

(b) (5)

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 05:52:19 +0000
To: (b) (6)
Subject: FW: East Palestine Train Derailment
Attachments: East Palestine Train Derailment_Rail Car List.xlsx, smime.p7s

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 12:39 AM
To: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Cc: DTRA.joc@mail.mil
Subject: [Non-DoD Source] East Palestine Train Derailment

Thank you for taking my call.

I need to confirm the location, but based on what I have here are the coordinates that I have so far.

40o 50' 26"N

-80 o 29' 43"W

(b) (6)

On-Scene Coordinator

US EPA

2565 Plymouth Road

Ann Arbor, MI 48105

(b) (6)

#	Postion	Car #	UN/NA	Product	Haz Class #	Load/Empty
1	2nd	GATX9166	1075	Residue LPG	2	Empty
2	26th	TILX402025	1086	Vinyl Chloride Stabilized	2.1	Load
3	27th	OCPX080235	1086	Vinyl Chloride Stabilized	2.1	Load
4	28h	OCPX080179	1086	Vinyl Chloride Stabilized	2.1	Load
5	29th	GATX95098	1086	Vinyl Chloride Stabilized	2.1	Load
6	34th	SHPX211226	1993	Combustible Liquid, Ethelyene Glycol	3	Load
7	36th	DOWX73168	1993	Ethyl-Hexayl Acrylate	3	Load
8	47th	NATX35844	1055	Iso-butylene	2.1	Load
9	48th	UTLX205907	2348	Butyl-Acrylates, Stabilized	3	Load
10	53rd	OCPX80370	1086	Vinyl Chloride Stabilized	2.1	Load
11	57th	DPRX259013	1114	Residue, Last contained Benzene	3	Empty
12	58th	DPRX258671	1114	Residue, Last contained Benzene	3	Empty
13	91st	UTLX667639	1993	Ethylene Glycol	3	Load
14	97th	GATX54892	1993	Combustible Liquid, nos	3	Load
15	100th	GATX54899	2348	Butyl-Acrylates, Stabilized	3	Load
16	116th	TILX101984	1832	Sulfuric Acid, Spent	8	Load
17	117th	GATX37935	1832	Sulfuric Acid, Spent	8	Load
18	118th	TILX101958	1832	Sulfuric Acid, Spent	8	Load
19	119th	GATX35941	1832	Sulfuric Acid, Spent	8	Load
20	120th	GATX35930	1832	Sulfuric Acid, Spent	8	Load

NS POC

(b) (6)

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 05:52:31 +0000
To: (b) (6)
Subject: FW: IMAAC ACTIVATION: Train Derailment East Palestine Ohio
Attachments: smime.p7s

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 12:46 AM
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>; DTRA Ft Belvoir RD Mailbox
Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>
Subject: [Non-DoD Source] RE: IMAAC ACTIVATION: Train Derailment East
Palestine Ohio

I got a little closer Lat/Long it is in decimals

40.8356359 W, -80.5357898 N

Thank you.

(b) (6)

On-Scene Coordinator

US EPA

2565 Plymouth Road

Ann Arbor, MI 48105

(b) (6)

From: DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>
Sent: Saturday, February 4, 2023 12:44 AM
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>; DTRA Ft Belvoir RD Mailbox
Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)
Subject: IMAAC ACTIVATION: Train Derailment East Palestine Ohio

ALCON,

At 04 0522Z FEB 2023, with the approval of the Requestor, Environmental Protection Agency Region 5, the Interagency Modeling and Atmospheric Assessment Center (IMAAAC) is standing up a IMAAC for the Train Derailment/Fire at East Palestine , Ohio.

Source: (b) (6), EPA Region 5

IMAAAC TECHNICAL OPERATIONS HUB

Phone: 703-767-2003

FEMA-NWC@FEMA.DHS.GOV <<mailto:FEMA-NWC@FEMA.DHS.GOV>>

Respectfully,

(b) (6)

Watch Officer

DTRA Joint Operations Center

(703) 767-2000 (DSN 427)

NSTS: 717-7208

NIPR: dtra.belvoir.oj.mbx.joint-ops-center@mail.mil
<<mailto:dtra.belvoir.oj.mbx.joint-ops-center@mail.mil>>

SIPR: dtra.belvoir.oj.mbx.joint-operations-center@mail.smil.mil
<<mailto:dtra.belvoir.oj.mbx.joint-operations-center@mail.smil.mil>>

JWICS: DTRA.OpsCenter@dtra.ic.gov <<mailto:DTRA.OpsCenter@dtra.ic.gov>>

From: (b) (6)
Sent: Sat, 4 Feb 2023 06:34:30 +0000
To: (b) (6)
Subject: IMAAC draft
Attachments: RFI_23-0081U_IMAAC_rev0.pptx, smime.p7s

Please see attached.

Respectfully,

(b) (6)

(b) (6)

Chemist/Shift Lead - Technical Reachback Division

Defense Threat Reduction Agency

Research and Development Directorate

Phone: (b) (6)

(b) (6)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, Ohio

(RFI 23-0081U)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	- Combustion products of 5 railcars on fire, filled with vinyl chloride: 36,706 kg Hydrogen chloride (HCl) 49,779 kg Phosgene (CCl₂O)
Location	East Palestine, OH 40.8356359 °N / 80.5357898 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	04FEB2023 0430Z (2330 03FEB2023 Local)
Executive Summary	- For phosgene, 17,972 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 1,901 people may be exposed to hazard levels that could possibly result in death. - For hydrogen chloride, 312 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 185 people may be exposed to hazard levels that could possibly result in death. - Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions

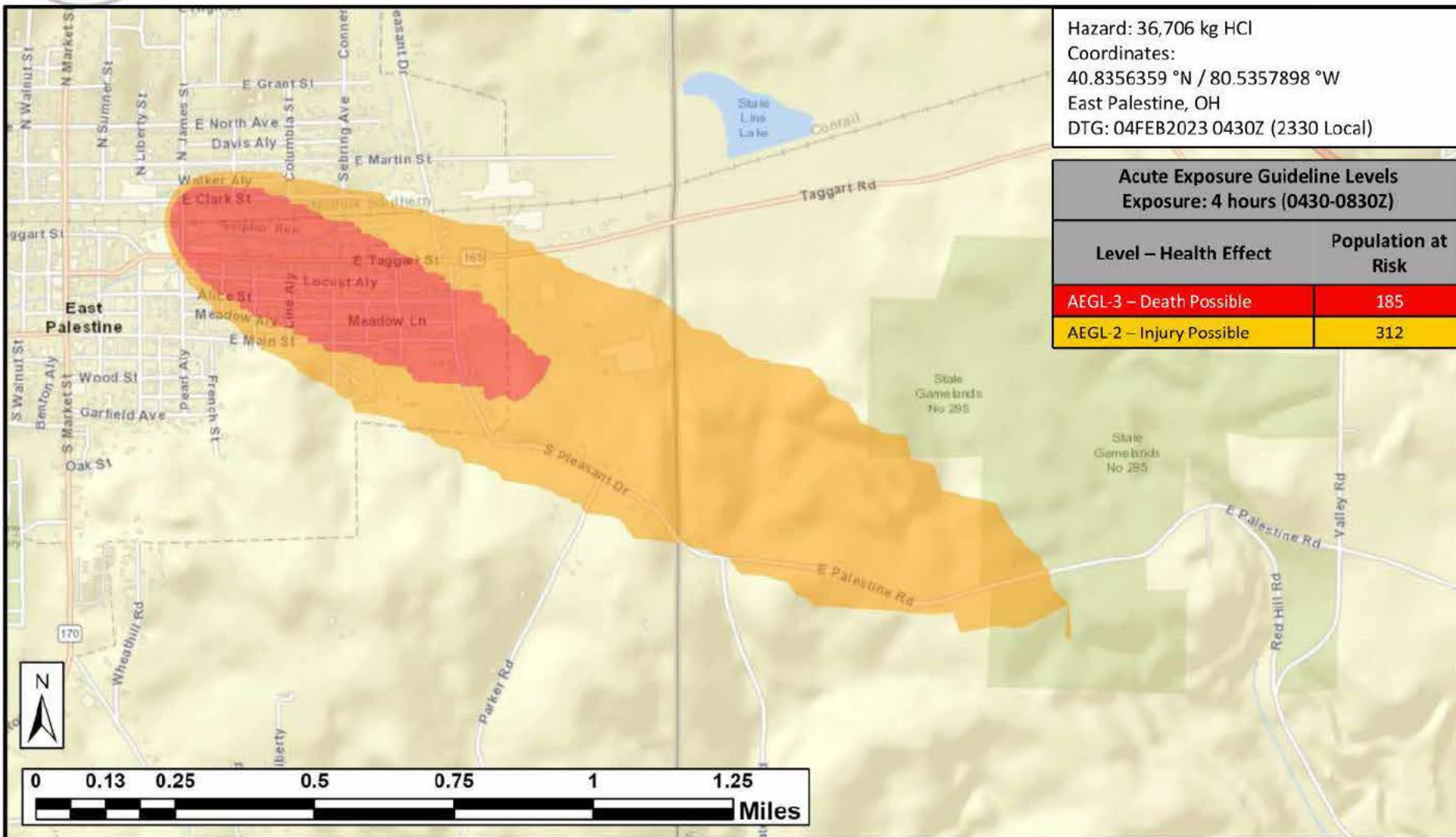
(b)(3)10USC130



CUI

RFI 22-0081U

Hydrogen Chloride – 0830Z



CUI



CUI

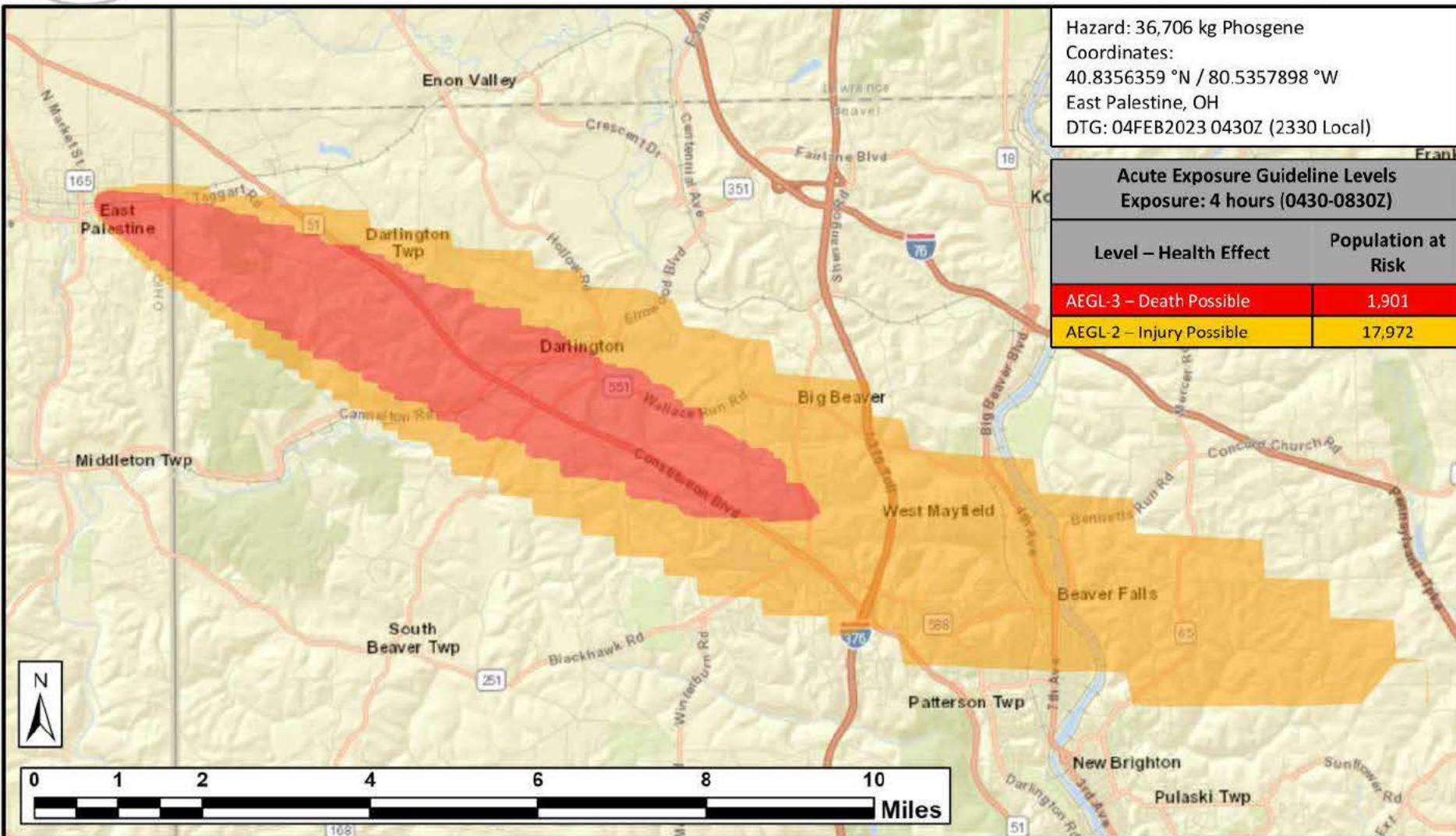
RFI 22-0081U

Phosgene – 0830Z

Hazard: 36,706 kg Phosgene
Coordinates:
40.8356359 °N / 80.5357898 °W
East Palestine, OH
DTG: 04FEB2023 0430Z (2330 Local)

Acute Exposure Guideline Levels Exposure: 4 hours (0430-0830Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1,901
AEGL-2 – Injury Possible	17,972



CUI



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

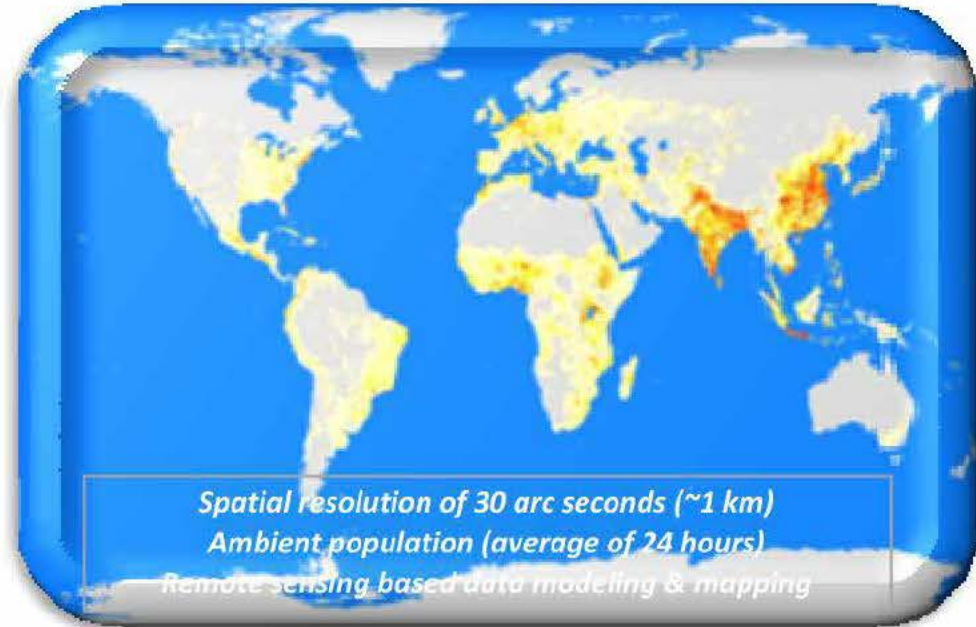


Population Data

~~CUI~~

RFI 22-0081U

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2020 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 06:51:24 +0000
To: Undisclosed recipients:
Subject: (Real World) IMAAC Product Available
Attachments: smime.p7s

IMAAC has completed an initial modeling product for activation requested by the EPA for a train derailment and fire in E. Palestine, OH at 11:30PM EST. The product is available on the IMAAC Portal page (<https://www.radresponder.net/app/index#imaac/modelrequest>).

IMAAC Technical Operations will conduct a coordination teleconference at 0210 EST (0710Z) to discuss source term and weather information, the initial modeling product, and other agency modeling products (if available). (b) (6)
(b) (6) , it would be helpful if you called in to this phone conference.

Teleconference information:
Phone number: 1-800-320-4330
PIN: 692400#

(b) (6)
IMAAC TECHNICAL OPERATIONS HUB
Phone: 703-767-2003
IMAAC@FEMA.DHS.GOV

From: (b) (6)
Sent: Sat, 4 Feb 2023 06:51:42 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; IMAAC@FEMA.DHS.GOV (b) (6)
Subject: [URL Verdict: Neutral][Non-DoD Source] (Real World) IMAAC Product Attached
Attachments: RFI_23-0081U_IMAAC.pdf, smime.p7s

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Please see the attached document(s) regarding the IMAAC Activation request for a train derailment and fire in E. Palestine, OH at 11:30PM EST. The product is available on the IMAAC Portal page (Caution-<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

(b) (6)

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, Ohio

(RFI 23-0081U)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6) EPA Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	• Combustion products of 5 railcars on fire, filled with vinyl chloride: • 36,706 kg Hydrogen chloride (HCl) • 49,779 kg Phosgene (CCl₂O)
Location	East Palestine, OH 40.8356359 °N / 80.5357898 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	04FEB2023 2330 03FEB2023 Local (0430Z)
Executive Summary	• For phosgene, 17,972 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 1,901 people may be exposed to hazard levels that could possibly result in death. • For hydrogen chloride, 312 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 185 people may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions

~~CUI~~

RFI 22-0081U

(b)(3)10USC130

~~CUI~~



CUI

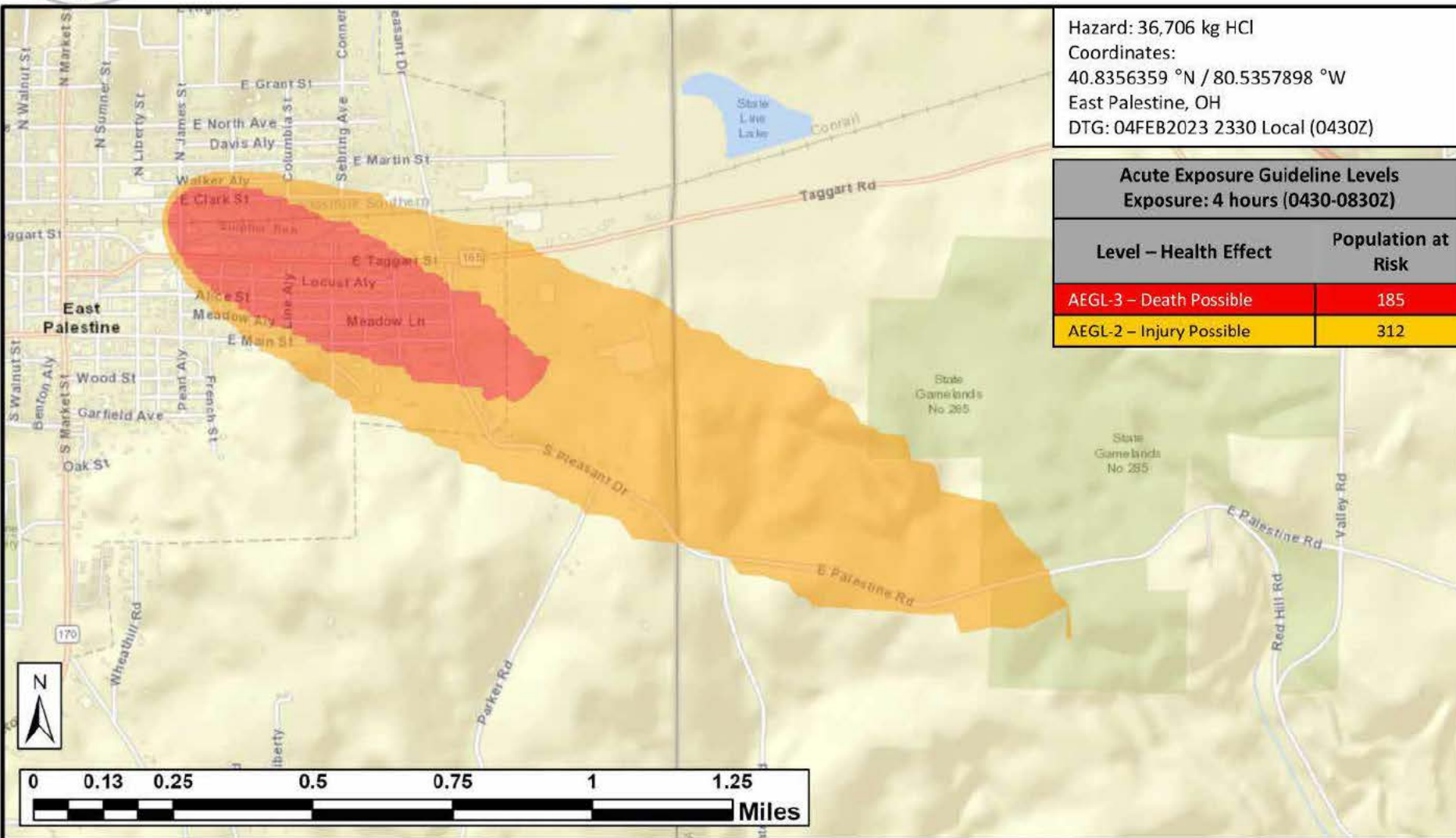
RFI 22-0081U

Hydrogen Chloride – 0330 Local

Hazard: 36,706 kg HCl
Coordinates:
40.8356359 °N / 80.5357898 °W
East Palestine, OH
DTG: 04FEB2023 2330 Local (0430Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (0430-0830Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	185
AEGL-2 – Injury Possible	312



CUI



~~CUI~~

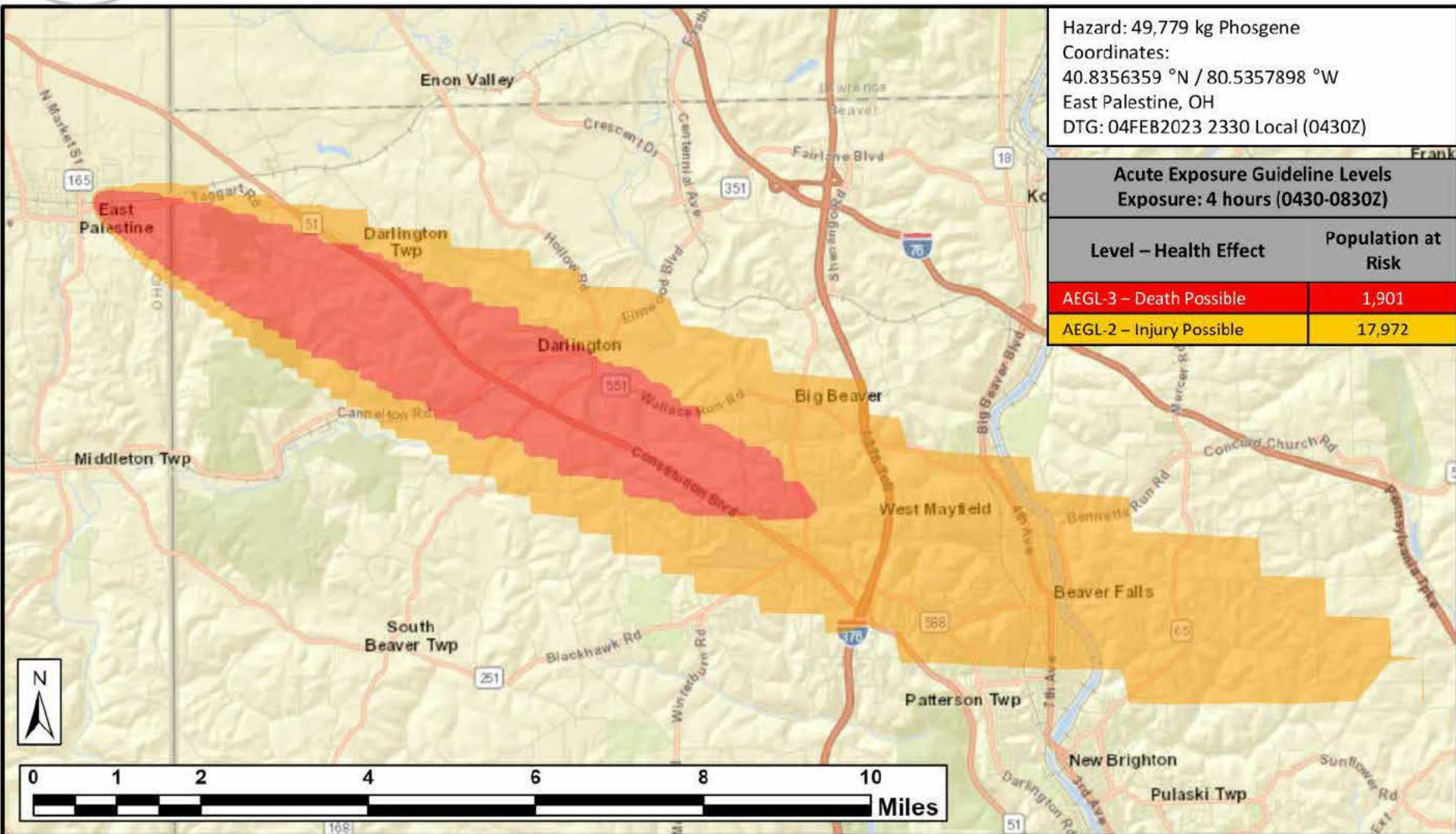
RFI 22-0081U

Phosgene – 0330 Local

Hazard: 49,779 kg Phosgene
Coordinates:
40.8356359 °N / 80.5357898 °W
East Palestine, OH
DTG: 04FEB2023 2330 Local (0430Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (0430-0830Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1,901
AEGL-2 – Injury Possible	17,972



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

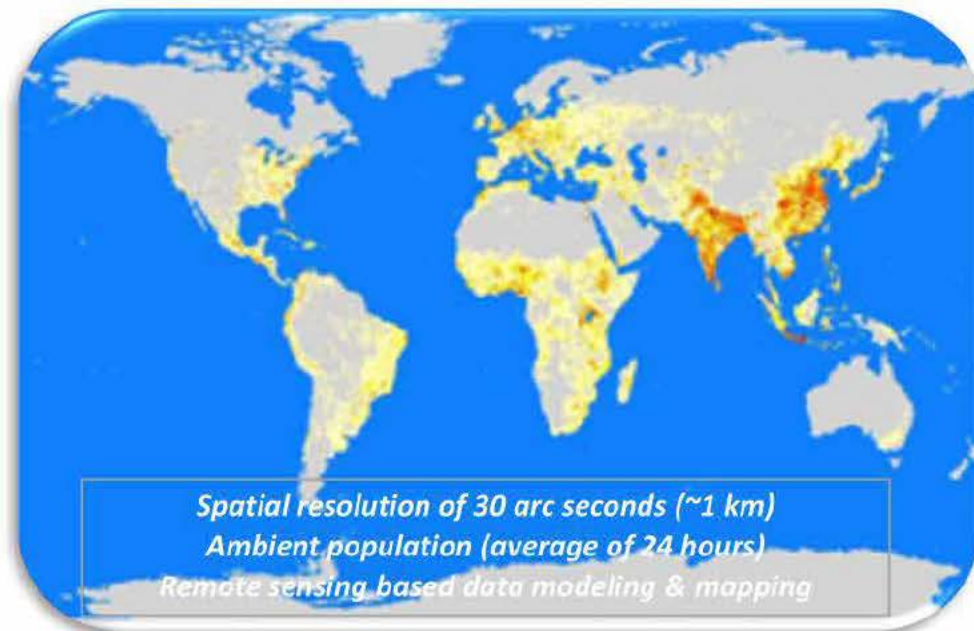
AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2020 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 07:00:03 +0000
To: (b) (6)
Subject: FW: Train manifest
Attachments: SHPX211226_Train_Export.csv, smime.p7s

(b) (6)

Here are some updated amounts, much larger than I assumed (there was a typo on the assumptions slide, I assumed each railcar held (b) (6) kg).

We can discuss on the call I suppose.

Thanks,

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 1:51 AM
To: (b) (6); DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>; DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>
Subject: [Non-DoD Source] Fwd: Train manifest

;

From: (b) (6)
Date: February 4, 2023 at 01:49:50 EST
To: (b) (6)
Subject: Train manifest

?

SEQ #	EQUIPMENT ID	CAR TYPE	CONTAINER ID	CONTAINER TYPE	L/E STATUS
1	NS 4178	LOCOMOTIVE			UNKNOWN
2	NS 4224	LOCOMOTIVE			UNKNOWN
3	OCPX 70524	HOPPER CAR			LOADED
4	GATX 9166	TANK CAR			EMPTY
5	TTPX 81589	BULKHEAD FLAT			LOADED
6	TTPX 805391	BULKHEAD FLAT			LOADED
7	TTPX 80902	BULKHEAD FLAT			LOADED
8	TTPX 806356	BULKHEAD FLAT			LOADED
9	TTZX 864660	BULKHEAD FLAT			LOADED
10	GACX 15324	HOPPER CAR			LOADED
11	NS 245167	HOPPER CAR			EMPTY
12	TBOX 641071	BOX CAR			LOADED
13	CSOX 23642	TANK CAR			EMPTY
14	UTCX 46842	HOPPER CAR			EMPTY
15	TILX 623413	HOPPER CAR			LOADED
16	BRKX 62205	HOPPER CAR			LOADED
17	GPLX 76170	HOPPER CAR			LOADED
18	GPLX 76158	HOPPER CAR			LOADED
19	GPLX 75450	HOPPER CAR			LOADED
20	MULX 53887	HOPPER CAR			LOADED
21	TILX 624042	HOPPER CAR			LOADED
22	BRKX 68611	HOPPER CAR			LOADED
23	ARSX 4145	HOPPER CAR			LOADED
24	BRKX 66738	HOPPER CAR			LOADED
25	GPLX 75465	HOPPER CAR			LOADED
26	ECUX 860375	HOPPER CAR			LOADED
27	UTLX 684543	TANK CAR			EMPTY
28	TILX 402025	TANK CAR			LOADED
29	OCPX 80235	TANK CAR			LOADED
30	OCPX 80179	TANK CAR			LOADED
31	GATX 95098	TANK CAR			LOADED
32	RACX 51629	TANK CAR			LOADED
33	LYBX 5191	TANK CAR			LOADED
34	RACX 51435	TANK CAR			LOADED
35	UTLX 671772	TANK CAR			LOADED
36	SHPX 211226	TANK CAR			LOADED
37	TILX 331319	HOPPER CAR			LOADED
38	DOWX 73168	TANK CAR			LOADED
39	ROIX 57036	HOPPER CAR			LOADED
40	NCUX 40057	HOPPER CAR			LOADED
41	UTLX 100055	TANK CAR			LOADED
42	XOMX 110664	TANK CAR			LOADED
43	UTLX 684798	TANK CAR			LOADED
44	UTLX 671310	TANK CAR			LOADED
45	CERX 30072	TANK CAR			LOADED
46	SHPX 211106	TANK CAR			LOADED
47	NATX 231335	TANK CAR			LOADED
48	UTLX 671913	TANK CAR			LOADED
49	NATX 35844	TANK CAR			LOADED
50	UTLX 205907	TANK CAR			LOADED
51	UTLX 661296	TANK CAR			LOADED

52	COCX 287059	TANK CAR	LOADED
53	ROIX 59396	HOPPER CAR	LOADED
54	ROIX 57782	HOPPER CAR	LOADED
55	OCPX 80370	TANK CAR	LOADED
56	TBOX 640019	BOX CAR	LOADED
57	BKTY 152621	BOX CAR	LOADED
58	LINX 7278	BOX CAR	LOADED
59	DPRX 259013	TANK CAR	EMPTY
60	DPRX 258671	TANK CAR	EMPTY
61	XOMX 110236	TANK CAR	LOADED
62	ELTX 7458	HOPPER CAR	LOADED
63	ELTX 3421	HOPPER CAR	LOADED
64	NDYX 892049	HOPPER CAR	LOADED
65	TTGX 953815	AUTORACK	LOADED
66	TBOX 889334	BOX CAR	LOADED
67	NOKL 603412	BOX CAR	LOADED
68	NS 472751	BOX CAR	LOADED
69	TBOX 676291	BOX CAR	LOADED
70	TBOX 670331	BOX CAR	LOADED
71	TBOX 662599	BOX CAR	LOADED
72	KCS 112405	BOX CAR	LOADED
73	TBOX 666771	BOX CAR	LOADED
74	TBOX 664264	BOX CAR	LOADED
75	TBOX 642155	BOX CAR	LOADED
76	TBOX 643155	BOX CAR	LOADED
77	TBOX 630049	BOX CAR	LOADED
78	BKTY 151113	BOX CAR	LOADED
79	TBOX 672287	BOX CAR	LOADED
80	TBOX 643036	BOX CAR	LOADED
81	TTZX 862546	BULKHEAD FLAT	LOADED
82	NAHX 320459	HOPPER CAR	LOADED
83	TTGX 696500	AUTORACK	LOADED
84	TTGX 851756	AUTORACK	LOADED
85	TTGX 981950	AUTORACK	LOADED
86	LRS 137205	BOX CAR	LOADED
87	NS 469567	BOX CAR	LOADED
88	TBOX 641883	BOX CAR	LOADED
89	TBOX 675515	BOX CAR	LOADED
90	LRS 2512	BOX CAR	LOADED
91	TBOX 672773	BOX CAR	LOADED
92	BKTY 152854	BOX CAR	LOADED
93	UTLX 667639	TANK CAR	LOADED
94	GATX 225435	TANK CAR	LOADED
95	UTLX 669739	TANK CAR	LOADED
96	NAHX 620163	HOPPER CAR	LOADED
97	TTPX 81575	BULKHEAD FLAT	LOADED
98	SHQX 4267	HOPPER CAR	LOADED
99	GATX 54892	TANK CAR	LOADED
100	TBOX 639745	BOX CAR	LOADED
101	TBOX 640016	BOX CAR	LOADED
102	GATX 54899	TANK CAR	LOADED
103	ROIX 58372	HOPPER CAR	LOADED

104	MULX 200058	HOPPER CAR	LOADED
105	SHPX 463835	HOPPER CAR	LOADED
106	ELTX 7538	HOPPER CAR	LOADED
107	CCBX 58366	HOPPER CAR	LOADED
108	BRKX 66231	HOPPER CAR	LOADED
109	CITX 200199	HOPPER CAR	LOADED
110	CITX 200288	HOPPER CAR	LOADED
111	GISX 1386	HOPPER CAR	LOADED
112	NS 4412	LOCOMOTIVE	UNKNOWN
113	GONX 320417	GONDOLA	LOADED
114	GONX 310070	GONDOLA	LOADED
115	NW 189995	GONDOLA	LOADED
116	NW 169645	GONDOLA	LOADED
117	NS 163615	GONDOLA	LOADED
118	NS 168788	GONDOLA	LOADED
119	TILX 101984	TANK CAR	LOADED
120	GATX 35935	TANK CAR	LOADED
121	TILX 101958	TANK CAR	LOADED
122	GATX 35941	TANK CAR	LOADED
123	GATX 35930	TANK CAR	LOADED
124	STX 51519	TANK CAR	LOADED
125	STX 3110	TANK CAR	LOADED
126	STX 51308	TANK CAR	LOADED
127	STX 61226	TANK CAR	LOADED
128	STX 4000	TANK CAR	LOADED
129	STX 4201	TANK CAR	LOADED
130	STX 3082	TANK CAR	LOADED
131	TILX 170527	TANK CAR	LOADED
132	ADMX 16442	TANK CAR	LOADED
133	DMIX 191118	TANK CAR	LOADED
134	ADMX 16192	TANK CAR	LOADED
135	DMIX 191011	TANK CAR	LOADED
136	VTGX 190085	TANK CAR	LOADED
137	GATX 73411	TANK CAR	LOADED
138	DMIX 190425	TANK CAR	LOADED
139	ADMX 15742	TANK CAR	LOADED
140	DMIX 190327	TANK CAR	LOADED
141	TILX 170647	TANK CAR	LOADED
142	ITFX 129067	HOPPER CAR	LOADED
143	SHPX 454520	HOPPER CAR	LOADED
144	CR 53534		EMPTY
145	CR 53318		EMPTY
146	CITX 701780	HOPPER CAR	LOADED
147	NS 168703	GONDOLA	LOADED
148	TILX 291356	TANK CAR	LOADED
149	TILX 650290	HOPPER CAR	LOADED
150	CEFX 360330	HOPPER CAR	LOADED
151	ADMX 64225	HOPPER CAR	LOADED
152	ADMX 63057	HOPPER CAR	LOADED
153	NS 76754	END OF TRAIN DEVICE	EMPTY

QUANTITY	UN/NA #	CONTENTS SHIPPING NAME	HAZARD CLASS
Net Weight: 184700 Pounds 0 Pounds	UN1075	POLYVINYL	2.1
Net Weight: 139029 Pounds		PETROLEUM GASES, LIQUEFIED	
Net Weight: 136981 Pounds		PIPE TUBG IORS	
Net Weight: 141588 Pounds		PIPE TUBG IORS	
Net Weight: 141906 Pounds		PIPE TUBG IORS	
Net Weight: 191400 Pounds		LBR TIMBER,DRID	
Net Weight: 214336 Pounds		FLOUR,WHEAT	
Net Weight: 148991 Pounds		MALT LIQUORS	
Net Weight: 193800 Pounds		POLYPROPYLENE	
Net Weight: 194350 Pounds		POLYPROPYLENE	
Net Weight: 149450 Pounds		POLYETHYLENE	
Net Weight: 153750 Pounds		POLYETHYLENE	
Net Weight: 156400 Pounds		POLYETHYLENE	
Net Weight: 195100 Pounds		POLYPROPYLENE	
Net Weight: 193450 Pounds		POLYPROPYLENE	
Net Weight: 195300 Pounds		POLYPROPYLENE	
Net Weight: 195100 Pounds		POLYPROPYLENE	
Net Weight: 193400 Pounds		POLYPROPYLENE	
Net Weight: 142900 Pounds		POLYETHYLENE	
Net Weight: 163200 Pounds		POLYETHYLENE	
178300 Pound-1 Carload	UN1086	VINYL CHLORIDE, STABILIZED	2.1
177250 Pound-1 Carload	UN1086	VINYL CHLORIDE, STABILIZED	2.1
177600 Pound-1 Carload	UN1086	VINYL CHLORIDE, STABILIZED	2.1
178150 Pound-1 Carload	UN1086	VINYL CHLORIDE, STABILIZED	2.1
Net Weight: 187400 Pounds		DIPROPYLENE	
Net Weight: 168030 Pounds		PROPYLENE	
Net Weight: 188934 Pounds		PROPYLENE	
Net Weight: 180000 Pounds		DIETHYLENE	
185750 Pound-1 Carload	NA1993	COMBUSTIBLE LIQUID,N.O.S.	CL
Net Weight: 208800 Pounds		SEMOLINA	
Net Weight: 205900 Pounds	NA1993	COMBUSTIBLE LIQUID,N.O.S.	CL
Net Weight: 186550 Pounds		POLYVINYL	
Net Weight: 191200 Pounds		POLYVINYL	
Net Weight: 150000 Pounds		PET LUB OIL	
Net Weight: 150000 Pounds		PET LUB OIL	
Net Weight: 150000 Pounds		PET LUB OIL	
Net Weight: 150000 Pounds		PET LUB OIL	
Net Weight: 200000 Pounds		POLYPROPYL GLYC	
Net Weight: 180890 Pounds		PROPYLENE	
Net Weight: 180000 Pounds		DIETHYLENE	
Net Weight: 180000 Pounds		DIETHYLENE	
155642 Pound-1 Carload	UN1055	ISOBUTYLENE	2.1
Net Weight: 180000 Pounds	UN2348	BUTYL ACRYLATES, STABILIZED	3
Net Weight: 172265 Pounds		PETRO OIL,NEC	

Net Weight: 176122 Pounds		ADDITIVES,FUEL	
Net Weight: 184450 Pounds		POLYVINYL	
Net Weight: 197150 Pounds		POLYVINYL	
176100 Pound-1 Carload	UN1086	VINYL CHLORIDE, STABILIZED	2.1
Net Weight: 197838 Pounds		BALLS,CTN,MEDCL	
Net Weight: 111057 Pounds		SHEET STEEL	
Gross Weight: 117005 Pounds		VEGTBLE FRZN	
0 Pounds	UN1114	BENZENE	3
0 Pounds	UN1114	BENZENE	3
Net Weight: 163662 Pounds		PARAFFIN WAX	
Net Weight: 203550 Pounds		FLAKES,POWDER	
Net Weight: 193100 Pounds		FLAKES,POWDER	
Net Weight: 222065 Pounds		HYDRAULIC CMT	
Net Weight: 24998 Pounds		AUTOS PASSENGER	
Net Weight: 172097 Pounds		MALT LIQUORS	
Net Weight: 172097 Pounds		MALT LIQUORS	
Net Weight: 122689 Pounds		MALT LIQUORS	
Net Weight: 122747 Pounds		MALT LIQUORS	
Net Weight: 150338 Pounds		MALT LIQUORS	
Net Weight: 162741 Pounds		MALT LIQUORS	
Net Weight: 158660 Pounds		MALT LIQUORS	
Net Weight: 122689 Pounds		MALT LIQUORS	
Net Weight: 149154 Pounds		MALT LIQUORS	
Net Weight: 149154 Pounds		MALT LIQUORS	
Net Weight: 158660 Pounds		MALT LIQUORS	
Net Weight: 158660 Pounds		MALT LIQUORS	
Net Weight: 123867 Pounds		MALT LIQUORS	
Net Weight: 116404 Pounds		BEVERAGES,ALCC	
Net Weight: 149154 Pounds		MALT LIQUORS	
Net Weight: 157054 Pounds		LBR TIMBER,DRID	
Net Weight: 181120 Pounds		SEMOLINA	
Net Weight: 40000 Pounds		AUTOS PASSENGER	
Net Weight: 40000 Pounds		AUTOS PASSENGER	
Net Weight: 40000 Pounds		AUTOS PASSENGER	
Net Weight: 172097 Pounds		MALT LIQUORS	
Net Weight: 149154 Pounds		MALT LIQUORS	
Net Weight: 149154 Pounds		MALT LIQUORS	
Net Weight: 121816 Pounds		PLPBDFBD N CORR	
Net Weight: 194675 Pounds		PLPBDFBD N CORR	
Net Weight: 113842 Pounds		PLPBDFBD N CORR	
181250 Pound-1 Carload	NA1993	COMBUSTIBLE LIQUID,N.O.S.	CL
Net Weight: 167900 Pounds		SOLVENTS,PLORV	
Net Weight: 179000 Pounds		PETRO OIL,NEC	
Net Weight: 168450 Pounds		POLYPROPYLENE	
Net Weight: 179615 Pounds		SHT STEEL BLACK	
Net Weight: 207025 Pounds		RICE,CLND BRKN	
Net Weight: 187600 Pounds	NA1993	COMBUSTIBLE LIQUID,N.O.S.	CL
Net Weight: 197838 Pounds		BALLS,CTN,MEDCL	
Net Weight: 197838 Pounds		BALLS,CTN,MEDCL	
Net Weight: 187300 Pounds	UN2348	BUTYL ACRYLATES, STABILIZED	3
Net Weight: 178900 Pounds		POLYVINYL	

Net Weight: 205310 Pounds		RICE,CLND BRKN	
Net Weight: 203150 Pounds		FLAKES,POWDER	
Net Weight: 203850 Pounds		FLAKES,POWDER	
Net Weight: 188800 Pounds		POLYETHYLENE	
Net Weight: 188000 Pounds		POLYPROPYLENE	
Net Weight: 202550 Pounds		POLYETHYLENE	
Net Weight: 188600 Pounds		POLYETHYLENE	
Net Weight: 205400 Pounds		FLAKES,POWDER	
Net Weight: 189910 Pounds		SCRAP I OR S	
Net Weight: 188110 Pounds		SCRAP I OR S	
Net Weight: 188750 Pounds		SCRAP I OR S	
Net Weight: 168990 Pounds		SHEET,IORS,NEC	
Net Weight: 172450 Pounds		SHEET,IORS,NEC	
Net Weight: 161130 Pounds		SHEET,IORS,NEC	
204923 Pound-1 Carload	UN1832	SULFURIC ACID, SPENT	8
204923 Pound-1 Carload	UN1832	SULFURIC ACID, SPENT	8
204923 Pound-1 Carload	UN1832	SULFURIC ACID, SPENT	8
204923 Pound-1 Carload	UN1832	SULFURIC ACID, SPENT	8
204923 Pound-1 Carload	UN1832	SULFURIC ACID, SPENT	8
Net Weight: 213688 Pounds		CRN SYR UNMXD	
Net Weight: 213188 Pounds		CRN SYR UNMXD	
Net Weight: 191150 Pounds		CRN SYR UNMXD	
Net Weight: 193350 Pounds		CRN SYR UNMXD	
Net Weight: 196850 Pounds		CRN SYR UNMXD	
Net Weight: 195900 Pounds		CRN SYR UNMXD	
Net Weight: 213500 Pounds		CRN SYR UNMXD	
Net Weight: 222000 Pounds		CRN SYR UNMXD	
Net Weight: 199750 Pounds		CRN SYR UNMXD	
Net Weight: 220700 Pounds		CRN SYR UNMXD	
Net Weight: 199300 Pounds		CRN SYR UNMXD	
Net Weight: 220350 Pounds		CRN SYR UNMXD	
Net Weight: 221800 Pounds		CRN SYR UNMXD	
Net Weight: 221350 Pounds		CRN SYR UNMXD	
Net Weight: 220600 Pounds		CRN SYR UNMXD	
Net Weight: 199850 Pounds		CRN SYR UNMXD	
Net Weight: 220200 Pounds		CRN SYR UNMXD	
Net Weight: 222200 Pounds		CRN SYR UNMXD	
Net Weight: 197000 Pounds		UREA OT LIQOLQD	
Net Weight: 194850 Pounds		UREA OT LIQOLQD	
Net Weight: 106000 Pounds		BEET PULP, DRY	
Net Weight: 146270 Pounds		SHEET,IORS,NEC	
Net Weight: 202530 Pounds		SOYBEAN OIL	
Net Weight: 214550 Pounds		SOYBN CK,ML,SCR	
Net Weight: 214550 Pounds		SOYBN CK,ML,SCR	
Net Weight: 215350 Pounds		SOYBN CK,ML,SCR	
Net Weight: 190750 Pounds		CORN CAKE OR ML	

PACKING GROUP

III

III

III

II
II

III

III

III

||
||
||
||
||

From: (b) (6)
Sent: Sat, 4 Feb 2023 07:03:01 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback
Subject: RE: Train manifest
Attachments: smime.p7s

(b) (5)

(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Saturday, February 4, 2023 2:00 AM
To: (b) (6)
Subject: FW: Train manifest

(b) (6)

Here are some updated amounts, much larger than I assumed (there was a typo on the assumptions slide, I assumed each railcar held (b) (3) kg).

We can discuss on the call I suppose.

Thanks,

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 1:51 AM
To: (b) (6); DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; DTRA Ft Belvoir OI Mailbox Joint Ops Center <dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>
Subject: [Non-DoD Source] Fwd: Train manifest

:

From: (b) (6)
Date: February 4, 2023 at 01:49:50 EST
To: (b) (6)
Subject: Train manifest

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 07:13:21 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; IMAAC@FEMA.DHS.GOV; (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: [URL Verdict: Neutral][Non-DoD Source] (Real World) IMAAC Product Attached
Attachments: RFI_23-0081U_IMAAC.pdf, smime.p7s

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Please see the attached document(s) regarding the IMAAC Activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution-<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, Ohio

(RFI 23-0081U)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	• Combustion products of 5 railcars on fire, filled with vinyl chloride: • 36,706 kg Hydrogen chloride (HCl) • 49,779 kg Phosgene (CCl₂O)
Location	East Palestine, OH 40.8356359 °N / 80.5357898 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	04FEB2023 2330 03FEB2023 Local (0430Z)
Executive Summary	• For phosgene, 17,972 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 1,901 people may be exposed to hazard levels that could possibly result in death. • For hydrogen chloride, 312 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 185 people may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions

~~CUI~~

RFI 22-0081U

(b)(3)10USC130

~~CUI~~



CUI

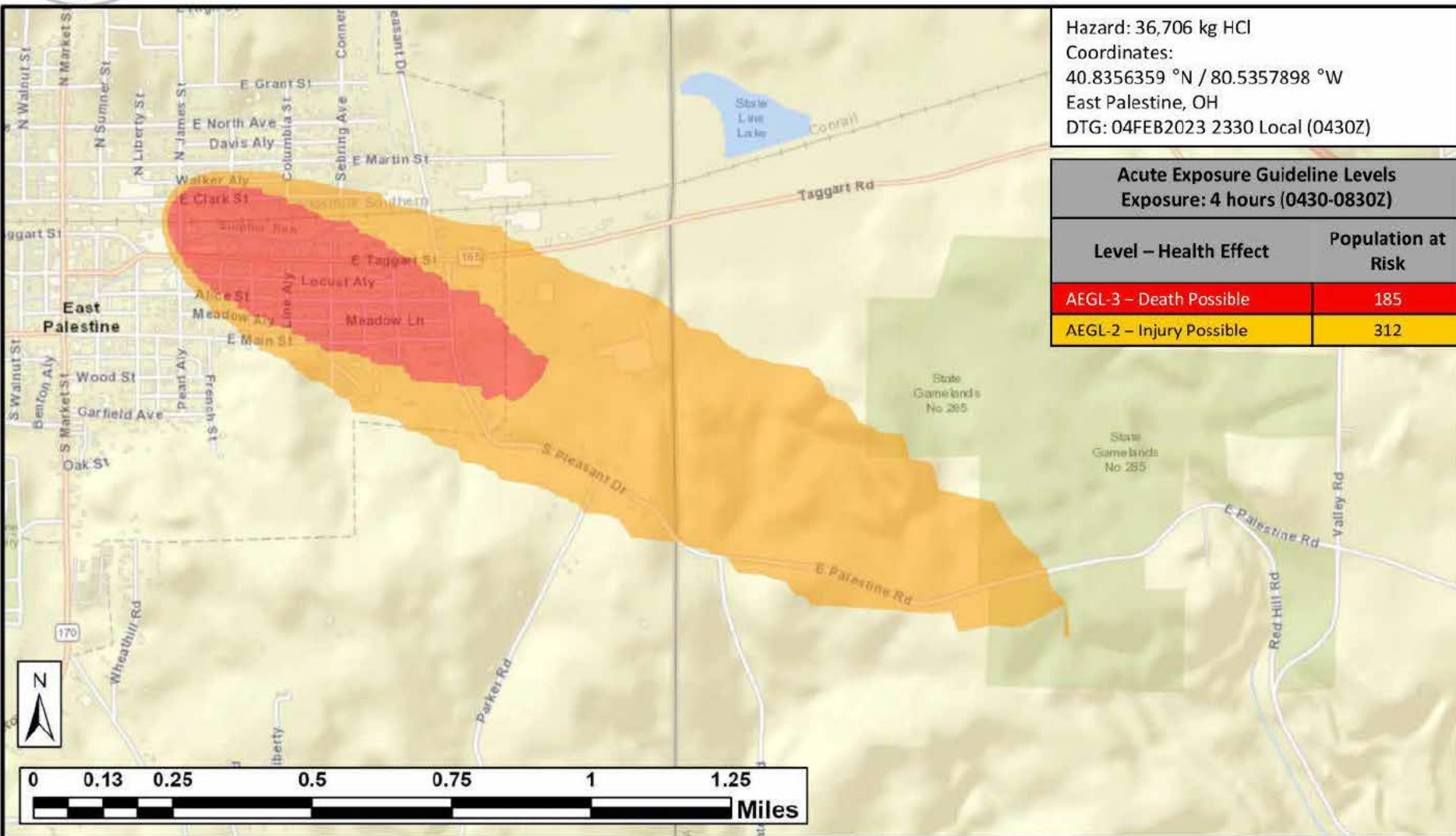
RFI 22-0081U

Hydrogen Chloride – 0330 Local

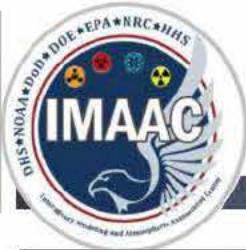
Hazard: 36,706 kg HCl
Coordinates:
40.8356359 °N / 80.5357898 °W
East Palestine, OH
DTG: 04FEB2023 2330 Local (0430Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (0430-0830Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	185
AEGL-2 – Injury Possible	312



CUI



CUI

RFI 22-0081U

Phosgene – 0330 Local

Hazard: 49,779 kg Phosgene
Coordinates:
40.8356359 °N / 80.5357898 °W
East Palestine, OH
DTG: 04FEB2023 2330 Local (0430Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (0430-0830Z)

Level – Health Effect

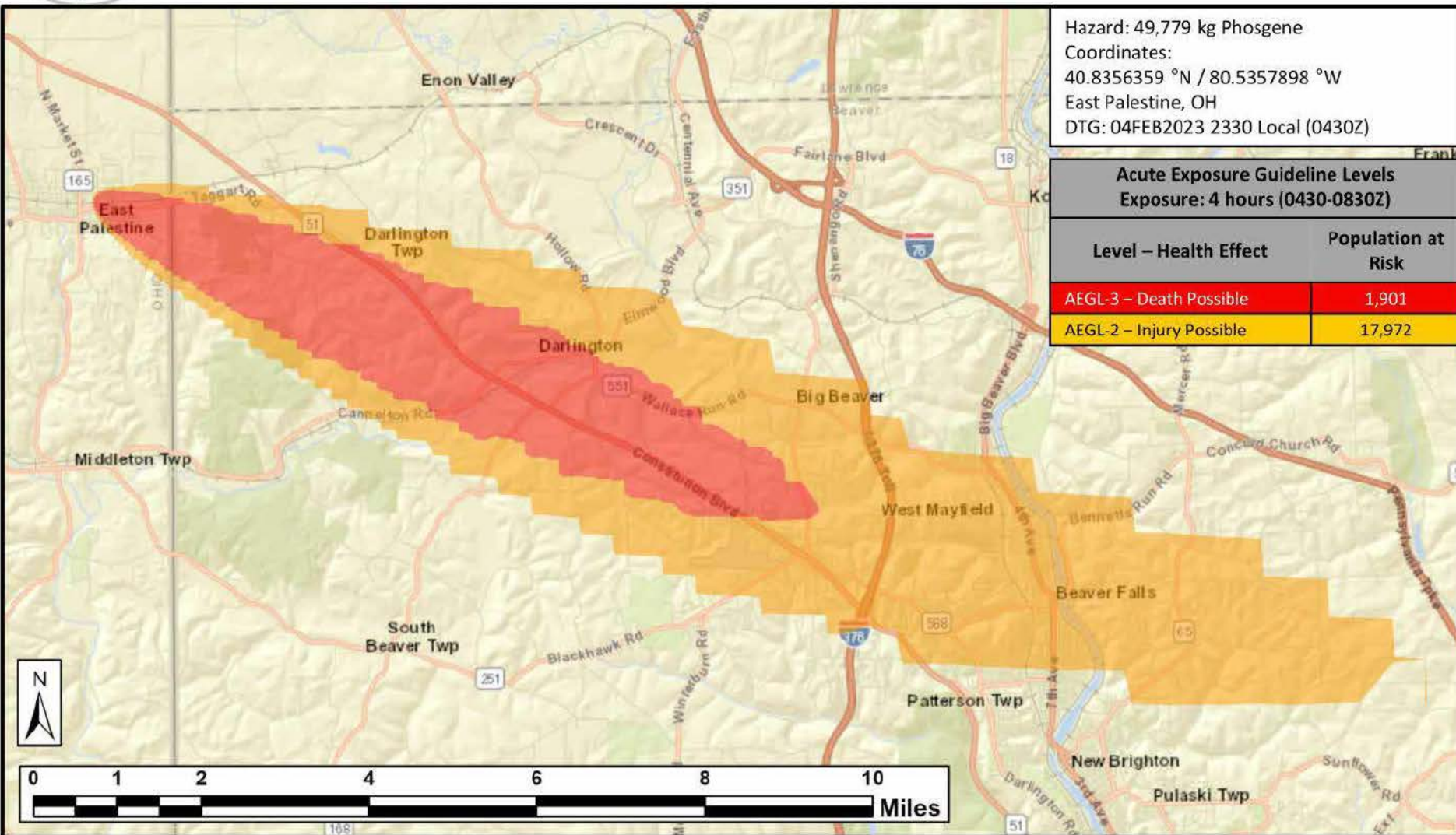
Population at Risk

AEGL-3 – Death Possible

1,901

AEGL-2 – Injury Possible

17,972



CUI



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

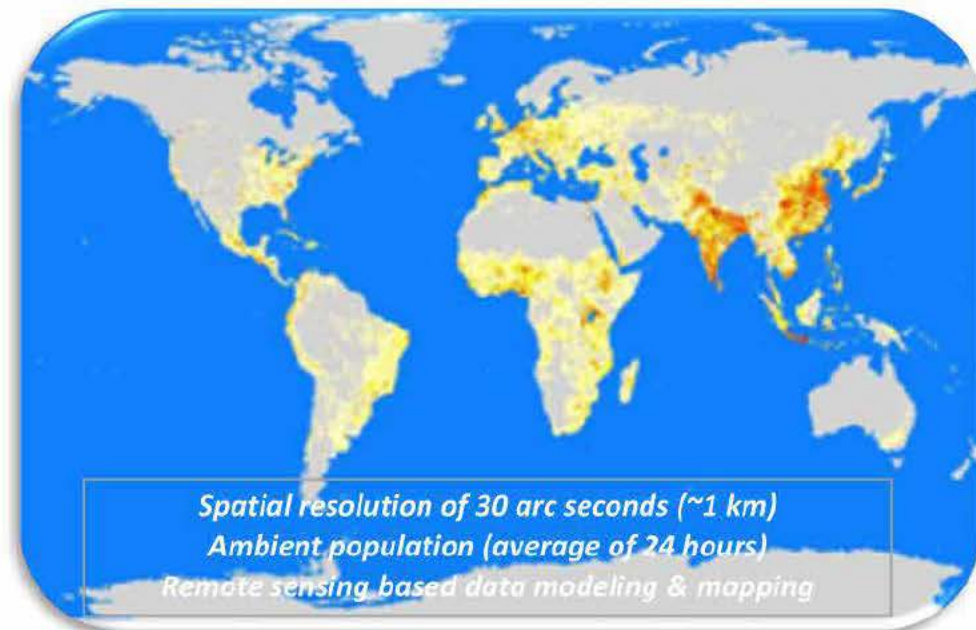
AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2020 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

From: (b) (6)
Sent: Sat, 4 Feb 2023 07:08:11 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback
Subject: RE: Train manifest
Attachments: smime.p7s

Make sure to send the 2nd email out (with the product) to the requestor, FEMA NWC, JOC, IMAAC Dir, etc.

