APPENDIX K
METHOD FOR ESTIMATING NONRADIOLOGICAL AIR QUALITY IMPACTS

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K.1 Introduction

This appendix presents the methodology used to estimate nonradiological air quality concentrations for each alternative evaluated in this environmental impact statement (EIS). Air quality impacts were assessed by estimating onsite and offsite concentrations of criteria pollutants and toxic air pollutants of environmental concern and comparing them to Federal and state health-based ambient air quality standards. Sources for potential air quality impacts include particulate matter (PM) generated by onsite activities and combustion product releases from operating construction equipment and other equipment and vehicles. The extent of the activities and modeled results varies among the alternatives, with the highest peak year emissions under the Sitewide Close-In-Place Alternative for most pollutants, and the lowest peak year emissions under the No Action or Phased Decisionmaking Alternatives.

Ambient air quality monitoring is conducted in the region to demonstrate that air emissions do not result in violation of the ambient air quality standards. The State of New York has adopted ambient air quality standards for carbon monoxide, sulfur dioxide, and nitrogen dioxide comparable to the National Ambient Air Quality Standards (NAAQS) set by the U.S. Environmental Protection Agency (EPA) to protect public health and welfare. In addition, the state has adopted ambient standards for suspended particulates, settleable particulates, nonmethane hydrocarbons, fluorides, beryllium, and hydrogen sulfide. The state uses the annual standard for suspended particulates (PM with an aerodynamic diameter less than or equal to 10 micrometers [PM_{10}]) of 45 micrograms per cubic meter for prediction purposes. The state has not yet adopted the 8-hour ozone standard or the $PM_{2.5}$ (PM with an aerodynamic diameter less than or equal to 2.5 micrometers) standard. For the purpose of analysis, the more restrictive of the Federal and state ambient standards, as shown in **Table K–1,** is used for assessing compliance and potential for impacts on public health and welfare (40 *Code of Federal Regulations* [CFR] 50, 6 New York Code of Rules and Regulations [NYCRR] Part 257). The Western New York Nuclear Service Center (WNYNSC) and the surrounding area in Cattaraugus County are in attainment for all regulated pollutants as described in Chapter 3, except for the northern portion of WNYNSC in Erie County, which is classified as nonattaining for the ozone 8-hour standard. The city of Buffalo, located about 48 kilometers (30 miles) from WNYNSC, and Erie and Niagara Counties are designated as nonattainment areas for ozone (8-hour averaging). The NAAQS are health-based and generally require that short-term (1 to 24 hours) and annual average concentrations of certain common criteria pollutants do not exceed specified levels. These levels were established at concentrations EPA has determined are "necessary, with an adequate margin of safety, to protect the public health" (40 CFR Part 50.2, "National Primary and Secondary Ambient Air Quality Standards"). These standards, or more-restrictive state standards, were used as a basis for comparing the nonradiological air impacts of implementing each alternative.

Five nonradiological air pollutants are of potential concern under the alternatives: nitrogen dioxide, sulfur dioxide, PM_{10}, $PM_{2.5}$, and carbon monoxide. Lead would be produced in such small quantities under the alternatives considered that it was not considered in this analysis. Ozone is not directly emitted, but results from emissions of precursor pollutants, including nitrogen dioxide and volatile organic compounds. These pollutants are quantified in this analysis, and nitrogen dioxide is evaluated separately. In addition to the criteria pollutants of concern, toxic pollutants, including benzene, toluene, xylene, and other pollutants, are emitted from diesel- and gasoline-fueled equipment. For the purpose of this EIS, benzene was evaluated as one of the primary toxic pollutants from gasoline equipment. To evaluate the effect of activities on ambient air quality, the following criteria pollutants were modeled using the EPA dispersion model Industrial Source Complex

Short Term 3 (ISCST3): carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, and sulfur dioxide (EPA 1995, 2002, 2003a). Concentrations of benzene were also modeled. Modeling results presented in this appendix are derived from emission estimates for the alternatives based on information in the technical reports prepared for each alternative and regional and site-specific meteorological data. Emissions reported in the technical reports represent a conservative (worst-case) estimate for compiling emissions during closure because it was assumed that no mitigative measures to control emissions would be used, except 75 percent control of fugitive dust on unpaved roads using chemical controls and water sprays (EPA 2006). Generally, the use of mitigative control measures during excavation, grading, and construction can reduce fugitive dust and PM_{10} emissions by as much as 80 percent (EPA 2003b). The emissions inventory included fugitive dust as total suspended particulates. It was assumed 36 percent of total suspended particulates could be considered to be PM_{10} (EPA 2006) for the fugitive dust component of the emissions inventory, and that 15 percent of PM_{10} was $PM_{2.5}$ (MRI 2006).

Table K–1 Applicable Ambient Air Quality Standards

Pollutant	*Averaging Period*	*Most Stringent Standard* [a] *(micrograms per cubic meter)*
Carbon monoxide	8-hour 1-hour	10,000 [b] 40,000 [b]
Nitrogen dioxide	Annual	100 [b]
PM_{10} [c]	Annual 24-hour	45 [d] 150 [b]
$PM_{2.5}$	Annual 24-hour	15 [e] 35 [e]
Sulfur dioxide	Annual 24-hour [f] 3-hour [f]	80 [b] 365 [b] 1,300 [b]
Benzene	Annual 1-hour	0.13 [g] 1,300 [g]

PM_{10} = particulate matter less than or equal to 10 micrometers in diameter, $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter.

