

APPENDIX M

**ADDITIONAL MATERIAL SUPPORTING THE HUMAN HEALTH RISK
ASSESSMENT**

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway	
Current	Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Site Worker	Adult	Ingestion	Quant	Current site worker may perform limited outdoor caretaker activities such as brush cutting and trimming trees.	
						Dermal	Quant		
				Trespasser	Adolescent (12 to 18 years)	Ingestion	Quant		Trespassers may occasionally access the site. The site is posted for no trespassing.
						Dermal	Quant		
				Recreational User	Youth (6 to 18 years)	Ingestion	Quant		Trespassers may occasionally access the site. The site is posted for no trespassing.
						Dermal	Quant		
		Air	Launch Area at the Former Nike BU-34/35 site	Site Worker	Adult	Inhalation	Quant	Current site worker may perform limited outdoor caretaker activities such as brush cutting and trimming trees.	
				Trespasser	Adolescent (12 to 18 years)	Inhalation	Qual	Trespassers may occasionally access the site. The site is posted, but not fenced.	
				Recreational User	Youth (6 to 18 years)	Inhalation	Qual	Site may be used for recreational activities. The site is posted for no trespassing, but not fenced.	
Future	Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Site Worker (new construction)	Adult	Ingestion	Quant	Future commercial/industrial building may be constructed onsite. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground	
						Dermal	Quant		
				Site Worker (reuse of silos)	Adult	Ingestion	Quant		Silos may be reused (e.g., silos may be used for storage). Workers may be exposed to surface and subsurface soil at site.
						Dermal	Quant		
				Construction Worker	Adult	Ingestion	Quant		Site may be developed for future commercial/industrial or residential use. Construction workers may be exposed to surface and subsurface soil during construction and excavation activities.
						Dermal	Quant		

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Future	Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Resident	Adult	Ingestion	Quant	Site may be developed for future residential use. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.	
						Dermal	Quant		
					Child (0-6 years)	Ingestion	Quant		
						Dermal	Quant		
				Trespasser	Adolescent (12 to 18 years)	Ingestion	Quant		Trespassers may occasionally access the site. The site is posted, but not fenced. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.
						Dermal	Quant		
		Recreational User	Youth (6 to 18 years)	Ingestion	Quant	Site may be used for recreational activities. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.			
				Dermal	Quant				
		Air	Launch Area at the Former Nike BU-34/35 site	Site Worker (new construction)	Adult	Inhalation	Qual	Future commercial/industrial building may be constructed onsite. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground	
				Site Worker (reuse of silos)	Adult	Inhalation	Qual	Silos may be reused (e.g., silos may be used for storage). Workers may be exposed to surface and subsurface soil at site.	
Construction Worker	Adult			Inhalation	Quant	Site may be developed for future commercial/industrial or residential use. Construction workers may be exposed to surface and subsurface soil during construction and excavation activities.			

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Future	Soil	Air	Launch Area at the Former Nike BU-34/35 site	Resident	Adult	Inhalation	Qual	Site may be developed for future residential use. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.	
					Child (0-6 years)	Inhalation	Qual		
				Trespasser	Adolescent (12 to 18 years)	Inhalation	Qual		Trespassers may occasionally access the site. The site is posted, but not fenced. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.
				Recreational User	Youth (6 to 18 years)	Inhalation	Qual		Site may be used for recreational activities. Construction activities may result in current surface and subsurface soil being mixed and exposed at ground surface.
	Groundwater	Groundwater	Tap Water	Site Worker (new construction)	Adult	Ingestion	Quant	Future commercial/industrial building may be constructed onsite and groundwater may be used as potable water supply.	
						Dermal	None	Workers not expected to bath at work.	
			Water in Silo	Site Worker (reuse of silos)	Adult	Ingestion	Quant	Silos may be reused (e.g., silos may be used for storage) and workers may contact groundwater that has infiltrated into silos.	
						Dermal	Quant		
			Tap Water	Resident	Adult	Adult	Ingestion	Quant	Site may be developed for future residential use and groundwater may be used as a potable water supply.
							Dermal	Quant	
						Child (0-6 years)	Ingestion	Quant	
							Dermal	Quant	

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Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Air	Water Vapors at Showerhead	Site Worker (new construction)	Adult	Inhalation	None	No VOC detected in groundwater
			Water Vapors from Water in Silo	Site Worker (reuse of silos)	Adult	Inhalation	None	
			Water Vapors at Showerhead	Resident	Adult	Inhalation	None	
					Child (0-6 years)	Inhalation	None	

Quant: will be quantitatively evaluated.

Qual: will be qualitatively evaluated.

None: Not considered to be a significant exposure pathway, and therefore not evaluated.

Table 2.1
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current/Future
 Medium: Surface Soil
 Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site	7429-90-5	Aluminum	4.1E+03	1.4E+04	MG/KG	SB18-02	26 / 26	-	1.4E+04	N/A	7.7E+03 N	N/A		NO	BKG
	7440-36-0	Antimony	9.7E-02 J	3.1E-01	MG/KG	SB4-02	26 / 26	-	3.1E-01	N/A	3.1E+00 N	N/A		NO	BSL
	7440-38-2	Arsenic	5.1E+00	1.1E+01	MG/KG	SB18-02	26 / 26	-	1.1E+01	N/A	6.8E-01 C	N/A		NO	BKG
	7440-39-3	Barium	2.8E+01	1.0E+02	MG/KG	SB11-00	26 / 26	-	1.0E+02	N/A	1.5E+03 N	N/A		NO	BSL
	7440-41-7	Beryllium	3.2E-01	1.4E+00	MG/KG	SB9-02	26 / 26	-	1.4E+00	N/A	1.6E+01 N	N/A		NO	BSL
	7440-43-9	Cadmium	1.8E-01 J	8.2E-01	MG/KG	SB18-02	26 / 26	-	8.2E-01	N/A	7.1E+00 N	N/A		NO	BSL
	7440-70-2	Calcium	1.4E+03	1.8E+05	MG/KG	TP-1-1.5	26 / 26	-	1.8E+05	N/A	N/A	N/A		NO	NUT
	7440-47-3	Chromium	6.7E+00	2.2E+01	MG/KG	SB4-02	26 / 26	-	2.2E+01	N/A	3.0E-01 C	N/A		NO	BKG
	7440-48-4	Cobalt	6.5E+00	1.6E+01	MG/KG	SB4-02	26 / 26	-	1.6E+01	N/A	2.3E+00 N	3.0E+01	NYSDEC SCO	NO	BKG
	7440-50-8	Copper	1.6E+01	5.0E+01	MG/KG	SB8-02	26 / 26	-	5.0E+01	N/A	3.1E+02 N	N/A		NO	BSL
	7439-89-6	Iron	1.5E+04	3.3E+04	MG/KG	SB18-02	26 / 26	-	3.3E+04	N/A	5.5E+03 N	2.0E+03	NYSDEC SCO	NO	BKG
	7439-92-1	Lead	8.8E+00	2.6E+01	MG/KG	TP-2-1	26 / 26	-	2.6E+01	N/A	4.0E+02 L	N/A		NO	BSL
	7439-95-4	Magnesium	2.0E+03	1.7E+04	MG/KG	SB5-01	26 / 26	-	1.7E+04	N/A	N/A	N/A		NO	NUT
	7439-96-5	Manganese	1.9E+02	1.2E+03	MG/KG	SB9-02, TP-2-1	26 / 26	-	1.2E+03	N/A	1.8E+02 N	N/A		NO	BKG
	7439-97-6	Mercury	1.9E-02 J	1.0E-01	MG/KG	SB11-00	26 / 26	-	1.0E-01	N/A	2.3E+00 N	N/A		NO	BSL
	7440-02-0	Nickel	1.8E+01	5.5E+01	MG/KG	SB4-02	26 / 26	-	5.5E+01	N/A	1.5E+02 N	N/A		NO	BSL
	7440-09-7	Potassium	5.8E+02	1.2E+03	MG/KG	SB17-2, SB18-02, SB4-02	26 / 26	-	1.2E+03	N/A	N/A	N/A		NO	NUT
	7782-49-2	Selenium	8.2E-01 J	1.9E+00	MG/KG	SB4-02	26 / 26	-	1.9E+00	N/A	3.9E+01 N	N/A		NO	BSL
	7440-22-4	Silver	2.1E-02 J	1.0E-01	MG/KG	SB10-02	26 / 26	-	1.0E-01	N/A	3.9E+01 N	N/A		NO	BSL
	7440-23-5	Sodium	4.0E+01 J	1.7E+02	MG/KG	SB9-02	16 / 26	110 - 130	1.7E+02	N/A	N/A	N/A		NO	NUT
	7440-28-0	Thallium	2.3E-01	9.3E-01	MG/KG	SB18-02	26 / 26	-	9.3E-01	N/A	7.8E-02 N	N/A		NO	BKG
	7440-62-2	Vanadium	1.3E+01	2.8E+01 J	MG/KG	SB10-02	26 / 26	-	2.8E+01 J	N/A	3.9E+01 N	1.0E+02	NYSDEC SCO	NO	BSL
	7440-66-6	Zinc	5.2E+01	1.4E+02 J	MG/KG	SB18-02, SB6-02	26 / 26	-	1.4E+02 J	N/A	2.3E+03 N	N/A		NO	BSL
	11096-82-5	Aroclor 1260	1.7E-02 J	1.7E-02 J	MG/KG	SB14-00	1 / 26	0.035 - 0.043	1.7E-02 J	N/A	2.4E-01 C	N/A		NO	BSL
	90-12-0	1-Methylnaphthalene	2.3E-01 J	2.3E-01 J	MG/KG	SB17-2	1 / 26	0.37 - 0.81	2.3E-01 J	N/A	1.8E+01 C	N/A		NO	BSL
	105-67-9	2,4-Dimethylphenol	2.3E-01 J	2.3E-01 J	MG/KG	SB18-00	1 / 26	0.37 - 0.81	2.3E-01 J	N/A	1.3E+02 N	N/A		NO	BSL
	91-57-6	2-Methylnaphthalene	4.3E-01	4.3E-01	MG/KG	SB17-2	1 / 26	0.37 - 0.81	4.3E-01	N/A	2.4E+01 N	4.1E-01	NYSDEC SCO	NO	BSL
	83-32-9	Acenaphthene	1.7E+00	1.7E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.7E+00	N/A	3.6E+02 N	N/A		NO	BSL
	120-12-7	Anthracene	3.2E+00	3.2E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	3.2E+00	N/A	1.8E+03 N	N/A		NO	BSL
	56-55-3	Benz(a)Anthracene	4.0E+00	4.0E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	4.0E+00	N/A	1.1E+00 C	N/A		YES	ASL
	191-24-2	Benzo (g,h,i) Perylene	2.4E-01 J	1.6E+00	MG/KG	SB17-2	2 / 26	0.37 - 0.81	1.6E+00	N/A	1.8E+02 N	N/A		NO	BSL
	50-32-8	Benzo(a)Pyrene	1.7E-01 J	2.8E+00	MG/KG	SB17-2	3 / 26	0.37 - 0.43	2.8E+00	N/A	1.1E-01 C	N/A		YES	ASL
	205-99-2	Benzo(b)Fluoranthene	2.8E-01 J	3.0E+00	MG/KG	SB17-2	2 / 26	0.37 - 0.43	3.0E+00	N/A	1.1E+00 C	N/A		YES	ASL
	207-08-9	Benzo(k)Fluoranthene	1.5E+00	1.5E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.5E+00	N/A	1.1E+01 C	N/A		NO	BSL
65-85-0	Benzoic Acid	2.4E+00	2.4E+00	MG/KG	SB18-00	1 / 26	1.9 - 4.1	2.4E+00	N/A	2.5E+04 N	1.0E+02	NYSDEC SCO	NO	BSL	

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 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
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Scenario Timeframe: Current/Future
 Medium: Surface Soil
 Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site (cont.)	86-74-8	Carbazole	1.3E+00	1.3E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.3E+00	N/A	N/A	N/A		NO	NTX
	218-01-9	Chrysene	3.4E+00	3.4E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	3.4E+00	N/A	1.1E+02 C	N/A		NO	BSL
	132-64-9	Dibenzofuran	1.1E+00	1.1E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.1E+00	N/A	7.3E+00 N	N/A		NO	BSL
	206-44-0	Fluoranthene	2.0E-01 J	6.3E-01 J	MG/KG	SB3-1	7 / 25	0.37 - 0.43	6.3E-01 J	N/A	2.4E+02 N	N/A		NO	BSL
	86-73-7	Fluorene	1.7E+00	1.7E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.7E+00	N/A	2.4E+02 N	N/A		NO	BSL
	193-39-5	Indeno(1,2,3-cd)Pyrene	2.0E-01 J	1.4E+00	MG/KG	SB17-2	2 / 26	0.37 - 0.81	1.4E+00	N/A	1.1E+00 C	N/A		YES	ASL
	91-20-3	Naphthalene	1.8E+00	1.8E+00	MG/KG	SB17-2	1 / 26	0.37 - 0.81	1.8E+00	N/A	3.8E+00 C	N/A		NO	BSL
	129-00-0	Pyrene	1.3E-01 J	3.2E-01 J	MG/KG	SB3-1	2 / 25	0.37 - 0.43	3.2E-01 J	N/A	1.8E+02 N	N/A		NO	BSL

- [1] Minimum/Maximum detected concentrations.
 [2] Maximum concentration is used for screening.
 [3] Background values not available.
 [4] Oak Ridge National Laboratory (ORNL). June, 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. Resident Soil.
 RSLs based on noncancer based on hazard quotient of 0.1, RSLs based on cancer based on cancer risk of 10⁻⁶.
 RSL value for chromium(VI) used for chromium.
 RSL value for mercuric chloride (and other mercury salts) used as surrogate for mercury.
 RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.
 The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
 [5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
 Deletion Reason: No Toxicity Information (NTX)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Statistically Similar to Background Concentrations (BKG)

COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
 To Be Considered
 J = Estimated Value
 L = screening value from the Revised Interim Soil lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
 C = Carcinogenic
 N = Noncarcinogenic
 MG/KG = Milligrams per kilogram
 N/A = Not applicable or not available
 NYSDEC SCO = New York State Department of Environmental Conservation
 Supplemental Soil Cleanup Objectives. Residential. (October, 2010)
 RSL = USEPA Regional Screening Levels (June, 2017)

Table 2.2
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current/Future
 Medium: Surface Soil
 Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site	7429-90-5	Aluminum	1.9E-03	6.5E-03	UG/M3	SB18-02	26 / 26	N/A	6.5E-03	N/A	5.2E-01 N	N/A		NO	BSL
	7440-36-0	Antimony	4.5E-08 J	1.4E-07	UG/M3	SB4-02	26 / 26	N/A	1.4E-07	N/A	N/A	N/A		NO	NTX
	7440-38-2	Arsenic	2.4E-06	5.1E-06	UG/M3	SB18-02	26 / 26	N/A	5.1E-06	N/A	6.5E-04 C	N/A		NO	BSL
	7440-39-3	Barium	1.3E-05	4.6E-05	UG/M3	SB11-00	26 / 26	N/A	4.6E-05	N/A	5.2E-02 N	N/A		NO	BSL
	7440-41-7	Beryllium	1.48E-07	6.5E-07	UG/M3	SB9-02	26 / 26	N/A	6.5E-07	N/A	1.2E-03 C	N/A		NO	BSL
	7440-43-9	Cadmium	8.3E-08 J	3.8E-07	UG/M3	SB18-02	26 / 26	N/A	3.8E-07	N/A	N/A	N/A		NO	NTX
	7440-70-2	Calcium	6.5E-04	8.3E-02	UG/M3	TP-1-1.5	26 / 26	N/A	8.3E-02	N/A	N/A	N/A		NO	NUT
	7440-47-3	Chromium	3.1E-06	1.0E-05	UG/M3	SB4-02	26 / 26	N/A	1.0E-05	N/A	1.2E-05 C	N/A		NO	BSL
	7440-48-4	Cobalt	3.0E-06	7.4E-06	UG/M3	SB4-02	26 / 26	N/A	7.4E-06	N/A	3.1E-04 C	N/A		NO	BSL
	7440-50-8	Copper	7.4E-06	2.3E-05	UG/M3	SB8-02	26 / 26	N/A	2.3E-05	N/A	N/A	N/A		NO	NTX
	7439-89-6	Iron	6.9E-03	1.5E-02	UG/M3	SB18-02	26 / 26	N/A	1.5E-02	N/A	N/A	N/A		NO	NTX
	7439-92-1	Lead	4.1E-06	1.2E-05	UG/M3	TP-2-1	26 / 26	N/A	1.2E-05	N/A	1.5E-01 L	N/A		NO	BSL
	7439-95-4	Magnesium	9.2E-04	7.8E-03	UG/M3	SB5-01	26 / 26	N/A	7.8E-03	N/A	N/A	N/A		NO	NUT
	7439-96-5	Manganese	8.8E-05	5.5E-04	UG/M3	SB9-02, TP-2-1	26 / 26	N/A	5.5E-04	N/A	5.2E-03 N	N/A		NO	BSL
	7439-97-6	Mercury	8.8E-09 J	4.6E-08	UG/M3	SB11-00	26 / 26	N/A	4.6E-08	N/A	3.1E-02 N	N/A		NO	BSL
	7440-02-0	Nickel	8.3E-06	2.5E-05	UG/M3	SB4-02	26 / 26	N/A	2.5E-05	N/A	9.4E-03 N	N/A		NO	BSL
	7440-09-7	Potassium	2.7E-04	5.5E-04	UG/M3	SB17-2, SB18-02, SB4-02	26 / 26	N/A	5.5E-04	N/A	N/A	N/A		NO	NUT
	7782-49-2	Selenium	3.8E-07 J	8.8E-07	UG/M3	SB4-02	26 / 26	N/A	8.8E-07	N/A	2.1E+00 N	N/A		NO	BSL
	7440-22-4	Silver	9.7E-09 J	4.6E-08	UG/M3	SB10-02	26 / 26	N/A	4.6E-08	N/A	N/A	N/A		NO	NTX
	7440-23-5	Sodium	1.8E-05 J	7.8E-05	UG/M3	SB9-02	16 / 26	N/A	7.8E-05	N/A	N/A	N/A		NO	NUT
	7440-28-0	Thallium	1.1E-07	4.3E-07	UG/M3	SB18-02	26 / 26	N/A	4.3E-07	N/A	N/A	N/A		NO	NTX
	7440-62-2	Vanadium	6.0E-06	1.3E-05 J	UG/M3	SB10-02	26 / 26	N/A	1.3E-05 J	N/A	1.0E-02 N	N/A		NO	BSL
	7440-66-6	Zinc	2.4E-05	6.5E-05 J	UG/M3	SB18-02, SB6-02	26 / 26	N/A	6.5E-05 J	N/A	N/A	N/A		NO	NTX
	11096-82-5	Aroclor 1260	1.0E-05 J	1.0E-05 J	UG/M3	SB14-00	1 / 26	N/A	1.0E-05 J	N/A	4.9E-03 C	N/A		NO	BSL
	90-12-0	1-Methylnaphthalene	3.1E-03 J	3.1E-03 J	UG/M3	SB17-2	1 / 26	N/A	3.1E-03 J	N/A	N/A	N/A		NO	NTX
	105-67-9	2,4-Dimethylphenol	1.1E-07 J	1.1E-07 J	UG/M3	SB18-00	1 / 26	N/A	1.1E-07 J	N/A	N/A	N/A		NO	NTX
	91-57-6	2-Methylnaphthalene	5.9E-03	5.9E-03	UG/M3	SB17-2	1 / 26	N/A	5.9E-03	N/A	N/A	N/A		NO	NTX
	83-32-9	Acenaphthene	9.6E-03	9.6E-03	UG/M3	SB17-2	1 / 26	N/A	9.6E-03	N/A	N/A	N/A		NO	NTX
	120-12-7	Anthracene	4.9E-03	4.9E-03	UG/M3	SB17-2	1 / 26	N/A	4.9E-03	N/A	N/A	N/A		NO	NTX
	56-55-3	Benzo(a)Anthracene	7.2E-04	7.2E-04	UG/M3	SB17-2	1 / 26	N/A	7.2E-04	N/A	1.7E-02 C	N/A		NO	BSL
	191-24-2	Benzo (g,h,i) Perylene	4.0E-06 J	2.7E-05	UG/M3	SB17-2	2 / 26	N/A	2.7E-05	N/A	N/A	N/A		NO	NTX
	50-32-8	Benzo(a)Pyrene	7.8E-08 J	1.3E-06	UG/M3	SB17-2	3 / 26	N/A	1.3E-06	N/A	2.1E-04 N	N/A		NO	BSL
	205-99-2	Benzo(b)Fluoranthene	1.3E-07 J	1.4E-06	UG/M3	SB17-2	2 / 26	N/A	1.4E-06	N/A	1.7E-02 C	N/A		NO	BSL
207-08-9	Benzo(k)Fluoranthene	6.9E-07	6.9E-07	UG/M3	SB17-2	1 / 26	N/A	6.9E-07	N/A	1.7E-01 C	N/A		NO	BSL	