(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Saturday, February 4, 2023 2:00 AM
To: (b) (6)
Subject: FW: Train manifest

(b) (6)

Here are some updated amounts, much larger than I assumed (there was a typo on the assumptions slide, I assumed each railcar held (b) (6) kg).

We can discuss on the call I suppose.

Thanks,

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 1:51 AM
To: (b) (6); DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; DTRA Ft Belvoir OI Mailbox Joint Ops Center <dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>
Subject: [Non-DoD Source] Fwd: Train manifest

:

From: (b) (6)
Date: February 4, 2023 at 01:49:50 EST
To: (b) (6)
Subject: Train manifest

?

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sat, 4 Feb 2023 07:37:47 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA); DTRA Ft Belvoir OI Mailbox Joint Ops Center
Subject: RE: (Real World) IMAAC Product Attached
Attachments: smime.p7s

(b) (6).

The product has been forwarded as requested.

(b) (6) from EPA has sent us some updated information about amounts in the railcars, and, unless you would like something sooner, our plan is to run an update at 0800 EST based on 10% of the new amounts, to account for the fire being diminished by then. If you have something else in mind, please let us know via email or phone us.
Thank you,

Respectfully,

(b) (6)

Defense Threat Reduction Agency
COM: (703) 767-3445 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 2:22 AM
To: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>; DTRA Ft Belvoir OI Mailbox Joint
Ops Center <dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>;
fema-nwc@fema.dhs.gov; IMAAC@FEMA.DHS.GOV; (b) (6)
>
Subject: [Non-DoD Source] RE: (Real World) IMAAC Product Attached

Thank you!

Can you please add (b) (6)
to your distribution list?

Thanks again!

(b) (6)

On-Scene Coordinator

US EPA
2565 Plymouth Road
Ann Arbor, MI 48105
(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Saturday, February 4, 2023 2:13 AM
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>; fema-nwc@fema.dhs.gov;
IMAAC@FEMA.DHS.GOV; (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Subject: (Real World) IMAAC Product Attached

Please see the attached document(s) regarding the IMAAC Activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)

From: (b) (6)
Sent: Sat, 4 Feb 2023 08:02:09 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback
Cc: (b) (6); DTRA Ft Belvoir OI Mailbox Joint Ops Center
Subject: [Non-DoD Source] RE: (Real World) IMAAC Product Attached

No. Thank you.

I found out that (b) (6) (from EPA Region 3) is there as a Fire Fighter, so he has boots on the ground - I am good with it.

Just please keep me in the loop.

(b) (6)
On-Scene Coordinator
US EPA
2565 Plymouth Road
Ann Arbor, MI 48105
(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Saturday, February 4, 2023 2:38 AM
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6); DTRA Ft Belvoir OI Mailbox Joint Ops Center <dtra.belvoir.oi.mbx.joint-ops-center@mail.mil>
Subject: RE: (Real World) IMAAC Product Attached

(b) (6)
The product has been forwarded as requested.

(b) (6) from EPA has sent us some updated information about amounts in the railcars, and, unless you would like something sooner, our plan is to run an update at 0800 EST based on 10% of the new amounts, to account for the fire being diminished by then. If you have something else in mind, please let us know via email or phone us.
Thank you,

Respectfully,
(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3445 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: (b) (6)
Sent: Saturday, February 4, 2023 2:22 AM
To: DTRA Ft Belvoir RD Mailbox Reachback
<dra.belvoir.rd.mbx.reachback@mail.mil>; DTRA Ft Belvoir OI Mailbox Joint
Ops Center <dra.belvoir.oi.mbx.joint-ops-center@mail.mil>;
fema-nwc@fema.dhs.gov; IMAAC@FEMA.DHS.GOV; (b) (6)
Cc: (b) (6)
Subject: [Non-DoD Source] RE: (Real World) IMAAC Product Attached

Thank you!

Can you please add (b) (6)
to your distribution list?

Thanks again!

(b) (6)
On-Scene Coordinator
US EPA
2565 Plymouth Road
Ann Arbor, MI 48105
(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Saturday, February 4, 2023 2:13 AM
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center
<dra.belvoir.oi.mbx.joint-ops-center@mail.mil>; fema-nwc@fema.dhs.gov;
IMAAC@FEMA.DHS.GOV; (b) (6)
>
Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dra.belvoir.rd.mbx.reachback@mail.mil>
Subject: (Real World) IMAAC Product Attached

Please see the attached document(s) regarding the IMAAC Activation request
for train derailment in East Palestine, OH. The product is also available
on the IMAAC Portal page
(<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sat, 4 Feb 2023 14:46:12 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) Updated IMAAC Product Attached
Attachments: RFI_23-0081aU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution- <https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,
IMAAC Technical Operations Hub
703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)
imaac@fema.dhs.gov

CUI (with attachment)

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sat, 4 Feb 2023 14:46:12 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov

Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) Updated IMAAC
Product Attached
Attachments: RFI_23-0081aU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution-
<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,
IMAAC Technical Operations Hub
703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)
imaac@fema.dhs.gov

CUI (with attachment)

~~CUI~~

Date: 04FEB2023 1415Z

Version: Revision A

Changes: Updated weather and hazards



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081aU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.83564 °N / 80.53579 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	0800 04FEB2023 Local (1300Z)
Executive Summary	• For phosgene, 840 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 517 people may be exposed to hazard levels that could possibly result in death. • For hydrogen chloride, 175 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 53 people may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

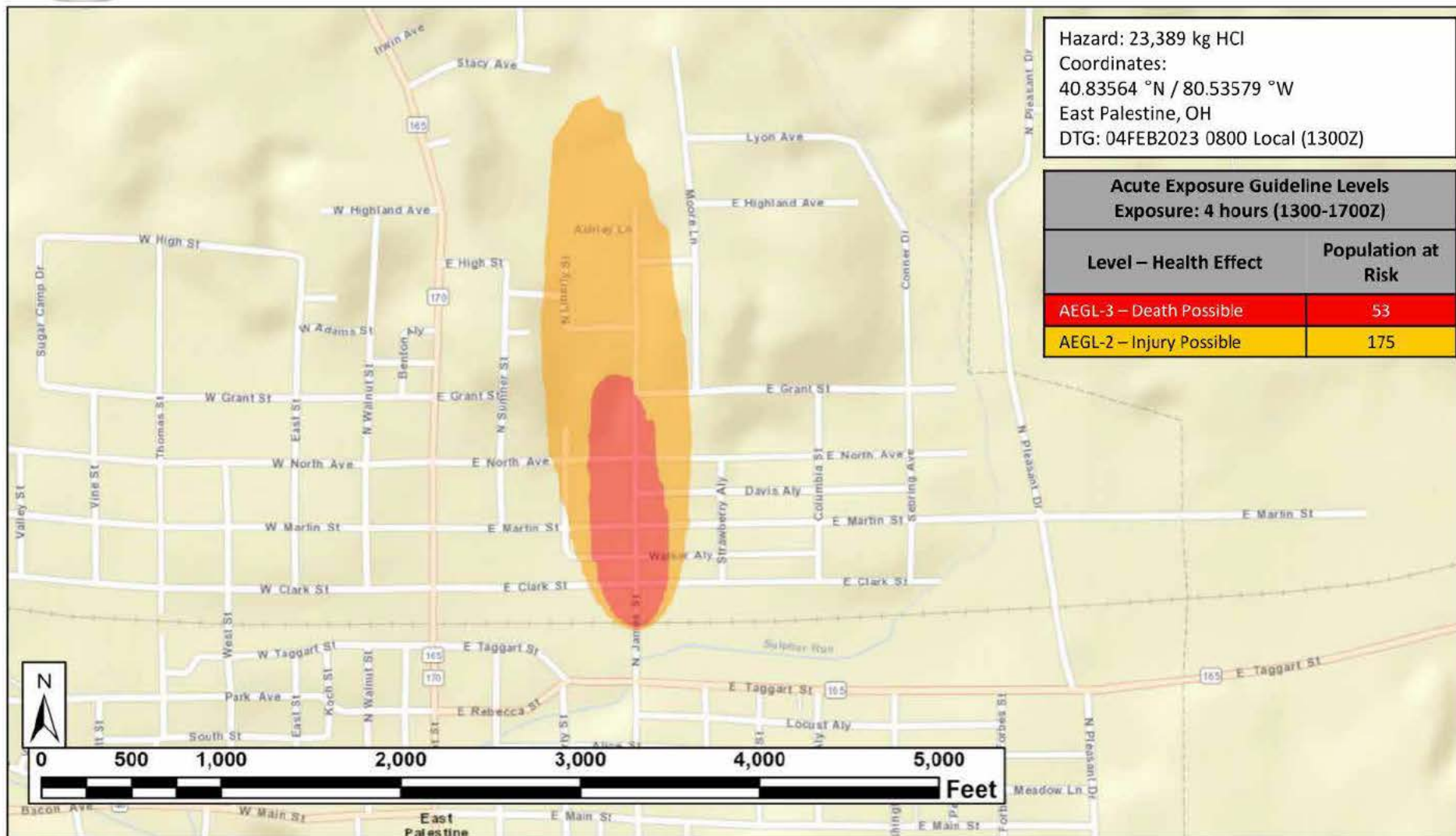
(b)(3)10USC130



CUI

RFI 22-0081aU

Hydrogen Chloride – 1200 Local



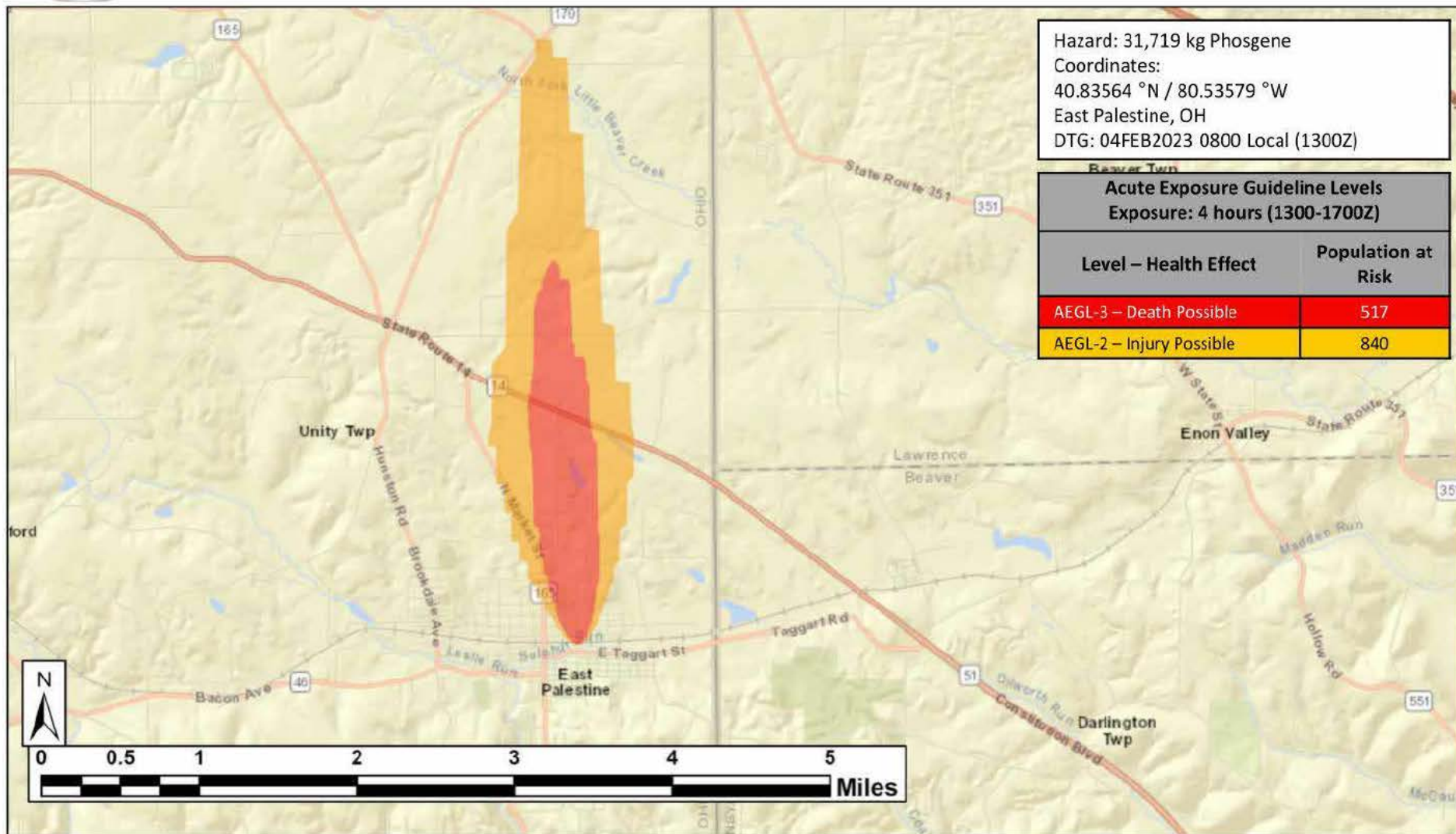
CUI



CUI

RFI 22-0081aU

Phosgene – 1200 Local



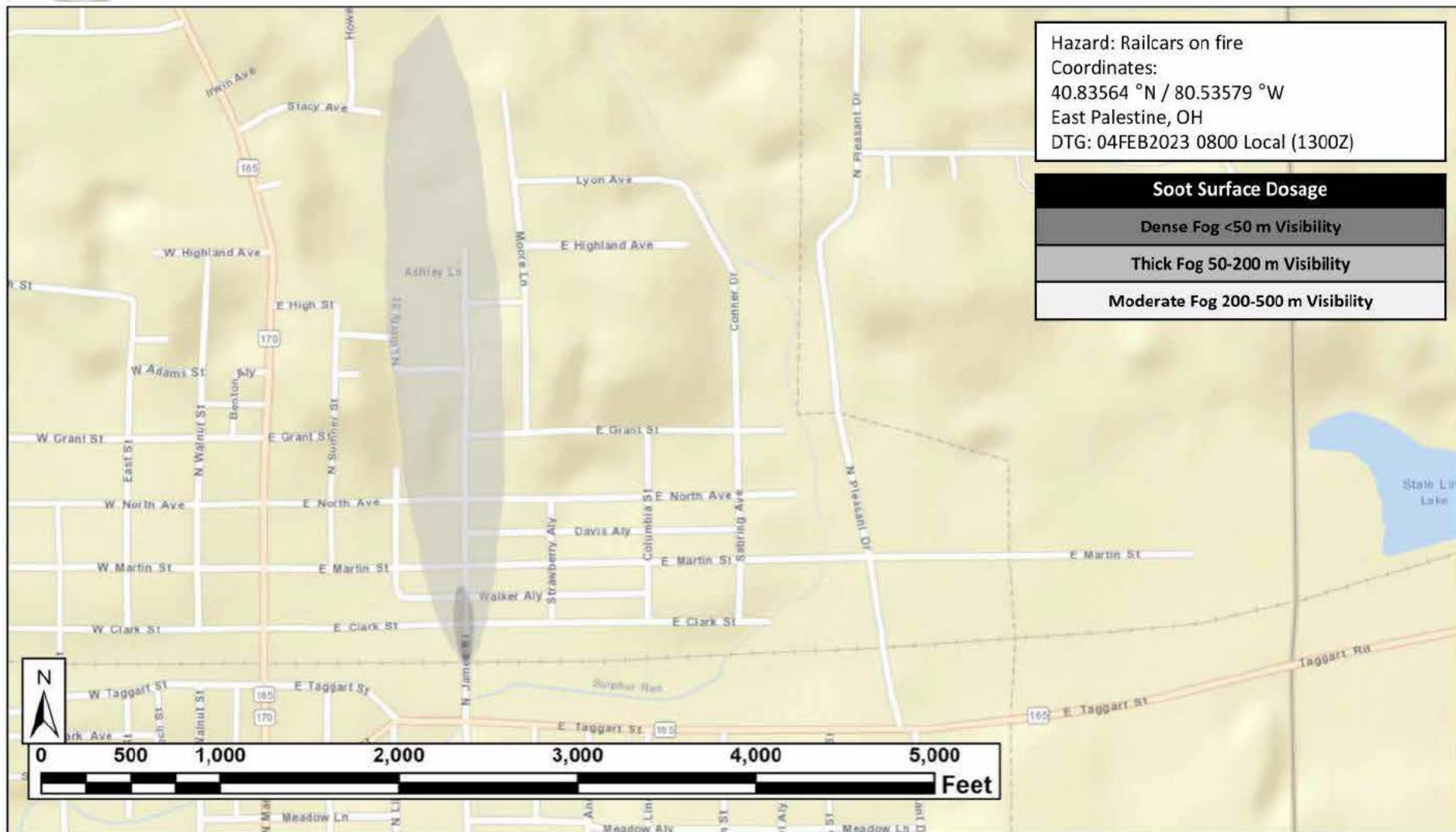
CUI



CUI

RFI 22-0081aU

Soot- 1200 Local



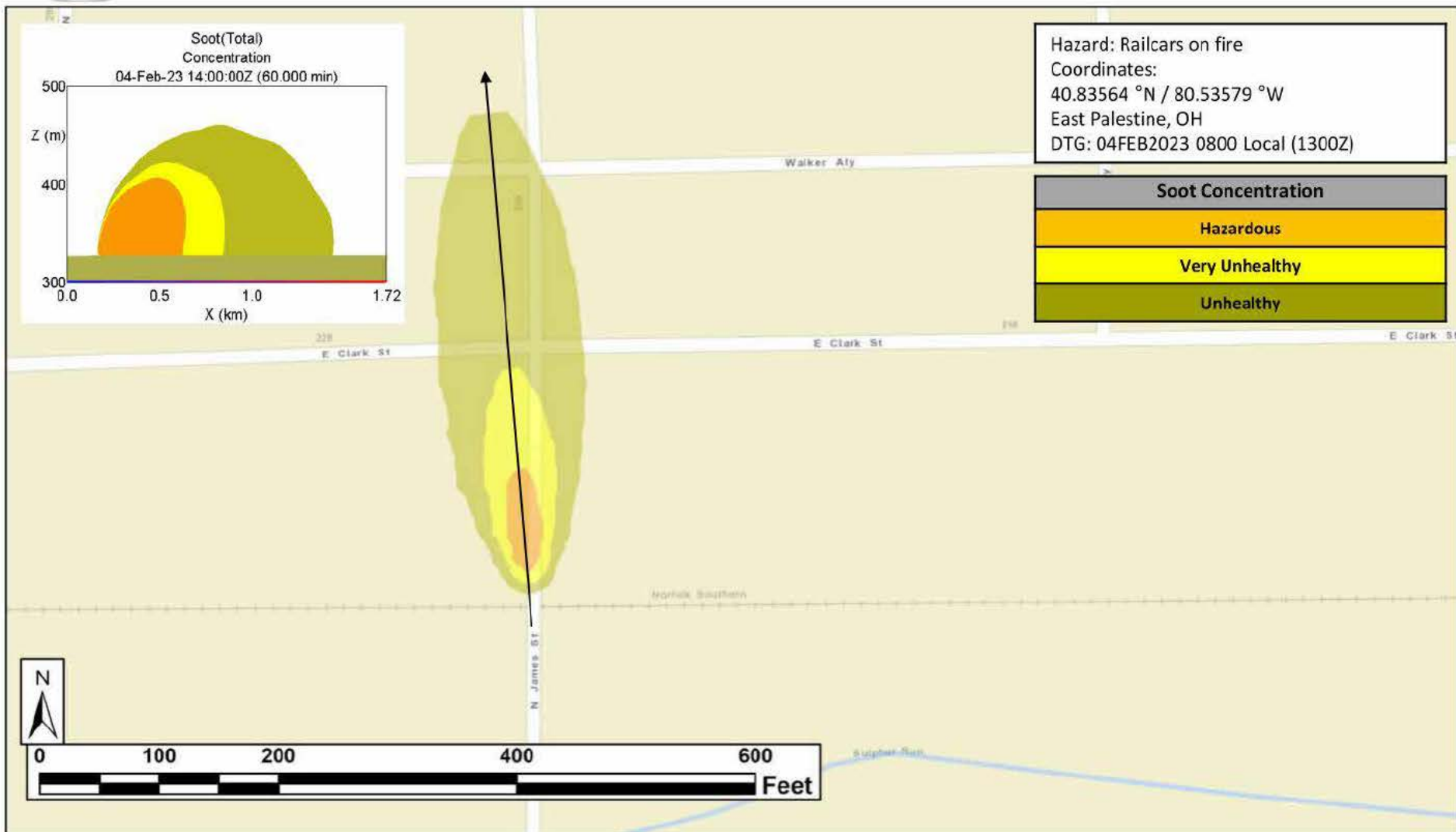
CUI



~~CUI~~

RFI 22-0081aU

Soot – 1200 Local



~~CUI~~

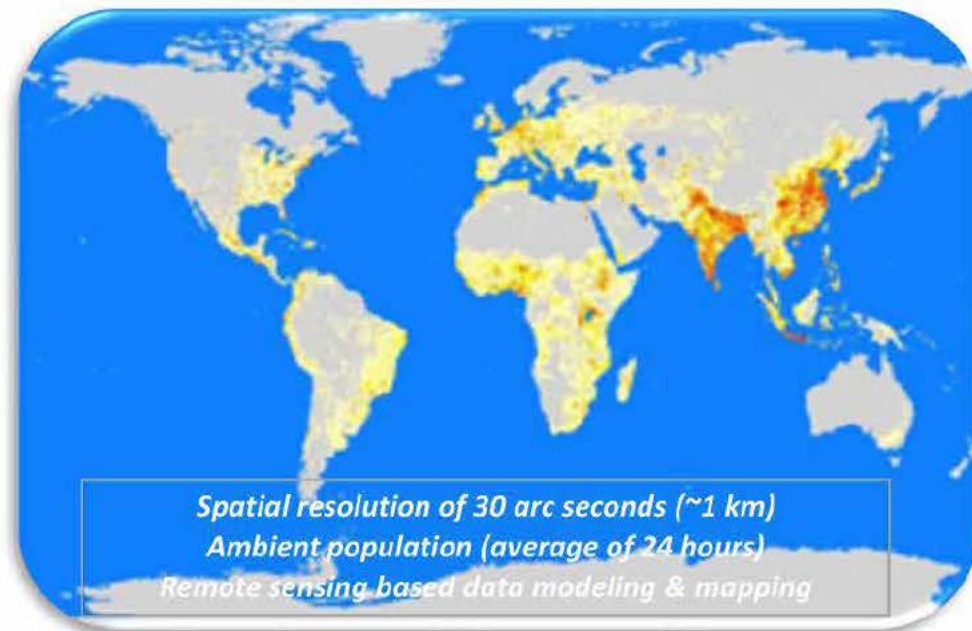


Population Data

~~CUI~~

RFI 22-0081aU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sat, 4 Feb 2023 23:19:42 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov
Cc: (b) (6)
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated Product Attached
Attachments: RFI_23-0081bU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC Activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution-<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)

CUI (with attachment)

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sat, 4 Feb 2023 23:19:42 +0000

To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov;
imaac@fema.dhs.gov
Cc: (b) (6)
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated
Product Attached
Attachments: RFI_23-0081bU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC Activation request for train derailment in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution-<https://www.radresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub
703-767-2003 (Operations Center) or 703-767-3445 (Technical Reachback)

CUI (with attachment)

~~CUI~~

Date: 04FEB2023 2300Z

Version: Revision B

Changes: Updated weather



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081bU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6) EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.83564 °N / 80.53579 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1800 04FEB2023 Local (2300Z) 2. 0000 05FEB2023 Local (0500Z)
Executive Summary	• For phosgene at 0000 Local, 1153 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 348 people may be exposed to hazard levels that could possibly result in death. (1800 local model shows slightly fewer at risk. • For HCl at 0000 Local, 118 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 57 people may be exposed to hazard levels that could possibly result in death. (1800 local model shows slightly fewer at risk.) • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- No additional information was provided on the fire that continues to burn and no changes were made on the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3) 10 USC 130

1800 Local (2300Z)

04FEB2023



CUI

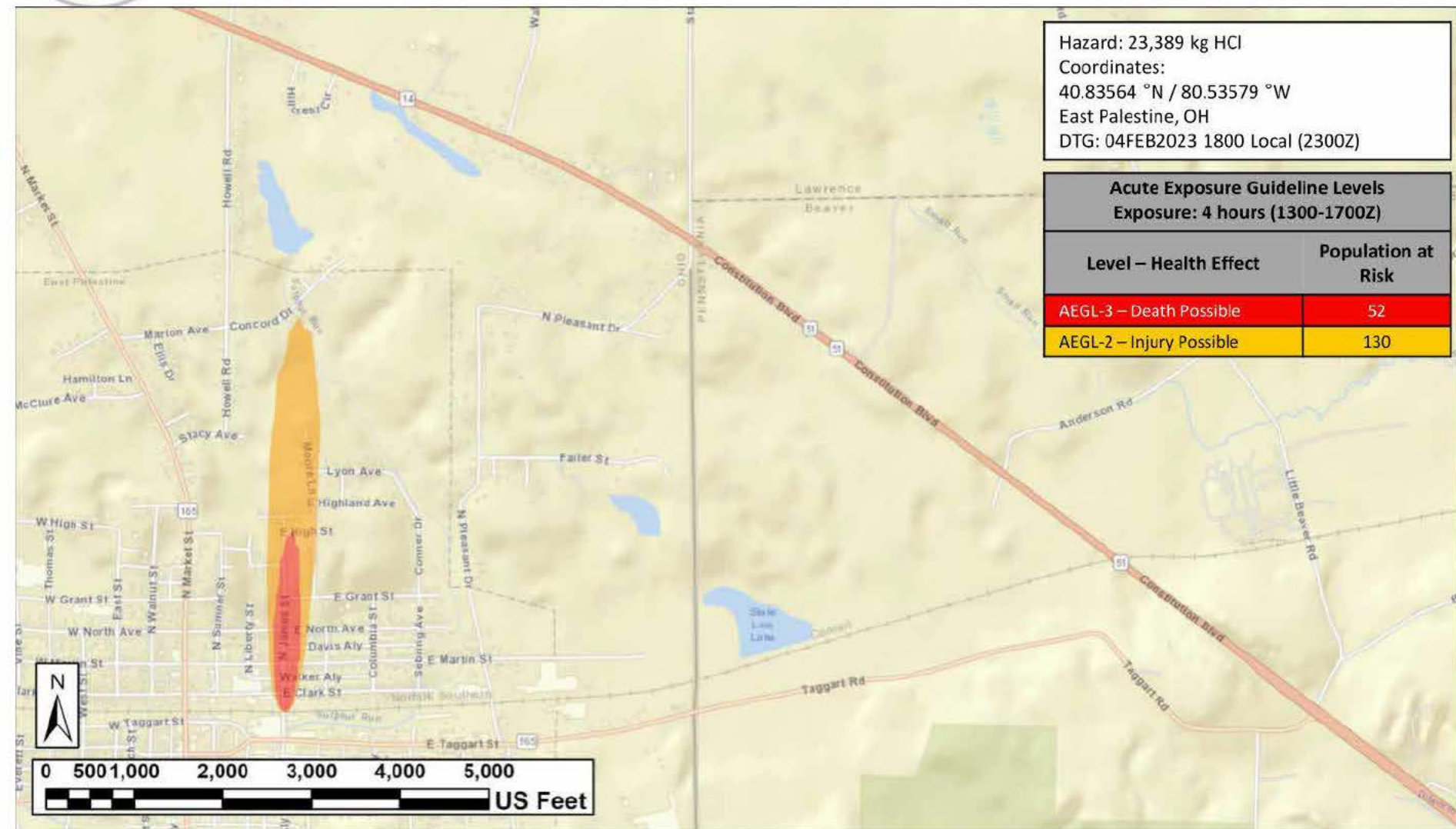
RFI 22-0081bU

Hydrogen Chloride – 1800 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 04FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1300-1700Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	52
AEGL-2 – Injury Possible	130



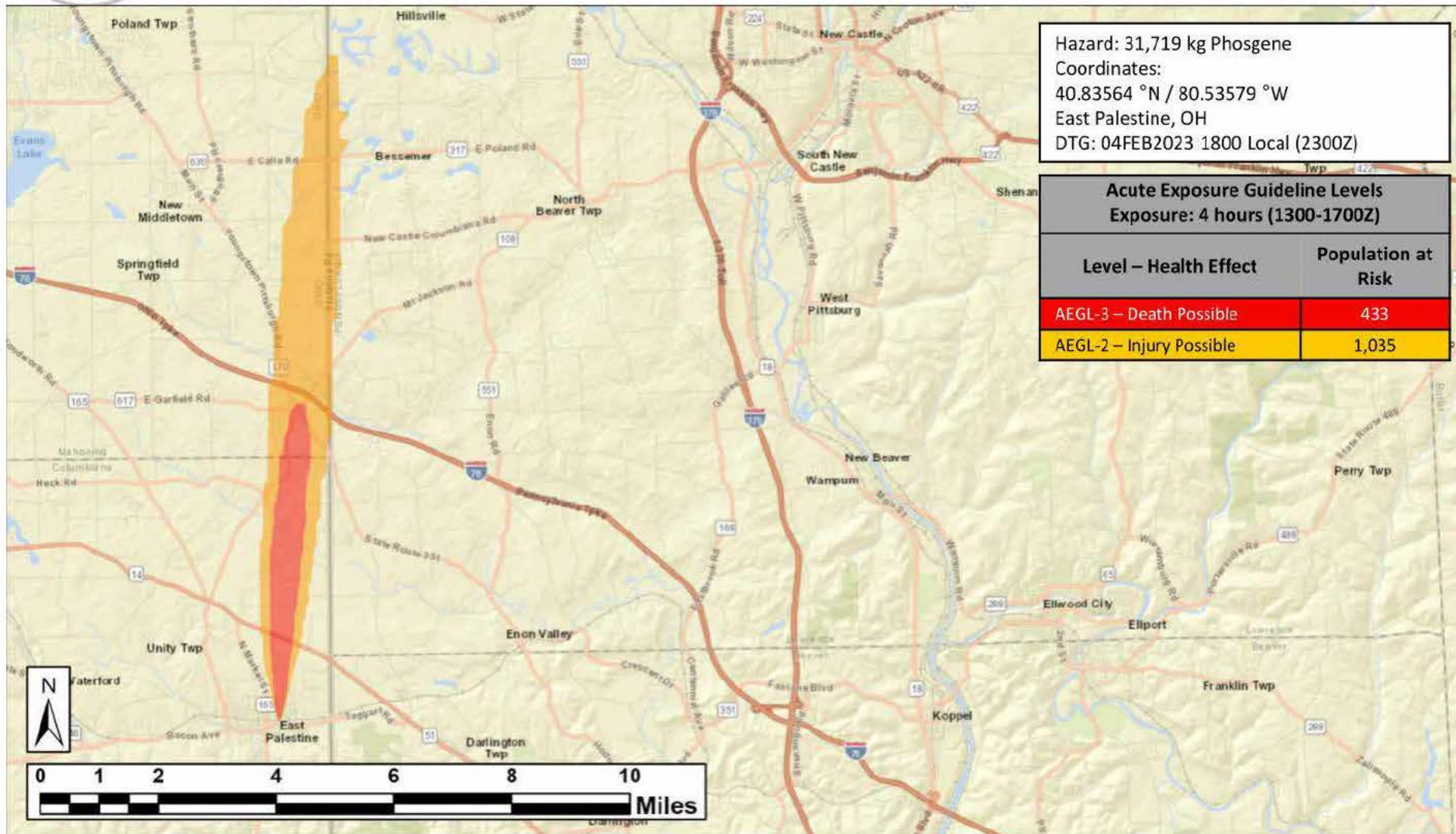
CUI



CUI

RFI 22-0081bU

Phosgene – 1800 Local



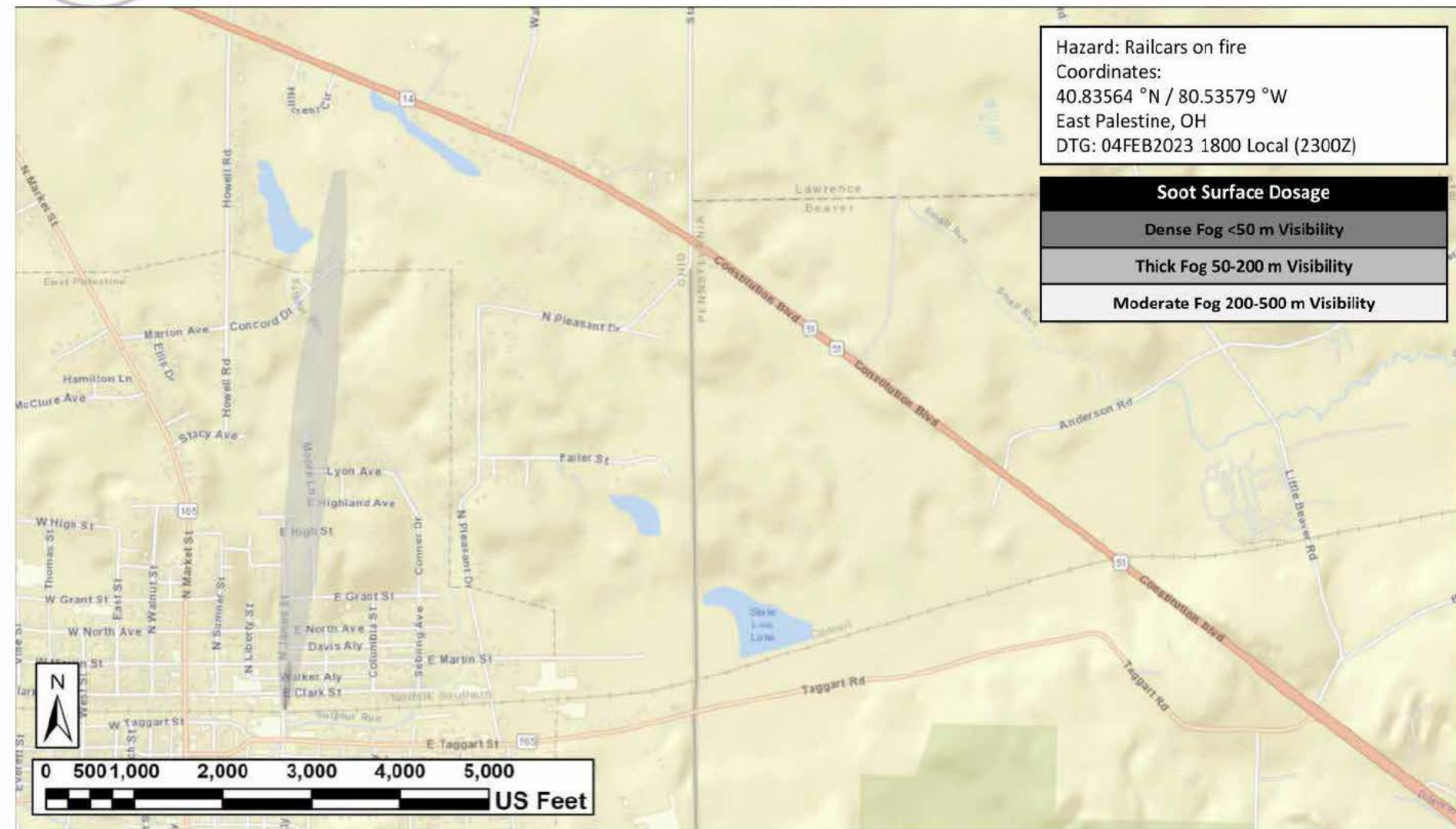
CUI



~~CUI~~

RFI 22-0081bU

Soot- 1800 Local



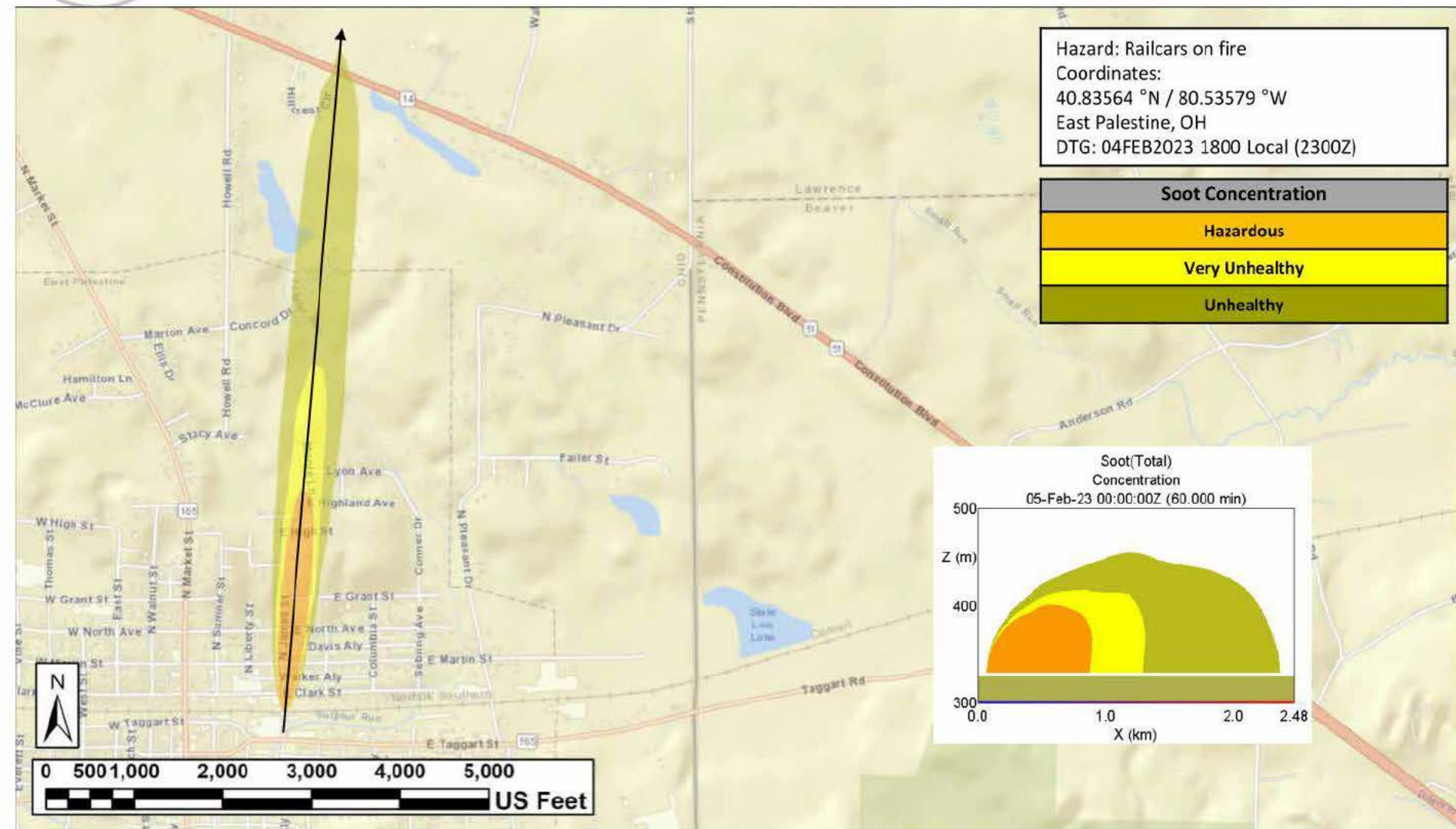
~~CUI~~



CUI

RFI 22-0081bU

Soot – 1800 Local



CUI

0000 Local (0500Z)

05FEB2023



CUI

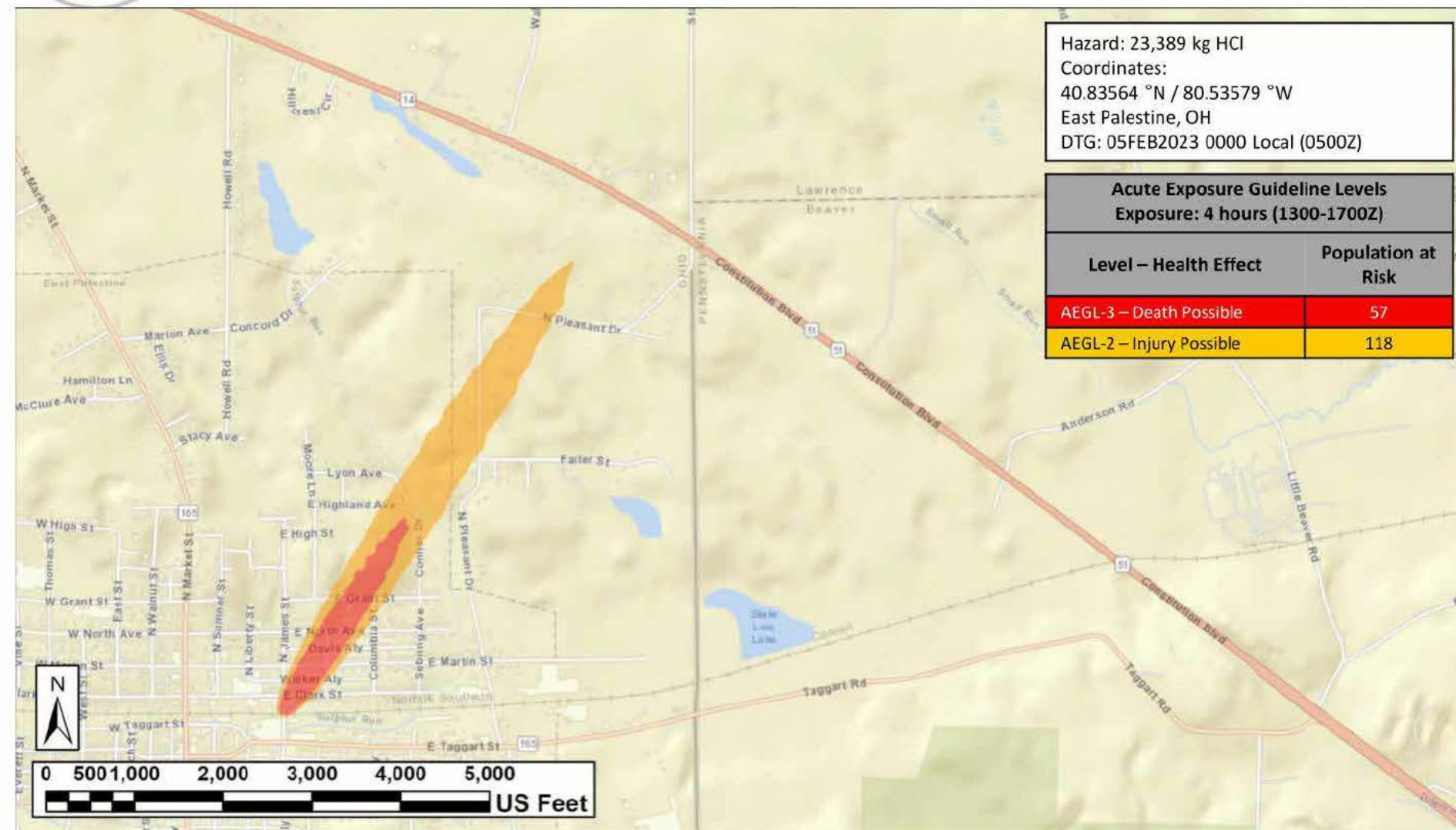
RFI 22-0081bU

Hydrogen Chloride – 0000 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0000 Local (0500Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1300-1700Z)

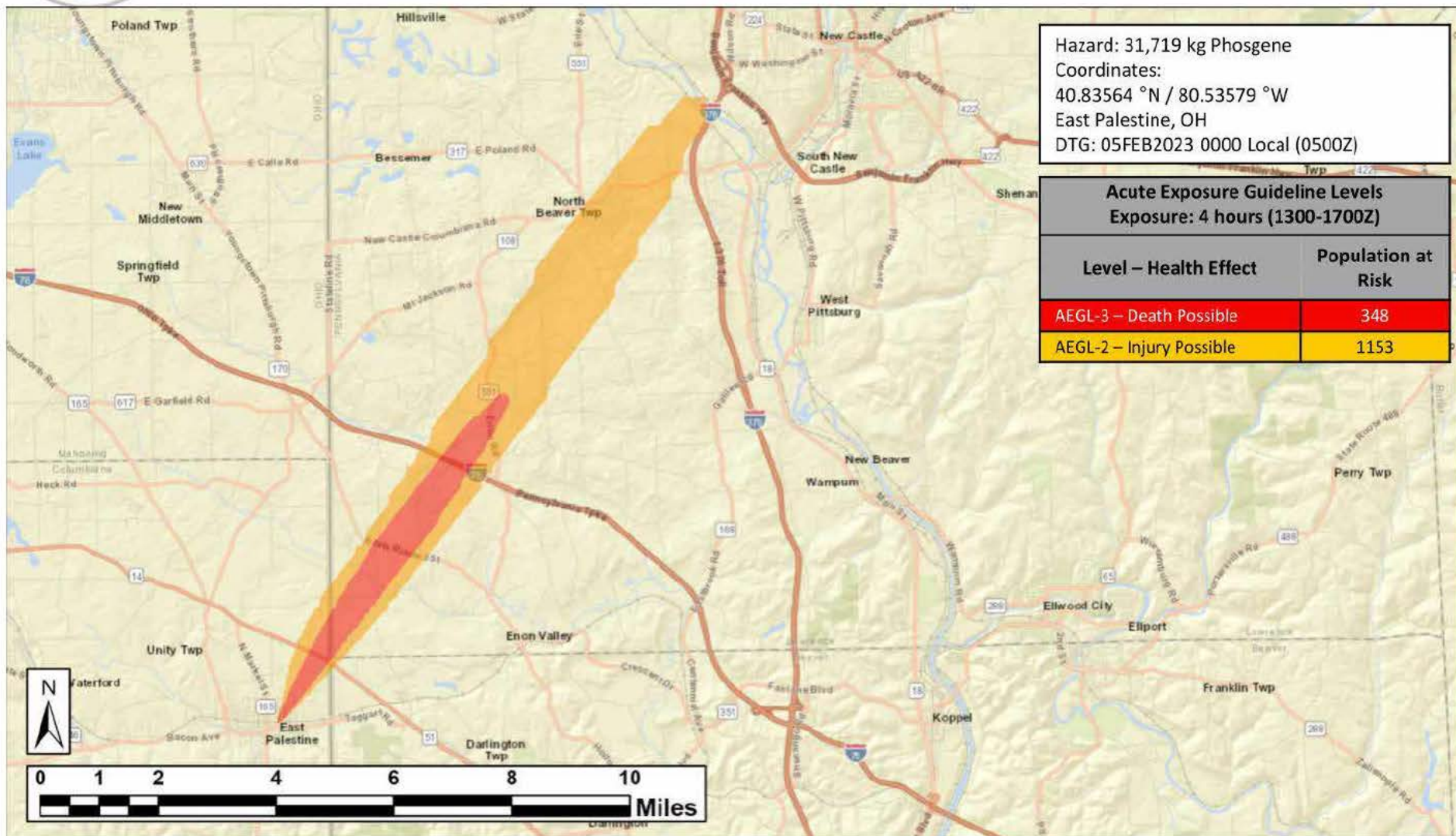
Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	57
AEGL-2 – Injury Possible	118



CUI



Phosgene – 0000 Local

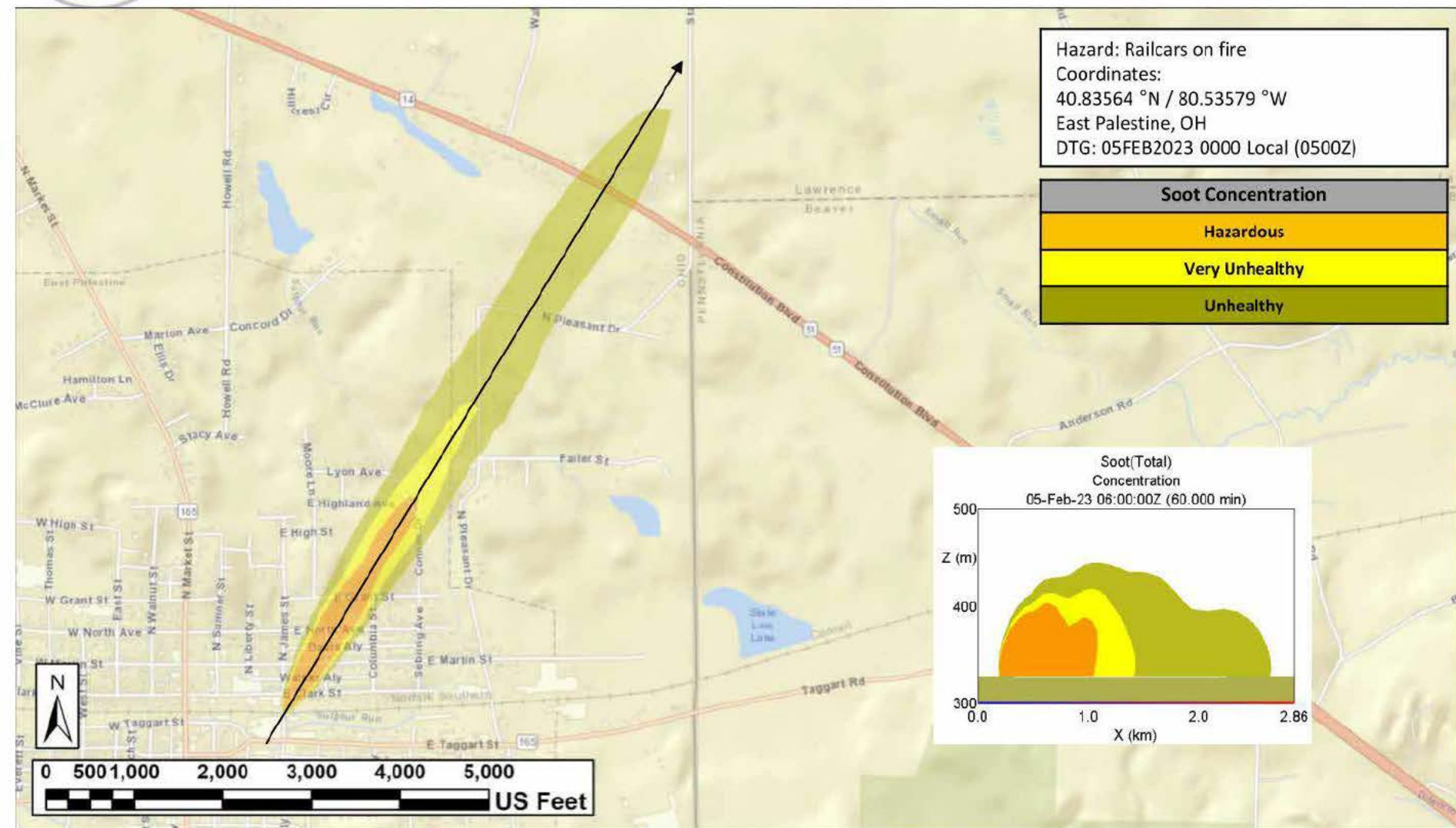




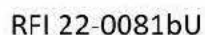
~~CUI~~

RFI 22-0081bU

Soot – 0000 Local



~~CUI~~



INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

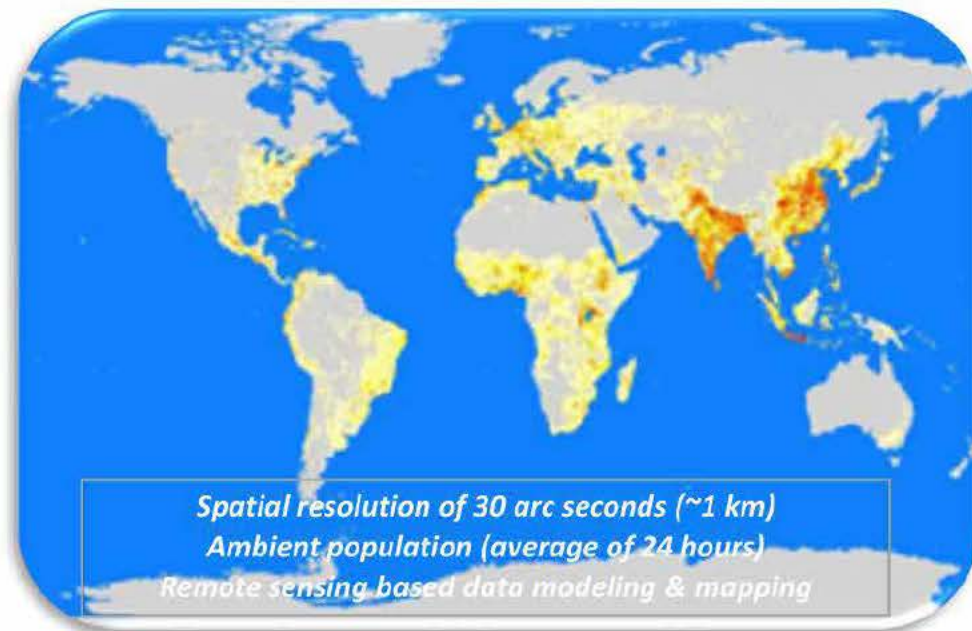


Population Data

~~CUI~~

RFI 22-0081bU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Sun, 5 Feb 2023 10:59:58 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: IMAAC update RFI 23-0081cU
Attachments: smime.p7s

IMAAC has completed an updated modeling product for activation requested by the USEPA Region 5 for train derailment in East Palestine, OH. The product is available on the IMAAC Portal page (<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Respectfully,

IMAAC Technical Operations Hub

703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)

imaac@fema.dhs.gov

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sun, 5 Feb 2023 23:55:50 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated Product Attached
Attachments: RFI_23-0081dU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for a [incident type, e.g., chemical spill] in [location: City, State]. The product is also available on the IMAAC Portal page (Caution-<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,
IMAAC Technical Operations Hub
703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)
imaac@fema.dhs.gov

CUI (with attachment)

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

From: (b) (6)
Sent: Sun, 5 Feb 2023 23:55:50 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov;

imaac@fema.dhs.gov

Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated
Product Attached
Attachments: RFI_23-0081dU_IMAAC.pdf, smime.p7s

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for a [incident type, e.g., chemical spill] in [location: City, State]. The product is also available on the IMAAC Portal page (Caution-
<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,
IMAAC Technical Operations Hub
703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)
imaac@fema.dhs.gov

CUI (with attachment)

~~CUI~~

Date: 05FEB2023 2300Z

Version: Revision D

Changes: Updated location & weather



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081dU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 05FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1800 05FEB2023 Local (2300Z) 2. 0000 06FEB2023 Local (0500Z)
Executive Summary	• The new location resulted in significantly lower number people being at risk. • For phosgene at 1800 Local, 2,718 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 433 people may be exposed to hazard levels that could possibly result in death. (0500 local model shows slightly fewer at risk. • For HCl at 0000 and 1800 Local, 4 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 people may be exposed to hazard levels that could possibly result in death. • Note: AEGs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- No additional information was provided on the fire that continues to burn and no changes were made on the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3) 10USC130

