

CUMULATIVE IMPACT ANALYSIS IN AIR PERMITS (RISK ASSESSMENT)





Overview

- Requires air permit applicants for larger facilities located in or near an environmental justice (EJ) population to conduct a cumulative impact analysis (CIA) prior to submitting a permit application
- Key components include:
 - Enhanced outreach to and involvement of EJ populations
 - Assessment of existing environmental, health, and socioeconomic conditions
 - New air toxics risk limits



Air Toxics Risk Characterization

- Applicant can use risk screening spreadsheet tool with emissions from facility and emissions from nearby significant permitted air sources (where data available)
- Must meet cumulative risk limits of 10 in 1 million cancer risk and Hazard Index of 1
 - Versus meeting non-cumulative chemical-by-chemical limits of 1 in 1 million cancer risk and 0.2 Hazard Index
- Option to conduct air dispersion modeling for input into risk screening tool
- Option to conduct detailed risk characterization if screening does not meet cumulative risk limits



Massachusetts Air Toxics Risk Screening Tool (MATRiST)

- Applicant uses MATRiST to calculate potential cumulative cancer and non-cancer air toxics risks
 - inputs include facility emissions, stack height, distance to fence line and nearby receptors
 - May include emissions from nearby significant permitted air sources (where data available)
- Built-in dispersion factors based on AERMOD version 22112 used to calculate emission concentrations
- Rural and urban options
- Built-in toxicity values for 237 air toxics used to calculate risk
- Tool Guidance – “READ ME” and “Emission Factor” worksheets
- Option to conduct air dispersion modeling via AERMOD for input into risk screening tool
- Option to conduct detailed risk characterization if screening does not meet cumulative risk standards



Averaging Periods for Dispersion Values

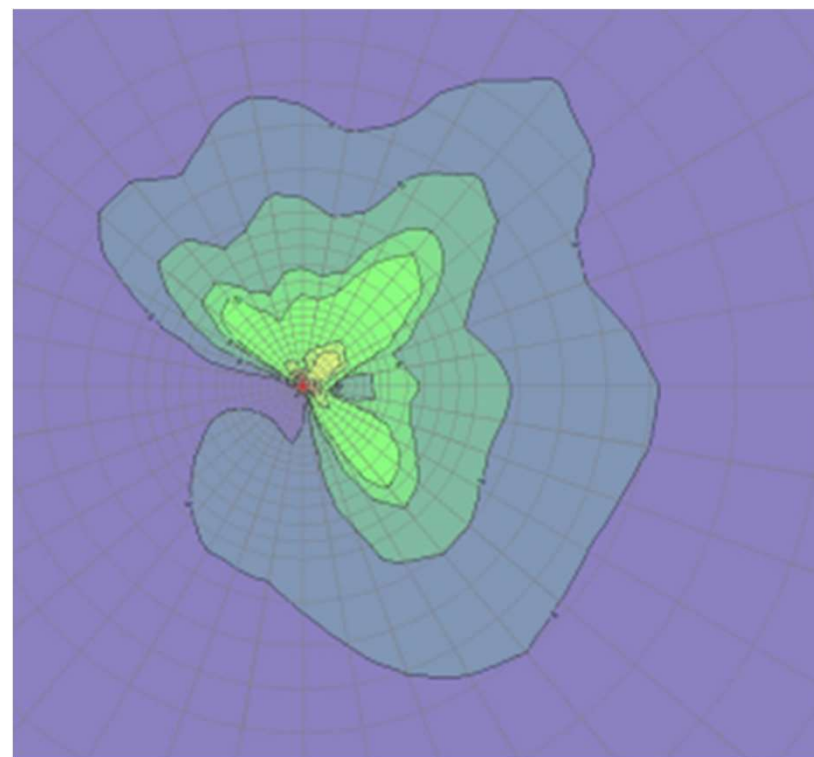
1-Hour and 24-Hour Dispersion Values

- 95th percentile concentration built into MATRiST
- Use the maximum concentration for site specific dispersion factors using the tool or conducting a refined risk assessment

Annual Dispersion Values (built-in & site specific)

- Average concentration

Concentration units are in $\mu\text{g}/\text{m}^3$





Screening Tool Overview

One Spreadsheet with 13 worksheets:

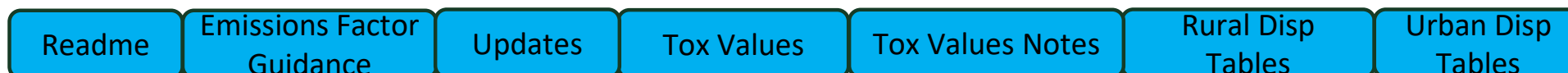
Input Worksheets (3)