[a] The more stringent of the Federal and New York State standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The 24-hour PM_{10} standard is attained when the standard is not exceeded more than once per year over a 3-year average. The annual $PM_{2.5}$ standard is attained when the 3-year average of the weighted annual mean concentration does not exceed the standard. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98^{th} percentile of the 24-hour concentrations does not exceed the standards. The 8-hour ozone standard is met when the average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to the standard (40 CFR 50).

[b] Federal and New York State standard.

[c] New York State also has particulate matter (PM_{10}) standards, applicable to this area, for 30-, 60-, and 90-day averaging periods of 80, 70, and 65 micrograms per cubic meter, respectively, but assesses the prediction of conformity on the annual average concentration.

[d] New York State standard.

[e] Federal standard.

[f] New York State also has 3- and 24-hour standards for sulfur dioxide, which are met when 99 percent of the concentrations during a year do not exceed the standard value. For the purpose of assessing predicted conformity, the state considers meeting the standards shown (not to be exceeded more than once per year) to be adequate.

[g] New York State air toxic guidance.

Sources: 40 CFR 50, 6 NYCRR 257, NYSDEC 2003.

Emissions were estimated for shipment of waste and other materials for each alternative based on the number of shipments, total travel distances, and emission factors for heavy-duty diesel trucks. The emission factors were calculated using EPA's MOBILE 6.2 vehicle emission factor model (EPA 2003c). These calculations were based on the higher of the truck shipment numbers presented in Chapter 4, Section 4.1.12, of this EIS.

Emissions for rail shipment were not calculated because the fuel efficiency of rail shipments is higher than truck shipments, being on average approximately three or more times more fuel efficient than trucks (AAR 2008). Thus, the corresponding emissions from rail shipments on a ton-mile basis would be expected to be less than the truck shipments reported in this EIS by a factor of three or more.

K.2 Model Description

A dispersion modeling approach using ISCST3 (EPA 1995, 2002) was used to estimate nonradiological pollutant (i.e., carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, sulfur dioxide, and benzene) concentrations at the WNYNSC boundary and along public roads through WNYNSC (see Chapter 3, Figure 3–2, of this EIS for the boundary and nearby roads). Emission rates by pollutant, activity, and year were used to estimate maximum concentrations. The ISCST3 is an EPA dispersion model applicable to areas in complex terrain. U.S. Geological Survey Digital Elevation Model data for the region were used to determine receptor elevations for a polar grid having 16 compass directions (22.5 degrees from north through 360 degrees) at 5 different radial distances (1.6, 3.2, 4.8, 6.4, and 8.0 kilometers [1, 2, 3, 4, and 5 miles]) from the center of the grid. The center of the grid was chosen to be a point centrally located in the West Valley Demonstration Project (WVDP) and was located near the southwest corner of Waste Management Area (WMA) 2. In addition, elevations were determined for special receptors in each direction at the nearest public access (road) and at the WNYNSC boundary. **Tables K–2** and **K–3** summarize the direction, distance, and elevation of each modeled receptor location (directions for the polar grid are shown in **Figure K–1** for reference). The use of the elevation data is discussed in the *ISCST3 User's Guide* (EPA 1995). Where there is elevated simple terrain, the ISCST3 model assumes the mixing height follows the terrain, and the plume stays at the same elevation. The wind speed is a function of height above the surface. Initial runs were made that indicated that the maximum concentrations would occur at the roadway receptors or the WNYNSC boundary. Therefore, concentration runs for each pollutant and alternative were made only for the roadway and WNYNSC boundary receptors.

Table K–2 Elevations at Polar Grid Receptors for ISCST3 Modeling (meters)

Compass Orientation		*Downwind Distance*				
Heading	***Direction***	***1,600***	***3,200***	***4,800***	***6,400***	***8,000***
22.5º	NNE	402	434	391	364	408
45.0º	NE	421	497	486	434	424
67.5º	ENE	440	498	481	518	570
90.0º	E	458	472	479	546	629
112.5º	ESE	426	434	566	540	605
135.0º	SE	422	412	443	561	627
157.5º	SSE	438	442	579	527	603
180.0º	S	462	581	546	610	588
202.5º	SSW	537	557	581	522	590
225.0º	SW	516	533	426	552	538
247.5º	WSW	538	494	414	452	492
270.0º	W	527	476	388	421	469
292.5º	WNW	474	422	409	395	329
315.0º	NW	460	413	389	410	410
337.5º	NNW	412	372	399	420	441
360.0º	N	360	414	363	418	423

ISCST3 = Industrial Source Complex Short Term 3.
Note: To convert meters to feet, multiply by 3.2808.

Table K–3 Elevations at Special Receptor Locations for ISCST3 Modeling (meters)

Compass Orientation		*Nearest Public Access* [a]		*Service Center Fence Line*	
Heading	***Direction***	***Distance***	***Elevation***	***Distance***	***Elevation***
22.5º	NNE	1,067	369	1,638	409
45.0º	NE	914	373	1,372	421
67.5º	ENE	838	378	1,753	421
90.0º	E	991	378	2,286	457
112.5º	ESE	1,105	386	2,438	436
135.0º	SE	1,181	419	2,629	421
157.5º	SSE	914	423	2,515	500
180.0º	S	838	434	2,286	494
202.5º	SSW	495	439	2,248	530
225.0º	SW	381	442	2,210	555
247.5º	WSW	381	445	1,676	536
270.0º	W	457	427	1,524	524
292.5º	WNW	610	439	1,295	476
315.0º	NW	1,372	442	1,524	451
337.5º	NNW	1,905	375	1,905	375
360.0º	N	1,295	369	2,248	396

ISCST3 = Industrial Source Complex Short Term 3.
[a] Although receptors were included along the rail line (receptors in direction NNW through ESE) they were not included in the analysis of short-term concentrations, since this rail line is not in use by the public.
Note: To convert meters to feet, multiply by 3.2808.

