

Non-Radiological Air Quality Modeling for the High-Level Waste Salt Disposition Environmental Impact Statement

RECORDS ADMINISTRATION



R0208511

by

C. H. Hunter

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

DOE Contract No. **DE-AC09-96SR18500**

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WSRC-TR-99-00403 (Rev. 1)
(SRT-NTS-990141)

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Summary

This report summarizes the results of dispersion modeling for emissions of non-radiological air pollutants associated with the construction and operation of four alternatives for high-level waste salt disposition at SRS. These data are intended for use by DOE-Savannah River in the preparation of the salt disposition supplemental environmental impact statement (DOE/EIS-0082-S2).

Estimated maximum ground-level concentrations of applicable regulated air pollutants at the site boundary and at the distance to a hypothetical, co-located onsite worker (640 meters) are summarized in Tables 4-7 (facility operations) and 8-9 (facility construction). In all cases, model estimated ambient concentrations are less than regulatory standards.

Introduction

The salt disposition (SD) supplemental environmental impact statement (SEIS) defines four alternatives for processing highly radioactive salt solutions stored in the F and H Area Tank Farms: (1) small tank precipitation (STP) with sodium tetraphenylborate, (2) caustic-side solvent extraction (CSSX), (3) non-elutable Ion Exchange (IE) with crystalline silicotitanate, and (4) direct disposal in grout (DG) (DOE, 1998). Non-radiological air emissions associated with the construction and operation of facilities supporting each of these alternatives will include regulated 'criteria' and toxic air pollutants. The 'criteria' pollutants consist of sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), total suspended particulates (TSP), particulate matter less than 10 micron diameter (PM-10), ozone, lead, and gaseous fluorides. Ambient concentration standards for these pollutants are defined by South Carolina Department of Health and Environmental Control (SCDHEC) Air Pollution Regulation 61-62.5, Standard 2. Ambient standards for toxic air pollutants are defined by SCDHEC Air Pollution Regulation 61-62.5, Standard 8. These standards are applicable to the general public and, for SRS emissions, are evaluated at the site boundary.

In addition, the Occupational Safety and Health Administration (OSHA) has established ambient concentration standards for the workplace. These standards are defined in the Code of Federal Regulations, Chapter 29, Part 1910.1000 and are evaluated with respect to a hypothetical uninvolved (co-located) worker. For the purposes of the EIS, the co-located worker is generically defined to be 640 meters from the proposed facility.

To support preparation of this EIS, the SRTC Atmospheric Technologies Group was requested to model SD-related air emissions and evaluate the impacts of these emissions with respect to ambient standards. New facilities required to implement the STP, CSSX, and IE alternatives were assumed to be located at SD proposed Site B, about 950 feet southeast of DWPF (Gladden, 1999); new facilities required for the DG alternative were assumed to be located adjacent to the existing Saltstone facility in Z-area (Pike, 2000).

Methodology

Emissions Data

Estimates of non-radiological air emissions for each of the four SD alternatives were developed by High Level Waste Engineering (Pike, 2000). For each alternative, the primary sources of air pollution during SD operations will be a process building exhaust stack, a cold chemical feeds building exhaust stack, and two emergency diesel generators, which will be used for backup power. In addition, emissions associated with the STP, CSSX, and IE alternatives will include existing sources in Z-area (Saltstone processing facilities and an emergency diesel generator). The process canyon, cold feeds facility, and diesel generators constructed for the DG alternative are assumed to replace the existing Z-area sources.

Source configuration and emissions data by alternative are summarized in Tables 1 and 2, respectively. Data for the Z-area sources were taken from the current SRS Air Emissions Inventory (AEI) database (AEI source identifiers ZDE12, ZDP71, ZDP72, ZDP88, ZDP91, ZDT1, ZDT2) and Pike (2000). The two backup diesel generators were assumed to be identical to those currently operating at the Defense Waste Processing Facility (DWPF) (AEI source identifiers STE2, STE3). All emissions data, whether for new facilities or from the SRS Air Emissions Inventory, are considered maximum potential emissions. Emissions from process facilities are expected to be continuous. Maximum hourly emissions rates were used for all dispersion calculations with concentration averaging times 24 hours or less; otherwise, an average emission rate based on total annual emissions was used. Backup diesel generators are projected to operate 250 hours per year, primarily for testing. For modeling purposes, each unit was conservatively assumed to operate concurrently one hour per day (5 PM) at the hourly maximum potential emission rate.

