# Appendix E

# Air Quality Analysis

# Appendix E

# Air Quality Analysis

This appendix provides information to support the non-radiological air quality impact analysis presented in Section 5.2. This analysis characterizes the routine emission of non-radiological pollutants by most Hanford Solid Waste (HSW) Program activities, the atmospheric dispersion of these pollutants, and the maximum air quality impacts to the public. The impacts associated with waste transportation activities and the emission of hazardous chemicals and radionuclides are not addressed in Section 5.2 or this appendix. Section 5.8 covers the air quality impacts associated with the transportation of radioactive and hazardous wastes. Section 5.11 and Appendix F report on the potential health impacts associated with the emission of chemicals and radionuclides.

The Clean Air Act (42 USC 7401) authorizes the U.S. Environmental Protection Agency (EPA) to set permissible levels of exposure for selected air pollutants using health-based criteria. These "criteria pollutants" include nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), particulate matter with aerodynamic diameters of 10 μm or less ($PM_{10}$), carbon monoxide (CO), lead, and ozone. The maximum permissible exposure levels for these pollutants are set in National Primary and Secondary Ambient Air Quality Standards (40 CFR 50). The standards focus on short-term exposures (1-hour or 3-hour), workday exposures (8-hour), and long-term exposures (24-hour or annual). The standards for some pollutants focus on short-term exposures (for example, CO and ozone), and the standards for other pollutants focus on long-term exposures (for example, $PM_{10}$ and $NO_2$). Primary standards are established to protect against adverse health effects. Secondary standards protect the public welfare from negative effects such as damage to crops, vegetation, and buildings, as well as decreased visibility. In addition, state and local governments can set additional or more restrictive standards. Washington State has defined such standards for particulate matter and sulfur dioxide. Section 4.2.3 indicates the standards applicable to the Hanford Site.

Carbon monoxide, particulate matter, sulfur dioxide, and nitrogen dioxide are produced from the combustion of fossil fuels. Particulate matter also is generated by the mechanical disturbance of ground materials by earthmoving activities, vehicle traffic over unpaved and paved roadways, and the action of the wind on disturbed soils. Two criteria pollutants, ozone[(a)] and lead, are not considered in this assessment because the level of their emissions, or that of essential precursor compounds, is negligible.

(a) Volatile organic compounds, a class of pollutant involved in ozone formation, would have a maximum project emission rate of less than 1 g/s. This release rate would not cause a detectable change in background concentration of this class of pollutants and therefore could not result in any detectable change in ozone concentrations within the local airshed.

To estimate maximum air quality impacts from HSW Program activities, the Industrial Source Complex Short-Term (ISCST3) Dispersion Model (EPA 1995b) was selected for use. The ISCST3 model is approved by the EPA for the calculation of the maximum air quality impacts of criteria pollutants. The model uses a steady-state Gaussian plume algorithm to estimate pollutant concentrations from a wide variety of sources associated with industrial complexes. The model is applicable for either flat or rolling terrain, modeling domains with a radius of 50 km (31 mi) or less from the point of release, and urban or rural environments.

Multiple years of hourly meteorological data from the Hanford Site were used in conducting ISCST3 modeling. These data provided an extended, climatologically representative period of local meteorology for computing atmospheric dispersion conditions. The hourly meteorological data covered a representative 4-year period (1993 through 1996) and included such parameters as wind transport direction, wind speed, atmospheric stability, mixing depth, and air temperature. All meteorological data were obtained from the Hanford Meteorology Station (HMS). The HMS is located between the 200 West and 200 East Areas; data from this station are representative of meteorological conditions at the HSW Program work sites in and around the 200 Areas. Area C is located about 6 km (4 mi) south of the HMS and data from the station are also representative of meteorological conditions at this work site. Wind measurements were made at 10 m (33 ft) above ground level on the 122-m (400-ft) tall instrumented tower located adjacent to the HMS. Wind transport directions were reported in the data set using 36 direction sectors (each sector is 10 degrees wide). Near-surface air temperature measurements were made at 1.5 m (5 ft) above ground level. Mixing-depth estimates were made using measurements from the HMS Doppler acoustic sodar, the HMS instrumented tower, and other sources of information. Atmospheric stability was computed using the U.S. Nuclear Regulatory Commission (NRC) $\Delta T$ method (NRC 1972). This methodology uses the wind speed and the difference between temperature measurements at 60 m (200 ft) and 10 m (30 ft) above the ground to estimate the atmospheric stability class.

The ISCST3 model uses meteorological data records to compute the maximum air quality impacts for various federal- and state-defined averaging periods and receptor locations. A Cartesian grid, polar grid, and an array of user-defined receptor points were all used in modeling air quality impacts. This dense network of receptors was used to capture air quality impacts to the public along the Hanford Site boundary, outside the boundary, and at points of public access within the boundaries of the site.

The characterization of pollutant emissions from HSW Program activities was a critical step in the air quality analysis. Criteria pollutant emissions would come from fugitive dust sources, diesel-fueled engines, and propane-fired equipment. The operation of vehicles and construction equipment would generate both exhaust and fugitive dust emissions. Potential pollutant-generating activities would include:

- construction or modification of waste-processing facilities (for example, T Plant, Central Waste Complex [CWC])
- construction of waste-disposal trenches (for example, LLW, MLLW, ILAW)
- waste-disposal operations

- excavation of backfill and capping material at the borrow pits
- transportation of capping materials from the borrow pit area to the disposal trenches
- backfill and capping activities at the disposal trenches
- leachate drying operations.

To simplify the modeling of air quality impacts, emissions from HSW Program activities were conservatively assumed to originate from only three source locations. These source locations were situated in the 200 West Area (near the southwestern edge of local project activities), 200 East Area (near the northwestern edge of local project activities), and Area C (at the borrow pit work site near State Route [SR] 240). These source locations were chosen because they represented the project work site in their major operating area that would generate the greatest air quality impacts to the public.

The 200 Area source locations each were represented using a 40-m by 40-m (130-ft by 130-ft) emissions area. The Area C source location was represented using two 40-m by 40-m emission areas. The emission area used to represent borrow pit operations was set on the southwest side of SR 240. The Area C emissions used to represent truck-loading operations was set on the northeast side of the highway. Both emissions areas were conservatively positioned so that they extend between 150 m (490 ft) and 95 m (310 ft) from SR 240. This is less than the 150-m minimum distance specified in project guidelines for conducting activities near SR 240. During Area C operations, most emissions would actually occur at distances between 300 m (980 ft) and 1.6 km (1 mi) from the highway. In modeling emissions from borrow pit operations, 4 diesel-powered vehicles (a scraper, bulldozer, front-end loader, and track hoe) were assumed to be operating at the borrow pit source location. In addition to the diesel exhaust, fugitive dust emissions from equipment operations and the material stockpile also were included in the source term. Detailed information on borrow pit operations is provided in the Technical Information Document (FH 2004).

The coordinates and sizes of all source locations were selected to provide conservative estimates of the maximum potential air quality impacts to the public that would result from activities to be conducted within each area. This included concentrating emissions from multiple activities into one source location, even though these emissions actually would occur at multiple work sites spread over a much larger work area. The transportation of backfill and capping materials also was handled in this manner. Twenty diesel-powered trucks were assumed to be in continuous operation during normal work periods to facilitate the transportation of the materials from Area C to the 200 Areas. Pollutant emissions associated with the operation of the trucks included exhaust emissions and fugitive dust. A conservative assumption was made that all truck emissions would be split between two fixed source locations: Area C and the 200 West Area. This assumption concentrated emissions rather than spreading them across a much broader area or line source, thereby maximizing estimates of air quality impacts.

Another conservative assumption involved not accounting for processes that would chemically decompose pollutants or remove pollutants from the atmosphere via deposition processes. In actuality, chemical decomposition and atmospheric-deposition processes would act to substantially reduce most pollutant concentrations and associated air quality impacts.

Based on ISCST3 model runs for pollutant releases in the 200 East and 200 West Areas, the locations where maximum air quality impacts to the public would occur were determined for various averaging periods. Table E.1 provides estimates of the maximum air quality impact locations and the associated dispersion factors. Multiplying a dispersion factor (s/m$^3$) by a maximum pollutant release rate (μg/s) generates an estimate of the maximum air-pollutant concentration (μg/m$^3$). For criteria pollutants with ambient air quality standards based on 8-hour or less averaging times, the maximum air quality impacts for emissions from the 200 Areas would occur at points of public access along SR 240. For criteria pollutants with 24-hour and annual standards, the greatest air quality impacts would occur at the site boundary, the closest point where a member of the public could potentially be located for an extended period of time. Long-term air quality impacts are not computed for SR 240 because this highway passes through Federal lands with restricted public access (between the Hanford Site and the Fitzner/Eberhardt Arid Lands Ecology Reserve).

**Table E.1**. 200 East and 200 West Area Emissions: Dispersion Factors Used to Determine Maximum Air Quality Impacts to the Public

| Area | Averaging Time Period | Maximum Impact Location and Corresponding Public Access | Distance and Direction from Pollutant Release Location to Maximum Public Impact Location[(a)] | Dispersion Factor for Maximum Impact Location (s/m$^3$)[(b)] |
|---|---|---|---|---|
| **200 East** | 1 hr | SR 240 | 8.5 km–SW | 8.4E-5 |
| | 3 hr | SR 240 | 9.0 km–SSW | 3.3E-5 |
| | 8 hr | SR 240 | 9.0 km–SSW | 2.2E-5 |
| | 24 hr | Hanford Site boundary | 15.3 km–WNW | 9.3E-6 |
| | Annual | Hanford Site boundary | 13.9 km–WNW | 8.9E-8 |
| **200 West** | 1 hr | SR 240 | 4.0 km–S | 1.6E-4 |
| | 3 hr | SR 240 | 4.0 km–S | 7.4E-5 |
| | 8 hr | SR 240 | 4.0 km–S | 5.1E-5 |
| | 24 hr | Hanford Site boundary | 8.5 km–WNW | 1.6E-5 |
| | Annual | Hanford Site boundary | 11.5 km–W | 1.5E-7 |

(a) Distance and direction determined by dispersion modeling. Pollutant-transport direction is reported using 16 compass sectors—starting with North (N) and continuing clockwise with NNE, NE, ENE, E (East), ESE, SE, SSE, S (South), SSW, SW, WSW, W (West), WNW, NW, and NNW.