Table 2.2
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Air
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Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site (cont.)	65-85-0	Benzoic Acid	1.1E-06	1.1E-06	UG/M3	SB18-00	1 / 26	N/A	1.1E-06	N/A	N/A	N/A		NO	NTX
	86-74-8	Carbazole	6.0E-07	6.0E-07	UG/M3	SB17-2	1 / 26	N/A	6.0E-07	N/A	N/A	N/A		NO	NTX
	218-01-9	Chrysene	1.6E-06	1.6E-06	UG/M3	SB17-2	1 / 26	N/A	1.6E-06	N/A	1.7E+00 C	N/A		NO	BSL
	132-64-9	Dibenzofuran	5.6E-03	5.6E-03	UG/M3	SB17-2	1 / 26	N/A	5.6E-03	N/A	N/A	N/A		NO	NTX
	206-44-0	Fluoranthene	9.2E-08 J	2.9E-07 J	UG/M3	SB3-1	7 / 25	N/A	2.9E-07 J	N/A	N/A	N/A		NO	NTX
	86-73-7	Fluorene	4.8E-03	4.8E-03	UG/M3	SB17-2	1 / 26	N/A	4.8E-03	N/A	N/A	N/A		NO	NTX
	193-39-5	Indeno(1,2,3-cd)Pyrene	9.2E-08 J	6.5E-07	UG/M3	SB17-2	2 / 26	N/A	6.5E-07	N/A	1.7E-02 C	N/A		NO	BSL
	91-20-3	Naphthalene	3.1E-02	3.1E-02	UG/M3	SB17-2	1 / 26	N/A	3.1E-02	N/A	8.3E-02 C	N/A		NO	BSL
	129-00-0	Pyrene	4.4E-05 J	1.1E-04 J	UG/M3	SB3-1	2 / 25	N/A	1.1E-04 J	N/A	N/A	N/A		NO	NTX

[1] Minimum/Maximum calculated air concentrations. Air concentrations calculated as $C_{air} = C_{soil} * 1000 * (1/PEF + 1/VF)$.
 VF calculated for volatile constituents only, on Table 2.2 Supplement A. PEF calculated on Table 2.2 Supplement B.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). June, 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. Resident Air.
 RSLs based on noncancer based on hazard quotient of 0.1, RSLs based on cancer based on cancer risk of 10^{-6} .

RSL value for chromium(VI) used for chromium.

RSL value for elemental mercury used for mercury.

RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
 Deletion Reason: No Toxicity Information (NTX)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
 To Be Considered

J = Estimated Value

L = National Ambient Air Quality Standard of 0.15 UG/M3

C = Carcinogenic

N = Noncarcinogenic

UG/M3 = Micrograms per cubic meter

N/A = Not applicable or not available

RSL = USEPA Regional Screening Levels (June, 2017)

PEF = Particulate emission factor

VF = Volatile emission factor

Table 2.2 Supplement A
 Calculation of Volatilization Factor - Soil
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Chemical	Diffusivity in Air (D _i) (cm ² /s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D _w) (cm ² /s)	Soil Organic Carbon Partition Coeff. (K _{oc}) (cm ³ /g)	Soil Water Partition Coeff. (K _d = K _{oc} x F _{oc}) (g/cm ³)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D _a) (cm ² /s)	Volatilization Factor (VF) (m ³ /kg)
Aroclor 1260	2.2E-02	1.4E-02	5.6E-06	3.5E+05	2.1E+03	1.4E-02	7.7E-09	1.7E+06
1-Methylnaphthalene	5.3E-02	2.1E-02	7.8E-06	2.5E+03	1.5E+01	2.6E+01	3.9E-06	7.4E+04
2-Methylnaphthalene	5.2E-02	2.1E-02	7.8E-06	2.5E+03	1.5E+01	2.5E+01	4.0E-06	7.3E+04
4-Nitrophenol	6.41E-02	1.70E-08	9.94E-06	2.91E+02	1.7E+00	1.16E+04	3.4E-08	7.8E+05
Acenaphthene	5.1E-02	7.5E-03	8.3E-06	5.0E+03	3.0E+01	3.9E+00	6.7E-07	1.8E+05
Anthracene	3.9E-02	2.3E-03	7.9E-06	1.6E+04	9.8E+01	4.3E-02	4.9E-08	6.6E+05
Benzo(a)anthracene	2.6E-02	4.9E-04	6.7E-06	1.8E+05	1.1E+03	9.4E-03	6.8E-10	5.5E+06
Benzo(g,h,i)perylene	4.48E-02	1.35E-05	5.23E-06	1.95E+06	1.2E+04	2.60E-04	5.6E-12	6.1E+07
Dibenzofuran	6.5E-02	8.7E-03	7.4E-06	9.2E+03	5.5E+01	3.1E+00	5.5E-07	2.0E+05
Fluorene	4.4E-02	3.9E-03	7.9E-06	9.2E+03	5.5E+01	1.7E+00	1.7E-07	3.5E+05
Naphthalene	6.0E-02	1.8E-02	8.4E-06	1.5E+03	9.3E+00	3.1E+01	6.2E-06	5.8E+04
Phenanthrene	3.45E-02	1.73E-03	6.69E-06	1.67E+04	1.0E+02	1.15E+00	3.2E-08	8.1E+05
Pyrene	2.8E-02	4.9E-04	7.2E-06	5.4E+04	3.3E+02	1.4E-01	2.3E-09	3.0E+06
1,2,4-Trimethylbenzene	6.1E-02	2.5E-01	7.9E-06	6.1E+02	3.7E+00	5.7E+01	2.1E-04	9.9E+03
1,3,5-Trimethylbenzene	6.0E-02	3.6E-01	7.8E-06	6.0E+02	3.6E+00	4.8E+01	3.0E-04	8.3E+03
2-Butanone (MEK)	9.1E-02	2.3E-03	1.0E-05	4.5E+00	2.7E-02	2.2E+05	8.9E-05	1.5E+04
2-Hexanone	7.0E-02	3.8E-03	8.4E-06	1.5E+01	9.0E-02	1.7E+04	7.5E-05	1.7E+04
4-Methyl-2-Pentanone (MIBK)	7.0E-02	5.6E-03	8.3E-06	1.3E+01	7.6E-02	1.9E+04	1.2E-04	1.3E+04
Acetone	1.1E-01	1.4E-03	1.2E-05	2.4E+00	1.4E-02	1.0E+06	7.1E-05	1.7E+04
Benzene	9.0E-02	2.3E-01	1.0E-05	1.5E+02	8.7E-01	1.8E+03	1.1E-03	4.4E+03
Carbon Disulfide	1.1E-01	5.9E-01	1.3E-05	2.2E+01	1.3E-01	2.2E+03	9.8E-03	1.5E+03
Chloromethane	1.2E-01	3.6E-01	1.4E-05	1.3E+01	7.9E-02	5.3E+03	9.6E-03	1.5E+03
Ethylbenzene	6.8E-02	3.2E-01	8.5E-06	4.5E+02	2.7E+00	1.7E+02	4.1E-04	7.1E+03
m,p-Xylene	6.8E-02	2.9E-01	8.4E-06	3.8E+02	2.3E+00	1.6E+02	4.4E-04	6.9E+03
o-Xylene	6.9E-02	2.1E-01	8.5E-06	3.8E+02	2.3E+00	1.8E+02	3.2E-04	8.1E+03
Toluene	7.8E-02	2.7E-01	9.2E-06	2.3E+02	1.4E+00	5.3E+02	7.2E-04	5.4E+03
Trichloroethene	6.9E-02	4.0E-01	1.0E-05	6.1E+01	3.6E-01	1.3E+03	2.7E-03	2.8E+03

$\text{Volatilization factor (VF)} = \frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4} \text{ m}^2/\text{cm}^2}{(\text{m}^3/\text{kg}) * 2 * \rho_b * D_A}$			
$\text{Apparent Diffusivity (D}_a\text{)} = \frac{[(\theta_a^{10/3} * D_i * H' + \theta_w^{10/3} * D_w)n^2]}{(\rho_b * K_d + \theta_w + \theta_a * H')}$			
$\frac{Q}{C_{vol}} = A * \exp \left[\frac{(\ln A_{site} - B)^2}{C} \right]$			
Parameters	Source	Values	Units
VF - Volatilization Factor	Equation 4-8, USEPA, 2002	chemical-specific	m ³ /kg
D _A - Apparent Diffusivity	Equation 4-8, USEPA, 2002	chemical-specific	cm ² /s
Q/C _{vol} - Inverse of the geometric mean air concentration to the volatilization flux at the center of a 0.5-acre-square source for Cleveland, OH	Exhibit D-3, USEPA 2002	85.63	g/m ² -s per kg/m ³
T - Exposure interval	site-specific	8.2E+08	s
A - Dispersion constants for Q/C _{vol} (Zone 7, Cleveland, OH)	Exhibit D-3, USEPA, 2002	12.8612	unitless
B - Dispersion constants for Q/C _{vol} (Zone 7, Cleveland, OH)	Exhibit D-3, USEPA, 2002	20.5164	unitless
C - Dispersion constants for Q/C _{vol} (Zone 7, Cleveland, OH)	Exhibit D-3, USEPA, 2002	237.2798	unitless
ρ _b - Soil bulk density	USEPA, 2002	1.50	g/cm ³
θ _a - Air-filled soil porosity = n - θ _w	USEPA, 2002	0.28	Lair/Lwater
n - Total soil porosity = 1 - (ρ _p /ρ _s)	USEPA, 2002	0.43	Lpore/Lsoil
θ _w - Water-filled soil porosity	USEPA, 2002	0.15	Lwater/Lsoil
ρ _s - Soil particle density	USEPA, 2002	2.65	g/cm ³
f _{oc} - fraction organic carbon in soil	USEPA, 2002	0.006	g/g

Equations from USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. OSWER 9355.4-24. December.
 Physical/chemical properties from Oak Ridge National Laboratory (ORNL). June, 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites. If not available, values from Risk Assessment Information System database (https://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef)

Table 2.2 Supplement B
 Particulate Emission Factor (PEF) Calculation - Surface Soil
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

$$PEF(m^3 / kg) = Q / C \times \frac{3,600s / h}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$$

$$\frac{Q}{C_{wind}} = A \times \exp \left[\frac{(\ln A_{site} - B)^2}{C} \right]$$

Parameter	Definition	Source	Value	Units
PEF	Particular Emission Factor	Site specific, Equation 4-5, USEPA, 2002	2.2E+09	m ³ /kg
Q/C	Inverse of mean concentration at center of 0.5-acre-square source	Site specific, Exhibit D-2, USEPA 2002	8.6E+01	g/m ² -s per kg/m ³
V	Fraction of vegetative cover	Default, Equation 4-5, USEPA, 2002	0.5	(unitless)
Um	Mean annual wind speed (Buffalo)	National Weather Service	3.67	m/s
Ut	Equivalent threshold value of windspeed at 7 meters	Default, Equation 4-5, USEPA, 2002	11.32	m/s
A	Dispersion constants for Q/C _{wind} (Zone 7, Cleveland, OH)	Exhibit D-2, USEPA, 2002	12.8612	unitless
B	Dispersion constants for Q/C _{wind} (Zone 7, Cleveland, OH)	Exhibit D-2, USEPA, 2002	20.5164	unitless
C	Dispersion constants for Q/C _{wind} (Zone 7, Cleveland, OH)	Exhibit D-2, USEPA, 2002	237.2798	unitless
A _{site}	Areal extent of site contamination	USEPA, 2002	0.5	acres
F(x)	Function dependent on Um/Ut, based on Cleveland, OH	Table D-2, USEPA 1996	0.232	(unitless)

USEPA, 1996. *Soil Screening Guidance: User's Guide*. EPA/540/R-96/018. May.

USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. OSWER 9355.4-24. December.

National Weather Service (<http://forecast.weather.gov/product.php?site=NWS&product=CLM&issuedby=BUF>)