The input parameters for ISCST3 include hourly meteorological data, upper air data, receptor location, terrain elevation, emission rate, and source location. Site-specific data for the period 1998 through 2002 were obtained from the onsite meteorological station. This was the most recent data set available when the analysis was begun and is considered to be representative of the site. Upper air data (twice-daily mixing heights) were obtained for the Buffalo National Weather Service Station for 1998 through 2002. The surface and upper air data sets were preprocessed using an EPA code, Meteorological Processor for Regulatory Models (EPA 1996, 1999), to format the data for use in ISCST3.

The mixing height data are derived values, presented twice daily, and were obtained from the National Climatic Data Center, Asheville, North Carolina. The Buffalo station was selected because it is most representative of the WNYNSC location (latitude and longitude) and station elevation.

Values for total emissions by alternative by year were calculated using data from the technical reports (WSMS 2009a–d). These emission estimates were calculated using EPA emission factors as discussed in the technical reports (WSMS 2009e). Emission rates were annualized and converted to grams per second for each alternative. For the purpose of analysis, it was assumed that the work schedule included an 8-hour workday, a 7-day workweek, and 52 workweeks per year. If the activities were to be conducted over only a 5-day workweek, this would result in concentrations 40 percent higher. Annual emissions by alternative used as input to the modeling are summarized in **Table K–4**. Annual emissions for similar activities that occur under more than one alternative vary as a result of the duration of the activity under each alternative. Descriptions of the activities as they would occur under each alternative are provided in Chapter 2 of this EIS. To conservatively estimate impacts, it was assumed that all implementation actions during each year would occur simultaneously.