(b) Values computed by the ISCST3 model. To convert to a concentration estimate (μg/m$^3$), a dispersion factor (s/m$^3$) is multiplied by the actual pollutant release rate (μg/s).

The 200 East and 200 West Area dispersion factors indicate that for a unit emission, releases from the 200 West Area would have a slightly greater air quality impact than would emissions from the 200 East Area. As a result, for project activities that could occur in either the 200 East or 200 West Areas, the bounding 200 West Area dispersion factor was used to estimate air quality impacts. For example, the lined modular facility proposed in Alternative Group D could be sited at locations in or near the 200 East or 200 West Areas, depending on the subalternative selected. The 200 West Area source location was used in the air quality analysis because it generated the greatest air quality impacts.

Table E.2 provides the locations where maximum air quality impacts to the public would occur for releases from the Area C borrow pit. The maximum short-term air quality impacts for emissions from the borrow pit would occur along SR 240, and the maximum long-term air quality impacts would occur at the site boundary. These impact locations are different from those for the 200 Areas.

HSW Program activities that would be associated with criteria pollutant emissions are shown in the timelines of Tables E.3 through E.8. These timelines show the expected years of various activities. A key for interpreting the timelines precedes Tables E.3 through E.8.

**Table E.2**. Area C Borrow Pit Emissions: Location and Dispersion Factors Used to Determine Maximum Air Quality Impacts

| Averaging Time | Maximum Impact Location | Distance from Release to Maximum Public Impact Location[a] | Unit Dispersion Factors for Maximum Impact Location ($s/m^3$)[b] |
|---|---|---|---|
| 1 hr | SR 240 | <150 m NE | 3.3E-3 |
| 3 hr | SR 240 | <150 m NE | 2.5E-3 |
| 8 hr | SR 240 | <150 m NE | 1.9E-3 |
| 24 hr | Hanford Site Boundary | 14.4 km WNW | 1.0E-5 |
| Annual | Hanford Site Boundary | 13.8 km WNW | 9.2E-8 |

(a) Distance and direction determined by dispersion modeling. Pollutant-transport direction is reported using 16 compass sectors—starting with North (N) and continuing clockwise with NNE, NE, ENE, E (East), ESE, SE, SSE, S (South), SSW, SW, WSW, W (West), WNW, NW, and NNW.

(b) Values computed by the ISCST3 model. To convert to a concentration estimate ($\mu g/m^3$), the dispersion factor ($s/m^3$) is multiplied by the actual pollutant release rate ($\mu g/s$).

## KEY to TIMELINE TABLES E.3-E.8

**Column Headings**: H = Hanford Only waste volume; L = Lower Bound waste volume; U = Upper Bound waste volume; and N = No Action waste volume that is disposed of (as opposed to stored). NA = activity is not applicable to the alternative; NWPF = new waste processing facility.

### CONSTRUCTION

**LLW Trench** – Number indicates the number of LLW trenches constructed during that year. The trench design can change by alternative. A fraction of a trench indicates that a less-than-full-sized trench, according to the design considered under the alternative, will be constructed.

**MLLW Trench** – Number indicates the number of MLLW trenches constructed during that year. The trench design can change by alternative. A fraction of a trench indicates that a less-than-full-sized trench, according to the design considered under the alternative, will be constructed. The "m" indicates the melter trench construction. "I" indicates immobilized low-activity waste (ILAW) trench (Alternative Groups A through E) or ILAW vault (No Action Alternative) construction. Six ILAW vaults are assumed to be constructed at a time.

**CWC Bldgs** – Number indicates the number of new CWC buildings to be constructed. Under the No Action Alternative, the first number indicates the number of CWC buildings constructed to store MLLW, and the second number indicates the number of CWC buildings constructed to store transuranic (TRU) waste. Also under the No Action Alternative, "melter pad construction" indicates the year that a pad would be constructed to store melters.

**T Plant Modif** – Check marks indicate years in which construction activity associated with T Plant modification for waste treatment occurs.

**NWPF** – Check marks indicate years in which construction of the new waste processing facility occurs.

**LMF** – Lined modular facility – also may be referred to as lined modular trench.

### CAPPING

**LLW** – Check marks indicate the years that the LLW burial grounds will be capped.

**MLLW** – The number indicates the total number of MLLW trenches capped during that year. The first two trenches to be capped are the existing trenches (MLLW Trenches 31 and 34). The "m" indicates melter trench capping. The "I" indicates ILAW trench or vault capping.

### OTHER

**CWC Propane** – The amount of propane required to power vehicles for routine operations at CWC are indicated as increasing or decreasing over time.

**MLLW Propane** – The number indicates the number of MLLW trenches that require leachate processing by pulse driers. The number does not include melter trench leachate processing, which occurs from 2026 through 2048 under all alternatives except the No Action Alternative.

**Table E.3.** Timeline of Alternative Group A Activities Resulting in Criteria Pollutant Emissions

| Year | CONSTRUCTION | | | | | | | | | CAPPING | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLW Trench | | | MLLW/ Melter Trench | | | ILAW Trench | CWC Bldgs | T Plant Modif | LLW | | | MLLW/Melter/ ILAW | | | CWC Propane | MLLW Propane | | |
| | H | L | U | H | L | U | | NA | | H | L | U | H | L | U | | H | L | U |
| 2000 | | | | | | | | | | | | | | | | * | | | |
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| 2005 | | | | | | | | | | | | | | | 1 | D | | | |
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| | | | | 1 | 1 | | I | | | | | | | | | C | | | |
| | | | | m | m | m | | | | | | | | | | R | | | |
| | | | | | | | | | ✓ | | | | 1 | 1 | | E | | | |
| 2010 | | | | | | | I | | ✓ | | | | | | | A | | | |
| | | | 1 | | | | I | | ✓ | | | | | | | S | | | |
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| 2015 | 1 | 1 | | | | | I | | | | | | | | | P | | | |
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| 2020 | | | | | | | | | | | | | | | | I | | | |
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| | | | | | | | I | | | | | | | | | S | | | |
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| 2025 | | | | | | | I | | | | | | | | | \| | | | |
| | | | | | | | I | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| 2030 | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | ▼ | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | No ops | 3 | 3 | 3 |
| 2035 | | | | | | | | | | | | | I | I | I | | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | | 3 | 3 | 2 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| 2040 | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| 2045 | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | 1 | 1 | 1 | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| 2050 | | | | | | | | | | | | | | | | | 1 | 1 | 1 |

**Table E.4**. Timeline of Alternative Group B Activities Resulting in Criteria Pollutant Emissions

| | CONSTRUCTION | | | | | | | | | CAPPING | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLW Trench | | | MLLW/Melter Trench | | | ILAW Trench | CWC | NWPF | LLW | | | MLLW/ Melter/ILAW | | | CWC Propane | MLLW Propane | | |
| Year | H | L | U | H | L | U | | NA | | H | L | U | H | L | U | | H | L | U |
| 2000 | | | | | | | | | | | | | | | | * | | | |
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| 2005 | 1 | 1 | 5 | 2 | 2 | 3 | | | | | | | 1 | 1 | | D | | | |
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| | | | 1 | m | m | m | | | | | | | | | 2 | R | | | |
| | 1 | 1 | 2 | | | | | | ✓ | | | | 1 | 1 | 1 | E | | | |
| 2010 | 1 | 1 | 1 | | | | I | | ✓ | | | | | | 1 | A | | | |
| | 2 | 2 | 2 | | | | I | | ✓ | | | | 2 | 2 | 1 | S | | | |
| | 2 | 2 | 3 | | | | | | ✓ | | | | | | | E | | | |
| | 2 | 2 | 3 | | | | | | | | | | 1 | 1 | 1 | | | | |
| | | | 2 | | | | I | | | | | | 1 | 1 | 1 | O | | | |
| 2015 | 1 | 1 | 2 | | | | I | | | | | | | | 1 | P | | | |
| | 3 | 3 | 3 | | | | | | | | | | 1 | 1 | | E | | | |
| | 2 | 2 | 1 | | | | | | | | | | | | 1 | R | | | |
| | | | 2 | | | | I | | | | | | m | m | m | A | | | |
| | 3 | 3 | 1 | | | | I | | | | | | | | | T | | | |
| 2020 | 1 | 1 | 2 | | | | | | | | | | 1 | 1 | | I | | | |
| | 1 | 1 | 1 | | | | | | | | | | | | 1 | O | | | |
| | 1 | 1 | | | | | I | | | | | | | | | N | | | |
| | | | 2 | | | | I | | | | | | | | | S | | | |
| | 2 | 2 | | | | | | | | | | | | | | \| | | | |
| 2025 | 0.3 | 0.3 | | | | | I | | | | | | | | | \| | | | |
| | 1 | 1 | 2 | | | | I | | | | | | | | | \| | 10 | 10 | 17 |
| | | | | | | | | | | | | | 1 | 1 | | \| | 10 | 10 | 17 |
| | | | | | | | | | | | | | | | 1 | \| | 10 | 10 | 17 |
| | | | | | | | | | | | | | | | | \| | 10 | 10 | 17 |
| 2030 | | | 1 | | | | | | | | | | | | | \| | 10 | 10 | 17 |
| | 0.3 | 0.3 | 1 | | | | | | | | | | | | | \| | 10 | 10 | 17 |
| | | | | | | | | | | | | | I | I | I,1 | \| | 10 | 10 | 17 |
| | | | 1 | | | | | | | | | | I | I | I | \| | 10 | 10 | 17 |
| | 1 | 1 | | | | | | | | | | | I | I | I | ▼ | 10 | 10 | 17 |
| 2035 | | | | | | | | | | | | | I | I | I | No ops | 10 | 10 | 16 |
| | | | | | | | | | | | | | I | I | I | | 9 | 9 | 16 |
| | | | | | | | | | | | | | I | I | I | | 9 | 9 | 15 |
| | | | 1 | | | | | | | | | | I | I | I | | 9 | 9 | 13 |
| | | | | | | | | | | | | | I | I | I | | 9 | 9 | 11 |
| 2040 | | | | | | | | | | | | | I | I | I | | 8 | 8 | 10 |
| | | | | | | | | | | | | | I | I | I | | 7 | 7 | 9 |
| | | | | | | | | | | | | | I | I | I | | 6 | 6 | 8 |
| | | | 1 | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 6 | 6 | 8 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 5 | 5 | 7 |
| 2045 | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 4 | 4 | 6 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 4 | 4 | 5 |
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| | | | | | | | | | | | | | | | | | 3 | 3 | 4 |
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| 2050 | | | | | | | | | | | | | | | | | 3 | 3 | 4 |