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New YorkScenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil and Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site	7429-90-5	Aluminum	1.7E+03	1.5E+04	MG/KG	SB3-11	67 / 67	-	1.5E+04	N/A	7.7E+03 N	N/A		NO	BKG
	7440-36-0	Antimony	3.1E-02 J	6.6E-01	MG/KG	SB10-06	67 / 67	-	6.6E-01	N/A	3.1E+00 N	N/A		NO	BSL
	7440-38-2	Arsenic	1.3E+00	1.3E+01	MG/KG	SB10-06	67 / 67	-	1.3E+01	N/A	6.8E-01 C	N/A		NO	BKG
	7440-39-3	Barium	1.2E+01	1.5E+02	MG/KG	SB10-06	67 / 67	-	1.5E+02	N/A	1.5E+03 N	N/A		NO	BSL
	7440-41-7	Beryllium	1.1E-01	1.4E+00	MG/KG	SB9-02	67 / 67	-	1.4E+00	N/A	1.6E+01 N	N/A		NO	BSL
	7440-43-9	Cadmium	3.9E-02 J	8.2E-01	MG/KG	SB18-02	67 / 67	-	8.2E-01	N/A	7.1E+00 N	N/A		NO	BSL
	7440-70-2	Calcium	1.3E+03	1.8E+05	MG/KG	TP-1-1.5	67 / 67	-	1.8E+05	N/A	N/A	N/A		NO	NUT
	7440-47-3	Chromium	2.6E+00	2.5E+01	MG/KG	SB3-11	67 / 67	-	2.5E+01	N/A	3.0E-01 C	N/A		NO	BKG
	7440-48-4	Cobalt	1.9E+00	2.2E+01	MG/KG	SB6-08	67 / 67	-	2.2E+01	N/A	2.3E+00 N	3.0E+01	NYSDEC SCO	NO	BKG
	7440-50-8	Copper	5.6E+00	5.0E+01	MG/KG	SB8-02	67 / 67	-	5.0E+01	N/A	3.1E+02 N	N/A		NO	BSL
	7439-89-6	Iron	3.9E+03	7.3E+04	MG/KG	SB10-06	67 / 67	-	7.3E+04	N/A	5.5E+03 N	2.0E+03	NYSDEC SCO	NO	BKG
	7439-92-1	Lead	2.3E+00	2.6E+01	MG/KG	TP-2-1	67 / 67	-	2.6E+01	N/A	4.0E+02 L	N/A		NO	BSL
	7439-95-4	Magnesium	1.8E+03	1.7E+04	MG/KG	SB5-01	67 / 67	-	1.7E+04	N/A	N/A	N/A		NO	NUT
	7439-96-5	Manganese	7.7E+01	1.2E+03	MG/KG	SB9-02, TP-2-1	67 / 67	-	1.2E+03	N/A	1.8E+02 N	N/A		NO	BKG
	7439-97-6	Mercury	1.4E-02 J	1.0E-01	MG/KG	SB11-00	67 / 67	-	1.0E-01	N/A	2.3E+00 N	N/A		NO	BSL
	7440-02-0	Nickel	4.6E+00	5.6E+01	MG/KG	SB6-08	67 / 67	-	5.6E+01	N/A	1.5E+02 N	N/A		NO	BSL
	7440-09-7	Potassium	3.0E+02	1.8E+03	MG/KG	SB16-15	67 / 67	-	1.8E+03	N/A	N/A	N/A		NO	NUT
	7782-49-2	Selenium	2.1E-01 J	2.4E+00	MG/KG	SB15-12	67 / 67	-	2.4E+00	N/A	3.9E+01 N	N/A		NO	BSL
	7440-22-4	Silver	9.3E-03 J	1.2E-01	MG/KG	SB10-06	67 / 67	-	1.2E-01	N/A	3.9E+01 N	N/A		NO	BSL
	7440-23-5	Sodium	3.3E+01 J	1.7E+02	MG/KG	SB9-02	53 / 67	110 - 130	1.7E+02	N/A	N/A	N/A		NO	NUT
	7440-28-0	Thallium	6.6E-02	9.9E-01	MG/KG	SB7-13	67 / 67	-	9.9E-01	N/A	7.8E-02 N	N/A		NO	BKG
	7440-62-2	Vanadium	3.7E+00	2.8E+01	MG/KG	SB10-02, SB3-11	67 / 67	-	2.8E+01	N/A	3.9E+01 N	1.0E+02	NYSDEC SCO	NO	BSL
	7440-66-6	Zinc	1.1E+01 J	1.4E+02 J	MG/KG	SB18-02, SB6-02	67 / 67	-	1.4E+02 J	N/A	2.3E+03 N	N/A		NO	BSL
	11096-82-5	Aroclor 1260	1.7E-02 J	1.7E-02 J	MG/KG	SB14-00	1 / 67	0.034 - 0.051	1.7E-02 J	N/A	2.4E-01 C	N/A		NO	BSL
	90-12-0	1-Methylnaphthalene	2.3E-01 J	2.3E-01 J	MG/KG	SB17-2	1 / 67	0.36 - 0.81	2.3E-01 J	N/A	1.8E+01 C	N/A		NO	BSL
	105-67-9	2,4-Dimethylphenol	2.3E-01 J	2.3E-01 J	MG/KG	SB18-00	1 / 67	0.36 - 0.81	2.3E-01 J	N/A	1.3E+02 N	N/A		NO	BSL
	91-57-6	2-Methylnaphthalene	4.3E-01	4.3E-01	MG/KG	SB17-2	1 / 67	0.36 - 0.81	4.3E-01	N/A	2.4E+01 N	4.1E-01	NYSDEC SCO	NO	BSL
	100-02-7	4-Nitrophenol	1.4E-01 J	1.4E-01 J	MG/KG	SB1-14	1 / 67	0.73 - 1.6	1.4E-01 J	N/A	5.1E+00 C	3.7E+00	NYSDEC SCO	NO	BSL
	83-32-9	Acenaphthene	1.3E-01 J	1.7E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	1.7E+00	N/A	3.6E+02 N	N/A		NO	BSL
	120-12-7	Anthracene	2.1E-01 J	3.2E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	3.2E+00	N/A	1.8E+03 N	N/A		NO	BSL
	56-55-3	Benzo(a)Anthracene	2.8E-01 J	4.0E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	4.0E+00	N/A	1.1E+00 C	N/A		YES	ASL
	191-24-2	Benzo (g,h,i) Perylene	2.4E-01 J	1.6E+00	MG/KG	SB17-2	3 / 67	0.36 - 0.81	1.6E+00	N/A	1.8E+02 N	N/A		NO	BSL
	50-32-8	Benzo(a)Pyrene	1.7E-01 J	2.8E+00	MG/KG	SB17-2	4 / 67	0.36 - 0.5	2.8E+00	N/A	1.1E-01 C	N/A		YES	ASL
205-99-2	Benzo(b)Fluoranthene	2.8E-01 J	3.0E+00	MG/KG	SB17-2	3 / 67	0.36 - 0.5	3.0E+00	N/A	1.1E+00 C	N/A		YES	ASL	
207-08-9	Benzo(k)Fluoranthene	1.5E+00	1.5E+00	MG/KG	SB17-2	1 / 67	0.36 - 0.81	1.5E+00	N/A	1.1E+01 C	N/A		NO	BSL	
65-85-0	Benzoic Acid	2.4E+00	2.4E+00	MG/KG	SB18-00	1 / 67	1.8 - 4.1	2.4E+00	N/A	2.5E+04 N	1.0E+02	NYSDEC SCO	NO	BSL	
117-81-7	Bis(2-Ethylhexyl) Phthalate	2.1E-01 J	8.3E-01	MG/KG	SB1-14	5 / 67	0.37 - 0.81	8.3E-01	N/A	3.9E+01 C	5.0E+01	NYSDEC SCO	NO	BSL	
86-74-8	Carbazole	1.3E+00	1.3E+00	MG/KG	SB17-2	1 / 67	0.36 - 0.81	1.3E+00	N/A	N/A	N/A		NO	NTX	
218-01-9	Chrysene	2.5E-01 J	3.4E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	3.4E+00	N/A	1.1E+02 C	N/A		NO	BSL	

Table 2.3
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Medium: Soil
 Exposure Medium: Surface Soil and Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site (cont.)	132-64-9	Dibenzofuran	1.1E+00	1.1E+00	MG/KG	SB17-2	1 / 67	0.36 - 0.81	1.1E+00	N/A	7.3E+00 N	N/A		NO	BSL
	206-44-0	Fluoranthene	1.9E-01 J	7.3E-01	MG/KG	SB17-4	10 / 66	0.36 - 0.5	7.3E-01	N/A	2.4E+02 N	N/A		NO	BSL
	86-73-7	Fluorene	1.4E-01 J	1.7E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	1.7E+00	N/A	2.4E+02 N	N/A		NO	BSL
	193-39-5	Indeno(1,2,3-cd)Pyrene	2.0E-01 J	1.4E+00	MG/KG	SB17-2	3 / 67	0.36 - 0.81	1.4E+00	N/A	1.1E+00 C	N/A		YES	ASL
	91-20-3	Naphthalene	1.5E-01 J	1.8E+00	MG/KG	SB17-2	2 / 67	0.36 - 0.81	1.8E+00	N/A	3.8E+00 C	N/A		NO	BSL
	85-01-8	Phenanthrene	7.8E-01	7.8E-01	MG/KG	SB17-4	1 / 66	0.36 - 0.81	7.8E-01	N/A	1.8E+03 N	N/A		NO	BSL
	129-00-0	Pyrene	1.3E-01 J	5.7E-01	MG/KG	SB17-4	3 / 66	0.36 - 0.5	5.7E-01	N/A	1.8E+02 N	N/A		NO	BSL
	95-63-6	1,2,4-Trimethylbenzene	1.2E-03 J	8.1E-03	MG/KG	SB11-12	31 / 41	0.0039 - 0.0048	8.1E-03	N/A	5.8E+00 N	N/A		NO	BSL
	108-67-8	1,3,5-Trimethylbenzene	1.2E-03 J	4.1E-03	MG/KG	SB1-07, SB11-12	19 / 41	0.0023 - 0.0066	4.1E-03	N/A	7.8E+01 N	N/A		NO	BSL
	78-93-3	2-Butanone (MEK)	4.3E-03 J	3.6E-02	MG/KG	SB3-5	16 / 41	0.015 - 0.028	3.6E-02	N/A	2.7E+03 N	1.0E+02	NYSDEC SCO	NO	BSL
	591-78-6	2-Hexanone	5.6E-03 J	7.9E-03 J	MG/KG	SB1-07	4 / 41	0.0093 - 0.026	7.9E-03 J	N/A	2.0E+01 N	N/A		NO	BSL
	108-10-1	4-Methyl-2-Pentanone (MIBK)	5.9E-03 J	5.9E-03 J	MG/KG	SB9-08	1 / 41	0.0093 - 0.026	5.9E-03 J	N/A	3.3E+03 N	N/A		NO	BSL
	67-64-1	Acetone	1.1E-02 J	1.7E-01	MG/KG	SB3-5	40 / 41	0.022 - 0.022	1.7E-01	N/A	6.1E+03 N	N/A		NO	BSL
	71-43-2	Benzene	6.6E-04 J	9.4E-03	MG/KG	SB1-07	32 / 41	0.0039 - 0.0047	9.4E-03	N/A	1.2E+00 C	N/A		NO	BSL
	75-15-0	Carbon Disulfide	1.2E-03 J	4.1E-03 J	MG/KG	TP-3-3	11 / 41	0.0023 - 0.0066	4.1E-03 J	N/A	7.7E+01 N	1.0E+02	NYSDEC SCO	NO	BSL
	74-87-3	Chloromethane	2.5E-03 J	2.5E-03 J	MG/KG	SB4-7	1 / 41	0.0023 - 0.0066	2.5E-03 J	N/A	1.1E+01 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.1E-03 J	3.4E-03 J	MG/KG	SB5-04	10 / 41	0.0023 - 0.0064	3.4E-03 J	N/A	5.8E+00 C	N/A		NO	BSL
m&pXYLEN	m,p-Xylene	1.4E-03 J	2.2E-02	MG/KG	SB11-12	29 / 41	0.0039 - 0.0094	2.2E-02	N/A	5.5E+01 N	N/A		NO	BSL	
95-47-6	o-Xylene	1.3E-03 J	5.6E-03	MG/KG	SB1-07, SB11-12	28 / 41	0.0023 - 0.0053	5.6E-03	N/A	6.5E+01 N	N/A		NO	BSL	
108-88-3	Toluene	1.5E-03 J	2.5E-02	MG/KG	SB1-07	32 / 41	0.0039 - 0.0047	2.5E-02	N/A	4.9E+02 N	N/A		NO	BSL	
79-01-6	Trichloroethene	1.9E-03 J	2.5E-02	MG/KG	SB14-07	4 / 41	0.0023 - 0.0066	2.5E-02	N/A	4.1E-01 N	N/A		NO	BSL	

[1] Minimum/Maximum detected concentrations.
 [2] Maximum concentration is used for screening.
 [3] Background values not available.
 [4] Oak Ridge National Laboratory (ORNL). June, 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Resident Soil.
 RSLs based on noncancer based on hazard quotient of 0.1, RSLs based on cancer based on cancer risk of 10⁻⁶.
 RSL for nitrobenzene used for 4-nitrophenol.
 RSL value for chromium(VI) used for chromium.
 RSL value for mercuric chloride (and other mercury salts) used as surrogate for mercury.
 RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.
 RSL value for anthracene used as surrogate for phenanthrene.
 The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
 [5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
 Deletion Reason: No Toxicity Information (NTX)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Statistically Similar to Background Concentrations (BKG)

COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
 To Be Considered
 J = Estimated Value
 L = screening value from the Revised Interim Soil lead Guidance for CERCLA Sites
 and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
 C = Carcinogenic
 N = Noncarcinogenic
 MG/KG = Milligrams per kilogram
 N/A = Not applicable or not available
 NYSDEC SCO = New York State Department of Environmental Conservation
 Supplemental Soil Cleanup Objectives. Residential. (October, 2010)
 RSL = USEPA Regional Screening Levels (June, 2017)

Table 2.4
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Medium: Surface and Subsurface Soil
 Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site	7429-90-5	Aluminum	1.4E-01	1.3E+00	UG/M3	SB3-11	67 / 67	N/A	1.3E+00	N/A	5.2E-01 N	N/A		NO	BKG
	7440-36-0	Antimony	2.6E-06 J	5.6E-05	UG/M3	SB10-06	67 / 67	N/A	5.6E-05	N/A	N/A	N/A		NO	NTX
	7440-38-2	Arsenic	1.1E-04	1.1E-03	UG/M3	SB10-06	67 / 67	N/A	1.1E-03	N/A	6.5E-04 C	N/A		NO	BKG
	7440-39-3	Barium	1.0E-03	1.3E-02	UG/M3	SB10-06	67 / 67	N/A	1.3E-02	N/A	5.2E-02 N	N/A		NO	BSL
	7440-41-7	Beryllium	9.4E-06	1.2E-04	UG/M3	SB9-02	67 / 67	N/A	1.2E-04	N/A	1.2E-03 C	N/A		NO	BSL
	7440-43-9	Cadmium	3.3E-06 J	7.0E-05	UG/M3	SB18-02	67 / 67	N/A	7.0E-05	N/A	N/A	N/A		NO	NTX
	7440-70-2	Calcium	1.1E-01	1.5E+01	UG/M3	TP-1-1.5	67 / 67	N/A	1.5E+01	N/A	N/A	N/A		NO	NUT
	7440-47-3	Chromium	2.2E-04	2.1E-03	UG/M3	SB3-11	67 / 67	N/A	2.1E-03	N/A	1.2E-05 C	N/A		NO	BKG
	7440-48-4	Cobalt	1.6E-04	1.9E-03	UG/M3	SB6-08	67 / 67	N/A	1.9E-03	N/A	3.1E-04 C	N/A		NO	BKG
	7440-50-8	Copper	4.8E-04	4.3E-03	UG/M3	SB8-02	67 / 67	N/A	4.3E-03	N/A	N/A	N/A		NO	NTX
	7439-89-6	Iron	3.3E-01	6.2E+00	UG/M3	SB10-06	67 / 67	N/A	6.2E+00	N/A	N/A	N/A		NO	NTX
	7439-92-1	Lead	2.0E-04	2.2E-03	UG/M3	TP-2-1	67 / 67	N/A	2.2E-03	N/A	1.5E-01 L	N/A		NO	BSL
	7439-95-4	Magnesium	1.5E-01	1.4E+00	UG/M3	SB5-01	67 / 67	N/A	1.4E+00	N/A	N/A	N/A		NO	NUT
	7439-96-5	Manganese	6.5E-03	1.0E-01	UG/M3	SB9-02, TP-2-1	67 / 67	N/A	1.0E-01	N/A	5.2E-03 N	N/A		NO	BKG
	7439-97-6	Mercury	1.2E-06 J	8.5E-06	UG/M3	SB11-00	67 / 67	N/A	8.5E-06	N/A	3.1E-02 N	N/A		NO	BSL
	7440-02-0	Nickel	3.9E-04	4.8E-03	UG/M3	SB6-08	67 / 67	N/A	4.8E-03	N/A	9.4E-03 N	N/A		NO	BSL
	7440-09-7	Potassium	2.6E-02	1.5E-01	UG/M3	SB16-15	67 / 67	N/A	1.5E-01	N/A	N/A	N/A		NO	NUT
	7782-49-2	Selenium	1.8E-05 J	2.0E-04	UG/M3	SB15-12	67 / 67	N/A	2.0E-04	N/A	2.1E+00 N	N/A		NO	BSL
	7440-22-4	Silver	7.9E-07 J	1.0E-05	UG/M3	SB10-06	67 / 67	N/A	1.0E-05	N/A	N/A	N/A		NO	NTX
	7440-23-5	Sodium	2.8E-03 J	1.4E-02	UG/M3	SB9-02	53 / 67	N/A	1.4E-02	N/A	N/A	N/A		NO	NUT
	7440-28-0	Thallium	5.6E-06	8.4E-05	UG/M3	SB7-13	67 / 67	N/A	8.4E-05	N/A	N/A	N/A		NO	NTX
	7440-62-2	Vanadium	3.1E-04	2.4E-03	UG/M3	SB10-02, SB3-11	67 / 67	N/A	2.4E-03	N/A	1.0E-02 N	N/A		NO	BSL
	7440-66-6	Zinc	9.4E-04 J	1.2E-02 J	UG/M3	SB18-02, SB6-02	67 / 67	N/A	1.2E-02 J	N/A	N/A	N/A		NO	NTX
	11096-82-5	Aroclor 1260	1.2E-05 J	1.2E-05 J	UG/M3	SB14-00	1 / 67	N/A	1.2E-05 J	N/A	4.9E-03 C	N/A		NO	BSL
	90-12-0	1-Methylnaphthalene	3.1E-03 J	3.1E-03 J	UG/M3	SB17-2	1 / 67	N/A	3.1E-03 J	N/A	N/A	N/A		NO	NTX
	105-67-9	2,4-Dimethylphenol	2.0E-05 J	2.0E-05 J	UG/M3	SB18-00	1 / 67	N/A	2.0E-05 J	N/A	N/A	N/A		NO	NTX
	91-57-6	2-Methylnaphthalene	5.9E-03	5.9E-03	UG/M3	SB17-2	1 / 67	N/A	5.9E-03	N/A	N/A	N/A		NO	NTX
	100-02-7	4-Nitrophenol	1.9E-04 J	1.9E-04 J	UG/M3	SB1-14	1 / 67	N/A	1.9E-04 J	N/A	7.0E-02 C	N/A		NO	BSL
	83-32-9	Acenaphthene	7.5E-04 J	9.8E-03	UG/M3	SB17-2	2 / 67	N/A	9.8E-03	N/A	N/A	N/A		NO	NTX
	120-12-7	Anthracene	3.4E-04 J	5.1E-03	UG/M3	SB17-2	2 / 67	N/A	5.1E-03	N/A	N/A	N/A		NO	NTX
	56-55-3	Benz(a)Anthracene	7.4E-05 J	1.1E-03	UG/M3	SB17-2	2 / 67	N/A	1.1E-03	N/A	1.7E-02 C	N/A		NO	BSL
	191-24-2	Benzo (g,h,i) Perylene	2.4E-05 J	1.6E-04	UG/M3	SB17-2	3 / 67	N/A	1.6E-04	N/A	N/A	N/A		NO	NTX
	50-32-8	Benzo(a)Pyrene	1.4E-05 J	2.4E-04	UG/M3	SB17-2	4 / 67	N/A	2.4E-04	N/A	2.1E-04 N	N/A		NO	BSL
	205-99-2	Benzo(b)Fluoranthene	2.4E-05 J	2.6E-04	UG/M3	SB17-2	3 / 67	N/A	2.6E-04	N/A	1.7E-02 C	N/A		NO	BSL
	207-08-9	Benzo(k)Fluoranthene	1.3E-04	1.3E-04	UG/M3	SB17-2	1 / 67	N/A	1.3E-04	N/A	1.7E-01 C	N/A		NO	BSL
	65-85-0	Benzoic Acid	2.0E-04	2.0E-04	UG/M3	SB18-00	1 / 67	N/A	2.0E-04	N/A	N/A	N/A		NO	NTX
	117-81-7	Bis(2-Ethylhexyl) Phthalate	1.8E-05 J	7.1E-05	UG/M3	SB1-14	5 / 67	N/A	7.1E-05	N/A	1.2E+00 C	N/A		NO	BSL
	86-74-8	Carbazole	1.1E-04	1.1E-04	UG/M3	SB17-2	1 / 67	N/A	1.1E-04	N/A	N/A	N/A		NO	NTX

