii with a requirement to read opacity with Test Method 9 of 40 C.F.R. Part 60, Appendix A-1, concurrently with source testing under Approval Condition 2.g.iii. Test Method 9 uses a shorter averaging period than the 20% general standard of WAC 173-400-040(2), but would provide reasonable documentation of opacity under challenging conditions on a regular basis.

B. WAC 173-400-050

This section sets general particulate matter (PM) standards for all combustion and incineration units, including more specific requirements for units meeting certain definitions. This project will not change, or impact DOE ability to comply with, these requirements for engines, boilers, and turbines. The LAB section of WTP does not include any combustion or incineration units.

The boilers are combustion units subject to the WAC 173-400-050(2) PM limit of 0.23 grams per dry cubic meter at standard conditions (gr/dscm). The three operating boilers were stack tested, including for PM₁₀, in November of 2020. Averaged PM₁₀ emissions for all three boilers were approximately 0.05 gr/dscm, as reported in 24509-CM-HC4-HX00-00007-0100005 00B (Reference 2 in Appendix A of this TSD).

Chapter 1.3 of AP-42, Compilation of Air Pollutant Emissions Factors from Stationary Sources, provides a particle size distribution for uncontrolled industrial boilers firing distillate oil in Table 1.3-6. It estimates that 50% of total PM is PM₁₀ for these units. Even if the 2020 results were doubled, the boilers were operating significantly below the WAC 173-400-050(2) limit during previous testing. The new boiler burners are not expected to increase PM emissions, which will be verified by future stack testing.

C. WAC 173-400-060

This section establishes a PM limit of 0.23 gr/dscm for general processes units, which are broadly defined in WAC 173-400-030(42) as "an emissions unit using a

procedure or a combination of procedures for the purpose of causing a change in material by either chemical or physical means, excluding combustion.” The boilers, as combustion units, are specifically excluded from the definition of general process units.

Processes at the LAB would involve changing materials physically and chemically. However, the purpose would typically be to determine the properties of an analytical sample, rather than to cause the material change itself. Additionally, the LAB stacks have relatively high airflow rates and limited PM emissions controlled by high efficiency particulate air (HEPA) filtration. Even if specific processes or equipment at LAB were determined to be general process units, they would not be capable of exceeding the WAC 173-400-060 concentration standard.

D. WAC 173-400-075

The Hanford Site is subject to Code of Federal Regulations Title 40 (40 C.F.R.) Part 61, Subpart A – General Provisions and Subpart H - National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (NESHAP Subpart H). These standards are adopted by reference in WAC 173-400-075. However, NESHAP Subpart H is delegated to the Washington State Department of Health (Health), as noted in 40 C.F.R. 61.04(c)(10), rather than Ecology. The LAB will be a source of radionuclides and DOE must ensure that the increase in samples is properly incorporated into the Radioactive Air Emissions License (RAEL) issued by Health. This is a separate application and issuance process than the one for non-radioactive air emissions addressed by DE02NWP-002, Revision 4.

The boilers are subject to Code of Federal Regulations Title 40 (40 C.F.R.) Part 63, Subpart A - General Provisions (NESHAP Subpart A) and Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (NESHAP Subpart DDDDD). These standards are adopted by reference in WAC 173-400-075(6)(b).

Replacement of the burners would not exceed 50% of the fixed capital cost to construct new boilers so it would not be reconstruction, as defined in 40 C.F.R. 63.2. Therefore, for the purposes of NESHAP Subpart DDDDD, the boilers will continue to be existing units designed to burn light liquid fuel with no change in requirements.

E. WAC 173-400-115

The boilers are subject to 40 C.F.R. Part 60, Subpart A – General Provisions (NSPS Subpart A) and Subpart Dc – Standards of Performance for Small Industrial-

Commercial-Institutional Steam Generating Units (NSPS Subpart Dc). These standards are adopted by reference in WAC 173-400-115(1)(a).