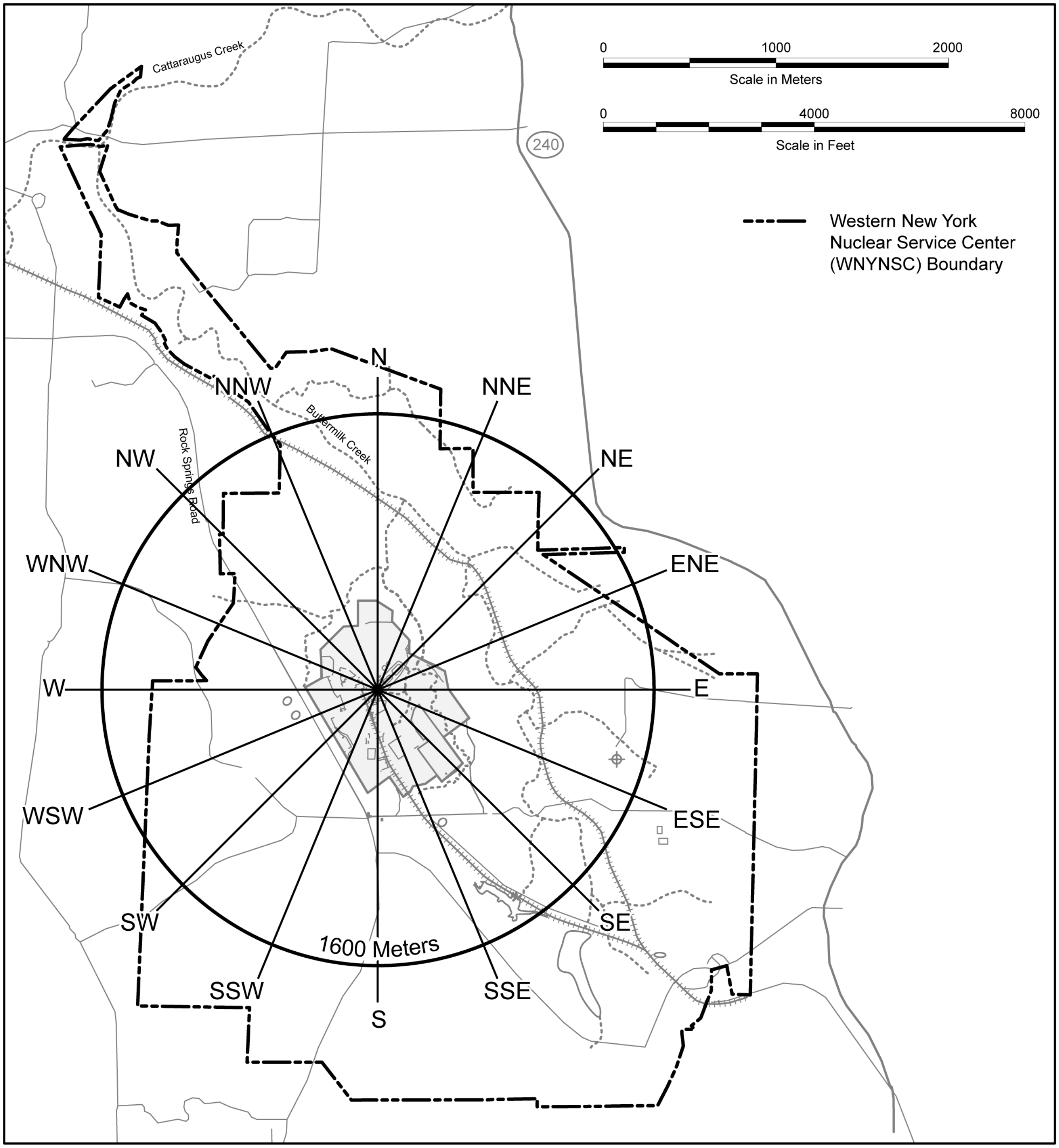

Figure K–1 Directions for Polar Grid

Table K–4 Emissions in Tons Per Year by Alternative

Activities for Each Alternative	*Period*		*Emissions*						
	Start Year	*End Year*	*Carbon Monoxide (tons per year)*	*Nitrogen Dioxide (tons per year)*	*PM_{10} (tons per year)*	*$PM_{2.5}$ (tons per year)*	*Sulfur Dioxide (tons per year)*	*Benzene (tons per year)*	*Nonmethane Hydrocarbons (tons per year)*
Sitewide Removal Alternative									
High-level Radioactive Waste Canister Removal – Construction of Dry Cask Storage Area	4	5	0.51	0.71	0.27	0.06	< 0.01	< 0.01	0.09
High-level Radioactive Waste Canister Removal – Load-In/Load-Out Modification and Operation	4	5	0.27	0.32	0.02	0.02	< 0.01	< 0.01	0.02
High-level Radioactive Waste Canister Removal – Operation of Dry Cask Storage Area	5	35	0.03	0.04	0.00	0.00	< 0.01	< 0.01	0.00
High-level Radioactive Waste Canister Removal – Demolition of Dry Cask Storage Area	36	38	0.2	0.34	0.19	0.04	< 0.01	< 0.01	0.06
WMA 1 Closure – Surface Structure Removal	5	11	4.6	3.34	4.51	0.82	0.01	< 0.01	0.66
WMA 1 Closure – Subsurface Soil Removal	11	15	0.58	0.86	2.23	0.38	< 0.01	< 0.01	0.11
WMA 2 Closure	56	58	1.27	1.9	1.72	0.35	0.01	< 0.01	0.24
WMA 3 Removal of Surface Structures	20	20	0.84	1.13	1.47	0.26	< 0.01	< 0.01	0.17
WMA 3 Closure – WTF WPF Construction	15	20	3.54	1.43	0.33	0.13	< 0.01	< 0.01	0.25
WMA 3 Closure – WTF WPF Operation	20	39	0.8	0.97	0.07	0.07	0.01	< 0.01	0.06
WMA 3 Closure – WTF WPF Demolition	40	47	1.03	2.12	1.66	0.33	< 0.01	< 0.01	0.43
WMA 4 Closure	56	59	0.1	0.25	0.31	0.06	< 0.01	< 0.01	0.03
WMA 5 Closure	59	59	4.59	2.23	3.43	0.6	< 0.01	< 0.01	0.46
WMA 6 Closure	59	59	0.24	0.32	0.74	0.12	< 0.01	< 0.01	0.05
Leachate Treatment Facility Construction	1	3	0.23	0.05	0.01	0.0	< 0.01	< 0.01	0.01
Leachate Treatment Facility Operation	4	52	0.07	0.08	0.01	0.01	< 0.01	< 0.01	< 0.01
Leachate Treatment Facility Closure	53	53	0.59	0.26	0.1	0.03	< 0.01	< 0.01	0.04
Container Management Facility Construction	1	3	13.5	2.78	0.41	0.23	0.01	0.02	0.61
Container Management Facility Operation	4	52	0.64	0.81	0.06	0.06	< 0.01	< 0.01	0.06
Container Management Facility Closure	53	56	2.9	1.08	1.02	0.2	< 0.01	< 0.01	0.19
WMA 7 Closure – Surface Structure Removal	1	1	0.1	0.11	2.78	0.42	< 0.01	< 0.01	0.02
WMA 7 Closure – Interceptor Trench Excavation	1	1	0.06	0.13	0.34	0.06	< 0.01	< 0.01	0.02
WMA 7 Closure – NDA EE Construction	1	3	4.54	1.15	0.09	0.08	< 0.01	0.01	0.22
WMA 7 Closure – WVDP Area EE Construction	3	4	0.24	0.59	0.09	0.03	< 0.01	< 0.01	0.13
WMA 7 Closure – NDA MSEE Construction	4	21	0.04	0.07	0.0	0.0	< 0.01	< 0.01	0.01
WMA 7 Closure – NDA Excavation/Backfill	4	21	0.57	0.72	0.2	0.07	< 0.01	< 0.01	0.06
WMA 7 Closure – WVDP Area EE Demolition	21	25	0.16	0.26	0.6	0.1	< 0.01	< 0.01	0.04