Table 2.4
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Medium: Surface and Subsurface Soil
 Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Launch Area at the Former Nike BU-34/35 site (cont.)	218-01-9	Chrysene	2.1E-05 J	2.9E-04	UG/M3	SB17-2	2 / 67	N/A	2.9E-04	N/A	1.7E+00 C	N/A		NO	BSL
	132-64-9	Dibenzofuran	5.7E-03	5.7E-03	UG/M3	SB17-2	1 / 67	N/A	5.7E-03	N/A	N/A	N/A		NO	NTX
	206-44-0	Fluoranthene	1.6E-05 J	6.2E-05	UG/M3	SB17-4	10 / 66	N/A	6.2E-05	N/A	N/A	N/A		NO	NTX
	86-73-7	Fluorene	4.1E-04 J	5.0E-03	UG/M3	SB17-2	2 / 67	N/A	5.0E-03	N/A	N/A	N/A		NO	NTX
	193-39-5	Indeno(1,2,3-cd)Pyrene	1.7E-05 J	1.2E-04	UG/M3	SB17-2	3 / 67	N/A	1.2E-04	N/A	1.7E-02 C	N/A		NO	BSL
	91-20-3	Naphthalene	2.6E-03 J	3.1E-02	UG/M3	SB17-2	2 / 67	N/A	3.1E-02	N/A	8.3E-02 C	N/A		NO	BSL
	85-01-8	Phenanthrene	1.0E-03	1.0E-03	UG/M3	SB17-4	1 / 66	N/A	1.0E-03	N/A	N/A	N/A		NO	NTX
	129-00-0	Pyrene	5.5E-05 J	2.4E-04	UG/M3	SB17-4	3 / 66	N/A	2.4E-04	N/A	N/A	N/A		NO	NTX
	95-63-6	1,2,4-Trimethylbenzene	1.2E-04 J	8.2E-04	UG/M3	SB11-12	31 / 41	N/A	8.2E-04	N/A	7.3E-01 N	N/A		NO	BSL
	108-67-8	1,3,5-Trimethylbenzene	1.4E-04 J	4.9E-04	UG/M3	SB1-07, SB11-12	19 / 41	N/A	4.9E-04	N/A	N/A	N/A		NO	NTX
	78-93-3	2-Butanone (MEK)	2.8E-04 J	2.4E-03	UG/M3	SB3-5	16 / 41	N/A	2.4E-03	N/A	5.2E+02 N	N/A		NO	BSL
	591-78-6	2-Hexanone	3.4E-04 J	4.7E-04 J	UG/M3	SB1-07	4 / 41	N/A	4.7E-04 J	N/A	3.1E+00 N	N/A		NO	BSL
	108-10-1	4-Methyl-2-Pentanone (MIBK)	4.4E-04 J	4.4E-04 J	UG/M3	SB9-08	1 / 41	N/A	4.4E-04 J	N/A	3.1E+02 N	N/A		NO	BSL
	67-64-1	Acetone	6.4E-04 J	9.9E-03	UG/M3	SB3-5	40 / 41	N/A	9.9E-03	N/A	3.2E+03 N	N/A		NO	BSL
	71-43-2	Benzene	1.5E-04 J	2.1E-03	UG/M3	SB1-07	32 / 41	N/A	2.1E-03	N/A	3.6E-01 C	N/A		NO	BSL
	75-15-0	Carbon Disulfide	8.2E-04 J	2.8E-03 J	UG/M3	TP-3-3	11 / 41	N/A	2.8E-03 J	N/A	7.3E+01 N	N/A		NO	BSL
	74-87-3	Chloromethane	1.7E-03 J	1.7E-03 J	UG/M3	SB4-7	1 / 41	N/A	1.7E-03 J	N/A	9.4E+00 N	N/A		NO	BSL
	100-41-4	Ethylbenzene	1.5E-04 J	4.8E-04 J	UG/M3	SB5-04	10 / 41	N/A	4.8E-04 J	N/A	1.1E+00 C	N/A		NO	BSL
	m&pXYLEN	m,p-Xylene	2.0E-04 J	3.2E-03	UG/M3	SB11-12	29 / 41	N/A	3.2E-03	N/A	1.0E+01 N	N/A		NO	BSL
	95-47-6	o-Xylene	1.6E-04 J	6.9E-04	UG/M3	SB1-07, SB11-12	28 / 41	N/A	6.9E-04	N/A	1.0E+01 N	N/A		NO	BSL
108-88-3	Toluene	2.8E-04 J	4.6E-03	UG/M3	SB1-07	32 / 41	N/A	4.6E-03	N/A	5.2E+02 N	N/A		NO	BSL	
79-01-6	Trichloroethene	6.9E-04 J	9.0E-03	UG/M3	SB14-07	4 / 41	N/A	9.0E-03	N/A	2.1E-01 N	N/A		NO	BSL	

[1] Minimum/Maximum calculated air concentrations. Air concentrations calculated as $C_{air} = C_{soil} * 1000 * (1/PEF + 1/VF)$. VF calculated for volatile constituents only, on Table 2.2 Supplement A. PEF calculated on Table 2.4 Supplement A.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Resident Air. RSLs based on noncancer based on hazard quotient of 0.1, RSLs based on cancer based on cancer risk of 10^{-6} .

RSL for nitrobenzene used for 4-nitrophenol.

RSL value for chromium(VI) used for chromium.

RSL value for elemental mercury used for mercury.

RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.

RSL value for anthracene used as surrogate for phenanthrene.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
 Deletion Reason: No Toxicity Information (NTX)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Statistically Similar to Background Concentrations (BKG)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

L = National Ambient Air Quality Standard of 0.15 UG/M3

C = Carcinogenic

N = Noncarcinogenic

UG/M3 = Micrograms per cubic meter

N/A = Not applicable or not available

RSL = USEPA Regional Screening Levels (June, 2017)

PEF = Particulate emission factor

VF = Volatile emission factor

Table 2.4 Supplement A
 Particulate Emission Factor - Construction Worker
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

PEF Equations:

$$\frac{Q}{C_{Sr}} = A \times \exp \left[\frac{(\ln A_{site} - B)^2}{C} \right]$$

Equation 5-6 (USEPA, 2002)

$$PEF_{SC} = \frac{Q}{C_{Sr}} \times \frac{1}{F_D} \frac{T \times A_R}{556 \times (W/3)^{0.4} \times \left(\frac{365 \text{ d/yr} - p}{365 \text{ d/yr}} \right) \times \Sigma \text{VKT}}$$

Equation 5-5 (USEPA, 2002)

$$F_D = 0.1852 + \frac{5.3537}{t_c} + \frac{-9.6318}{t_c^2}$$

Equation E-16 (USEPA, 2002)

PEF and Box Model Input Parameters

Parameter	Definition	Value	Units	Source
Q/C _{Sr}	inverse ratio of the geometric mean air concentration to the emission flux at the center of a square source	23.0	m	calculated
A	Constant	12.9351	unitless	default (Eqn. 5-6; USEPA, 2002)
B	Constant	5.7383	unitless	default (Eqn. 5-6; USEPA, 2002)
C	Constant	71.7711	unitless	default (Eqn. 5-6; USEPA, 2002)
A _{site}	Areal extent of site contamination	0.5	acres	(1)
PEF _{SC}	subchronic road particulate emission factor	1.18E+07	m ³ /kg	calculated
F _D	Dispersion correction factor	0.189	unitless	calculated
t _c	duration of construction (180 days for 8 hr/day)	1,440	hr	assumed
T	total time over which construction occurs (t _c x 3600 s/hr)	5,184,000	s	assumed
A _R	surface area of contaminated road segment (square root of site surface contamination configured as a square x default width of road segment of 20 ft)	274	m ²	calculated
W	mean weight of vehicle [(1 car @ 2 tons/car) + (2 trucks @ 20 tons/truck)] / 3 vehicles)	14	tons	assumed
p	number of days with at least 0.01 inches of precipitation	150	days/yr	Exhibit 5-2 (USEPA, 2002)
VKT	sum of fleet vehicle kilometers traveled during the exposure duration (assumed 3 vehicles x 0.045 km/day x 180 days)	24.3	km	assumed

Notes:

(1) The extent of site contamination is assumed to be 0.5 acre.

Reference:

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, EPA Office of Solid Waste and Emergency Response. OSWER 9355.4-24. December.

Table 2.5
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Tap Water, Water in Silo	7429-90-5	Aluminum	1.6E+01 J	8.6E+02	UG/L	MW-3	8 / 9	18 - 18	8.6E+02	N/A	2.0E+03 N	N/A		NO	BSL
	7440-36-0	Antimony	1.0E-01 J	1.6E+00	UG/L	MW-1	8 / 9	1 - 1	1.6E+00	N/A	7.8E-01 N	6.0E+00	MCL	NO	BKG
	7440-38-2	Arsenic	4.0E-01 J	1.4E+00 J	UG/L	MW-4, MW-9	7 / 9	2 - 2	1.4E+00 J	N/A	5.2E-02 C	3.0E+00	NYSDEC WQS		
	7440-39-3	Barium	2.2E+01	2.0E+02	UG/L	MW-9	9 / 9	-	2.0E+02	N/A	3.8E+02 N	1.0E+01	MCL	NO	BKG
	7440-41-7	Beryllium	2.9E-01 J	2.9E-01 J	UG/L	MW-4	1 / 9	0.5 - 0.5	2.9E-01 J	N/A	2.5E+00 N	2.5E+01	NYSDEC WQS		
	7440-43-9	Cadmium	1.2E-01 J	2.8E-01 J	UG/L	MW-7	2 / 9	2 - 2	2.8E-01 J	N/A	N/A	4.0E+00	MCL	NO	BSL
	7440-70-2	Calcium	8.1E+04	2.1E+05	UG/L	MW-6	9 / 9	-	2.1E+05	N/A	N/A	5.0E+00	MCL	NO	NTX
	7440-47-3	Chromium	1.1E+00 J	1.1E+00 J	UG/L	MW-3, MW-8	2 / 9	10 - 10	1.1E+00 J	N/A	3.5E-02 C	5.0E+00	NYSDEC WQS		
	7440-48-4	Cobalt	2.1E-01 J	6.8E+00	UG/L	MW-7	8 / 9	5 - 5	6.8E+00	N/A	6.0E-01 N	5.0E+01	NYSDEC WQS		
	7440-50-8	Copper	1.1E+00 J	3.4E+00 J	UG/L	MW-3	6 / 9	20 - 20	3.4E+00 J	N/A	8.0E+01 N	1.0E+02	MCL	NO	BKG
	7439-89-6	Iron	4.0E+01 J	2.2E+03	UG/L	MW-9	9 / 9	-	2.2E+03	N/A	1.4E+03 N	2.0E+02	NYSDEC WQS		
	7439-95-4	Magnesium	7.8E+03 J	3.8E+04	UG/L	MW-6	9 / 9	-	3.8E+04	N/A	N/A	3.0E+02	NYSDEC WQS		
	7439-96-5	Manganese	1.6E+00 J	1.6E+04	UG/L	MW-7	9 / 9	-	1.6E+04	N/A	4.3E+01 N	3.0E+02	NYSDEC WQS		
	7440-02-0	Nickel	6.0E+00 J	6.0E+00 J	UG/L	MW-7	1 / 9	20 - 20	6.0E+00 J	N/A	3.9E+01 N	1.0E+02	NYSDEC WQS		
	7440-09-7	Potassium	3.9E+02 J	2.8E+03	UG/L	MW-9	8 / 9	1000 - 1000	2.8E+03	N/A	N/A	1.0E+02	NYSDEC WQS		
	7440-23-5	Sodium	1.3E+03	1.5E+04	UG/L	MW-8	9 / 9	-	1.5E+04	N/A	N/A	2.0E+04	NYSDEC WQS		
	7440-28-0	Thallium	3.0E-02 J	7.0E-02 J	UG/L	MW-8	5 / 9	0.1 - 0.1	7.0E-02 J	N/A	2.0E-02 N	2.0E+00	MCL	NO	BKG
	7440-62-2	Vanadium	7.9E-01 J	2.0E+00 J	UG/L	MW-6	6 / 9	5 - 5	2.0E+00 J	N/A	8.6E+00 N	N/A		NO	BSL
	7440-66-6	Zinc	1.9E+01 J	2.8E+01 J	UG/L	MW-9	6 / 9	100 - 100	2.8E+01 J	N/A	6.0E+02 N	N/A		NO	BSL

Table 2.5
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
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[1] Minimum/Maximum detected concentrations, total metals.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL), June, 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. Tapwater.
 RSLs based on noncancer based on hazard quotient of 0.1, RSLs based on cancer based on cancer risk of 10⁻⁶.
 RSL value for chromium(VI) used for chromium.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
 Deletion Reason: Below Screening Level (BSL)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Statistically Similar to Background Concentrations based on site soil and background soil concentrations (BKG)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
 To Be Considered

J = Estimated Value

MCL = Maximum Contaminant Level

N/A = Not applicable/Not available

UG/L = Micrograms per liter

NYSDEC WQS = New York State Department of Environmental Conservation
 Water Quality Standards, 6 NYCRR 703.5, March, 1998.

Table 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Launch Area at the Former Nike BU-34/35 site	Benz(a)Anthracene	MG/KG	N/A	N/A	4.0E+00	4.0E+00	MG/KG	Maximum	5
	Benzo(a)Pyrene	MG/KG	3.5E-01	N/A	2.8E+00	2.8E+00	MG/KG	Maximum	6
	Benzo(b)Fluoranthene	MG/KG	3.9E-01	N/A	3.0E+00	3.0E+00	MG/KG	Maximum	6
	Indeno(1,2,3-cd)Pyrene	MG/KG	2.5E-01	N/A	1.4E+00	1.4E+00	MG/KG	Maximum	6

ProUCL, Version 5.1.001 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA, October, 2015. Prepared by Lockheed Martin Environmental Services).

- (1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
- (2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
- (3) Anderson-Darling and/or Kolmogorov-Smirnov Tests indicate data are gamma distributed.
- (4) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
- (5) Maximum detected concentration used because only one detected concentration.
- (6) Data set has 3 or less detected values. Per ProUCL, this is not enough to compute meaningful or reliable statistics and estimates.

N/A = Not available

MG/KG = Milligrams per kilogram

UCL = Upper confidence limit on mean concentration

Table 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Launch Area at the Former Nike BU-34/35 site	Benz(a)Anthracene	MG/KG	3.4E-01	N/A	4.0E+00	4.0E+00	MG/KG	Maximum	5
	Benzo(a)Pyrene	MG/KG	3.1E-01	3.9E-01	G 2.8E+00	3.9E-01	MG/KG	95% KM Approximate Gamma UCL	1, 3
	Benzo(b)Fluoranthene	MG/KG	3.3E-01	N/A	3.0E+00	3.0E+00	MG/KG	Maximum	5
	Indeno(1,2,3-cd)Pyrene	MG/KG	2.6E-01	N/A	1.4E+00	1.4E+00	MG/KG	Maximum	5

ProUCL, Version 5.1.001 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. October, 2015. Prepared by Lockheed Martin Environmental Services).

- (1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
- (2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
- (3) Anderson-Darling and/or Kolmogorov-Smirnov Tests indicate data are gamma distributed.
- (4) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
- (5) Data set has 3 or less detected values. Per ProUCL, this is not enough to compute meaningful or reliable statistics and estimates.

G = gamma distribution
N/A = Not available
MG/KG = Milligrams per kilogram
KM = Kaplan-Meier
UCL = Upper confidence limit on mean concentration

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Site Worker	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2014	
				EF	Exposure Frequency	72	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 2014	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Trespasser	Adolescent (12 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	CDI (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2011	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	6	years	(2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	62	kg	EPA, 2011 (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Recreational User	Youth (6 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	CDI (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2011	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	12	years	EPA, 1989	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	44	kg	EPA, 2011 (4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	4,380	days	EPA, 1989	
Dermal	Site Worker	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,527	cm ²	EPA, 2014	
				SSAF	Soil to Skin Adherence Factor	0.12	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	72	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 2014	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adolescent (12 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4,403	cm ²	EPA, 2011 (5)	
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	6	years	(2)	
				BW	Body Weight	62	kg	EPA, 2011 (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989				
	Recreational User	Youth (6 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.1	mg/kg	Table 3.1	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	4,200	cm ²	EPA, 2011 (6)	
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	12	years	EPA, 1989	
				BW	Body Weight	44	kg	EPA, 2011 (4)	
AT-C				Averaging Time (Cancer)	25,550	days	EPA, 1989		
AT-N	Averaging Time (Non-Cancer)	4,380	days	EPA, 1989					

Notes:

- (1) Professional judgment assuming 2 days per week for 9 months a year when soil is not covered by snow.
- (2) Exposure duration for an adolescent trespasser, age 12 to 18 years.
- (3) Weighted average of children 12 to <18 years in age (Table 8-1, EPA, 2011).
- (4) Based on the weighted average weight for children 6 to <21 years in age (Table 8-1, EPA, 2011)
- (5) Based on weighted average surface area for head, hands, forearms, and lower legs for children 12 to <18 years in age (Table 7-2, EPA, 2011) using forearm and lower leg ratios for nearest available age group (Table 7-8, EPA, 2011)
- (6) Based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 18 years (Table 7-2, EPA, 2011)

Sources:

- EPA, 1989. Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
- EPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July.
- EPA, 2009. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002. OSWER 9285.7-82. January.
- EPA, 2011. Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F.
- EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 6.