1800 Local (2300Z)

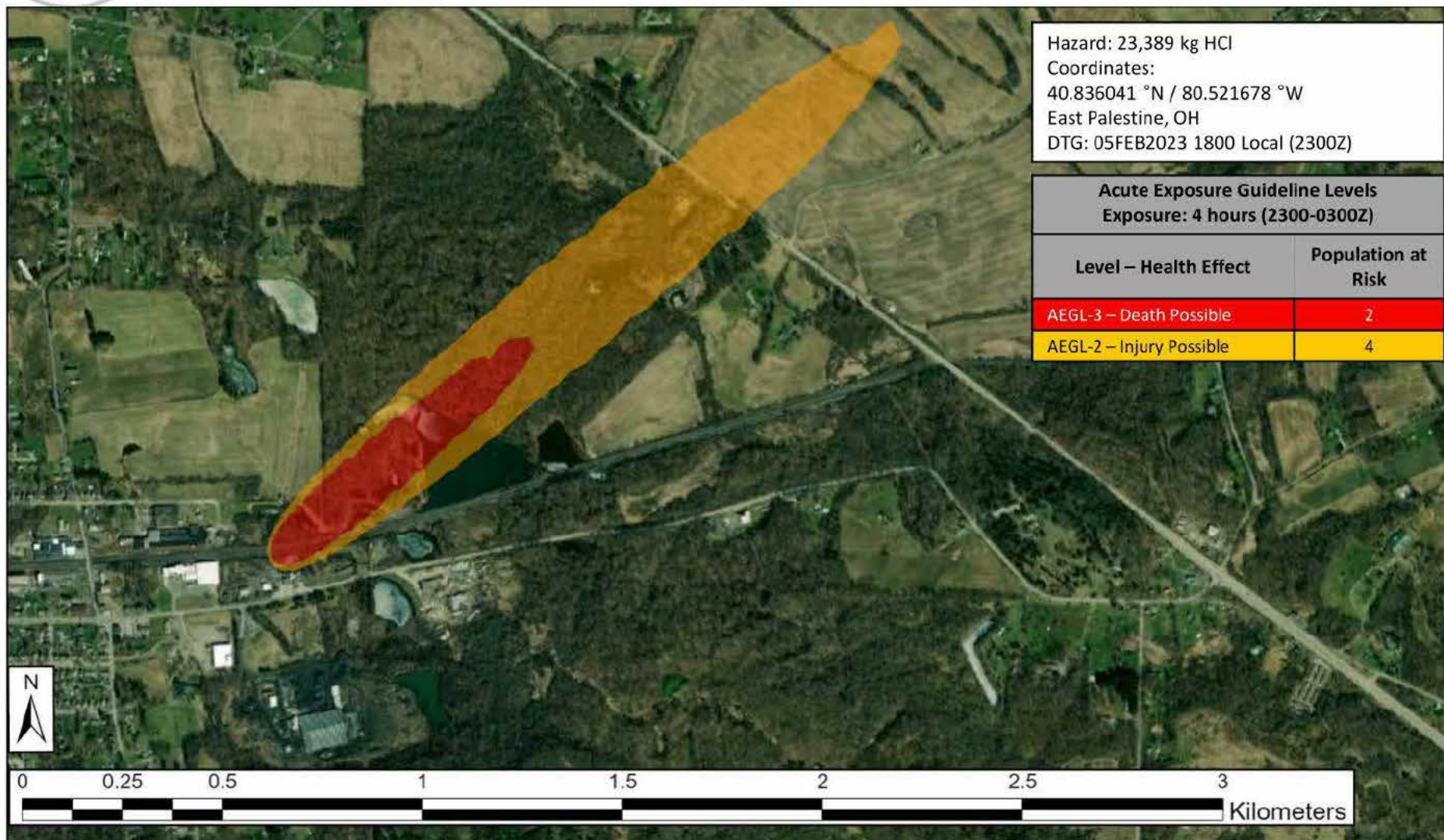
05FEB2023



CUI

RFI 22-0081dU

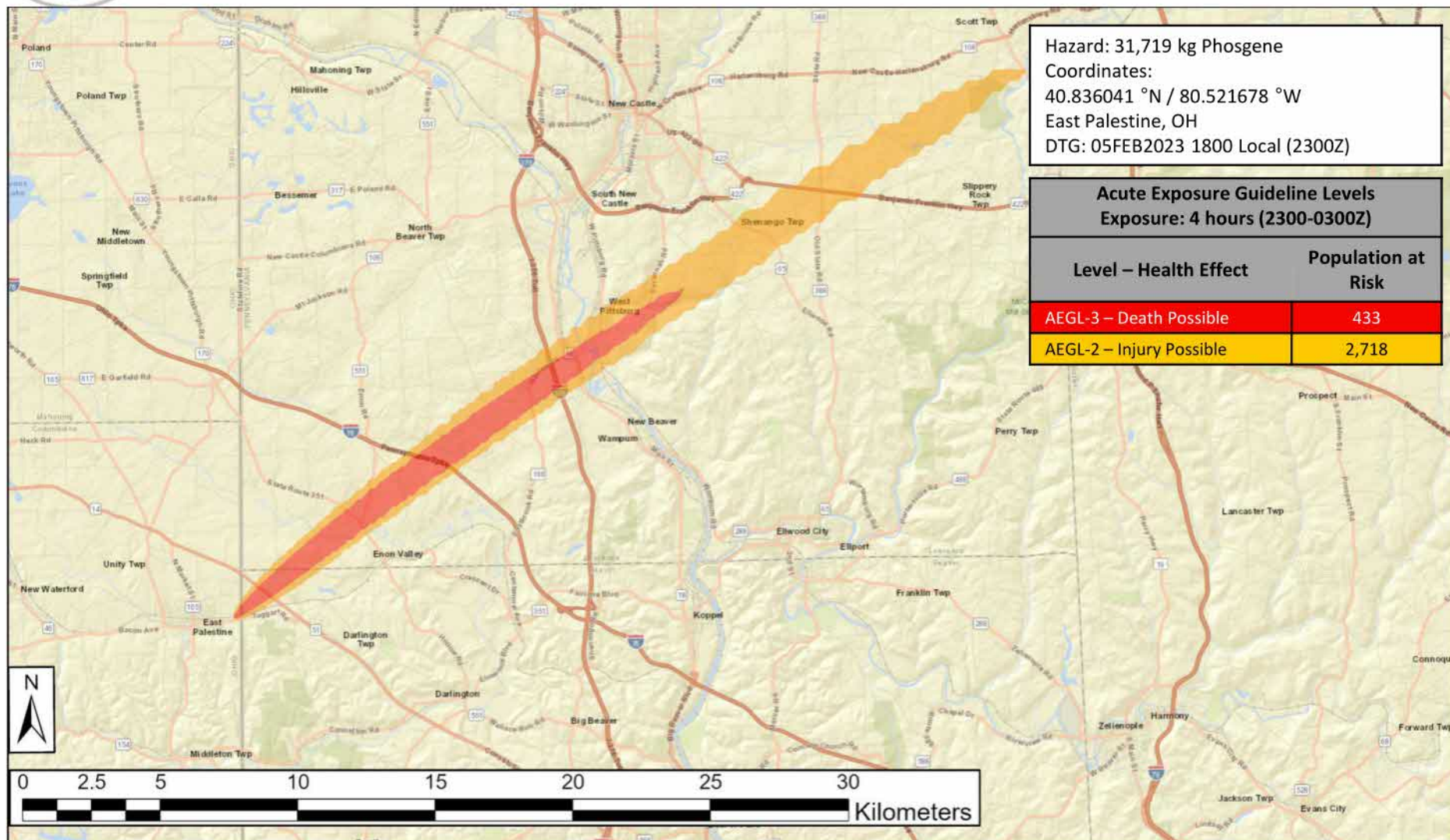
Hydrogen Chloride – 1800 Local



CUI



Phosgene – 1800 Local





~~CUI~~

RFI 22-0081dU

Soot– Surface Dosage- 1800 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 05FEB2023 1800 Local (2300Z)

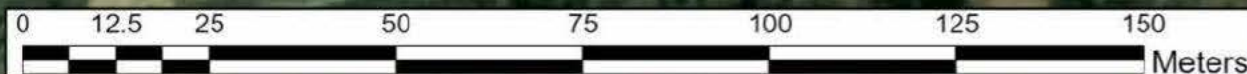
Soot Surface Dosage
Exposure: 2 hours (2300Z – 0100Z)

Hazardous

Very Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



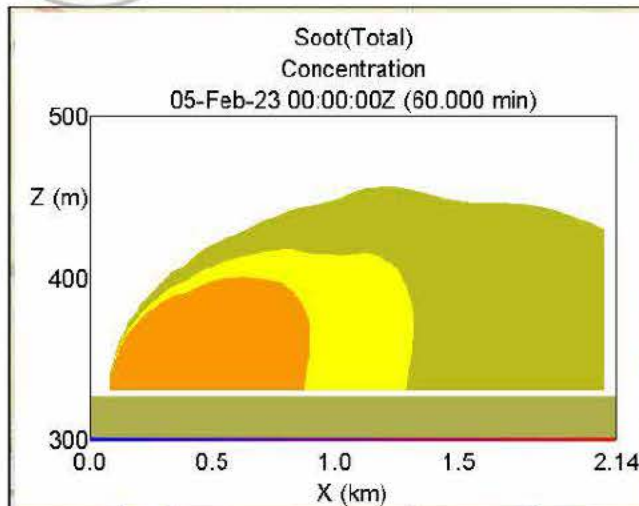
~~CUI~~



~~CUI~~

RFI 22-0081dU

Soot – Vertical Profile-1800 Local



Hazard: Railcars on fire
Coordinates:
40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 05FEB2023 1800 Local (2300Z)

Soot Concentration @ 1800 Local

Hazardous

Very Unhealthy

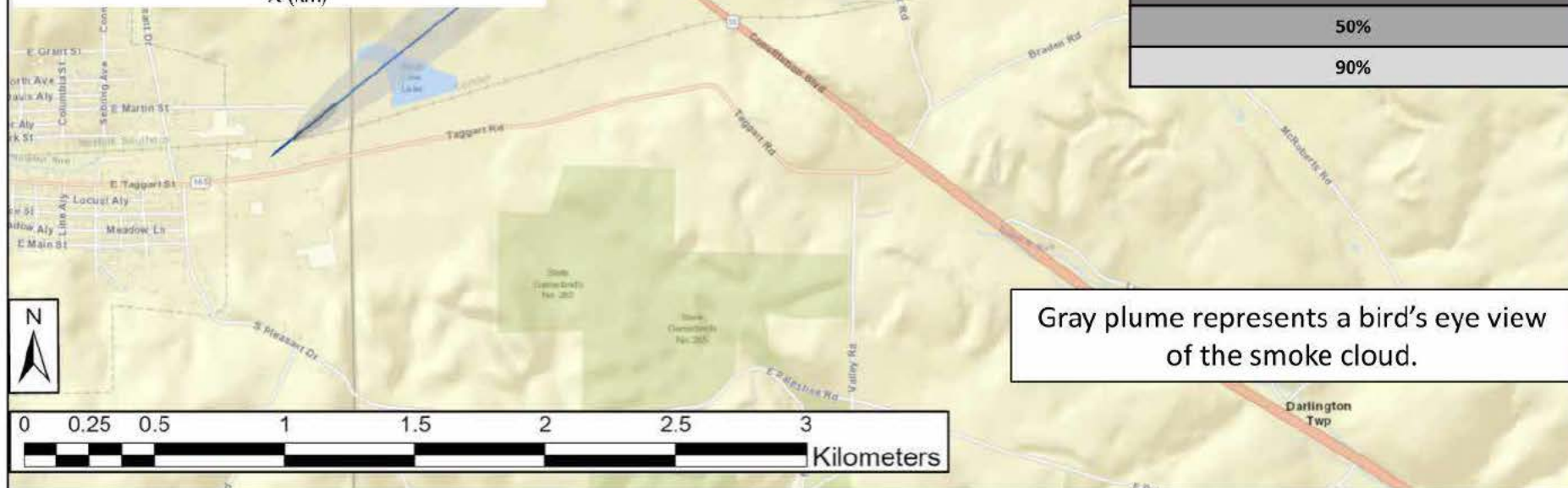
Unhealthy

Light Transmittance

10%

50%

90%



~~CUI~~

0000 Local (0500Z)

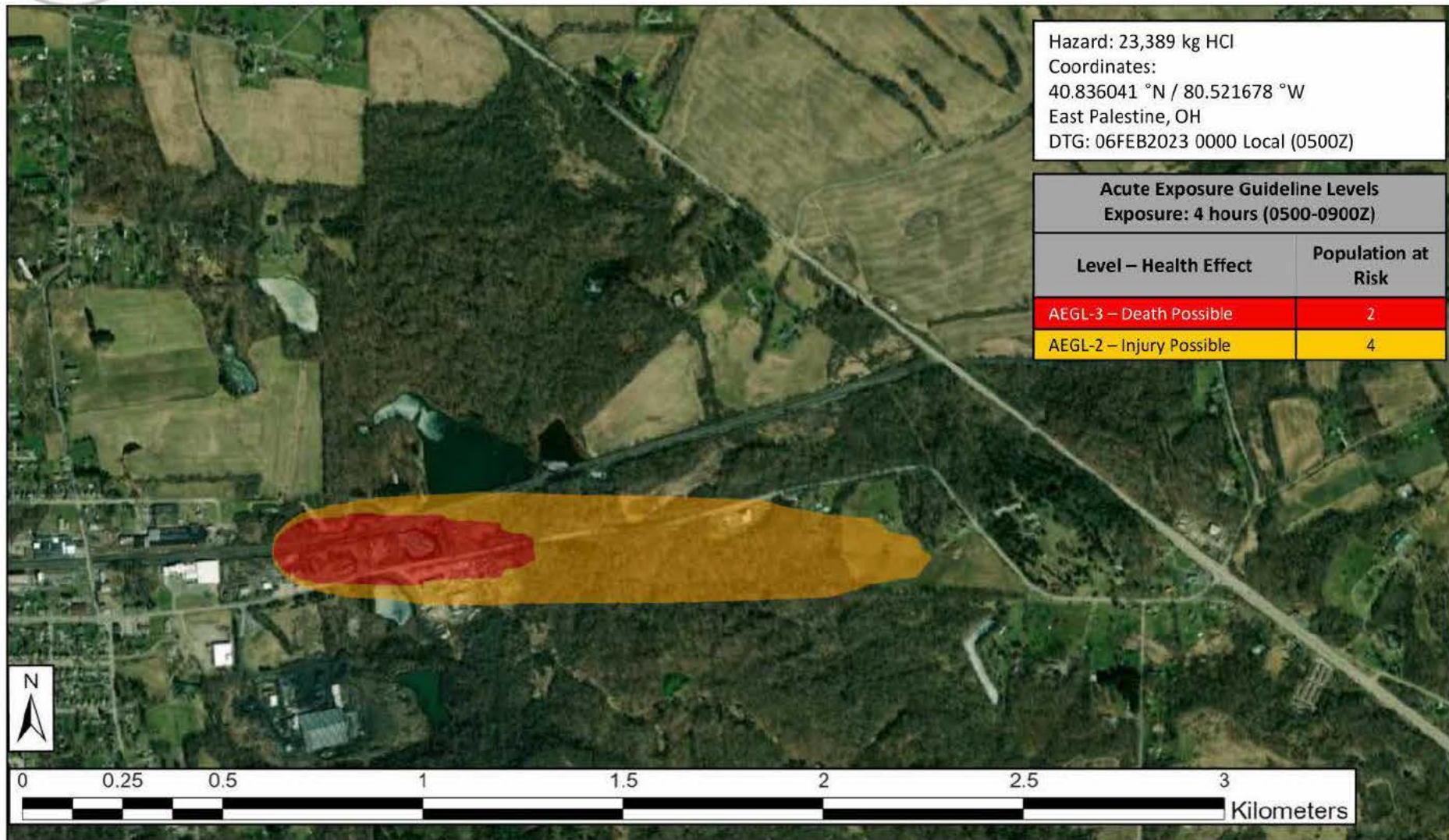
06FEB2023



~~CUI~~

RFI 22-0081dU

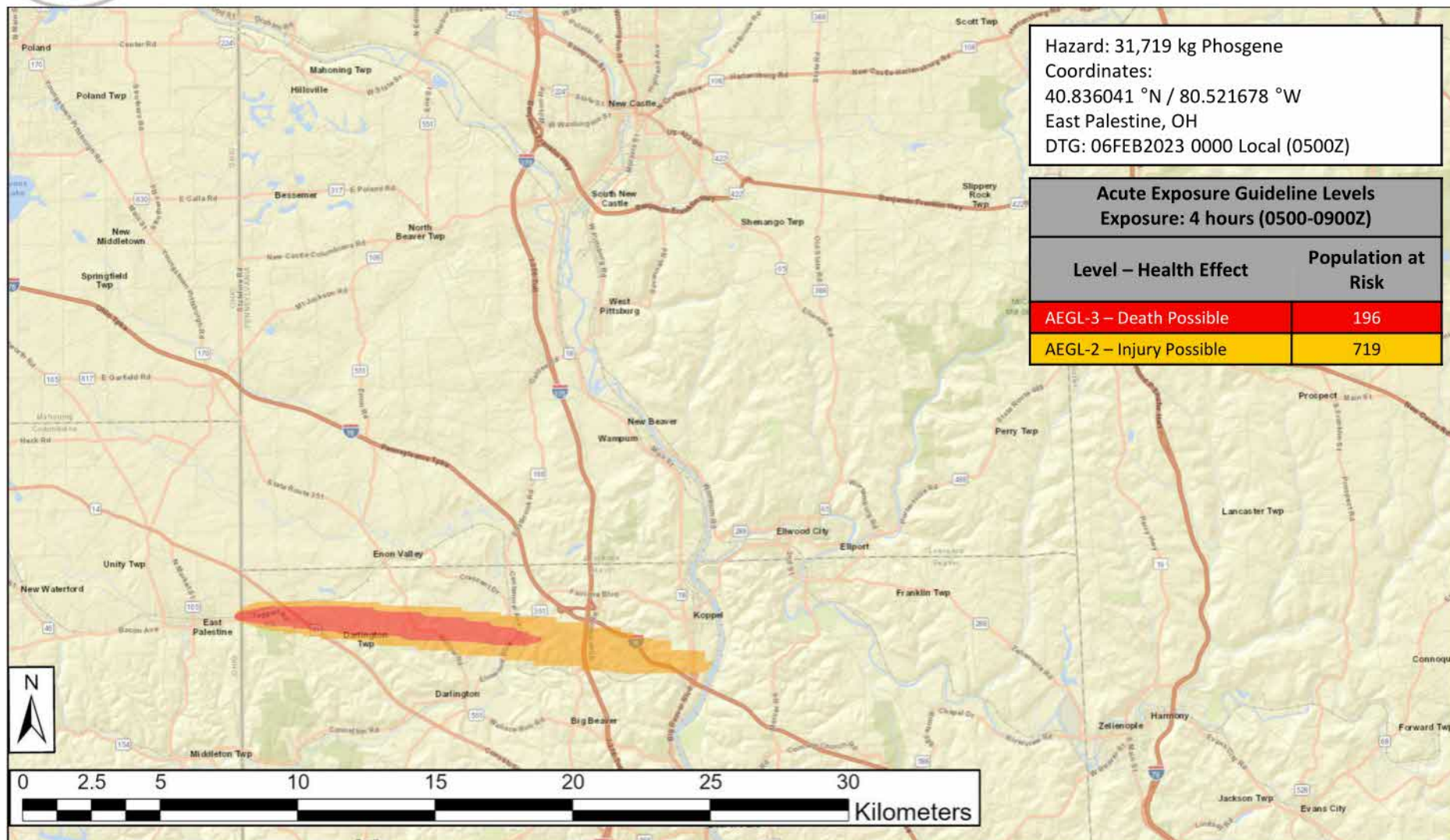
Hydrogen Chloride – 0000 Local



~~CUI~~



Phosgene – 0000 Local





Soot– Surface Dosage- 0000 Local

Hazard: Railcars on fire
Coordinates:
40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0000 Local (0500Z)

Soot Surface Dosage
Exposure: 2 hours (0500Z – 0700Z)

Hazardous

Very Unhealthy

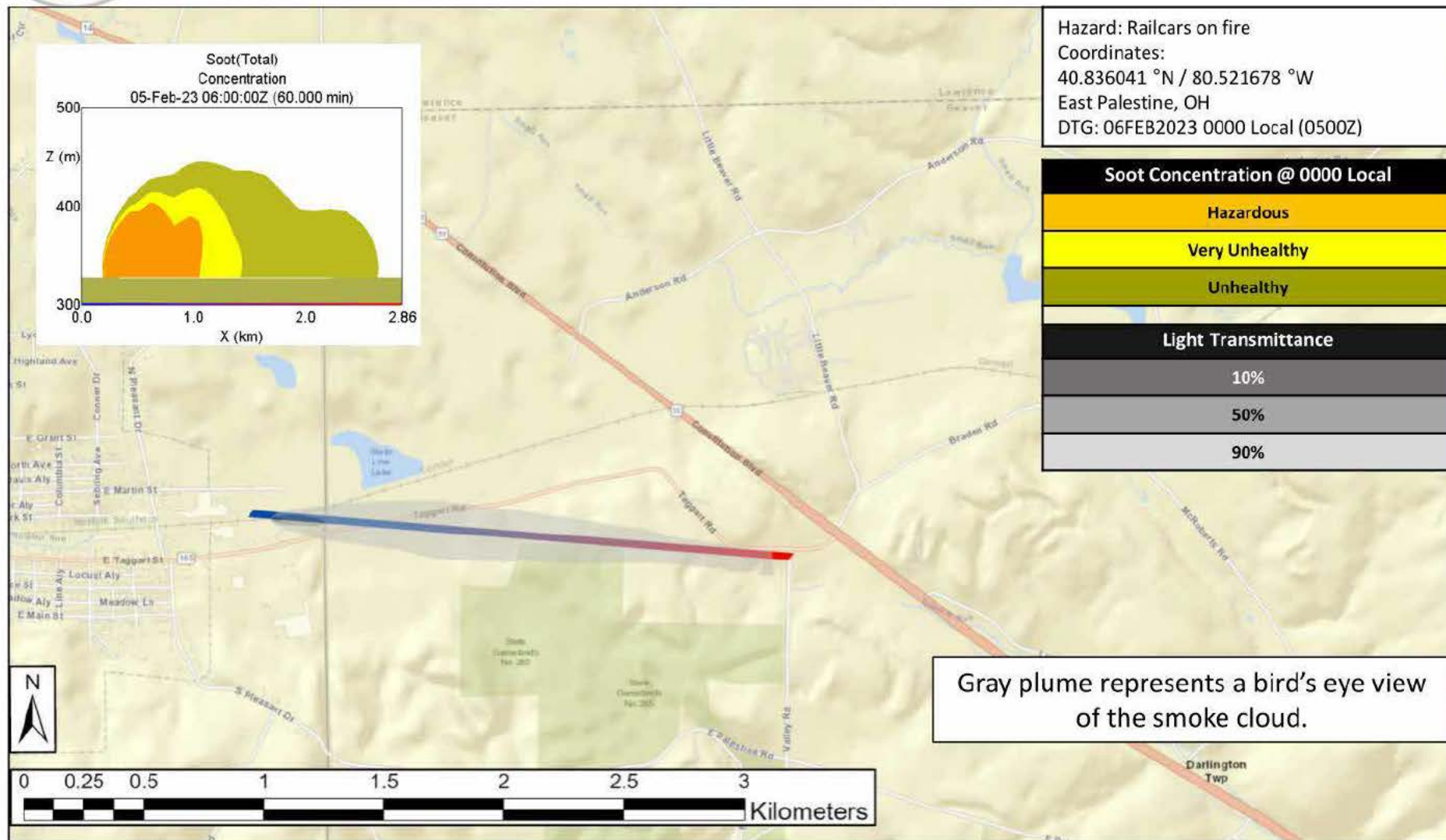
Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0





Soot – Vertical Profile-0000 Local





Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

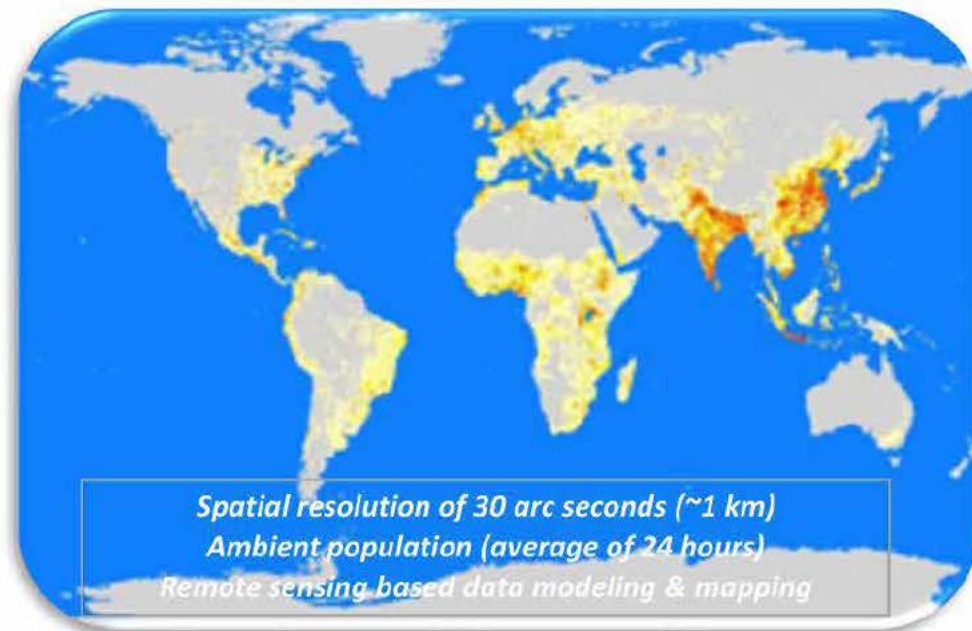


Population Data

CUI

RFI 22-0081dU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 03:23:57 +0000
To: (b) (6)
Subject: RFI_23_0081E IMAAC Product Draft
Attachments: RFI_23-0081eU_IMAAC_rev0.pdf, RFI_23-0081eU_IMAAC_rev0.pptx, smime.p7s

(b) (6)

I've attached the PPT and PDF versions of the draft here.

Respectfully,

JB

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

~~CUI~~

Date: 06FEB2023 0330Z

Version: Revision E

Changes: Updated Time



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081eU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 406 and 70 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 159 and 22 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 3 and 6 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

0600 Local (1100Z)

06FEB2023



~~CUI~~

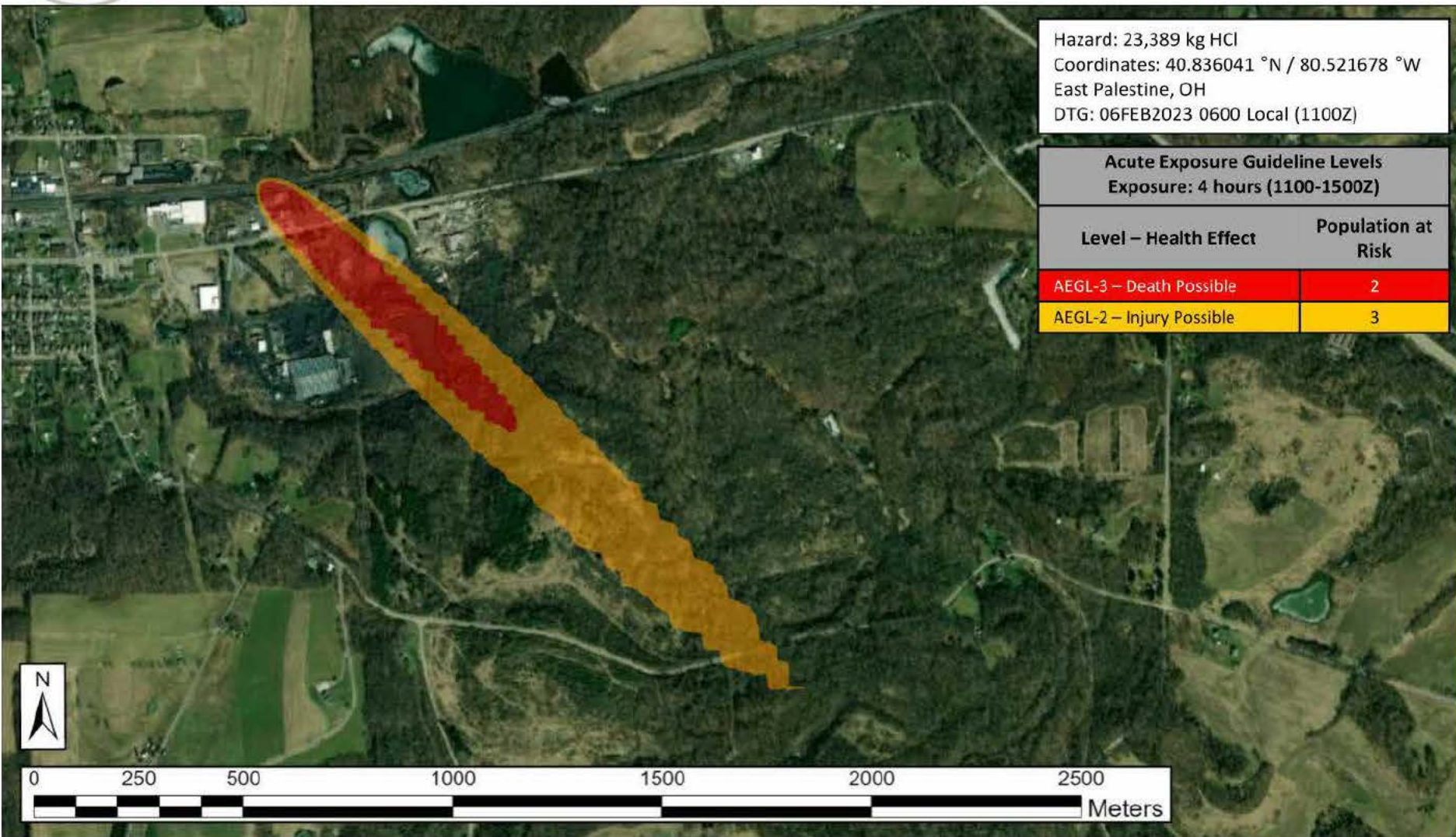
RFI 22-0081eU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	3



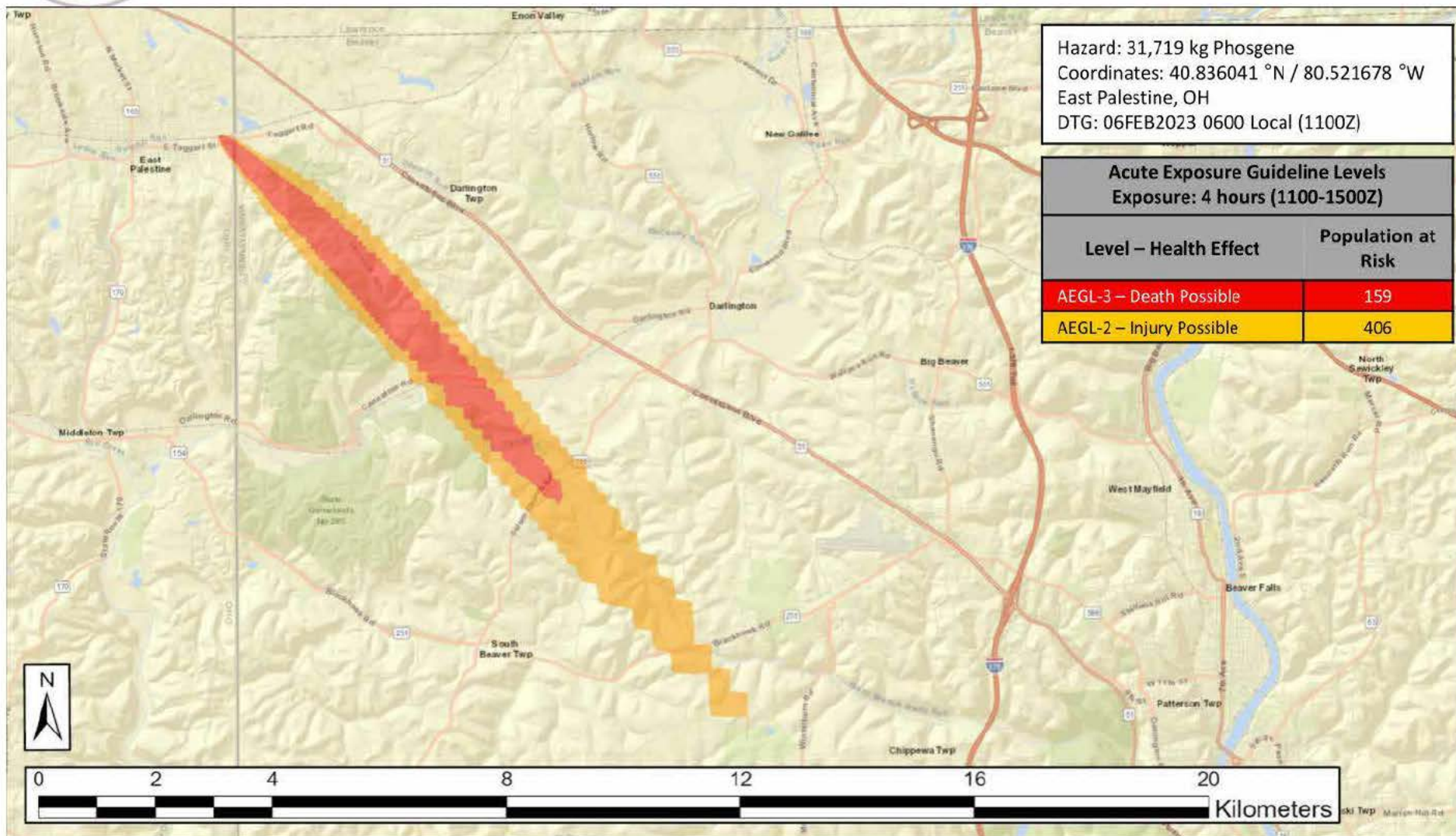
~~CUI~~



CUI

RFI 22-0081eU

Phosgene – 0600 Local



CUI



~~CUI~~

RFI 22-0081eU

Soot– Surface Dosage – 0600 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0600 Local (1100Z)

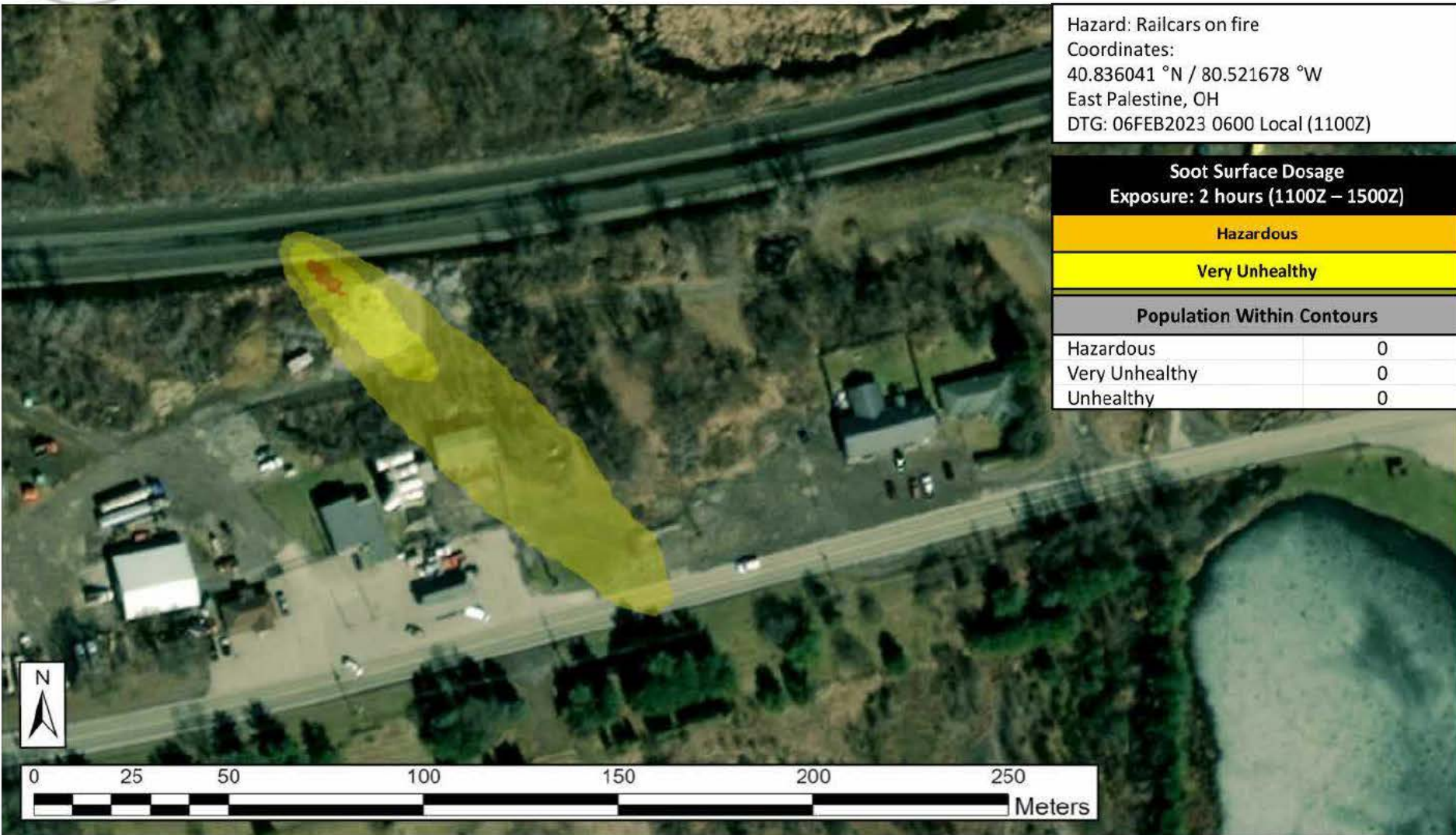
Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

Population Within Contours

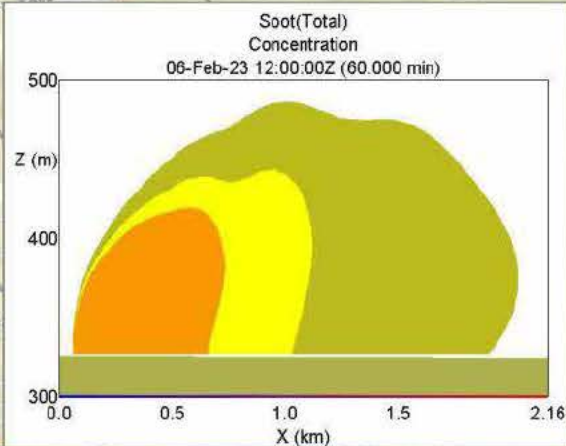
Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~



Soot – Vertical Profile – 0600 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Soot Concentration @ 0600 Local

Hazardous

Very Unhealthy

Unhealthy

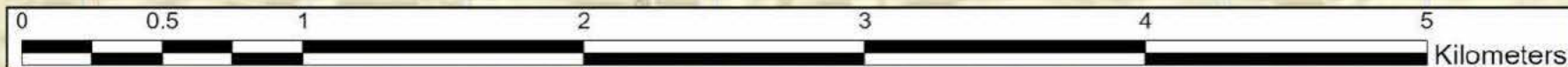
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.



1200 Local (1700Z)

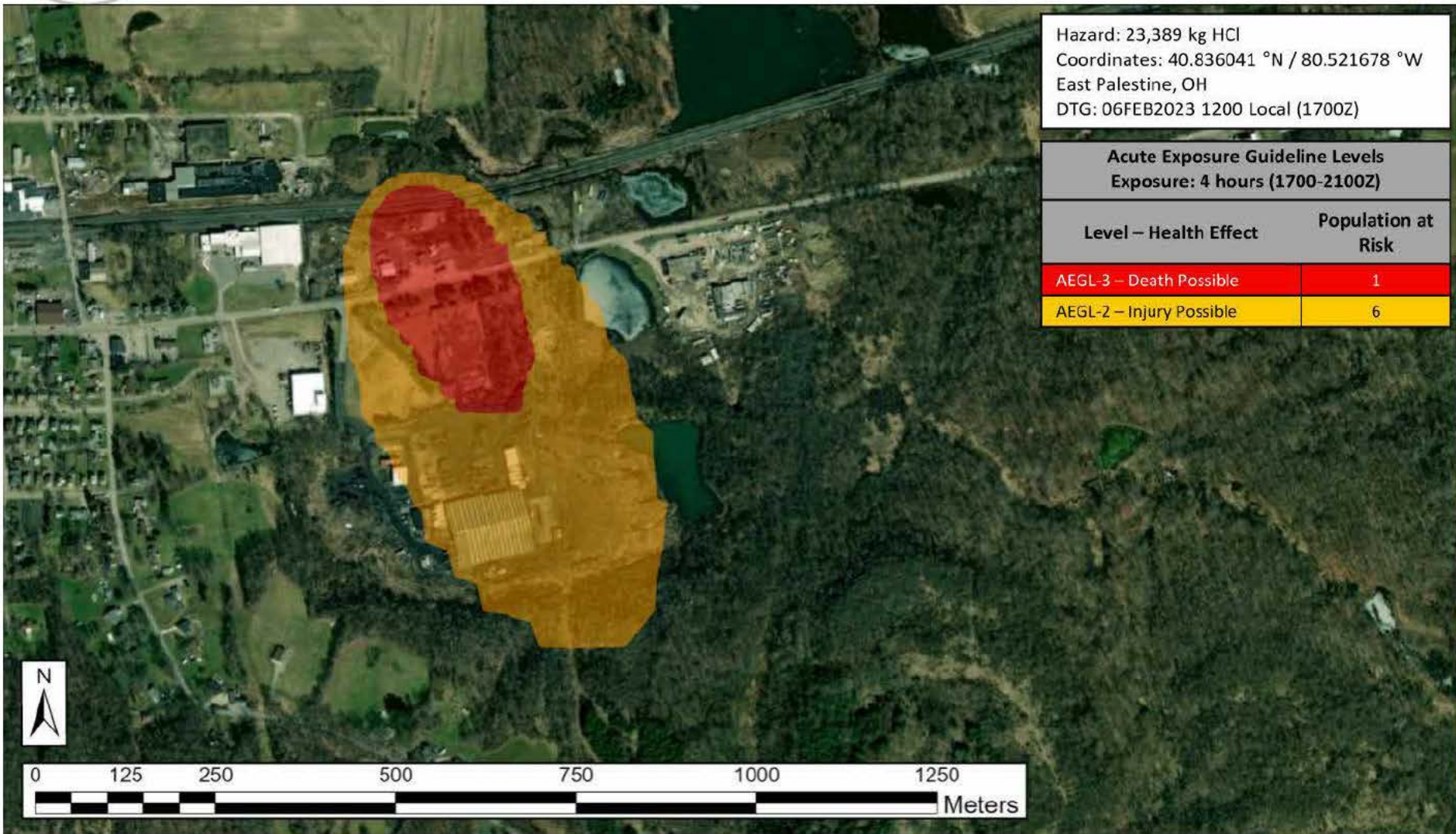
06FEB2023



~~CUI~~

RFI 22-0081eU

Hydrogen Chloride – 1200 Local



~~CUI~~



~~CUI~~

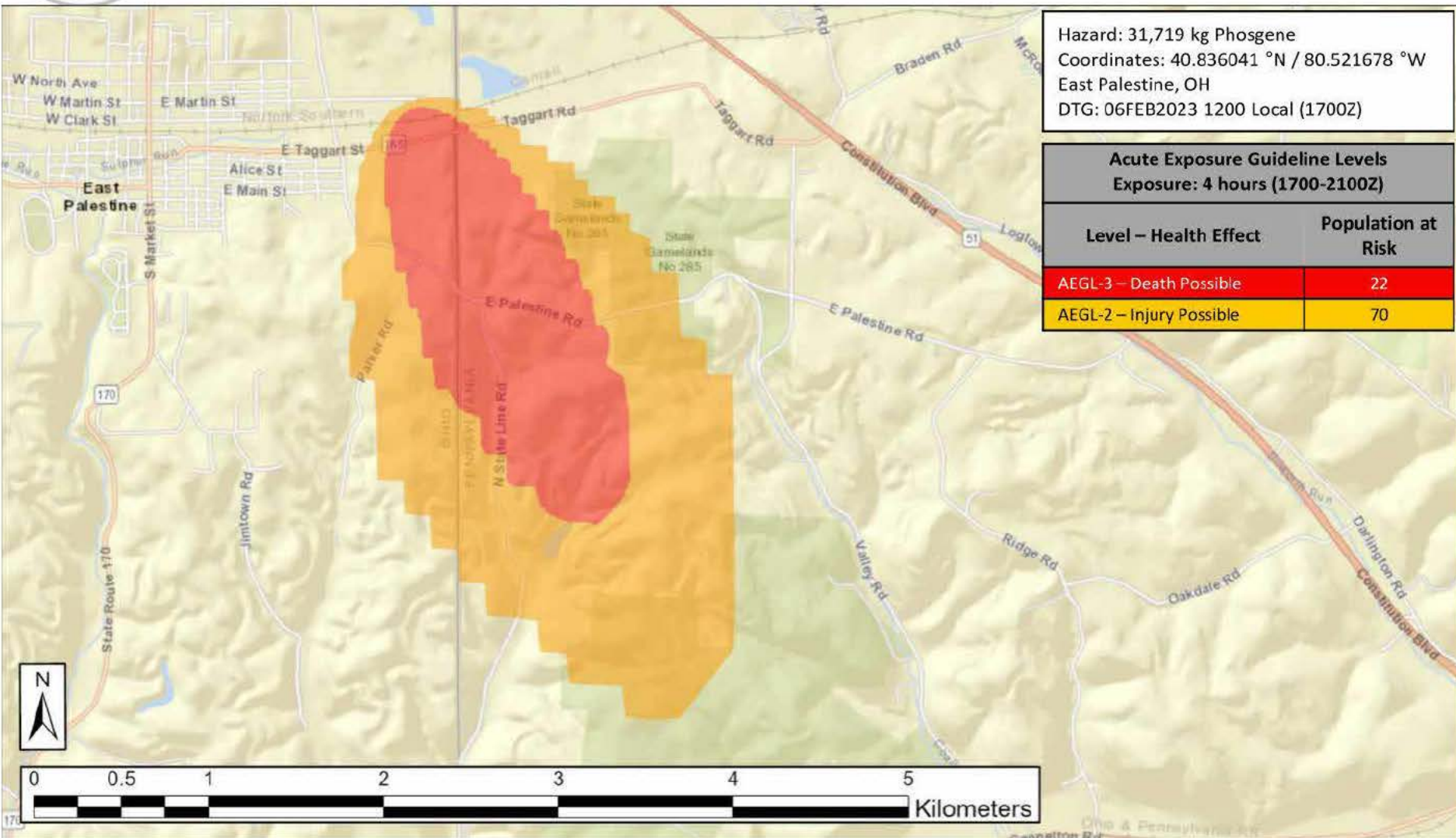
RFI 22-0081eU

Phosgene – 1200 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	22
AEGL-2 – Injury Possible	70



~~CUI~~



~~CUI~~

RFI 22-0081eU

Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

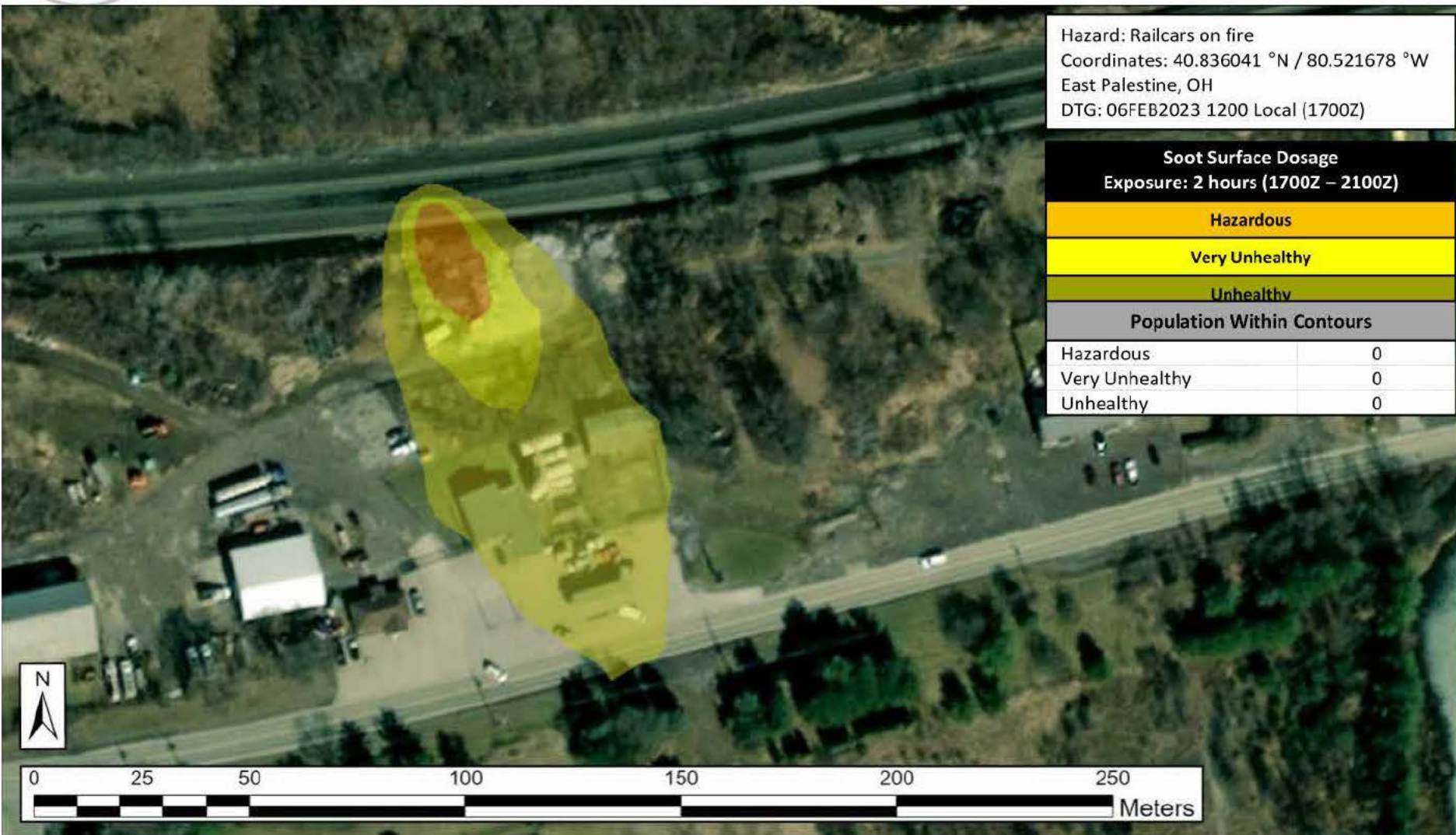
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

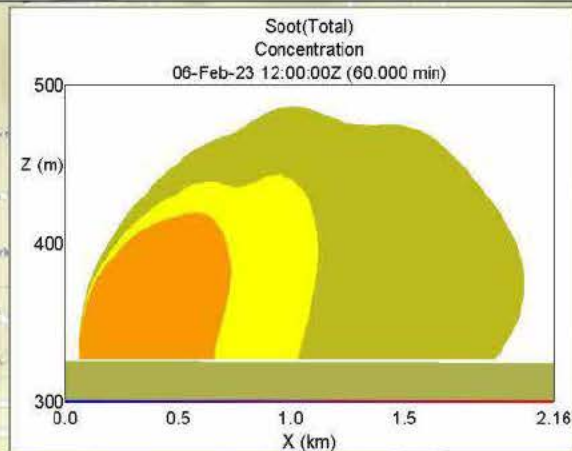
Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~



Soot – Vertical Profile – 1200 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Concentration @ 1200 Local

Hazardous

Very Unhealthy

Unhealthy

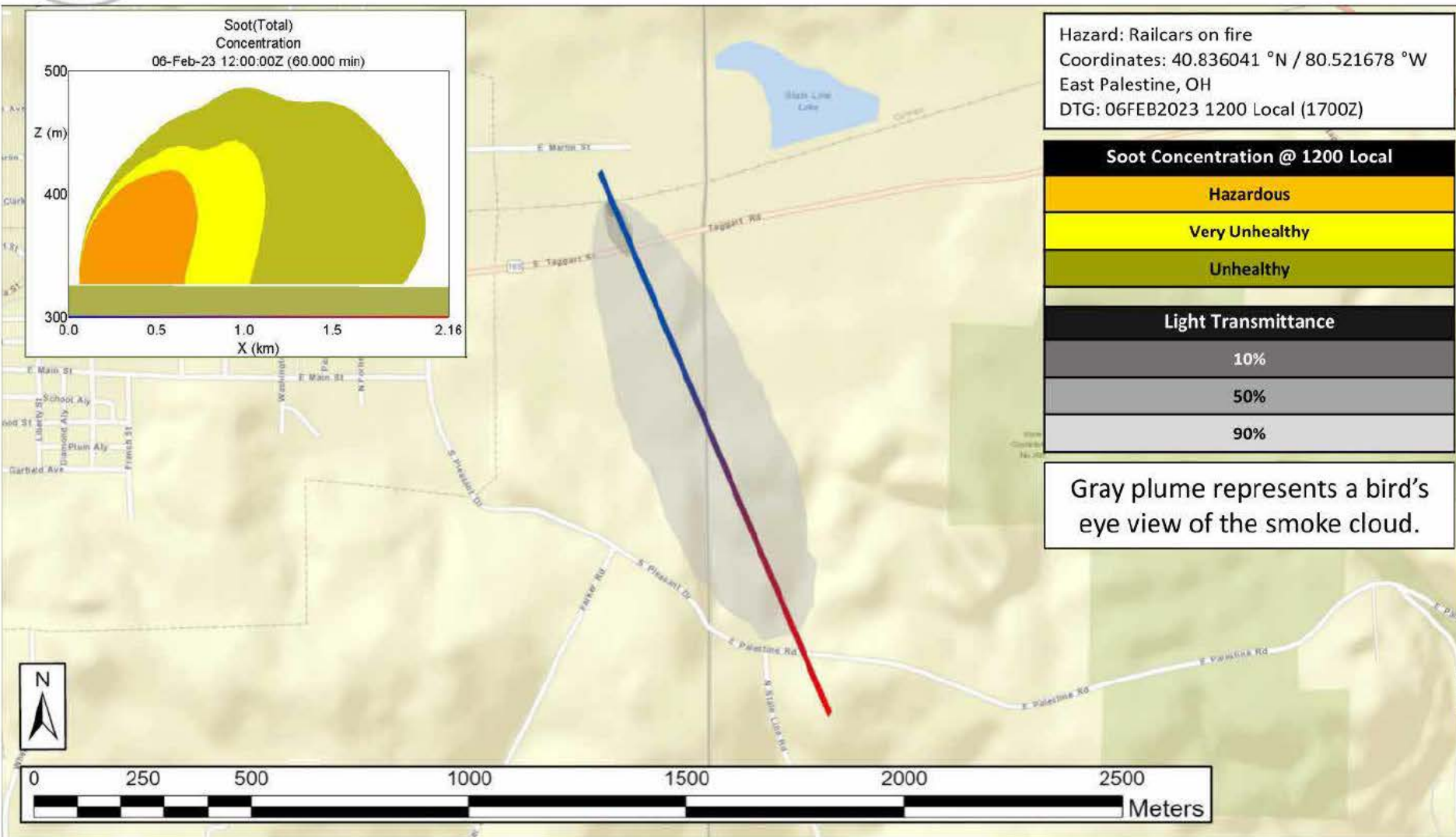
Light Transmittance

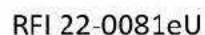
10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.





INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

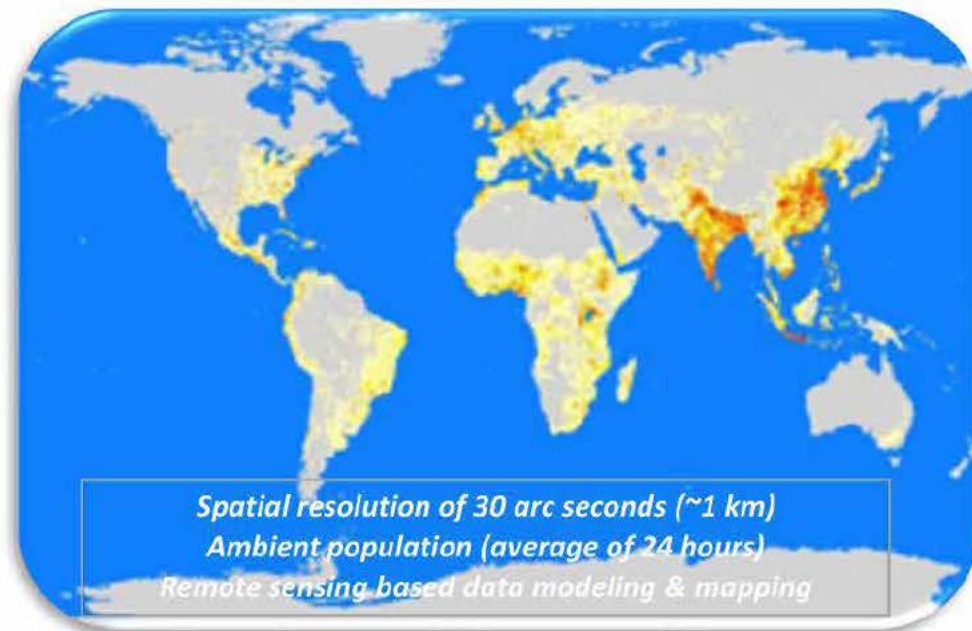


Population Data

~~CUI~~

RFI 22-0081eU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

~~CUI~~

Date: 06FEB2023 0330Z

Version: Revision E

Changes: Updated Time



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081eU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 406 and 70 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 159 and 22 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 3 and 6 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

0600 Local (1100Z)

06FEB2023



~~CUI~~

RFI 22-0081eU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	3



0 250 500 1000 1500 2000 2500 Meters

~~CUI~~



CUI

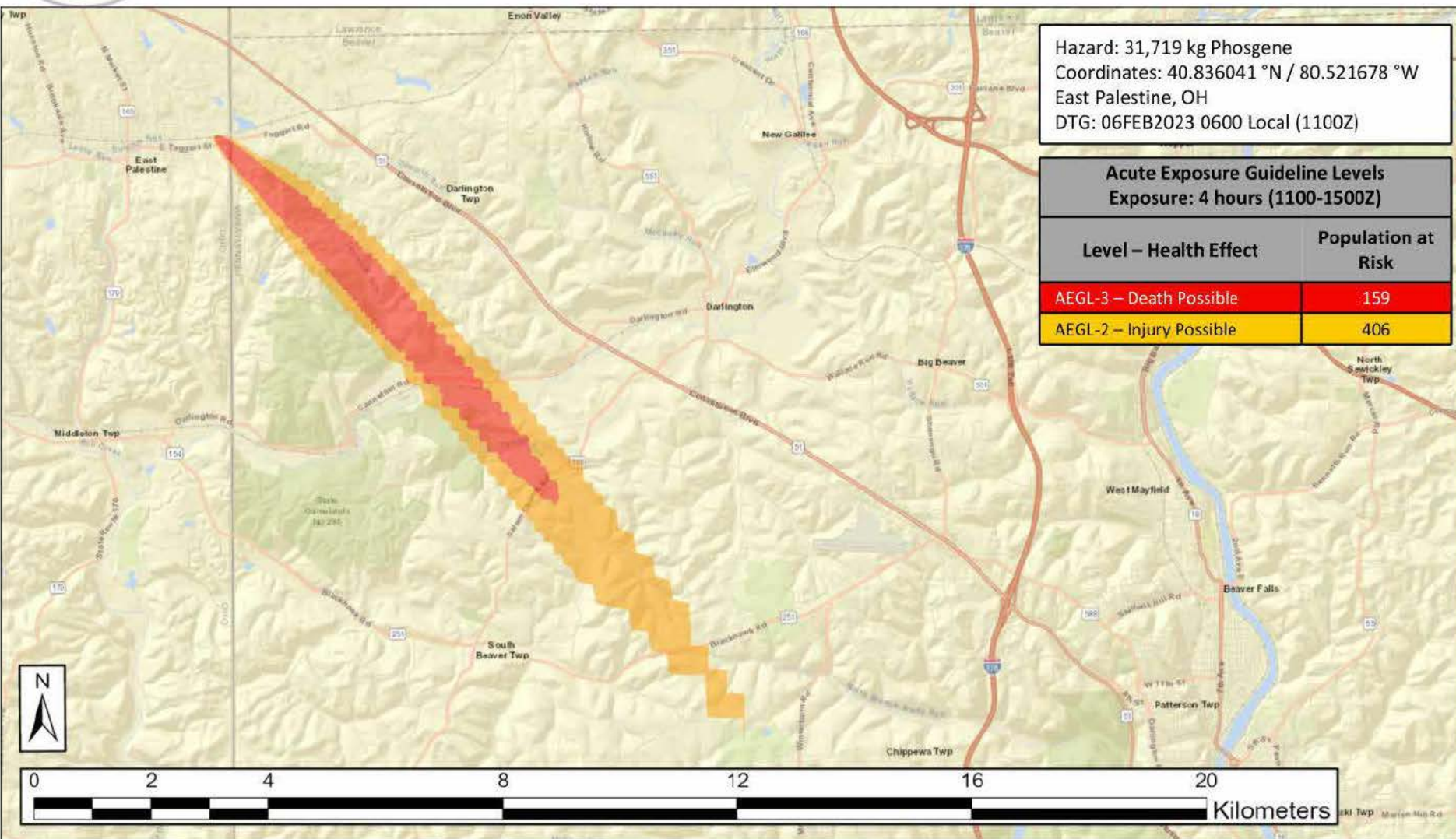
RFI 22-0081eU

Phosgene – 0600 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	159
AEGL-2 – Injury Possible	406



CUI



Soot– Surface Dosage – 0600 Local



Hazard: Railcars on fire
Coordinates:
40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

Population Within Contours

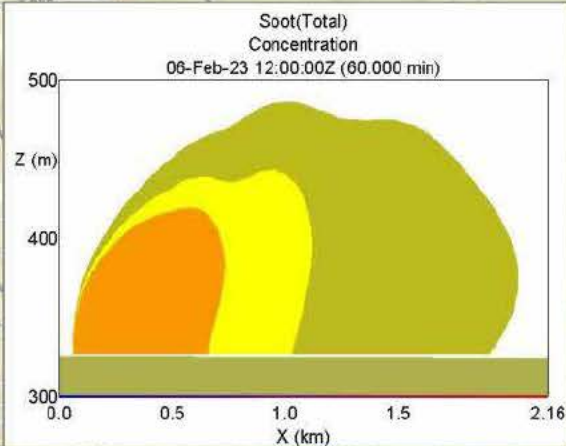
Hazardous	0
Very Unhealthy	0
Unhealthy	0



CUI

RFI 22-0081eU

Soot – Vertical Profile – 0600 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Soot Concentration @ 0600 Local

Hazardous

Very Unhealthy

Unhealthy

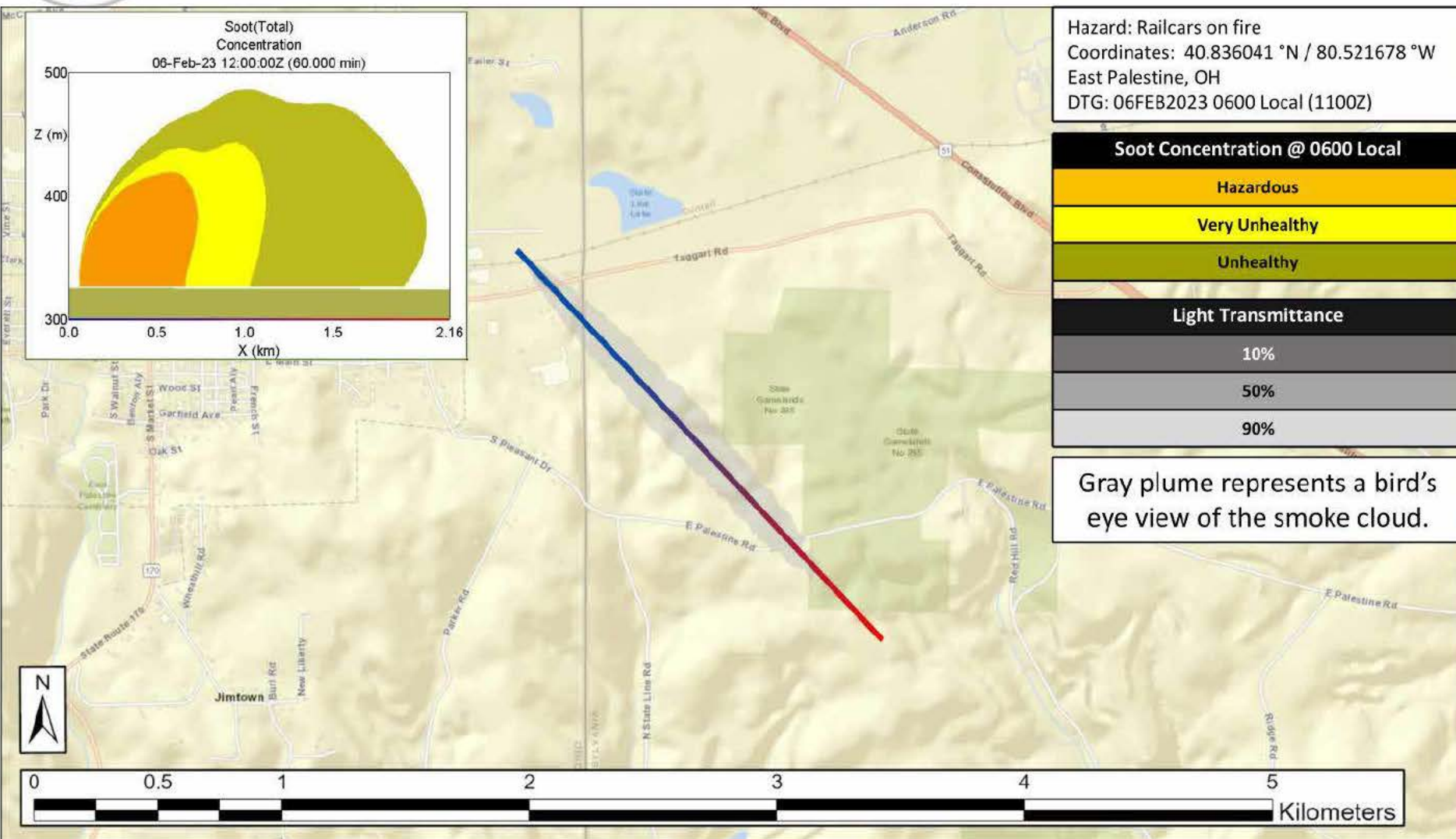
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.