**Table E.5.** Timeline of Alternative Group C Activities Resulting in Criteria Pollutant Emissions

| | CONSTRUCTION | | | | | | | | | CAPPING | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLW Trench | | | MLLW/ Melter Trench | | | ILAW | CWC Bldgs | T Plant Modif | LLW | | | MLLW/Melter /ILAW | | | CWC Propane | MLLW Propane | | |
| Year | H | L | U | H | L | U | | NA | | H | L | U | H | L | U | | H | L | U |
| 2000 | | | | | | | | | | | | | | | | * | | | |
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| 2010 | | | | | | | I | | ✓ | | | | | | | A | | | |
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| 2020 | | | | | | | | | | | | | | | | I | | | |
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| 2025 | | | | | | | I | | | | | | | | | \| | | | |
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| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| 2030 | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | ▼ | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | No ops | 3 | 3 | 3 |
| 2035 | | | | | | | | | | | | | I | I | I | | 3 | 3 | 3 |
| | | | | | | | | | | | | | I | I | I | | 3 | 3 | 2 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| 2040 | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| 2045 | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | 1 | 1 | 1 | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | | 1 | 1 | 1 |

**Table E.6**. Timeline of Alternative Group D Activities Resulting in Criteria Pollutant Emissions

| Year | CONSTRUCTION | | | | | | | | CAPPING | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LMF (LLW/MLLW modules) | | | LMF (ILAW and melter modules) | | | CWC Bldg | T Plant Modif | LMF (LLW/ MLLW modules) | | | LMF (ILAW and melter modules) | | | CWC Propane | MLLW Propane | | |
| | H | L | U | H | L | U | NA | | H | L | U | H | L | U | | H | L | U |
| 2000 | | | | | | | | | | | | | | | * | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| 2005 | | | | | | | | | | | | | | 1 | D | | | |
| | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | 1 | 1 | 1 | E | | | |
| | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | C | | | |
| | | | | | | | | | | | | | | | R | | | |
| | | | | | | | | ✓ | | | | 1 | 1 | | E | | | |
| 2010 | | | | | | | | ✓ | | | | | | | A | | | |
| | | | | | | | | ✓ | | | | | | | S | | | |
| | | | | | | | | ✓ | | | | | | | E | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | O | | | |
| 2015 | | | | | | | | | | | | | | | P | | | |
| | | | | | | | | | | | | | | | E | | | |
| | | | | | | | | | | | | | | | R | | | |
| | | | | | | | | | | | | m | m | m | A | | | |
| | | | | | | | | | | | | | | | T | | | |
| 2020 | | | | | | | | | | | | | | | I | | | |
| | | | | | | | | | | | | | | | O | | | |
| | | | | | | | | | | | | | | | N | | | |
| | | | | | | | | | | | | | | | S | | | |
| | | | | | | | | | | | | | | | \| | | | |
| 2025 | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| 2030 | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | ▼ | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | No ops | 3 | 3 | 3 |
| 2035 | | | | | | | | | | | | I | I | I | | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | | 3 | 3 | 2 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| 2040 | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| 2045 | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| 2050 | | | | | | | | | | | | | | | | 1 | 1 | 1 |

**Table E.7**. Timeline of Alternative Group E Activities Resulting in Criteria Pollutant Emissions

| Year | CONSTRUCTION | | | | | | | | CAPPING | | | | | | OTHER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLW & MLLW Trenches | | | ILAW and Melter Trenches | | | CWC Bldg | T Plant Modif | LLW & MLLW | | | ILAW and Melter | | | CWC Propane | MLLW Propane | | |
| | H | L | U | H | L | U | NA | | H | L | U | H | L | U | | H | L | U |
| 2000 | | | | | | | | | | | | | | | * | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| | | | | | | | | | | | | | | | \| | | | |
| 2005 | | | | | | | | | | | | | | 1 | D | | | |
| | ✓ | ✓ | ✓ | I | I | I | | | | | | 1 | 1 | 1 | E | | | |
| | ✓ | ✓ | ✓ | Im | Im | Im | | | | | | | | | C | | | |
| | | | | | | | | | | | | | | | R | | | |
| | | | | | | | | ✓ | | | | 1 | 1 | | E | | | |
| 2010 | | | | I | I | I | | ✓ | | | | | | | A | | | |
| | | | | I | I | I | | ✓ | | | | | | | S | | | |
| | | | | | | | | ✓ | | | | | | | E | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | I | I | I | | | | | | | | | O | | | |
| 2015 | | | | I | I | I | | | | | | | | | P | | | |
| | | | | | | | | | | | | | | | E | | | |
| | | | | | | | | | | | | | | | R | | | |
| | | | | I | I | I | | | | | | m | m | m | A | | | |
| | | | | I | I | I | | | | | | | | | T | | | |
| 2020 | | | | | | | | | | | | | | | I | | | |
| | | | | | | | | | | | | | | | O | | | |
| | | | | I | I | I | | | | | | | | | N | | | |
| | | | | I | I | I | | | | | | | | | S | | | |
| | | | | | | | | | | | | | | | \| | | | |
| 2025 | | | | I | I | I | | | | | | | | | \| | | | |
| | | | | I | I | I | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| 2030 | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | | | | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | \| | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | ▼ | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | No ops | 3 | 3 | 3 |
| 2035 | | | | | | | | | | | | I | I | I | | 3 | 3 | 3 |
| | | | | | | | | | | | | I | I | I | | 3 | 3 | 2 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| | | | | | | | | | | | | I | I | I | | 2 | 2 | 1 |
| 2040 | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| 2045 | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | ✓ | ✓ | ✓ | I | I | I | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | | 1 | 1 | 1 |
| 2050 | | | | | | | | | | | | | | | | 1 | 1 | 1 |

**Table E.8**. Timeline of the No Action Alternative Resulting in Criteria Pollutant Emissions

| Year | CONSTRUCTION | | | | | | | CAPPING | | | OTHER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLW Trench | | MLLW/ Melter Trench | | ILAW Vaults | CWC Bldgs LLW+MLLW/TRU | NWPF/T Plant | LLW | MLLW/ melter/ ILAW | | CWC Propane | MLLW Propane | |
| | H | N | NA | NA | | H & N | NA | NA | H | N | H & N | H | N |
| 2000 | | | | | | | | | | | * | | |
| | | | | | | | | | | | \| | | |
| | 3 | 3 | | | | | | | | | \| | | |
| | 1 | 1 | | | I | | | | | | I | | |
| | 1 | 1 | | | | | | | | | N | | |
| 2005 | 1 | 1 | | | I | 4/3 | | | | | C | | |
| | | | | | I | 4/3 | | | | | R | | |
| | 2 | 2 | | | | 4/3 | | | 1 | 1 | E | | |
| | | | | | I | 4/3 & melter pad | | | | | A | | |
| | 1 | 1 | | | I | 4/3 | | | | | S | | |
| 2010 | 1 | 1 | | | | 4/3 | | | 1 | 1 | E | | |
| | 2 | 2 | | | I | 4/4 | | | | | | | |
| | 2 | 2 | | | I | 4/4 | | | | | O | | |
| | 2 | 2 | | | | 4/4 | | | | | P | | |
| | 2 | 2 | | | I | | | | | | S | | |
| 2015 | 1 | 1 | | | | | | | | | \| | | |
| | 3 | 3 | | | I | | | | | | \| | | |
| | 2 | 2 | | | | | | | | | ▼ | | |
| | | | | | I | | | | m | m | * | | |
| | 3 | 3 | | | | | | | | | C | | |
| 2020 | 1 | 1 | | | I | | | | | | O | | |
| | 1 | 1 | | | | | | | | | N | | |
| | 1 | 1 | | | | | | | | | S | | |
| | | | | | | | | | | | T | | |
| | 2 | 2 | | | | | | | | | A | | |
| 2025 | 0.3 | 0.3 | | | | | | | | | N | | |
| | | | | | | | | | | | T | 2 | 2 |
| | | | | | | | | | | | | 2 | 2 |
| | | | | | | | | | | | L | 2 | 2 |
| | | | | | | | | | | | E | 2 | 2 |
| 2030 | | | | | | | | | I | I | V | 2 | 2 |
| | 0.3 | 0.3 | | | | | | | I | I | E | 2 | 2 |
| | | | | | | | | | I | I | L | 2 | 2 |
| | | | | | | | | | I | I | | 2 | 2 |
| | 1 | 1 | | | | | | | I | I | O | 2 | 2 |
| 2035 | | | | | | | | | I | I | P | 2 | 2 |
| | | | | | | | | | I | I | S | 2 | 2 |
| | | | | | | | | | I | I | \| | 2 | 2 |
| | | | | | | | | | I | I | \| | 1 | 1 |
| | | | | | | | | | I | I | \| | 1 | 1 |
| 2040 | | | | | | | | | I | I | \| | 1 | 1 |
| | | | | | | | | | | | \| | 0 | 0 |
| | | | | | | | | | | | \| | | |
| | | | | | | | | | | | \| | | |
| | | | | | | | | | | | \| | | |
| 2045 | | | | | | | | | | | ▼ | | |
| | | | | | | | | | | | No ops | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 2050 | | | | | | | | | | | | | |

## E.1 Combustion Engine Emissions

For the facilities and operations evaluated in this study, diesel-fueled engines would be used in machines such as backhoes, forklifts, and air compressors. Propane fuel would be used in leachate-treatment equipment beginning in 2026 and for CWC vehicles. Gasoline would be used to fuel construction-support vehicles. However, these would generally be mobile sources and use very small quantities of fuel compared with the program's diesel-powered construction equipment. Therefore, criteria pollutant emissions from gasoline-fueled vehicles were not explicitly evaluated. Criteria pollutant emissions from diesel engines are estimated using the following equation:

$$A_{o,c,a} = F_{o,a} \times E_{c,f} \times D_a \tag{E.1}$$

where $A_{o,c,a}$ = air concentration of criteria pollutant **c** with an averaging time **a** for operation **o** $\mu g/m^3$
$F_{o,a}$ = fuel-consumption rate for operation **o** and averaging time **a** L/s (or gal/s)
$E_{c,f}$ = generation rate for criteria pollutant **c** for fuel **f** µg/L (or µg /gal)
$D_a$ = dispersion factor for averaging time **a**, $\mu g/m^3$ per g/s.