Burner replacement would not exceed 50% of the fixed capital cost to construct new boilers, so it would not be reconstruction under 40 C.F.R. 60.15. There will also be no increase in emissions for modification under 40 C.F.R. 60.14. Even if these were triggered, the construction start date for the boilers would fall after June 9, 1989, and there will be no change in fuel type or heat input capacity. Therefore, the applicable requirements would remain the same even if burner replacement were reconstruction or modification.

F. Chapter 173-480 WAC

This chapter establishes requirements for radionuclides, including a 10 millirem public exposure standard in WAC 173-480-040. In accordance with WAC 173-480-070(1) and WAC 246-247-002, Health is the agency responsible for administration of these regulations.

LAB samples will be a source of radionuclides and DOE must ensure that the increase in samples is properly incorporated into the RAEL issued by Health. This is a separate application and issuance process than that for non-radioactive air emissions addressed by DE02NWP-002, Revision 4.

b. Federal Regulations

In accordance with WAC 173-400-113, proposed new and modified sources must comply with all applicable New Source Performance Standards (NSPSs) included in 40 C.F.R. Part 60, National Emission Standards for Hazardous Air Pollutants (NESHAPs) included in 40 C.F.R. Part 61, and NESHAPs for source categories included in 40 C.F.R. Part 63. The following applicable emission standards are associated with the proposed project:

i. Standards of Performance for New Stationary Sources

As discussed in Section 3.a.iii.E above, the boilers are subject to NSPS Subparts A and Dc. Replacement of the burners will not change applicable requirements. The boilers will still be capable of meeting these requirements, if properly operated and maintained.

ii. National Emission Standards for Hazardous Air Pollutants

As discussed in Section 3.a.iii.D above, the LAB is subject to 40 C.F.R. Part 61, Subpart A, and NESHAP Subpart H. These requirements are delegated to Health, rather than Ecology, and will be evaluated separately.

iii. National Emission Standards for Hazardous Air Pollutants for Source Categories

As discussed in Section 3.a.iii.D above, the boilers are subject to NESHAP Subparts A and DDDDD. Replacement of the burners will not change applicable requirements. The boilers will still be capable of meeting these requirements, if properly operated and maintained

4. Emissions

a. Emission Factors/Calculations

The Permittee did not provide an emissions estimate for GHG. LAB GHG emissions are extremely limited, compared to regulatory thresholds, and would not have the potential to trigger additional requirements on their own. The boilers are a significant source of GHG, primarily carbon dioxide, from combustion of diesel fuel. Ecology would generally use GHG emission factors from 40 C.F.R Part 98, Subpart C, Tables C-1 and C-2, to estimate these emissions. However, these emission factors are based upon the high heat value of fuel combusted. The replacement burners are not expected to cause an increase in the amount of fuel combusted and the annual fuel use limit remains the same. Based upon this, Ecology does not expect an increase in either actual or potential GHG emissions from the boilers.

For LAB, emissions are based upon a permittee-developed set of calculations documented in 24590-LAB-RPT-ENV-18-001, Revision 1, WTP Analytical Laboratory Emissions Estimate (LAB Emissions Estimate, Reference 3 in Appendix A of this TSD). For everything but laser ablation inductively coupled plasma spectroscopy (LA-ICP) samples, the LAB Emissions Estimate bases emissions upon: (1) estimated annual volume for samples from specific sampling points, (2) a default release fraction of 1E-3, and (3) mass fractions derived from adjusting the WTP waste acceptance criteria (bounding feed vector) for the processes which occur prior to the sampling point.

LA-ICP samples are glass coupons, rather than liquids. Therefore, it's assumed that volatiles will already have been emitted or destroyed in the glass-making process, but non-volatiles will have a release fraction of 1 (complete conversion to PM) for the 0.1 milliliters analyzed per sample.

Use of the release fraction for liquids and particulate solids from WAC 246-247-030(21)(a)(ii), rather than calculations based upon partial vapor pressures or other material properties, is a simplification that may not be appropriate for a process involving larger volumes of specific chemicals. If the release fraction is accurate on average, it would underestimate emissions of the volatile chemicals that evaporate more quickly and overestimate emissions of less volatile chemicals. However, it is an approach that is specifically allowed for radionuclides in Washington and it simplifies calculations for the hundreds of TAPs which would be emitted in very small quantities from LAB.