Output Sheets (3)



Reference Worksheets (7)





Emissions Worksheet

Emissions

Version 2.1

*Replace stack names with source IDs: 'SV01'

Facility Name: Facility #1
Facility AQ ID: 1
Date: 4/4/2024
Receptor Location: Fenceline

Enter information for 50 stacks

CASRN	Pollutant Name	Total Facility Emissions (tons/yr)	Stack #1		Stack #2		Stack #3		Stack #4		Stack #5	
			Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
237 Air Pollutants												
83-32-9	Acenaphthene	2.00000E+00	1.00000E-02	1.00000E+00					1.00000E-02	1.00000E+00		
208-96-8	Acenaphthylene	0.00000E+00										
75-07-0	Acetaldehyde	0.00000E+00										
60-35-5	Acetamide	0.00000E+00										
67-64-1	Acetone	2.00000E+00			1.00000E-02	1.00000E+00			1.00000E-02	1.00000E+00		
75-05-8	Acetonitrile	0.00000E+00										
53-96-3	Acetylamino fluorene, 2-	0.00000E+00										
107-02-8	Acrolein	0.00000E+00										
79-06-1	Acrylamide	0.00000E+00										
79-10-7	Acrylic Acid	0.00000E+00										
107-13-1	Acrylonitrile	0.00000E+00										
C5-C8 aliphatic	Alkanes/alkenes (C5-C8 aliphatic)	0.00000E+00										
107-05-1	Allyl Chloride	0.00000E+00										
92-67-1	Aminobiphenyl, 4-	0.00000E+00										
7664-41-7	Ammonia	1.00000E+00					1.00000E-02	1.00000E+00				
62-53-3	Aniline	0.00000E+00										
90-04-0	Anisidine, o-	0.00000E+00										
120-12-7	Anthracene	0.00000E+00										
7440-36-0	Antimony (including compounds)	0.00000E+00										
C9-C18 aromatic	Aromatic Mixtures (C9 - C18 aromatic)	0.00000E+00										
7440-38-2	Arsenic (including compounds)	0.00000E+00										
1332-21-4	Asbestos	0.00000E+00										
7440-39-3	Barium	0.00000E+00										
71-43-2	Benzene	1.00000E-02									1.00000E-02	1.00000E-02



Dispersion Worksheet

Dispersion		Stack #1	Stack #2	Stack #3	Stack #4	Stack #5	Stack #6	Stack #7	Stack #8	Stack #9	Stack #10	Stack #11	Stack #12
Version 2.1													
*Inputs should be made in yellow cells. For stack height and distance, select from the dropdown list of values.													
*You may run AERMOD or other refined dispersion modeling to replace the default dispersion values. If replacing defaults, enter the refined dispersion values in the yellow manual entry cells. Values are unit dispersion: 1 µg/m ³ per 1 g/s emissions.													
Facility Name:	Facility #1												
Facility AQ ID:	1												
Date:	4/4/2024												
Receptor Location:	Fenceline												
Select Rural or Urban Dispersion	Rural												
	Urban												
Notes		Stack #1	Stack #2	Stack #3	Stack #4	Stack #5	Stack #6	Stack #7	Stack #8	Stack #9	Stack #10	Stack #11	Stack #12
Stack height (meters)	required for lookup (1-60 m)	2	4	6	8	10							
Distance to Fenceline (meters)	required for lookup (10-10,000 m)	10	20	30	40	50							
1-hr dispersion value	manual entry							100					
24-hr dispersion value	manual entry							35					
Annual dispersion value	manual entry							12					
1-hr dispersion value	auto-lookup	20787.1539	6748.38472	3210.49818	1732.71295	1145.40871							
24-hr dispersion value	auto-lookup	11990.3214	3925.98436	2038.41456	1128.76244	741.075665							
Annual dispersion value	auto-lookup	3383.14344	1125.22532	580.305195	357.63575	230.024865							
1-hr dispersion value	value used in calculations	20787.1539	6748.38472	3210.49818	1732.71295	1145.40871		100					
24-hr dispersion value	value used in calculations	11990.3214	3925.98436	2038.41456	1128.76244	741.075665		35					
Annual dispersion value	value used in calculations	3383.14344	1125.22532	580.305195	357.63575	230.024865		12					