Estimated emissions of regulated air pollutants associated with SD construction are summarized in Table 3. These emissions were calculated from standard EPA methods using data supplied by Sessions (1999). Construction-related sources of air pollution include criteria pollutants in the exhaust of diesel equipment, and particulate matter from excavation and transfers of soils, stirring of surface dust by the movement of heavy equipment, and the operation of a concrete batch plant. Emissions were determined for each of two distinct phases of construction, site preparation and facility construction. Site preparation is expected to require 120 ten-hour workdays; facility construction is expected to require 200 ten-hour workdays until completion. Construction requirements for each of the four alternatives were assumed to be identical.

Pollutant-specific emission rates for diesel exhaust were calculated from emission factors by equipment type (grams of pollutant per horsepower-hour), as defined in EPA (1991), and equipment inventories provided by Sessions (1999). The hourly emission rates shown in Table 3 for the four primary criteria pollutants are a sum of emissions over all equipment categories adjusted by an average use factor of 0.5 (the fraction of the vehicle fleet that is in use at any given time on the average).

Three sources of fugitive particulates (dust) were considered: the transfer of excavated soil to haul trucks for removal, grading activities, and the stirring of dust from cleared, unpaved surfaces by the movement of heavy equipment.

1. Fugitive emissions from batch transfer of soils to or from haul trucks (in kilograms of dust per megagram of soil transferred) are given by EPA (1995) as:

$$E = k (0.0016) (U/2.2)^{1.3} / (M/2)^{1.4} \quad (1)$$

where

k is a multiplier for particle size,

U is the mean wind speed at ground level, and

M is the moisture content of the soil.

The average ground level wind speed and soil moisture content were assigned values of 2.5 meters/sec (Hunter, 1997) and 0.25 percent (Looney, 1990), respectively. The multiplier k is given values of 1, 0.35, and 0.11 for total particulate matter (TPM), PM-10, and PM-2.5 (particulate matter less than 2.5 microns), respectively. The emissions estimates summarized in Table 3 (excavation) were based on 85,000 cubic yards (yd³) of soil excavated, transported, and dumped in an adjacent disposal area (2 transfers) and an additional 40,000 yd³ excavated and used for backfill (1 transfer). Hourly emission rates were based on the assumption that total emissions calculated from equation 1 occurred uniformly over 120 ten-hour days (Sessions, 1999).

2. Emission factors for grading operations, in pounds of particulates per vehicle mile, are defined by EPA (1998a) as:

$$E(\text{TPM}) = 0.04(S)^{2.5} \quad (2)$$

$$E(\text{PM-10}) = 0.031(S)^2 \quad (3)$$

$$E(\text{PM-2.5}) = 0.0012(S)^{2.5} \quad (4)$$

Average vehicle speed, S, was assumed to be 5 miles per hour. Total emissions from grading were based on a single grader operating 10 hours per day for 120 days.

3. Fugitive emissions from the movement of heavy vehicles over unpaved roads (in kilograms of dust per vehicle kilometer) is given by (EPA, 1998b) as:

$$E = k (s/12)^{0.8} (W/3)^{0.5} / (M/0.2)^{0.4} \quad (5)$$

where

s is the silt content of the soil,

W is the mean vehicle weight,

and M is the moisture content of the soil.

The average silt content of SRS soils is about 15 percent (Looney, 1990).

Emissions estimates were calculated using a fleet average weight of each category of vehicle identified in the equipment inventory (Sessions, 1999). The vehicle fleet was assumed to travel an average of 80 km/day on the construction site during the site preparation phase (primarily dump trucks) and between 10 km/day and 16 km/day during the facility construction.

Batch plant emissions were calculated using an emission factor of 0.06 pound TPM per cubic yard of concrete produced (EPA, 1986). Batch plant emissions in Table 3 are based on a plant with a capacity of 150 yd³ per hour (Pair, 1999).