Activities for Each Alternative	*Period*		*Emissions*						
	Start Year	***End Year***	***Carbon Monoxide (tons per year)***	***Nitrogen Dioxide (tons per year)***	***PM_{10} (tons per year)***	***$PM_{2.5}$ (tons per year)***	***Sulfur Dioxide (tons per year)***	***Benzene (tons per year)***	***Nonmethane Hydrocarbons (tons per year)***
WMA 7 Closure – NDA EE Demolition	21	25	9.53	1.21	0.8	0.21	< 0.01	0.01	0.28
WMA 8 Closure – Surface Structure Removal	21	21	0.37	0.16	0.04	0.01	< 0.01	< 0.01	0.02
WMA 8 Closure – South SDA EE Construction	26	31	4.36	1.03	4.12	0.68	< 0.01	0.01	0.2
WMA 8 Closure – North SDA EE Construction	19	21	6.3	1.57	3.23	0.57	< 0.01	0.01	0.30
WMA 8 Closure – SDA MSEE Construction	22	52	0.08	0.15	0.01	0.01	< 0.01	< 0.01	0.03
WMA 8 Closure – Lagoon Confinement Construction	22	23	2.47	0.62	0.06	0.04	< 0.01	< 0.01	0.12
WMA 8 Closure – SDA Waste Excavation	22	52	0.85	1.06	0.36	0.12	0.01	< 0.01	0.07
WMA 8 Closure – Lagoon Confinement Demolition	36	39	4.44	0.54	0.18	0.07	< 0.01	0.01	0.13
WMA 8 Closure – North SDA EE Demolition	36	45	6.28	0.86	0.91	0.2	< 0.01	0.01	0.2
WMA 8 Closure – South SDA EE Demolition	52	56	17.7	2.31	0.36	0.22	0.01	0.02	0.54
WMA 9 Closure	1	1	0.63	1.51	1.22	0.24	< 0.01	< 0.01	0.25
WMA 10 Closure	59	59	0.36	0.85	8.45	1.29	< 0.01	< 0.01	0.13
WMA 11 Closure	59	59	0.1	0.22	0.31	0.05	< 0.01	< 0.01	0.03
WMA 12 Closure	59	60	1.2	1.62	2.16	0.39	< 0.01	< 0.01	0.21
Soil Drying Facility Construction	8	10	0.82	0.94	7.68	1.19	< 0.01	< 0.01	0.17
Soil Drying Facility Operation (also years 48-55)	11	15	0.76	0.98	1.35	0.26	0.01	< 0.01	0.07
Soil Drying Facility Closure	56	58	9.45	1.22	1.45	0.3	< 0.01	0.01	0.28
North Plateau Groundwater Plume	48	55	0.54	1.69	16.4	2.5	< 0.01	< 0.01	0.26
Cesium Prong	55	58	0.32	0.51	1.64	0.27	< 0.01	< 0.01	0.05
Monitoring and Maintenance	1	58	0.33	0.28	0.01	0.01	< 0.01	< 0.01	0.01
Security	1	60	0.36	0.31	0.02	0.02	< 0.01	< 0.01	0.02
Sitewide Close-In-Place Alternative									
High-level Radioactive Waste Canister Removal – Construction of Dry Cask Storage Area	1	1	1.02	1.42	0.54	0.12	< 0.01	< 0.01	0.18
High-level Radioactive Waste Canister Removal – Load-In/Load-Out Modification and Operation	1	2	0.27	0.32	0.03	0.03	< 0.01	< 0.01	0.02
High-level Radioactive Waste Canister Removal – Operation of Dry Cask Storage Area	3	32	0.03	0.04	0.00	0.00	< 0.01	< 0.01	< 0.01
High-level Radioactive Waste Canister Removal – Demolition of Dry Cask Storage Area	33	33	0.51	0.88	0.05	0.05	< 0.01	< 0.01	0.18
WMA 1 Closure	1	7	3.62	2.03	2.08	0.4	0.01	< 0.01	0.41
WMA 2 Closure	3	5	0.49	0.92	7.29	1.12	< 0.01	< 0.01	0.13
WMA 3 Surface Structure Removal	2	2	0.59	1.05	1.12	0.21	< 0.01	< 0.01	0.13
WMA 3 Grouting Operations	3	5	0.08	0.15	0.25	0.04	< 0.01	< 0.01	0.03