Dispersion factors ($D_a$) were given in Tables E.1 and E.2. The generation rates for criteria pollutants ($E_{c,f}$) for diesel fuel and propane are shown in Table E.9. The rates of pollutant generation for diesel fuel for carbon monoxide, nitrogen dioxide, and particulates are based on average values for a variety of heavy-duty construction equipment (EPA 1991). The values for particulates listed in Table E.9 are total suspended particulates but are conservatively assumed to be $PM_{10}$. Sulfur dioxide emissions are based on the maximum permissible amount of sulfur allowed in diesel fuel (a 500-ppm limit). No credit is taken for the substantial reduction in the sulfur content of diesel fuel (a 15-ppm limit) scheduled to be phased in beginning June 2006 or a tightening of the emission standards for nitrogen dioxide and particulate matter scheduled to be phased in beginning 2007 (EPA 2000). The propane pollutant generation rates presented in Table E.9 are based on a propane industrial boiler (EPA 1996).

Fine material on road surfaces is emitted into the atmosphere as a result of vehicular traffic. The rate of particulate emissions is a function of the weight and the amount of dust on the road surface. Equations for computing the rate of particulate emissions are provided in EPA (1991) and Grelinger et al. (1988). Using information on the likely dust concentrations on paved roads at Hanford (0.4 $g/m^2$) and the average weight of the trucks, a rate of $PM_{10}$ emissions at 16 g (0.564 oz) per vehicle mile traveled was conservatively estimated. For a 24-km (15-mi) roundtrip, this equates to a $PM_{10}$ emission rate of 0.067 g/s per truck.

**Table E.9**. Emission Factors for Criteria Pollutants

| Criteria Pollutant | Diesel-Fuel Pollutant Generation Rate (µg pollutant/L diesel fuel) | Propane Pollutant Generation Rate (µg pollutant/gal propane) |
|---|---|---|
| Carbon monoxide | 1.5E+07 | 1.4E+06 |
| Nitrogen dioxide | 3.9E+07 | 8.6E+06 |
| Particulates | 3.5E+06 | 2.7E+05 |
| Sulfur dioxide | 8.2E+05 | None |

Fuel consumption rates ($F_{o,a}$ of Equation E.1) are shown in Table E.10 for diesel fuel and Table E.11 for propane. The fuel consumption rates vary according to the averaging time selected. The hourly emission rates consider operation of the equipment over the 1-, 3-, or 8-hour periods. For daily averaging times, the diesel-fueled engines are assumed to run for one shift per day (that is, one-third of a day). Therefore, the emission rates averaged over a day (24 hours) are one-third of the hourly rate. For the propane-fueled leachate treatment equipment that would be operated 24 hr/day, the hourly and daily fuel consumption rates are the same because they run full time, not just one-third of a day as with the diesel engines. Most operations do not occur over the full year. Therefore, the emission rate for annual averaging times was adjusted to the average over a year. In situations in which the operation does in fact occur for a 1-year period and daily operations are estimated from annual use, the assumption is that operations would occur 250 days/yr (5 days per week and 50 weeks per year).

For operational safety, diesel-fired backup generators would be located at some facilities, such as the T Plant. Pollutant emissions would occur during brief periods when the generators are fired up for testing and maintenance purposes. At Hanford, backup diesel-fired generators are routinely run only once per month for a period of about 30 minutes. As a result of the low frequency and short duration of backup generator operations, the maximum annual air quality impacts to the public from all HSW Program activities should not be affected by the limited testing of diesel-fired generators. Flexibility in scheduling the operation of the generators would prevent emissions from occurring during periods with unfavorable dispersion conditions. As a result, the diesel-fired backup generators would not be in operation under conditions when emissions from other pollutant sources would produce the program's maximum 1-, 3-, 8-, and 24-hour air quality impacts to the public.

## E.2 Fugitive Dust

Fugitive dust would be generated during HSW Program activities as a result of various earthmoving activities and truck traffic. The release rate of particulates (with aerodynamic diameters of 30 μm or less) for earthmoving was estimated as 0.27 kg/($m^2$-month) (EPA 1995a). This particulate emission rate was based on measurements made during the construction of apartments and shopping centers. The characteristics of the soil in this study are similar to soil conditions found in the 200 Areas. Assuming that the construction activities generating this level of particulate emissions were active 8 hr/day and 30 days/month, the particulate emission rate would amount to 3.1E-4 g/($m^2$-s).

Much of the fugitive dust generated by construction activities would be at the larger end of the 30-μm range and would tend to settle rapidly (Seinfeld 1986). Experiments on dust suspension due to construction found that at 50 m (160 ft) downwind of the source, a maximum of 30 percent of the remaining suspended particulates at respirable height were in the $PM_{10}$ range (Grelinger et al. 1988). Based on this factor, only 30 percent of the total suspended particulates were assumed to be emitted as $PM_{10}$.

**Table E.10**. Average Diesel Fuel Consumption Rates

| Activity[a] | Diesel-Fuel Use (Liters) | Operation/ Construction Time | Note | Fuel Consumption Rate for Indicated Averaging Time (Liter/second) Hourly | Daily | Annual |
|---|---|---|---|---|---|---|
| **LLW Construction** | | | | | | |
| Alt. Group A – H & L | 110,000 | 40 d | 1 trench | 0.095 | 0.032 | 0.0035 |
| Alt. Group A – U | 110,000 | 40 d | 1 trench | 0.095 | 0.032 | 0.0035 |
| Alt. Group B – H & L | 164,000 | 40 d | 3 trenches[b] | 0.14 | 0.047 | 0.0052 |
| Alt. Group B – U | 275,000 | 40 d | 5 trenches[b] | 0.24 | 0.080 | 0.0087 |
| Alt. Group C – H & L | 110,000 | 40 d | 1 trench | 0.095 | 0.032 | 0.0035 |
| Alt. Group C – U | 110,000 | 40 d | 1 trench | 0.095 | 0.032 | 0.0035 |
| No Action Alternative | 164,000 | 40 d | 3 trenches[b] | 0.14 | 0.047 | 0.0052 |
| **MLLW Construction** | | | | | | |
| Alt. Group A – H & L | 200,000 | 1 yr | 1.5 ha trench | 0.028 | 0.0093 | 0.0063 |
| Alt. Group A – U | 400,000 | 1 yr | 3.0 ha trench | 0.056 | 0.019 | 0.013 |
| Alt. Group B – H & L | 300,000 | 28 wk | 2x1.25ha trench[b] | 0.25[c] | 0.084[c] | 0.0095 |
| Alt. Group B – U | 450,000 | 28 wk | 3x1.25 ha trench[b] | 0.38[c] | 0.13[c] | 0.014 |
| Alt. Group C – H & L | 200,000 | 1 yr | - | 0.028 | 0.0093 | 0.0063 |
| Alt. Group C – U | 400,000 | 1 yr | - | 0.056 | 0.019 | 0.013 |
| No Action Alternative | 150,000 | 28 wk | 1 trench | 0.13[c] | 0.042[c] | 0.0048 |
| **LMF Construction** | | | | | | |
| Alt. Group D – H & L | 7,760,000 | 2 yr | [d] | 0.54 | 0.18 | 0.12 |
| Alt. Group D – U | 7,960,000 | 2 yr | [d] | 0.55 | 0.18 | 0.13 |
| Alt. Group E – H & L | 420,000 | 1 yr | [e] | 0.058 | 0.019 | 0.013 |
| Alt. Group E – U | 840,000 | 1 yr | [e] | 0.12 | 0.039 | 0.027 |
| **Melter & ILAW Construction** | | | | | | |
| Melter trench | 450,000 | 40 wk | 1 trench[f] | 0.31[c] | 0.042[c] | 0.014 |
| ILAW trench | 7,000,000 | 2 yr | 6 vaults/yr | 0.49 | 0.16 | 0.11 |
| ILAW vault | 582,000 | 1 yr | | 0.081 | 0.027 | 0.018 |
| **CWC Construction** | | | | | | |
| No Action – per building | 10,600[g] | 120 d/bldg | 4 bldgs[b] & | 0.012[b] | 0.0041[b] | 0.0027[b] |
| No Action – melter pad | 24,600 | 50 d | 8 bldg/y (2008) | 0.017 | 0.0057 | 0.00078 |
| **LLBG Capping** | | | | | | |
| All Action Alternatives[h] | 912,000 | 1 yr | 2046-2049 | 0.13 | 0.042 | 0.029 |
| **MLLW Capping[c]** | | | | | | |
| Alt. Group A – H & L | 145,920 | 8 wk | 1.5 ha trench | 0.13 | 0.042 | 0.0046 |
| Alt. Group A – U | 273,600 | 15 wk | 3 ha trench | 0.13 | 0.042 | 0.0087 |
| Alt. Group B – H & L | 109,440 | 3 wk | 2x1.25ha trench[b] | 0.25 | 0.084 | 0.0035 |
| Alt. Group B – U | 109,440 | 3 wk | 2x1.25ha trench[b] | 0.25 | 0.084 | 0.0035 |
| Alt. Group C – H & L | 145,920 | 8 wk | - | 0.13 | 0.042 | 0.0046 |
| Alt. Group C – U | 273,600 | 15 wk | - | 0.13 | 0.042 | 0.0087 |
| No Action Alternative | 54,720 | 3 wk | 1.25 ha trench | 0.13 | 0.042 | 0.0017 |
| **Melter and ILAW Capping** | | | | | | |
| Melter | 364,800 | 20 wk | 2018 | 0.13 | 0.042 | 0.012 |
| ILAW trenches | 2,520,000 | 1 yr | - | 0.35 | 0.12 | 0.080 |
| ILAW vault | 6,600,000 | 1 yr | - | 0.92 | 0.31 | 0.21 |
| **LLW Backfilling** | | | | | | |
| Alt. Group A – H & L | 820 | 1 yr | - | 0.016[i] | 0.0053[i] | 0.000026 |
| Alt. Group A – U | 3,210 | 1 yr | - | 0.032[j] | 0.011[j] | 0.00010 |
| Alt. Group B – H & L | 6,780 | 1 yr | 3 trenches[b] | 0.048[i] | 0.016[i] | 0.00021 |
| Alt. Group B – U | 11,300 | 1 yr | 5 trenches[b] | 0.079[i] | 0.026[i] | 0.00036 |