Dispersion Model Configuration

Release 3 of the Environmental Protection Agency's Industrial Source Complex - Short Term (ISCST3) model (EPA, 1995) was used to perform calculations for:

- All operational emissions including process building stacks and diesel generators,
- Emissions from the exhaust of diesel-powered construction equipment, and
- Emissions from the concrete batch plant supporting construction

Model input parameters were set to invoke a 'regulatory default' option which utilizes generic values for the vertical profile of wind speed and potential temperature gradient and invokes algorithms to simulate stack wake downwash and enhanced mixing from turbulence generated by buoyant plumes, as applicable. In addition, the model was set to accommodate variable elevations for sources and receptors.

The receptor network used for all site boundary calculations consisted of a set of 180 grid points placed along the SRS perimeter. The receptor spacing ranged between 30m and 1 km depending on the configuration of the boundary and proximity to significant sources of air pollution. Receptor elevations were taken from U. S. Geological Survey 1:48000 scale maps. This receptor configuration is used for most regulatory modeling applications at SRS.

A polar grid configuration was used to calculate impacts to the hypothetical co-located worker. A total of 90 grid points were placed in 4 degree increments at the prescribed radial distance of 640 meters. In addition, the receptors were placed at an elevation of 1.8 meters above ground to simulate the breathing height of a typical adult.

The concentration averaging time for each calculation was set to the value specified by the SCDHEC or OSHA standards (see Tables 4 and 5, respectively). The OSHA standards are expressed either as an 8-hour time weighted average (TWA) or as a ceiling value. The ceiling values were determined by calculating a 1 hour average with ISCST3 (the minimum averaging period allowed by the model), then manually adjusting the one hour value to a 15-minute average using the following algorithm:

$$C_{15\text{min}} = C_{60\text{min}} (60/15)^{0.2} \text{ (EPA, 1988)}$$

where C is the ground-level concentration and averaging time is indicated by the subscript.

Meteorological data used in the calculations consisted of sequential hourly averages of wind speed, wind direction, turbulence intensity (stability), and temperature from the onsite meteorological tower network and concurrent hourly values of mixing height (rural) derived from twice-daily upper air data from Atlanta, GA. The onsite meteorological data are collected at a height of 200-feet above ground. A one-year data set for 1996 was used.

The EPA's Fugitive Dust Model (FDM) (EPA, 1992) was used to model 'fugitive' emissions of particulates from batch transfers of excavated soils and stirring produced by the movement of trucks, graders, and other heavy construction vehicles. The FDM is commonly used for this application because it can easily accommodate 'area' sources and because it uses superior algorithms for calculating deposition. Five particle size classes were defined for emissions of total particulates (greater than 500 μ , 100-500 μ , 10-100 μ , 1-10 μ , and less than 1 μ); three size classes were used for PM-10 emissions (5-10 μ , 1-5 μ , and less than 1 μ). The fraction of particulates assigned to each particle size class was derived from an analysis of SRS soil conducted by Looney (1990). Model default values for deposition velocity and gravitational settling by particle size class were used. Roughness length and average particle density were assigned values of 20 cm and 2 grams/cm³, respectively. The receptor arrays and the meteorological data set used for the FDM calculations were identical to those used for ISCST3.

Results

Impacts with Respect to SCDHEC Standards

Estimated site boundary concentration maxima for postulated emissions from SD operations are summarized in Table 4 (Standard 2 pollutants) and Table 5 (Standard 8 pollutants). These tables also summarize the most recent SRS 'baseline' concentration established for each of these pollutants. The baseline values consist of the sum of a calculated maximum site boundary concentration, based on maximum potential emissions from all sources of the pollutant at SRS (Hunter, 1998), and the maximum observed concentration of the pollutant (if available) at the nearest SCDHEC air monitoring station during 1997 (SCDHEC, 1998). The 'baseline' modeling included those sources that were not exempt from Clean Air Act Title V requirements. The SCDHEC Bureau of Air Quality uses the baseline values as a means of assessing the permitability of new or modified sources of air pollution at SRS.

For all alternatives, the incremental increase in the maximum site boundary concentration for each of the applicable Standard 2 pollutants is extremely small (less than one percent) with respect to the existing SRS baseline and does not result in a cumulative concentration that exceeds any of the ambient standards. (Note that Table 4 provides ambient concentrations of total volatile (reactive) organic compounds as a conservative bound on incremental increases in ozone concentration. Explicit modeling of ozone is not a regulatory requirement at this time). The maximum site boundary concentration of total VOC is higher for the STP alternative than for the other alternatives due to higher emissions of benzene.