Concentrations Worksheet

Concentrations

Version 2.1

No inputs needed on this page

Air Concentrations in $\mu\text{g}/\text{m}^3$

Facility Name: Facility #1
 Facility AQ ID: 1
 Date: 4/4/2024
 Receptor Location: Fenceline

CASRN	Pollutant Name	Total - All stacks			Stack #1			Stack #2			Stack #3		
		C(1-hr)	C(24-hr)	C(annual)	C(1-hr)	C(24-hr)	C(annual)	C(1-hr)	C(24-hr)	C(annual)	C(1-hr)	C(24-hr)	C(annual)
83-32-9	Acenaphthene	28.37	16.53	107.61	26.19	15.11	97.32	-	-	-	-	-	-
208-96-8	Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-
75-07-0	Acetaldehyde	-	-	-	-	-	-	-	-	-	-	-	-
60-35-5	Acetamide	-	-	-	-	-	-	-	-	-	-	-	-
67-64-1	Acetone	10.69	6.37	42.66	-	-	-	8.50	4.95	32.37	-	-	-
75-05-8	Acetonitrile	-	-	-	-	-	-	-	-	-	-	-	-
53-96-3	Acetylaminofluorene, 2-	-	-	-	-	-	-	-	-	-	-	-	-
107-02-8	Acrolein	-	-	-	-	-	-	-	-	-	-	-	-
79-06-1	Acrylamide	-	-	-	-	-	-	-	-	-	-	-	-
79-10-7	Acrylic Acid	-	-	-	-	-	-	-	-	-	-	-	-
107-13-1	Acrylonitrile	-	-	-	-	-	-	-	-	-	-	-	-
C5-C8 aliphatic	Alkanes/alkenes (C5-C8 aliphatic)	-	-	-	-	-	-	-	-	-	-	-	-
107-05-1	Allyl Chloride	-	-	-	-	-	-	-	-	-	-	-	-
92-67-1	Aminobiphenyl, 4-	-	-	-	-	-	-	-	-	-	-	-	-
7664-41-7	Ammonia	4.05	2.57	16.69	-	-	-	-	-	-	4.05	2.57	16.69
62-53-3	Aniline	-	-	-	-	-	-	-	-	-	-	-	-
90-04-0	Anisidine, o-	-	-	-	-	-	-	-	-	-	-	-	-
120-12-7	Anthracene	-	-	-	-	-	-	-	-	-	-	-	-
7440-36-0	Antimony (including compounds)	-	-	-	-	-	-	-	-	-	-	-	-
C9-C18 aromatic	Aromatic Mixtures (C9 - C18 aromatic)	-	-	-	-	-	-	-	-	-	-	-	-
7440-38-2	Arsenic (including compounds)	-	-	-	-	-	-	-	-	-	-	-	-
1332-21-4	Asbestos	-	-	-	-	-	-	-	-	-	-	-	-
7440-39-3	Barium	-	-	-	-	-	-	-	-	-	-	-	-
71-43-2	Benzene	1.44	0.93	0.07	-	-	-	-	-	-	-	-	-



Risk Calculations Worksheet

Risk Calculations		F	H	J
Version 2.1				
No inputs on this page				
Facility Name:	Facility #1			
Facility AQ ID:	1			
Date:	4/4/2024			
Receptor Location:	Fenceline			
		Inhalation Risks		
CASRN	Pollutant Name	Acute	Chronic Noncancer	Cancer
All pollutant total:		0.05	0.65	5.29E-07
83-32-9	Acenaphthene		0.33	
208-96-8	Acenaphthylene			
75-07-0	Acetaldehyde			
60-35-5	Acetamide			
67-64-1	Acetone	0.000534297	0.01	
75-05-8	Acetonitrile			
53-96-3	Acetylamino fluorene, 2-			
107-02-8	Acrolein			
79-06-1	Acrylamide			
79-10-7	Acrylic Acid			
107-13-1	Acrylonitrile			
C5-C8 aliphatic	Alkanes/alkenes (C5-C8 aliphatic)			
107-05-1	Allyl Chloride			
92-67-1	Aminobiphenyl, 4-			
7664-41-7	Ammonia	0.00134838	0.01	
62-53-3	Aniline			
90-04-0	Anisidine, o-			
120-12-7	Anthracene			
7440-36-0	Antimony (including compounds)			
C9-C18 aromatic	Aromatic Mixtures (C9 - C18 aromatic)			
7440-38-2	Arsenic (including compounds)			
1332-21-4	Asbestos			
7440-39-3	Barium			
71-43-2	Benzene	0.048106105	0.31	5.29E-07