**Table E.10**. (contd)

| Activity[a] | Diesel-Fuel Use (Liters) | Operation/ Construction Time | Note | Fuel Consumption Rate for Indicated Averaging Time (Liter/second) | | |
|---|---|---|---|---|---|---|
| | | | | Hourly | Daily | Annual |
| **LLW Backfilling (cont.)** | | | | | | |
| Alt. Group C – H & L | 820 | 1 yr | - | 0.016 | 0.0053 | 0.000026 |
| Alt. Group C – U | 3,210 | 1 yr | - | 0.032 | 0.011 | 0.00010 |
| Alt. Group D – H & L | 95,920 | 1 yr | (d) | 0.048 | 0.021 | 0.0022 |
| Alt. Group D – U | 100,000 | 1 yr | (d) | 0.064 | 0.027 | 0.0024 |
| Alt. Group E – H & L | 2,520 | 1 yr | (e) | 0.016 | 0.0054 | 0.000080 |
| Alt. Group E – U | 6,610 | 1 yr | (e) | 0.032 | 0.012 | 0.00021 |
| No Action Alternative | 6,780 | 1 yr | 3 trenches[b] | 0.048[i] | 0.016[i] | 0.00021 |
| **MLLW Backfilling** | | | | | | |
| Alt. Group A – H & L[k] | 1,700 | 1 yr | 2005-8 max years | 0.00024 | 0.000079 | 0.000054 |
| Alt. Group A – U[l] | 3,400 | 1 yr | 2004-5 max years | 0.00047 | 0.00016 | 0.00011 |
| Alt. Group B – H & L[m] | 6,800 | 1 yr | 2009-10 max years | 0.00094 | 0.00031 | 0.00022 |
| Alt. Group B – U[m] | 13,600 | 1 yr | 2007 max year | 0.0019 | 0.00063 | 0.00043 |
| Alt. Group C – H & L | 1,700 | 1 yr | - | 0.00024 | 0.000079 | 0.000054 |
| Alt. Group C – U | 3,400 | 1 yr | - | 0.00047 | 0.00016 | 0.00011 |
| No Action[n] | 1,700 | 1 yr | 2006-9 max years | 0.00024 | 0.000079 | 0.000054 |
| **Melter and ILAW Backfilling** | | | | | | |
| Melter[o] | 25,000 | 25 wk | - | 0.0069 | 0.0023 | 0.00079 |
| ILAW trench and vault | 1,250,000 | 1 yr | - | 0.032[j] | 0.016[j] | 0.040 |
| **Treatment Facility** | | | | | | |
| T Plant modification | 1,200,000 | 4 yr | - | 0.042 | 0.014 | 0.0095 |
| NWPF construction | 2,900,000 | 4 yr | - | 0.10 | 0.034 | 0.023 |
| **Borrow Pit** | | | | | | |
| Utility extension | 27,000 | 4 wk | Prior to ops | 0.047 | 0.016 | 0.00086 |
| Borrow operations | 5,960,000 | 12.6 yr | As needed to cap | 0.066 | 0.022 | 0.015 |

(a) Waste volume considered – Hanford Only (H), Lower Bound (L), and Upper Bound (U) waste volumes.
(b) Simultaneous construction/activity assumed.
(c) Assumed maximum of eight trucks operating on each trench at one time, except for ILAW capping.
(d) The sum of diesel used for LLW (Alt. A), MLLW(Alt. A), melter, and ILAW trenches construction.
(e) The sum of diesel used for Alternative Group A LLW and MLLW trenches construction.
(f) Assumed consumption for each multiple trench design and for two modules of the single ILAW trench design.
(g) Diesel required per building.
(h) Applies to the LMF under Alternative Groups D and E.
(i) Assumed maximum of one truck operating on each trench at a time.
(j) Assumed maximum of two trucks operating on each trench at a time.
(k) Other years Alternative Group A–L: 1000 L/yr 1999-2005 and 1200 L/yr 2008–2046.
(l) Other years Alternative Group A–U: 1100 L/yr 1999-2004 and 2300 L/yr 2005–2046.
(m) Assumed 6800 L/yr to backfill one current-design trench in one year.
(n) Other year No Action Alt.: 1000 L/yr 2000–2006.
(o) Melter trench backfilling could occur over 15 campaigns or all at once. All at once was assumed for conservatism (that is, highest emission rate of pollutants).
LMF = lined modular facility.
NWPF = new waste processing facility.
Source: FH (2004).

**Table E.11**. Average Propane Fuel Consumption Rates

| Operation/ Alternative[a] | Maximum Propane Use | Time of Maximum Use[b] | Note[b] | Fuel Consumption Rate for Indicated Averaging Time (gal/s) | | |
|---|---|---|---|---|---|---|
| | | | | Hourly | Daily | Annual |
| **MLLW Leachate Pulse Drier** | **Ton/yr[c]** | | | | | |
| Alt. Group A – H & L | 533 | 36 d/yr | 2032; 50 hr/camp | 0.14 | 0.14 | 0.0069 |
| Alt. Group A – U | 674 | 71 d/yr | 2032; 96 hr/camp | 0.18 | 0.18 | 0.0088 |
| Alt. Group B – H & L | 1,232 | 190 d/yr | 2033; 32 hr/camp per tr; 7.5 trenches | 0.13 | 0.13 | 0.016 |
| Alt. Group B – U | 2,072 | 1 yr | 2033; 32 hr/camp per tr; 15 trenches | 0.13 | 0.13 | 0.027 |
| Alt. Group C – H & L | 533 | 36 d/yr | 2032; 50 hr/camp | 0.14 | 0.14 | 0.0069 |
| Alt. Group C – U | 674 | 71 d/yr | 2032; 96 hr/camp | 0.18 | 0.18 | 0.0088 |
| Alt. Group D – H & L | 694 | 77 d/yr | 2033; 108 hr/camp | 0.19 | 0.19 | 0.0090 |
| Alt. Group D – U | 851 | 116 d/yr | 2033; 158 hr/camp | 0.23 | 0.23 | 0.011 |
| Alt. Group E – H & L | 694 | 77 d/yr | 2033; 108 hr/camp | 0.19 | 0.19 | 0.0090 |
| Alt. Group E – U | 851 | 116 d/yr | 2033; 158 hr/camp | 0.23 | 0.23 | 0.011 |
| No Action Alternative | 224 | 1 yr | 32 hr/camp | 0.057 | 0.057 | 0.0029 |
| One existing trench | 112 | 25 d/yr | 32 hr/campaign | 0.028 | 0.028 | 0.0015 |
| **Melter Leachate/Pulse Drier** | | | | | | |
| Melter | 168 | 42 d/yr | 60 hr/campaign | 0.048 | 0.048 | 0.0022 |
| **CWC Vehicles** | **Liter/yr[d]** | | | | | |
| Alt. Group A – H & L | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group A – U | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group B – H & L | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group B – U | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group C – H & L | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group C – U | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group D – H & L | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group D – U | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group E – H & L | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| Alt. Group E – U | 7,600 | 1 yr | Max year 2002 | 0.00028 | 0.000093 | 0.000064 |
| No Action – H & L | 32,400 | 1 yr | Max 2014-47 | 0.0012 | 0.00040 | 0.00027 |

(a) Waste volume considered – Hanford Only (H), Lower Bound (L), and Upper Bound (U) waste volumes.
(b) Pulse drier times and notes apply to MLLW trenches and/or modules other than the existing trenches and melter trench and/or module, unless specifically indicated. All campaigns are assumed to be carried out in series over the year.
(c) Conversion factor for propane = 409.8 gal/ton (Lide 2001).
(d) Conversion factor 1 liter = 0.265 gallons.
Camp = leachate processing campaign.
Camp per tr = campaign per trench.
Source: FH (2004).

All HSW Program activities would be conducted using dust-suppression techniques; however, no credit is taken for any reduction in $PM_{10}$ emissions as a result of dust suppression. Dust control during large earthmoving activities would comply with nuisance-dust-emission control requirements. Earthmoving activities would be restricted on days with excessive wind speeds. The use of dust-suppression methods would depend on the soil that is being excavated, wind speed, and visual observations. Water sprays for dust suppression were found to be very effective in controlling $PM_{10}$ emissions at the Hanford Site (DOE-RL 1996). Monitoring of the effectiveness of water sprays found air-particulate concentrations at the location of earthmoving activity to be under 90 $\mu g/m^3$ (DOE-RL 1996), well within the 24-hour ambient air quality standard for $PM_{10}$ of 150 $\mu g/m^3$. Most values were even lower.

Although not governed by ambient air quality standards, a potential concern for public safety is a short-term, wind-blown dust event at the borrow pit that could limit visibility on SR 240 and cause problems for passing motorists. To guard against this, an aggressive dust-suppression program is planned for this area. This dust-control program would include the following as needed:

- spraying of active work areas with water and a soil adhesive
- rocking of 8 km (5 mi) of project roads and periodic spray with soil adhesive
- covering of materials in truck beds with rollout tarps prior to transport
- other dust-suppression activities when wind speeds are projected to exceed the threshold for substantial dust generation.

The estimation of the annual and 24-hour average $PM_{10}$ emission values from earthmoving operations requires an estimate of the area being disturbed by earthmoving equipment. Estimates of the amount of area that would be disturbed by earthmoving activities are presented in Table E.12. The actual area that is actively being disturbed at any given time is estimated on a case-by-case basis. In general, for work sites where operation/construction times exceed a year, 2 percent of the annual disturbed area is assumed to be active at any one time. Work sites where the soil is actively disturbed for shorter periods of time have a correspondingly larger percentage of their total area being disturbed at any given time. For example, consider the 2.2 ha (5.4 ac) that would be disturbed over a period of 40 days for LLW construction activities under Alternative Group A. It was assumed that 2200 $m^2$ (2630 $yd^2$), about 10 percent of the total disturbed area, would be actively disturbed at any given moment during this construction activity. Estimates of fugitive dust from material stockpiles are conservatively determined by assuming that the entire stockpile, or an appropriate portion of the stockpile based on its size, is an active construction site.