Incremental increases in estimated maximum concentration of the Standard 8 pollutants are somewhat greater relative to 'baseline' concentrations than those observed for the Standard 2 pollutants; however, cumulative concentrations are also very small relative to the ambient standards. The baseline concentration listed in Table 5 for benzene includes sources that will be supplanted by SD implementation.

Table 6 summarizes the estimated cumulative increase in ambient pollution concentrations at the site boundary from implementation of the preferred SD alternative (STP) and the preferred alternatives for six additional activities planned for implementation at SRS (Disposition of Highly Enriched Uranium, Interim Management of Nuclear Materials, Tritium Extraction, Management of Plutonium Residues and Scrub Metal Alloy, Spent Nuclear Fuel, and High Level Waste Tank Closure). Again, the cumulative increase in air pollution emissions is not expected to adversely impact the ambient standards.

Impacts with Respect to the OSHA Standards

Concentration maxima for the hypothetical co-located worker are summarized in Table 7. Estimated concentrations for this receptor are negligible with respect to the applicable standards except for NO₂, which is approximately 90 percent of standard. The NO₂ emissions for all SD alternatives result from periodic operation of the diesel generators. Since concurrent operation of the diesels is highly unlikely, the estimated NO₂ concentration given in Table 7 should be considered quite conservative.

Impacts Related to SD Construction

Estimated concentration maxima from construction-related emissions are summarized in Table 8 (Standard 2 pollutants) and Table 9 (OSHA pollutants). Concentration maxima for each averaging time were computed for each of the two phases of construction. The values summarized in the tables are the higher of the two sets of calculations. Construction-related impacts are negligible with respect to both the SCDHEC and OSHA standards, except for NO₂ emissions which result in a concentration maximum that is approximately one-half the standard.

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Table 1. Source Data for Proposed SD Process Facilities (All Alternatives)

	SD Process Bldg	Cold Feeds
Stack Coordinates (UTM):		
Site B (S-Area)	440520E, 683652N	440520E, 683702N
Z-Area	440350E, 685000N	440300E, 685000N
Base Elevation (m):		
Site B (S-Area)	83.8	83.8
Z-Area	88.4	88.4
Release Height (m):	45	5
Exit Velocity (m/sec):	10	1.0
Stack Diameter (m):	1.5	0.5
Exit Temperature (K):	298	299

Source: Pike (2000) and Gladden (1999)

Table 2. Summary of Non-radiological Air Emissions for HLW SD Sources - Operations

Small Tank Precipitation

	Process Bldg.			Process Facility			Generators (2)			Z-Area		Total for STP Alternative (lb)
	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	Max (lb/hr)	Annual (lb)		
											Cold Feeds	
SOx	---	---	---	---	---	---	2.4	600	0.2	50	650	
TSP	---	---	---	---	---	---	3.6	900	1.4	1000	1900	
PM-10	---	---	---	---	---	---	2.4	600	0.8	200	800	
CO	---	---	---	---	---	---	39	9800	3.8	950	10,750	
VOC	56	93,500 (38,000)	16.0	6000	4.8	1200	---	---	9.1	11,850	112,000 (57,000)	
NOx	---	---	---	---	---	---	150	38,000	18	4500	42,500	
Lead	---	---	---	---	---	---	2.8E-3	0.7	2.4E-4	0.06	0.8	
Benzene	56	93,500 (38,000)	4.7	2100	6.4E-2	16	---	---	7.7	11500	107,000 (51,600)	
Mercury	5.4 E-4	4.8	---	---	6.9E-4	0.2	---	---	7.7E-5	0.2	5.2	
Biphenyl	---	---	4.7	2100	---	---	---	---	---	---	2100	
Methanol	---	---	3.3	840	---	---	---	---	---	---	840	
n-Propanol	---	---	3.3	840	---	---	---	---	---	---	840	
Formic Acid	0.18	3200	8 E-3	70	---	---	---	---	---	---	3270	
Beryllium	---	---	---	---	5.6E-4	0.1	---	---	4.6E-5	0.01	0.2	

Process building and cold feeds facility emissions are from Pike(2000); emissions for the two emergency generators are based on data for similar generators currently listed in the SRS Air Emissions Inventory; Z-area emissions are from Pike (2000) and the SRS Air Emissions Inventory and include the existing Salistone processing facilities and an existing diesel generator. Values in parenthesis for VOC and benzene are total emissions for this alternative excluding the existing precipitate hydrolysis process currently permitted for operation at DWPF. All values are maximum potential emissions.