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Site Worker (new construction)	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 2014	
				EF	Exposure Frequency	250	days/year	EPA, 2014	
				ED	Exposure Duration	25	years	EPA, 2014	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Site Worker (reuse of silos)	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2014	
				EF	Exposure Frequency	225	days/year	EPA, 2014	
				ED	Exposure Duration	25	years	EPA, 2014	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Construction Worker	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	330	mg/day	EPA, 2002	
				EF	Exposure Frequency	180	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 2002	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Resident	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2014	
				EF	Exposure Frequency	350	days/year	EPA, 2014	
				ED	Exposure Duration	20	years	EPA, 2014	
CF1				Conversion Factor 1	0.000001	kg/mg	--		
BW				Body Weight	80	kg	EPA, 2014		
AT-C				Averaging Time (Cancer)	25,550	days	EPA, 1989		
AT-N				Averaging Time (Non-Cancer)	7,300	days	EPA, 1989		

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name				
Ingestion	Resident	Child	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI \text{ (mg/kg-day)} = CS \times IR-S \times EF \times ED \times CF1 \times 1/BW \times 1/AT$				
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 2014					
				EF	Exposure Frequency	350	days/year	EPA, 2014					
				ED	Exposure Duration	6	years	EPA, 2014					
				CF1	Conversion Factor 1	0.000001	kg/mg	--					
				BW	Body Weight	15	kg	EPA, 2014					
		AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989							
		Child/Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI \text{ (mg/kg-day)} = CS \times IR-S-Adj \times EF \times CF1 \times 1/AT$ $IR-S-Adj \text{ (mg-year/kg-day)} = (ED-C \times IR-S-C / BW-C) + (ED-A \times IR-S-A / BW-A)$				
				IR-S-A	Ingestion Rate of Soil, Adult	100	mg/day	EPA, 2014					
				IR-S-C	Ingestion Rate of Soil, Child	200	mg/day	EPA, 2014					
	IR-S-Adj			Ingestion Rate of Soil, Age-adjusted	105	mg-year/kg-day	Calculated						
	EF			Exposure Frequency	350	days/year	EPA, 2014						
	ED-A			Exposure Duration, Adult	20	years	EPA, 2014						
	ED-C			Exposure Duration, Child	6	years	EPA, 2014						
	CF1			Conversion Factor 1	0.000001	kg/mg	--						
	BW-A	Body Weight, Adult	80	kg	EPA, 2014								
	BW-C	Body Weight, Child	15	kg	EPA, 2014								
	AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989								
	Trespasser	Adolescent (12 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI \text{ (mg/kg-day)} = CS \times IR-S \times EF \times ED \times CF1 \times 1/BW \times 1/AT$				
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 2011					
				EF	Exposure Frequency	100	days/year	EPA, 2009					
				ED	Exposure Duration	6	years	(2)					
				CF1	Conversion Factor 1	0.000001	kg/mg	--					
				BW	Body Weight	62	kg	EPA, 2011 (3)					
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989					
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989					
				Recreational User	Youth (6 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil		Table 3.2	mg/kg	Table 3.2	$CDI \text{ (mg/kg-day)} = CS \times IR-S \times EF \times ED \times CF1 \times 1/BW \times 1/AT$
							IR-S	Ingestion Rate of Soil		100	mg/day	EPA, 2011	
EF	Exposure Frequency	100	days/year				EPA, 2009						
ED	Exposure Duration	12	years				EPA, 1989						
CF1	Conversion Factor 1	0.000001	kg/mg				--						
BW	Body Weight	44	kg				EPA, 2011 (4)						
AT-C	Averaging Time (Cancer)	25,550	days				EPA, 1989						
AT-N	Averaging Time (Non-Cancer)	4,380	days				EPA, 1989						

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Site Worker (new construction)	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,527	cm ²	EPA, 2014	
				SSAF	Soil to Skin Adherence Factor	0.12	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	250	days/year	EPA, 2014	
				ED	Exposure Duration	25	years	EPA, 2014	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989				
	Site Worker (reuse of silos)	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,527	cm ²	EPA, 2014	
				SSAF	Soil to Skin Adherence Factor	0.12	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	225	days/year	EPA, 2014	
				ED	Exposure Duration	25	years	EPA, 2014	
				BW	Body Weight	80	kg	EPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989				
	Construction Worker	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,527	cm ²	EPA, 2014	
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm ² -day	EPA, 2002	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	180	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 2002	
BW				Body Weight	80	kg	EPA, 2014		
AT-C				Averaging Time (Cancer)	25,550	days	EPA, 1989		
AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989					

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name				
Dermal	Resident	Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI (mg/kg\text{-}day) = CS \times SA \times SSAF \times DABS \times CF1 \times EF \times ED \times 1/BW \times 1/AT$				
				SA	Skin Surface Area Available for Contact	6,032	cm ²	EPA, 2014					
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm ² -day	EPA, 2014					
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004					
				CF1	Conversion Factor 1	0.000001	kg/mg	--					
				EF	Exposure Frequency	350	days/year	EPA, 2014					
				ED	Exposure Duration	20	years	EPA, 2014					
				BW	Body Weight	80	kg	EPA, 2014					
				AT-N	Averaging Time (Non-Cancer)	7,300	days	EPA, 1989					
				Resident	Child/Adult	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil		Table 3.2	mg/kg	Table 3.2	$CDI (mg/kg\text{-}day) = CS \times SA \times SSAF \times DABS \times CF1 \times EF \times ED \times 1/BW \times 1/AT$
							SA	Skin Surface Area Available for Contact		2,373	cm ²	EPA, 2014	
							SSAF	Soil to Skin Adherence Factor		0.2	mg/cm ² -day	EPA, 2014	
	DABS	Dermal Absorption Factor Solids	Chemical specific				--	EPA, 2004					
	CF1	Conversion Factor 1	0.000001				kg/mg	--					
	EF	Exposure Frequency	350				days/year	EPA, 2014					
	ED	Exposure Duration	6				years	EPA, 2014					
	BW	Body Weight	15				kg	EPA, 2014					
	AT-N	Averaging Time (Non-Cancer)	2,190				days	EPA, 1989					
	Resident	Child/Adult	Launch Area at the Former Nike BU-34/35 site				CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI (mg/kg\text{-}day) = CS \times DA\text{-}Adj \times DABS \times CF1 \times EF \times 1/AT$ $DA\text{-}Adj (mg\text{-}year/kg\text{-}day) = [(ED\text{-}C \times SA\text{-}C \times SSAF\text{-}C / BW\text{-}C) + (ED\text{-}A \times SA\text{-}A \times SSAF\text{-}A / BW\text{-}A)]$	
							SA-A	Skin Surface Area Available for Contact, Adult	6,032	cm ²	EPA, 2014		
							SA-C	Skin Surface Area Available for Contact, Child	2,373	cm ²	EPA, 2014		
				SSAF-A	Soil to Skin Adherence Factor, Adult	0.07	mg/cm ² -day	EPA, 2004					
				SSAF-C	Soil to Skin Adherence Factor, Child	0.2	mg/cm ² -day	EPA, 2004					
				DA-Adj	Dermal Absorption, Age-adjusted	295	mg-year/kg-day	calculated					
DABS				Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004						
CF1				Conversion Factor 1	0.000001	kg/mg	--						
EF				Exposure Frequency	350	days/year	EPA, 2014						
ED-A				Exposure Duration, Adult	20	years	EPA, 2014						
ED-C				Exposure Duration, Child	6	years	EPA, 2014						
BW-A				Body Weight, Adult	80	kg	EPA, 2014						
BW-C	Body Weight, Child	15	kg	EPA, 2014									
AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989									

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adolescent (12 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI (mg/kg\text{-}day) = CS \times SA \times SSAF \times DABS \times CF1 \times EF \times ED \times 1/BW \times 1/AT$
				SA	Skin Surface Area Available for Contact	4,403	cm ²	EPA, 2011 (5)	
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	6	years	(2)	
				BW	Body Weight	62	kg	EPA, 2011 (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
	Recreational User	Youth (6 to 18 years)	Launch Area at the Former Nike BU-34/35 site	CS	Chemical Concentration in Soil	Table 3.2	mg/kg	Table 3.2	$CDI (mg/kg\text{-}day) = CS \times SA \times SSAF \times DABS \times CF1 \times EF \times ED \times 1/BW \times 1/AT$
				SA	Skin Surface Area Available for Contact	4,200	cm ²	EPA, 2011 (6)	
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm ² -day	EPA, 2014	
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	100	days/year	EPA, 2009	
				ED	Exposure Duration	12	years	EPA, 1989	
				BW	Body Weight	44	kg	EPA, 2011 (4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	4,380	days	EPA, 1989					

Notes:

- (1) Assumes 5 days per week for 9 months out of the year when soil is not covered by snow.
- (2) Exposure duration for an adolescent trespasser, age 12 to 18 years.
- (3) Weighted average of children 12 to <18 years in age (Table 8-1, EPA, 2011).
- (4) Based on the weighted average weight for children 6 to <21 years in age (Table 8-1, EPA, 2011)
- (5) Based on weighted average surface area for head, hands, forearms, and lower legs for children 12 to <18 years in age (Table 7-2, EPA, 2011) using forearm and lower leg ratios for nearest available age group (Table 7-8, EPA, 2011)
- (6) Based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 18 years (Table 7-2, EPA, 2011)

Sources:

- EPA, 1989. Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
- EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
- EPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July.
- EPA, 2009. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002. OSWER 9285.7-82. January.
- EPA, 2011. Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F.
- EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 6.

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3)
Benz(a)anthracene	Chronic Subchronic	N/A N/A			N/A N/A					
Benzo(a)pyrene	Chronic Subchronic	3.0E-04 N/A	mg/kg-day	58 - 89%	3.0E-04 N/A	mg/kg-day	Developmental, Neurological	300	IRIS	8/2/2017
Benzo(b)fluoranthene	Chronic Subchronic	N/A N/A			N/A N/A					
Indeno(1,2,3-cd)pyrene	Chronic Subchronic	N/A N/A			N/A N/A					

Notes:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health

Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.

Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%.

Constituents that do not have oral absorption efficiencies reported on this table or on the RSL table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E. (dermal RfD = oral RfD x oral absorption efficiency)

(3) For IRIS values, the date IRIS was searched.

Definitions: IRIS = Integrated Risk Information System

N/A = Not Available

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC: Target Organ	Dates of RfC: Target Organ (1)
Benzo(a)anthracene	Chronic Subchronic	N/A N/A					
Benzo(a)pyrene	Chronic Subchronic	2.0E-06 N/A	mg/m ³	Developmental	3000	IRIS	8/2/2017
Benzo(b)fluoranthene	Chronic Subchronic	N/A N/A					
Indeno(1,2,3-cd)pyrene	Chronic Subchronic	N/A N/A					

Note:

(1) For IRIS values, the date IRIS was searched.

Definitions:

IRIS = Integrated Risk Information System

N/A = Not Available

TABLE 6.1
 CANCER TOXICITY DATA -- ORAL/DERMAL
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	EPA Carcinogen Group (Source, if different from slope factor source)	Source	Date (4)
Benzo(a)anthracene (3)	1.0E-01	58 - 89%	1.0E-01	(mg/kg-day) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993
Benzo(a)pyrene (3)	1.0E+00	58 - 89%	1.0E+00	(mg/kg-day) ⁻¹	Carcinogenic to humans	IRIS	8/2/2017
Benzo(b)fluoranthene (3)	1.0E-01	58 - 89%	1.0E-01	(mg/kg-day) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993
Indeno(1,2,3-cd)pyrene (3)	1.0E-01	58 - 89%	1.0E-01	(mg/kg-day) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table or on the RSL table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E. (dermal CSF = oral CSF / oral absorption efficiency)

(3) This chemical operates with a mutagenic mode of action. Chemical-specific data are not available; therefore, default age-dependent adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	ADAF	EXPOSURE DURATION
0-<2	10	2
2-<6	3	4
6-<16	3	10
16-<26	1	10

Definitions: ADAF = Age-Dependent Adjustment Factor
 IRIS = Integrated Risk Information System
 N/A = Not Available
 NCEA = National Center for Environmental Assessment

(4) For IRIS values, the date IRIS was searched.
 For NCEA values, the date of the NCEA document.

TABLE 6.2
 CANCER TOXICITY DATA -- INHALATION
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Chemical of Potential Concern	Unit Risk	Units	EPA Carcinogen Group	Source	Date (1)
Benzo(a)anthracene (2)	6.0E-05	(ug/m3) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993
Benzo(a)pyrene (2)	6.0E-04	(ug/m3) ⁻¹	Carcinogenic to humans	IRIS	8/2/2017
Benzo(b)fluoranthene (2)	6.0E-05	(ug/m3) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993
Indeno(1,2,3-cd)pyrene (2)	6.0E-05	(ug/m3) ⁻¹	Carcinogenic to humans	NCEA	7/1/1993

Note:

- (1) For IRIS values, the date IRIS was searched.
 For NCEA values, the date of the NCEA document.

Definitions:

ADAF = Age-Dependent Adjustment Factor
 IRIS = Integrated Risk Information System
 NCEA = National Center for Environmental Assessment

- (2) This chemical operates with a mutagenic mode of action (USEPA 2005).
 Chemical-specific data are not available; therefore, USEPA (2005) default age-dependent adjustment factors (ADAF) will be applied to the slope factor as follows:

AGE	ADAF	EXPOSURE DURATION
0-<2	10	2
2-<6	3	4
2-<16	3	10
16-<26	1	10

TABLE 7.1.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current Receptor Population: Site Worker Receptor Age: Adult
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Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	3.5E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	3.5E-08	9.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	
				Benzo(a)pyrene	2.8E+00	mg/kg	2.5E-07	mg/kg-day	1.0E+00	1/(mg/kg-day)	2.5E-07	6.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.3E-03	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	2.6E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	2.6E-08	7.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.2E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.2E-08	3.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	
				Exp. Route Total							3.2E-07						2.3E-03
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	1.9E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.9E-08	5.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	
				Benzo(a)pyrene	2.8E+00	mg/kg	1.4E-07	mg/kg-day	1.0E+00	1/(mg/kg-day)	1.4E-07	3.8E-07	mg/kg-day	3.0E-04	mg/kg-day	1.3E-03	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	1.5E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.5E-08	4.1E-07	mg/kg-day	N/A	mg/kg-day	N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	6.8E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	6.8E-09	1.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	
			Exp. Route Total							1.8E-07						1.3E-03	
			Total								5.0E-07						3.6E-03
			Exposure Medium Total								5.0E-07						3.6E-03
			Surface Soil Total								5.0E-07						3.6E-03
			Total Surface Soil								5.0E-07						3.6E-03
										Receptor Risks		Receptor Hazards					

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.2.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent (12 to 18 years)

Medium	Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	3.5E-08	1.8E-06	mg/kg-day	N/A		N/A
				Benzo(a)pyrene ¹	2.8E+00	mg/kg			1.0E+00	1/(mg/kg-day)	2.5E-07	1.2E-06	mg/kg-day	3.0E-04	mg/kg-day	4.1E-03
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	2.7E-08	1.3E-06	mg/kg-day	N/A		N/A
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.2E-08	6.2E-07	mg/kg-day	N/A		N/A
				Exp. Route Total								3.2E-07				
			Dermal ²	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.4E-08	7.1E-07	mg/kg-day	N/A		N/A
				Benzo(a)pyrene ¹	2.8E+00	mg/kg			1.0E+00	1/(mg/kg-day)	9.9E-08	5.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.1E-08	5.3E-07	mg/kg-day	N/A		N/A
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	5.0E-09	2.5E-07	mg/kg-day	N/A		N/A
				Exp. Route Total								1.3E-07				1.7E-03
			Exposure Point Total									4.5E-07				5.8E-03
			Exposure Medium Total									4.5E-07				5.8E-03
			Surface Soil Total									4.5E-07				5.8E-03
			Total Surface Soil									Receptor Risks	4.5E-07			Receptor Hazards

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ See Table 7.2.RME Supplement A for calculation of intake and cancer risk following MMOA method.

² Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.2.RME Supplement A
 CALCULATION OF CHEMICAL CANCER RISKS FOR COPCs WITH MUTAGENIC MODE OF ACTION
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent (12 to 18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Intake			CSF/Unit Risk			Cancer Risk
					Value	Units	Intake		Units	CSF/Unit Risk			
							12-16 yrs	16-18 yrs		12-16 yrs (ADAF=3)	16-18 yrs (ADAF=1)	Units	
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	1.0E-07	5.1E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	3.5E-08
				Benzo(a)pyrene	2.8E+00	mg/kg	7.1E-08	3.5E-08	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	2.5E-07
				Benzo(b)fluoranthene	3.0E+00	mg/kg	7.6E-08	3.8E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	2.7E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	3.5E-08	1.8E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.2E-08
			Dermal	Benzo(a)anthracene	4.0E+00	mg/kg	4.0E-08	2.0E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.4E-08
				Benzo(a)pyrene	2.8E+00	mg/kg	2.8E-08	1.4E-08	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	9.9E-08
				Benzo(b)fluoranthene	3.0E+00	mg/kg	3.0E-08	1.5E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.1E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.4E-08	7.1E-09	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	5.0E-09

Cancer risk = (Intake₁₂₋₁₆ × CSF₁₂₋₁₆) + (Intake₁₆₋₁₈ × CSF₁₆₋₁₈)

Soil:
 Ingestion Intake₁₂₋₁₆ = EPC x 100 mg/day x 100 days/year x 4 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Ingestion Intake₁₆₋₂₆ = EPC x 100 mg/day x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Dermal Intake₁₂₋₁₆ = EPC x 4403 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 100 days/year x 4 years x 0.000001 kg/mg x 1/62 kg x 1/25550 days
 Dermal Intake₁₆₋₁₈ = EPC x 4403 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 100 days/year x 2 years x 0.000001 kg/mg x 1/62 kg x 1/25550 days

DABS of 0.13 used for PAHs.