DOE also recommends the general approach of a release fraction/airborne release fraction for nuclear facilities nationwide in DOE Handbook "*Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities, Volume 1 – Analysis of Experimental Data*" (DOE-HDBK-3010-94, December 1994). A release fraction of 1E-3 corresponds to the median value for boiling of aqueous solutions in DOE-HDBK-3010-94. WAC 246-247-030(21)(a)(ii) specifically allows the use of this release fraction up to, but not at, the boiling point for liquids. This indicates that the value is likely reasonably conservative for the processes at LAB.

For PM abatement, it is assumed that the single-stage HEPA filtration for stack LB-S1 will be 99.95% effective (decontamination factor of 2,000) and that the dual-stage HEPA filtration for LB-S2 will be 99.9995% effective (decontamination factor of 200,000). The former is a typical assumption, given the definition of HEPA is removal of at least 99.97% of particles with a diameter of 0.3 micrometers. The latter is at the edge of potential real-world performance for multi-stage HEPA, but can be potentially reached when filters are designed, operated, and maintained optimally.

For LAB calculations, two conservative assumptions make the decontamination factor for dual-stage HEPA acceptable. First is the assumption that LB-S1 and LB-S2 stacks will each have unabated emissions equal to the averaged emission rate for all annual samples. This is essentially doubling emissions for volatiles and eliminating the extreme control efficiency for LB-S2 by also assuming emissions will go to LB-S1 with the single-stage HEPA decontamination factor.

The other main point of conservatism is assuming that waste sampled will be at the worst-case concentration for every constituent addressed by the bounding feed vector. In reality, any specific batch of waste might approach the maximum concentration for some constituents but could not approach all of them simultaneously.

With these assumptions, the provided potential to emit should also be sufficient to cover incidental sources of emissions at LAB which are not directly evaluated such as calibration standards. The conservative assumptions also help ensure that the averaged emission rate is overestimated enough to cover short-term spikes in one-hour TAPs which might occur when a particular batch of samples is processed.

For the boilers with original burners, the Permittee provided manufacturer emission estimates for CO, NO_x, SO_x, VOC, and PM in Appendix B of 24590-WTP-RPT-ENV-01-007, Revision 1 (Reference 4 in Appendix A of this TSD). Manufacturer specifications for the new burners are identical to, or better than, the original specifications to three significant figures. VOC is slightly greater in absolute terms (1.51 vs. 1.506 lb/hr), but they are equivalent when rounded to the same number of significant figures.

Table 4. Comparison of Boiler Burner Design Emission Rates

Pollutant/Parameter	Original Burners	Replacement Burners
CO	90 ppm and 3.51 lb/hr	89 ppm and 3.51 lb/hr
NO _x	0.09 lb/MMBtu and 4.68 lb/hr	0.09 lb/MMBtu and 4.52 lb/hr
PM ₁₀	0.02 lb/MMBtu and 0.999 lb/hr	0.02 lb/MMbtu and 1 lb/hr
SO ₂	2.59 lb/hr	0.15 lb/hr
VOC	1.506 lb/hr	1.51 lb/hr
Opacity		10%

b. Best Available Control Technology (BACT) | Best Available Control Technology for Toxics (tBACT)

WAC 173-400-113(2) requires BACT for pollutants not previously emitted and those which would increase as a result of the new source or modification. WAC 173-460-040(3)(a) requires that new or modified emission units use tBACT for TAPs with emission increases that trigger NSR.

For all WTP emission units and processes, BACT for PM₁₀ and NO_x is established by PSD Permit No. PSD-02-01, Amendment 3, issued April 4, 2013. There are no PSD BACT requirements for LAB. For the boilers, BACT for NO_x is low-NO_x burners with steam atomization. Boiler BACT for PM₁₀ is good combustion practices with reduced operation.