Table 2. Summary of Non-radiological Air Emissions for HLW SD Sources – Operations (continued)

Caustic-Side Solvent Extraction

	Process Bldg			Process Facility			Generators			Z-Area		Total for IE Alternative (lb)
	Max (lb/h)	Annual (lb)	Cold Feeds	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	Max (lb/hr)	Annual (lb)	Max (lb/hr)	Annual (lb)	
SOx	---	---	---	2.4	600	0.2	50	650				
TSP	---	---	---	3.6	900	1.4	1000	1900				
PM-10	---	---	---	2.4	600	0.8	200	800				
CO	---	---	---	39	9800	3.8	950	10,750				
Volatile Organics	6.8	60,000	19700	4.8	1200	1.4	350	81,000				
NOx	---	---	---	150	38,000	18	4500	42,500				
Lead	---	---	---	2.8E-3	0.7	2.4E-4	0.06	0.8				
Benzene	---	---	---	6.4E-2	16	5.4E-3	1.4	17				
Mercury	5.4 E-4	4.8	---	6.9E-4	0.2	7.7E-5	0.2	5.2				
Methanol	---	---	840	---	---	---	---	840				
n-Propanol	---	---	840	---	---	---	---	840				
Beryllium	---	---	---	5.6E-4	0.1	4.6E-5	0.01	0.2				

Process building and cold feeds facility emissions are from Pike(2000); emissions for the emergency diesel generators are based on data for similar generators currently listed in the SRS Air Emissions Inventory; Z-area emissions are from the SRS Air Emissions Inventory and include the existing Saltstone processing facilities and a single diesel generator. All values are maximum potential emissions.

Table 2. Summary of Non-radiological Air Emissions for HLW SD Sources - Operations (continued)

Ion-Exchange

	Process Facility			Generators		Z-Area		Total for IE Alternative (lb)	
	Process Bldg		Cold Feeds		Max (lb/hr)	Annual (lb)	Max (lb/hr)		Annual (lb)
	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)					
SOx	---	---	---	---	2.4	600	0.2	50	650
TSP	---	---	---	---	3.6	900	1.4	1000	1900
PM-10	---	---	---	---	2.4	600	0.8	200	800
CO	---	---	---	---	39	9800	3.8	950	10,750
Volatile Organics	---	---	6.6	1700	4.8	1200	1.4	350	3250
NOx	---	---	---	---	150	38,000	18	4500	42,500
Lead	---	---	---	---	2.8E-3	0.7	2.4E-4	0.06	0.8
Benzene	---	---	---	---	6.4E-2	16	5.4E-3	1.4	17
Mercury	5.4 E-4	4.8	---	---	6.9E-4	0.2	7.7E-5	0.2	5.2
Methanol	---	---	3.3	840	---	---	---	---	840
n-Propanol	---	---	3.3	840	---	---	---	---	840
Beryllium	---	---	---	---	5.6E-4	0.1	4.6E-5	0.01	0.2

Process building and cold feeds facility emissions are from Pike(2000); emissions for the emergency diesel generators are based on data for a similar generator currently listed in the SRS Air Emissions Inventory; Z-area emissions are from the SRS Air Emissions Inventory and include the existing Saltstone processing facilities and a single diesel generator. All values are maximum potential emissions.