## E.3 Calculating Maximum Air Quality Impacts

The maximum air quality impacts associated with each major project activity were calculated by putting together previous information, including unit dispersion factors (from ISCST3 model runs), fuel consumption rates, sizes of disturbed areas, and emission factors. Table E.13 provides the maximum air quality impacts to the public for activities conducted in the 200 Areas under the assumptions noted for each activity in Tables E.10 and E.11. Construction and capping operations at the trenches (LLW, MLLW, and ILAW) and the transportation of capping materials would be substantial sources of pollutants and major contributors to maximum air quality impacts. Table E.14 indicates the maximum air quality impacts to the public from activities in the 200 Area. Table E.15 presents comparable information for Area C activities. Looking at the individual pollutants

- LLW and ILAW capping would be the largest contributors to $PM_{10}$ air quality impacts. The transportation of capping materials to the trenches and trench construction activities (lined modular facility, LLW, and ILAW) also would represent substantial sources of $PM_{10}$.

- LMF construction and ILAW capping would generate the largest air quality impacts for $SO_2$ and CO. LLW and MLLW construction and capping activities (particularly under Alternative Group B) also would represent substantial sources of $SO_2$ and CO.

- ILAW capping activities (particularly under the No Action Alternative) and LMF construction would produce the largest air quality impact for $NO_2$.

The maximum air quality impacts from all project emissions in the 200 Areas were obtained by combining the data in Table E.13 with the project activity scheduling data presented in Tables E.3 through E.8. These estimates are presented in Table 5.5 and Tables 5.7 through 5.11 in Section 5.2.

Operations at the borrow pit and the emissions from the transportation of capping materials are the two largest sources of pollutants in the vicinity of Area C. Both activities generally would occur simultaneously. The maximum air quality impacts from emissions in Area C were obtained by combining the data in Table E.15 with the project activity scheduling data presented in Tables E.3 through E.8. These estimates are presented in Table 5.6 in Section 5.2.

**Table E.12**. Size of Disturbed Areas and Associated Durations for Various Activities/Alternatives

| Activity[a] | Cumulative Disturbed Area (Hectares) | Duration of Operation/ Construction (Time) | Percentage of Total Area Actively Disturbed | Amount of Area Being Disturbed at Any Given Time ($m^2$) |
|---|---|---|---|---|
| **LLW Construction** | | | | |
| Alt. Group A – H & L | 2.2 | 40 d | 10 | 2200 |
| Alt. Group A – U | 2.2 | 40 d | 10 | 2200 |
| Alt. Group B – H & L | 3 x 0.55 | 40 d | 10 | 1650 |
| Alt. Group B – U | 5 x 0.55 | 40 d | 10 | 2750 |
| Alt. Group C – H & L | 2.2 | 40 d | 10 | 2200 |
| Alt. Group C – U | 2.2 | 40 d | 10 | 2200 |
| No Action Alternative | 3 x 0.55 | 40 d | 10 | 1650 |
| **MLLW Construction** | | | | |
| Alt. Group A – H & L | 1.50 | 1 yr | 2.0 | 300 |
| Alt. Group A – U | 3.00 | 1 yr | 2.0 | 600 |
| Alt. Group B – H & L | 2 x 0.60 | 28 wk | 3.6 | 430 |
| Alt. Group B – U | 3 x 0.60 | 28 wk | 3.6 | 640 |
| Alt. Group C – H & L | 1.50 | 1 yr | 2.0 | 300 |
| Alt. Group C – U | 3.00 | 1 yr | 2.0 | 600 |
| No Action Alternative | 0.60 | 28 wk | 3.3 | 200 |
| **LMF Construction**[b] | | | | |
| Alt. Group D – H & L | 3.7 | 2 yr | 6.3 | 2350 |
| Alt. Group D – U | 5.2 | 2 yr | 4.8 | 2500 |
| Alt. Group E – H & L | 3.7 | 2 yr | 6.3 | 2350 |
| Alt. Group E – U | 5.2 | 2 yr | 4.8 | 2500 |
| **Melter Construction** | | | | |
| Melter trench | 6.0 [c] | 40 wk | 2.5 | 1500 |
| **ILAW Construction** | | | | |
| Alt. Group A – ILAW Trench | 26.0 | 15 yr | 1.0 | 2600 |
| Alt. Group B – ILAW Trench | 26.0 | 15 yr | 1.0 | 2600 |
| Alt. Group C – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| Alt. Group D – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| Alt. Group E – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| No Action – ILAW Vaults | 10.0 | 15 yr | 1.0 | 1000 |
| **CWC Construction** | | | | |
| No Action – per building | 1.00 | 1 yr | 5 | 500 |
| No Action – pad construction | 0.100 | 50 d | 20 | 200 |
| **LLBG Capping** | | | | |
| All Action Alternatives | 93.50 | 4 yr | 0.50 | 4700 |

**Table E.12.** (contd)

| Activity[(a)] | Cumulative Disturbed Area (Hectares) | Duration of Operation/ Construction (Time) | Percentage of Total Area Actively Disturbed | Amount of Area Being Disturbed at Any Given Time($m^2$) |
|---|---|---|---|---|
| **MLLW Capping** | | | | |
| Alt. Group A – H & L | 1.50 | 8 wk | 10 | 1500 |
| Alt. Group A – U | 3.00 | 15 wk | 5 | 1500 |
| Alt. Group B – H & L | 2 x 0.60 | 3 wk | 10 | 1200 |
| Alt. Group B – U | 2 x 0.60 | 3 wk | 10 | 1200 |
| Alt. Group C – H & L | 1.50 | 8 wk | 10 | 1500 |
| Alt. Group C – U | 3.00 | 15 wk | 5 | 1500 |
| Alt. Group D – H & L | 1.50 | 8 wk | 10 | 1500 |
| Alt. Group D – U | 3.00 | 15 wk | 5 | 1500 |
| Alt. Group E – H & L | 1.50 | 8 wk | 10 | 1500 |
| Alt. Group E – U | 3.00 | 15 wk | 5 | 1500 |
| No Action Alternative | 0.60 | 3 wk | 10 | 600 |
| **Melter and ILAW Capping** | | | | |
| Melter | 6.0 | 20 wk | 3 | 1800 |
| Alt. Group A – ILAW Trench | 26.0 | 15 yr | 1.0 | 2600 |
| Alt. Group B – ILAW Trench | 26.0 | 15 yr | 1.0 | 2600 |
| Alt. Group C – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| Alt. Group D – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| Alt. Group E – ILAW Trench | 8.0 | 15 yr | 1.0 | 800 |
| No Action – ILAW Vaults | 10.0 | 15 yr | 1.0 | 1000 |
| **LLW Backfilling** | | | | |
| Alt. Group A – H & L | 0.18 | 1 yr | 2.0 | 40 |
| Alt. Group A – U | 0.71 | 1 yr | 2.0 | 140 |
| Alt. Group B – H & L | 1.50 | 1 yr | 2.0 | 300 |
| Alt. Group B – U | 2.50 | 1 yr | 2.0 | 500 |
| Alt. Group C – H & L | 0.18 | 1 yr | 2.0 | 40 |
| Alt. Group C – U | 0.71 | 1 yr | 2.0 | 140 |
| Alt. Group D – H & L | 0.18 | 1 yr | 2.0 | 40 |
| Alt. Group D – U | 0.71 | 1 yr | 2.0 | 140 |
| Alt. Group E – H & L | 0.18 | 1 yr | 2.0 | 40 |
| Alt. Group E – U | 0.71 | 1 yr | 2.0 | 140 |
| No Action Alternative | 1.50 | 1 yr | 2.0 | 300 |
| **MLLW Backfilling**[(d)] | | | | |
| Alt. Group A – H & L | 0.15 max | 1 yr | 2.0 | 30 |
| Alt. Group A – U | 0.30 max | 1 yr | 2.0 | 60 |
| Alt. Group B – H & L | 0.60 max | 1 yr | 2.0 | 120 |
| Alt. Group B – U | 1.20 max | 1 yr | 2.0 | 240 |
| Alt. Group C – H & L | 0.15 max | 1 yr | 2.0 | 30 |
| Alt. Group C – U | 0.30 max | 1 yr | 2.0 | 60 |
| Alt. Group D – H & L | 0.15 max | 1 yr | 2.0 | 30 |
| Alt. Group D – U | 0.30 max | 1 yr | 2.0 | 60 |
| Alt. Group E – H & L | 0.15 max | 1 yr | 2.0 | 30 |
| Alt. Group E – U | 0.30 max | 1 yr | 2.0 | 60 |
| No Action Alternative | 0.15 max | 1 yr | 2.0 | 30 |
| Melter | 3.50[(c)] | 6 wk | 10 | 3500 |

**Table E.12**. (contd)

| Activity[(a)] | Cumulative Disturbed Area (Hectares) | Duration of Operation/ Construction (Time) | Percentage of Total Area Actively Disturbed | Amount of Area Being Disturbed at Any Given Time ($m^2$) |
|---|---|---|---|---|
| **Treatment Facility** | | | | |
| T Plant Modification (Alt A,C,D,E) | 3.50 | 4 yr | 1.0 | 350 |
| NWPF Construction (Alt B) | 3.50 | 4 yr | 1.0 | 350 |
| **Borrow Activity** | | | | |
| Borrow operations | 81.0 | 12 yr | 0.20 | 1600 |

(a) Waste volume considered – Hanford Only (H), Lower Bound (L) and Upper Bound (U) waste volumes.
(b) Without ILAW or melter construction portions.
(c) Includes road construction.
(d) Waste area only; all-at-once backfilling considered to maximize emission rate of particulates.
NWPF = new waste processing facility.
Source: FH (2004).