Activities for Each Alternative	***Period***		***Emissions***						
	Start Year	***End Year***	***Carbon Monoxide (tons per year)***	***Nitrogen Dioxide (tons per year)***	***PM_{10} (tons per year)***	***$PM_{2.5}$ (tons per year)***	***Sulfur Dioxide (tons per year)***	***Benzene (tons per year)***	***Nonmethane Hydrocarbons (tons per year)***
North Plateau Cap Construction	5	7	1.09	1.89	9.32	1.45	< 0.01	< 0.01	0.29
WMA 4 Closure	1	6	0.00	0.00	0.00	0.00	< 0.01	0.0	0.00
WMA 5 Closure	7	7	0.59	1.6	0.5	0.12	< 0.01	< 0.01	0.36
WMA 6 Closure	7	7	0.14	0.08	0.13	0.02	< 0.01	< 0.01	0.01
WMA 6 Leachate Treatment Facility Construction	1	1	0.69	0.16	0.02	0.02	< 0.01	< 0.01	0.03
WMA 6 Leachate Treatment Facility Operation	2	6	0.64	0.76	0.06	0.06	< 0.01	< 0.01	0.04
WMA 6 Leachate Treatment Facility Closure	6	6	0.59	0.26	0.1	0.03	< 0.01	< 0.01	0.04
WMA 7 Closure	2	6	3.17	1.67	6.83	1.08	< 0.01	< 0.01	0.31
WMA 8 Closure	2	6	16.7	6.12	54.7	8.45	0.01	0.02	1.28
WMA 9 Closure	1	1	0.53	1.33	1.13	0.21	< 0.01	< 0.01	0.23
WMA 10 Closure	7	7	0.06	0.22	0.1	0.02	< 0.01	< 0.01	0.03
WMA 12 Closure	7	7	0.02	0.09	0.06	0.01	< 0.01	< 0.01	0.01
North Plateau Groundwater Plume (nonsource area)	5	5	0.04	0.01	0.01	0.00	< 0.01	< 0.01	0.00
Existing Facility Maintenance	1	6	0.23	0.18	0.01	0.01	0.01	< 0.01	0.02
Security [a]	1	60	0.2	0.17	0.01	0.01	< 0.01	< 0.01	0.01
Environmental Monitoring Installations	7	7	0.37	2.24	1.29	0.23	< 0.01	< 0.01	0.31
Security Installations	7	7	1.0	0.44	2.45	0.39	< 0.01	< 0.01	0.06
Erosion Control System Replacement (assume WMA 8)	6	7	7.81	20.2	79.0	12.3	0.01	0.01	3.27
Long-term Monitor/Maintain [a]	8	60	1.4	0.19	5.13	0.79	< 0.01	< 0.01	0.11
North Plateau Groundwater Plume Permeable Reactive Barrier Replacement (also Years 40 and 60)	20	20	0.08	0.06	0.1	0.02	< 0.01	< 0.01	0.01
Phased Decisionmaking Alternative (Phase 1)									
High-level Radioactive Waste Canister Removal – Construction of Dry Cask Storage Area	1	1	1.02	1.42	0.54	0.12	< 0.01	0.0008	0.18
High-level Radioactive Waste Canister Removal – Load-In/Load-Out Modification and Operation	1	2	0.27	0.32	0.03	0.03	< 0.01	< 0.01	0.02
High-level Radioactive Waste Canister Removal – Operation of Dry Cask Storage Area	3	29	0.03	0.04	< 0.01	< 0.01	< 0.01	< 0.01	0.00
High-level Radioactive Waste Canister Removal – Demolition of Dry Cask Storage Area	30	30	0.61	1.03	0.58	0.13	< 0.01	< 0.01	0.19
WMA 1 Closure – Surface Structure Removal	1	4	8.05	5.85	7.89	1.43	0.01	0.007	1.16
WMA 1 Closure – Subsurface Soil Removal	4	8	0.58	0.84	2.25	0.38	< 0.01	0.0001	0.11
WMA 2 Closure	5	8	1.03	1.47	1.29	0.27	0.01	0.0002	0.17
WMA 3 Closure	3	3	0.98	0.9	1.35	0.25	< 0.01	0.0006	0.12

Activities for Each Alternative	Period		Emissions						
	Start Year	End Year	Carbon Monoxide (tons per year)	Nitrogen Dioxide (tons per year)	PM_{10} (tons per year)	$PM_{2.5}$ (tons per year)	Sulfur Dioxide (tons per year)	Benzene (tons per year)	Nonmethane Hydrocarbons (tons per year)
WMA 5 Closure	5	7	1.53	0.74	1.14	0.2	< 0.01	0.0017	0.15
WMA 6 Closure	7	7	0.18	0.18	0.57	0.1	0.00	0.0001	0.03
WMA 7 Maintenance	1	30	0.07	0.05	< 0.01	< 0.01	< 0.01	< 0.0001	0.00
WMA 8 Maintenance	1	30	0.18	0.15	0.01	0.01	< 0.01	0.0001	0.01
WMA 9 Closure	5	7	0.21	0.5	0.41	0.08	< 0.01	< 0.0001	0.09
WMA 10 Closure	7	7	0.11	0.3	6.96	1.06	< 0.01	< 0.0001	0.04
WMA 12 Closure	7	7	0.11	0.19	0.01	0.01	< 0.01	< 0.0001	0.03
Environmental Monitoring Installations	8	8	0.37	2.24	1.29	0.23	< 0.01	< 0.0001	0.31
Security Installations	8	8	1.0	0.44	2.45	0.39	< 0.01	0.0012	0.06
Annual Environmental Monitoring	8	30	1.24	0.45	0.02	0.02	< 0.01	0.0015	0.07
North Plateau Groundwater Plume Permeable Reactive Barrier Replacement	20	20	0.07	0.16	0.09	0.02	0.00	< 0.0001	0.02
SDA (WMA 8) Geomembrane Replacement	15	15	0.29	0.38	12.7	1.94	< 0.01	< 0.0001	0.03
Existing Facility Maintenance	1	7	0.89	0.71	0.05	0.05	< 0.01	0.0004	0.05
Security	1	30	0.29	0.25	0.02	0.02	< 0.01	0.0001	0.02
No Action Alternative									
WVDP Annual Maintenance [b]	1	60	1.02	0.86	0.07	0.07	0.005	0.00	0.05
SDA Annual Maintenance [b]	1	60	0.1	0.11	0.01	0.01	0.0	0.00	0.01
Process Building Roof Replacement [c]	16	16	1.8	0.36	0.03	0.03	0.002	0.00	0.02
Other Roof Replacements [c]	11	11	0.61	0.13	0.01	0.01	0.000	0.00	0.01
SDA Geomembrane Replacement [c]	15	15	0.54	2.71	8.63	1.32	0.002	0.00	0.32
NDA Geomembrane Replacement [c]	22	22	0.13	1.05	3.21	0.49	0.000	0.00	0.11
Permeable Treatment Wall Media Replacement [d]	20	20	0.05	0.06	0.01	0.01	0.000	0.00	< 0.01

EE = Environmental Enclosure, MSEE = Modular Shielded Environmental Enclosure, NDA = NRC [U.S. Nuclear Regulatory Commission]-Licensed Disposal Area, PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter, SDA = State-Licensed Disposal Area, WMA = Waste Management Area, WTF WPF = Waste Tank Farm Waste Processing Facility, WVDP = West Valley Demonstration Project.