Tox Values Worksheet

Tox Values

Version 2.1

No inputs on this page

Air Concentrations in $\mu\text{g}/\text{m}^3$

Toxicity Values Reference Table										
CASRN	Pollutant Name	Chemical Group	Surrogate CASRN	EPA HAP	Acute Inhalation Concentration ($\mu\text{g}/\text{m}^3$)	Acute Inhalation Reference	Chronic Inhalation Concentration ($\mu\text{g}/\text{m}^3$)	Chronic Inhalation Reference	Cancer Inhalation Unit Risk $1/(\mu\text{g}/\text{m}^3)$	Cancer Inhalation Reference
83-32-9	Acenaphthene	PAH	Aromatic Mixtures (C9 - C18 aromatic)				50	Aromatic Mixtures (C9 - C18 aromatic) Surrogate		
208-96-8	Acenaphthylene	PAH	Aromatic Mixtures (C9 - C18 aromatic)				50	Aromatic Mixtures (C9 - C18 aromatic) Surrogate		
75-07-0	Acetaldehyde			X	500	OEHA 2008	100	OEHA 2008	2.00E-06	IRIS 1988
60-35-5	Acetamide			X					2.00E-05	OEHA 2011
67-64-1	Acetone				20,000	ATSDR 2022	800	MassDEP 1990		
75-05-8	Acetonitrile			X			60	IRIS 1999		
53-96-3	Acetylaminofluorene, 2-			X					1.00E-03	OEHA 1992
107-02-8	Acrolein			X	2	OEHA 2008	0.4	OEHA 2008		
79-06-1	Acrylamide			X			6	IRIS 2010	1.00E-04	IRIS 2010
79-10-7	Acrylic Acid			X	6,000	OEHA 1999	0.2	PPRTV 2010 + additional UFS = 3		
107-13-1	Acrylonitrile			X			5	OEHA 2001	3.00E-04	OEHA 2011
C5-C8 aliphatic	Alkanes/alkenes (C5-C8 aliphatic)	TPH	110-54-3	X			200	110-54-3 Surrogate		
107-05-1	Allyl Chloride			X			1	IRIS 1991	6.00E-06	OEHA 2011
92-67-1	Aminobiphenyl, 4-			X					6.00E-03	OEHA 1992
7664-41-7	Ammonia				3,000	OEHA 1999	500	IRIS 2016		
62-53-3	Aniline			X			1	IRIS 1990	2.00E-06	OEHA 2012
90-04-0	Antisidine, o-			X					4.00E-05	OEHA 1992
120-12-7	Anthracene	PAH	Aromatic Mixtures (C9 - C18 aromatic)				50	Aromatic Mixtures (C9 - C18 aromatic) Surrogate		
7440-36-0	Antimony (including compounds)	Sb		X			0.08	IRIS 1995 + MW conversion factor		
C9-C18 aromatic	Aromatic Mixtures (C9 - C18 aromatic)	TPH					50	MassDEP 2003		
7440-38-2	Arsenic (including compounds)	As		X	0.2	OEHA 2014	0.02	OEHA 2014	3.00E-03	OEHA 2011
1332-21-4	Asbestos			X					2.00E-01	IRIS 1988
7440-39-3	Barium						200	OEHA 2003 ADD RiR extrapolation		
71-43-2	Benzene	TPH		X	30	OEHA 2014	3	OEHA 2014	8.00E-06	IRIS 2000 (higher end of range)