**Table E.13**. Maximum Air Quality Impacts to the Public from Major Activities with a Source Location in the 200 West or 200 East Areas

| Activity[(a)] | Maximum Air Quality Impacts (μg/m³) for the Indicated Averaging Periods | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$[(c)] | | $SO_2$ | | | | CO | | $NO_2$ |
| | 24 hr | Annual | 1 hr | 3 hr | 24 hr | Annual | 1 hr | 8 hr | Annual |
| **LLW Construction** | | | | | | | | | |
| Alt. Group A – H&L | 12 | 0.013 | 12 | 5.8 | 0.42 | 4.3E-4 | 230 | 73 | 0.020 |
| Alt. Group A – U | 12 | 0.013 | 12 | 5.8 | 0.42 | 4.3E-4 | 230 | 73 | 0.020 |
| Alt. Group B – H&L | 11 | 0.011 | 18 | 8.5 | 0.62 | 6.4E-4 | 340 | 110 | 0.030 |
| Alt. Group B – U | 18 | 0.018 | 31 | 15 | 1.0 | 1.1E-3 | 580 | 180 | 0.051 |
| Alt. Group C – H&L | 12 | 0.013 | 12 | 5.8 | 0.42 | 4.3E-4 | 230 | 73 | 0.020 |
| Alt. Group C – U | 12 | 0.013 | 12 | 5.8 | 0.42 | 4.3E-4 | 230 | 73 | 0.020 |
| No Action Alternative | 11 | 0.011 | 18 | 8.5 | 0.62 | 6.4E-4 | 340 | 110 | 0.030 |
| **MLLW Construction** | | | | | | | | | |
| Alt. Group A – H&L | 2.0 | 0.017 | 3.7 | 1.7 | 0.12 | 7.7E-4 | 67 | 21 | 0.037 |
| Alt. Group A – U | 3.9 | 0.034 | 7.3 | 3.4 | 0.25 | 1.6E-3 | 130 | 43 | 0.076 |
| Alt. Group B – H&L | 6.8 | 0.015 | 33 | 15 | 1.1 | 1.2E-3 | 600 | 190 | 0.056 |
| Alt. Group B – U | 10 | 0.023 | 50 | 23 | 1.7 | 1.7E-3 | 910 | 290 | 0.082 |
| Alt. Group C – H&L | 1.1 | 0.010 | 1.9 | 0.76 | 0.071 | 4.6E-4 | 35 | 9.2 | 0.022 |
| Alt. Group C – U | 2.3 | 0.020 | 3.9 | 1.5 | 0.14 | 9.5E-4 | 71 | 18 | 0.045 |
| No Action Alternative | 3.3 | 0.0074 | 17 | 7.9 | 0.55 | 5.9E-4 | 310 | 99 | 0.028 |
| **LMF Construction** | | | | | | | | | |
| Alt. Group D – H&L | 11 | 0.070 | 71[(b)] | 33[(b)] | 2.4[(b)] | 0.015[(b)] | 1300[(b)] | 410[(b)] | 0.70 |
| Alt. Group D – U | 11 | 0.070 | 71[(b)] | 33[(b)] | 2.4[(b)] | 0.015[(b)] | 1300[(b)] | 410[(b)] | 0.70 |
| Alt. Group E – H&L | 1.8 | 0.014 | 7.6 | 3.5 | 0.25 | 1.6E-3 | 140 | 44 | 0.076 |
| Alt. Group E – U | 3.6 | 0.028 | 16 | 7.3 | 0.51 | 3.3E-3 | 290 | 92 | 0.16 |

**Table E.13.** (contd)

| Activity[(a)] | Maximum Air Quality Impacts (μg/m³) for the Indicated Averaging Periods[(b)] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$[(c)] | | $SO_2$ | | | | CO | | $NO_2$ |
| | 24 hr | Annual | 1 hr | 3 hr | 24 hr | Annual | 1 hr | 8 hr | Annual |
| **Melter & ILAW Construction** | | | | | | | | | |
| Melter trench | 5.6 | 0.035 | 21 | 8.4 | 0.32 | 1.0E-3 | 390 | 100 | 0.049 |
| ILAW Alt. Groups A, B | 21 | 0.17 | 64 | 30 | 2.1 | 0.014 | 1200 | 370 | 0.64 |
| ILAW portions only Alt. Groups C, D, E | 13 | 0.094 | 64 | 30 | 2.1 | 0.014 | 1200 | 370 | 0.64 |
| ILAW No Action | 3.7 | 0.032 | 5.6 | 2.2 | 0.21 | 1.3E-3 | 100 | 27 | 0.062 |
| **CWC Construction** | | | | | | | | | |
| No Action – per bldg | 2.6 | 0.024 | 1.6 | 0.73 | 0.054 | 3.3E-4 | 29 | 9.2 | 0.016 |
| No Action – melter pad | 1.3 | 0.0016 | 2.2 | 1.0 | 0.075 | 9.6E-5 | 41 | 13 | 4.6E-3 |
| **Transporting Capping Materials** | | | | | | | | | |
| All Alternatives | 24 | 0.23[(b)] | 4.2 | 1.9 | 0.42 | 3.9E-3 | 130 | 42 | 0.081 |
| | | | | | | | | | |
| **LLBG Capping** | | | | | | | | | |
| All Action Alts | 25[(b)] | 0.23[(b)] | 17 | 7.9 | 0.55 | 3.6E-3 | 310 | 99 | 0.17 |
| **MLLW Capping[(d)]** | | | | | | | | | |
| Alt. Group A – H&L | 9.6 | 0.013 | 17 | 7.9 | 0.55 | 5.7E-4 | 310 | 99 | 0.027 |
| Alt. Group A – U | 9.6 | 0.024 | 17 | 7.9 | 0.55 | 1.1E-3 | 310 | 99 | 0.051 |
| Alt. Group B – H&L | 10 | 4.9E-3 | 33 | 15 | 1.1 | 4.3E-4 | 600 | 190 | 0.020 |
| Alt. Group B – U | 10 | 4.9E-3 | 33 | 15 | 1.1 | 4.3E-4 | 600 | 190 | 0.020 |
| Alt. Group C – H&L | 5.6 | 7.6E-3 | 9.0 | 3.5 | 0.32 | 3.4E-4 | 160 | 43 | 0.016 |
| Alt. Group C – U | 5.6 | 0.014 | 9.0 | 3.5 | 0.32 | 6.3E-4 | 160 | 43 | 0.030 |
| No Action | 3.0 | 1.5E-3 | 9.0 | 3.5 | 0.32 | 1.2E-4 | 160 | 43 | 5.9E-3 |
| **Melter & ILAW Capping** | | | | | | | | | |
| Melter trench | 6.4 | 0.022 | 9.0 | 3.5 | 0.32 | 8.8E-4 | 160 | 43 | 0.042 |
| ILAW Alt. Groups A, B | 19 | 0.16 | 46 | 21 | 1.6 | 9.8E-3 | 840 | 270 | 0.47 |
| ILAW Alt. Groups C, D, E | 11 | 0.078 | 46 | 21 | 1.6 | 9.8E-3 | 840 | 270 | 0.47 |
| ILAW No Action | 13 | 0.092 | 63 | 25 | 2.4[(b)] | 0.015[(b)] | 1200 | 300 | 0.73[(b)] |
| **LLW Backfilling** | | | | | | | | | |
| Alt. Group A – H&L | 0.49 | 1.8E-3 | 2.1 | 0.97 | 0.070 | 3.2E-6 | 38 | 12 | 1.5E-4 |
| Alt. Group A – U | 1.3 | 6.4E-3 | 4.2 | 1.9 | 0.14 | 1.2E-5 | 77 | 24 | 5.9E-4 |
| Alt. Group B – H&L | 2.3 | 0.014 | 6.3 | 2.9 | 0.21 | 2.6E-5 | 120 | 37 | 1.2E-3 |
| Alt. Group B – U | 3.9 | 0.023 | 10 | 4.8 | 0.34 | 4.4E-5 | 190 | 60 | 2.1E-3 |
| Alt. Group C – H&L | 0.49 | 1.8E-3 | 2.1 | 0.97 | 0.070 | 3.2E-6 | 38 | 12 | 1.5E-4 |
| Alt. Group C – U | 1.3 | 6.4E-3 | 4.2 | 1.9 | 0.14 | 1.2E-5 | 77 | 24 | 5.9E-4 |
| Alt. Group D – H&L | 1.4 | 3.0E-3 | 6.3 | 2.9 | 0.28 | 2.7E-4 | 120 | 37 | 0.013 |
| Alt. Group D – U | 2.2 | 7.6E-3 | 8.4 | 3.9 | 0.35 | 3.0E-4 | 150 | 49 | 0.014 |
| Alt. Group E – H&L | 0.49 | 1.8E-3 | 2.1 | 0.97 | 0.071 | 9.8E-6 | 38 | 12 | 4.7E-4 |
| Alt. Group E – U | 1.3 | 6.4E-3 | 4.2 | 1.9 | 0.16 | 2.6E-5 | 77 | 24 | 1.2E-3 |
| No Action | 1.4 | 8.1E-3 | 3.3 | 1.3 | 0.12 | 1.5E-5 | 120 | 16 | 7.3E-4 |

**Table E.13**. (contd)

| Activity[(a)] | Maximum Air Quality Impacts (μg/m³) for the Indicated Averaging Periods[(b)] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$[(c)] | | $SO_2$ | | | | CO | | $NO_2$ |
| | 24 hr | Annual | 1 hr | 3 hr | 24 hr | Annual | 1 hr | 8 hr | Annual |
| **MLLW Backfilling**[€] | | | | | | | | | |
| Alt. Group A – H&L | 0.15 | 1.4E-3 | 0.031 | 0.015 | 1.0E-3 | 6.6E-6 | 0.58 | 0.18 | 3.2E-4 |
| Alt. Group A – U | 0.30 | 2.8E-3 | 0.062 | 0.029 | 2.1E-3 | 1.4E-5 | 1.1 | 0.36 | 6.4E-4 |
| Alt. Group B – H&L | 0.59 | 5.5E-3 | 0.12 | 0.057 | 4.1E-3 | 2.7E-5 | 2.3 | 0.72 | 1.3E-3 |
| Alt. Group B – U | 1.2 | 0.011 | 0.25 | 0.12 | 8.3E-3 | 5.3E-5 | 4.6 | 1.5 | 2.5E-3 |
| Alt. Group C – H&L | 0.086 | 8.2E-4 | 0.017 | 6.5E-3 | 6.0E-4 | 3.9E-6 | 0.30 | 0.079 | 1.9E-4 |
| Alt. Group C – U | 0.17 | 1.6E-3 | 0.032 | 1.3E-2 | 1.2E-3 | 8.0E-6 | 0.59 | 0.16 | 3.8E-4 |
| No Action | 0.086 | 8.2E-4 | 0.017 | 6.5E-3 | 6.0E-4 | 3.9E-6 | 0.30 | 0.079 | 1.9E-4 |
| Melter Trench | 9.8 | 0.011 | 0.48 | 0.19 | 0.018 | 5.8E-5 | 8.7 | 2.3 | 2.7E-3 |
| ILAW trench & vault | 0.90 | 0.021 | 4.2 | 1.9 | 0.21 | 4.9E-3 | 77 | 24 | 0.23 |
| **Treatment Plant** | | | | | | | | | |
| T Plant mod | 2.5 | 0.021 | 5.5 | 2.5 | 0.18 | 1.2E-3 | 100 | 32 | 0.056 |
| NWPF const | 3.6 | 0.028 | 13 | 6.1 | 0.45 | 2.8E-3 | 240 | 77 | 0.13 |
| **MLLW Leachate** | | | | | | | | | |
| Alt. Group A – H&L | 0.62 | 2.8E-4 | NA | NA | NA | NA | 33 | 11 | 0.0090 |
| Alt. Group A – U | 0.78 | 3.6E-4 | NA | NA | NA | NA | 42 | 13 | 0.011 |
| Alt. Group B – H&L | 0.58 | 6.5E-4 | NA | NA | NA | NA | 31 | 9.8 | 0.021 |
| Alt. Group B – U | 0.55 | 1.1E-3 | NA | NA | NA | NA | 29 | 9.3 | 0.035 |
| Alt. Group C – H&L | 0.62 | 2.8E-4 | NA | NA | NA | NA | 33 | 11 | 0.0090 |
| Alt. Group C – U | 0.78 | 3.6E-4 | NA | NA | NA | NA | 42 | 13 | 0.011 |
| Alt. Group D – H&L | 0.82 | 3.7E-4 | NA | NA | NA | NA | 44 | 14 | 0.012 |
| Alt. Group D – U | 0.99 | 4.5E-4 | NA | NA | NA | NA | 53 | 17 | 0.014 |
| Alt. Group E – H&L | 0.82 | 3.7E-4 | NA | NA | NA | NA | 44 | 14 | 0.012 |
| Alt. Group E – U | 0.99 | 4.5E-4 | NA | NA | NA | NA | 53 | 17 | 0.014 |
| No Action | 0.25 | 1.2E-4 | NA | NA | NA | NA | 13 | 4.2 | 0.0038 |
| Melter trench | 0.12 | 5.3E-5 | NA | NA | NA | NA | 5.8 | 1.5 | 0.0017 |
| **CWC Vehicles** | | | | | | | | | |
| Alt. Groups A-E | 4.0E-4 | 2.6E-6 | NA | NA | NA | NA | 0.065 | 0.021 | 3.6E-4 |
| No Action Alternative | 1.7E-3 | 1.1E-5 | NA | NA | NA | NA | 0.28 | 0.089 | 1.6E-3 |