[a] For the purposes of analysis, the time period analyzed for the Sitewide Close-In-Place Alternative was assumed to be 60 years. Long-term monitoring and maintenance and security would continue in perpetuity with small annual air pollutant emissions.

[b] For the purposes of analysis, the time period analyzed for the No Action Alternative was assumed to be 60 years. WVDP and SDA annual maintenance would continue in perpetuity with very small annual air pollutant emissions.

[c] These activities would recur approximately every 25 years.

[d] This activity would recur approximately every 20 years.

Note: To convert tons to metric tons, multiply by 0.90718.

Sources: WSMS 2009a, 2009b, 2009c, 2009d.

Nitrogen dioxide and nonmethane hydrocarbon emissions, which are ozone precursors, were compared to 2002 county emissions of nitrogen dioxide and volatile organic compounds for each alternative. The comparison of the peak year emissions to the county emissions by alternative is presented in **Table K–5**. The 2002 emissions data was the most recent year for which EPA reported county data on its Air Data Website.

Table K–5 Comparison of Ozone Precursor Emissions to Cattaraugus County Emissions by Alternative (percent) [a]

Pollutant	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Nitrogen dioxide	0.23	0.97	0.25	0.11
Nonmethane hydrocarbons	0.02	0.08	0.02	0.01

[a] Based on the most recent year reported (2002) in the EPA Air Data database (EPA 2009).

K.3 Summary of Modeling Results

Air pollutant concentrations were modeled for carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, sulfur dioxide, and benzene for the years with highest emissions. Concentrations were modeled at the WNYNSC boundary and along public roads passing through WNYNSC. Short-term concentrations along the rail line through WNYNSC were not evaluated as the rail line is not used by the public. Emission estimates for shipments of waste and other materials are presented in Section K.4.

K.3.1 Sitewide Removal Alternative

Under the Sitewide Removal Alternative, the highest concentrations for both PM_{10} (Year 55) and $PM_{2.5}$ (Year 55) would be attributed to activity at the North Plateau Groundwater Plume. The highest concentration for carbon monoxide, nitrogen dioxide, and benzene (Year 56) would be attributed to WMA 8 closure. The highest concentrations appropriate for comparison to the ambient standards and guidelines for each pollutant and averaging time and corresponding ambient standards are presented in **Table K–6**. Concentrations to which the public would be exposed are expected to be below the ambient standards, with the exception of $PM_{2.5}$, when background concentrations are included. Background concentrations are based on the nearest available ambient monitoring data as discussed in Chapter 3, Section 3.7, of this EIS.

K.3.2 Sitewide Close-In-Place Alternative

Under the Sitewide Close-In-Place Alternative, the highest concentration for PM_{10}, $PM_{2.5}$, carbon monoxide, sulfur dioxide, benzene, and nitrogen dioxide (Year 6) would be attributed to WMA 1 closure, North Plateau Cap construction, WMA 8 closure, and Erosion Control System replacement. The highest concentrations appropriate for comparison to the ambient standards and guidelines for each pollutant and averaging time and corresponding ambient standards are presented in Table K–6. Concentrations to which the public would be exposed are expected to be below the ambient standards when background concentrations are included, with the exception of PM_{10} and $PM_{2.5}$. PM_{10} and $PM_{2.5}$ 24-hour concentrations would be above the ambient standards. Concentrations are above standard without addition of background concentrations.

Table K–6 Nonradiological Air Pollutant Concentrations by Alternative

Criteria Pollutant	Averaging Period	Most Stringent Standard or Guideline (micrograms per cubic meter) [a]	Maximum Incremental Concentration (micrograms per cubic meter) [b]				Background Concentration (micrograms per cubic meter) [c]
			Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1)	No Action Alternative	
Carbon monoxide	8 hours 1 hour	10,000 40,000	304 1,070	223 1,270	141 641	39.4 214	3,500 7,000
Nitrogen dioxide	Annual	100	0.64	1.49	0.518	0.163	30
PM_{10}	Annual 24 hours	45 150	1.37 29.7	7.02 262 [e]	0.607 24.5	0.411 16.6	13 28
$PM_{2.5}$	Annual 24 hours	15 35	0.23 4.65 [d]	1.1 40.2 [e]	0.119 4.09 [d]	0.0651 2.43	11 34
Sulfur dioxide	Annual 24 hours 3 hours	80 365 1,300	0.00195 0.109 0.442	0.0017 0.0833 0.5	0.0016 0.0948 0.489	0.00041 0.0364 0.203	7.9 34 94
Benzene	Annual 1 hours	0.13 1,300	0.00204 1.3	0.00154 1.29	0.0005 0.539	0 0	Not reported Not reported

PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. The 24-hour PM_{10} standard is met when the expected number of exceedances is 1 or less over a 3-year period. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of the 98^{th} percentile 24-hour averages is less than or equal to the standard. The annual $PM_{2.5}$ standard is met when the 3-year average of the annual means is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. These values have been converted to micrograms per cubic meter.

[b] Concentrations were analyzed at locations to which the public has continual access and at the WNYNSC boundary.

[c] Based on available regional monitoring data as discussed in Chapter 3, Section 3.7, of this EIS.

[d] Standard could be exceeded when background is added to the modeled increment for this alternative.