Table 2. Summary of Non-radiological Air Emissions for HLW SD Sources -- Operations (continued)

Direct Grout

	Process Facility						Total for DG Alternative (lb)
	Process Bldg.		Cold Feeds		Generators		
	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	Max (lb/h)	Annual (lb)	
SOx	---	---	---	---	2.4	600	600
TSP	0.1	700	---	---	3.6	900	1600
PM-10	---	---	---	---	2.4	600	600
CO	---	---	---	---	39	9800	9800
Volatile Organics	---	---	6.6	1700	4.8	1200	2900
NOx	---	---	---	---	150	38,000	38000
Lead	---	---	---	---	2.8E-3	0.7	0.7
Benzene	---	---	---	---	6.4E-2	16	16
Mercury	5.4 E-4	4.8	---	---	6.9E-4	0.2	5.0
Methanol	---	---	3.3	836	---	---	836
n-Propanol	---	---	3.3	836	---	---	836
Beryllium	---	---	---	---	5.6E-4	0.1	0.1

Process building and cold feeds facility emissions are from Pike(2000); emissions for the emergency diesel generators are based on data for similar generators currently listed in the SRS Air Emissions Inventory. All values are maximum potential emissions.

Table 3. Non-radiological Air Emissions from Construction (All Alternatives)

Vehicle Exhaust

	Maximum Rate (lb/hr)		Annual Total (lb)
	Facility Construction	Site Preparation	
Sulfur Oxides	13	7.2	26,000
Total Particulates	16	6.6	32,000
Carbon Monoxide	60	28	120,000
Nitrogen Oxides	150	78	300,000

Based on 200 ten-hour days during facility construction

Fugitive Dust

	Maximum Rate (lb/hr)				Annual Total (lb)		
	TPM	PM-10	PM-2.5	TPM	PM-10	PM-2.5	
Site preparation	20	7	2	24000	8400	2400	
Excavation/transfers	90	22	3	108,000	26400	3600	
Moving vehicles/ grading							
Facility construction	34	8	1.2	68000	16000	2400	
Moving vehicles	14			2800			
Batch Plant							

Note: Annual total emissions were based on a total of 120 ten-hour workdays for site preparation (excavation/transfers) and 200 10-hour workdays annually for facility construction.

Table 4. Estimated Maximum Ambient Concentration in ($\mu\text{g}/\text{m}^3$) at the SRS Boundary for Standard 2 Air Pollutants
-SD Operations.

Pollutant	Averaging Time	South Carolina Standard ^a	SRS Baseline ^b	Salt Disposition Alternative			
				STP	CSSX	IE	DG
Oxides of Sulfur	3-hr	1300	1244	0.3	0.3	0.3	0.4
	24-hr	365	349	0.04	0.04	0.04	0.05
	Annual	80	33.6	0.0004	0.0004	0.0004	0.0005
Total Particulates	Annual	75	67.1	0.001	0.001	0.001	0.001
	24-hr	150 (65)	132.7	0.07	0.07	0.07	0.07
Carbon Monoxide	Annual	50 (15)	25.3	0.001	0.001	0.001	0.001
	1-hr	40,000	10,354	15	15	15	18
	8-hr	10,000	6866	1.9	1.9	1.9	2.3
Ozone (as total VOC) ^c	1-hr	235	----- ^d	69	16	10	16
	(8-hr)	(175)		(11)	(3)	(1.9)	(2.1)
Oxides of Nitrogen	Annual	100	26.2	0.03	0.03	0.03	0.03
	Max. Quarter	1.5	0.03	4 x 10 ⁻⁷	4 x 10 ⁻⁷	4 x 10 ⁻⁷	4 x 10 ⁻⁷

^a From SCDHEC Air Pollution Reg. 61-62.5, Standard 2. Values in parenthesis are the revised standards recently promulgated by EPA for particulates (2.5 microns) and ozone; it is expected that the new standards will be incorporated into Standard 2 during the period of the SD project.

^b The SRS air quality compliance baseline consists of: the sum of a calculated maximum site boundary concentration from all sources of the indicated pollutant at SRS not exempt from Clean Air Act Title V requirements (based on maximum potential emissions from the 1998 Air Emissions Inventory data base) and the maximum concentration observed at the nearest SCDHEC air monitoring station in 1997. These baseline values are used by SCDHEC for air permit compliance assessments.

^c Dispersion modeling for emissions of total volatile (reactive) organic compounds provides a highly conservative bound on the potential impact to ambient concentrations of ozone; VOC concentration maxima given in the Table are for information only and should not be used for explicit assessments of ozone compliance.

^d SCDHEC does not presently require a Clean Air Act Title V baseline for ozone. The observed ozone maximum in the SRS vicinity during 1997 was 215.6 $\mu\text{g}/\text{m}^3$ (SCDHEC, 1998).