As discussed in Section 3.a.ii above, this project does not appear to be a modification for PSD and there is no net increase in emissions for the boiler burner replacement. The new burners are low-NO_x with steam atomization and the replacement will not impact the Permittee's ability to use good combustion practices and reduced operation.

Under the original issuance of DE02NWP-002 on July 8, 2002, good combustion practices were also established as BACT for CO from the boilers and the use of ultra-low sulfur diesel (ULSD) was established as BACT for SO₂ from boilers and engines. DE02NWP-002, Revision 2, issued on April 24, 2013, expanded these requirements to good combustion practices with reduced operation for CO and ULSD use in boilers, engines, and turbines for SO₂. Ecology is maintaining these requirements in DE02NWP-002, Revision 4. Good combustion practices are being more clearly defined to include the use of a direct-reading measurement device after maintenance to ensure that NO_x and CO emissions are consistent with the most recent stack testing.

For LAB, the increase in chromium (VI) exceeded permitting thresholds. Most chromium compounds would be emitted as PM at standard conditions. HEPA filtration, the tBACT requirement for LAB in DE02NWP-002, Revision 3, is typically the best performing option for PM. Additionally, it's likely that no particulate control would have been found to be cost effective for LAB if it weren't already required for nuclear safety regulations, due to

extremely limited PM emissions. Based upon these factors, Ecology accepted HEPA filtration for LAB as continuing to be tBACT in DE02NWP-002, Revision 4, without requiring a full top-down analysis.

5. Ambient Air Quality Standards

As specified in WAC 173-400-113, the proposed new or modified source(s) must not cause or contribute to a violation of any ambient air quality standard. This includes the ambient air quality standards for both criteria and toxic air pollutants.

a. Pollutants Listed Under WAC 173-400-110 (Except TAPs)

Because the allowable emissions increase of the LAB and boiler projects, as limited by the NOC Approval Order, are below each of the Table 110(5) exemption levels listed under WAC 173-400-110, modeling was not required for these pollutants. This is in keeping with prior practice within this section, where it is assumed that the exemption levels were based on concentrations which would not cause or contribute to violations of the National Ambient Air Quality Standards or Washington Ambient Air Quality Standards.

b. Toxic Air Pollutants (TAPs)

In accordance with WAC 173-460-040, modified TAP sources must meet the requirements of Chapter 173-460 WAC, unless they are exempt by WAC 173-400-110(5).

As shown in Table 2, minor NSR is required for chromium (VI) from LAB. As such, the modified LAB systems must comply with WAC 173-460-070 (ambient impact requirement). The source may demonstrate compliance with the ambient impact requirement by either showing that the emissions increase is less than the small quantity emissions rates (SQER) or through dispersion modeling.

Table 5. TAP Analysis

TAP	Estimated Increase	SQER	Modeling Required?
Chromium (VI) & compounds, NOS	1.77E-04 pounds/year	6.5E-04 pounds/year	No

Because the chromium (VI) increase is less than the SQER, and no increase in TAPs is expected for the boiler burner replacement, Ecology did not require modeling to support issuance of DE02NWP-002, Revision 4.

Appendix A – Permittee Documents Referenced

Table A-1 provides additional information for permittee documents which are specifically referenced in this TSD. They are available in the Hanford Administrative Record (Hanford AR, <https://pdw.hanford.gov/>) by searching for the Accession Number.

Table A-1. Permittee Documents Referenced

Reference	Document	Submittal Letter	Hanford AR Accession Number & Date	Associated Permitting Action
1	24590-WTP-RPT-ENV-25-001, Revision 1	25-ECD-0058	AR-36170 8/5/2025	DE02NWP-002, Revision 4
2	24509-CM-HC4-HX00-00007-0100005 00B	21-ECD-001244	AR-12704 4/21/2021	N/A – Test Report
3	24590-LAB-RPT-ENV-18-001, Revision 1	21-ECD-001057	AR-12028 4/7/2021	DE02NWP-002, Revision 3
4	24590-WTP-RPT-ENV-01-007, Revision 1	03-ED-101	D2130374 6/25/2003	PSD-02-01, Amendment 1