(a) Waste volume considered – Hanford Only (H), Lower Bound (L) and Upper Bound (U) waste volumes.
(b) Indicates the overall maximum air quality impact for each averaging period from any single activity. (Summarized in Table E.14.)
(c) Includes both fugitive dust and diesel combustion particulates.
(d) For Alternative Groups D & E, see Low Level Burial Ground (LLBG) capping; MLLW is in the lined modular facility (LMF). LMF capping impacts are the same as the LLBG capping impacts during the maximum year.
(e) For Alternative Groups D & E, see Low Level Waste (LLW) backfilling; MLLW is in the LMF. LMF backfilling impacts are the same as the LLW backfilling impacts during the maximum year.
NA = not applicable; there are no $SO_2$ emissions from the propane used for this activity.

**Table E.14**. Maximum Impacts from Any Single Activity Conducted in the 200 Areas

| | $PM_{10}$ | | $SO_2$ | | | | CO | | $NO_2$ |
|---|---|---|---|---|---|---|---|---|---|
| | 24 hr | Annual | 1 hr | 3 hr | 24 hr | Annual | 1 hr | 8 hr | Annual |
| Ambient Air Quality Standard (μg/m$^3$) | 150 | 50 | 1,000 | 1,300 | 260 | 50 | 40,000 | 10,000 | 100 |
| Maximum Impact – single activity (μg/m$^3$) | 25 | 0.23 | 71 | 33 | 2.4 | 0.015 | 1300 | 410 | 0.73 |
| Maximum Impact – single activity (Percent of Standard) | 17 | 0.46 | 7.1 | 2.5 | 0.92 | 0.030 | 3.2 | 4.1 | 0.73 |
| Activity creating maximum impact[(a)] | a | a, d | b | b | b, c | b, c | b | b | c |

Note: All alternatives are considered in selecting the activities with the maximum air quality impacts.
(a) Activities creating maximum impacts:
a. LLBG capping
b. LMF trench construction
c. ILAW vault capping
d. transportation of capping materials.

**Table E.15**. Maximum Air Quality Impacts to the Public from Activities with an Area C Source Location

| | Maximum Air Quality Impacts (μg/m$^3$) for the Indicated Averaging Periods | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | | $SO_2$ | | | | CO | | $NO_2$ |
| Activity[(a)] | 24 hr | Annual | 1 hr | 3 hr | 24 hr | Annual | 1 hr | 8 hr | Annual |
| **Utility Extensions** | | | | | | | | | |
| All Alternatives | 0.56 | 2.8E-4 | 130 | 96 | 0.13 | 6.5E-05 | 2300 | 1300 | 3.1E-03 |
| | | | | | | | | | |
| **Operations** | | | | | | | | | |
| All Alternatives | 5.6 | 0.049 | 180[(b)] | 140[(b)] | 0.18 | 1.1E-03 | 3300[(b)] | 1900[(b)] | 0.054[(b)] |
| | | | | | | | | | |
| **Propane Emissions** | | | | | | | | | |
| All Alternatives | 0.056 | 3.8E-4 | - | - | - | - | 320 | 180 | 0.052 |
| | | | | | | | | | |
| **Transportation of Capping Materials** | | | | | | | | | |
| All Alternatives | 15[(b)] | 0.14[(b)] | 85 | 65 | 0.26[(b)] | 2.4E-03[(b)] | 2700 | 1600 | 0.050 |

(a) Waste volume considered – Hanford Only (H), Lower Bound (L) and Upper Bound (U) waste volumes.
(b) Indicates the maximum air quality impact for each averaging period.

## E.4 Clean Air Act General Conformity Review

DOE guidance suggests a method to formally report how EIS actions relate to the Clean Air Act (CAA) (42 USC 7401), which implements General Conformity Requirements (DOE 2000). The CAA General Conformity Requirements method is, in general, another means to validate the acceptability of the release estimates resulting from an action. The guidance requires that a conformity review be conducted to determine if detailed analyses and reporting would be required for EIS actions to be conducted. It is intended to ensure that actions would not further impair or sustain current excesses of criteria pollutant levels. This review would allow faster implementation of the action once a record of decision or finding of no significant impact is issued. It is important to note that the emissions reported in a conformity review may be narrower than sources considered in an EIS air quality assessment (DOE 2000).

The conformity review process consists of answering four questions (see Table E.16). DOE (2000) recommends that a conformity review be conducted for each EIS alternative. Normally, a conformity review is not needed for the No Action Alternative (DOE 2000). The results of the conformity review are presented in Table E.16. As a result of the conformity review process, it has been determined that a Conformity Determination need not be conducted.

**Table E.16**. Clean Air Act Conformity Review for the Alternatives

| Question | All Alternative Groups |
|---|---|
| 1. Are criteria pollutants emitted? | Yes. |
| 2. Would criteria pollutant emissions occur in a non-attainment or maintenance area? | No, the Hanford Site is an attainment or unclassified area.[a] |
| 3. Is the action(s) exempt from the Clean Air Act Conformity Requirements? | No; therefore, the actions are not exempt outright from air quality requirements. |
| 4. What are the estimated emissions and how do they compare with the non-attainment (or maintenance) area threshold emission rates and emission inventory? | The Hanford Site is in an attainment or unclassified area. Also, the estimated maximum releases do not exceed Clean Air Act Criteria Pollutant standards. |
| (a) Ecology (2001). | |

## E.5 References

40 CFR 50. "National Primary and Secondary Ambient Air Quality Standards." Code of Federal Regulations. Online at: http://www.access.gpo.gov/nara/cfr/waisidx_01/40cfr50_01.html

42 USC 7401, et seq. Clean Air Act, as amended. Online at: http://www4.law.cornell.edu/uscode/42/7401.html

DOE. 2000. *Clean Air Act General Conformity Requirements and the National Environmental Policy Act Process*. U.S. Department of Energy, Environment, Safety, and Health, Office of NEPA Policy and Assistance. Online at: http://tis.eh.doe.gov/nepa/tools/guidance/caaguidance.pdf

DOE-RL. 1996. *100 Area Excavation Treatability Study Report.* DOE/RL-94-16, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology. 2001. "Hanford Air Operating Permit." Washington State Department of Ecology Publication Number 00-05-006. Olympia, Washington. Online at: http://www.ecy.wa.gov/programs/nwp/pdf/final%201.pdf

EPA. 1991. *Compilation of Air Pollution Emission Factors Vol II Mobile Sources. Supplement A.* AP-42, U.S. Environmental Protection Agency, Ann Arbor, Michigan.

EPA. 1995a. Section 13.2.3: Heavy Equipment Operation." Chapter 13 in *Compilation of Air Pollutant Emissions Factors*. *AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources*. AP-42, U.S. Environmental Protection Agency, Triangle Research Park, N.C. Online at: http://www.epa.gov/ttn/chief/ap42/

EPA. 1995b. *User's Guide for the Industrial Source Complex (ICS3) Dispersion Models. Volumes 1 & 2. User Instructions.* EPA-454/B-95-003a, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

EPA. 1996. "Liquefied petroleum gas combustion," *External Combustion Sources, Vol I (Chapter 1.5, Supplement B), Compilation of Air Pollution Emission Factors*. AP-42, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. Online at: http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s05.pdf

EPA. 2000. *Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements.* EPA 420-F-00-057, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. Online at: http://www.epa.gov/otaq/regs/hd2007/frm/f00057.pdf

FH. 2004. *Hanford Site Solid Waste Management Environmental Impact Statement Technical Information Document*. HNF-4755, Rev. 2., U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Grelinger, M. A., G. Muleski, J. S. Kinsey, C. Cowherd, and D. Hecht. 1988. *Gap Filling PM10 Emission Factors for Selected Open Area Dust Sources*. EPA-450/4-88-003, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Lide, D. R. (ed). 2001. *CRC Handbook of Chemistry and Physics, 2001-2002*, 82nd ed., CRC Press, Boca Raton, Florida.

NRC. 1972. *Onsite Meteorological Programs.* Regulatory Guide 1.23 (Safety Guide 23). U.S. Nuclear Regulatory Commission, Washington, D.C. Online at: http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active/index.html

Seinfeld, J. H. 1986. *Atmospheric Chemistry and Physics of Air Pollution*. John Wiley and Sons, Inc.: New York.