[e] Standard could be exceeded.

K.3.3 Phased Decisionmaking Alternative

Under Phase 1 of the Phased Decisionmaking Alternative, the highest concentration for carbon monoxide, nitrogen dioxide, sulfur dioxide, and benzene (Year 1) would be attributed to WMA 1 closure – surface structure removal. The highest concentrations for PM_{10} (Year 15) would be attributed to the State-Licensed Disposal Area (SDA) geomembrane replacement. The highest concentrations for $PM_{2.5}$ (Year 7) would be attributed to WMA 10 closure. The highest concentrations appropriate for comparison to the ambient standards and guidelines for each pollutant and averaging time and corresponding ambient standards are presented in Table K–6. Concentrations to which the public would be exposed are expected to be below the ambient standards, with the exception of $PM_{2.5}$, when background concentrations are included.

K.3.4 No Action Alternative

Under the No Action Alternative, the highest concentration for all air pollutants would occur in the years when Process Building roof replacement or SDA geomembrane replacement activities occur. For the purpose of this analysis, those are years 15 and 16. These activities would recur approximately every 25 years. The highest concentrations appropriate for comparison to the ambient standards and guidelines for each pollutant and averaging time and corresponding ambient standards are presented in Table K–6. Concentrations to which the public would be exposed are expected to be below the ambient standards, with the exception of $PM_{2.5}$, when background concentrations are included.

K.4 Comparison of Modeling Results

Table K–6 summarizes modeling results for each alternative, along with regional background concentrations measured at urban and suburban sites in Buffalo, New York, and ambient air quality standards for each modeled pollutant. For comparison, the highest average values are presented for carbon monoxide, nitrogen dioxide, sulfur dioxide, benzene, annual PM_{10}, and annual $PM_{2.5}$. The 98^{th} percentile 24-hour value for $PM_{2.5}$ is presented (represented by the average eighth highest 24-hour value) and the average sixth high 24-hour value for PM_{10} is presented (as recommended by EPA for comparison to the standard).

Regional background concentrations (see Chapter 3) are less than the ambient standards for all the modeled pollutants. The estimated WNYNSC boundary concentrations for each alternative would be below those for the regional background and below the ambient standards, except for 24-hour PM_{10} and $PM_{2.5}$ concentrations. The sum of background concentrations and the modeled results for all pollutants at all locations would be less than the ambient air quality standards, except for PM_{10} and $PM_{2.5}$. The ambient standards were developed based on criteria to protect public health and welfare. Therefore, the modeling results indicate that the impact on public health of nonradiological emissions (except for PM_{10} and $PM_{2.5}$) would be minor under all alternatives.

Generally, it can be concluded that nonradiological air quality impacts under the No Action Alternative would be less than those under the other alternatives. The Sitewide Close-In-Place Alternative results in the highest peak incremental short-term concentrations, except for carbon monoxide (8-hour) and benzene, for which the Sitewide Removal Alternative has the highest concentrations. For Phase 1 of the Phased Decisionmaking Alternative, impacts principally occur over the first 8 years of alternative implementation. Impacts from Phase 2 activities would be expected to be bounded by the Sitewide Removal Alternative and the Sitewide Close-In-Place Alternative. The impacts of the Sitewide Removal Alternative occur over a period of about 60 years. Most of the activities with larger emissions for the Sitewide Close-In-Place Alternative occur in the first 7 years.

Air quality impacts in Canada from the activities under the alternatives considered would be negligible as a result of the distance to the nearest border, and the low release height of the nonradiological pollutants. As discussed in Chapter 4, Section 4.1.5.1, of this EIS, the Region of Influence is the area in which concentrations of criteria pollutants would increase more than a significant amount. This distance is expected to be a few kilometers from the source. The increases in concentration resulting from the peak year of activity under each alternative are presented in Table K–6 and are less than the significance levels at the WVDP boundary, except for PM_{10} for all alternatives and for nitrogen dioxide for the Sitewide Close-In-Place Alternative. In the Region of Influence (8 kilometers [5 miles]) in the direction of the closest distance to the Canadian border, the PM_{10} concentrations under the Sitewide Close-In-Place Alternative are estimated to be 0.535 and 10.8 micrograms per cubic meter, respectively, for the annual and 24-hour averaging periods, just below the significance level for the annual average and above for the 24-hour average. At the Canadian border (50 kilometers [31 miles]), the PM_{10} concentrations under the Sitewide Close-In-Place Alternative are estimated to be 0.0489 and 1.4 micrograms per cubic meter, respectively, for the annual and 24-hour averaging periods. Concentrations from other alternatives would be less. As most of the nonradiological releases are from construction-type equipment, which releases exhaust close to the ground, and particulate emissions from soil disturbance within a few feet of the ground, the highest concentrations are generally expected to occur on or near the site.

Emissions from shipping wastes and other materials by truck are shown by alternative in **Table K–7**. The highest emissions would be from the Sitewide Removal Alternative, and the lowest from the No Action Alternative. Emissions from shipment by rail would be expected to be less by a factor of 3 or more.

Table K–7 Nonradiological Emissions from Trucking Shipments of Waste and Other Materials (metric tons)

Pollutant	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Carbon monoxide	1,440	17.9	201	9.67
Nitrogen dioxide	5,050	62.9	704	33.9
PM_{10}	142	1.77	19.9	0.957
$PM_{2.5}$	118	1.46	16.4	0.79
Volatile organic compounds	247	3.07	34.4	1.66

PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter.

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