Table 5. Estimated Maximum 24-Hour Concentrations in ($\mu\text{g}/\text{m}^3$) at the SRS Boundary for Standard 8 Air Pollutants –
SD Operations

Pollutant	Averaging Time	South Carolina Standard ^a	SRS Baseline ^b	Tank Closure Alternative		
				STP	IE/CSSX	DG
Mercury	24-hr	0.25	0.03	0.00003	0.00003	0.00003
Benzene	24-hr	150	4.6	4.0	0.001	0.001
Methyl Alcohol	24-hr	1310	0.9	0.32	0.32	0.53
Biphenyl	24-hr	6	0.02	0.45	-----	-----
Formic Acid	24-hr	225	0.15	0.01	-----	-----
Beryllium	24-hr	0.01	0.009	0.00001	0.00001	0.00001

^a From SCDHEC Air Pollution Reg. 61-62.5, Standard 8

^b Values consist of a calculated maximum site boundary concentration from all sources of the indicated pollutant at SRS not exempt from Clean Air Act Title V modeling requirements (maximum potential emissions from the 1998 Air Emissions Inventory data base). These baseline values are used by SCDHEC for air permit compliance assessments. Note: Benzene releases from STP operations will supplant emissions from existing permitted sources that were used to define baseline.

Table 6. Estimated Cumulative Ground-Level Concentrations in ($\mu\text{g}/\text{m}^3$) of Non-radiological Air Pollutants at the SRS Boundary – SD Operations (Preferred Alternative) plus Emissions from Potential Future Activities

Pollutant	Averaging Time	SCDHEC Standard ^a	SRS Baseline ^b	Emissions from Proposed Salt Disposition	Emissions from Other New Sources ^c	Cumulative Impacts
Oxides of Sulfur	3-hr	1300	1244	0.3	4.8	1249
	24-hr	365	349	0.04	1.6	351
	Annual	80	33.6	0.0004	0.12	33.7
Total Particulates	Annual	75	67.1	0.001	0.07	67.2
Particulates < 10 μ	24-hr	150 (65)	132.7	0.07	0.26	133
	Annual	50 (15)	25.3	0.001	0.03	25.3
Carbon Monoxide	1-hr	40,000	10,354	1.5	84	10,453
	8-hr	10,000	6866	1.9	18	6886
Ozone (as total VOC) ^d	1-hr	235	----- ^e	69	1.4	70
	(8-hr)	(157)		(11)		
Oxides of Nitrogen	Annual	100	26.2	0.03	4.7	31
	Max. Quarter	1.5	0.03	4 x 10 ⁻⁷	<0.0001	0.03
Benzene	24-hr	150	4.6	4.0	<0.01	8.6
Formic Acid	24-hr	225	0.15	0.01	<0.01	0.16
Beryllium	24-hr	0.01	0.009	0.00001	0.00001	0.009

^a From SCDHEC Air Pollution Reg. 61-62.5, Standard 2. Values in parenthesis are the revised standards recently promulgated by EPA for particulates (2.5 microns) and ozone; it is expected that the new standards will be incorporated into Standard 2 during the period of the SD project.

Table 6. Estimated Cumulative Ground-Level Concentrations in ($\mu\text{g}/\text{m}^3$) of Non-radiological Air Pollutants at the SRS Boundary – SD Operations (Preferred Alternative) plus Emissions from Potential Future Activities (continued)

- ^b The SRS air quality compliance baseline consists of: the sum of a calculated maximum site boundary concentration from all sources of the indicated pollutant at SRS not exempt from Clean Air Act Title V requirements (based on maximum potential emissions from the 1998 Air Emissions Inventory data base) and the maximum concentration observed at the nearest SCDHEC air monitoring station in 1997. These baseline values are used by SCDHEC for air permit compliance assessments.
- ^c Based on model-estimated air concentration maxima at the SRS boundary for emissions from the following activities scheduled for implementation at SRS: Disposition of Highly Enriched Uranium (DOE/EIS-0240), Interim Management of Nuclear Materials (DOE/EIS-0220), Tritium Extraction Facility (DOE/EIS-0271), Management of Plutonium Residues and Scrub Metal Alloy (DOE/EIS-0277), Spent Nuclear Fuel (DOE/EIS-0279), and High Level Waste Tank Closure (DOE/EIS-0303).
- ^d Dispersion modeling for emissions of total volatile organic compounds provide a highly conservative bound on the potential impact to ambient concentrations of ozone; consequently VOC concentration maxima are for information only and should not be used for explicit assessments of ozone compliance.
- ^e SCDHEC does not require a Clean Air Act Title V baseline for ozone. The observed ozone maximum in the SRS vicinity during 1997 was $215.6 \mu\text{g}/\text{m}^3$ (SCDHEC, 1998).