Notes:
 ADAF = Age-dependent adjustment factor
 CSF = Cancer slope factor
 cm² = square centimeters
 DABS = chemical specific dermal absorption factor
 EPC = Exposure point concentration
 kg = kilograms
 kg/mg = kilograms per milligram
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day

TABLE 7.3.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RID/RIC		Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.1E-07	2.5E-06	mg/kg-day	N/A		N/A
				Benzo(a)pyrene ¹	2.8E+00	mg/kg			1.0E+00	1/(mg/kg-day)	8.0E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.8E-03
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	8.5E-08	1.9E-06	mg/kg-day	N/A		N/A
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	4.0E-08	8.7E-07	mg/kg-day	N/A		N/A
				Exp. Route Total								1.0E-06				
			Dermal ²	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	4.4E-08	9.5E-07	mg/kg-day	N/A		N/A
				Benzo(a)pyrene ¹	2.8E+00	mg/kg			1.0E+00	1/(mg/kg-day)	3.0E-07	6.7E-07	mg/kg-day	3.0E-04	mg/kg-day	2.2E-03
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	3.3E-08	7.1E-07	mg/kg-day	N/A		N/A
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.5E-08	3.3E-07	mg/kg-day	N/A		N/A
				Exp. Route Total							4.0E-07					2.2E-03
	Exposure Point Total							1.4E-06					8.0E-03			
	Exposure Medium Total							1.4E-06					8.0E-03			
	Surface Soil Total							1.4E-06					8.0E-03			
	Total Surface Soil							1.4E-06					8.0E-03			
								Receptor Risks					Receptor Hazards	8.0E-03		

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ See Table 7.3.RME Supplement A for calculation of intake and cancer risk following MMOA method.

² Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.3.RME Supplement A
 CALCULATION OF CHEMICAL CANCER RISKS FOR COPCs WITH MUTAGENIC MODE OF ACTION
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Intake			CSF/Unit Risk			Cancer Risk
					Value	Units	Intake		Units	CSF/Unit Risk			
							6-16 yrs	16-18 yrs		6-16 yrs (ADAF=3)	16-18 yrs (ADAF=1)	Units	
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	3.6E-07	7.1E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.1E-07
				Benzo(a)pyrene	2.8E+00	mg/kg	2.5E-07	5.0E-08	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	8.0E-07
				Benzo(b)fluoranthene	3.0E+00	mg/kg	2.7E-07	5.3E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	8.5E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.2E-07	2.5E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	4.0E-08
			Dermal	Benzo(a)anthracene	4.0E+00	mg/kg	1.4E-07	2.7E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	4.4E-08
				Benzo(a)pyrene	2.8E+00	mg/kg	9.5E-08	1.9E-08	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	3.0E-07
				Benzo(b)fluoranthene	3.0E+00	mg/kg	1.0E-07	2.0E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	3.3E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	4.8E-08	9.5E-09	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.5E-08

Cancer risk = (Intake₆₋₁₆ × CSF₆₋₁₆) + (Intake₁₆₋₁₈ × CSF₁₆₋₁₈)

Soil:
 Ingestion Intake₆₋₁₆ = EPC × 100 mg/day × 100 days/year × 10 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Ingestion Intake₁₆₋₁₈ = EPC × 100 mg/day × 100 days/year × 2 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Dermal Intake₆₋₁₆ = EPC × 4200 cm² × 0.07 mg-cm²/event × 1 event/day × DABS × 100 days/year × 10 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Dermal Intake₁₆₋₂₆ = EPC × 4200 cm² × 0.07 mg-cm²/event × 1 event/day × DABS × 100 days/year × 2 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days

DABS of 0.13 used for PAHs.

- Notes:
- ADAF = Age-dependent adjustment factor
 - CSF = Cancer slope factor
 - cm² = square centimeters
 - DABS = chemical specific dermal absorption factor
 - EPC = Exposure point concentration
 - kg = kilograms
 - kg/mg = kilograms per milligram
 - mg/day = milligrams per day
 - mg/kg = milligrams per kilogram
 - mg/kg-day = milligrams per kilogram per day

TABLE 7.4.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Site Worker (new construction)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	6.1E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	6.1E-08	1.7E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	5.9E-08	mg/kg-day	1.0E+00	1/(mg/kg-day)	5.9E-08	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	5.5E-04	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	4.6E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	4.6E-08	1.3E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	2.1E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	2.1E-08	6.0E-07	mg/kg-day	N/A		N/A	
				Exp. Route Total													5.5E-04
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	6.7E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	6.7E-08	1.9E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	6.5E-08	mg/kg-day	1.0E+00	1/(mg/kg-day)	6.5E-08	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	6.1E-04	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	5.0E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	5.0E-08	1.4E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	2.4E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	2.4E-08	6.6E-07	mg/kg-day	N/A		N/A	
				Exp. Route Total							2.1E-07					6.1E-04	
				Exposure Point Total							3.9E-07					1.2E-03	
				Exposure Medium Total							3.9E-07					1.2E-03	
			Surface and Subsurface Soil Total								3.9E-07					1.2E-03	
			Total Surface and Subsurface Soil										Receptor Risks		Receptor Hazards		1.2E-03

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.5.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future Receptor Population: Site Worker (reuse of silos) Receptor Age: Adult
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Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	1.1E-06	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.1E-07	3.1E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	1.1E-07	mg/kg-day	1.0E+00	1/(mg/kg-day)	1.1E-07	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1.0E-03	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	8.3E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	8.3E-08	2.3E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	3.9E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	3.9E-08	1.1E-06	mg/kg-day	N/A		N/A	
			Exp. Route Total								3.4E-07					1.0E-03	
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	6.1E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	6.1E-08	1.7E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	5.9E-08	mg/kg-day	1.0E+00	1/(mg/kg-day)	5.9E-08	1.6E-07	mg/kg-day	3.0E-04	mg/kg-day	5.5E-04	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	4.5E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	4.5E-08	1.3E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	2.1E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	2.1E-08	5.9E-07	mg/kg-day	N/A		N/A	
			Exp. Route Total								1.9E-07					5.5E-04	
			Total									5.2E-07					1.5E-03
			Exposure Medium Total									5.2E-07					1.5E-03
			Surface and Subsurface Soil Total									5.2E-07					1.5E-03
			Total Surface and Subsurface Soil									Receptor Risks	5.2E-07			Receptor Hazard	1.5E-03

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs..

TABLE 7.6.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Receptor Population: Construction Worker
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations								
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RID/RfC		Quotient				
							Value	Units	Value	Units		Value	Units							
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	1.2E-07	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.2E-08	8.1E-06	mg/kg-day	N/A		N/A				
				Benzo(a)pyrene	3.9E-01	mg/kg	1.1E-08	mg/kg-day	1.0E+00	1/(mg/kg-day)	1.1E-08	7.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.6E-03				
				Benzo(b)fluoranthene	3.0E+00	mg/kg	8.7E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	8.7E-09	6.1E-06	mg/kg-day	N/A		N/A				
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	4.1E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	4.1E-09	2.8E-06	mg/kg-day	N/A		N/A				
				Exp. Route Total														2.6E-03		
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	4.8E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	4.8E-09	3.4E-06	mg/kg-day	N/A		N/A				
				Benzo(a)pyrene	3.9E-01	mg/kg	4.7E-09	mg/kg-day	1.0E+00	1/(mg/kg-day)	4.7E-09	3.3E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03				
				Benzo(b)fluoranthene	3.0E+00	mg/kg	3.6E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	3.6E-09	2.5E-06	mg/kg-day	N/A		N/A				
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.7E-08	mg/kg-day	1.0E-01	1/(mg/kg-day)	1.7E-09	1.2E-06	mg/kg-day	N/A		N/A				
				Exp. Route Total								1.5E-08				1.1E-03				
				Exposure Point Total								5.1E-08				3.7E-03				
				Exposure Medium Total								5.1E-08				3.7E-03				
				Surface and Subsurface Soil Total								5.1E-08				3.7E-03				
	Total Surface and Subsurface Soil								5.1E-08				3.7E-03							
																Receptor Risks	5.1E-08		Receptor Hazards	3.7E-03

Notes-
 EPC = Exposure Point Concentration
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day
 mg/m³ = milligrams per cubic meter
 N/A = Not applicable.
¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.7.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future Receptor Population: Resident Receptor Age: Adult
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Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RID/RIC		Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	N/A		N/A		N/A	4.8E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	N/A		N/A		N/A	4.7E-07	mg/kg-day	3.0E-04	mg/kg-day	1.6E-03	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	N/A		N/A		N/A	3.6E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	N/A		N/A		N/A	1.7E-06	mg/kg-day	N/A		N/A	
				Exp. Route Total							N/A						1.6E-03
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	N/A		N/A		N/A		2.6E-06	mg/kg-day	N/A		N/A
				Benzo(a)pyrene	3.9E-01	mg/kg	N/A		N/A		N/A		2.6E-07	mg/kg-day	3.0E-04	mg/kg-day	8.5E-04
				Benzo(b)fluoranthene	3.0E+00	mg/kg	N/A		N/A		N/A		2.0E-06	mg/kg-day	N/A		N/A
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	N/A		N/A		N/A		9.2E-07	mg/kg-day	N/A		N/A
				Exp. Route Total							N/A						8.5E-04
				Exposure Point Total							N/A						2.4E-03
				Exposure Medium Total							N/A						2.4E-03
				Surface and Subsurface Soil Total							N/A						2.4E-03
				Total Surface and Subsurface Soil							Receptor Risks	N/A				Receptor Hazards	2.4E-03

Notes-

EPC = Exposure Point Concentration
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day
 N/A = Not applicable.

¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.8.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				Non-Cancer Hazard Calculations				Quotient		
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Intake/Exposure Concentration		RfD/RfC				
							Value	Units	Value	Units	Value	Units	Value	Units			
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	N/A		N/A		N/A	5.1E-05	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	N/A		N/A		N/A	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	N/A		N/A		N/A	3.8E-05	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	N/A		N/A		N/A	1.8E-05	mg/kg-day	N/A		N/A	
			Exp. Route Total								N/A						1.7E-02
			Dermal ¹	Benzo(a)anthracene	4.0E+00	mg/kg	N/A		N/A		N/A	1.6E-05	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene	3.9E-01	mg/kg	N/A		N/A		N/A	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	5.1E-03	
				Benzo(b)fluoranthene	3.0E+00	mg/kg	N/A		N/A		N/A	1.2E-05	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	N/A		N/A		N/A	5.5E-06	mg/kg-day	N/A		N/A	
			Exp. Route Total								N/A						5.1E-03
			Exposure Point Total							N/A						2.2E-02	
			Exposure Medium Total							N/A						2.2E-02	
			Surface and Subsurface Soil Total							N/A						2.2E-02	
			Total Surface and Subsurface Soil							Receptor Risks		Receptor Hazards				2.2E-02	

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

ug/L = micrograms per liter

N/A = Not applicable.

¹ Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.9.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	2.6E-06	N/A		N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	2.5E-06	N/A		N/A		N/A	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	2.0E-06	N/A		N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	9.1E-07	N/A		N/A		N/A	
				Exp. Route Total													
			Dermal ²	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	8.7E-07	N/A		N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	8.5E-07	N/A		N/A		N/A	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	6.5E-07	N/A		N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	3.1E-07	N/A		N/A		N/A	
			Exp. Route Total														
Exposure Point Total																	
Exposure Medium Total																	
Surface and Subsurface Soil Total																	
Total Surface and Subsurface Soil																	
										Receptor Risks	1.1E-05	Receptor Hazards		N/A			

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ See Table 7.9.RME Supplement A for calculation of intake and cancer risk following MMOA method.

² Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.9.RME Supplement A
 CALCULATION OF CHEMICAL CANCER RISKS FOR COPCs WITH MUTAGENIC MODE OF ACTION
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Receptor Population: Resident
 Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations										Cancer Risk
					Value	Units	Intake				Units	CSF/Unit Risk				Units	
							Value					0-2 yrs (ADAF=10)	2-6 yrs (ADAF=3)	6-16 yrs (ADAF=3)	16-26 yrs (ADAF=1)		
							0-2 yrs	2-6 yrs	6-16 yrs	16-26 yrs							
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	1.5E-06	2.9E-06	6.8E-07	6.8E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	2.6E-06
				Benzo(a)pyrene	3.9E-01	mg/kg	1.4E-07	2.8E-07	6.6E-08	6.6E-08	mg/kg-day	1.0E+01	3.0E+00	3.0E+00	1.0E+00	1/mg/kg-day	2.5E-06
				Benzo(b)fluoranthene	3.0E+00	mg/kg	1.1E-06	2.2E-06	5.1E-07	5.1E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	2.0E-06
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	5.1E-07	1.0E-06	2.4E-07	2.4E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	9.1E-07
			Dermal	Benzo(a)anthracene	4.0E+00	mg/kg	4.5E-07	9.0E-07	3.8E-07	3.8E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	8.7E-07
				Benzo(a)pyrene	3.9E-01	mg/kg	4.4E-08	8.7E-08	3.6E-08	3.6E-08	mg/kg-day	1.0E+01	3.0E+00	3.0E+00	1.0E+00	1/mg/kg-day	8.5E-07
				Benzo(b)fluoranthene	3.0E+00	mg/kg	3.4E-07	6.8E-07	2.8E-07	2.8E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	6.5E-07
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.6E-07	3.2E-07	1.3E-07	1.3E-07	mg/kg-day	1.0E+00	3.0E-01	3.0E-01	1.0E-01	1/mg/kg-day	3.1E-07

Cancer risk = (Intake₀₋₂ x CSF₀₋₂) + (Intake₂₋₆ x CSF₂₋₆) + (Intake₆₋₁₆ x CSF₆₋₁₆) + (Intake₁₆₋₂₆ x CSF₁₆₋₂₆)

Soil:
 Ingestion Intake₀₋₂ = EPC x 200 mg/day x 350 days/year x 2 years x 0.000001 kg/mg x 1/15 kg x 1/25550 days
 Ingestion Intake₂₋₆ = EPC x 200 mg/day x 350 days/year x 4 years x 0.000001 kg/mg x 1/15 kg x 1/25550 days
 Ingestion Intake₆₋₁₆ = EPC x 100 mg/day x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Ingestion Intake₁₆₋₂₆ = EPC x 100 mg/day x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Dermal Intake₀₋₂ = EPC x 2373 cm² x 0.2 mg-cm²/event x 1 event/day x DABS x 350 days/year x 2 years x 0.000001 kg/mg x 1/15 kg x 1/25550 days
 Dermal Intake₂₋₆ = EPC x 2373 cm² x 0.2 mg-cm²/event x 1 event/day x DABS x 350 days/year x 4 years x 0.000001 kg/mg x 1/15 kg x 1/25550 days
 Dermal Intake₆₋₁₆ = EPC x 6032 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Dermal Intake₁₆₋₂₆ = EPC x 6032 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days

DABS of 0.13 used for PAHs.

Notes:
 ADAF = Age-dependent adjustment factor
 CSF = Cancer slope factor
 cm² = square centimeters
 DABS = chemical specific dermal absorption factor
 EPC = Exposure point concentration
 mg = milligram
 kg = kilograms
 kg/mg = kilograms per milligram
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day

TABLE 7.10.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future Receptor Population: Trespasser Receptor Age: Adolescent (12 to 18 years)
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Medium	Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	3.5E-08	1.8E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	3.4E-08	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	5.7E-04	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	2.7E-08	1.3E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.2E-08	6.2E-07	mg/kg-day	N/A		N/A	
				Exp. Route Total									1.1E-07				5.7E-04
			Dermal ²	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.4E-08	7.1E-07	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	1.4E-08	6.9E-08	mg/kg-day	3.0E-04	mg/kg-day	2.3E-04	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.1E-08	5.3E-07	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	5.0E-09	2.5E-07	mg/kg-day	N/A		N/A	
				Exp. Route Total							4.3E-08					2.3E-04	
				Exposure Point Total							1.5E-07					8.0E-04	
				Exposure Medium Total							1.5E-07					8.0E-04	
				Surface and Subsurface Soil Total							1.5E-07					8.0E-04	
				Total Surface and Subsurface Soil							Receptor Risks	1.5E-07			Receptor Hazards	8.0E-04	

Notes-
 EPC = Exposure Point Concentration
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day
 N/A = Not applicable.

¹ See Table 7.10.RME Supplement A for calculation of intake and cancer risk following MMOA method.

² Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13 used for PAHs.

TABLE 7.10.RME Supplement A
 CALCULATION OF CHEMICAL CANCER RISKS FOR COPCs WITH MUTAGENIC MODE OF ACTION
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
 Receptor Population: Trespasser
 Receptor Age: Adolescent (12 to 18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Intake			CSF/Unit Risk			Cancer Risk
					Value	Units	Intake		Units	CSF/Unit Risk			
							12-16 yrs	16-18 yrs		12-16 yrs (ADAF=3)	16-18 yrs (ADAF=1)	Units	
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene	4.0E+00	mg/kg	1.0E-07	5.1E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	3.5E-08
				Benzo(a)pyrene	3.9E-01	mg/kg	9.8E-09	4.9E-09	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	3.4E-08
				Benzo(b)fluoranthene	3.0E+00	mg/kg	7.6E-08	3.8E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	2.7E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	3.5E-08	1.8E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.2E-08
			Dermal	Benzo(a)anthracene	4.0E+00	mg/kg	4.0E-08	2.0E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.4E-08
				Benzo(a)pyrene	3.9E-01	mg/kg	3.9E-09	2.0E-09	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	1.4E-08
				Benzo(b)fluoranthene	3.0E+00	mg/kg	3.0E-08	1.5E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.1E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.4E-08	7.1E-09	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	5.0E-09

$$\text{Cancer risk} = (\text{Intake}_{12-16} \times \text{CSF}_{12-16}) + (\text{Intake}_{16-18} \times \text{CSF}_{16-18})$$

Soil:
 Ingestion Intake₁₂₋₁₆ = EPC x 100 mg/day x 100 days/year x 4 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Ingestion Intake₁₆₋₂₆ = EPC x 100 mg/day x 350 days/year x 10 years x 0.000001 kg/mg x 1/80 kg x 1/25550 days
 Dermal Intake₁₂₋₁₆ = EPC x 4403 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 100 days/year x 4 years x 0.000001 kg/mg x 1/62 kg x 1/25550 days
 Dermal Intake₁₆₋₁₈ = EPC x 4403 cm² x 0.07 mg-cm²/event x 1 event/day x DABS x 100 days/year x 2 years x 0.000001 kg/mg x 1/62 kg x 1/25550 days

DABS of 0.13 used for PAHs.