CUI

1200 Local (1700Z)

06FEB2023



~~CUI~~

RFI 22-0081eU

Hydrogen Chloride – 1200 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	6



~~CUI~~



~~CUI~~

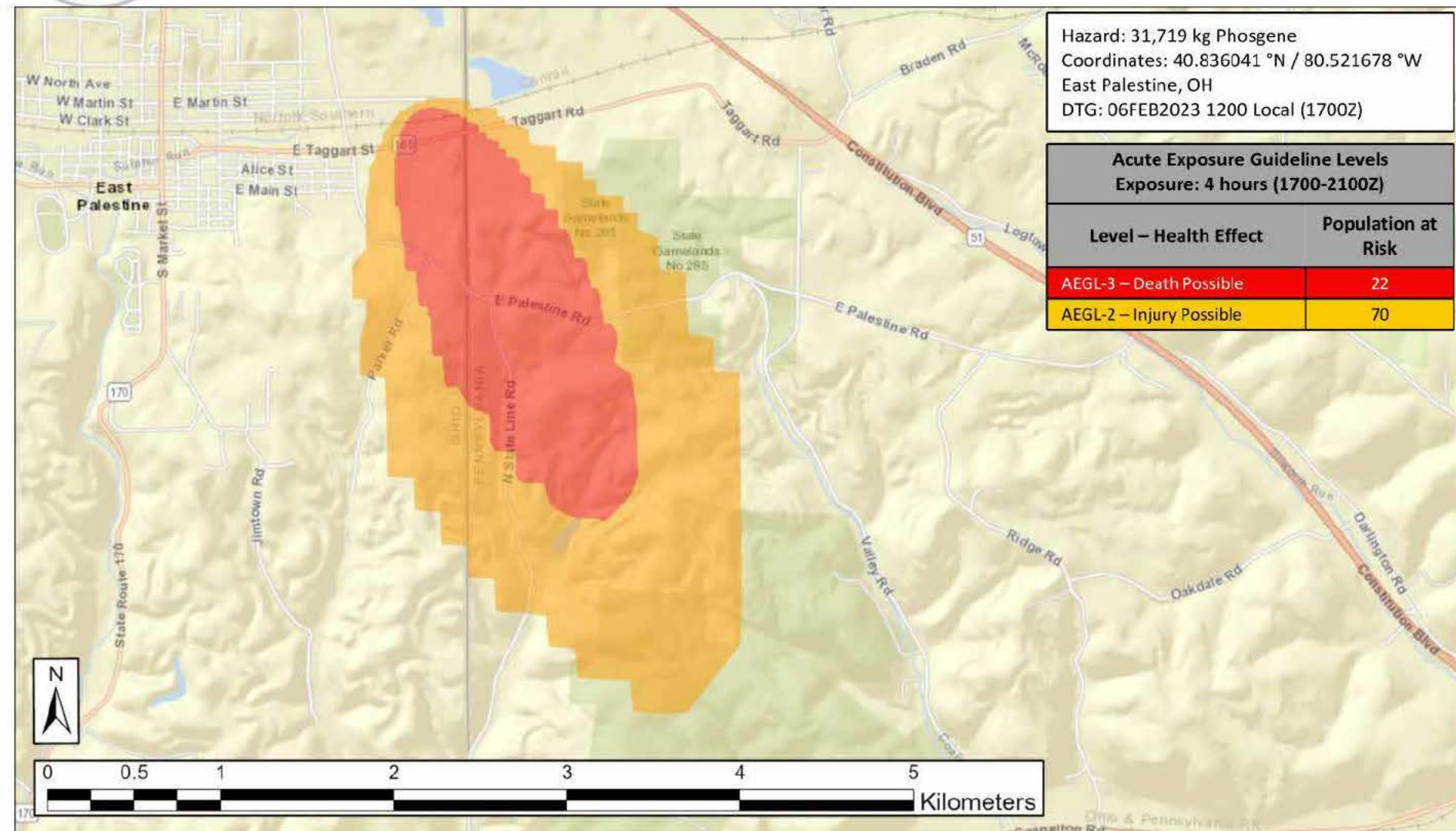
RFI 22-0081eU

Phosgene – 1200 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	22
AEGL-2 – Injury Possible	70



~~CUI~~



~~CUI~~

RFI 22-0081eU

Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

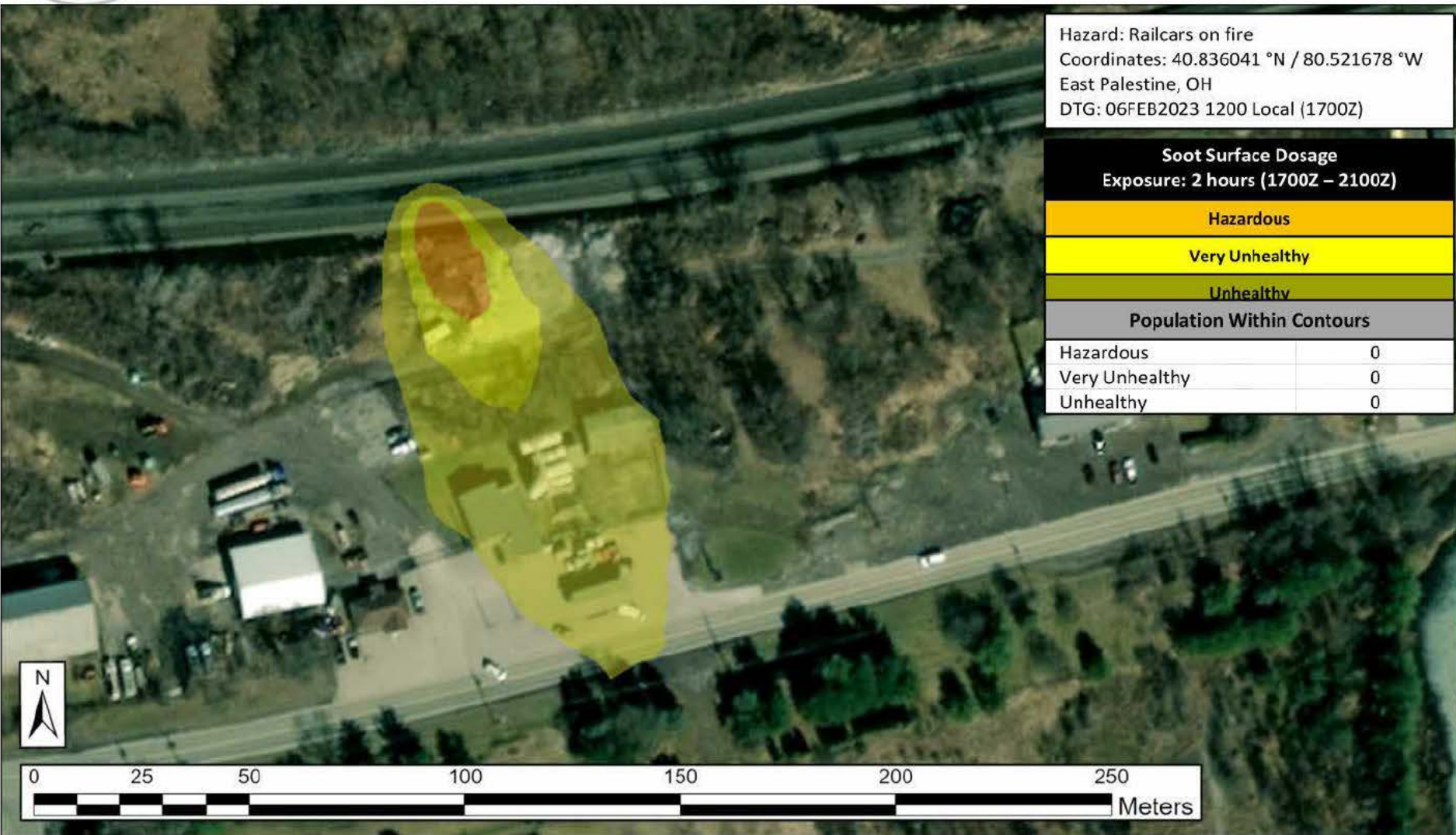
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



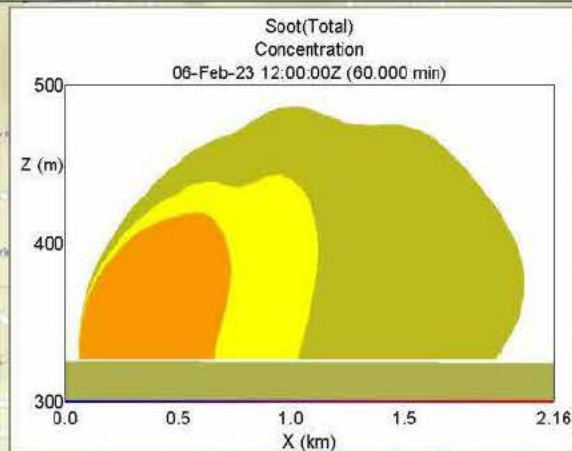
~~CUI~~



CUI

RFI 22-0081eU

Soot – Vertical Profile – 1200 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Concentration @ 1200 Local

Hazardous

Very Unhealthy

Unhealthy

Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.



CUI



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

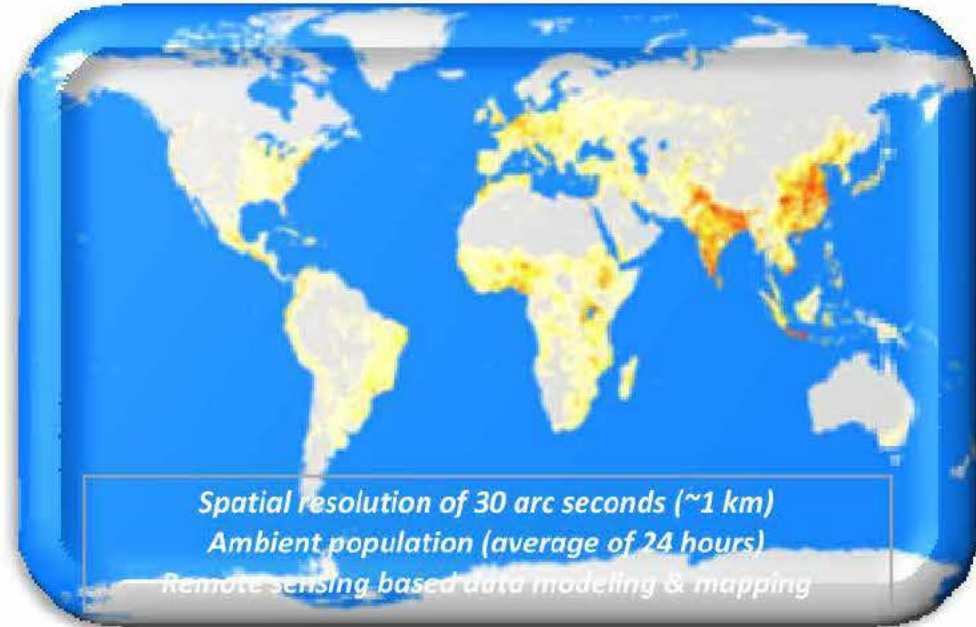


Population Data

~~CUI~~

RFI 22-0081eU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

From: (b) (6)
Sent: Mon, 6 Feb 2023 10:47:46 +0000
To: (b) (6)
Subject: RFI_23_0081U_IMAAC – revF Update
Attachments: RFI_23-0081fU_IMAAC_rev0.pptx, smime.p7s

(b) (6)

See the latest draft update attached.

Respectfully,

(b) (6)
DTRA Reachback Shift Lead - ARA Meteorologist
703-767-3445

(b) (6)

~~CUI~~

Date: 06FEB2023 1045Z

Version: Revision F

Changes: Added BLEVE Scenario



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081fU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 163 and 119 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 29 and 24 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 4 and 5 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals). • BLEVE something....



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

0600 Local (1100Z)

06FEB2023



~~CUI~~

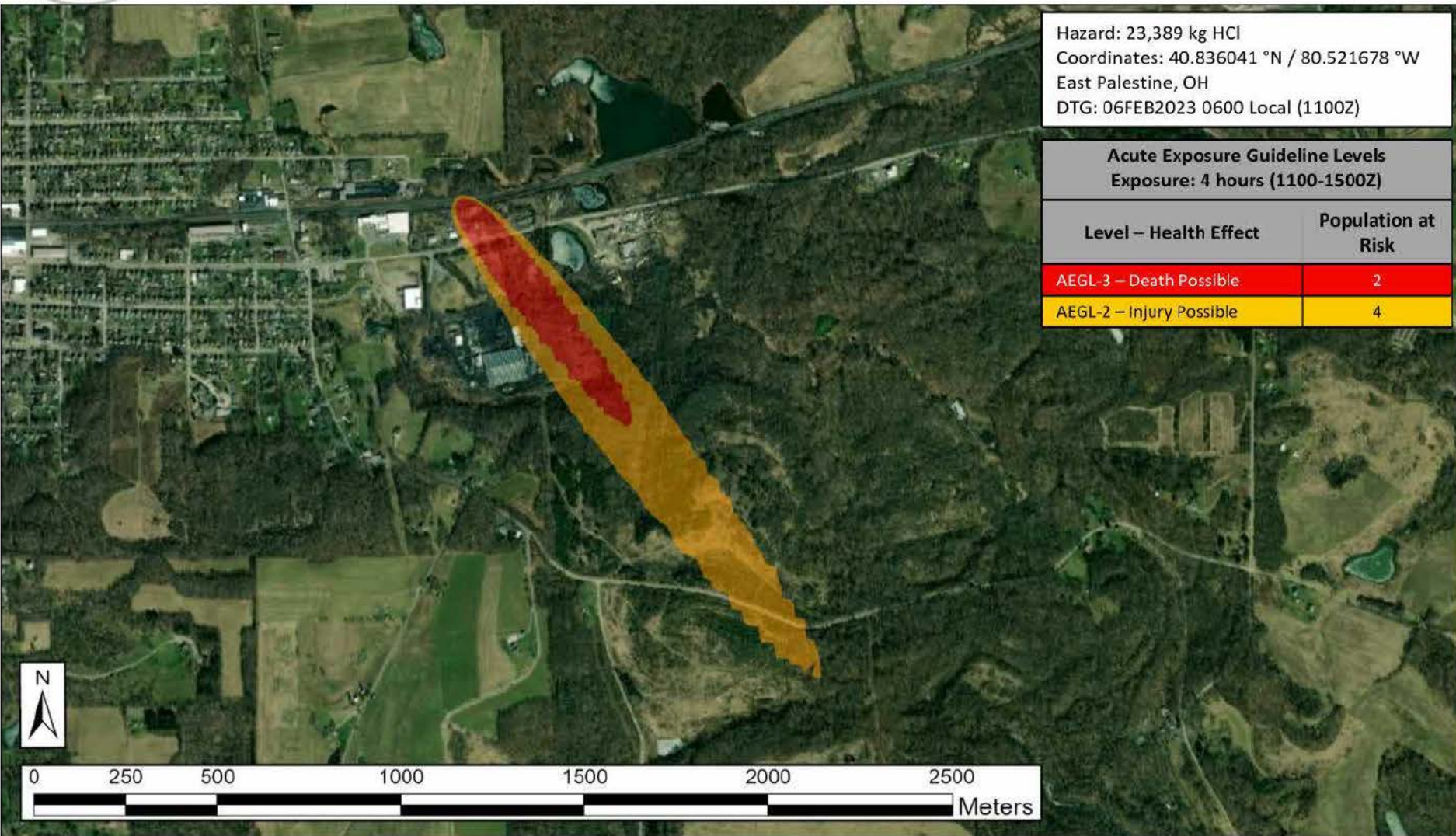
RFI 22-0081fU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	4



~~CUI~~



~~CUI~~

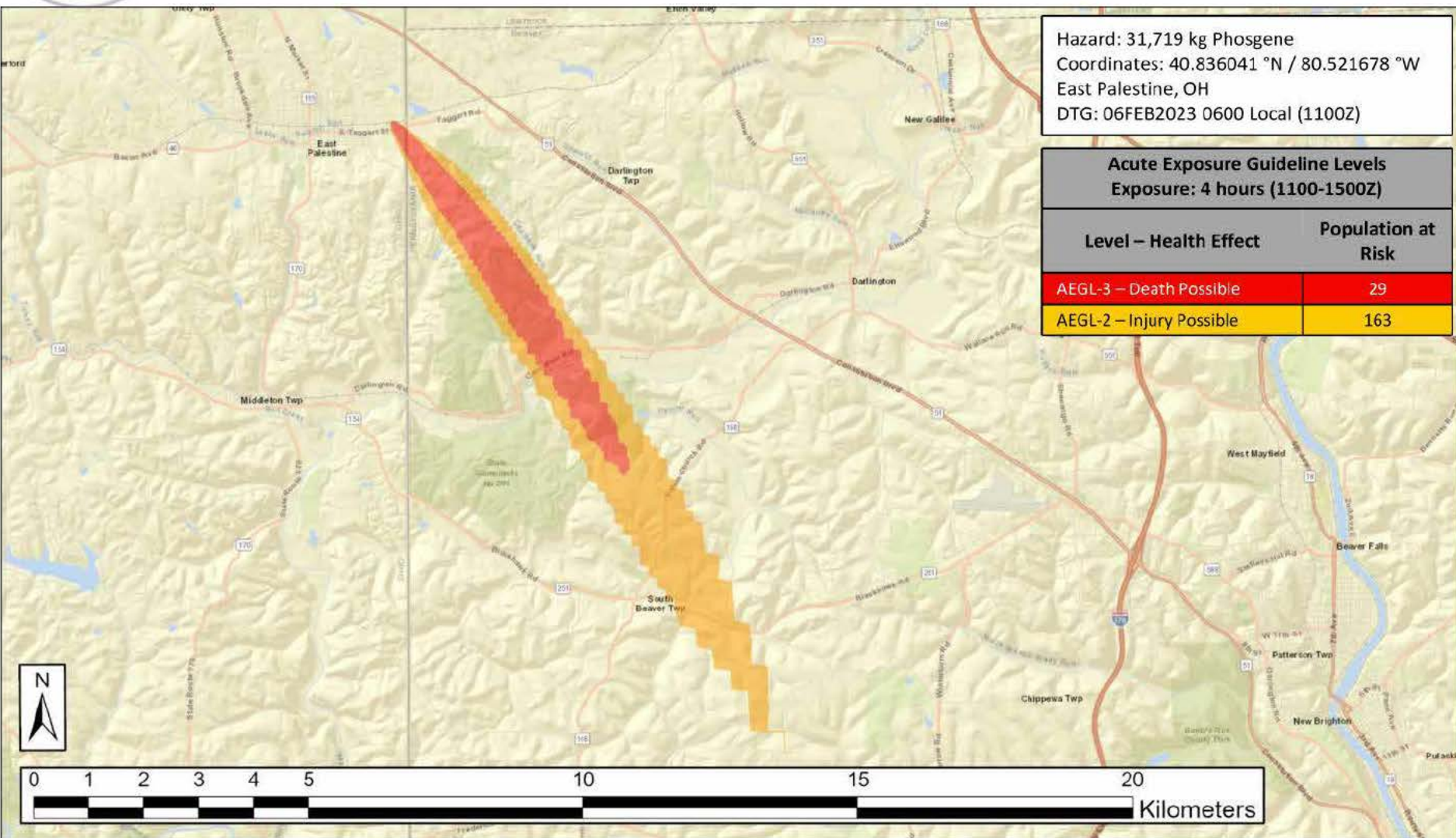
RFI 22-0081fU

Phosgene – 0600 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	29
AEGL-2 – Injury Possible	163



~~CUI~~



~~CUI~~

RFI 22-0081fU

Soot– Surface Dosage – 0600 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0600 Local (1100Z)

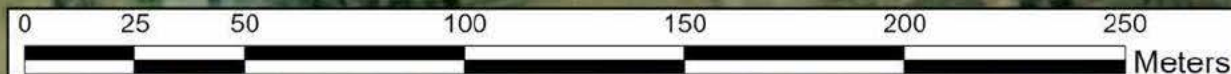
Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

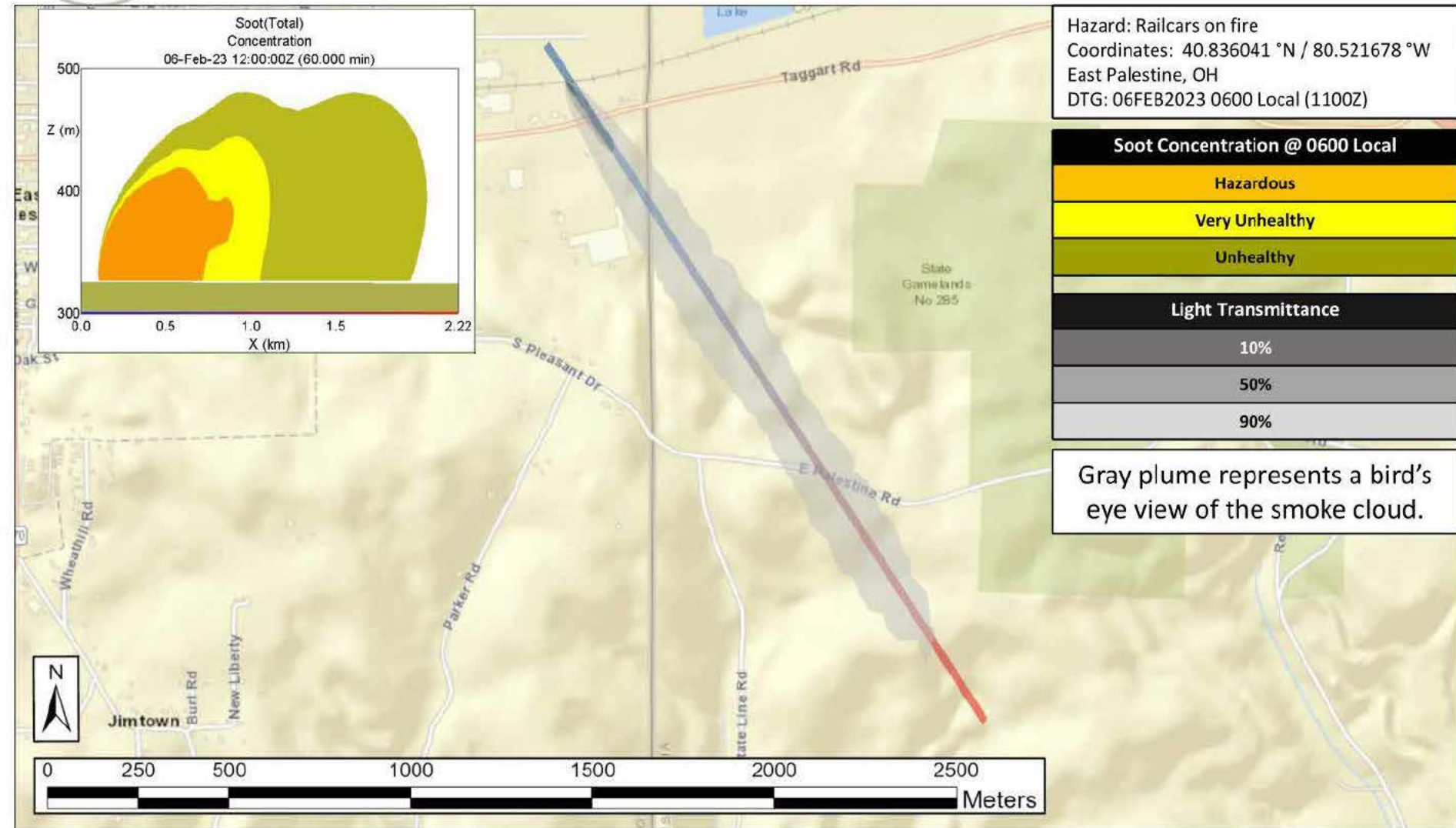
Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~

Soot – Vertical Profile – 0600 Local



1200 Local (1700Z)

06FEB2023



~~CUI~~

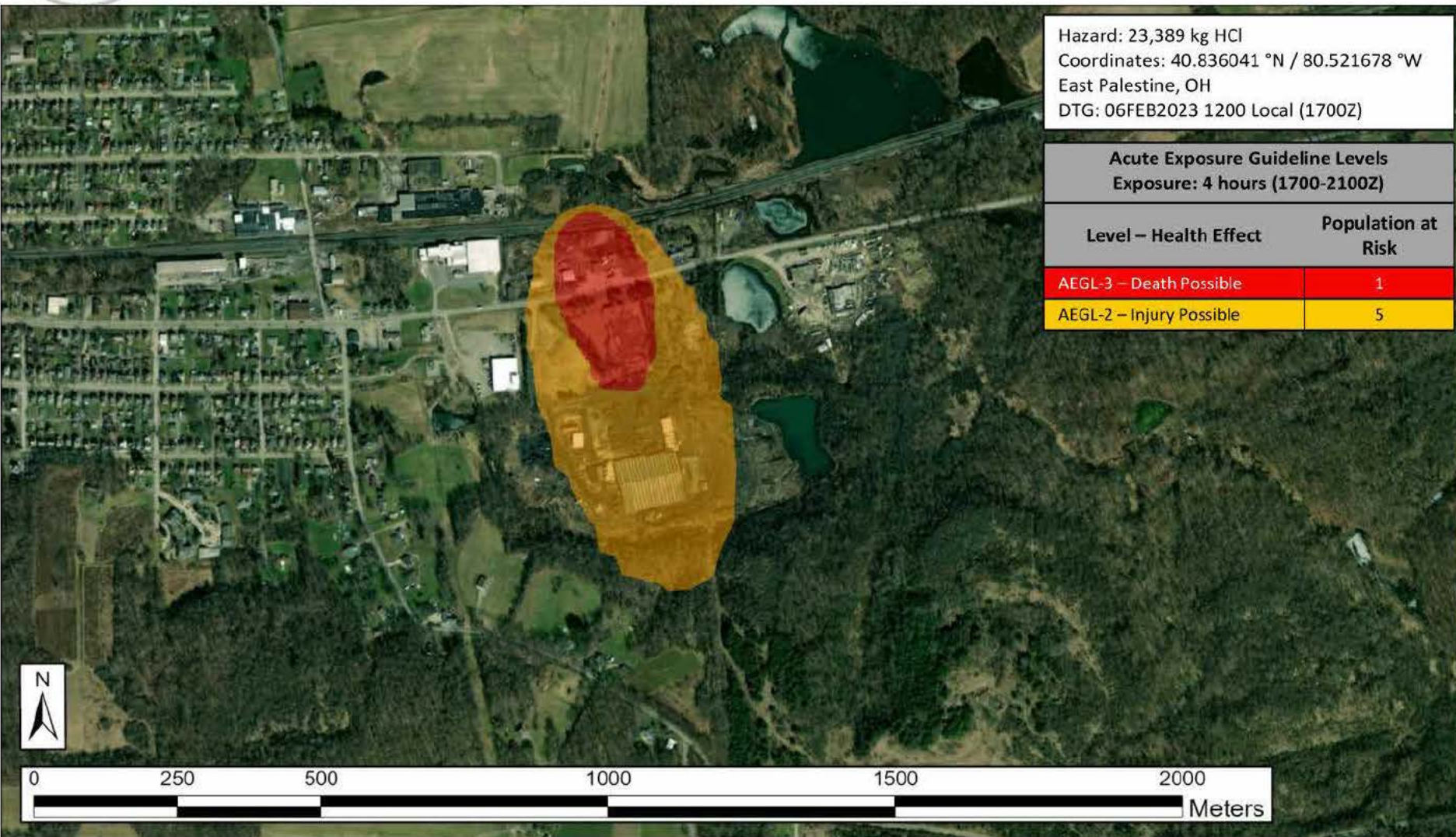
RFI 22-0081fu

Hydrogen Chloride – 1200 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	5



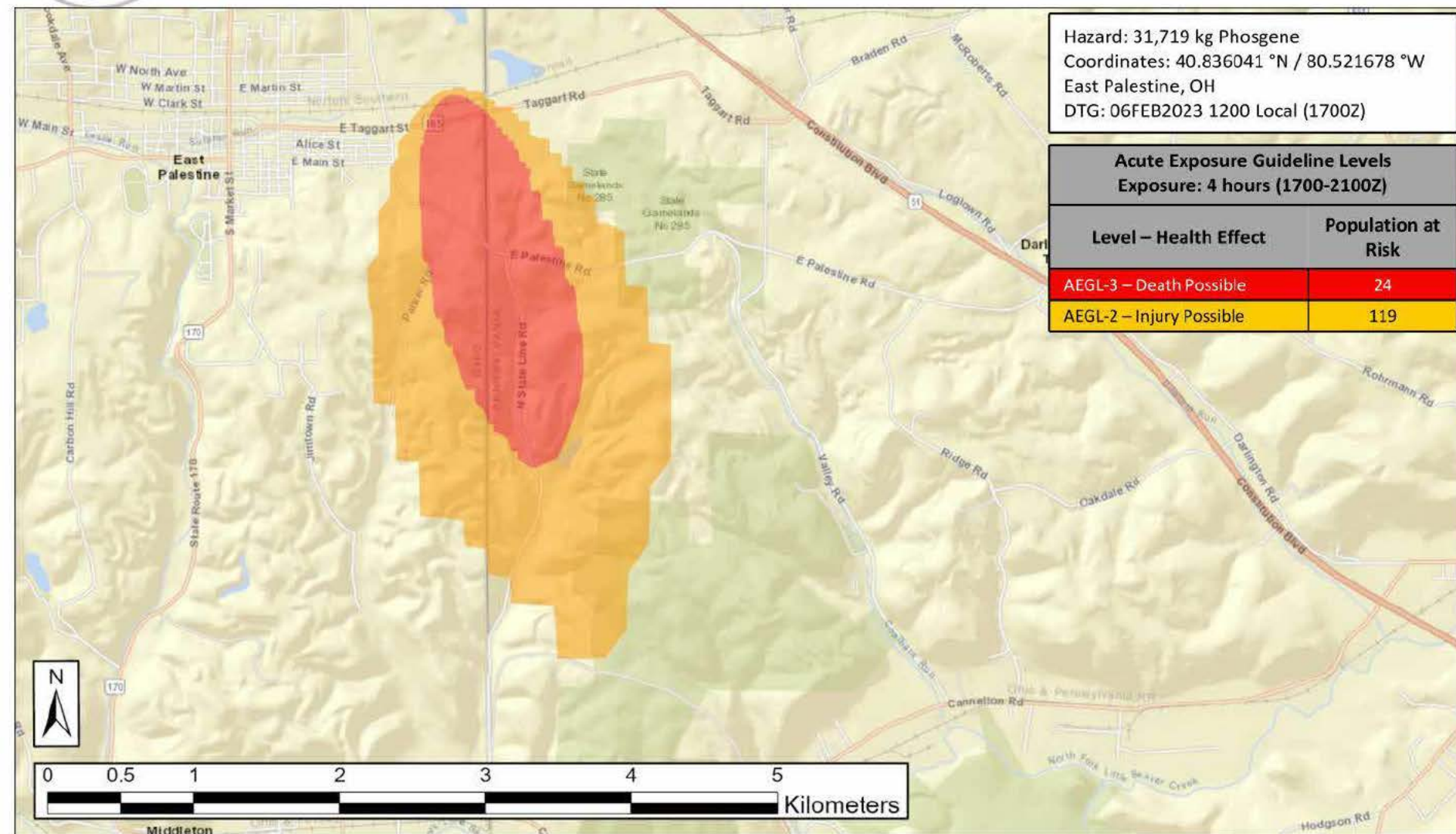
~~CUI~~



CUI

RFI 22-0081fU

Phosgene – 1200 Local



CUI



~~CUI~~

RFI 22-0081fU

Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

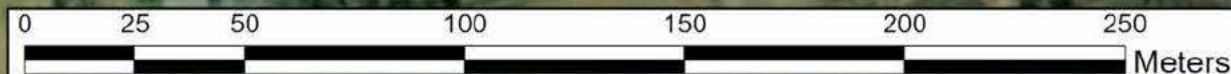
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



BLEVE Scenario

06FEB2023



~~CUI~~

RFI 22-0081fU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Liquid Mass: 23,389 kg
Lofted Mass: 23,389 kg
Estimated NEW: 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



~~CUI~~



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, 1985; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, 1977

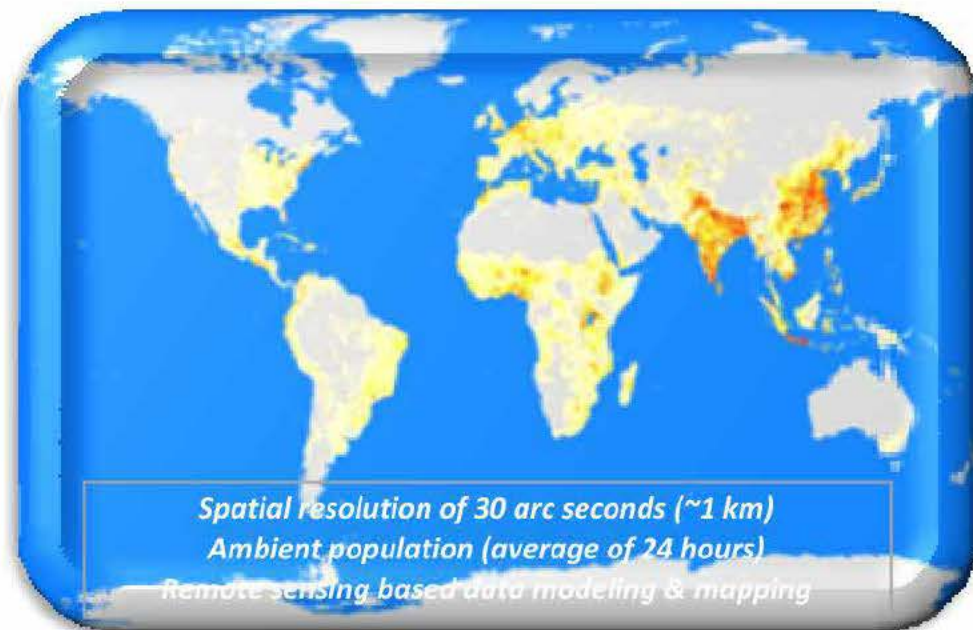


Population Data

CUI

RFI 22-0081fu

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 11:05:50 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated Product Attached
Attachments: RFI_23-0081fU_IMAAC.pdf, smime.p7s

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for a [incident type, e.g., chemical spill] in [location: City, State]. The product is also available on the IMAAC Portal page (Caution-<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

IMAAC Technical Operations Hub

703-767-2003 (Operations Center) | 703-767-3445 (Technical Reachback)

imaac@fema.dhs.gov

CUI (with attachment)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081fU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O) • HCl BLEVE
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 163 and 119 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 29 and 24 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 4 and 5 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • BLEVE from vaporized HCl can produce minor injuries out to 226 meters in a worst case scenario.



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

0600 Local (1100Z)

06FEB2023



~~CUI~~

RFI 22-0081fU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

**Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)**

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	4



~~CUI~~



CUI

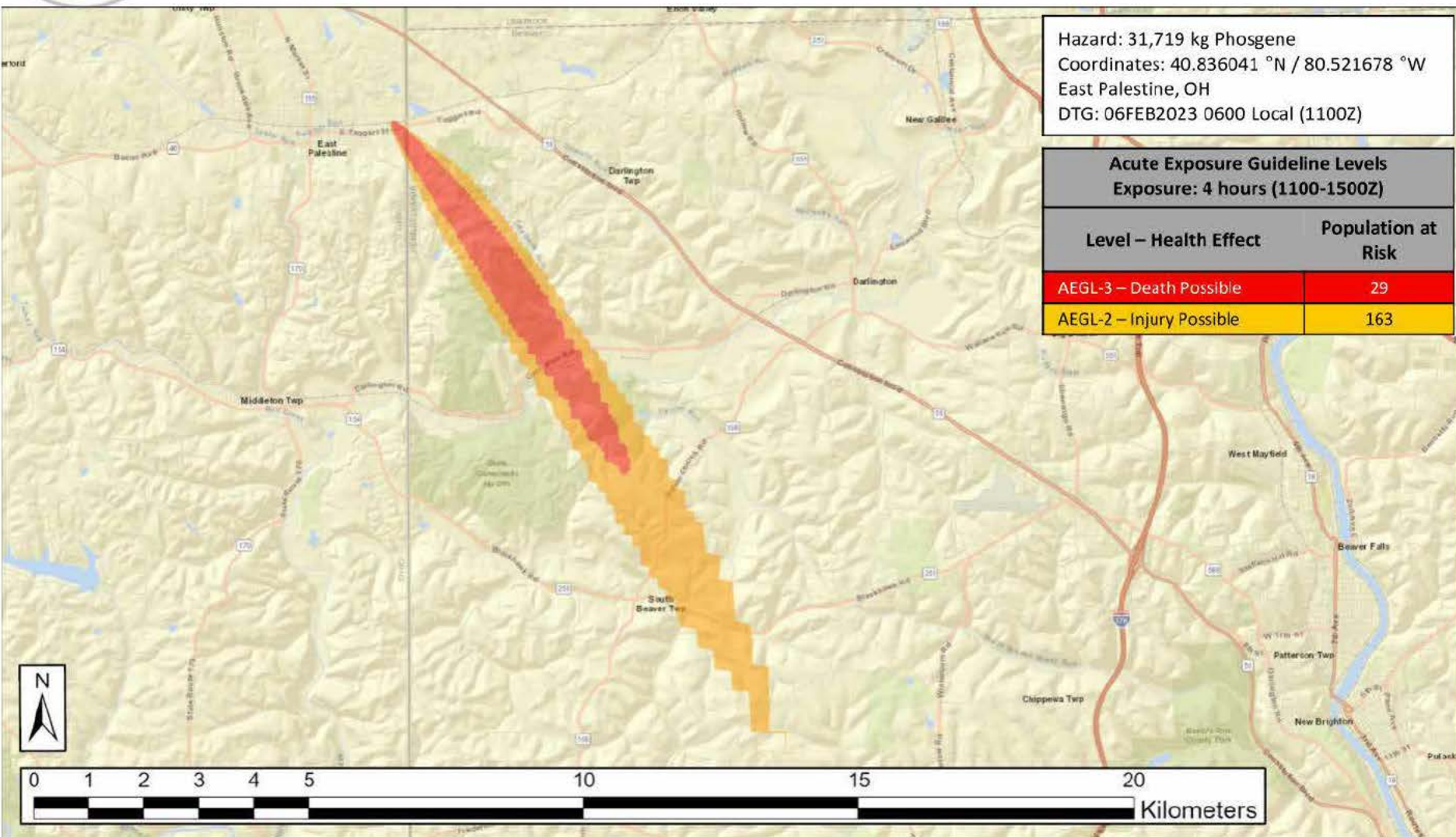
RFI 22-0081fU

Phosgene – 0600 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	29
AEGL-2 – Injury Possible	163



CUI



~~CUI~~

RFI 22-0081FU

Soot– Surface Dosage – 0600 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0600 Local (1100Z)

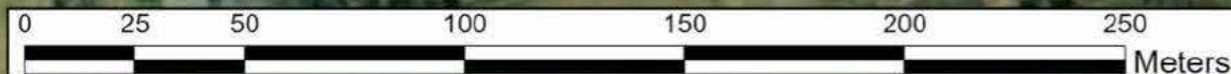
Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

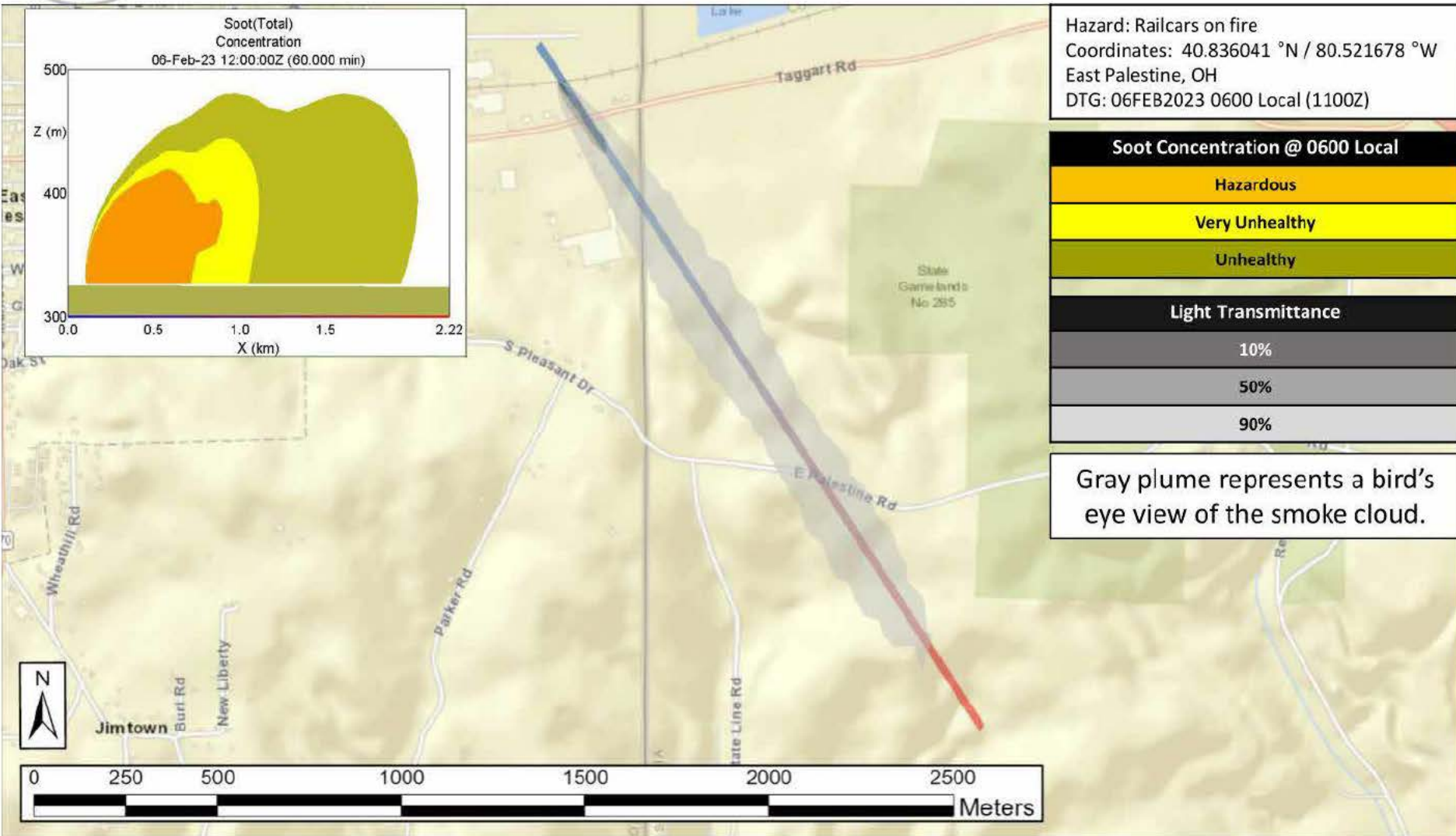
Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~

Soot – Vertical Profile – 0600 Local



1200 Local (1700Z)

06FEB2023



~~CUI~~

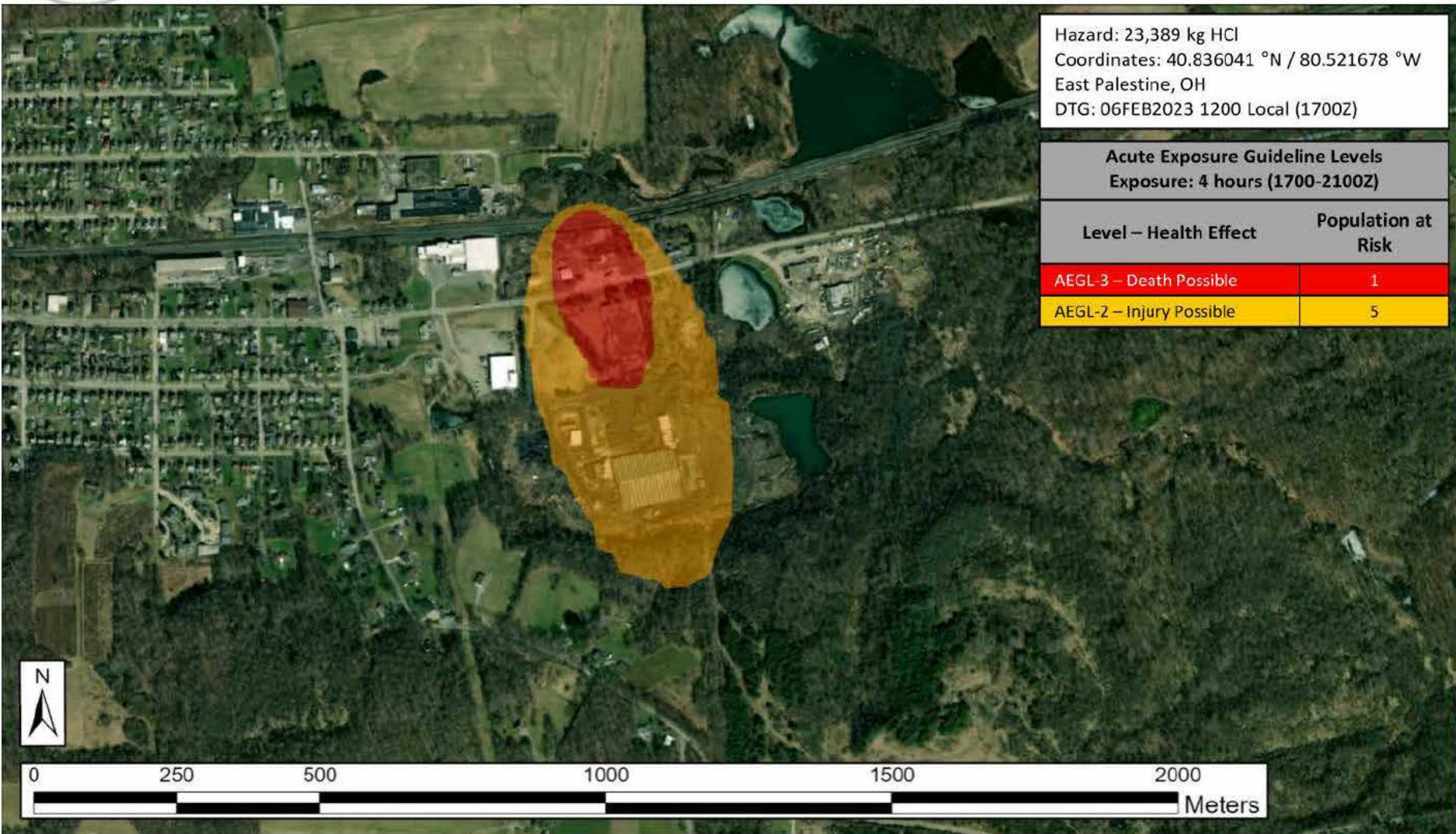
RFI 22-0081fU

Hydrogen Chloride – 1200 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	5



~~CUI~~

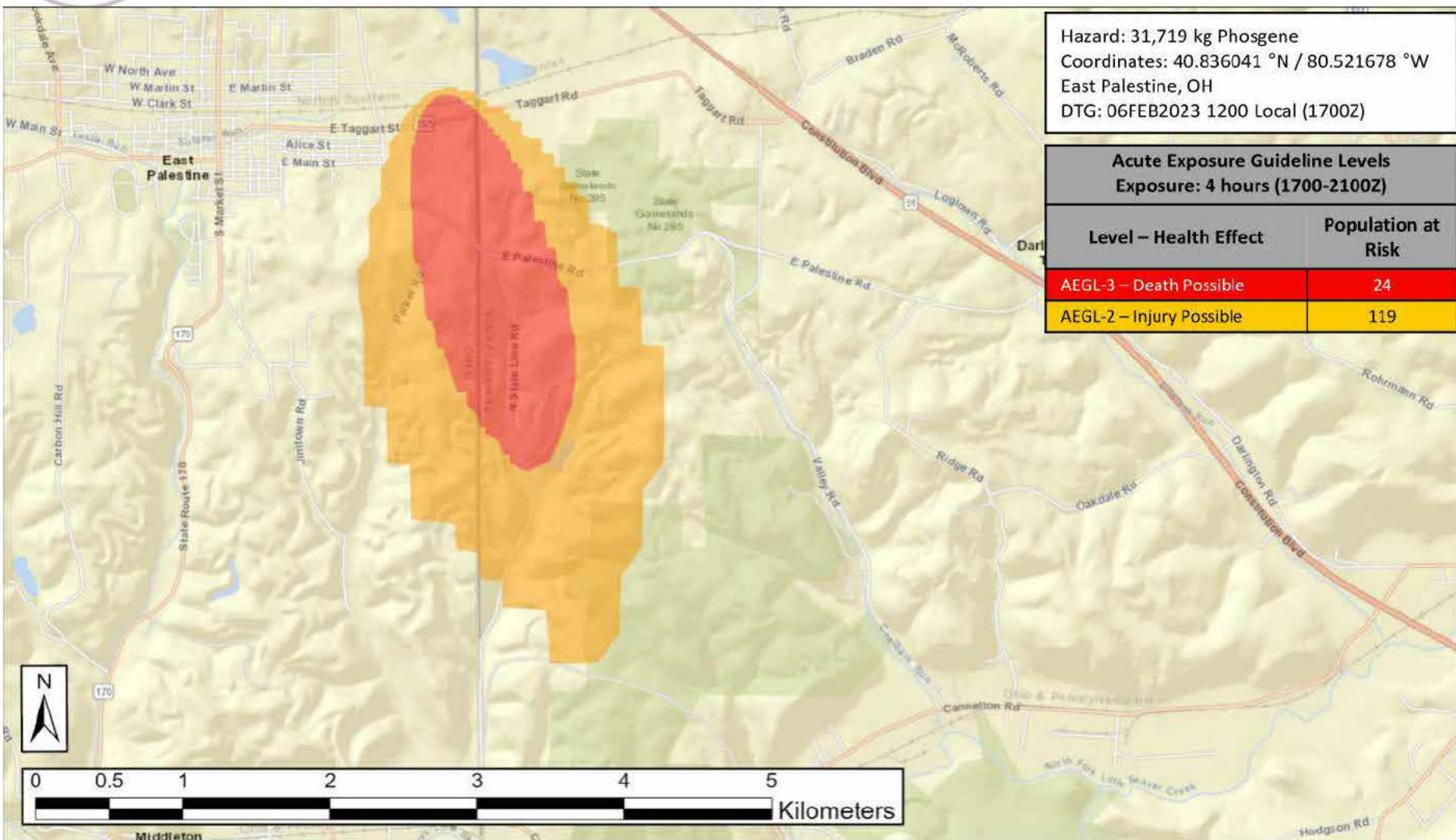


Phosgene – 1200 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	24
AEGL-2 – Injury Possible	119





Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

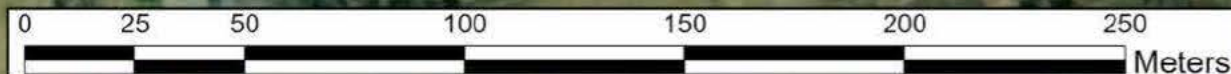
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0

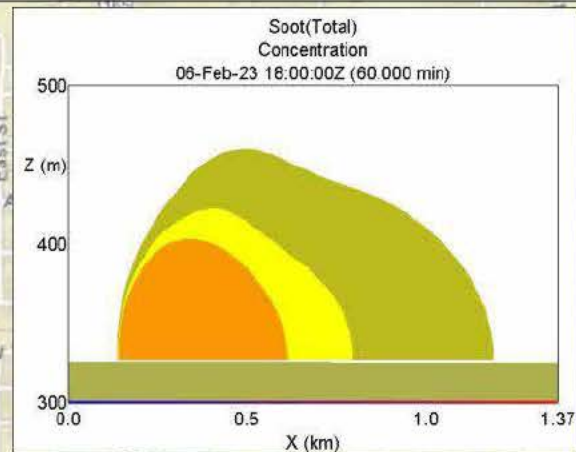




CUI

RFI 22-0081fu

Soot – Vertical Profile – 1200 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Concentration @ 1200 Local

Hazardous

Very Unhealthy

Unhealthy

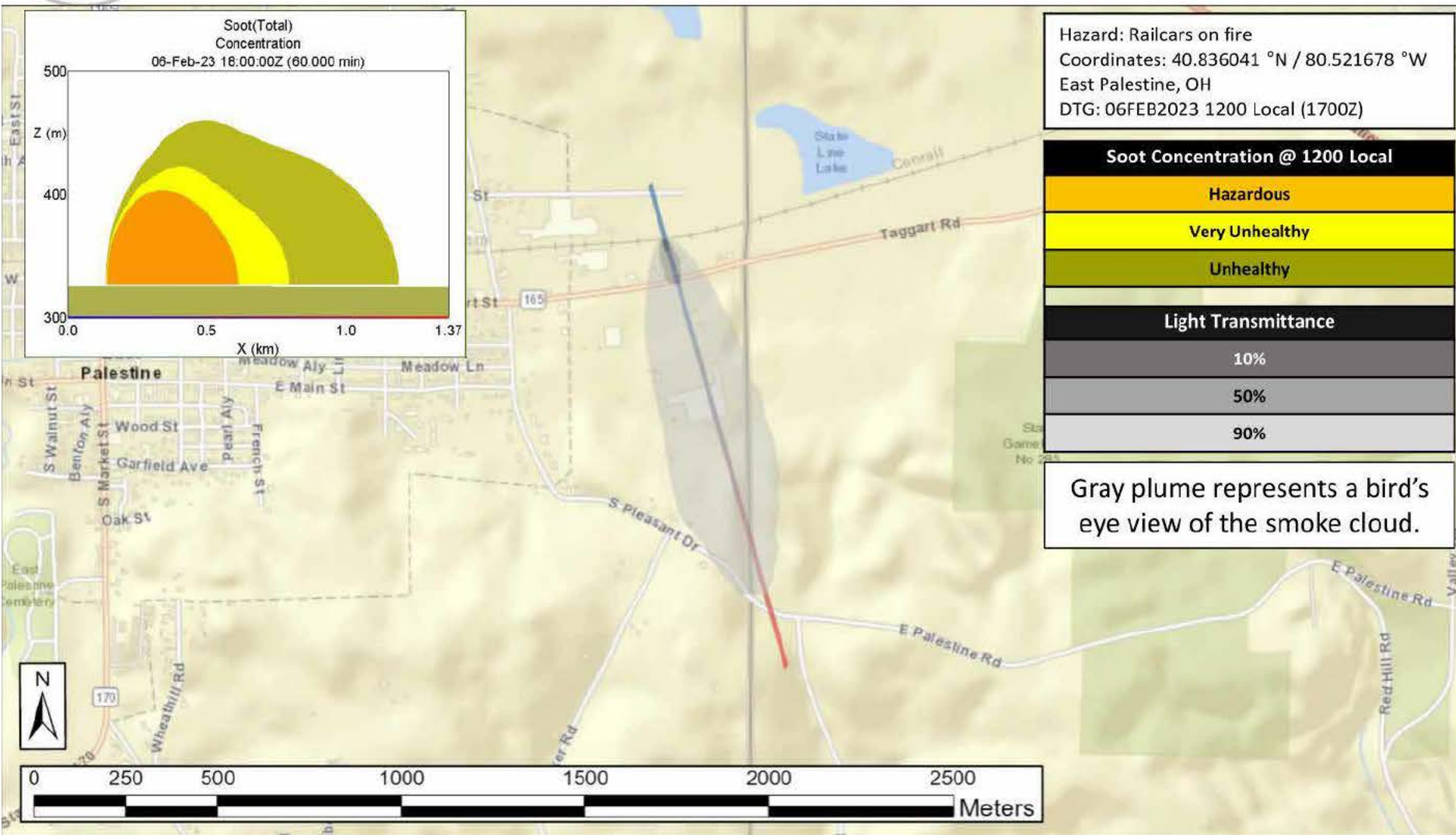
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.