Table 7. Estimated Maximum Concentration in (mg/m³) of Air Pollutants Regulated by OSHA^a – SD Operations

Pollutant	Averaging Time ^b	OSHA Standard ^b	EIS Alternatives			
			STP	IE/CSSX	DG	DG
Oxides of Sulfur	8-hr TWA	13	0.01	0.01	0.01	0.01
Total Particulates	8-hr TWA	15	0.02	0.02	0.01	0.01
Particulates < 10µ	8-hr TWA	5	0.02	0.02	0.01	0.01
Carbon Monoxide	8-hr TWA	55	0.2	0.2	0.2	0.2
Oxides of Nitrogen	Ceiling	9	7	7	7	7
Lead	8-hr TWA	0.5	0.00001	0.00001	0.00001	0.00001
Beryllium	8-hr	0.002	0.000003	0.000003	0.000003	0.000003
Mercury	Ceiling	0.005	0.00003	0.00003	0.00003	0.00003
Benzene	Ceiling	0.1	0.00003	0.00003	0.00004	0.00004
Formic Acid	8-hr	3.1	0.1	0.0003	0.0003	0.0003
Methyl alcohol	Ceiling	15.5	0.8	0.004	0.004	0.004
n-Propyl Alcohol	8-hr TWA	9	0.00022	-----	-----	-----
	8-hr TWA	260	0.08	0.08	0.08	0.08
	8-hr TWA	500	0.08	0.08	0.08	0.08

^a For a co-located onsite worker at a distance of 640 meters from the process building stack and a 1.8-meter breathing height.

^b From 29CFR 19.10.1000

Table 8. Estimated Maximum Concentrations in ($\mu\text{g}/\text{m}^3$) of Regulated Pollutants at the SRS Boundary – Construction

Pollutant	Averaging Time	South Carolina Standard ^a	SRS Baseline ^b	Max Concentration
Oxides of Sulfur	3-hr	1300	1244	5
	24-hr	365	349	0.7
Total Particulates	Annual	80	33.6	0.009
	Annual	75	67.1	0.04
Particulates < 10 μ	24-hr	150 (65)	132.7	2
	Annual	50 (15)	25.3	0.03
Carbon Monoxide	1-hr	40,000	10,354	70
	8-hr	10,000	6866	10
Oxides of Nitrogen	Annual	100	26.2	0.1

^a From SCDHEC Air Pollution Reg. 61-62.5, Standard 2. Values in parenthesis are the revised standards recently promulgated by EPA for particulates (2.5 microns) and ozone; it is expected that the new standards will be incorporated into Standard 2 during the period of the SD project.

^b The SRS air quality compliance baseline consists of: the sum of a calculated maximum site boundary concentration from all sources of the indicated pollutant at SRS not exempt from Clean Air Act Title V requirements (based on maximum potential emissions from the 1998 Air Emissions Inventory data base) and the maximum concentration observed at the nearest SCDHEC air monitoring station in 1997. These baseline values are used by SCDHEC for air permit compliance assessments.

Table 9. Estimated Maximum Concentration in (mg/m³) of Air Pollutants Regulated by OSHA^a – SD Construction

Pollutant	Averaging Time ^b	OSHA Standard ^b	Max Concentration
Oxides of Sulfur	8-hr TWA	13	0.05
Total Particulates	8-hr TWA	15	0.5
PM-10	8-hr TWA	5	0.5
Carbon Monoxide	8-hr TWA	55	0.3
Oxides of Nitrogen	Ceiling	9	6

^a For a co-located onsite worker at a distance of 640 meters from the process building stack and a 1.8-meter breathing height.

^b From 29CFR1910.1000