Notes:
 ADAF = Age-dependent adjustment factor
 CSF = Cancer slope factor
 cm² = square centimeters
 DABS = chemical specific dermal absorption factor
 EPC = Exposure point concentration
 kg = kilograms
 kg/mg = kilograms per milligram
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day

TABLE 7.11.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RID/RfC		Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.1E-07	2.5E-06	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	1.1E-07	2.4E-07	mg/kg-day	3.0E-04	mg/kg-day	8.1E-04	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	8.5E-08	1.9E-06	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	4.0E-08	8.7E-07	mg/kg-day	N/A		N/A	
				Exp. Route Total													
			Dermal ²	Benzo(a)anthracene ¹	4.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	4.4E-08	9.5E-07	mg/kg-day	N/A		N/A	
				Benzo(a)pyrene ¹	3.9E-01	mg/kg			1.0E+00	1/(mg/kg-day)	4.2E-08	9.2E-08	mg/kg-day	3.0E-04	mg/kg-day	3.1E-04	
				Benzo(b)fluoranthene ¹	3.0E+00	mg/kg			1.0E-01	1/(mg/kg-day)	3.3E-08	7.1E-07	mg/kg-day	N/A		N/A	
				Indeno(1,2,3-cd)pyrene ¹	1.4E+00	mg/kg			1.0E-01	1/(mg/kg-day)	1.5E-08	3.3E-07	mg/kg-day	N/A		N/A	
			Exp. Route Total								1.3E-07					3.1E-04	
Exposure Point Total									4.8E-07					1.1E-03			
Exposure Medium Total									4.8E-07					1.1E-03			
Surface and Subsurface Soil Total									4.8E-07					1.1E-03			
Total Surface and Subsurface Soil									4.8E-07					1.1E-03			
										Receptor Risks	4.8E-07	Receptor Hazards			1.1E-03		

Notes-

EPC = Exposure Point Concentration

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

N/A = Not applicable.

¹ See Table 7.11.RME Supplement A for calculation of intake and cancer risk following MMOA method.

² Dermal absorption factors (DABS) used to calculate dermal absorption intake from soil are chemical specific. DABS of 0.13.

TABLE 7.11.RME Supplement A
 CALCULATION OF CHEMICAL CANCER RISKS FOR COPCs WITH MUTAGENIC MODE OF ACTION
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Intake			CSF/Unit Risk			Cancer Risk
					Value	Units	Intake		Units	CSF/Unit Risk			
							6-16 years	16-18 yrs		6-16 yrs (ADAF=3)	16-18 yrs (ADAF=1)	Units	
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Ingestion	Benzo(a)pyrene	4.0E+00	mg/kg	3.6E-07	7.1E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.1E-07
				Benzo(b)fluoranthene	3.9E-01	mg/kg	3.5E-08	6.9E-09	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	1.1E-07
				Benzo(k)fluoranthene	3.0E+00	mg/kg	2.7E-07	5.3E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	8.5E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	1.2E-07	2.5E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	4.0E-08
			Dermal	Benzo(a)pyrene	4.0E+00	mg/kg	1.4E-07	2.7E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	4.4E-08
				Benzo(b)fluoranthene	3.9E-01	mg/kg	1.3E-08	2.6E-09	mg/kg-day	3.0E+00	1.0E+00	1/mg/kg-day	4.2E-08
				Benzo(k)fluoranthene	3.0E+00	mg/kg	1.0E-07	2.0E-08	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	3.3E-08
				Indeno(1,2,3-cd)pyrene	1.4E+00	mg/kg	4.8E-08	9.5E-09	mg/kg-day	3.0E-01	1.0E-01	1/mg/kg-day	1.5E-08

Cancer risk = (Intake₆₋₁₆ × CSF₆₋₁₆) + (Intake₁₆₋₁₈ × CSF₁₆₋₁₈)

Soil:
 Ingestion Intake₆₋₁₆ = EPC × 100 mg/day × 100 days/year × 10 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Ingestion Intake₁₆₋₁₈ = EPC × 100 mg/day × 100 days/year × 2 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Dermal Intake₆₋₁₆ = EPC × 4200 cm² × 0.07 mg-cm²/event × 1 event/day × DABS × 100 days/year × 10 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days
 Dermal Intake₁₆₋₂₆ = EPC × 4200 cm² × 0.07 mg-cm²/event × 1 event/day × DABS × 100 days/year × 2 years × 0.000001 kg/mg × 1/44 kg × 1/25550 days

DABS of 0.13 used for PAHs.

Notes:
 ADAF = Age-dependent adjustment factor
 CSF = Cancer slope factor
 cm² = square centimeters
 DABS = chemical specific dermal absorption factor
 EPC = Exposure point concentration
 kg = kilograms
 kg/mg = kilograms per milligram
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 mg/kg-day = milligrams per kilogram per day

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	4E-08	N/A	2E-08	5E-08	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	2E-07	N/A	1E-07	4E-07	Developmental, Neurological	2E-03	N/A	1E-03	4E-03
			Benzo(b)fluoranthene	3E-08	N/A	1E-08	4E-08	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	1E-08	N/A	7E-09	2E-08	N/A	N/A	N/A	N/A	N/A
			Chemical Total	3E-07	N/A	2E-07	5E-07		2E-03	N/A	1E-03	4E-03
		Exposure Point Total				5E-07					4E-03	
		Exposure Medium Total				5E-07					4E-03	
Surface Soil Total							5E-07					4E-03
Receptor Total							5E-07				Receptor HI Total	4E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	4E-03
Total Neurological HI Across All Media =	4E-03

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent (12 to 18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	4E-08	N/A	1E-08	5E-08	N/A Developmental, Neurological	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	2E-07	N/A	1E-07	3E-07		4E-03	N/A	2E-03	6E-03
			Benzo(b)fluoranthene	3E-08	N/A	1E-08	4E-08		N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	1E-08	N/A	5E-09	2E-08		N/A	N/A	N/A	N/A
			Chemical Total	3E-07	N/A	1E-07	5E-07			4E-03	N/A	2E-03
		Exposure Point Total				5E-07					6E-03	
		Exposure Medium Total				5E-07					6E-03	
Surface Soil Total							5E-07					6E-03
Receptor Total							5E-07				Receptor HI Total	6E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	6E-03
Total Neurological HI Across All Media =	6E-03

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	1E-07	N/A	4E-08	2E-07	N/A Developmental, Neurological	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	8E-07	N/A	3E-07	1E-06		6E-03	N/A	2E-03	8E-03
			Benzo(b)fluoranthene	9E-08	N/A	3E-08	1E-07		N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	4E-08	N/A	2E-08	6E-08		N/A	N/A	N/A	N/A
			Chemical Total	1E-06	N/A	4E-07	1E-06		6E-03	N/A	2E-03	8E-03
		Exposure Point Total				1E-06					8E-03	
		Exposure Medium Total				1E-06					8E-03	
Surface Soil Total							1E-06					8E-03
Receptor Total							1E-06				Receptor HI Total	8E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	8E-03
Total Neurological HI Across All Media =	8E-03

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Site Worker (new construction)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	6E-08	N/A	7E-08	1E-07	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	6E-08	N/A	7E-08	1E-07	Developmental, Neurological	6E-04	N/A	6E-04	1E-03
			Benzo(b)fluoranthene	5E-08	N/A	5E-08	1E-07	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	2E-08	N/A	2E-08	4E-08	N/A	N/A	N/A	N/A	N/A
			Chemical Total	2E-07	N/A	2E-07	4E-07		6E-04	N/A	6E-04	1E-03
		Exposure Point Total				4E-07					1E-03	
		Exposure Medium Total				4E-07					1E-03	
Soil Total							4E-07					1E-03
Receptor Total							4E-07				Receptor HI Total	1E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	1E-03
Total Neurological HI Across All Media =	1E-03

TABLE 9.5.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Site Worker (reuse of silos)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	1E-07	N/A	6E-08	2E-07	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	1E-07	N/A	6E-08	2E-07	Developmental, Neurological	1E-03	N/A	5E-04	2E-03
			Benzo(b)fluoranthene	8E-08	N/A	5E-08	1E-07	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	4E-08	N/A	2E-08	6E-08	N/A	N/A	N/A	N/A	N/A
			Chemical Total	3E-07	N/A	2E-07	5E-07		1E-03	N/A	5E-04	2E-03
		Exposure Point Total				5E-07					2E-03	
		Exposure Medium Total				5E-07					2E-03	
Soil Total							5E-07					2E-03
Receptor Total							5E-07				Receptor HI Total	2E-03

Notes:
 HI = Hazard Index
 N/A = Not applicable

Total Developmental HI Across All Media =	2E-03
Total Neurological HI Across All Media =	2E-03

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	1E-08	N/A	5E-09	2E-08	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	1E-08	N/A	5E-09	2E-08	Developmental, Neurological	3E-03	N/A	1E-03	4E-03
			Benzo(b)fluoranthene	9E-09	N/A	4E-09	1E-08	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	4E-09	N/A	2E-09	6E-09	N/A	N/A	N/A	N/A	N/A
			Chemical Total	4E-08	N/A	1E-08	5E-08		3E-03	N/A	1E-03	4E-03
		Exposure Point Total				5E-08					4E-03	
		Exposure Medium Total				5E-08					4E-03	
Soil Total							5E-08					4E-03
Receptor Total							5E-08				Receptor HI Total	4E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	4E-03
Total Neurological HI Across All Media =	4E-03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	N/A	N/A	N/A	0E+00	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	N/A	N/A	N/A	0E+00	Developmental, Neurological	2E-03	N/A	9E-04	2E-03
			Benzo(b)fluoranthene	N/A	N/A	N/A	0E+00	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	0E+00	N/A	N/A	N/A	N/A	N/A
			Chemical Total	N/A	N/A	N/A	N/A		2E-03	N/A	9E-04	2E-03
		Exposure Point Total				N/A					2E-03	
		Exposure Medium Total				N/A					2E-03	
Soil Total							N/A					2E-03
Receptor Total							N/A				Receptor HI Total	2E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	2E-03
Total Neurological HI Across All Media =	2E-03

TABLE 9.8.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURE
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	N/A	N/A	N/A	N/A	Developmental, Neurological	2E-02	N/A	5E-03	2E-02	
			Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			Chemical Total	N/A	N/A	N/A	N/A		2E-02	N/A	5E-03	2E-02	
		Exposure Point Total				N/A					2E-02		
		Exposure Medium Total				N/A					2E-02		
Soil Total							N/A					2E-02	
Receptor Total							N/A				Receptor HI Total	2E-02	

Notes:
 HI = Hazard Index
 N/A = Not applicable

Total Developmental HI Across All Media =	2E-02
Total Neurological HI Across All Media =	2E-02

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	3E-06	N/A	9E-07	3E-06	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	3E-06	N/A	8E-07	3E-06	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	2E-06	N/A	7E-07	3E-06	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	9E-07	N/A	3E-07	1E-06	N/A	N/A	N/A	N/A	N/A
			Chemical Total	8E-06	N/A	3E-06	1E-05		N/A	N/A	N/A	N/A
		Exposure Point Total				1E-05					N/A	
		Exposure Medium Total				1E-05					N/A	
Soil Total							1E-05					N/A
Receptor Total							1E-05				Receptor HI Total	N/A

Notes:
HI = Hazard Index
N/A = Not applicable

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent (12 to 18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	4E-08	N/A	1E-08	5E-08	N/A Developmental, Neurological	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	3E-08	N/A	1E-08	5E-08					
			Benzo(b)fluoranthene	3E-08	N/A	1E-08	4E-08					
			Indeno(1,2,3-cd)pyrene	1E-08	N/A	5E-09	2E-08					
			Chemical Total	1E-07	N/A	4E-08	2E-07	6E-04	N/A	2E-04	8E-04	
Exposure Point Total							8E-04					
Exposure Medium Total							8E-04					
Soil Total							8E-04					
Receptor Total							Receptor HI Total 8E-04					

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	8E-04
Total Neurological HI Across All Media =	8E-04

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Youth (6 to 18 years)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	Launch Area at the Former Nike BU-34/35 site	Benzo(a)anthracene	1E-07	N/A	4E-08	2E-07	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	1E-07	N/A	4E-08	2E-07	N/A	8E-04	N/A	3E-04	1E-03
			Benzo(b)fluoranthene	9E-08	N/A	3E-08	1E-07	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	4E-08	N/A	2E-08	6E-08	N/A	N/A	N/A	N/A	N/A
			Chemical Total	3E-07	N/A	1E-07	5E-07		8E-04	N/A	3E-04	1E-03
		Exposure Point Total				5E-07					1E-03	
		Exposure Medium Total				5E-07					1E-03	
Soil Total							5E-07					1E-03
Receptor Total							5E-07				Receptor HI Total	1E-03

Notes:
HI = Hazard Index
N/A = Not applicable

Total Developmental HI Across All Media =	1E-03
Total Neurological HI Across All Media =	1E-03

Surface Soil ProUCL Output										
UCL Statistics for Data Sets with Non-Detects										
User Selected Options										
Date/Time of Computation		ProUCL 5.110/11/2016 12:48:27 PM								
From File		Nike_ProUCL_Input_100616_SO_SS.xls								
Full Precision		OFF								
Confidence Coefficient		95%								
Number of Bootstrap Operations		2000								
BENZ(A)ANTHRACENE (MG/KG)										
General Statistics										
Total Number of Observations		26		Number of Distinct Observations		9				
Number of Detects		1		Number of Non-Detects		25				
Number of Distinct Detects		1		Number of Distinct Non-Detects		8				
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, B</p>										
The data set for variable BENZ(A)ANTHRACENE (MG/KG) was not processed!										
BENZO(A)PYRENE (MG/KG)										
General Statistics										
Total Number of Observations		26		Number of Distinct Observations		10				
Number of Detects		3		Number of Non-Detects		23				
Number of Distinct Detects		3		Number of Distinct Non-Detects		7				
Minimum Detect		0.17		Minimum Non-Detect		0.37				
Maximum Detect		2.8		Maximum Non-Detect		0.43				
Variance Detects		2.174		Percent Non-Detects		88.46%				
Mean Detects		1.1		SD Detects		1.474				
Median Detects		0.33		CV Detects		1.34				
Skewness Detects		1.709		Kurtosis Detects		N/A				
Mean of Logged Detects		-0.617		SD of Logged Detects		1.464				
<p>Warning: Data set has only 3 Detected Values.</p> <p>This is not enough to compute meaningful or reliable statistics and estimates.</p>										
Normal GOF Test on Detects Only										
Shapiro Wilk Test Statistic		0.795		Shapiro Wilk GOF Test						
5% Shapiro Wilk Critical Value		0.767		Detected Data appear Normal at 5% Significance Level						
Lilliefors Test Statistic		0.366		Lilliefors GOF Test						
5% Lilliefors Critical Value		0.425		Detected Data appear Normal at 5% Significance Level						
Detected Data appear Normal at 5% Significance Level										
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs										
KM Mean		0.348		KM Standard Error of Mean		0.135				
KM SD		0.497		95% KM (BCA) UCL		N/A				
95% KM (t) UCL		0.579		95% KM (Percentile Bootstrap) UCL		N/A				
95% KM (z) UCL		0.571		95% KM Bootstrap t UCL		N/A				
90% KM Chebyshev UCL		0.754		95% KM Chebyshev UCL		0.938				
97.5% KM Chebyshev UCL		1.193		99% KM Chebyshev UCL		1.694				

Surface Soil ProUCL Output										
Gamma GOF Tests on Detected Observations Only										
Not Enough Data to Perform GOF Test										
Gamma Statistics on Detected Data Only										
	k hat (MLE)	0.829		k star (bias corrected MLE)	N/A					
	Theta hat (MLE)	1.326		Theta star (bias corrected MLE)	N/A					
	nu hat (MLE)	4.976		nu star (bias corrected)	N/A					
	Mean (detects)	1.1								
Gamma ROS Statistics using Imputed Non-Detects										
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)										
For such situations, GROS method may yield incorrect values of UCLs and BTVs										
This is especially true when the sample size is small.										
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
	Minimum	0.01		Mean	0.408					
	Maximum	2.8		Median	0.222					
	SD	0.577		CV	1.415					
	k hat (MLE)	0.628		k star (bias corrected MLE)	0.581					
	Theta hat (MLE)	0.649		Theta star (bias corrected MLE)	0.701					
	nu hat (MLE)	32.65		nu star (bias corrected)	30.22					
	Adjusted Level of Significance (β)	0.0398								
	Approximate Chi Square Value (30.22, α)	18.66		Adjusted Chi Square Value (30.22, β)	18.06					
	95% Gamma Approximate UCL (use when $n \geq 50$)	0.66		95% Gamma Adjusted UCL (use when $n < 50$)	N/A					
Estimates of Gamma Parameters using KM Estimates										
	Mean (KM)	0.348		SD (KM)	0.497					
	Variance (KM)	0.247		SE of Mean (KM)	0.135					
	k hat (KM)	0.491		k star (KM)	0.46					
	nu hat (KM)	25.55		nu star (KM)	23.93					
	theta hat (KM)	0.709		theta star (KM)	0.756					
	80% gamma percentile (KM)	0.569		90% gamma percentile (KM)	0.958					
	95% gamma percentile (KM)	1.377		99% gamma percentile (KM)	2.417					
Gamma Kaplan-Meier (KM) Statistics										
	Approximate Chi Square Value (23.93, α)	13.8		Adjusted Chi Square Value (23.93, β)	13.29					
	95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.604		95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.627					
Lognormal GOF Test on Detected Observations Only										
	Shapiro Wilk Test Statistic	0.915		Shapiro Wilk GOF Test						
	5% Shapiro Wilk Critical Value	0.767		Detected Data appear Lognormal at 5% Significance Level						
	Lilliefors Test Statistic	0.298		Lilliefors GOF Test						
	5% Lilliefors Critical Value	0.425		Detected Data appear Lognormal at 5% Significance Level						
Detected Data appear Lognormal at 5% Significance Level										
Lognormal ROS Statistics Using Imputed Non-Detects										
	Mean in Original Scale	0.39		Mean in Log Scale	-1.328					
	SD in Original Scale	0.525		SD in Log Scale	0.797					
	95% t UCL (assumes normality of ROS data)	0.565		95% Percentile Bootstrap UCL	0.574					
	95% BCA Bootstrap UCL	0.681		95% Bootstrap t UCL	0.84					
	95% H-UCL (Log ROS)	0.523								
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution										
	KM Mean (logged)	-1.345		KM Geo Mean	0.26					
	KM SD (logged)	0.576		95% Critical H Value (KM-Log)	2.032					