CUI



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



~~CUI~~

RFI 22-0081fU

BLEVE Scenario

06FEB2023

~~CUI~~



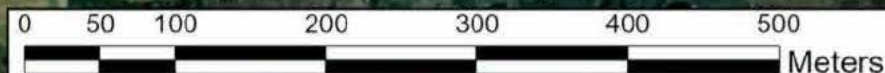
BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Liquid Mass: 23,389 kg
Lofted Mass: 23,389 kg
Estimated NEW: 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.





BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, **1977**

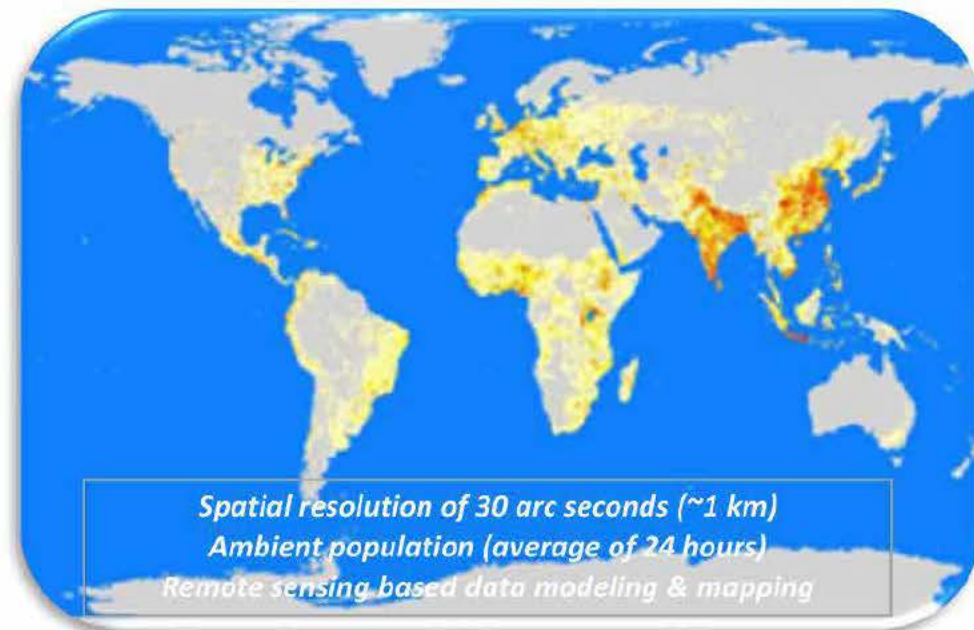


Population Data

~~CUI~~

RFI 22-0081fU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

From: (b) (6)
Sent: Mon, 6 Feb 2023 12:28:11 +0000
To: DTRA Ft Belvoir RD List DTRA Technical Reachback DDOs
Cc: (b) (6)
RD (USA)
Subject: Re: Train derailment in Ohio
Attachments: smime.p7m

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 17:04:27 +0000
To: (b) (6)
Subject: FW: Weather Look ahead
Attachments: 12km NAM 1800Z (1300 Local) wind vectors.png, 12km NAM 1900Z (1400 Local) wind vectors.png, 12km NAM 2300Z (1800 Local) wind vectors.png, smime.p7s

Just for SA, we sent some wind forecasts to the CST for their awareness (they were wondering if there would be wind shifts upcoming).

They needed it fast, so it wasn't pretty.

(b) (6)
Operations Manager, DTRA Reachback
703-767-3447

-----Original Message-----

From: (b) (6) >
Sent: Monday, February 6, 2023 11:56 AM
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Subject: Weather Look ahead

(b) (6)

Weather wind plots for 1300, 1400, and 1800 local.

Note the change in wind direction expected at 1800 local.

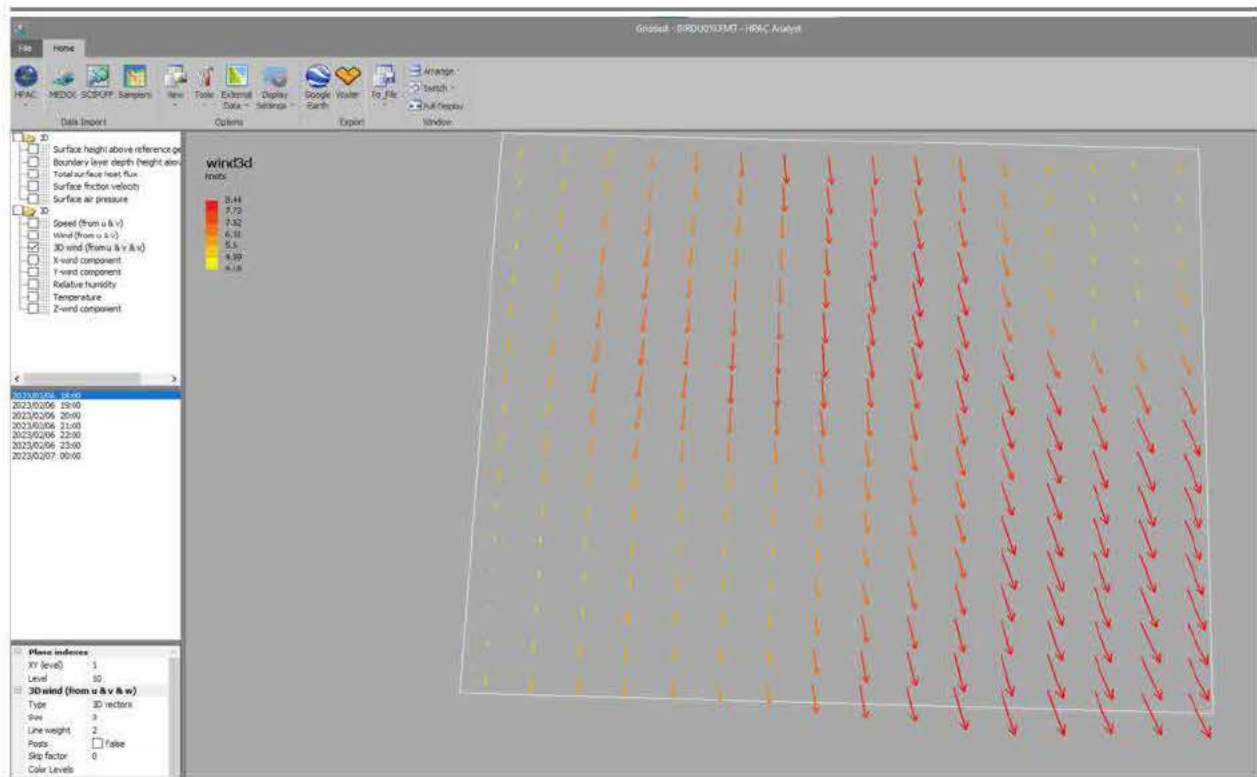
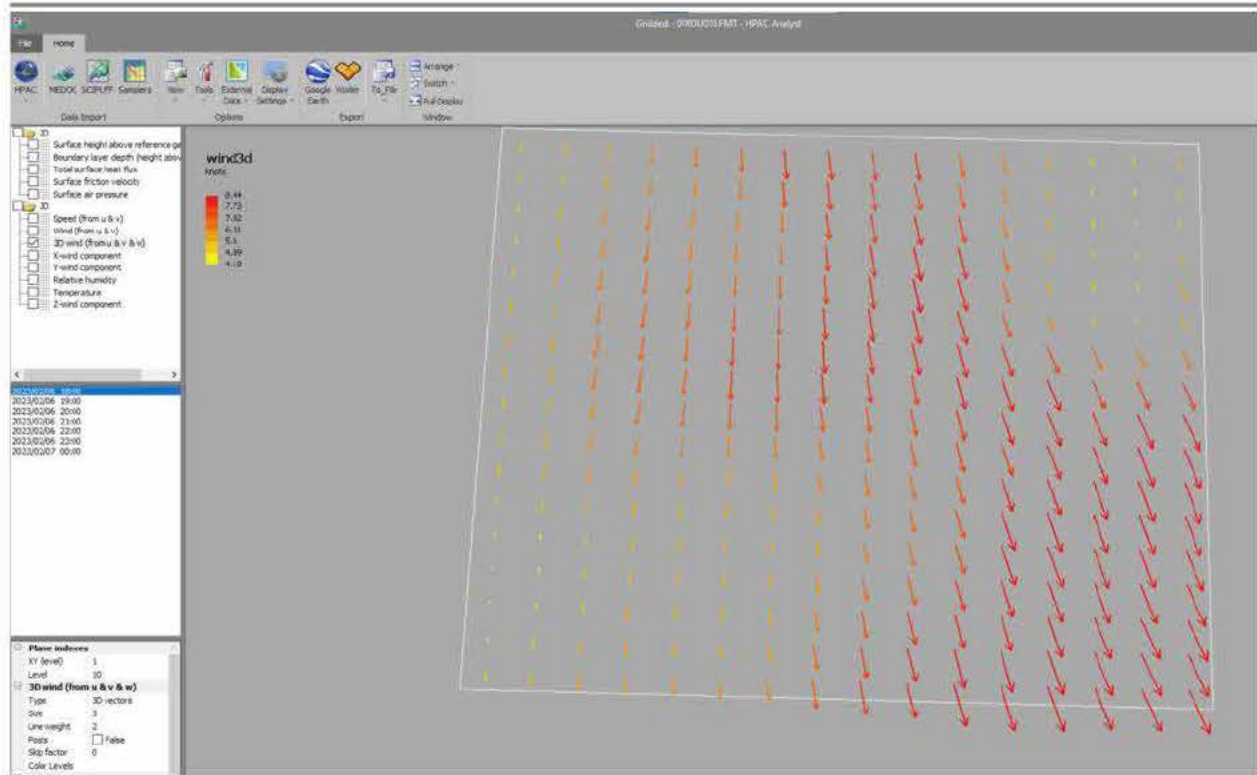
Respectfully,

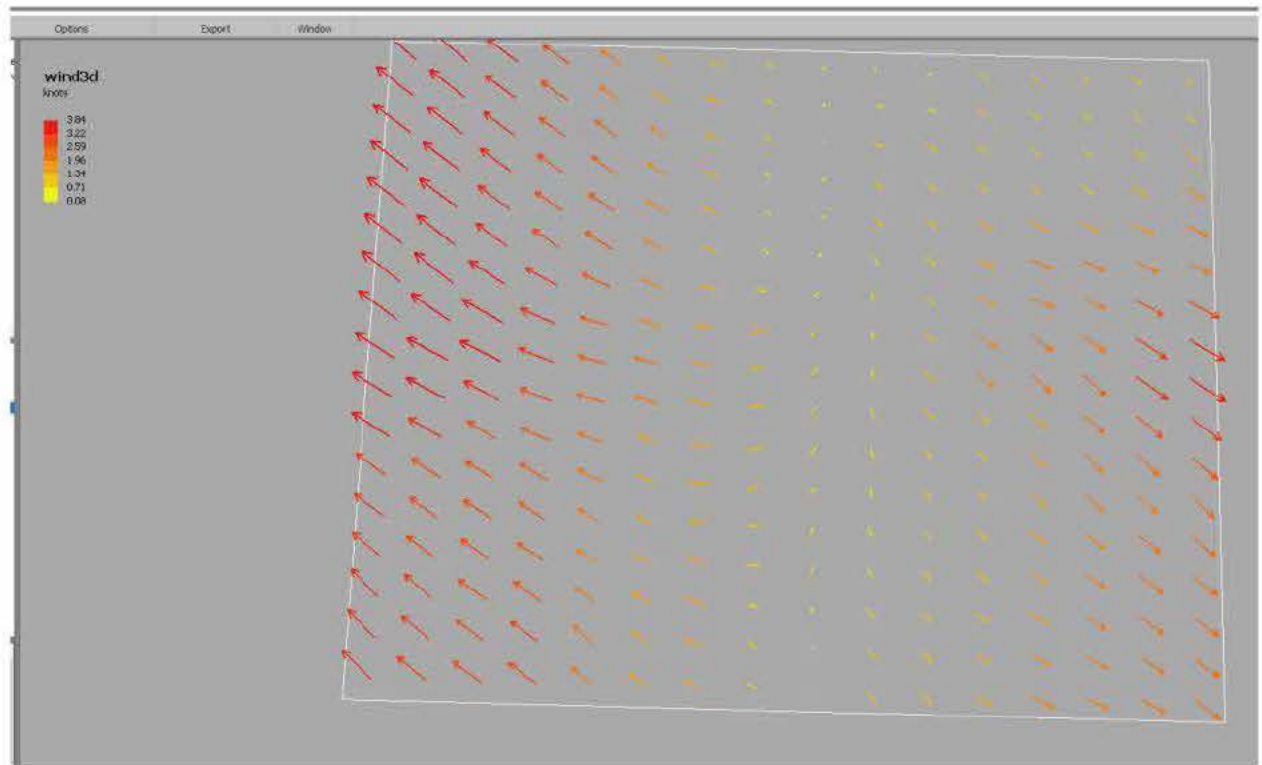
(b) (6)

CBRNE Analyst / Chemistry SME

(b) (6)

DTRA Technical Reachback (RD-OPR)
703-767-3445
Dtra-reachback@mail.mil







File

Home



HPAC



MEDOC



SCIPLIFF



Samplers



View



Tools



External Data



Display Settings



Google Earth



Voxler



To_File



Arrange

▼

Switch

Full Display

Window

Data Import

Options

Export

- ☐ 2D
 - ☐ Surface height above reference ge
 - ☐ Boundary layer depth (height above
 - ☐ Total surface heat flux
 - ☐ Surface friction velocity
 - ☐ Surface air pressure
- ☐ 3D
 - ☐ Speed (from u & v)
 - ☐ Wind (from u & v)
 - ☒ 3D wind (from u & v & w)
 - ☐ X-wind component
 - ☐ Y-wind component
 - ☐ Relative humidity
 - ☐ Temperature
 - ☐ Z-wind component

< >

2023/02/06 18:00

2023/02/06 19:00

2023/02/06 20:00

2023/02/06 21:00

2023/02/06 22:00

2023/02/06 23:00

2023/02/07 00:00

Plane indexes

XY (level)

1

Level

10

3D wind (from u & v & w)

Type

3D vectors

Size

3

Line weight

2

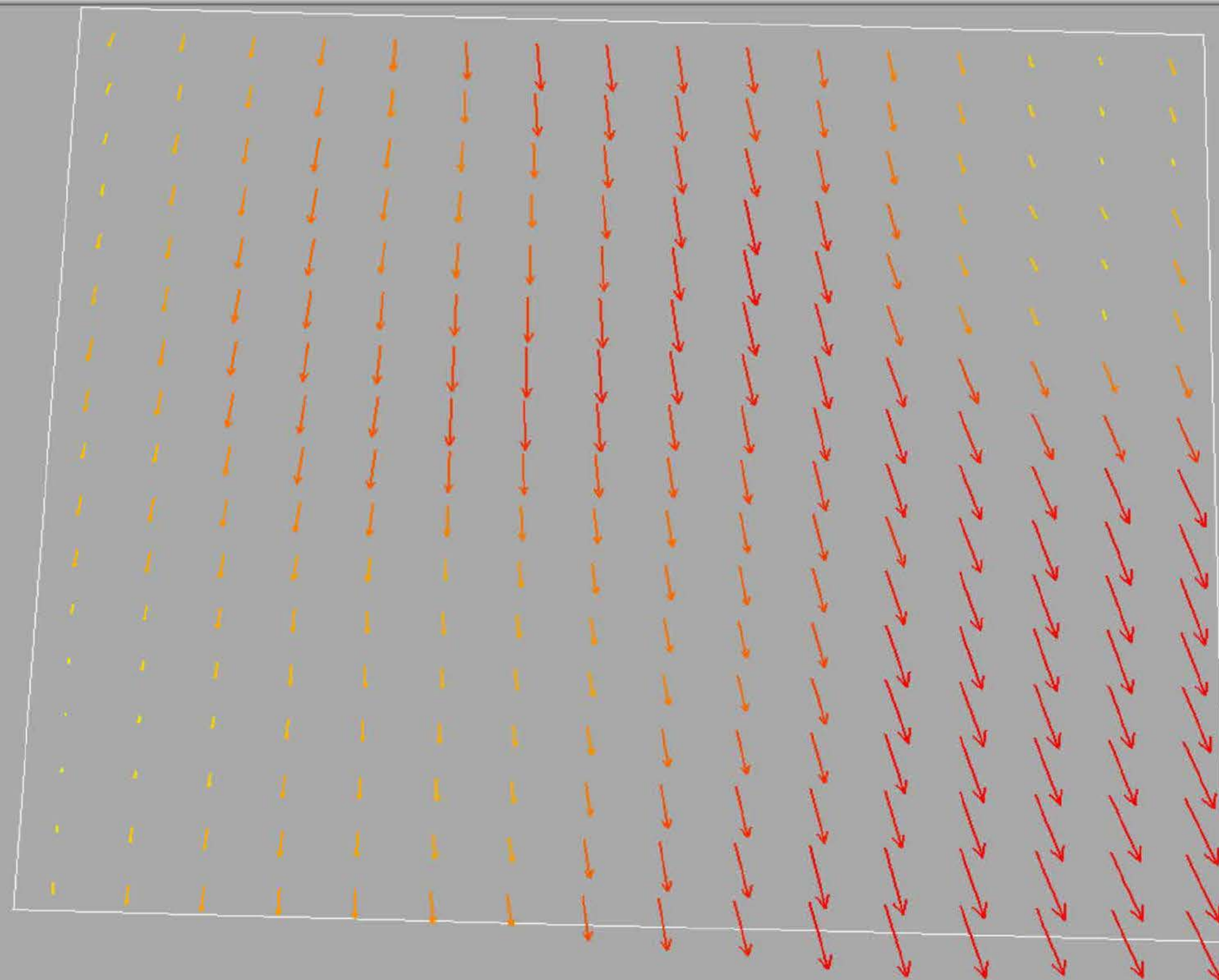
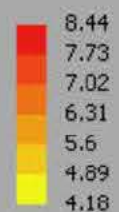
Posts

☐ False

Skip factor

0

Color Levels

wind3d
knots



File Home

HPAC MEDOC SCIPUFF Samplers View Tools External Data Display Settings Google Earth Voxler To_File

Data Import Options Export Window

Arrange
Switch
Full Display

2D

- ☐ Surface height above reference ge
- ☐ Boundary layer depth (height above
- ☐ Total surface heat flux
- ☐ Surface friction velocity
- ☐ Surface air pressure

3D

- ☐ Speed (from u & v)
- ☐ Wind (from u & v)
- ☒ 3D wind (from u & v & w)
- ☐ X-wind component
- ☐ Y-wind component
- ☐ Relative humidity
- ☐ Temperature
- ☐ Z-wind component

2023/02/06 18:00
2023/02/06 19:00
2023/02/06 20:00
2023/02/06 21:00
2023/02/06 22:00
2023/02/06 23:00
2023/02/07 00:00

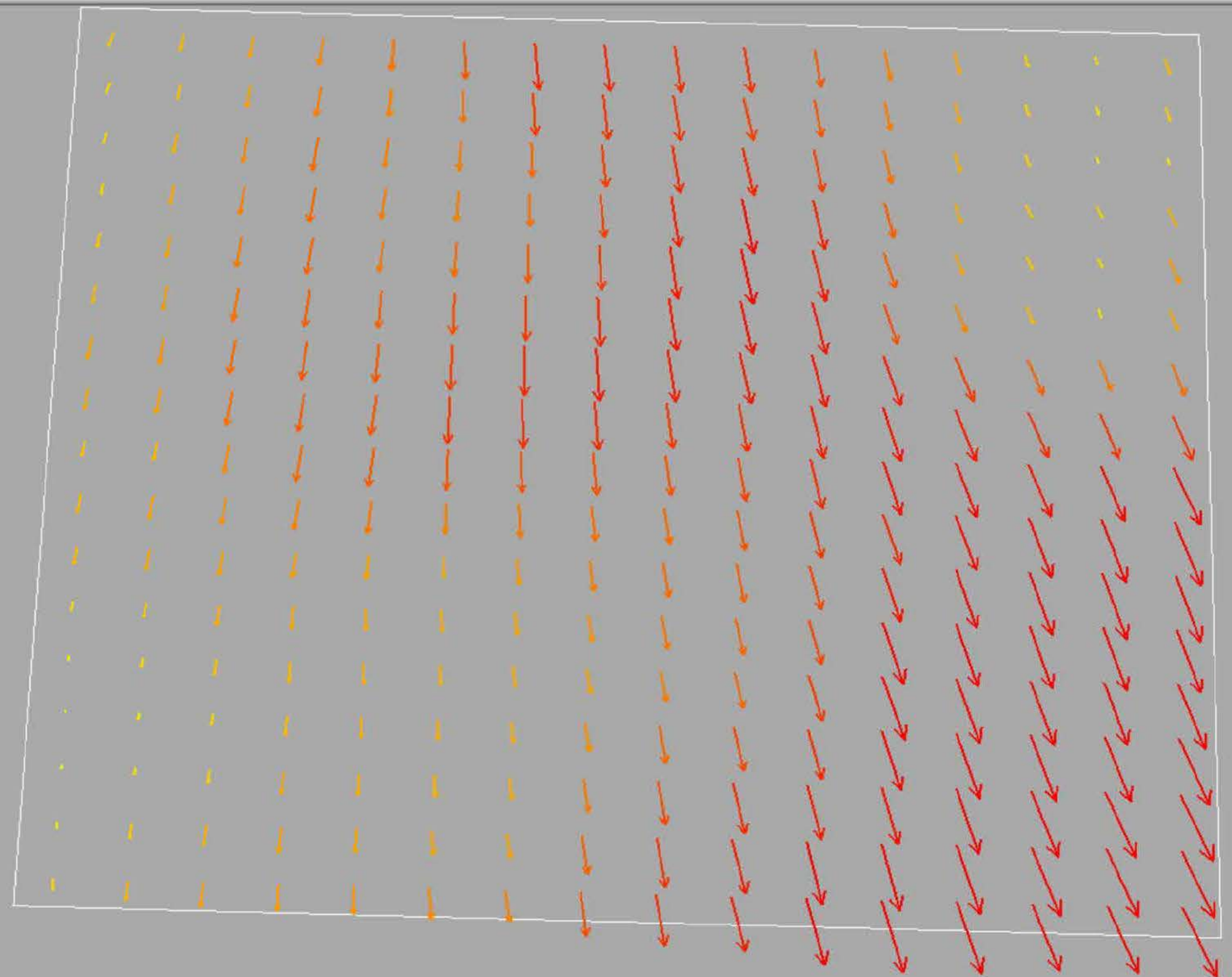
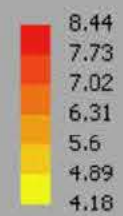
Plane indexes

XY (level)	1
Level	10

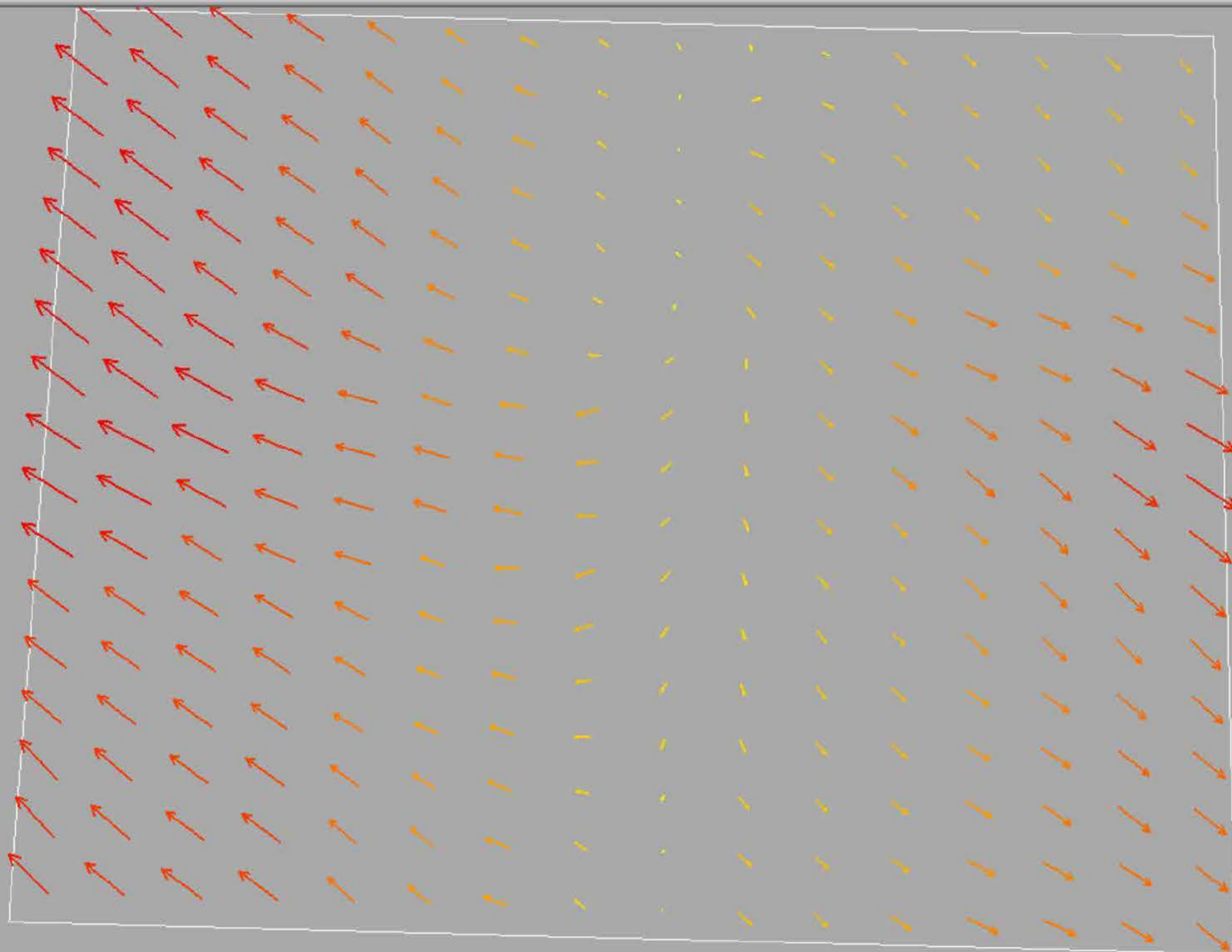
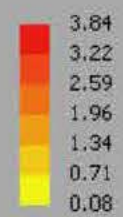
3D wind (from u & v & w)

Type	3D vectors
Size	3
Line weight	2
Posts	☐ False
Skip factor	0
Color Levels	

wind3d
knots



wind3d
knots



From: (b) (6)
Sent: Mon, 6 Feb 2023 12:46:39 +0000
To: (b) (6) DTRA Ft Belvoir RD List
DTRA Technical Reachback DDOs
Subject: RE: Train derailment in Ohio
Attachments: smime.p7m

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 17:47:42 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA)
Subject: For Review
Attachments: RFI_23-0081gU_IMAAC_rev1.pptx, smime.p7s

CUI

(b) (6)

Here's the updated product for review.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Categories: CTI
Distribution/Dissemination Statement: C
POC: RD-OPR, dtra-reachback@mail.mil, 703-767-3445

CUI

~~CUI~~

Date: 06FEB2023 1745Z

Version: Revision G

Changes: Planned breach model



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081gU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 1 single railcar, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1400 06FEB2023 Local (1900Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081gU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



CUI

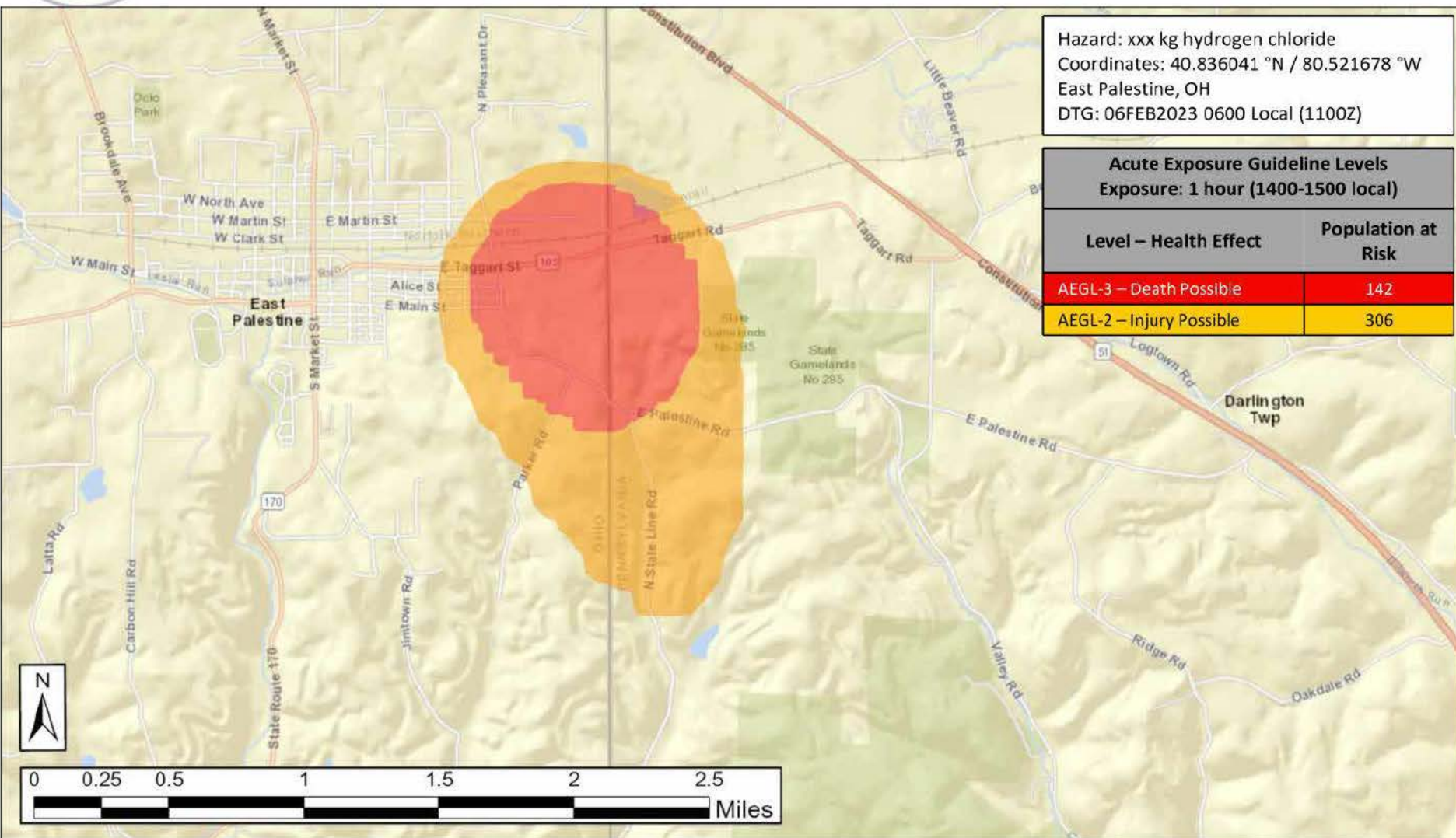
RFI 22-0081gU

Hydrogen Chloride – 1400 Local

Hazard: xxx kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



CUI



CUI

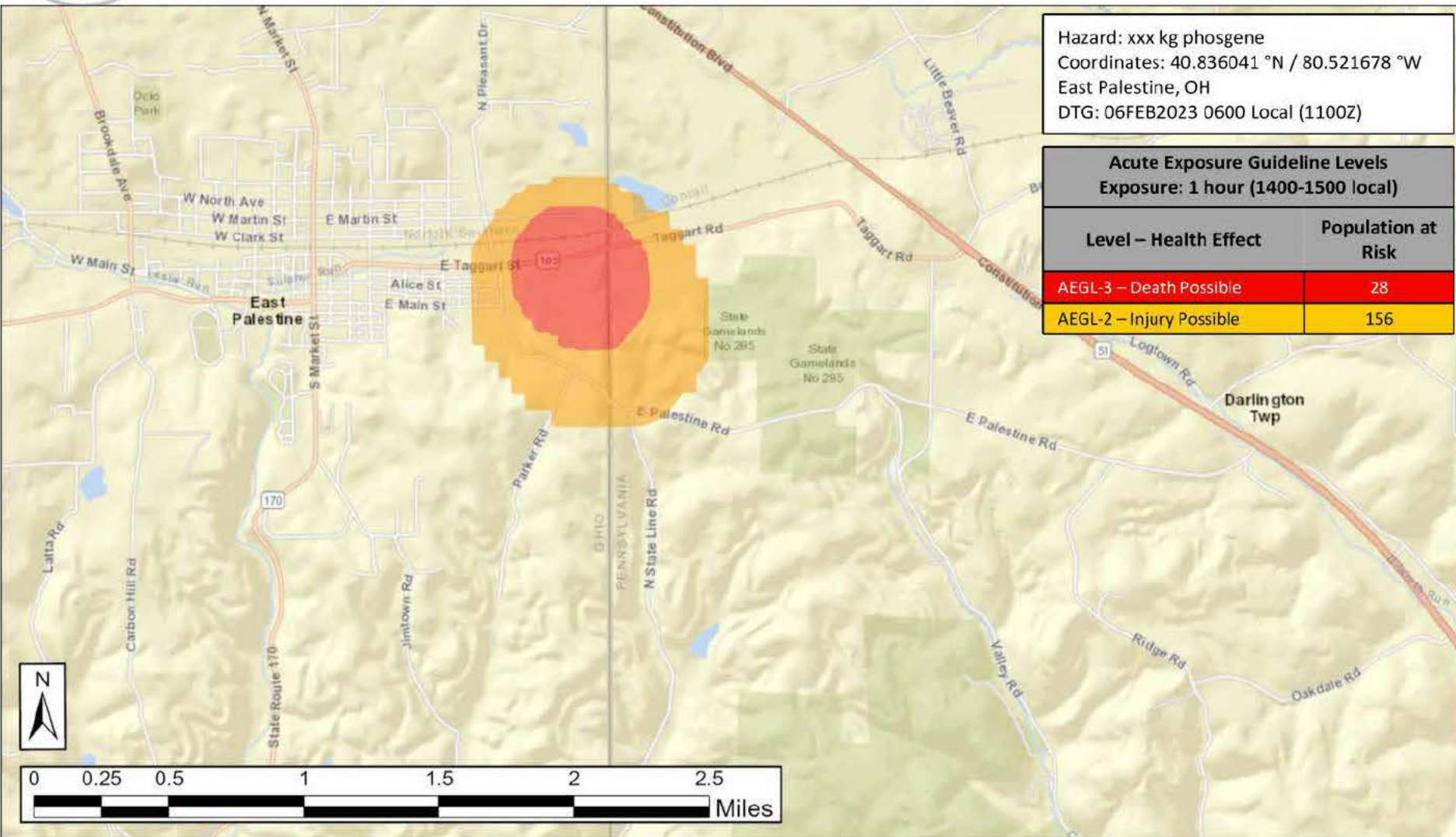
RFI 22-0081gU

Phosgene – 1400 Local

Hazard: xxx kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI



~~CUI~~

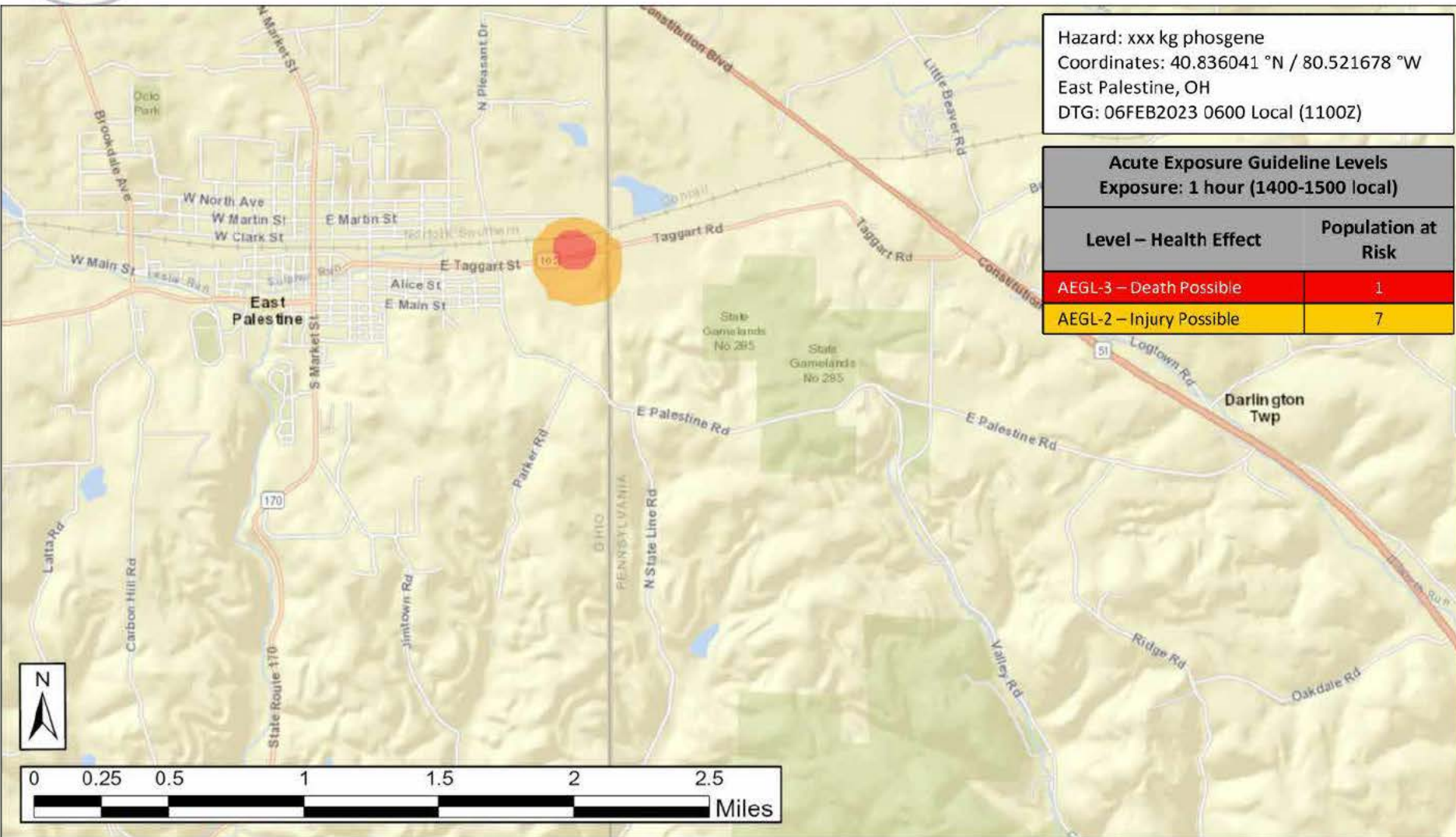
RFI 22-0081gU

Vinyl Chloride – 1400 Local

Hazard: xxx kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081gU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Liquid Mass: 23,389 kg
Lofted Mass: 23,389 kg
Estimated NEW: 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



0 50 100 200 300 400 500
Meters

CUI



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

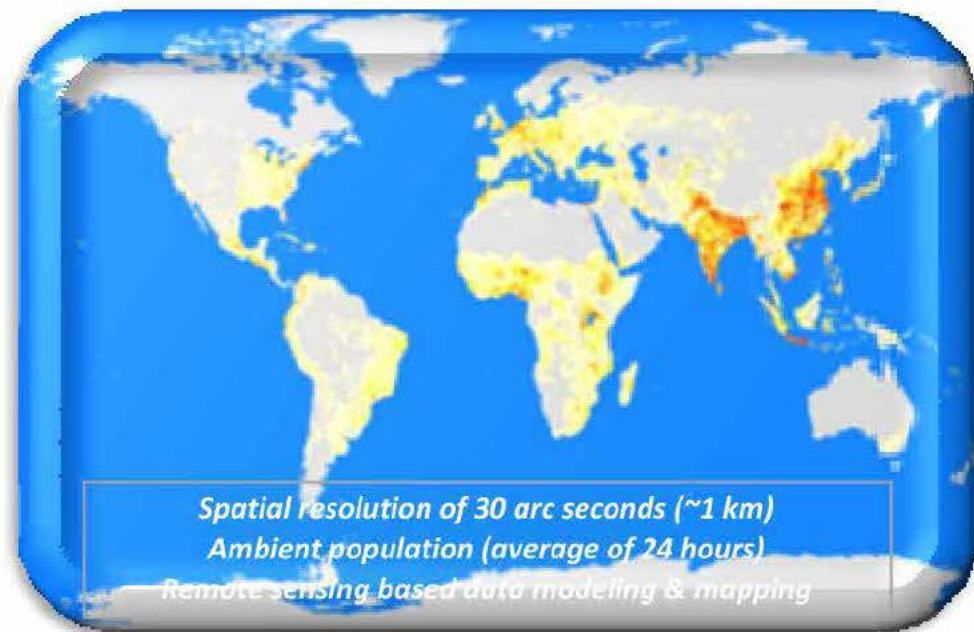
Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, **1977**



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 18:21:40 +0000
To: (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA)
Subject: Updated Product
Attachments: smime.p7s

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)

Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

From: (b) (6)
Sent: Mon, 6 Feb 2023 18:24:40 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)

Subject: Press Conf
Attachments: smime.p7s

Time to look at is 1:51.

<https://www.wkbn.com/uncategorized/emergency-press-conference-to-be-held-sunday/>

Respectfully,

(b) (6)
DTRA Reachback
Principal Scientist (ARA)

(b) (6)
? DSN 322-616-5866

(b) (6)

24/7 Reachback:
DTRA-Reachback@mail.mil

(b) (6)

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 19:42:52 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)

Subject: RE: Updated Product
Attachments: smime.p7s

ALCON,

Just saw on the governor's news conference that the plan is to conduct the operation at 1530 EST. So we are doing an update for that time.

We can also do an update for 1800 if that's still necessary.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Monday, February 6, 2023 1:22 PM
To: (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: Updated Product

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)

(b) (5)



Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

From: (b) (6)
Sent: Mon, 6 Feb 2023 19:47:01 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
[Redacted]
[Redacted]
[Redacted]
Subject: [Non-DoD Source] RE: Updated Product

Great! Thank you very much.

(b) (6)
On-Scene Coordinator
US EPA
2565 Plymouth Road
Ann Arbor, MI 48105
(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Monday, February 6, 2023 2:43 PM
To: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil> (b) (6)
[Redacted]
[Redacted]
[Redacted]
Subject: RE: Updated Product

ALCON,

Just saw on the governor's news conference that the plan is to conduct the operation at 1530 EST. So we are doing an update for that time.

We can also do an update for 1800 if that's still necessary.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Monday, February 6, 2023 1:22 PM

To: (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback

<dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: Updated Product

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)

Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency

COM: (703) 767-3448 (DSN 427-)

STE: (703) 767-2138

NIPR: dtra-reachback@mail.mil

SIPR: dtra-reachback@mail.smil.mil

JWICS: reachback@dtra.ic.gov

R&D Directorate

Technical Reachback Division

From: (b) (6)
Sent: Mon, 6 Feb 2023 19:56:56 +0000
To: (b) (6)
[Redacted]
[Redacted]
[Redacted]
Subject: Re: Updated Product

(b) (5)
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

Respectfully,

(b) (6)
52nd Civil Support Team (WMD)
Operations NCOIC
8202 S. Access Rd. Bldg. 946
Columbus, Oh 43217
☎ Comm: 614-336-6080
☎ Cell: 614-989-1219

(b) (6)
Emergency: 1-866-4-WMD-CST (1-866-496-3278)
From: (b) (6)
Sent: Monday, February 6, 2023 2:47 PM
To: DTRA Ft Belvoir RD Mailbox Reachback ; (b) (6)
[Redacted]
[Redacted]
[Redacted]
Subject: [Non-DoD Source] RE: Updated Product
Great! Thank you very much.

(b) (6)

On-Scene Coordinator
US EPA
2565 Plymouth Road
Ann Arbor, MI 48105

(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback

Sent: Monday, February 6, 2023 2:43 PM

To: DTRA Ft Belvoir RD Mailbox Reachback ; (b) (6)

Subject: RE: Updated Product

ALCON,

Just saw on the governor's news conference that the plan is to conduct the operation at 1530 EST. So we are doing an update for that time.

We can also do an update for 1800 if that's still necessary.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback

Sent: Monday, February 6, 2023 1:22 PM

To: (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback

; (b) (6)

Subject: Updated Product

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)



Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

From: (b) (6)
Sent: Mon, 6 Feb 2023 19:59:54 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback (b) (6)
(USA)
Subject: Deliberate Tank Breach
Attachments: smime.p7s

(b) (6)

Recognizing that you guys are probably busy, we would like to know

Details of the planned breach

(b) (5)

Any received data can certainly wait until after the event transpires.

With thanks,

(b) (6)

CBRNE Analyst / Chemistry SME

(b) (6)

DTRA Technical Reachback (RD-OPR)
703-767-3445
Dtra-reachback@mail.mil

From: (b) (6)
Sent: Mon, 6 Feb 2023 20:05:57 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA)
Subject: Re: Deliberate Tank Breach

5 tanks
plan unknown to me
duration estimated between 30 minutes and 3 hours. I have been conservatively estimating full
3 hours
there is fixed frame

Respectfully,

(b) (6)
52nd Civil Support Team (WMD)
Operations NCOIC
8202 S. Access Rd. Bldg. 946
Columbus, Oh 43217

Comm: (b) (6)

Cell: (b) (6)

(b) (6)

Emergency: (b) (6))

From: (b) (6)
Sent: Monday, February 6, 2023 2:59 PM
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
Subject: Deliberate Tank Breach

(b) (6)

Recognizing that you guys are probably busy, we would like to know

(b) (5)

Any received data can certainly wait until after the event transpires.

With thanks,

(b) (6)

[REDACTED]

CBRNE Analyst / Chemistry SME

(b) (6)

DTRA Technical Reachback (RD-OPR)

703-767-3445

Dtra-reachback@mail.mil

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 20:08:10 +0000
To: (b) (6)

Subject: RE: Updated Product
Attachments: smime.p7s

(b) (5)

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 2:57 PM
To: (b) (6)

Subject: Re: Updated Product

(b) (5)

(b) (5)

Respectfully,

(b) (6)

52nd Civil Support Team (WMD)

Operations NCOIC

8202 S. Access Rd. Bldg. 946

Columbus, Oh 43217

? Comm: (b) (6)

? Cell: (b) (6)

(b) (6)

Emergency: 1-866-4-WMD-CST (1-866-496-3278)

From: (b) (6)

Sent: Monday, February 6, 2023 2:47 PM

To: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: [Non-DoD Source] RE: Updated Product

Great! Thank you very much.

(b) (6)

On-Scene Coordinator

US EPA

2565 Plymouth Road

Ann Arbor, MI 48105

(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>

Sent: Monday, February 6, 2023 2:43 PM

To: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

(b) (6)

Subject: RE: Updated Product

ALCON,

Just saw on the governor's news conference that the plan is to conduct the operation at 1530 EST. So we are doing an update for that time.

We can also do an update for 1800 if that's still necessary.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>

Sent: Monday, February 6, 2023 1:22 PM

(b) (6)

Subject: Updated Product

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)

Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

From: (b) (6)
Sent: Mon, 6 Feb 2023 20:10:31 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: For review
Attachments: RFI_23-0081hU_IMAAC_rev0.pptx, smime.p7s

CUI

For review.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Categories: CTI
Distribution/Dissemination Statement: C
POC: RD-OPR, dtra-reachback@mail.mil, 703-767-3445

CUI

~~CUI~~

Date: 06FEB2023 1745Z

Version: Revision H

Changes: Planned breach model; adjusted amounts (see Slide #3)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081hU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6) [REDACTED] EPA Region 5, Emergency Response Branch
Contact information	(b) (6) [REDACTED] (b) (6) [REDACTED]
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 1 single railcar, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl₂O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1530 06FEB2023 Local (2030Z) 2. 1800 06FEB2023 Local (2030Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081hU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



~~CUI~~

RFI 22-0081hU

**3:30PM Breach (2030Z)
06 FEB 2023**

~~CUI~~

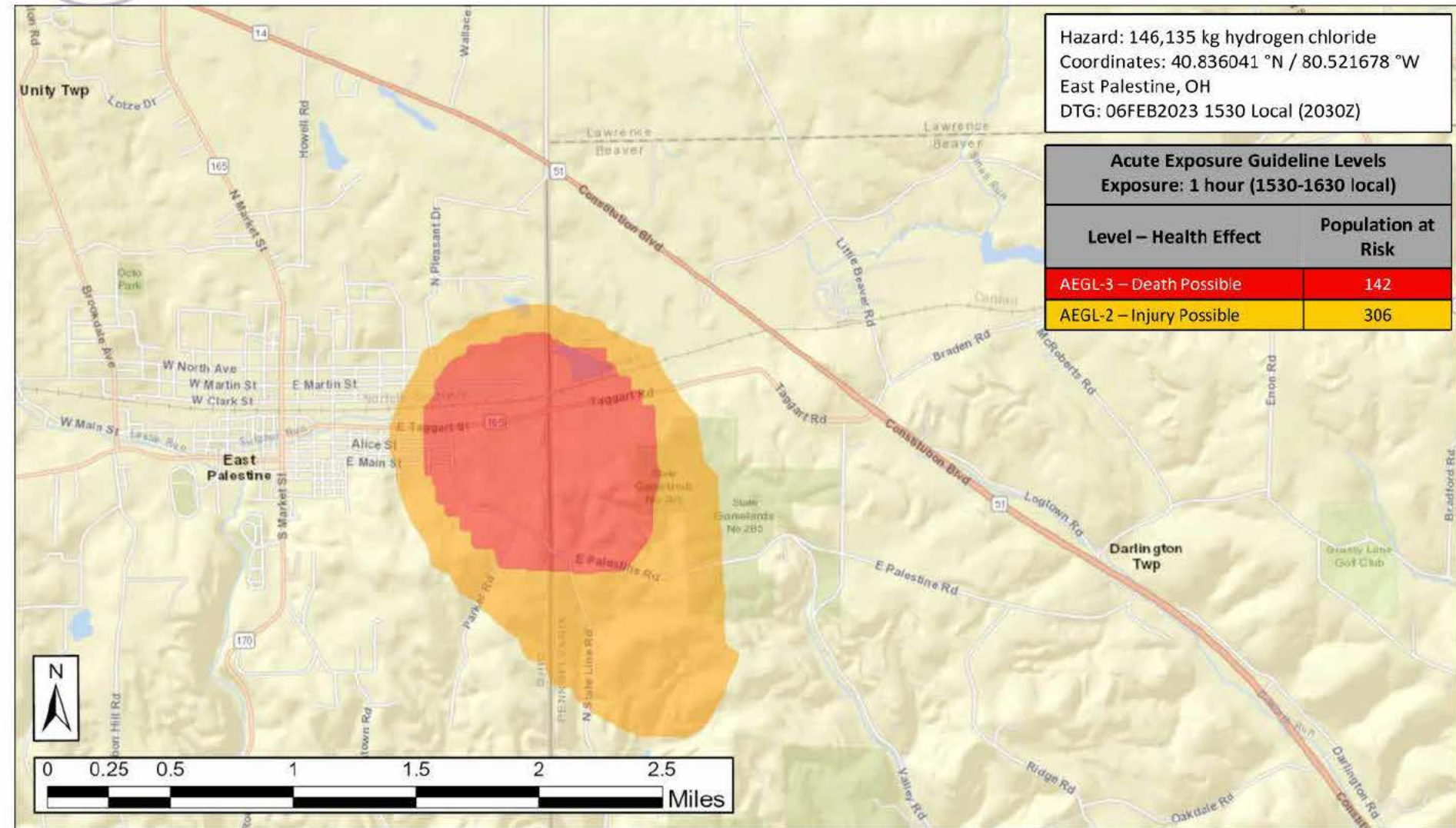


Hydrogen Chloride – 1530 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306





CUI

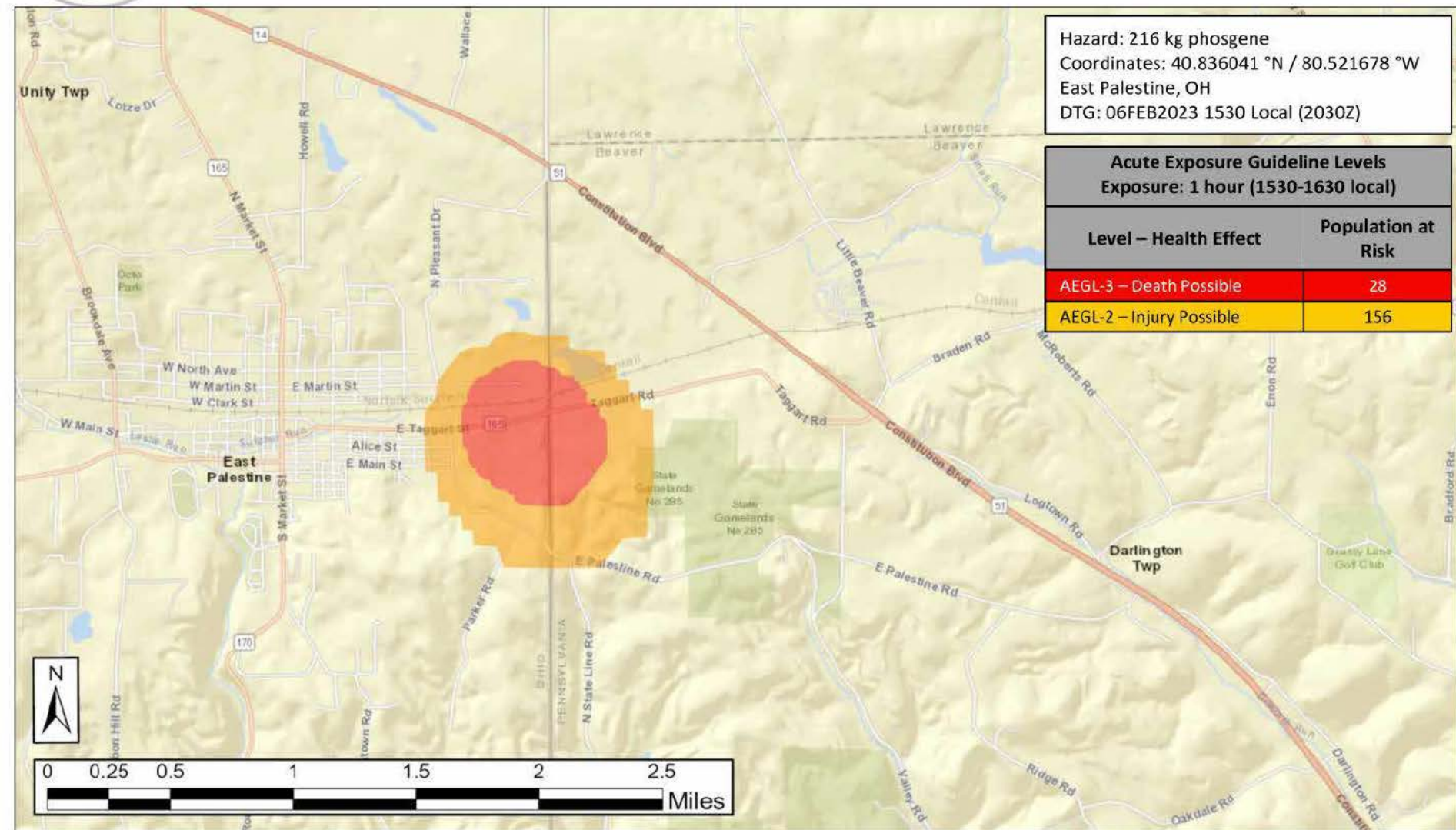
RFI 22-0081hU

Phosgene – 1530 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

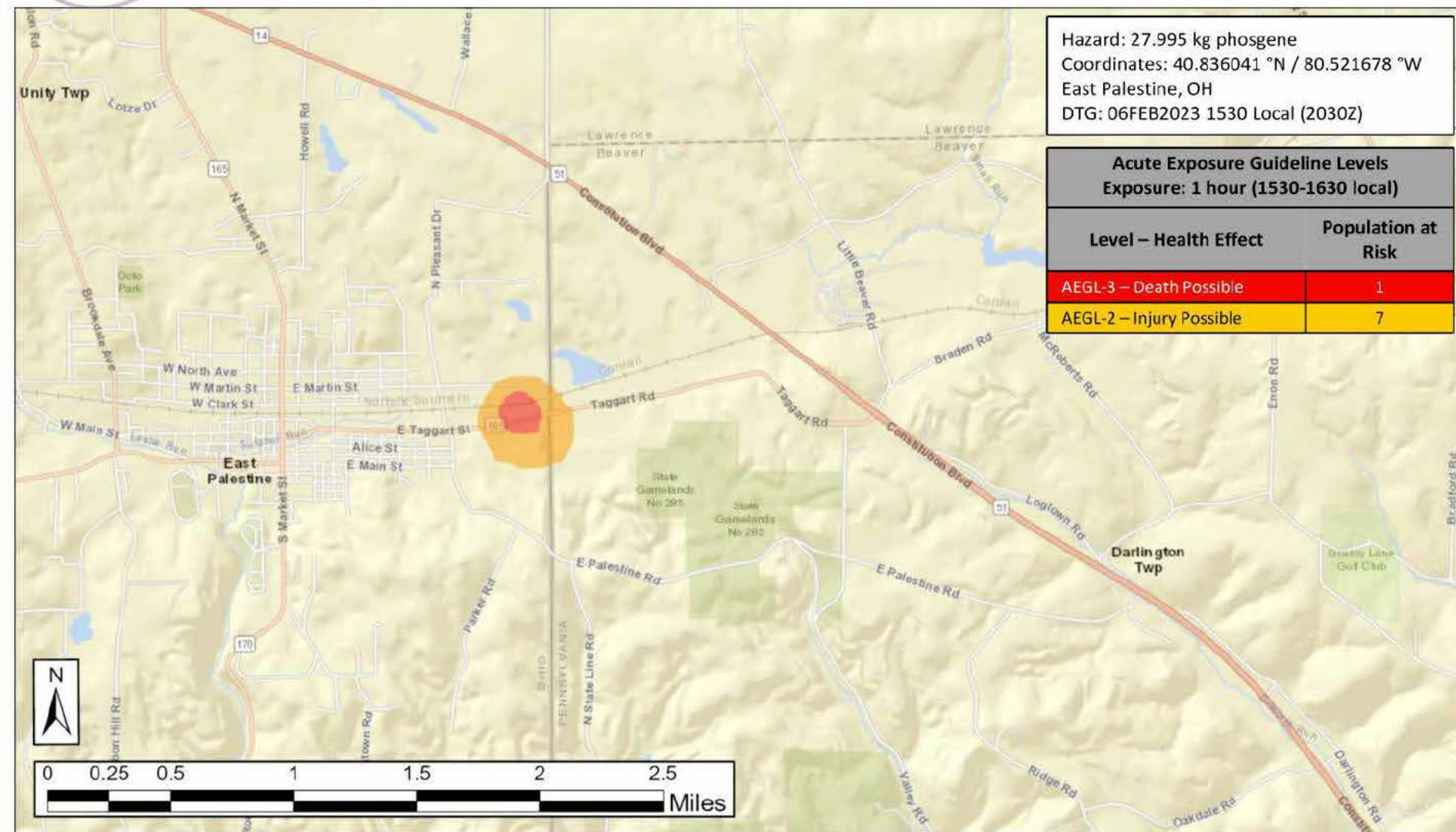
Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI

Vinyl Chloride – 1530 Local





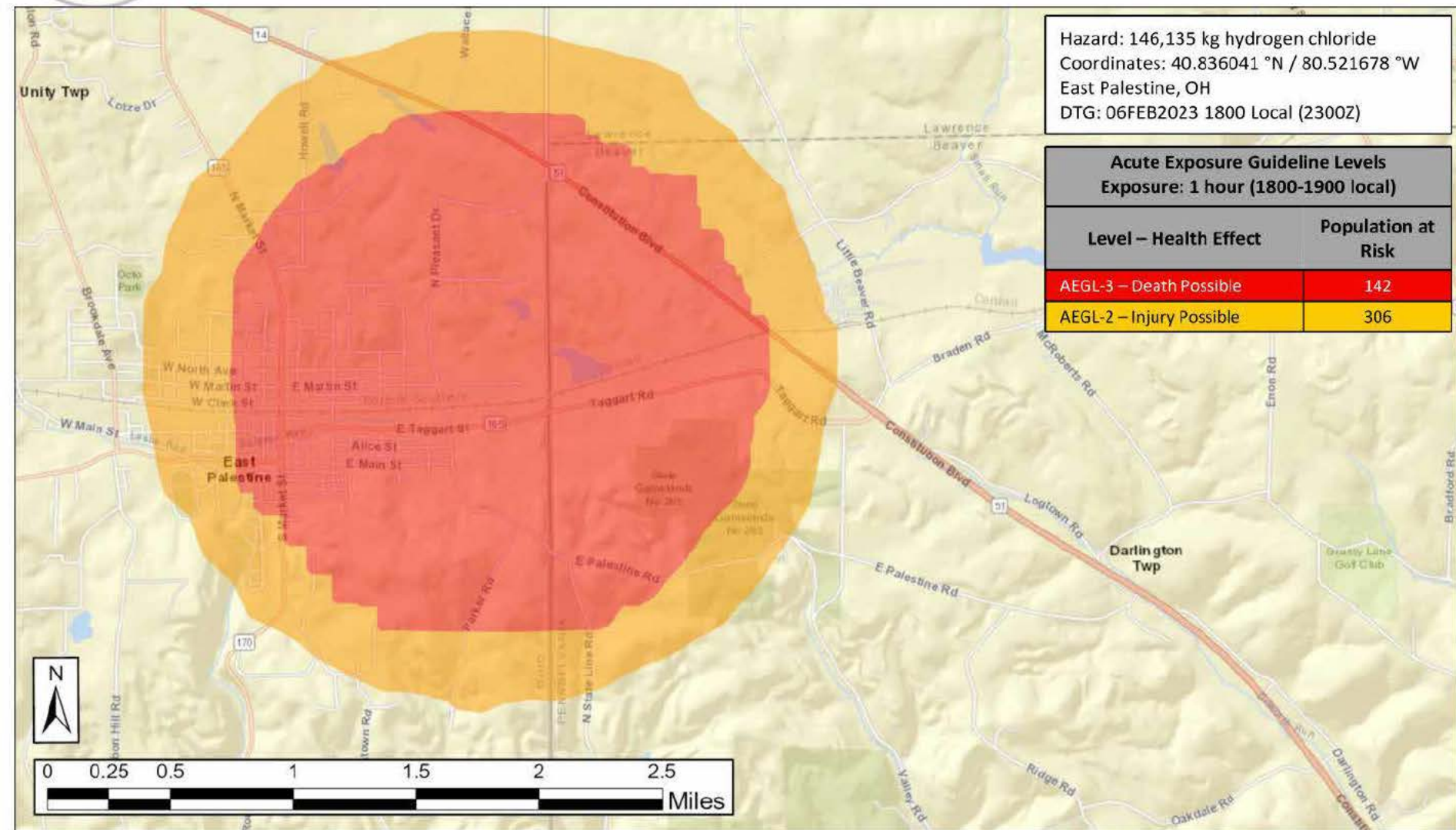
6:00PM Breach (2300Z) 06 FEB 2023



~~CUI~~

RFI 22-0081hU

Hydrogen Chloride – 1800 Local



~~CUI~~



CUI

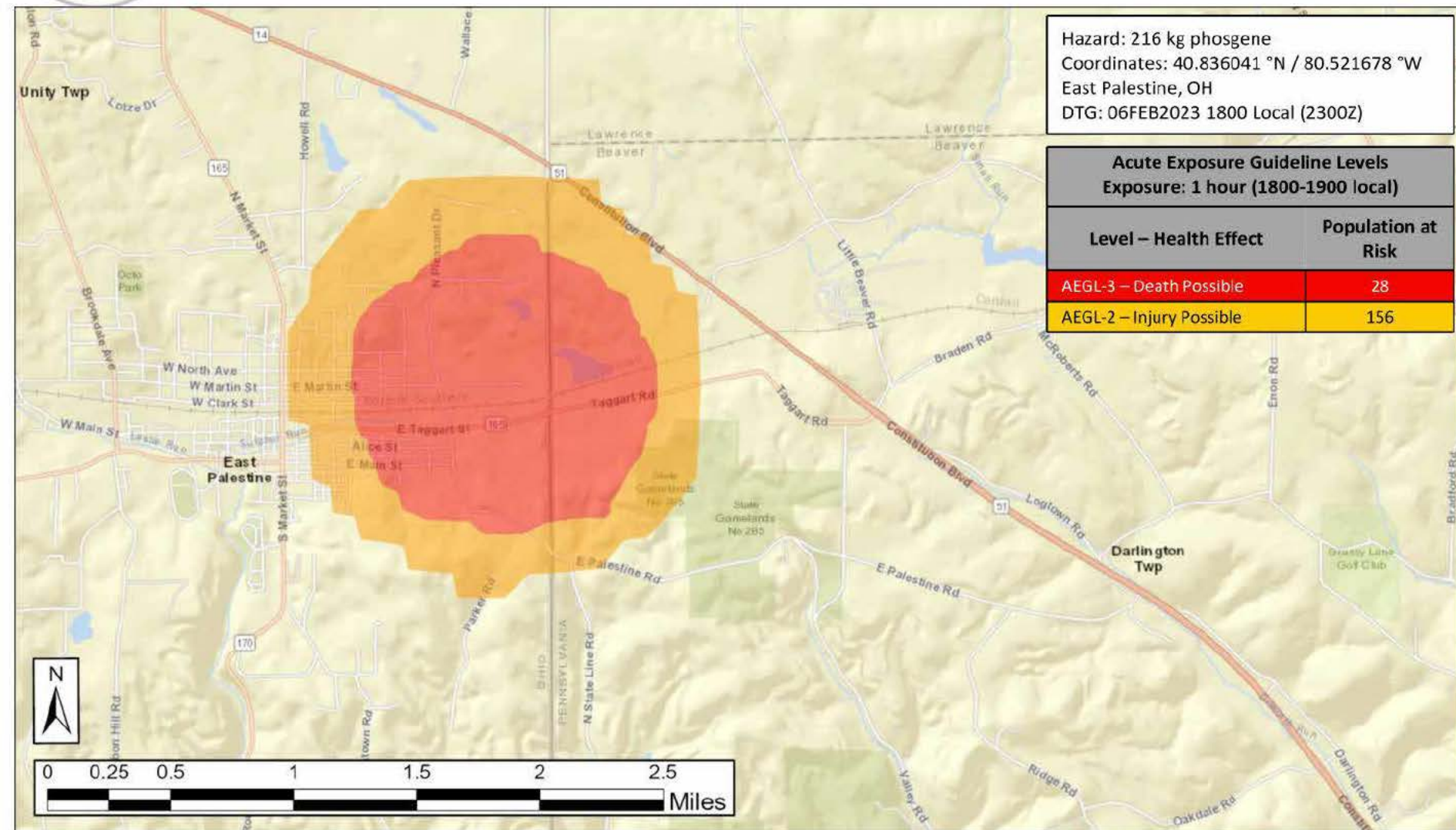
RFI 22-0081hU

Phosgene – 1800 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI



~~CUI~~

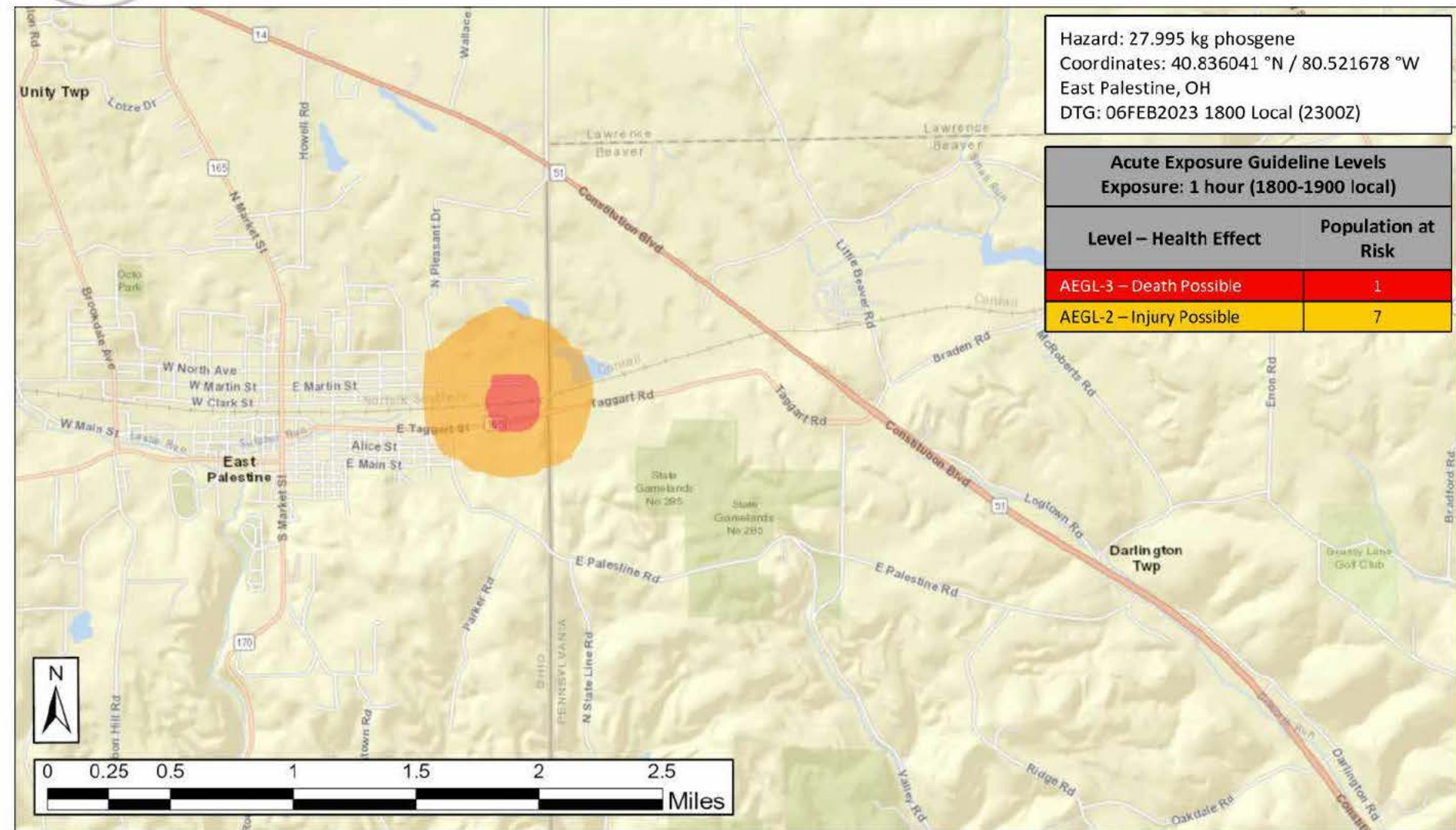
RFI 22-0081hU

Vinyl Chloride – 1800 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.





BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

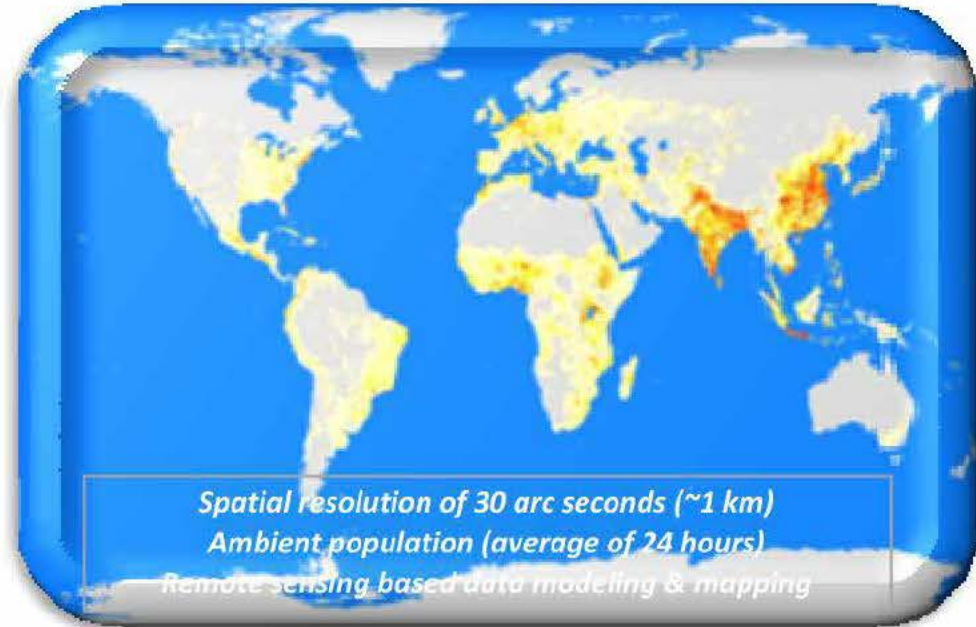
Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, 1985; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, 1977



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

From: (b) (6)
Sent: Mon, 6 Feb 2023 20:18:47 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)

Subject: RE: Updated Product
Attachments: RFI_23-0081hU_IMAAC.pdf, 1800_HCL_AEGL_1h0.kml,
1800_phosgene_AEGL_1h0.kml, 1800_VCL_AEGL_1h0.kml, 1530_HCL_AEGL_1h0.kml,
1530_phosgene_AEGL_1h0.kml, 1530_VCL_AEGL_1h0.kml, smime.p7s

CUI

Given the time crunch I'm sending this to you directly. You will probably receive another copy from our Ops Center shortly.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Categories: CTI
Distribution/Dissemination Statement: C
POC: RD-OPR, dtra-reachback@mail.mil, 703-767-3445

CUI

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Monday, February 6, 2023 3:08 PM
To: (b) (6)

(b) (6) DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>:
(b) (6)

Subject: RE: Updated Product

Suspect it would burn faster than that. But the math seems okay.

Respectfully,

(b) (5)

Columbus, Oh 43217

? Comm (b) (6)

? Cell: (b) (6)

(b) (6)

Emergency: 1-866-4-WMD-CST (1-866-496-3278)

From: Edwards, Tricia (b) (6)

Sent: Monday, February 6, 2023 2:47 PM

To: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: [Non-DoD Source] RE: Updated Product

Great! Thank you very much.

(b) (6)

On-Scene Coordinator

US EPA

2565 Plymouth Road

Ann Arbor, MI 48105

(b) (6)

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>

Sent: Monday, February 6, 2023 2:43 PM

To: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: RE: Updated Product

ALCON,

Just saw on the governor's news conference that the plan is to conduct the operation at 1530 EST. So we are doing an update for that time.

We can also do an update for 1800 if that's still necessary.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>

Sent: Monday, February 6, 2023 1:22 PM

To: (b) (6)

Cc: DTRA Ft Belvoir RD Mailbox Reachback <dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)

Subject: Updated Product

ALCON,

We sent out an updated product to our Ops Center. They should be forwarding it to you shortly.

This analysis was based on a few changes:

(b) (5)

Please let us know if there's any questions or if the product doesn't show up within the next few minutes.

Respectfully,

BZ

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

~~CUI~~

Date: 06FEB2023 1745Z

Version: Revision H

Changes: Planned breach model; adjusted amounts (see Slide #3)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081hU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6) EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 5 railcars, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1530 06FEB2023 Local (2030Z) 2. 1800 06FEB2023 Local (2030Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081hU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



3:30PM Breach (2030Z) 06 FEB 2023

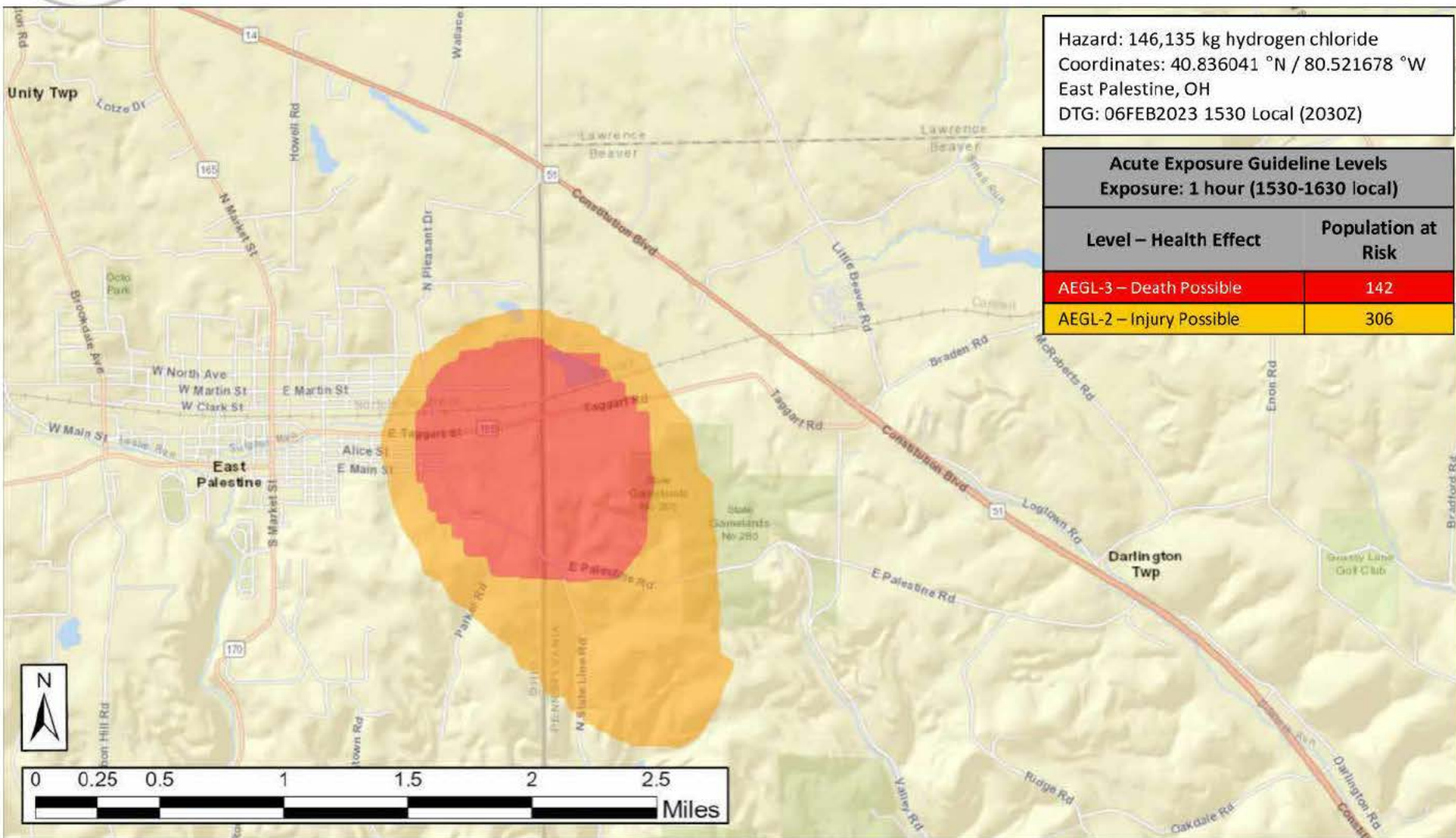


Hydrogen Chloride – 1530 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306





CUI

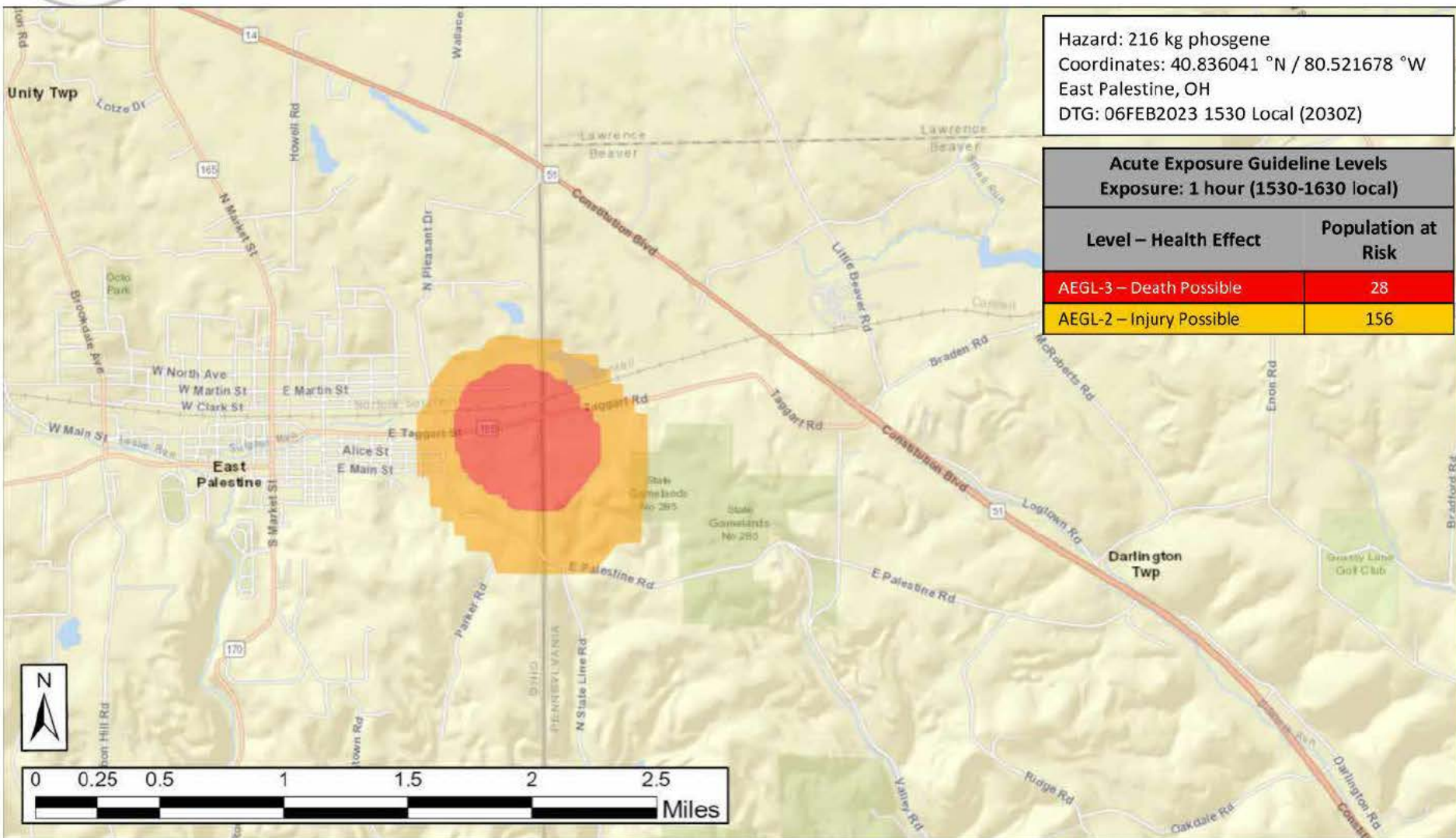
RFI 22-0081hU

Phosgene – 1530 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI

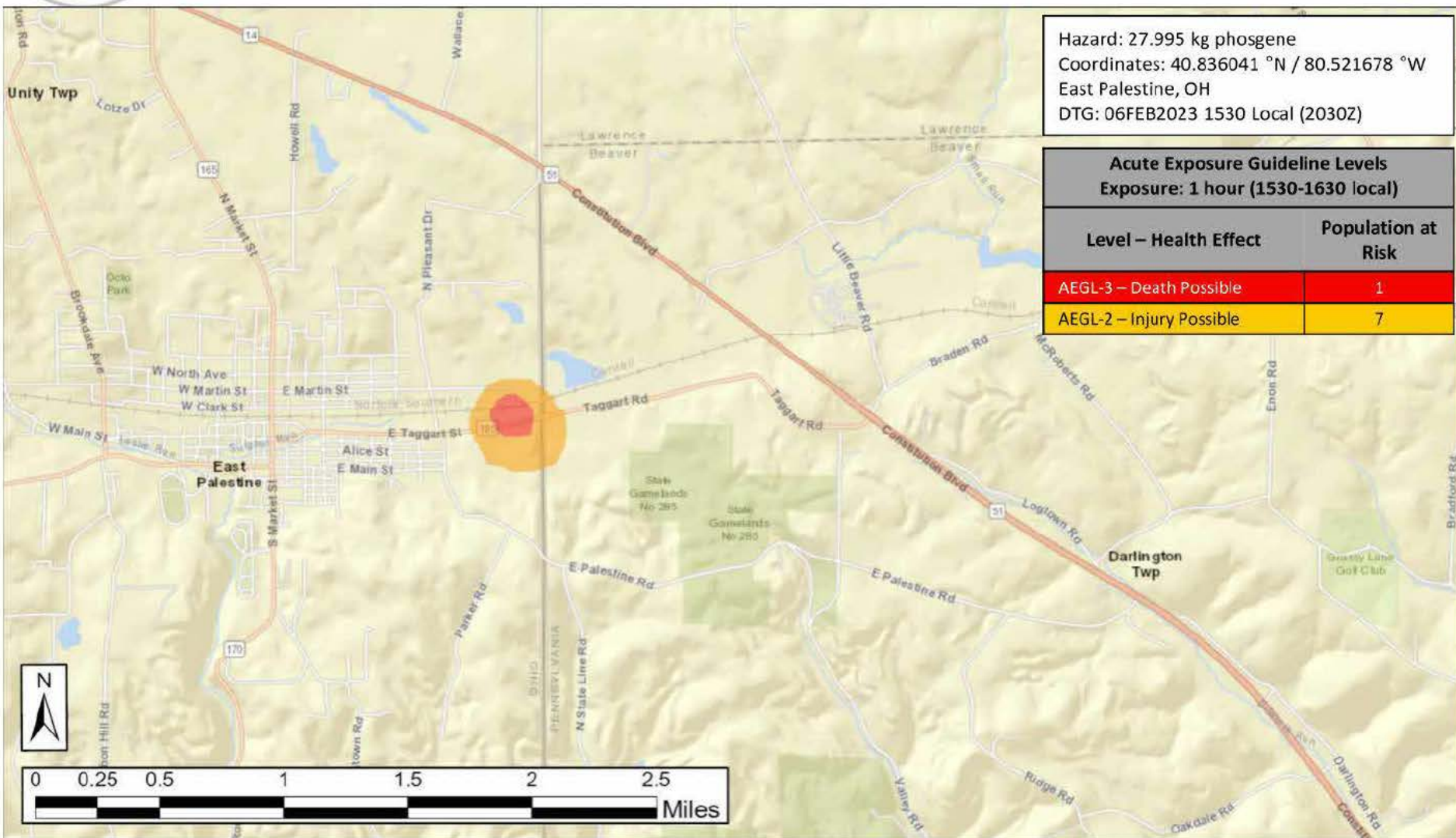


Vinyl Chloride – 1530 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7





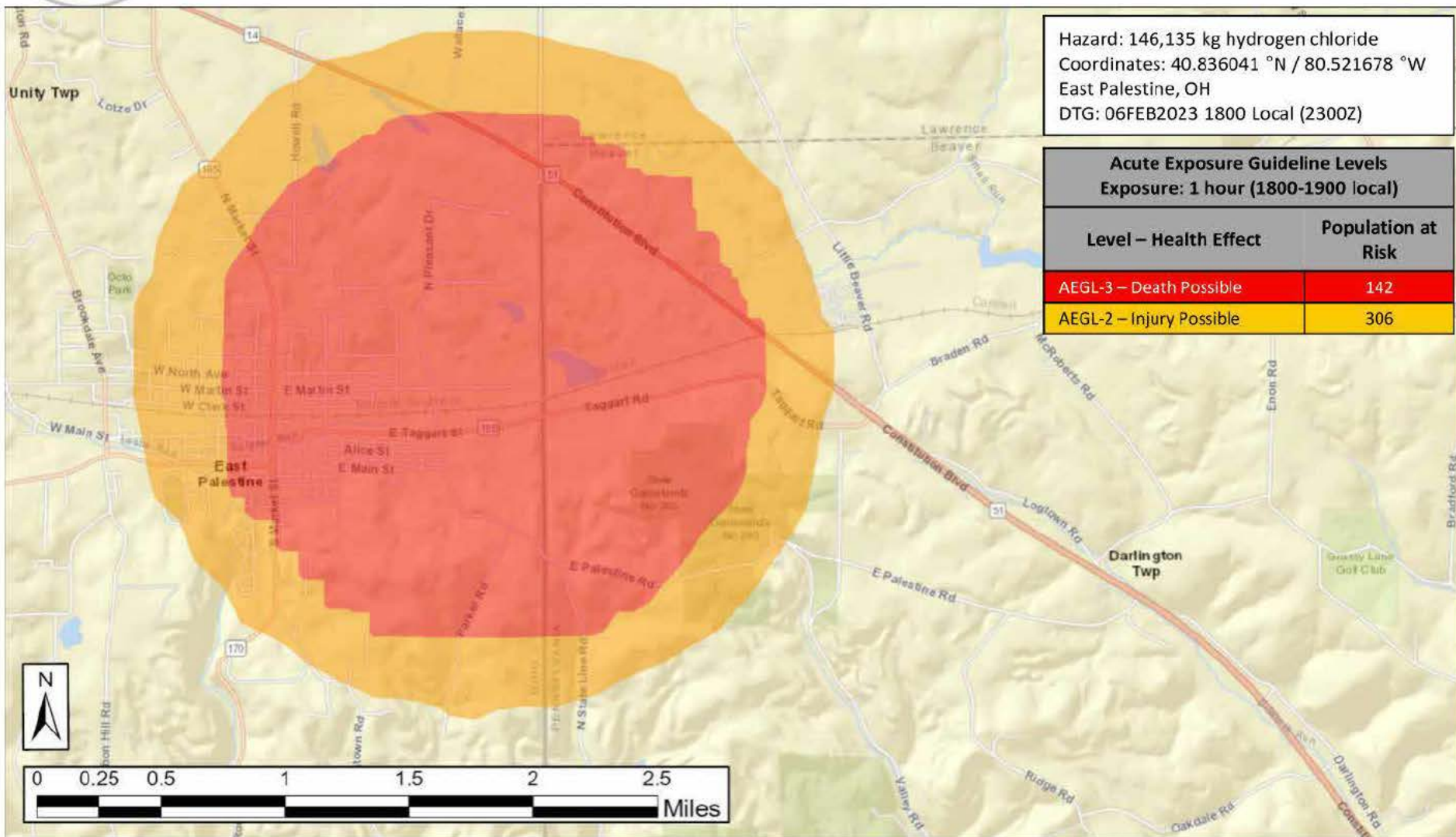
**6:00PM Breach (2300Z)
06 FEB 2023**



CUI

RFI 22-0081hU

Hydrogen Chloride – 1800 Local



CUI

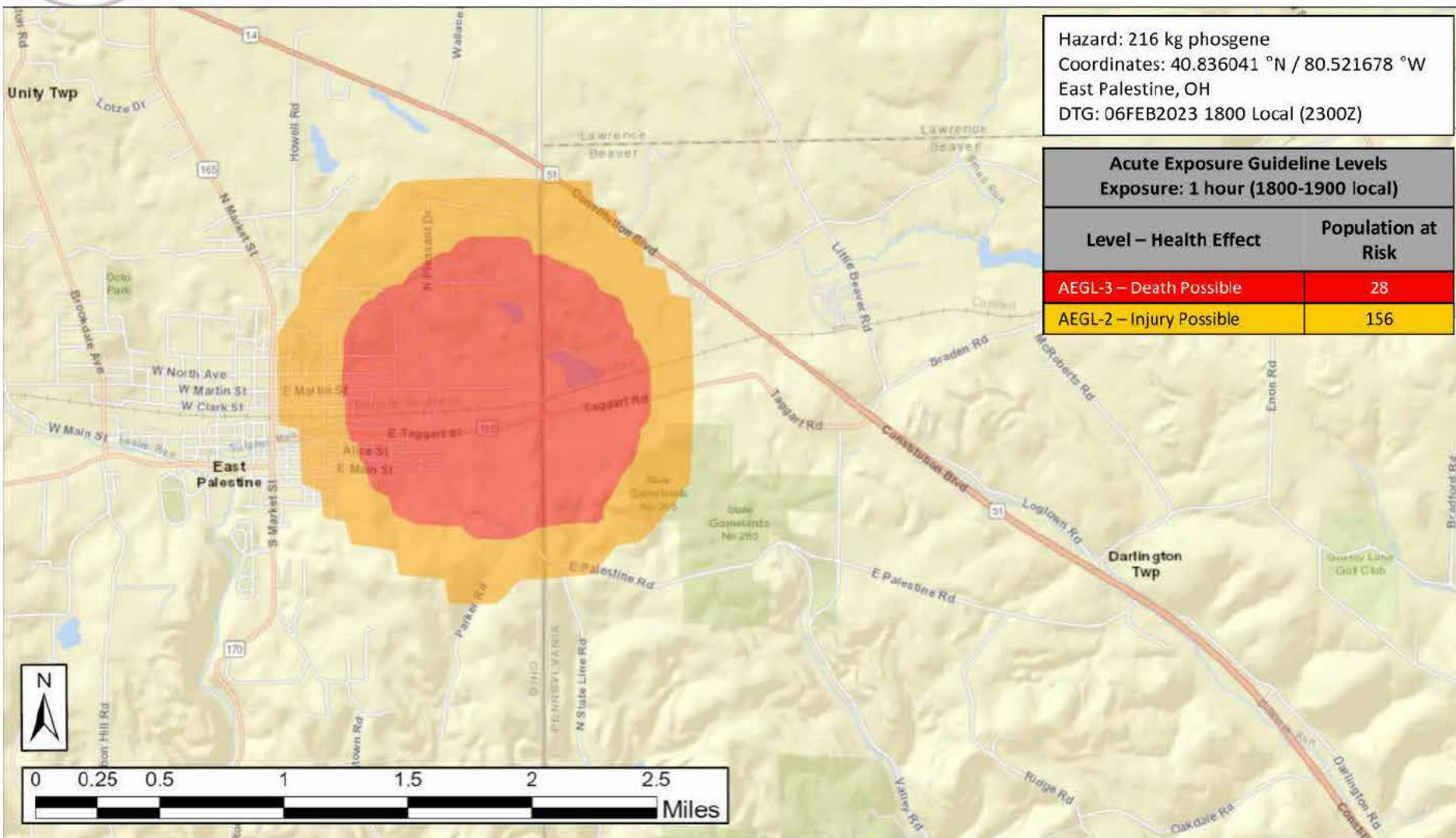


Phosgene – 1800 Local

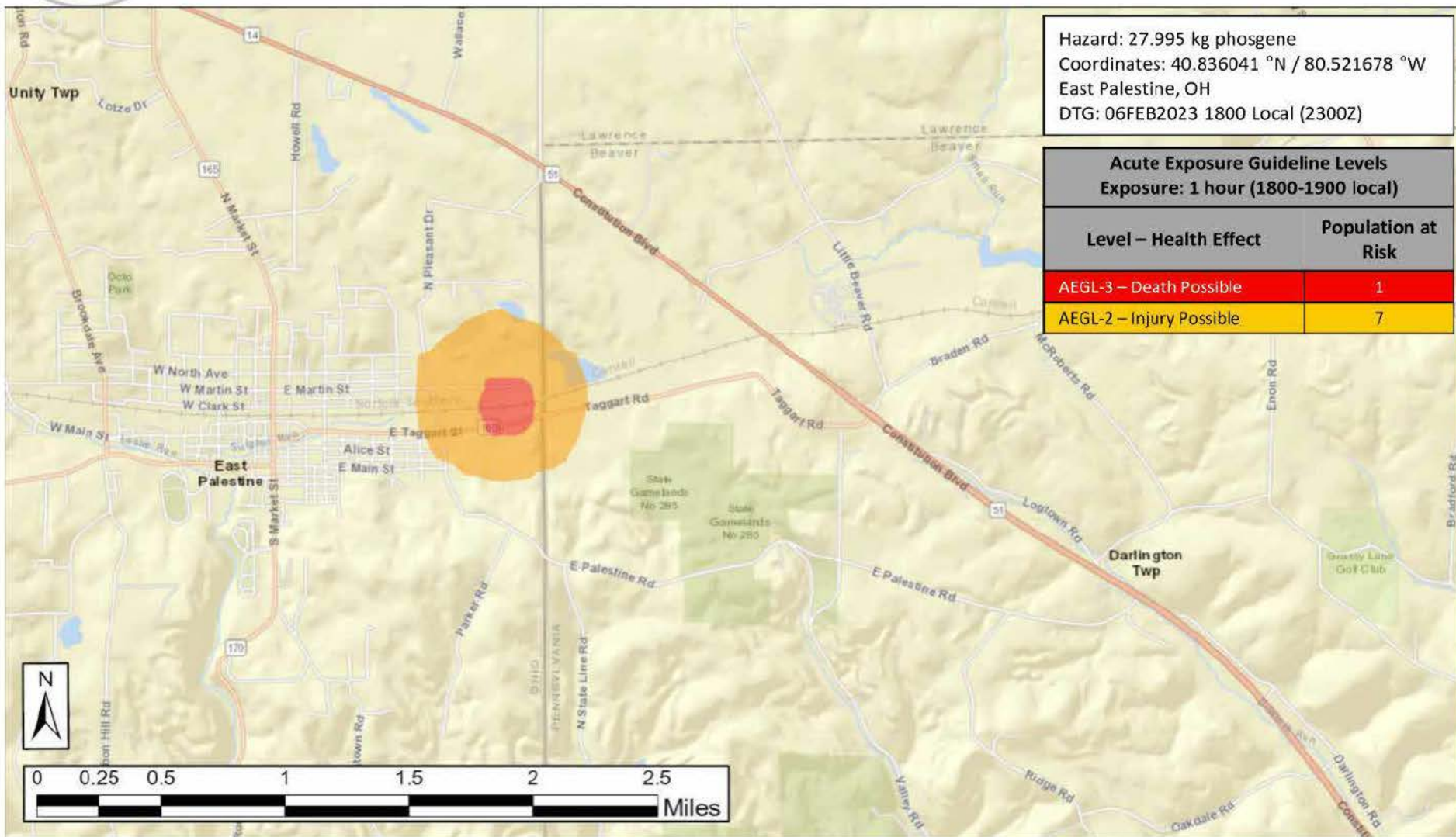
Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



Vinyl Chloride – 1800 Local





Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081hU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



CUI



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, 1985; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, 1977

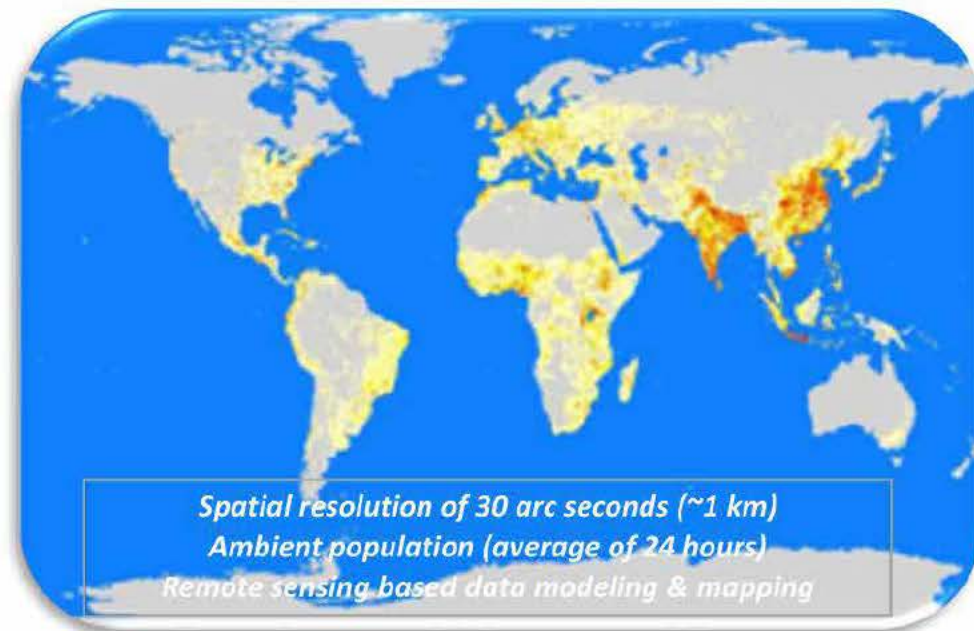


Population Data

CUI

RFI 22-0081hU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 21:25:31 +0000
To: (b) (6)
[REDACTED]
[REDACTED]
[REDACTED] DTRA Ft Belvoir RD Mailbox Reachback
Subject: IMAAC support for train derailment
Attachments: smime.p7s

All -

We will keep this request "open", but we are not planning to do any further modeling unless requested. We are standing by.

Respectfully,

(b) (6)

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
RD Directorate
Technical Reachback Division

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 20:43:10 +0000
To: (b) (6)
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: We are famous
Attachments: smime.p7s

<https://www.cbsnews.com/pittsburgh/live-updates/east-palestine-ohio-train-de-railment-hazardous-materials-ntsb-evacuations/>

The PA governor showed our plume in his news conference as well.

Respectfully,

(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3445/8 (427-)
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
Research and Development Directorate, Technical Reachback Division

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 21:25:57 +0000
To: fema-nwc@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA)
Subject: IMAAC RFIs
Attachments: RFI_23-0081hU_IMAAC.pdf, RFI_23-0081gU_IMAAC.pdf, RFI_23-0081fU_IMAAC.pdf, RFI_23-0081eU_IMAAC.pdf, smime.p7s

CUI

Good Afternoon,

Please see the updates attached for the IMAAC. The most recent is version h (RFI 23-0081hU_IMAAC.pdf). I will send another email with others that were done over the weekend.

Respectfully,

(b) (6)

Defense Threat Reduction Agency
COM: (703) 767-3445/8 (427-)
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
Research and Development Directorate, Technical Reachback Division

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

CUI



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081hU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 5 railcars, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1530 06FEB2023 Local (2030Z) 2. 1800 06FEB2023 Local (2030Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081hU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