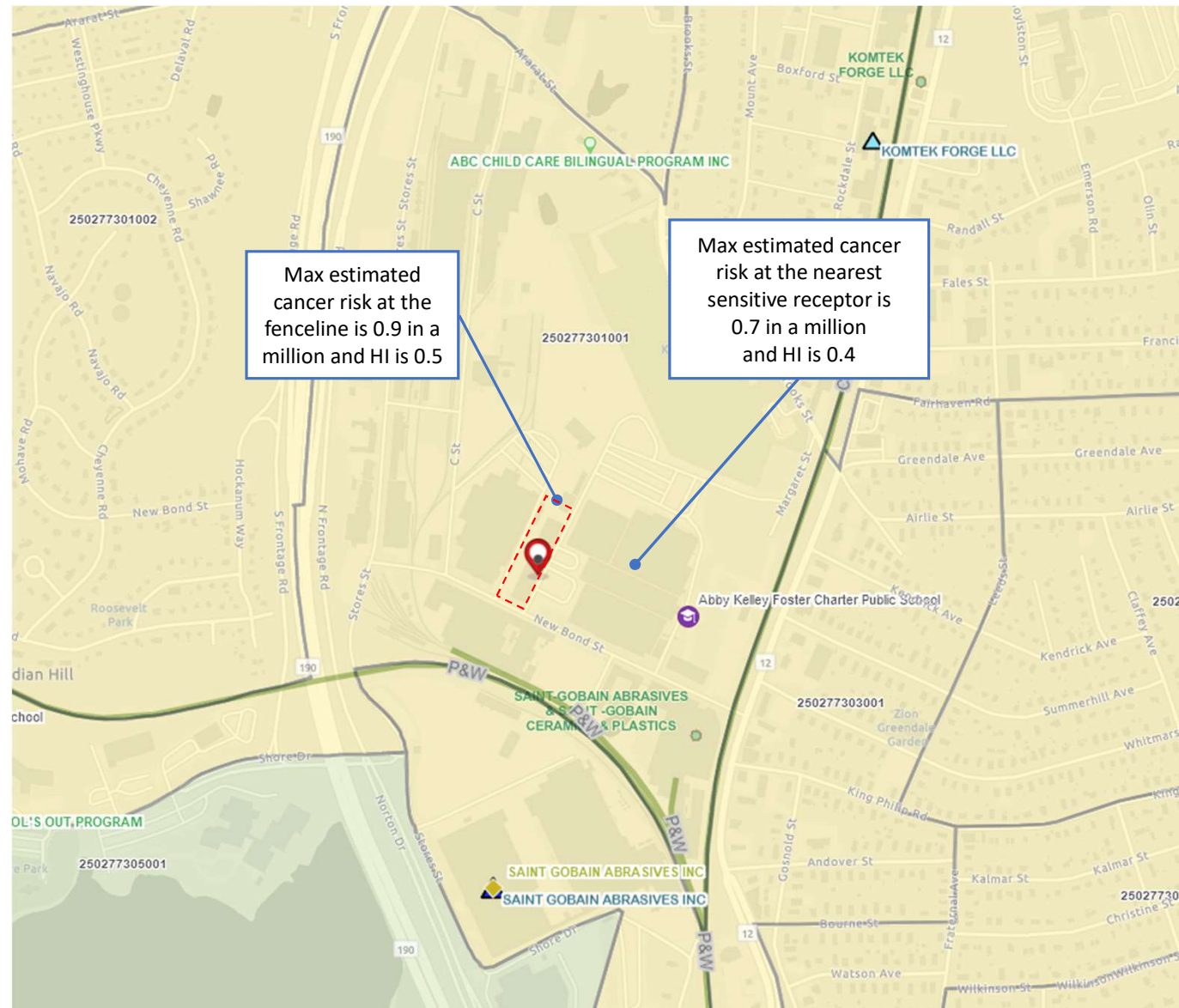


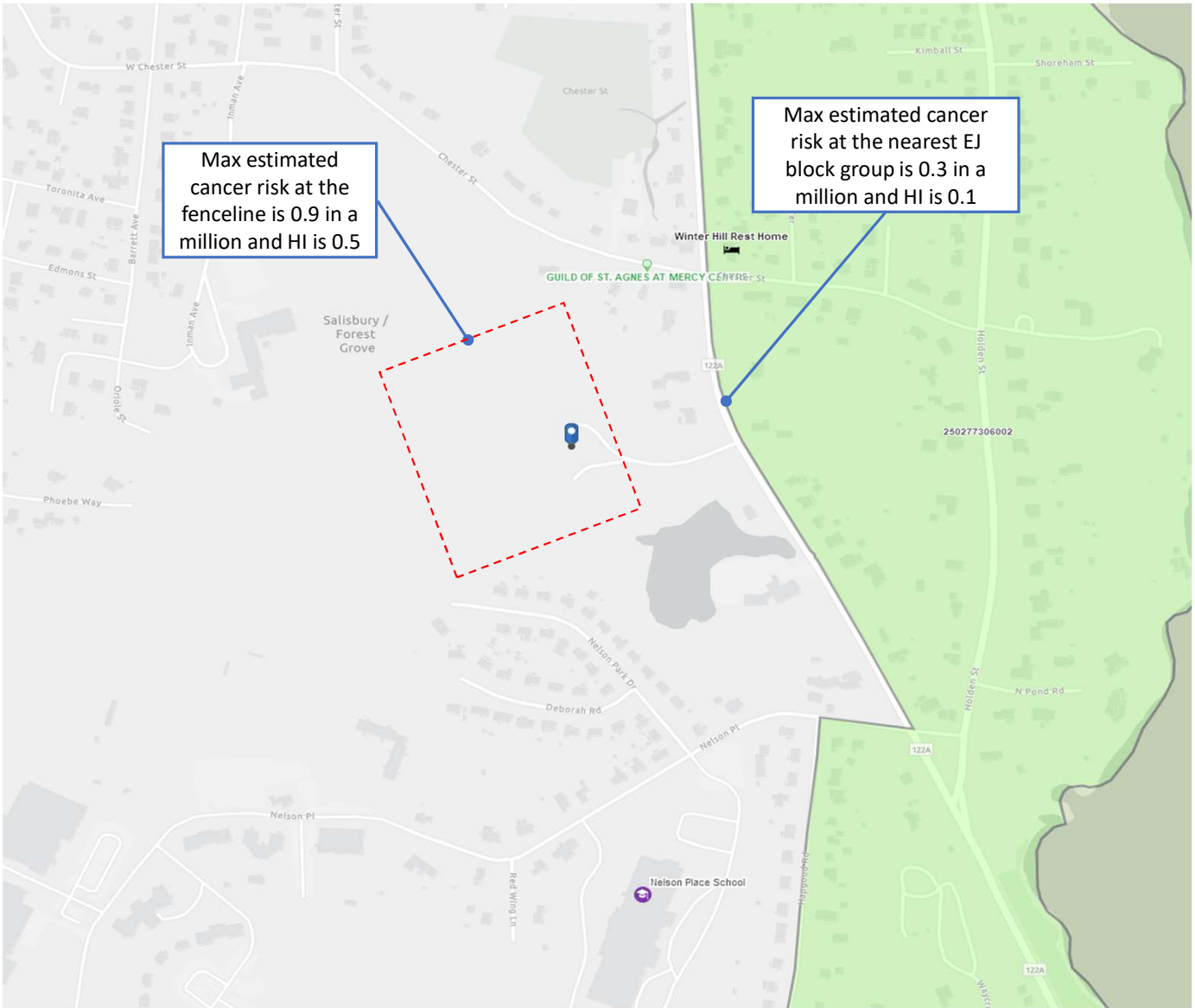
MATRiST Results

Summary			
Version 2.1			
No inputs on this page			
Facility Name:		Facility #1	
Facility AQ ID:		1	
Date:		4/4/2024	
Receptor Location:		Fenceline	
Cumulative Air Toxics Risk			
Acute	Lifetime Noncancer Hazard Index	Excess Lifetime Cancer Risk (1 = 1E-06)	
0	1	1	<-- Rounded value for reporting
1	1	10	<-- Guidance level
MEETS	MEETS	MEETS	<-- MEETS or REFINE
0.05	0.65	0.53	<-- Calculated value

Max Risk and HI in EJ block group

- Show EJ block groups
- Show sensitive receptors
- Show two locations where the max cancer risk and max HI are not in the same place
- Here the fence line is within the EJ block group and so the map shows the nearest sensitive receptor





Max Risk and HI in EJ block group

- Show separate fence line and EJ block group values where the site is not in an EJ block group



Contact for Further Information

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Links to Cumulative Impact Analysis Information

1. The Cumulative Impact Analysis in Air Quality Permitting:

- Regulations, CIA Guidance and Tools, What You Need to Know, How You Can Participate, How to Stay Informed, and Contact

Web page:

<https://www.mass.gov/info-details/cumulative-impact-analysis-in-air-quality-permitting>

2. MassDEP Air Plan Applications:

- Before You Apply – Cumulative Impact Analysis Requirements
- Air Quality Modeling
- Massachusetts Air Quality Modeling Guidance

Web page:

<https://www.mass.gov/guides/massdep-air-plan-applications>

3. Meteorological Data:

- Download meteorological data for air quality dispersion modeling.

Web page:

<https://www.mass.gov/info-details/meteorological-data>

4. MassDEP finalized amendments to 310 CMR 7.00 Air Pollution Control:

- Recently promulgated amendments (March 2024) - Cumulative impact analysis (CIA) for Comprehensive Plan Approval (CPA) applications for facilities located in or near environmental justice (EJ) populations (310 CMR 7.02(14)).

Web page:

<https://www.mass.gov/regulations/310-CMR-700-air-pollution-control#recently-promulgated-amendments>