Surface Soil ProUCL Output			
KM Standard Error of Mean (logged)	0.299	95% H-UCL (KM -Log)	0.388
KM SD (logged)	0.576	95% Critical H Value (KM-Log)	2.032
KM Standard Error of Mean (logged)	0.299		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.303	Mean in Log Scale	-1.498
SD in Original Scale	0.51	SD in Log Scale	0.527
95% t UCL (Assumes normality)	0.474	95% H-Stat UCL	0.317
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.579		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZO(B)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	2	Number of Non-Detects	24
Number of Distinct Detects	2	Number of Distinct Non-Detects	7
Minimum Detect	0.28	Minimum Non-Detect	0.37
Maximum Detect	3	Maximum Non-Detect	0.43
Variance Detects	3.699	Percent Non-Detects	92.31%
Mean Detects	1.64	SD Detects	1.923
Median Detects	1.64	CV Detects	1.173
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.0872	SD of Logged Detects	1.677
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.385	KM Standard Error of Mean	0.145
KM SD	0.523	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.632	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.623	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.82	95% KM Chebyshev UCL	1.017
97.5% KM Chebyshev UCL	1.291	99% KM Chebyshev UCL	1.828
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			

Surface Soil ProUCL Output				
k hat (MLE)	0.993	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	1.652	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	3.971	nu star (bias corrected)	N/A	
Mean (detects)	1.64			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.385	SD (KM)	0.523	
Variance (KM)	0.274	SE of Mean (KM)	0.145	
k hat (KM)	0.541	k star (KM)	0.504	
nu hat (KM)	28.11	nu star (KM)	26.2	
theta hat (KM)	0.711	theta star (KM)	0.763	
80% gamma percentile (KM)	0.632	90% gamma percentile (KM)	1.039	
95% gamma percentile (KM)	1.473	99% gamma percentile (KM)	2.541	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0398	
Approximate Chi Square Value (26.20, α)	15.54	Adjusted Chi Square Value (26.20, β)	14.99	
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.649	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.672	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.44	Mean in Log Scale	-1.192	
SD in Original Scale	0.564	SD in Log Scale	0.796	
95% t UCL (assumes normality of ROS data)	0.629	95% Percentile Bootstrap UCL	0.642	
95% BCA Bootstrap UCL	0.754	95% Bootstrap t UCL	0.893	
95% H-UCL (Log ROS)	0.597			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.182	KM Geo Mean	0.307	
KM SD (logged)	0.456	95% Critical H Value (KM-Log)	1.929	
KM Standard Error of Mean (logged)	0.126	95% H-UCL (KM -Log)	0.406	
KM SD (logged)	0.456	95% Critical H Value (KM-Log)	1.929	
KM Standard Error of Mean (logged)	0.126			
DL/2 Statistics				
DL/2 Normal		DL/2 Log-Transformed		
Mean in Original Scale	0.311	Mean in Log Scale	-1.493	
SD in Original Scale	0.549	SD in Log Scale	0.534	
95% t UCL (Assumes normality)	0.495	95% H-Stat UCL	0.321	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.017			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
INDENO(1,2,3-CD)PYRENE (MG/KG)				

Surface Soil ProUCL Output			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	24
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.2	Minimum Non-Detect	0.37
Maximum Detect	1.4	Maximum Non-Detect	0.81
Variance Detects	0.72	Percent Non-Detects	92.31%
Mean Detects	0.8	SD Detects	0.849
Median Detects	0.8	CV Detects	1.061
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.636	SD of Logged Detects	1.376
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.246	KM Standard Error of Mean	0.064
KM SD	0.231	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.355	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.351	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.438	95% KM Chebyshev UCL	0.525
97.5% KM Chebyshev UCL	0.646	99% KM Chebyshev UCL	0.883
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.352	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.592	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	5.408	nu star (bias corrected)	N/A
Mean (detects)	0.8		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.246	SD (KM)	0.231
Variance (KM)	0.0533	SE of Mean (KM)	0.064
k hat (KM)	1.138	k star (KM)	1.032
nu hat (KM)	59.16	nu star (KM)	53.67
theta hat (KM)	0.216	theta star (KM)	0.238
80% gamma percentile (KM)	0.395	90% gamma percentile (KM)	0.562
95% gamma percentile (KM)	0.729	99% gamma percentile (KM)	1.116
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0398
Approximate Chi Square Value (53.67, α)	37.84	Adjusted Chi Square Value (53.67, β)	36.96
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.349	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.357
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			

Surface Soil ProUCL Output				
Mean in Original Scale	0.271	Mean in Log Scale	-1.543	
SD in Original Scale	0.257	SD in Log Scale	0.64	
95% t UCL (assumes normality of ROS data)	0.357	95% Percentile Bootstrap UCL	0.358	
95% BCA Bootstrap UCL	0.404	95% Bootstrap t UCL	0.455	
95% H-UCL (Log ROS)	0.343			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.535	KM Geo Mean	0.216	
KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.867	
KM Standard Error of Mean (logged)	0.104	95% H-UCL (KM -Log)	0.266	
KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.867	
KM Standard Error of Mean (logged)	0.104			
DL/2 Statistics				
DL/2 Normal		DL/2 Log-Transformed		
Mean in Original Scale	0.254	Mean in Log Scale	-1.51	
SD in Original Scale	0.237	SD in Log Scale	0.403	
95% t UCL (Assumes normality)	0.333	95% H-Stat UCL	0.279	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.525			
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>				

Surface and Subsurface Soil ProUCL Output			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.110/11/2016 12:08:25 PM		
From File	Nike_ProUCL_Input_100616_SO_Sub.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
BENZ(A)ANTHRACENE (MG/KG)			
General Statistics			
Total Number of Observations	67	Number of Distinct Observations	12
Number of Detects	2	Number of Non-Detects	65
Number of Distinct Detects	2	Number of Distinct Non-Detects	10
Minimum Detect	0.28	Minimum Non-Detect	0.36
Maximum Detect	4	Maximum Non-Detect	0.81
Variance Detects	6.919	Percent Non-Detects	97.01%
Mean Detects	2.14	SD Detects	2.63
Median Detects	2.14	CV Detects	1.229
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.0567	SD of Logged Detects	1.88
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.336	KM Standard Error of Mean	0.0779
KM SD	0.451	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.466	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.464	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.569	95% KM Chebyshev UCL	0.675
97.5% KM Chebyshev UCL	0.822	99% KM Chebyshev UCL	1.111
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.838	k star (bias corrected MLE)	N/A
Theta hat (MLE)	2.554	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	3.351	nu star (bias corrected)	N/A
Mean (detects)	2.14		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.336	SD (KM)	0.451
Variance (KM)	0.203	SE of Mean (KM)	0.0779
k hat (KM)	0.553	k star (KM)	0.538
nu hat (KM)	74.14	nu star (KM)	72.16
theta hat (KM)	0.606	theta star (KM)	0.623
80% gamma percentile (KM)	0.552	90% gamma percentile (KM)	0.894

Surface and Subsurface Soil ProUCL Output			
95% gamma percentile (KM)	1.255	99% gamma percentile (KM)	2.138
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (72.16, α)	53.6	Adjusted Chi Square Value (72.16, β)	53.25
5% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.452	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.455
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.433	Mean in Log Scale	-1.241
SD in Original Scale	0.538	SD in Log Scale	0.869
95% t UCL (assumes normality of ROS data)	0.542	95% Percentile Bootstrap UCL	0.55
95% BCA Bootstrap UCL	0.593	95% Bootstrap t UCL	0.615
95% H-UCL (Log ROS)	0.531		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.233	KM Geo Mean	0.291
KM SD (logged)	0.322	95% Critical H Value (KM-Log)	1.767
KM Standard Error of Mean (logged)	0.0557	95% H-UCL (KM -Log)	0.329
KM SD (logged)	0.322	95% Critical H Value (KM-Log)	1.767
KM Standard Error of Mean (logged)	0.0557		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.259	Mean in Log Scale	-1.56
SD in Original Scale	0.465	SD in Log Scale	0.381
95% t UCL (Assumes normality)	0.354	95% H-Stat UCL	0.246
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.675		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
BENZO(A)PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	67	Number of Distinct Observations	13
Number of Detects	4	Number of Non-Detects	63
Number of Distinct Detects	4	Number of Distinct Non-Detects	9
Minimum Detect	0.17	Minimum Non-Detect	0.36
Maximum Detect	2.8	Maximum Non-Detect	0.5
Variance Detects	1.601	Percent Non-Detects	94.03%
Mean Detects	0.905	SD Detects	1.265
Median Detects	0.325	CV Detects	1.398
Skewness Detects	1.98	Kurtosis Detects	3.936
Mean of Logged Detects	-0.748	SD of Logged Detects	1.224

Surface and Subsurface Soil ProUCL Output			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.681	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.425	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.311	KM Standard Error of Mean	0.0646
KM SD	0.315	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.419	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.417	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.505	95% KM Chebyshev UCL	0.593
97.5% KM Chebyshev UCL	0.715	99% KM Chebyshev UCL	0.954
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.653	Anderson-Darling GOF Test	
5% A-D Critical Value	0.668	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.422	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.403	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.902	k star (bias corrected MLE)	0.392
Theta hat (MLE)	1.003	Theta star (bias corrected MLE)	2.307
nu hat (MLE)	7.218	nu star (bias corrected)	3.138
Mean (detects)	0.905		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.386
Maximum	2.8	Median	0.238
SD	0.462	CV	1.197
k hat (MLE)	0.679	k star (bias corrected MLE)	0.659
Theta hat (MLE)	0.568	Theta star (bias corrected MLE)	0.585
nu hat (MLE)	91.01	nu star (bias corrected)	88.27
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (88.27, α)	67.61	Adjusted Chi Square Value (88.27, β)	67.21
95% Gamma Approximate UCL (use when $n \geq 50$)	0.503	95% Gamma Adjusted UCL (use when $n < 50$)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.311	SD (KM)	0.315
Variance (KM)	0.0991	SE of Mean (KM)	0.0646
k hat (KM)	0.976	k star (KM)	0.942
nu hat (KM)	130.8	nu star (KM)	126.2
theta hat (KM)	0.319	theta star (KM)	0.33
80% gamma percentile (KM)	0.503	90% gamma percentile (KM)	0.727
95% gamma percentile (KM)	0.952	99% gamma percentile (KM)	1.476
Gamma Kaplan-Meier (KM) Statistics			

Surface and Subsurface Soil ProUCL Output			
Approximate Chi Square Value (126.25, α)	101.3	Adjusted Chi Square Value (126.25, β)	100.8
5% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.388	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.39
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.83	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.366	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.373	Mean in Log Scale	-1.265
SD in Original Scale	0.374	SD in Log Scale	0.717
95% t UCL (assumes normality of ROS data)	0.449	95% Percentile Bootstrap UCL	0.459
95% BCA Bootstrap UCL	0.488	95% Bootstrap t UCL	0.494
95% H-UCL (Log ROS)	0.437		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.305	KM Geo Mean	0.271
KM SD (logged)	0.418	95% Critical H Value (KM-Log)	1.817
KM Standard Error of Mean (logged)	0.205	95% H-UCL (KM -Log)	0.325
KM SD (logged)	0.418	95% Critical H Value (KM-Log)	1.817
KM Standard Error of Mean (logged)	0.205		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.24	Mean in Log Scale	-1.57
SD in Original Scale	0.318	SD in Log Scale	0.338
95% t UCL (Assumes normality)	0.305	95% H-Stat UCL	0.237
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.388		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician			
BENZO(B)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	67	Number of Distinct Observations	12
Number of Detects	3	Number of Non-Detects	64
Number of Distinct Detects	3	Number of Distinct Non-Detects	9
Minimum Detect	0.28	Minimum Non-Detect	0.36
Maximum Detect	3	Maximum Non-Detect	0.5
Variance Detects	2.457	Percent Non-Detects	95.52%
Mean Detects	1.19	SD Detects	1.568

Surface and Subsurface Soil ProUCL Output			
Median Detects	0.29	CV Detects	1.317
Skewness Detects	1.732	Kurtosis Detects	N/A
Mean of Logged Detects	-0.471	SD of Logged Detects	1.359
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.753	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.384	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.326	KM Standard Error of Mean	0.0494
KM SD	0.329	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.408	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.407	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.474	95% KM Chebyshev UCL	0.541
97.5% KM Chebyshev UCL	0.634	99% KM Chebyshev UCL	0.817
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.906	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.313	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	5.436	nu star (bias corrected)	N/A
Mean (detects)	1.19		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.423
Maximum	3	Median	0.264
SD	0.5	CV	1.182
k hat (MLE)	0.675	k star (bias corrected MLE)	0.655
Theta hat (MLE)	0.626	Theta star (bias corrected MLE)	0.646
nu hat (MLE)	90.46	nu star (bias corrected)	87.75
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (87.75, α)	67.15	Adjusted Chi Square Value (87.75, β)	66.76
95% Gamma Approximate UCL (use when $n \geq 50$)	0.553	95% Gamma Adjusted UCL (use when $n < 50$)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.326	SD (KM)	0.329
Variance (KM)	0.108	SE of Mean (KM)	0.0494
k hat (KM)	0.978	k star (KM)	0.944
nu hat (KM)	131	nu star (KM)	126.5
theta hat (KM)	0.333	theta star (KM)	0.345
80% gamma percentile (KM)	0.526	90% gamma percentile (KM)	0.76

Surface and Subsurface Soil ProUCL Output			
95% gamma percentile (KM)	0.995	99% gamma percentile (KM)	1.544
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (126.46, α)	101.5	Adjusted Chi Square Value (126.46, β)	101
5% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.406	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.408
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.761	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.38	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.41	Mean in Log Scale	-1.166
SD in Original Scale	0.403	SD in Log Scale	0.714
95% t UCL (assumes normality of ROS data)	0.492	95% Percentile Bootstrap UCL	0.497
95% BCA Bootstrap UCL	0.526	95% Bootstrap t UCL	0.541
95% H-UCL (Log ROS)	0.48		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.22	KM Geo Mean	0.295
KM SD (logged)	0.286	95% Critical H Value (KM-Log)	1.75
KM Standard Error of Mean (logged)	0.0453	95% H-UCL (KM -Log)	0.327
KM SD (logged)	0.286	95% Critical H Value (KM-Log)	1.75
KM Standard Error of Mean (logged)	0.0453		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.242	Mean in Log Scale	-1.569
SD in Original Scale	0.342	SD in Log Scale	0.341
95% t UCL (Assumes normality)	0.312	95% H-Stat UCL	0.238
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.408		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician			
INDENO(1,2,3-CD)PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	67	Number of Distinct Observations	13
Number of Detects	3	Number of Non-Detects	64
Number of Distinct Detects	3	Number of Distinct Non-Detects	10
Minimum Detect	0.2	Minimum Non-Detect	0.36

Surface and Subsurface Soil ProUCL Output			
Maximum Detect	1.4	Maximum Non-Detect	0.81
Variance Detects	0.447	Percent Non-Detects	95.52%
Mean Detects	0.63	SD Detects	0.668
Median Detects	0.29	CV Detects	1.061
Skewness Detects	1.697	Kurtosis Detects	N/A
Mean of Logged Detects	-0.837	SD of Logged Detects	1.033
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.361	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.262	KM Standard Error of Mean	0.0437
KM SD	0.147	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.335	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.334	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.393	95% KM Chebyshev UCL	0.453
97.5% KM Chebyshev UCL	0.535	99% KM Chebyshev UCL	0.697
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.478	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.426	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	8.869	nu star (bias corrected)	N/A
Mean (detects)	0.63		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.294
Maximum	1.4	Median	0.237
SD	0.237	CV	0.806
k hat (MLE)	1.563	k star (bias corrected MLE)	1.503
Theta hat (MLE)	0.188	Theta star (bias corrected MLE)	0.195
nu hat (MLE)	209.5	nu star (bias corrected)	201.4
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (201.45, α)	169.6	Adjusted Chi Square Value (201.45, β)	169
95% Gamma Approximate UCL (use when $n \geq 50$)	0.349	95% Gamma Adjusted UCL (use when $n < 50$)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.262	SD (KM)	0.147
Variance (KM)	0.0216	SE of Mean (KM)	0.0437
k hat (KM)	3.183	k star (KM)	3.05

Surface and Subsurface Soil ProUCL Output			
nu hat (KM)	426.5	nu star (KM)	408.7
theta hat (KM)	0.0824	theta star (KM)	0.086
80% gamma percentile (KM)	0.373	90% gamma percentile (KM)	0.464
95% gamma percentile (KM)	0.548	99% gamma percentile (KM)	0.73
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (408.70, α)	362.8	Adjusted Chi Square Value (408.70, β)	361.9
5% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.295	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.296
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.887	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.318	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.295	Mean in Log Scale	-1.383
SD in Original Scale	0.198	SD in Log Scale	0.555
95% t UCL (assumes normality of ROS data)	0.335	95% Percentile Bootstrap UCL	0.335
95% BCA Bootstrap UCL	0.341	95% Bootstrap t UCL	0.348
95% H-UCL (Log ROS)	0.333		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.397	KM Geo Mean	0.247
KM SD (logged)	0.282	95% Critical H Value (KM-Log)	1.748
KM Standard Error of Mean (logged)	0.162	95% H-UCL (KM -Log)	0.273
KM SD (logged)	0.282	95% Critical H Value (KM-Log)	1.748
KM Standard Error of Mean (logged)	0.162		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.22	Mean in Log Scale	-1.576
SD in Original Scale	0.149	SD in Log Scale	0.262
95% t UCL (Assumes normality)	0.251	95% H-Stat UCL	0.226
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.335		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			