3:30PM Breach (2030Z) 06 FEB 2023

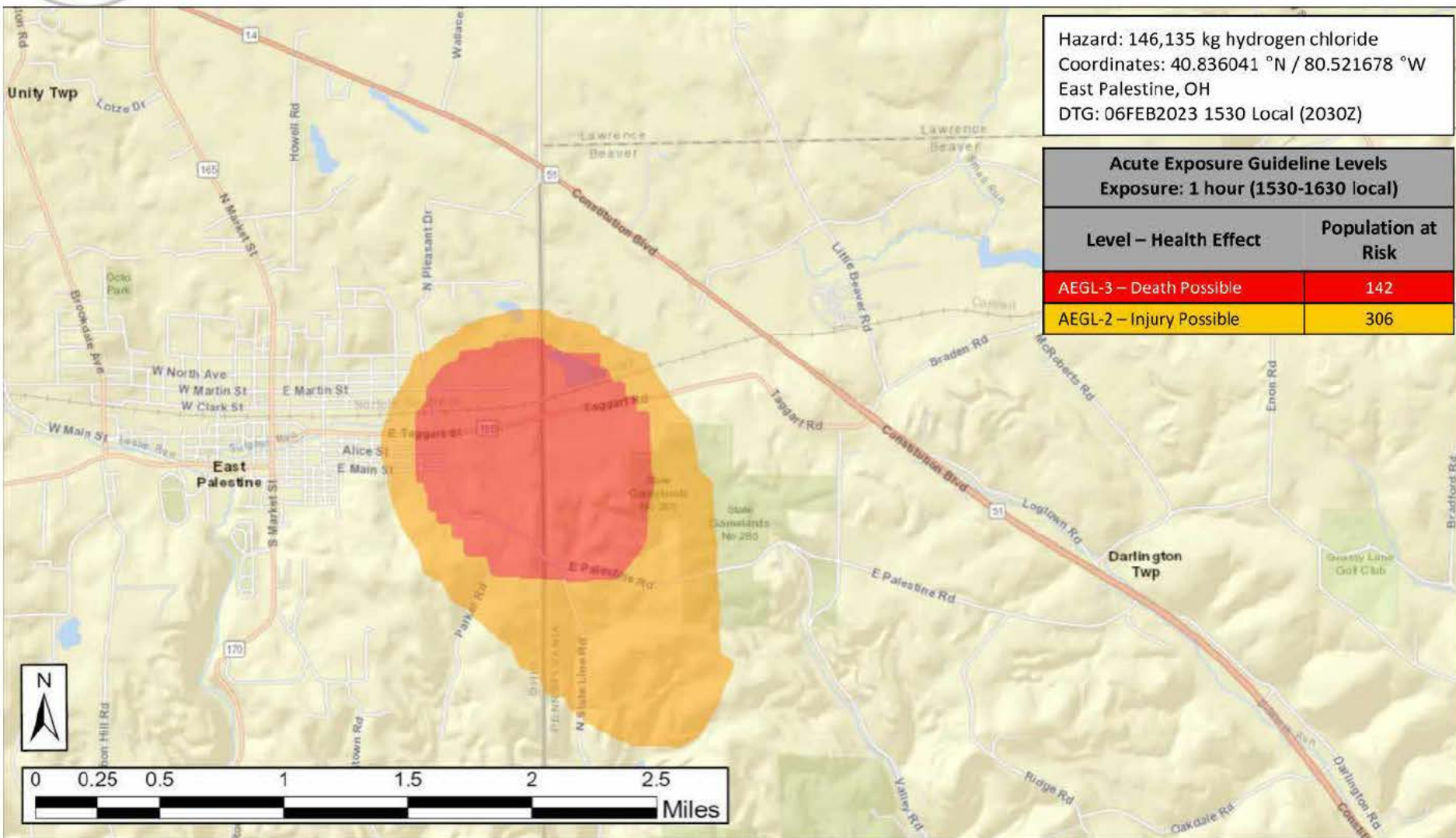


Hydrogen Chloride – 1530 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



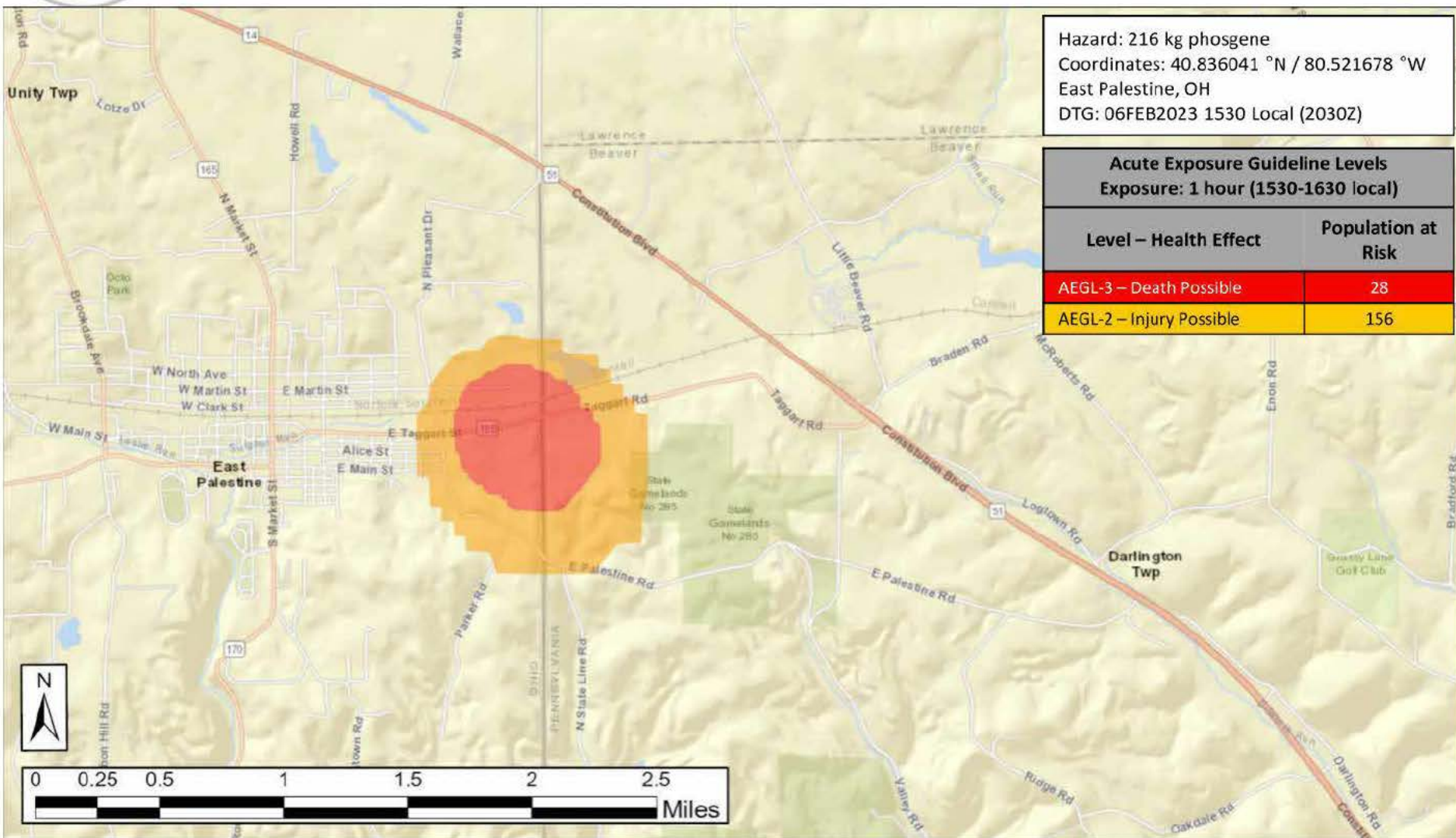


Phosgene – 1530 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156





~~CUI~~

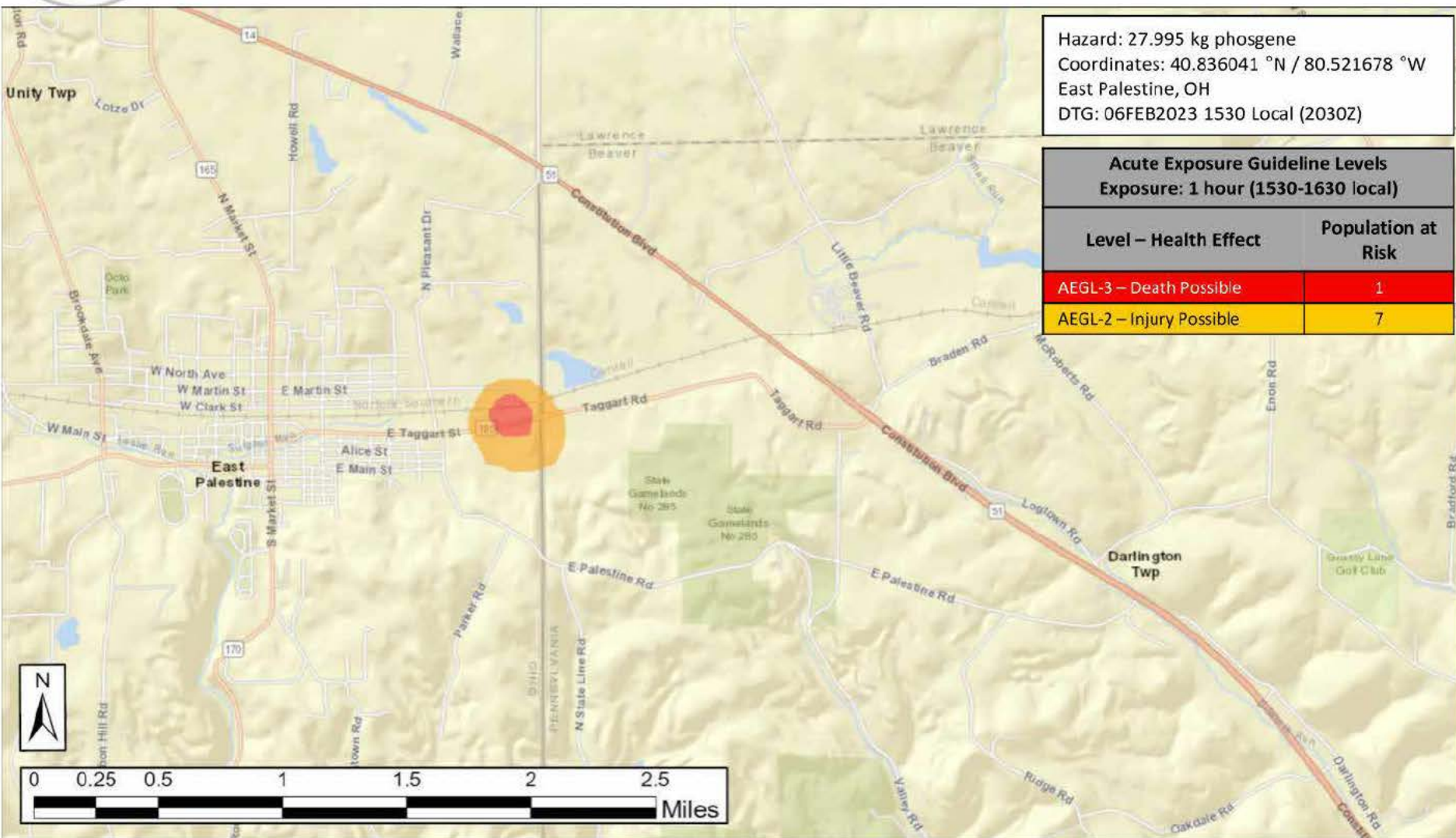
RFI 22-0081hU

Vinyl Chloride – 1530 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



~~CUI~~



6:00PM Breach (2300Z) 06 FEB 2023



CUI

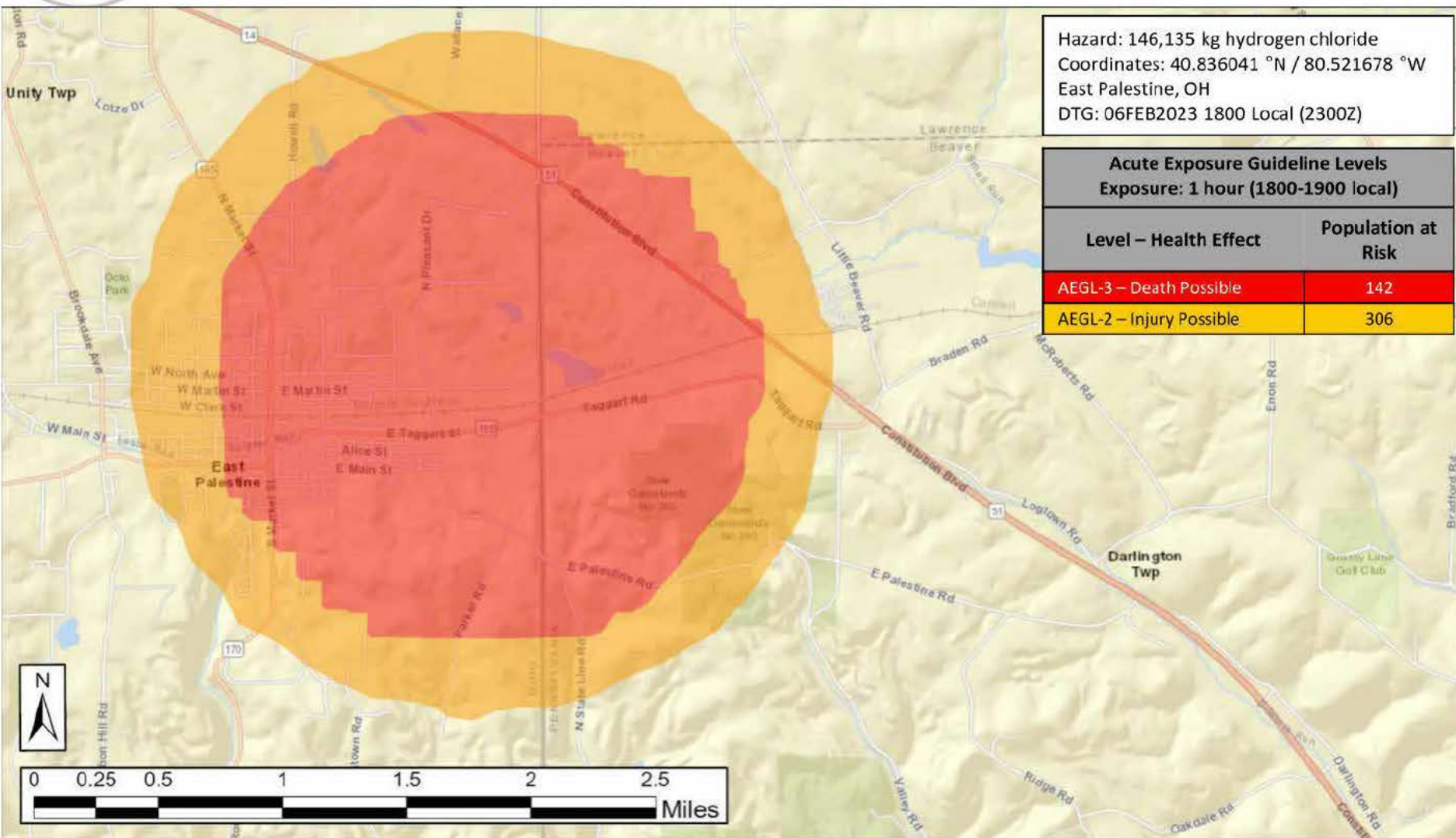
RFI 22-0081hU

Hydrogen Chloride – 1800 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



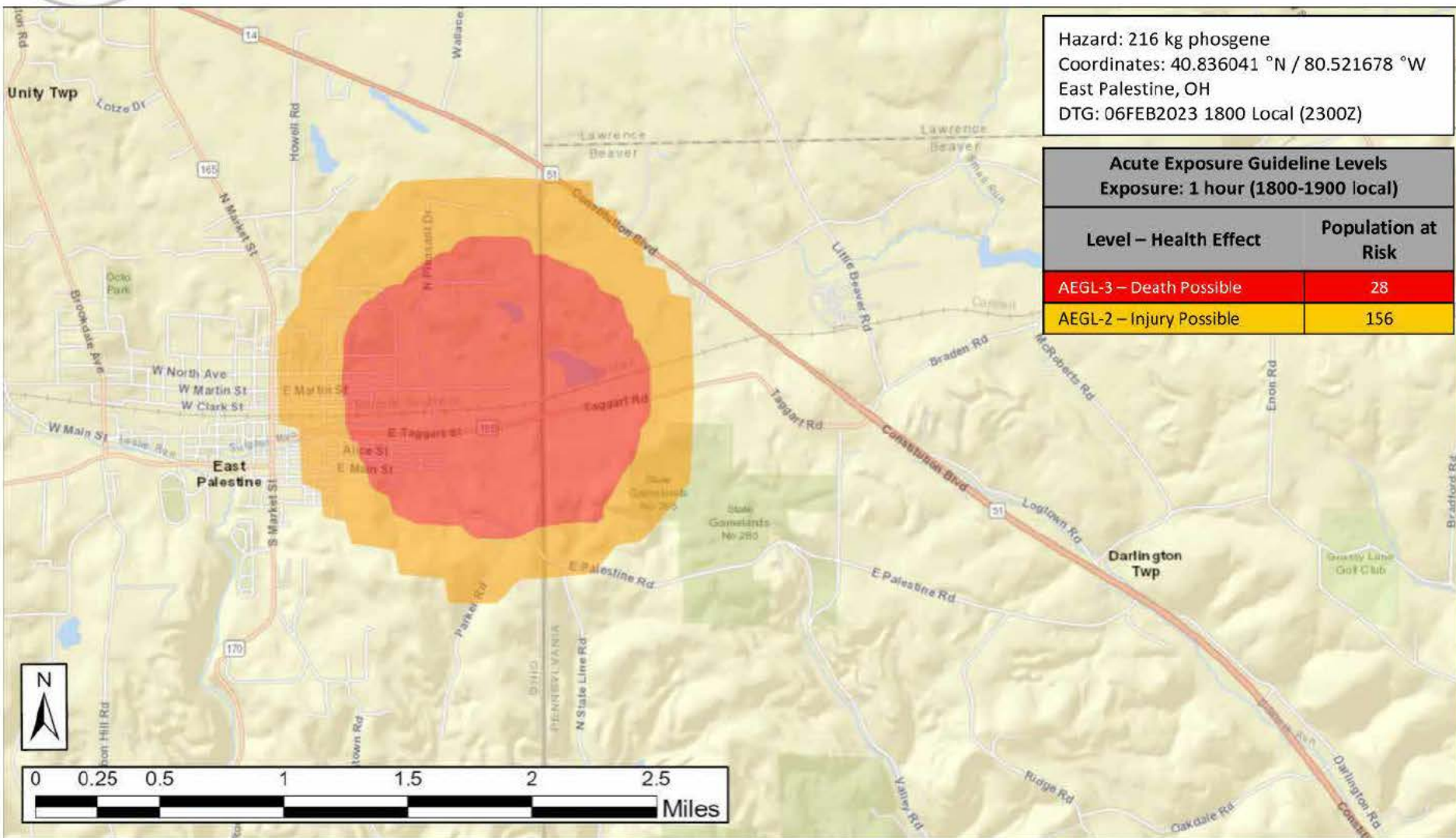
CUI



~~CUI~~

RFI 22-0081hU

Phosgene – 1800 Local



~~CUI~~

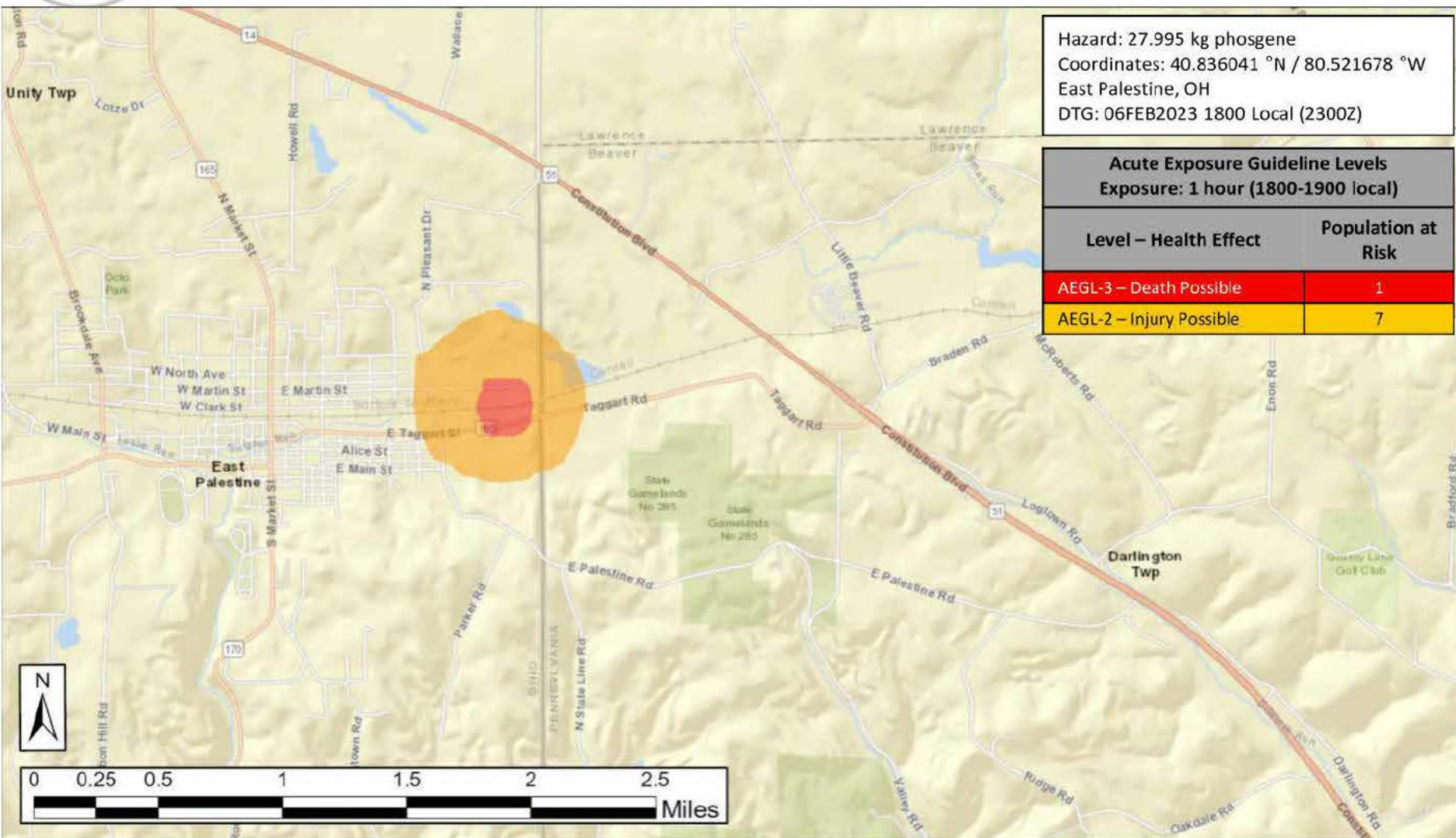


Vinyl Chloride – 1800 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7





Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081hU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



CUI



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

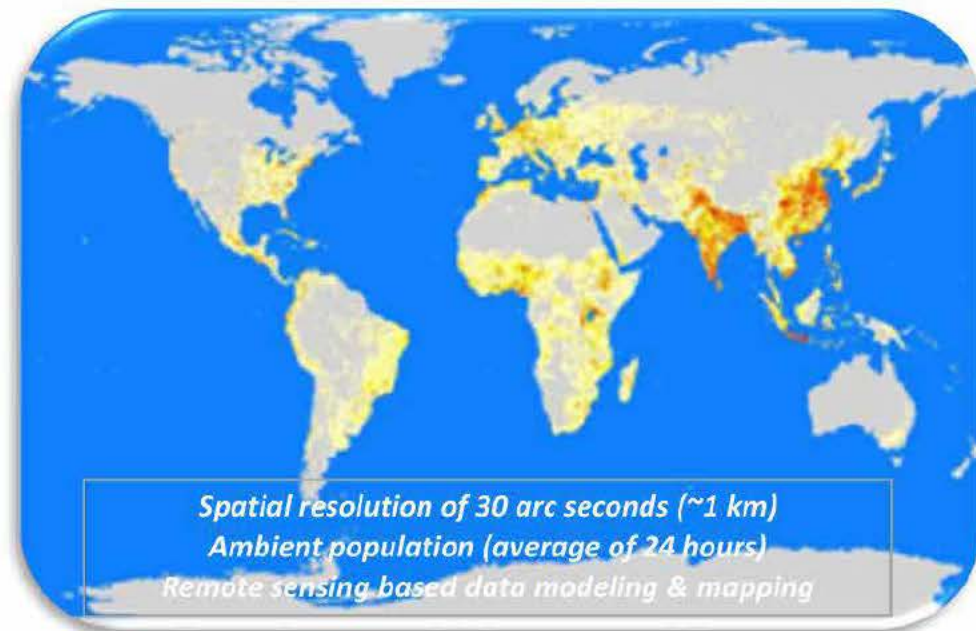
Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, **1977**



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

Date: 06FEB2023 1745Z

Version: Revision G

Changes: Planned breach model; adjusted amounts (see Slide #3)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081gU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 1 single railcar, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1400 06FEB2023 Local (1900Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3) 10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081gU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



~~CUI~~

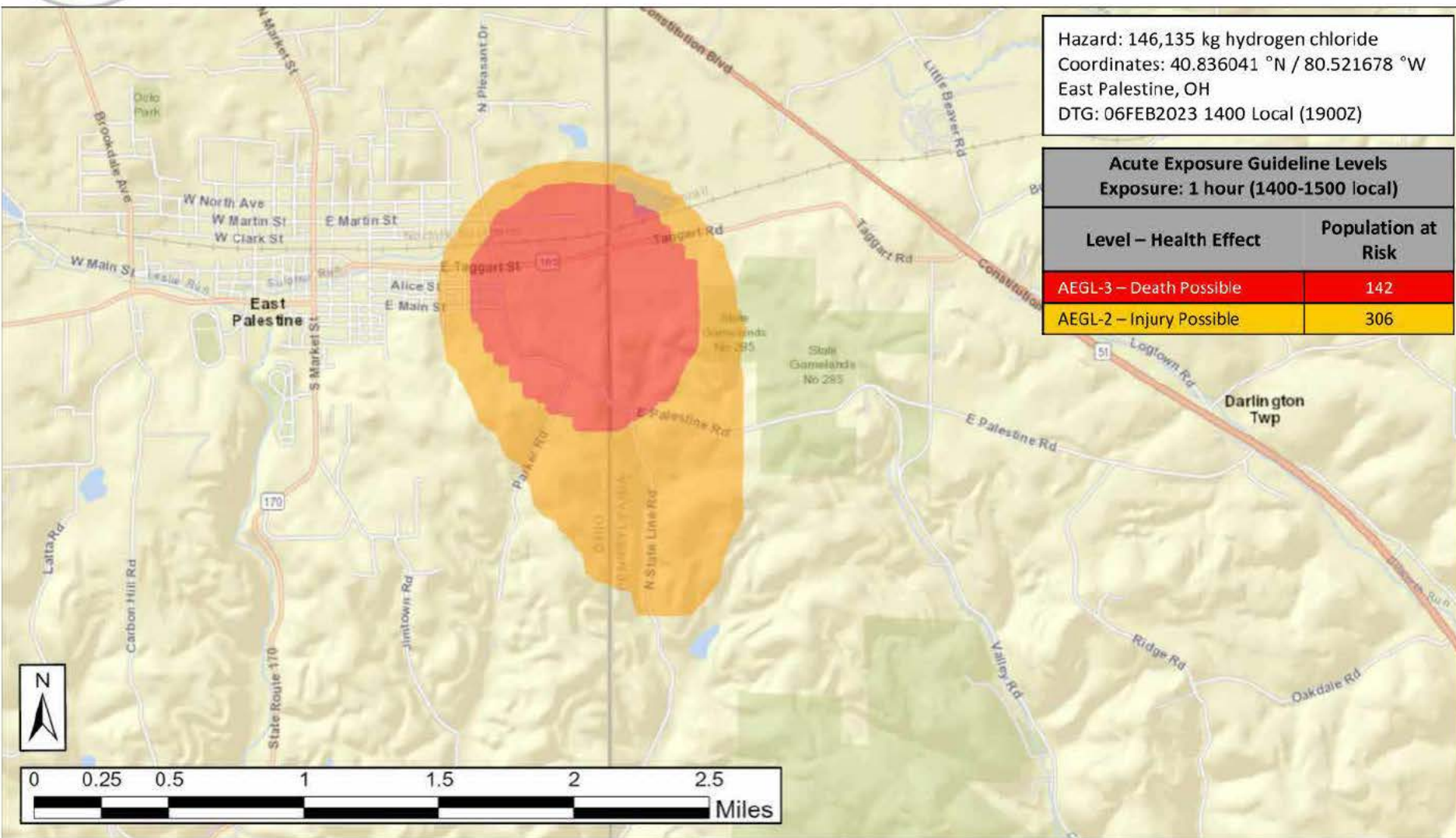
RFI 22-0081gU

Hydrogen Chloride – 1400 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



~~CUI~~



~~CUI~~

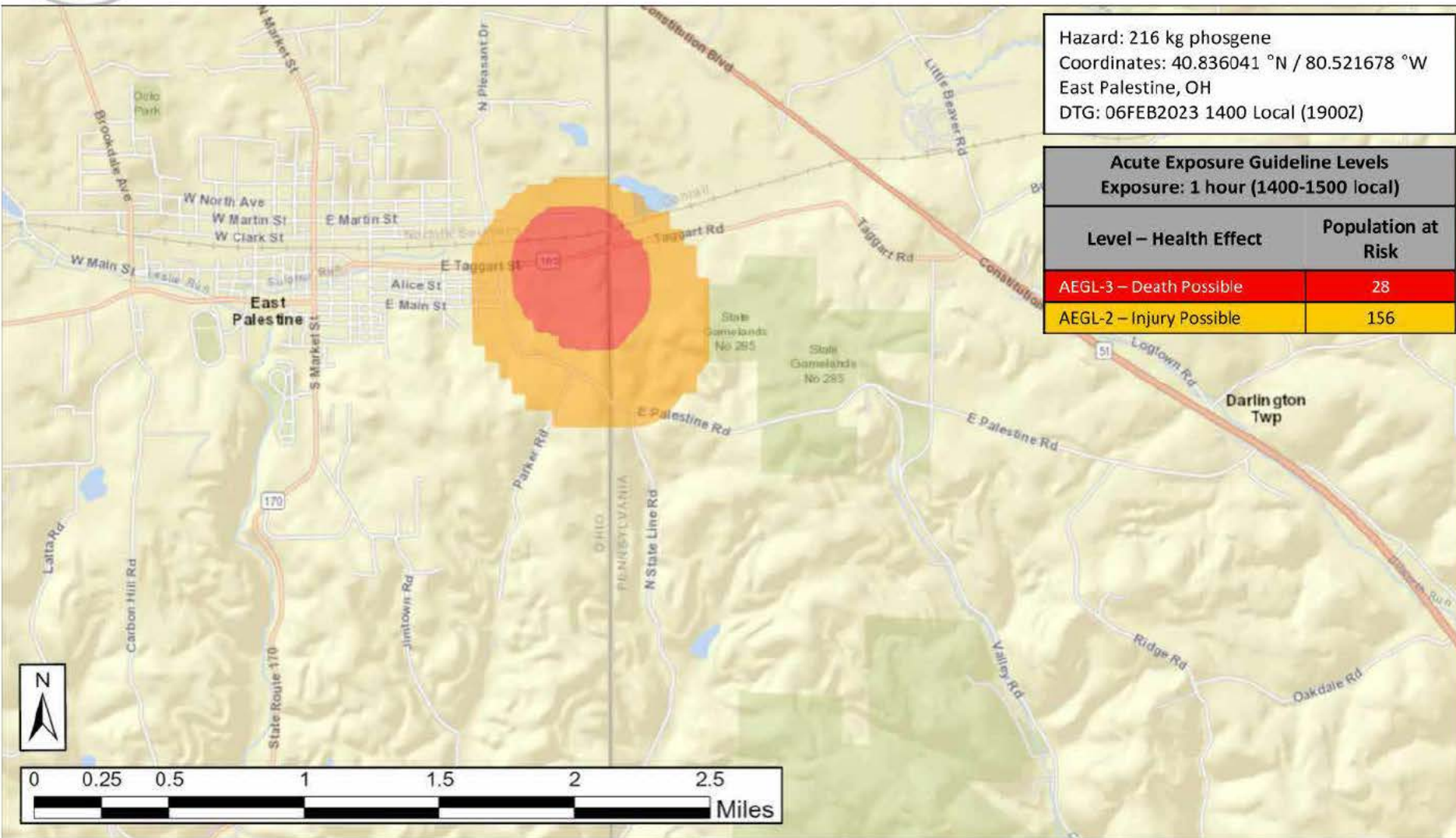
RFI 22-0081gU

Phosgene – 1400 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



~~CUI~~



CUI

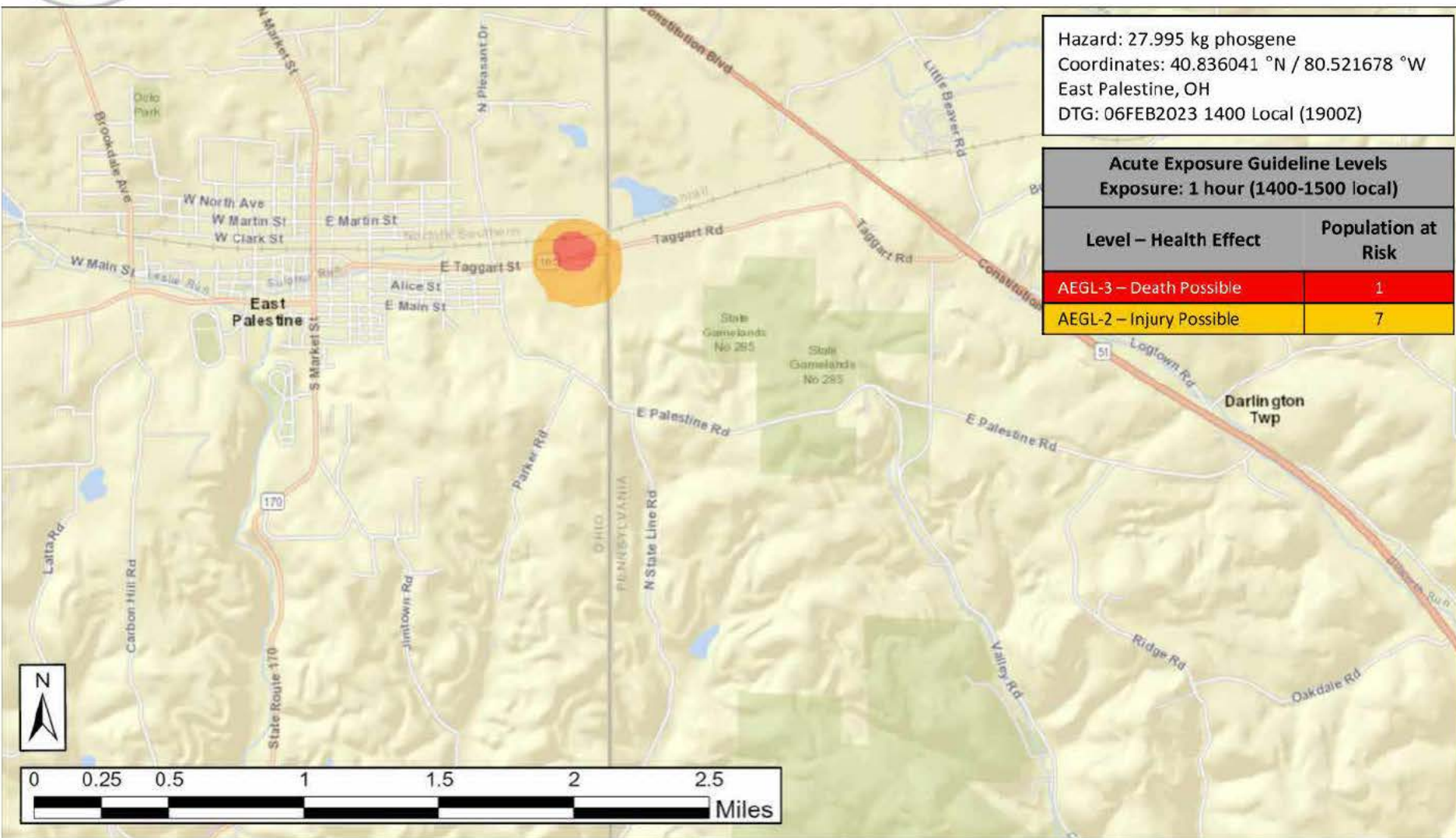
RFI 22-0081gU

Vinyl Chloride – 1400 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



CUI



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081gU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



CUI



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, **1977**

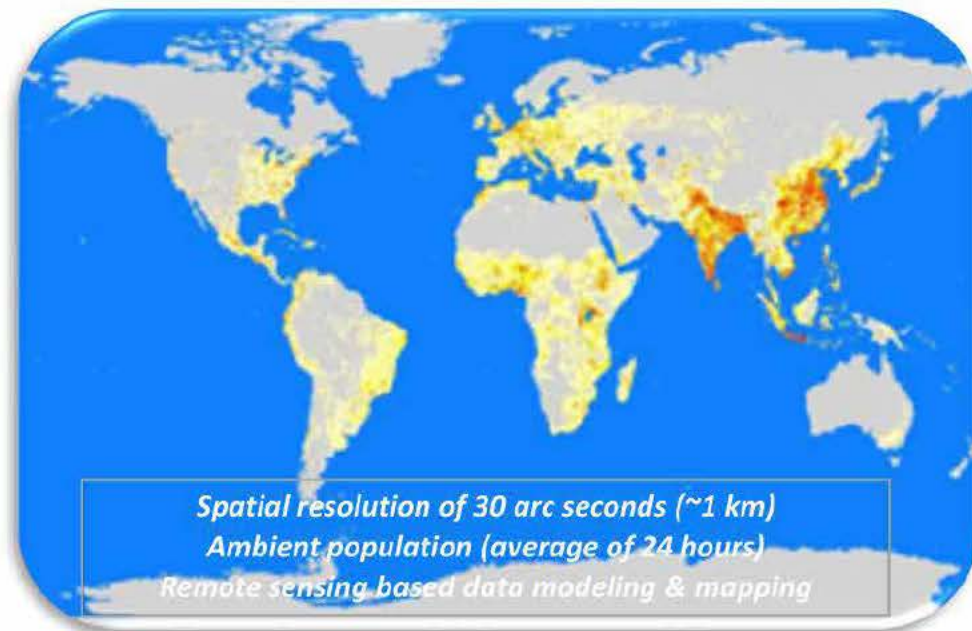


Population Data

CUI

RFI 22-0081gU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

~~CUI~~

Date: 06FEB2023 1045Z

Version: Revision F

Changes: Added BLEVE Scenario



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081fU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O) • HCl BLEVE
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 163 and 119 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 29 and 24 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 4 and 5 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • BLEVE from vaporized HCl can produce minor injuries out to 226 meters in a worst case scenario.



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).
- Worst-case situations are modeled, in which the vinyl chloride is wholly consumed in the fire and converts completely to either hydrogen chloride or phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decomposing to phosgene. Amounts modeled likely overstate the expected hazard and be considered an absolute worst-case hazard (upper bound).
- A worse case BLEVE outcome is provided, where all available HCl is vaporized into a pressure wave. HCl is non-flammable and does not pose a thermal hazard.

0600 Local (1100Z)

06FEB2023



~~CUI~~

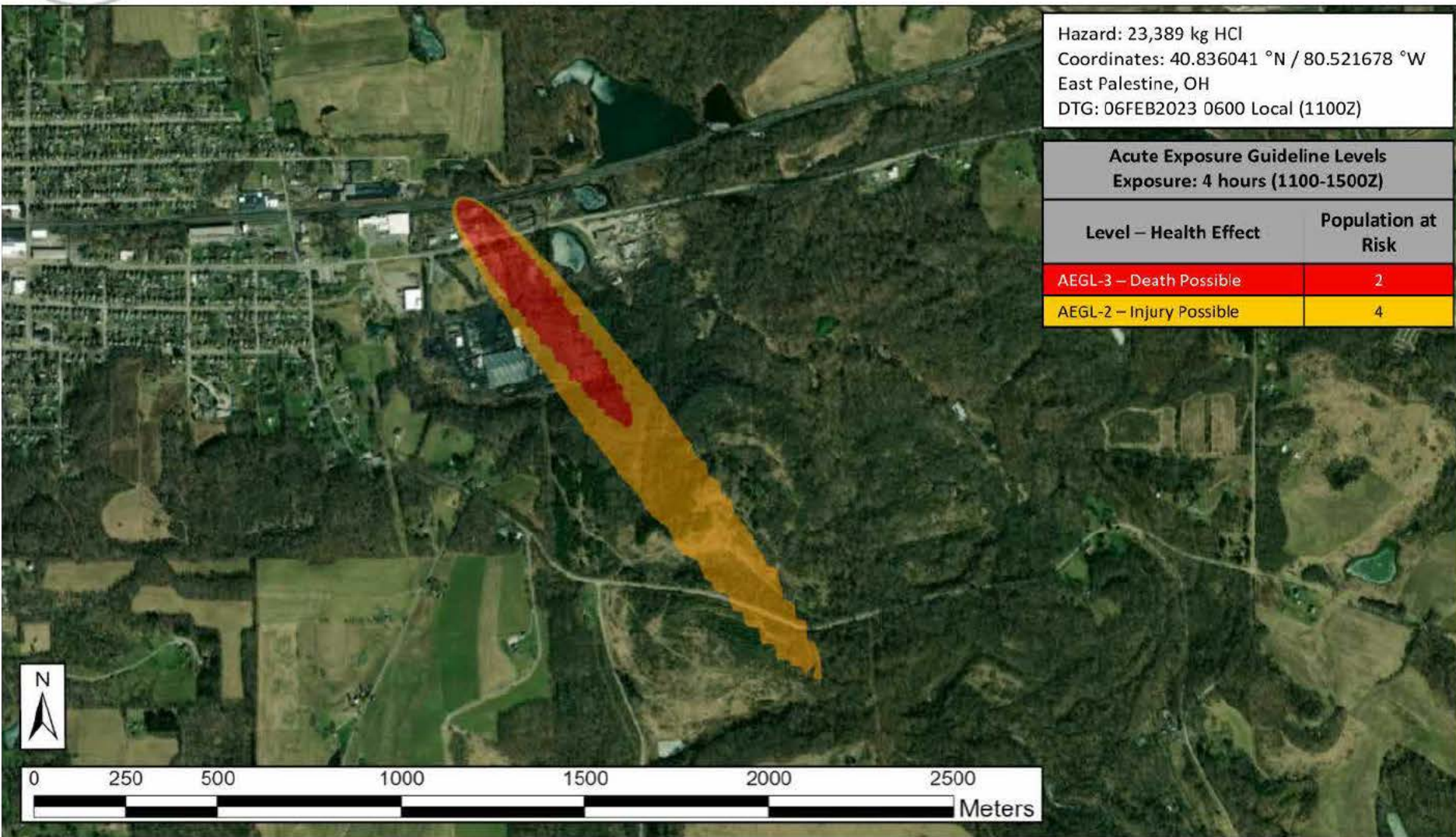
RFI 22-0081fU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

**Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)**

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	4



~~CUI~~



~~CUI~~

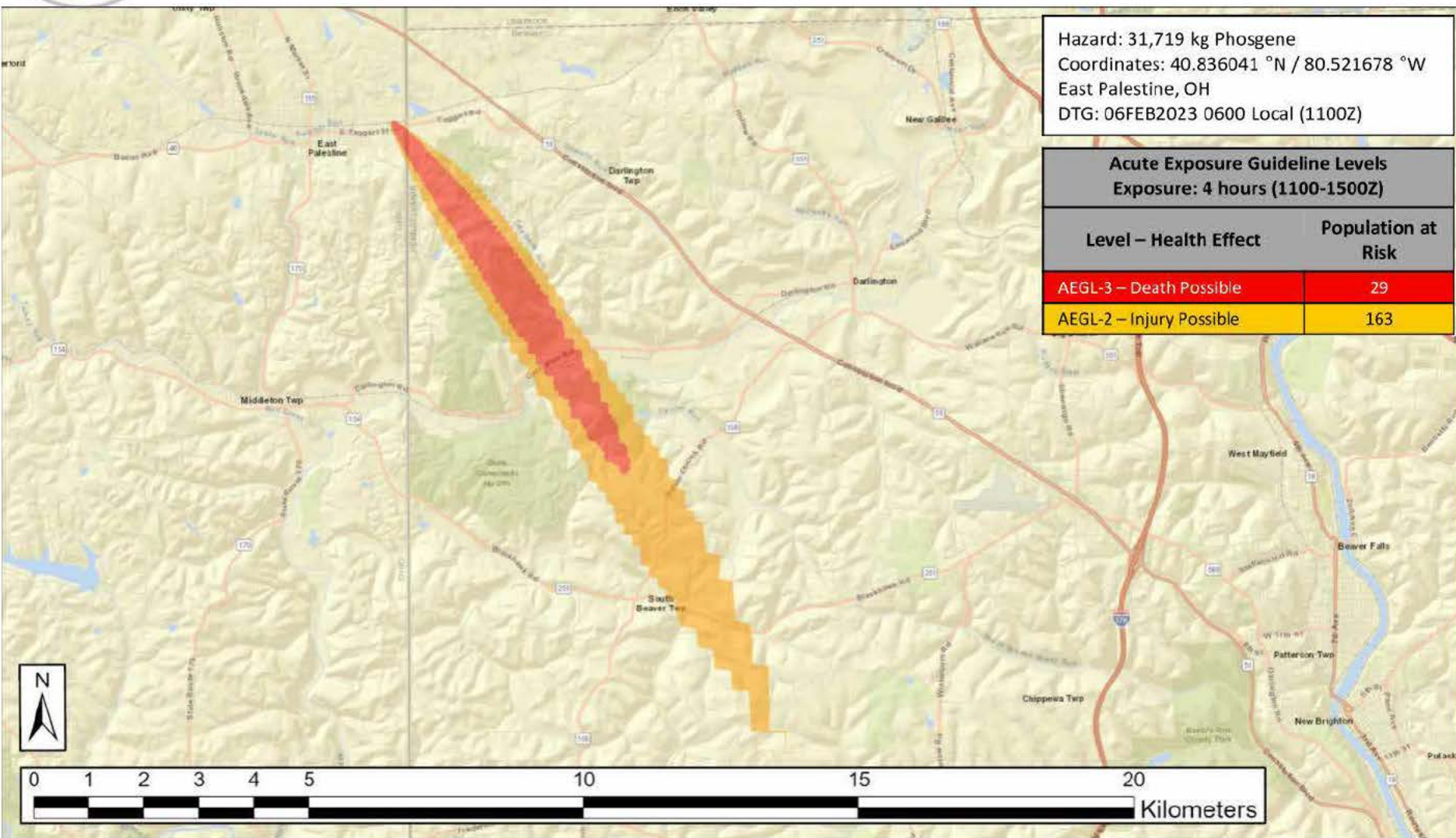
RFI 22-0081fu

Phosgene – 0600 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	29
AEGL-2 – Injury Possible	163



~~CUI~~



~~CUI~~

RFI 22-0081fU

Soot– Surface Dosage – 0600 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0600 Local (1100Z)

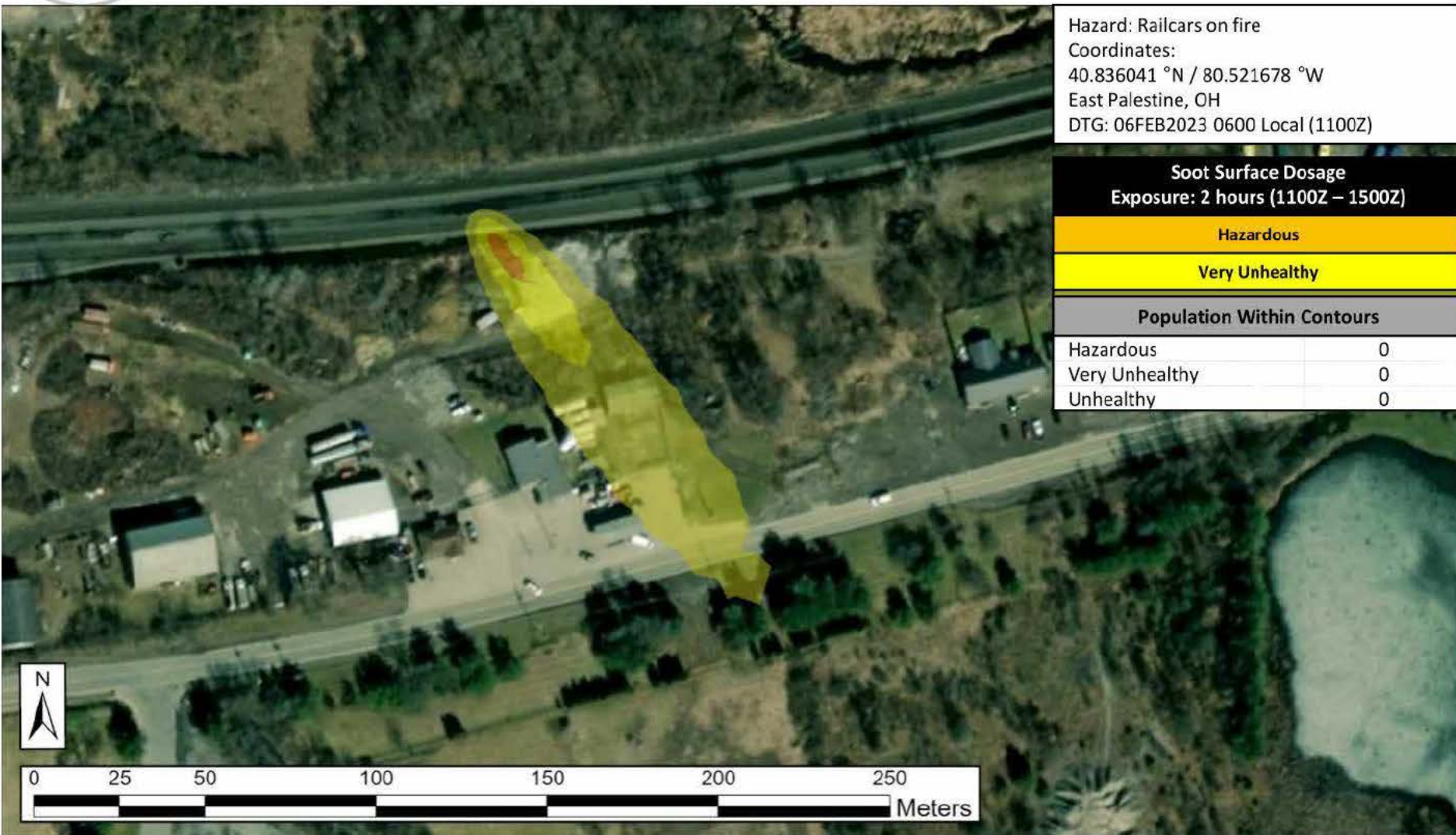
Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

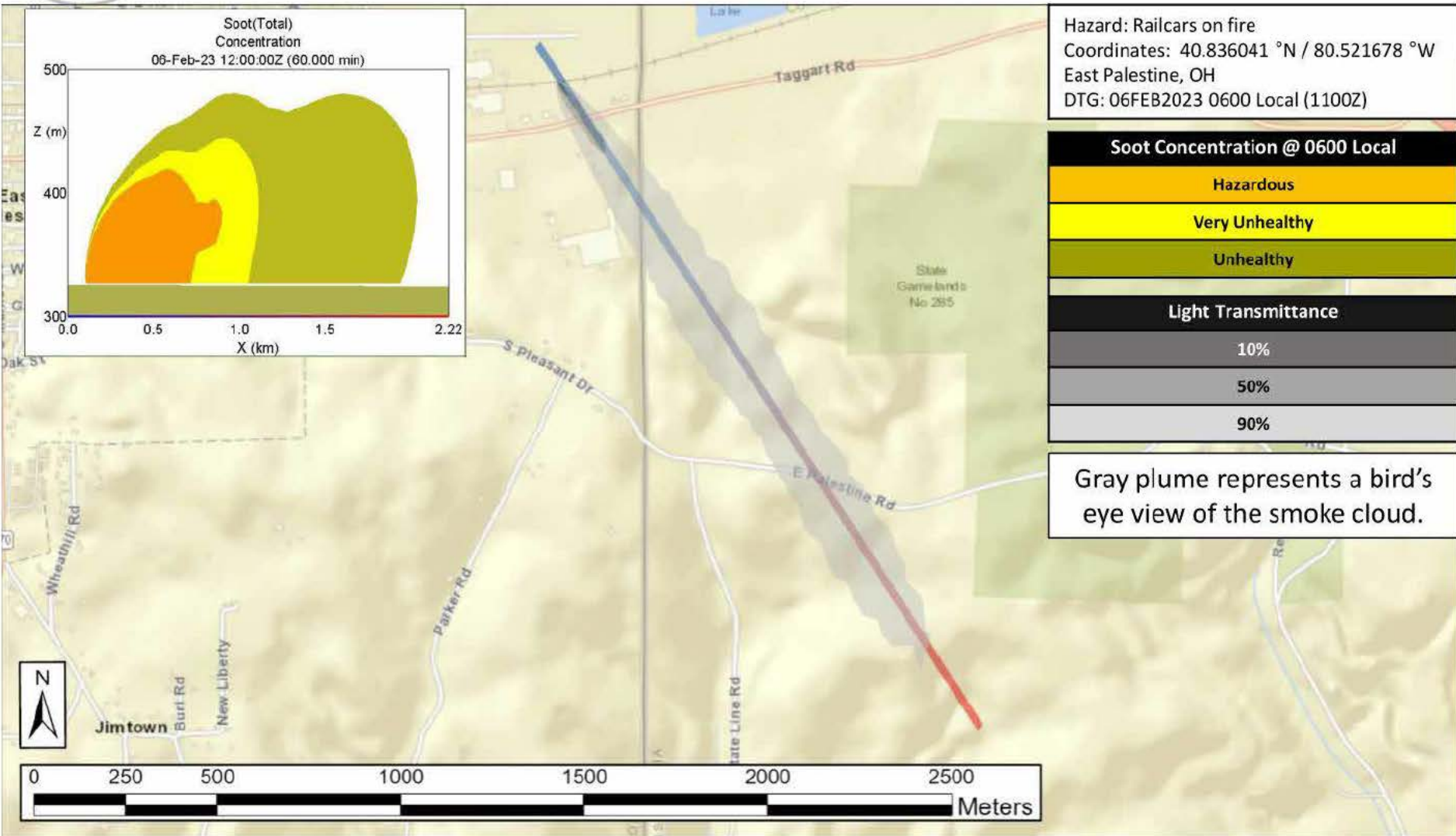
Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~

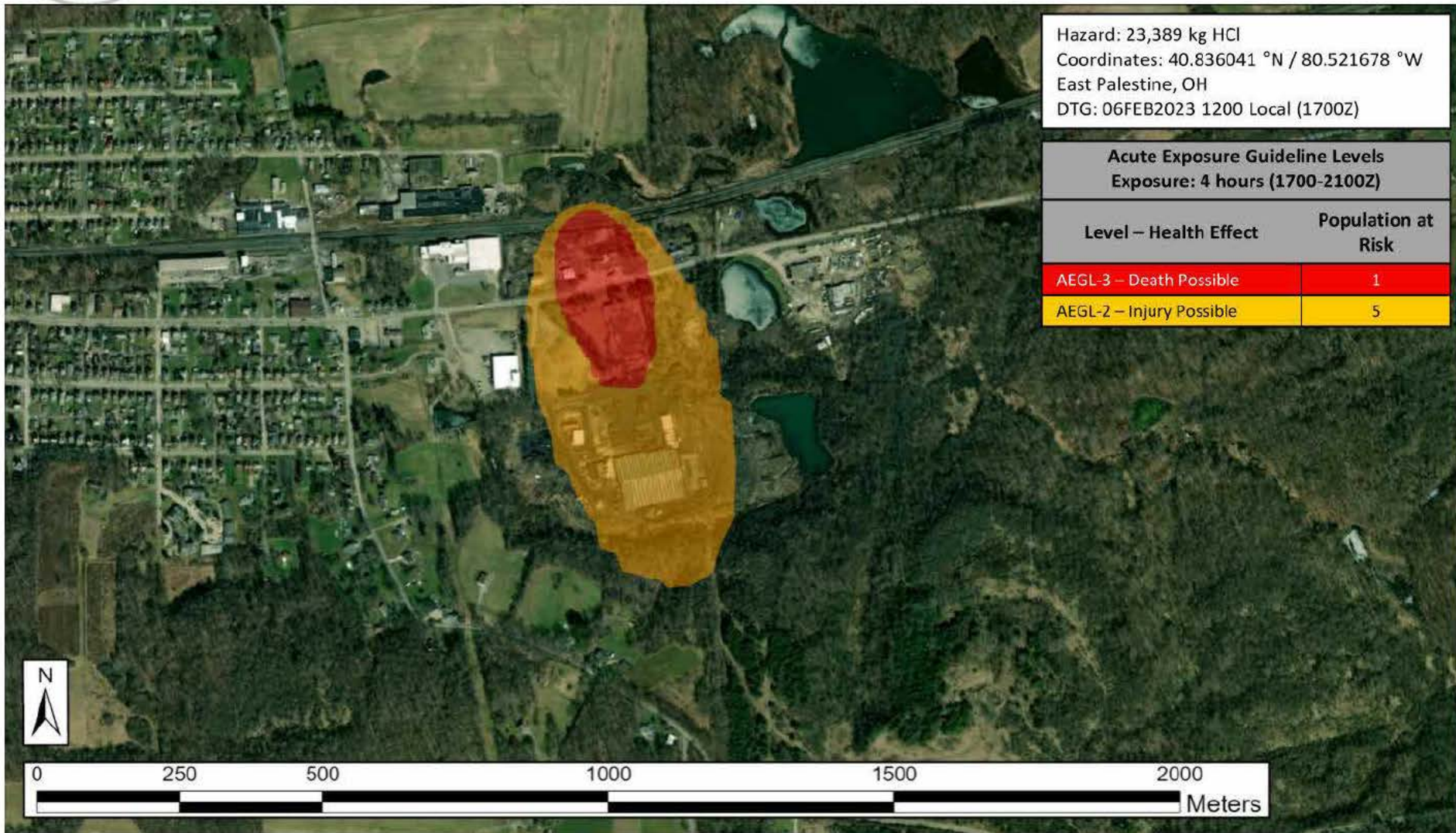
Soot – Vertical Profile – 0600 Local



1200 Local (1700Z)

06FEB2023

Hydrogen Chloride – 1200 Local

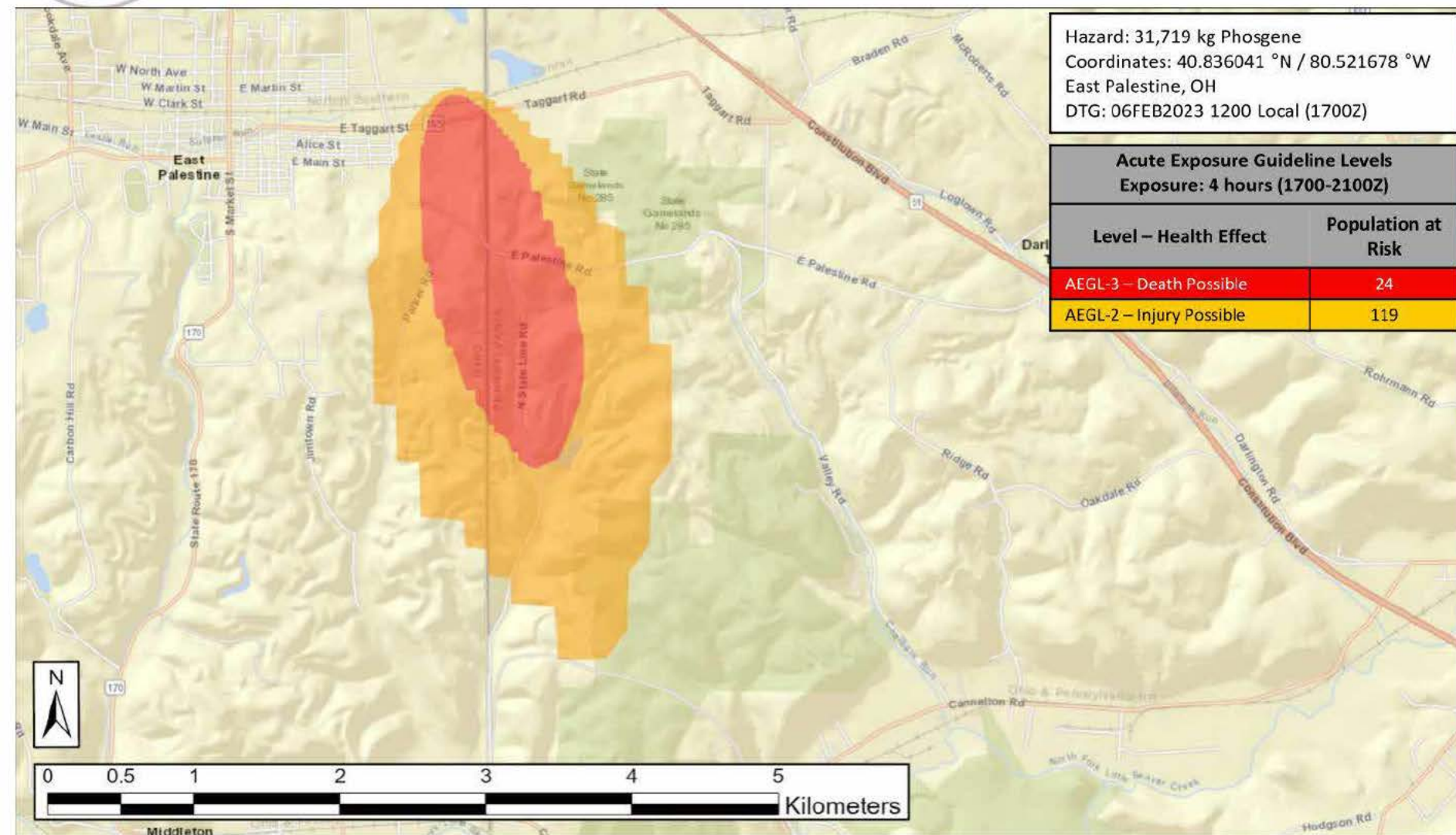




CUI

RFI 22-0081FU

Phosgene – 1200 Local



CUI



~~CUI~~

RFI 22-0081FU

Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

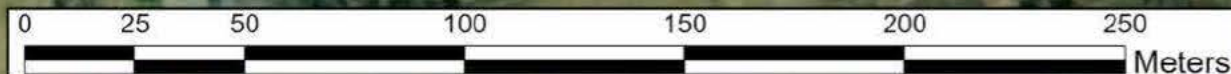
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0



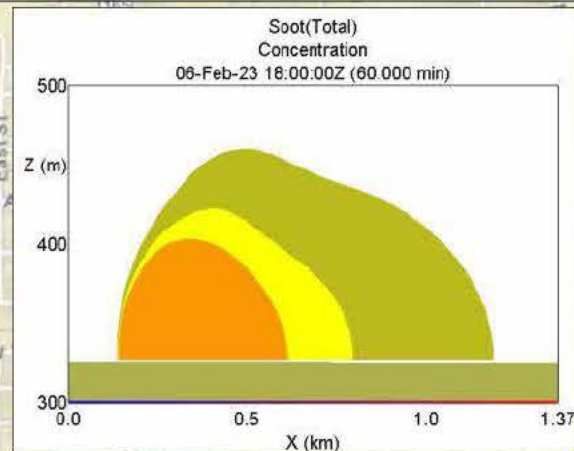
~~CUI~~



CUI

RFI 22-0081fu

Soot – Vertical Profile – 1200 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Concentration @ 1200 Local

Hazardous

Very Unhealthy

Unhealthy

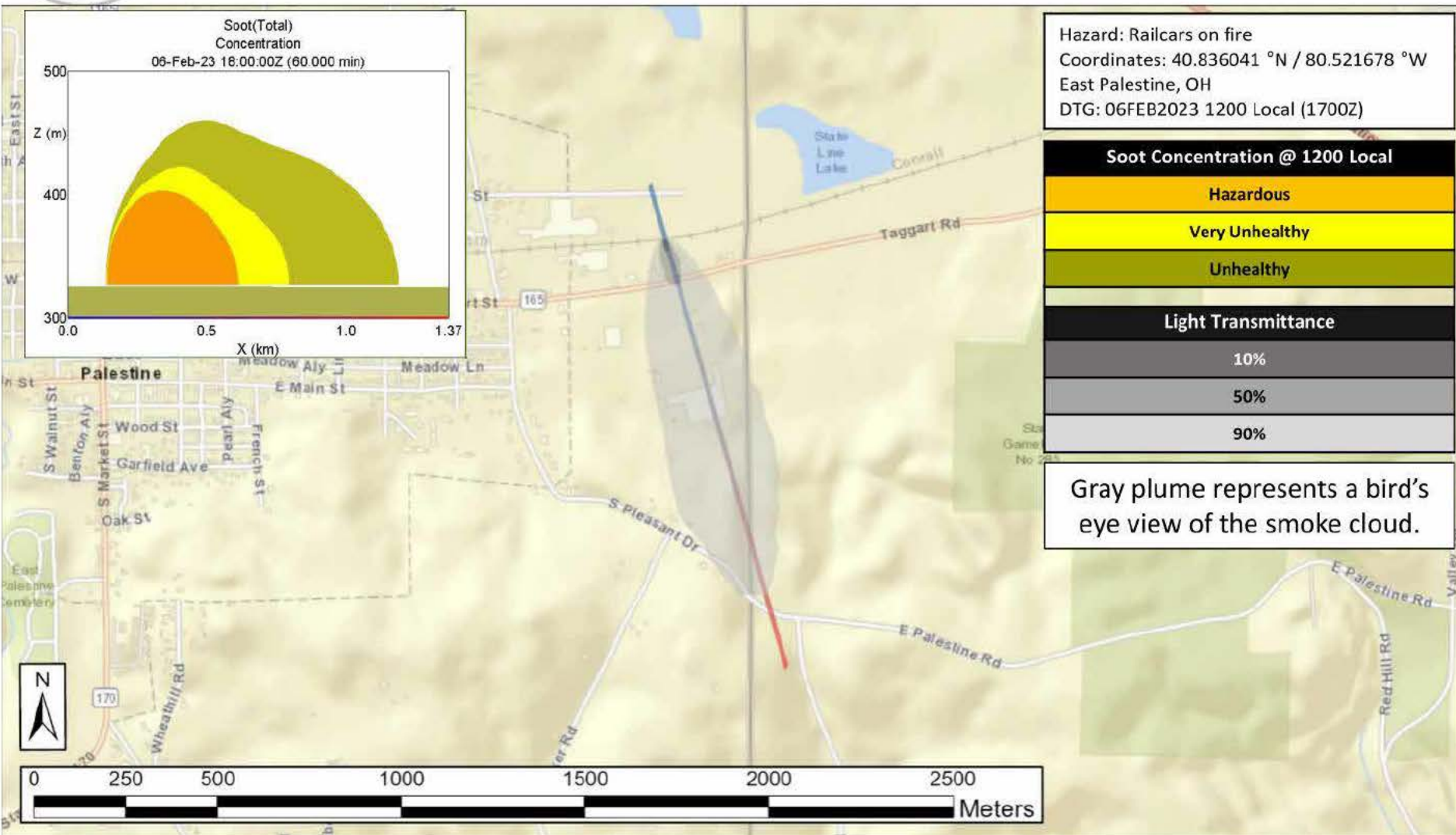
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.



CUI



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



BLEVE Scenario

06FEB2023



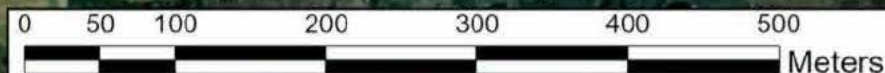
BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Liquid Mass: 23,389 kg
Lofted Mass: 23,389 kg
Estimated NEW: 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.





BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

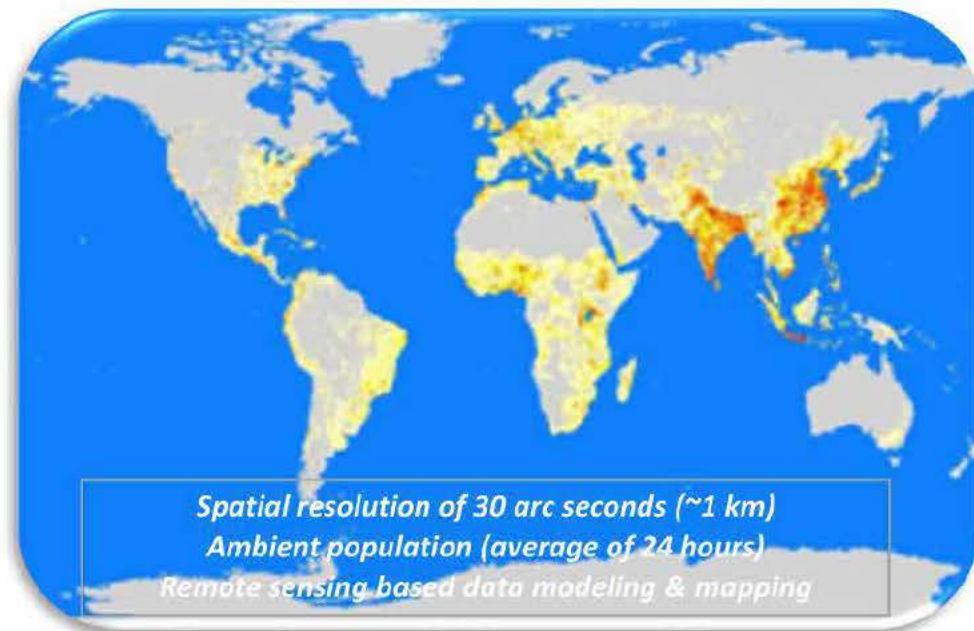
Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, **1977**



Population Data

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

Date: 06FEB2023 0330Z

Version: Revision E

Changes: Updated Time



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081eU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6) EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 06FEB2023 Local (1100Z) 2. 1200 06FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 and 1200 Local, 406 and 70 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 159 and 22 people respectively may be exposed to hazard levels that could possibly result in death. (0600 local model shows fewer at risk). • For HCl at 0600 and 1200 Local, 3 and 6 people respectively are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 and 1 people respectively may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions & Comments

- No additional information was provided on the fire that continues to burn, and no changes were made to the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor: (178,000 lb ~ 81,000 kg).
- Worst-case situations are modeled, in which the vinyl chloride is wholly consumed in the fire and converts completely to either hydrogen chloride or phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decomposing to phosgene. Amounts modeled likely overstate the expected hazard and be considered an absolute worst-case hazard (upper bound).

0600 Local (1100Z)

06FEB2023



CUI

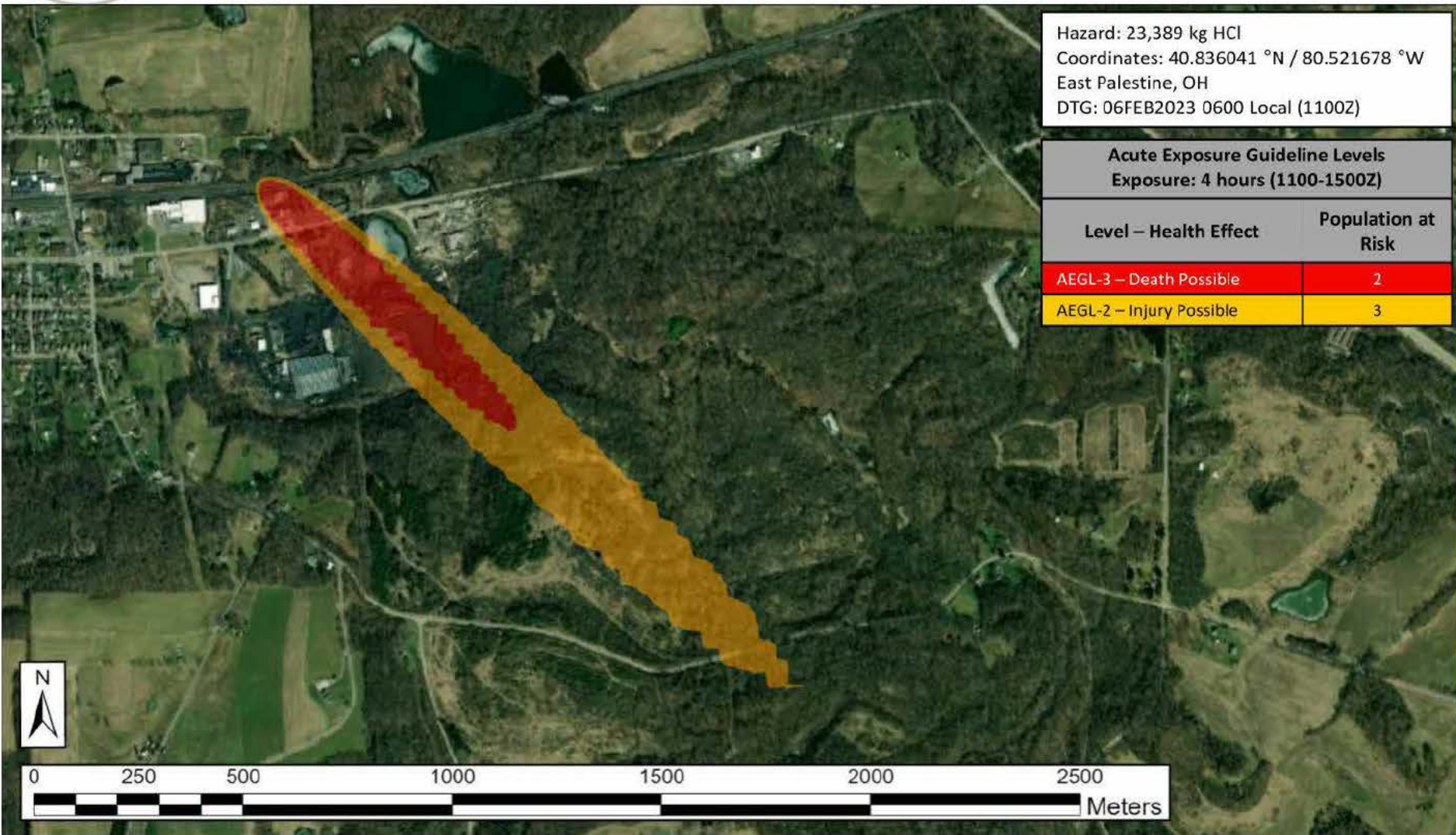
RFI 22-0081eU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	2
AEGL-2 – Injury Possible	3



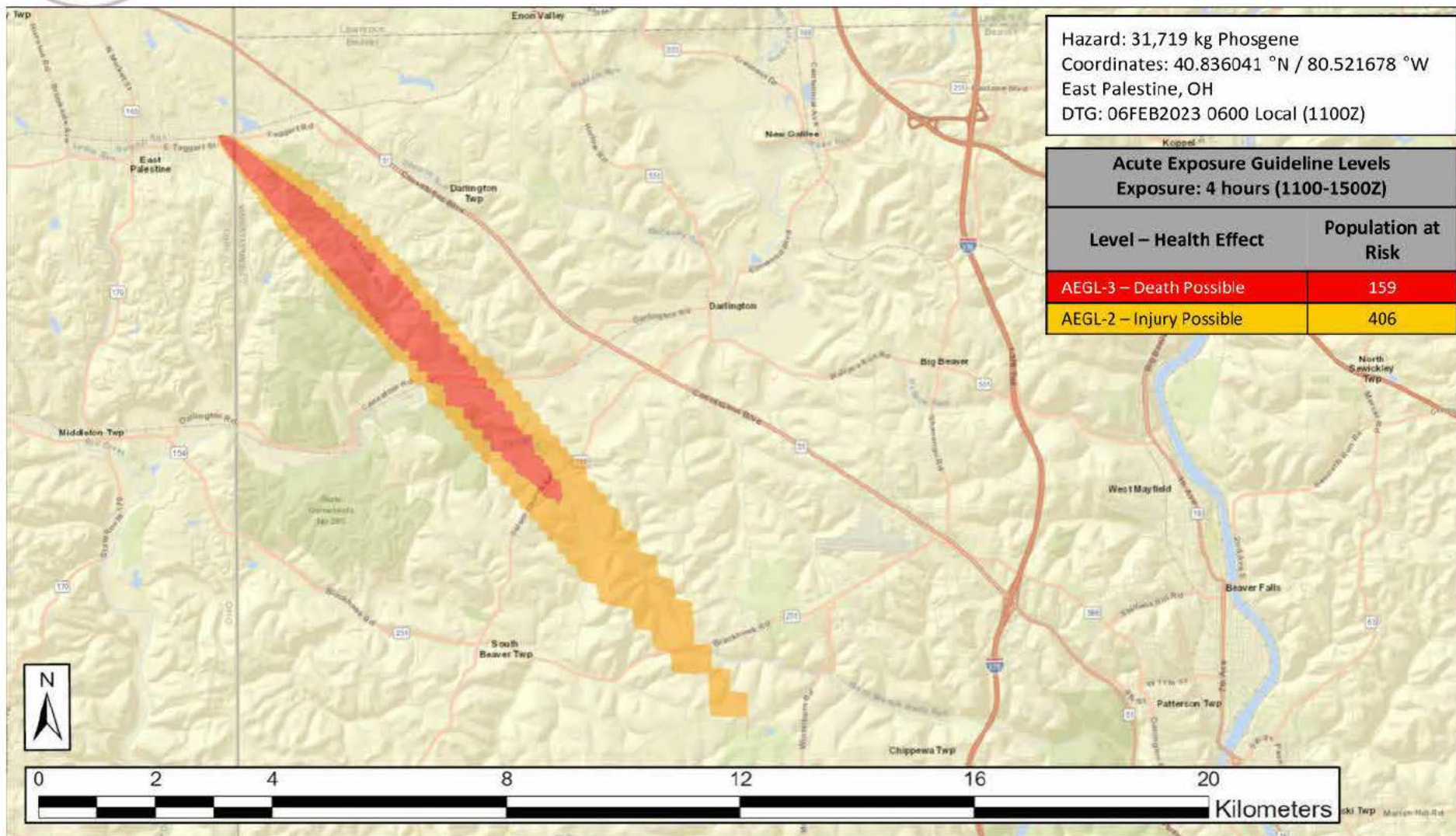
CUI



CUI

RFI 22-0081eU

Phosgene – 0600 Local



CUI



~~CUI~~

RFI 22-0081eU

Soot– Surface Dosage – 0600 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0600 Local (1100Z)

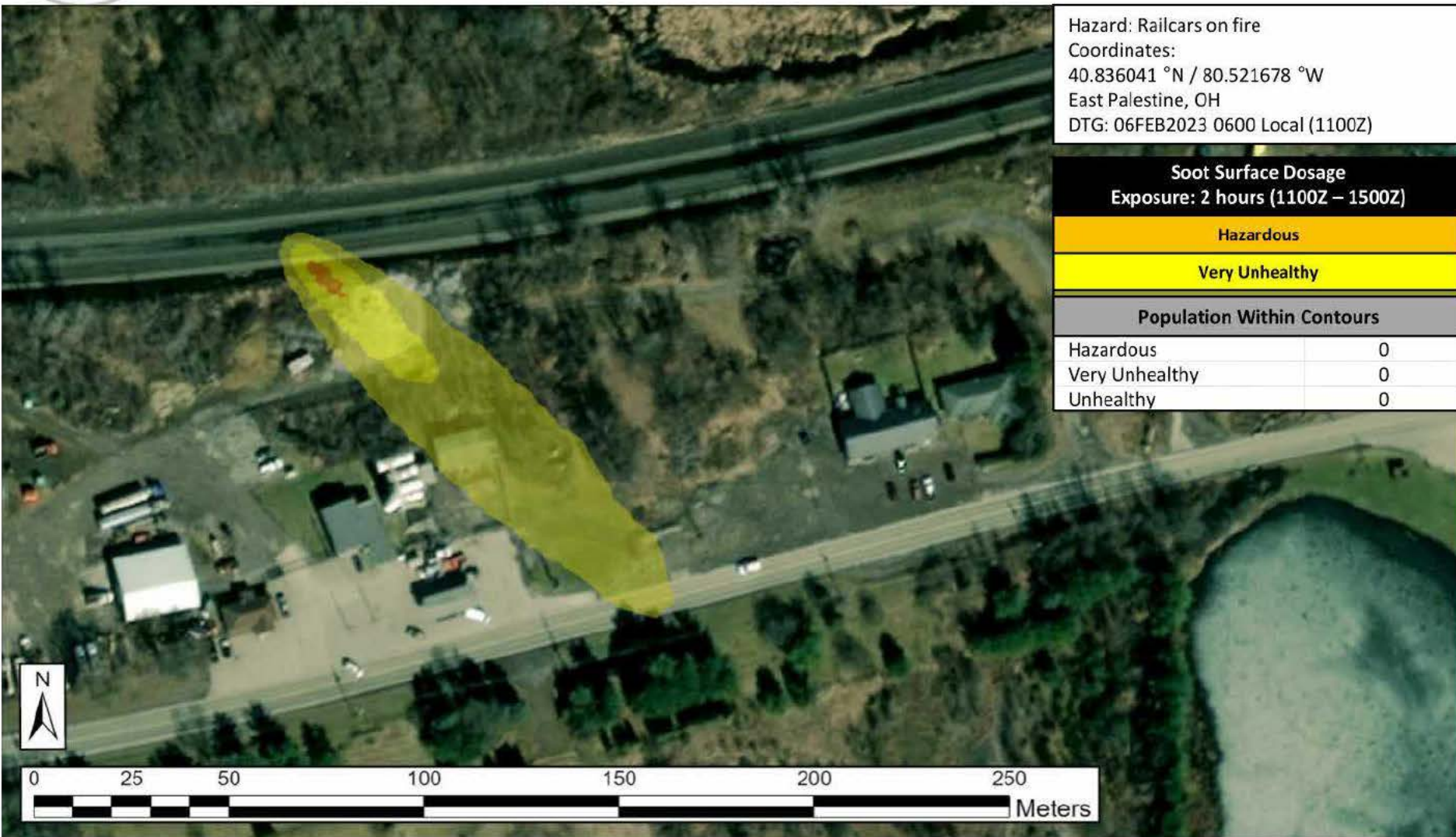
Soot Surface Dosage
Exposure: 2 hours (1100Z – 1500Z)

Hazardous

Very Unhealthy

Population Within Contours

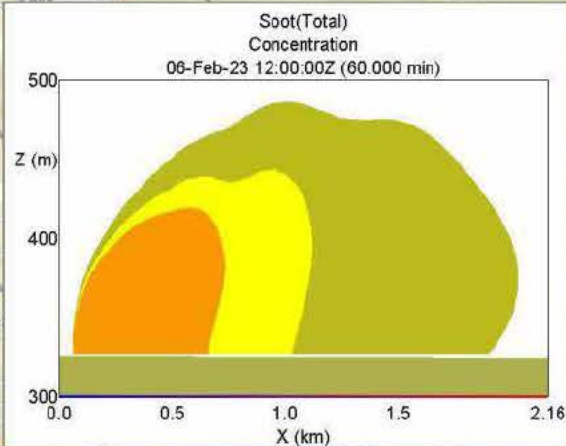
Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~



Soot – Vertical Profile – 0600 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 0600 Local (1100Z)

Soot Concentration @ 0600 Local

Hazardous

Very Unhealthy

Unhealthy

Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.

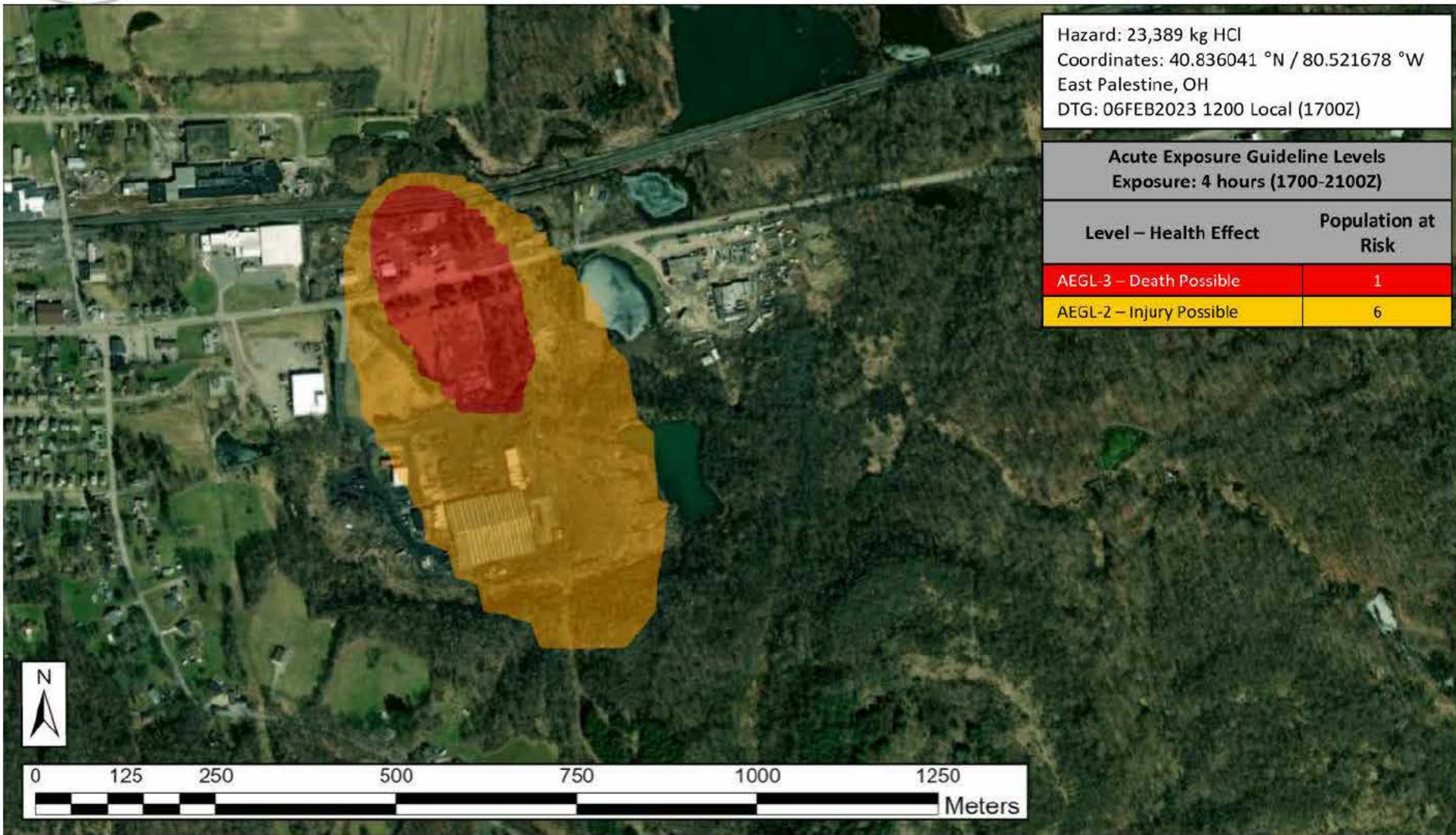


1200 Local (1700Z)

06FEB2023



Hydrogen Chloride – 1200 Local





CUI

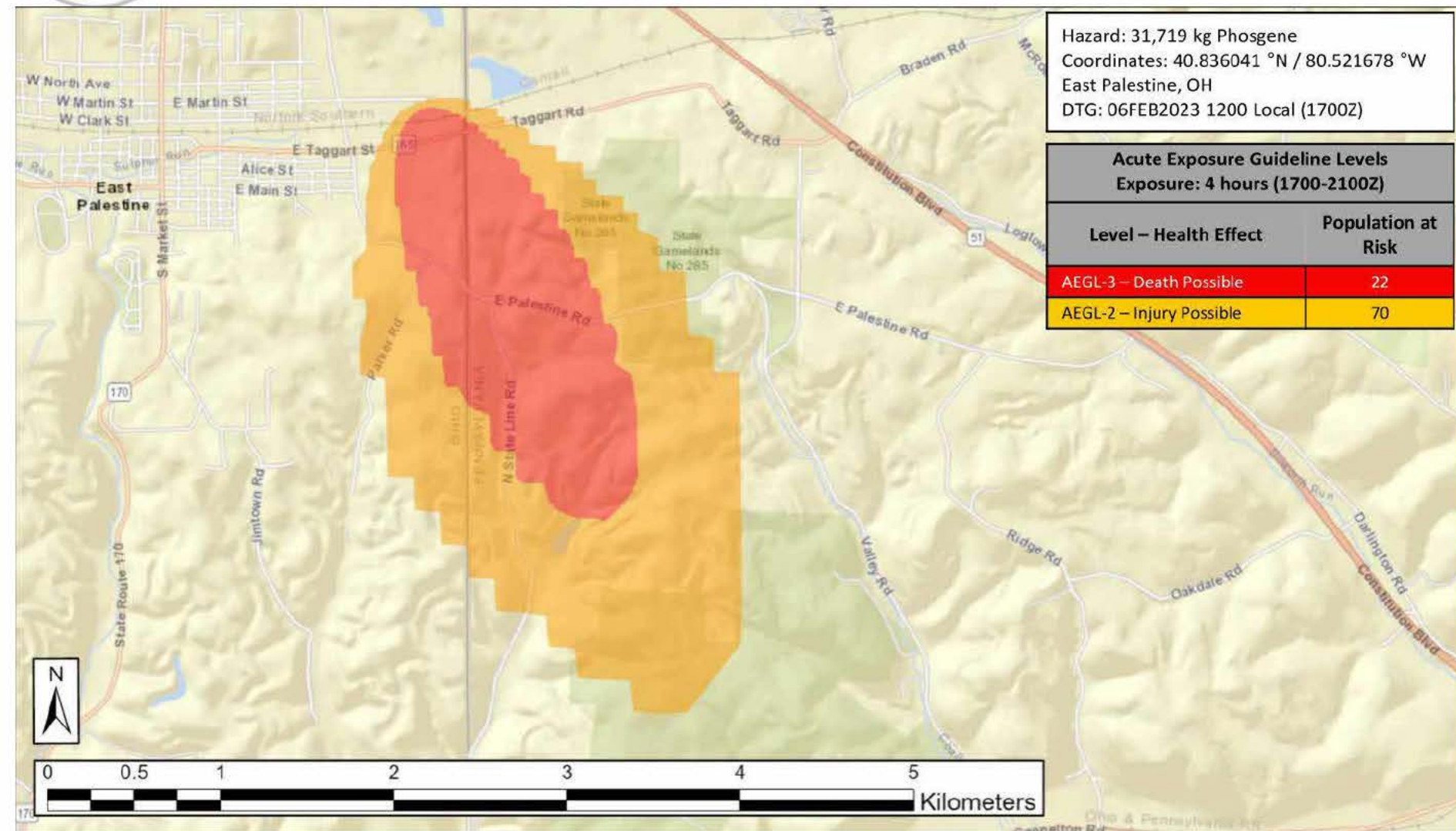
RFI 22-0081eU

Phosgene – 1200 Local

Hazard: 31,719 kg Phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	22
AEGL-2 – Injury Possible	70



CUI



CUI

RFI 22-0081eU

Soot– Surface Dosage – 1200 Local

Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Surface Dosage
Exposure: 2 hours (1700Z – 2100Z)

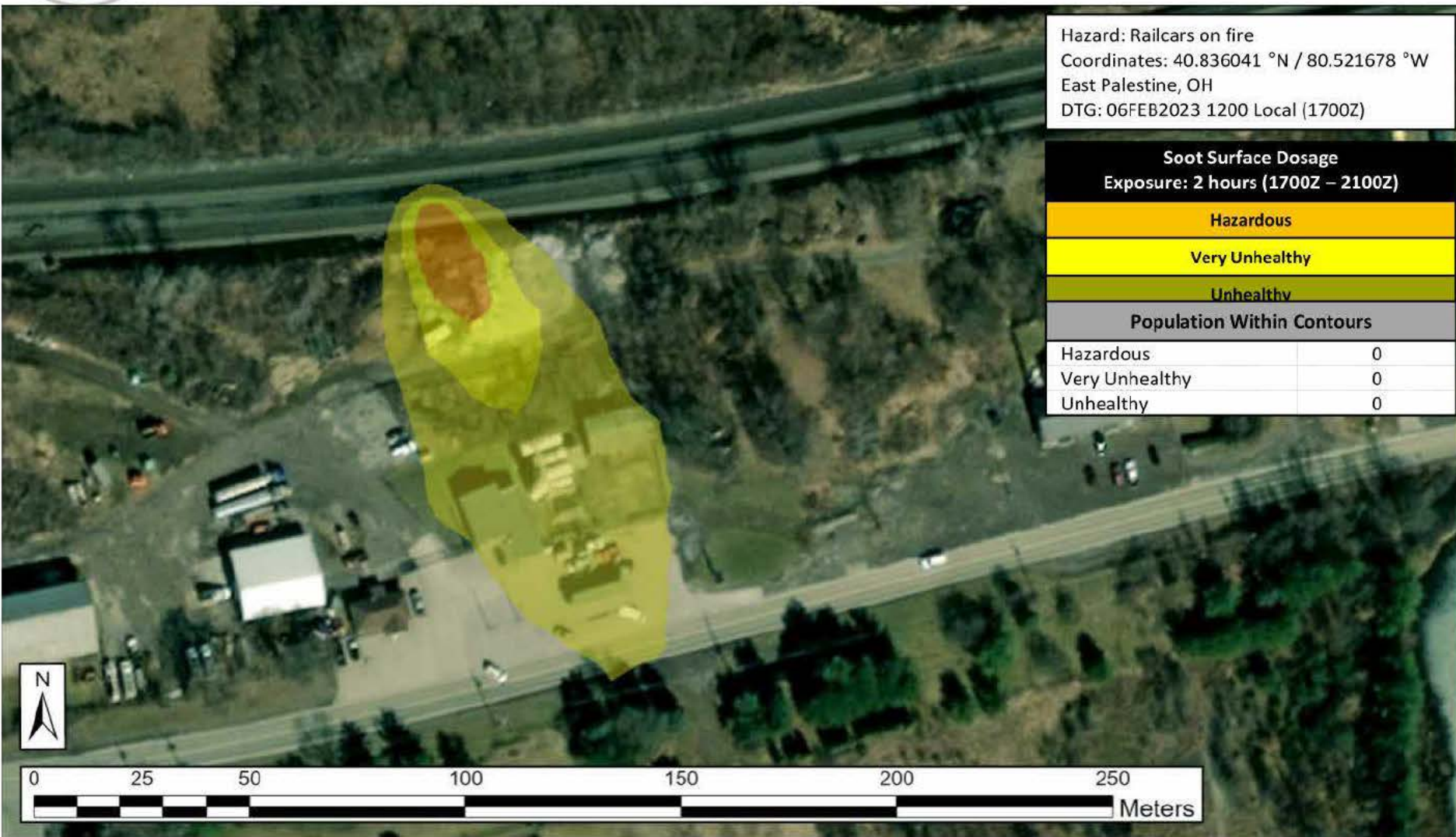
Hazardous

Very Unhealthy

Unhealthy

Population Within Contours

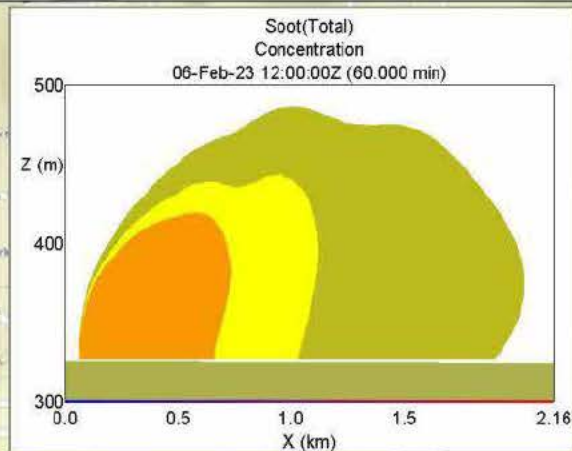
Hazardous	0
Very Unhealthy	0
Unhealthy	0



CUI



Soot – Vertical Profile – 1200 Local



Hazard: Railcars on fire
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1200 Local (1700Z)

Soot Concentration @ 1200 Local

Hazardous

Very Unhealthy

Unhealthy

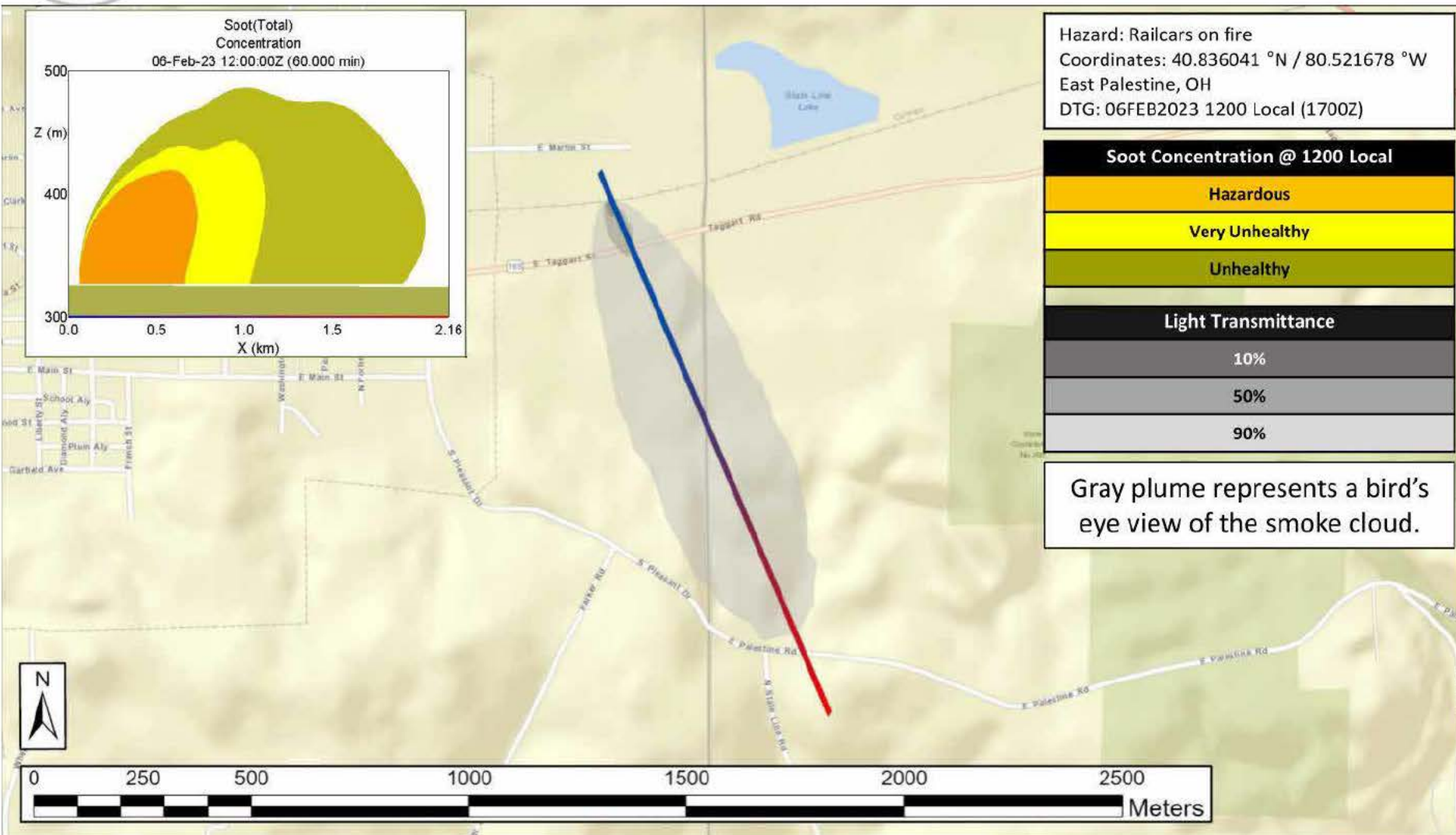
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.





Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

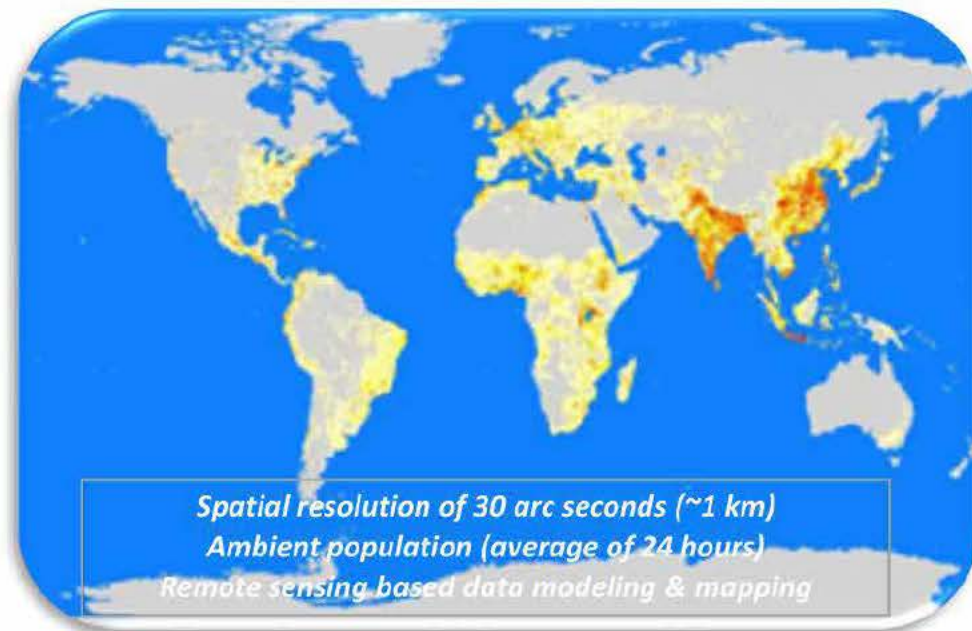


Population Data

CUI

RFI 22-0081eU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 21:28:30 +0000
To: DTRA Ft Belvoir RD Mailbox Reachback; fema-nwc@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback; (b) (6)
(USA)
Subject: RE: IMAAC RFIs
Attachments: RFI_23-0081dU_IMAAC.pdf, RFI_23-0081cU_IMAAC.pdf, RFI_23-0081bU_IMAAC.pdf, RFI_23-0081aU_IMAAC.pdf, smime.p7s

CUI

Good Afternoon,

Please see the other earlier updates for the ongoing IMAAC.

Respectfully,

(b) (6)

Defense Threat Reduction Agency

COM: (703) 767-3445/8 (427-)

NIPR: dtra-reachback@mail.mil

SIPR: dtra-reachback@mail.smil.mil

JWICS: reachback@dtra.ic.gov

Research and Development Directorate, Technical Reachback Division

Controlled by: Defense Threat Reduction Agency

Controlled by: Research and Development

CUI Category: CTI

Distribution/Dissemination Statement: C

POC: RD-OPR, 703-767-3445

CUI

~~CUI~~

Date: 05FEB2023 2300Z

Version: Revision D

Changes: Updated location & weather



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081dU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 05FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1800 05FEB2023 Local (2300Z) 2. 0000 06FEB2023 Local (0500Z)
Executive Summary	• The new location resulted in significantly lower number people being at risk. • For phosgene at 1800 Local, 2,718 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 433 people may be exposed to hazard levels that could possibly result in death. (0500 local model shows slightly fewer at risk. • For HCl at 0000 and 1800 Local, 4 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 2 people may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- No additional information was provided on the fire that continues to burn and no changes were made on the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

- Worst case situations are modeled, in which all of the vinyl chloride is consumed in the fire and converts completely to either hydrogen chloride or to phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decompose to phosgene. Amounts modeled likely over-state the expected hazard and be considered as an absolute worst case hazard (upper bound)

1800 Local (2300Z)

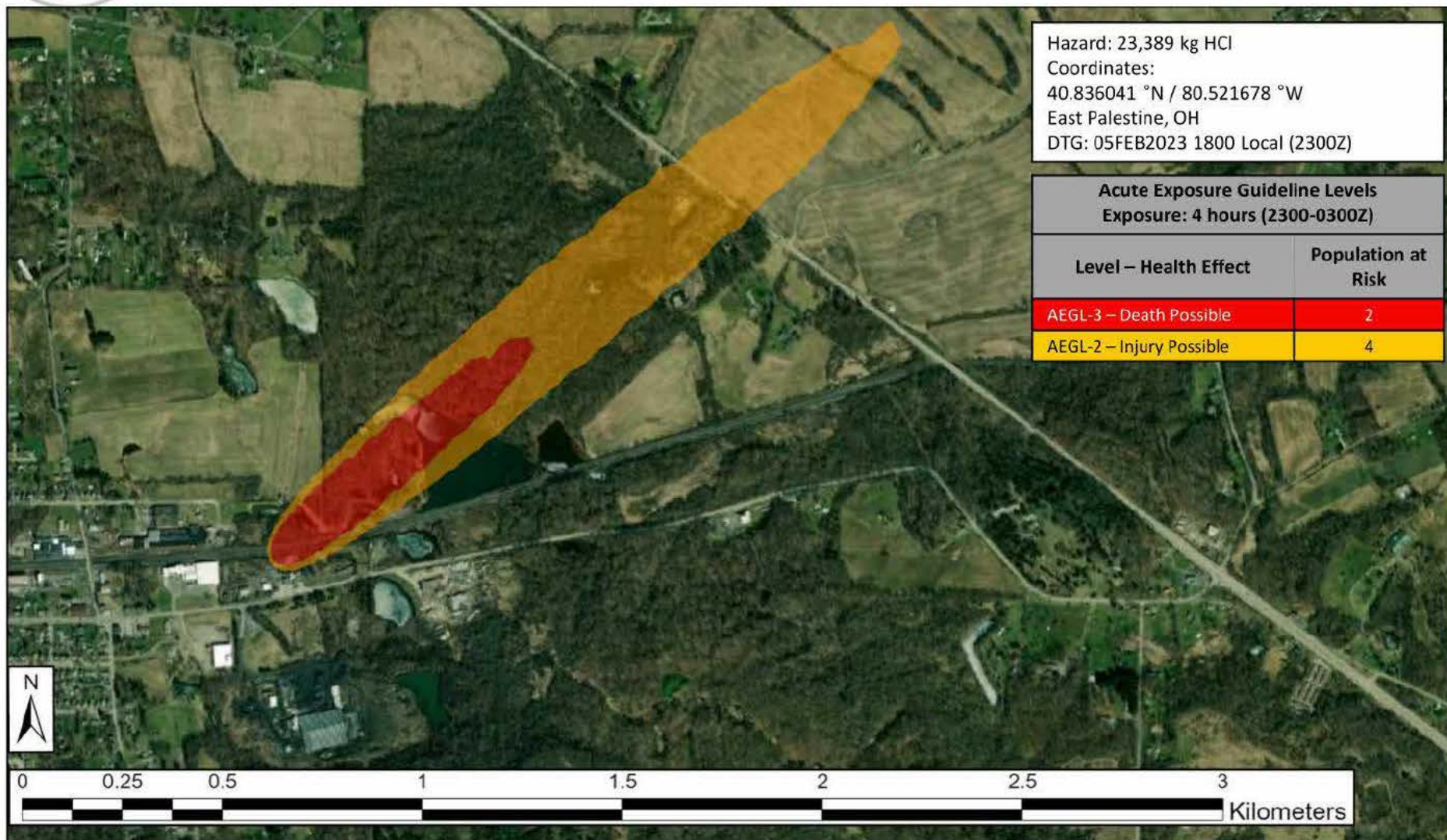
05FEB2023



~~CUI~~

RFI 22-0081dU

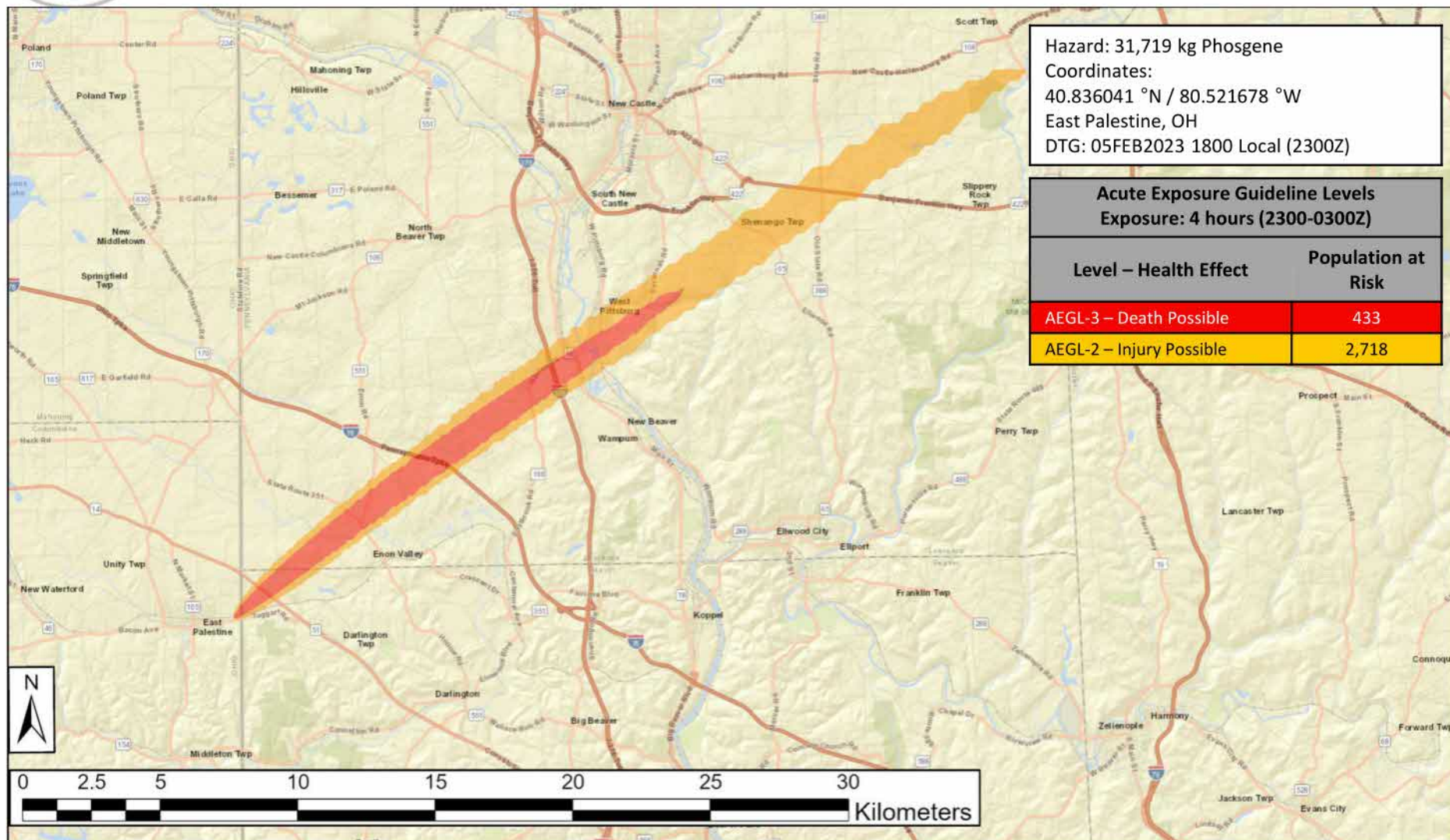
Hydrogen Chloride – 1800 Local



~~CUI~~



Phosgene – 1800 Local





Soot– Surface Dosage- 1800 Local

Hazard: Railcars on fire
Coordinates:
40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 05FEB2023 1800 Local (2300Z)

Soot Surface Dosage
Exposure: 2 hours (2300Z – 0100Z)

Hazardous

Very Unhealthy

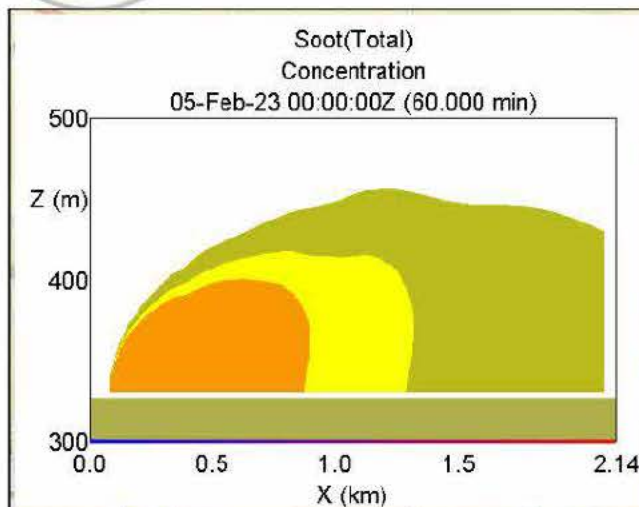
Population Within Contours

Hazardous	0
Very Unhealthy	0
Unhealthy	0





Soot – Vertical Profile-1800 Local



Hazard: Railcars on fire
Coordinates:
40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 05FEB2023 1800 Local (2300Z)

Soot Concentration @ 1800 Local

Hazardous

Very Unhealthy

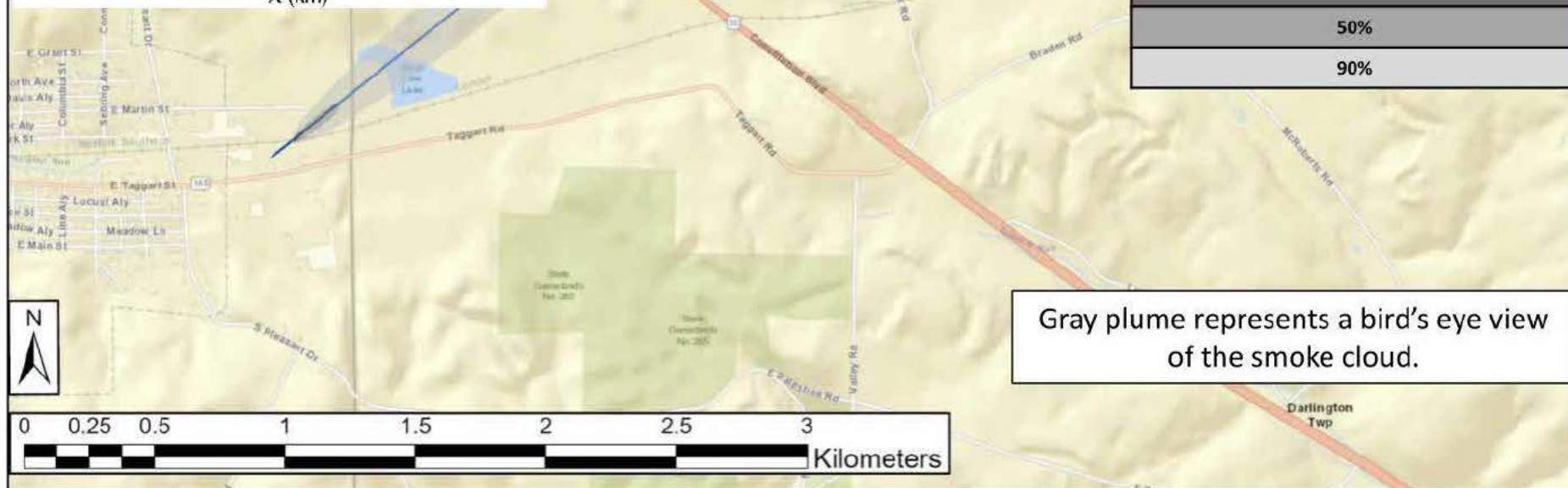
Unhealthy

Light Transmittance

10%

50%

90%



0000 Local (0500Z)

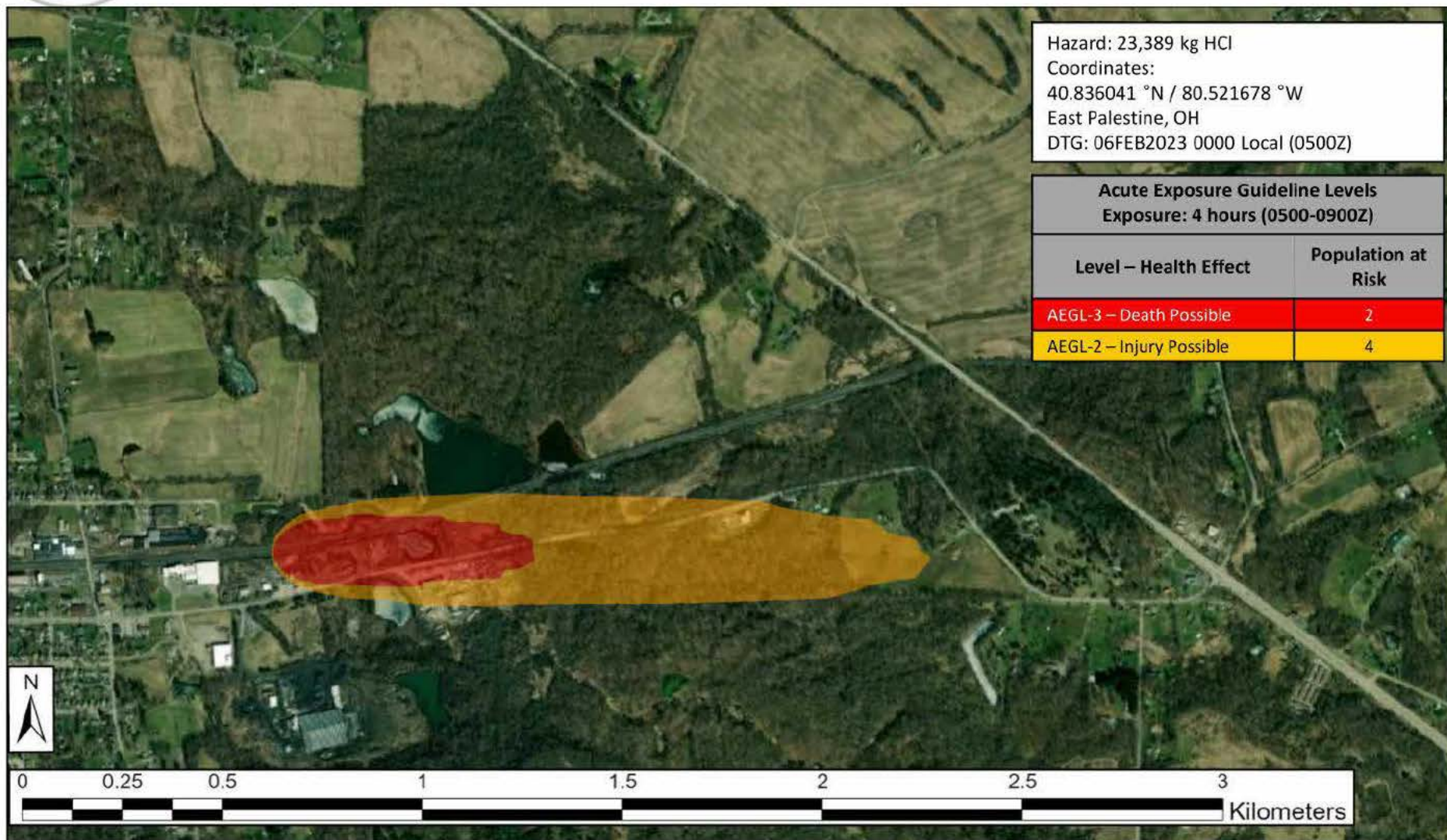
06FEB2023



~~CUI~~

RFI 22-0081dU

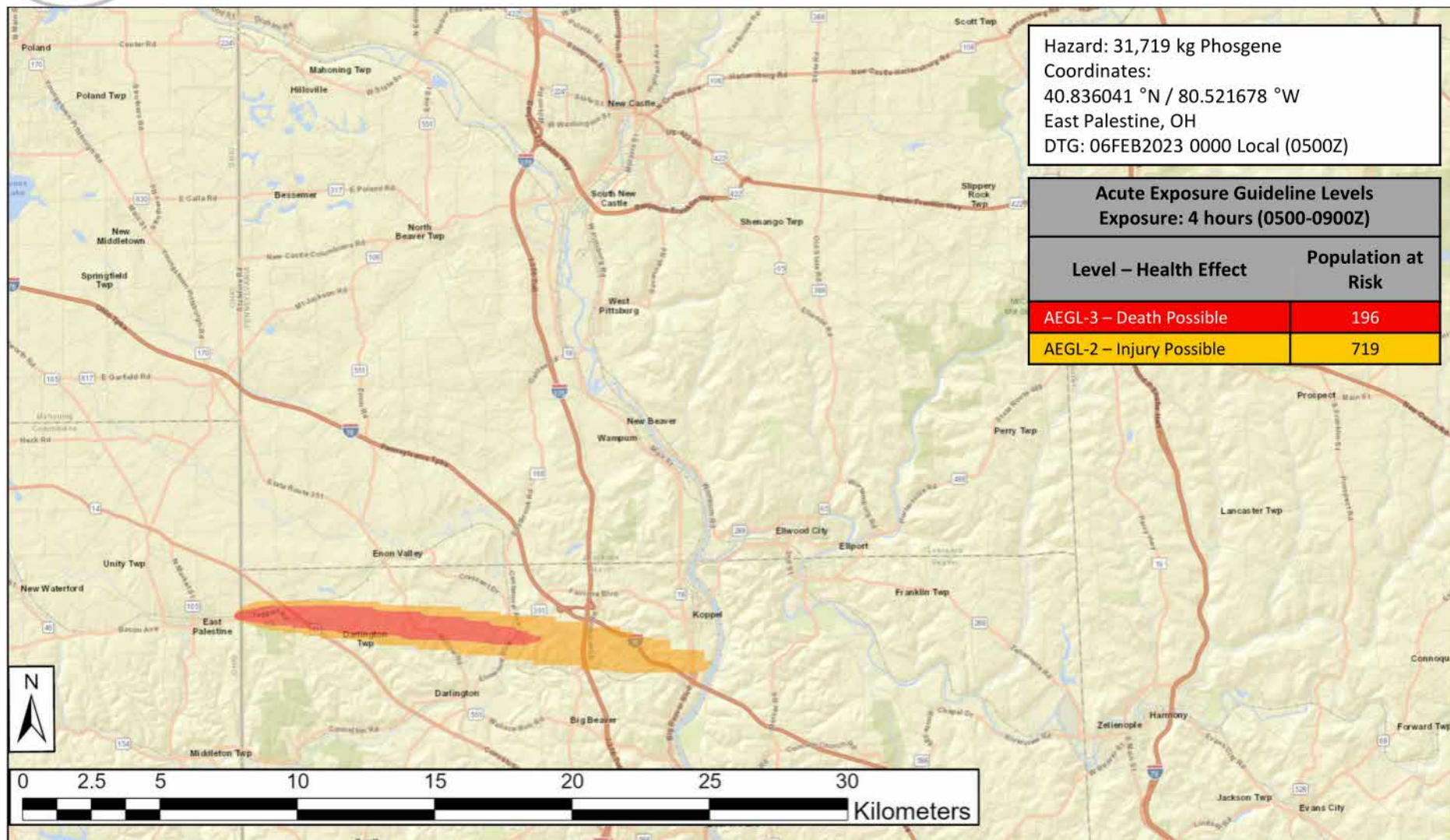
Hydrogen Chloride – 0000 Local



~~CUI~~



Phosgene – 0000 Local





~~CUI~~

RFI 22-0081dU

Soot– Surface Dosage- 0000 Local

Hazard: Railcars on fire

Coordinates:

40.836041 °N / 80.521678 °W

East Palestine, OH

DTG: 06FEB2023 0000 Local (0500Z)

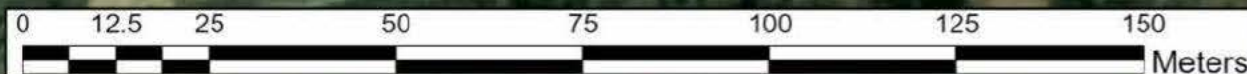
Soot Surface Dosage
Exposure: 2 hours (0500Z – 0700Z)

Hazardous

Very Unhealthy

Population Within Contours

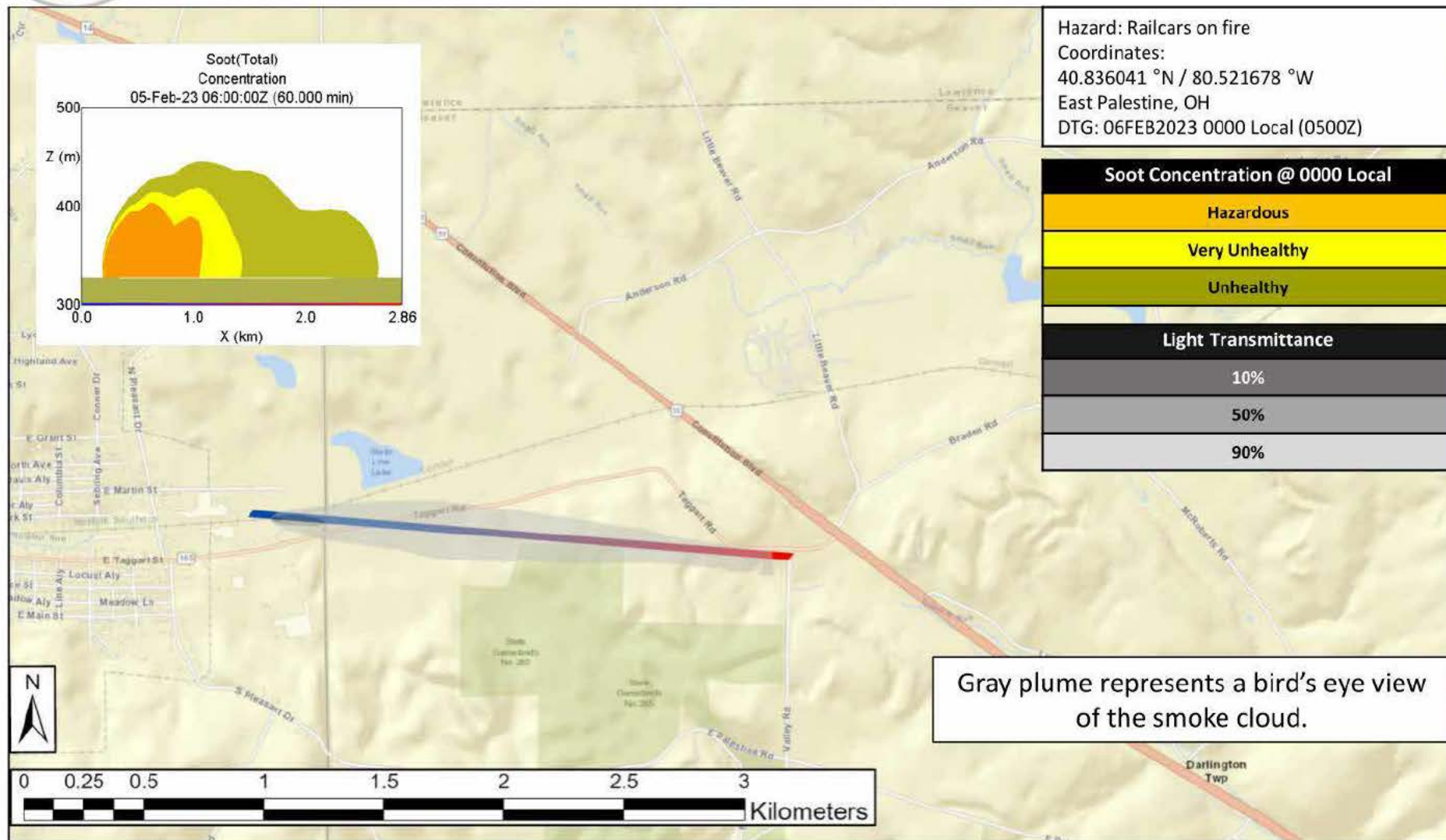
Hazardous	0
Very Unhealthy	0
Unhealthy	0



~~CUI~~



Soot – Vertical Profile-0000 Local





Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

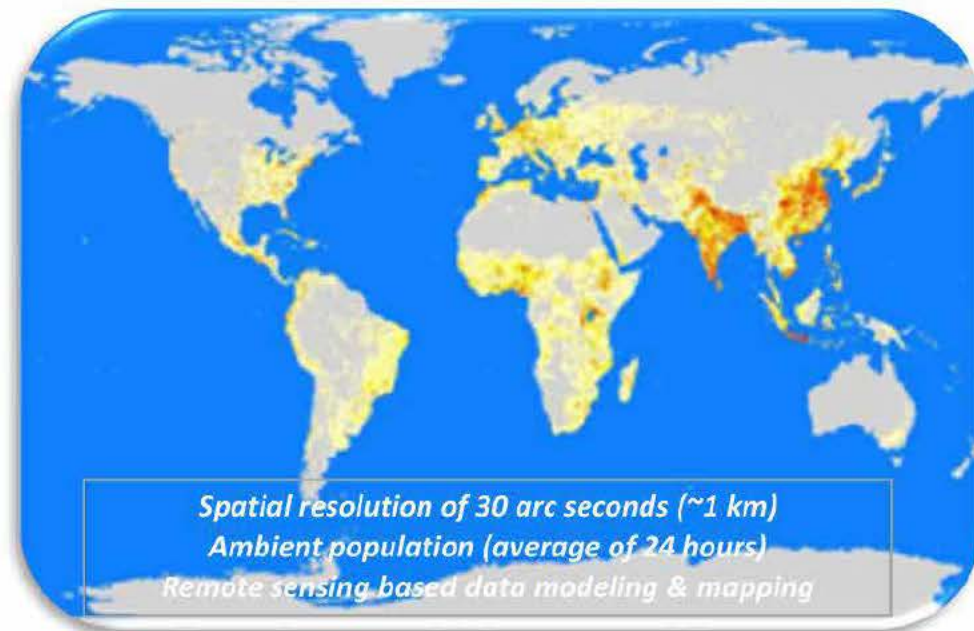


Population Data

CUI

RFI 22-0081dU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081cU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 05FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.83564 °N / 80.53579 °W
Weather	High Resolution Numerical Weather Prediction: 3 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 05FEB2023 Local (1100Z) 2. 1200 05FEB2023 Local (1700Z)
Executive Summary	• For phosgene at 0600 Local, 797 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 274 people may be exposed to hazard levels that could possibly result in death. (1200 local model shows slightly fewer at risk. • For HCl at 1200 Local, 101 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 29 people may be exposed to hazard levels that could possibly result in death. (0600 local model shows slightly fewer at risk.) • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- No additional information was provided on the fire that continues to burn and no changes were made on the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

- Worst case situations are modeled, in which all of the vinyl chloride is consumed in the fire and converts completely to either hydrogen chloride or to phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decompose to phosgene. Amounts modeled likely over-state the expected hazard and be considered as an absolute worst case hazard (upper bound)

0600 Local (1700Z)

05FEB2023



CUI

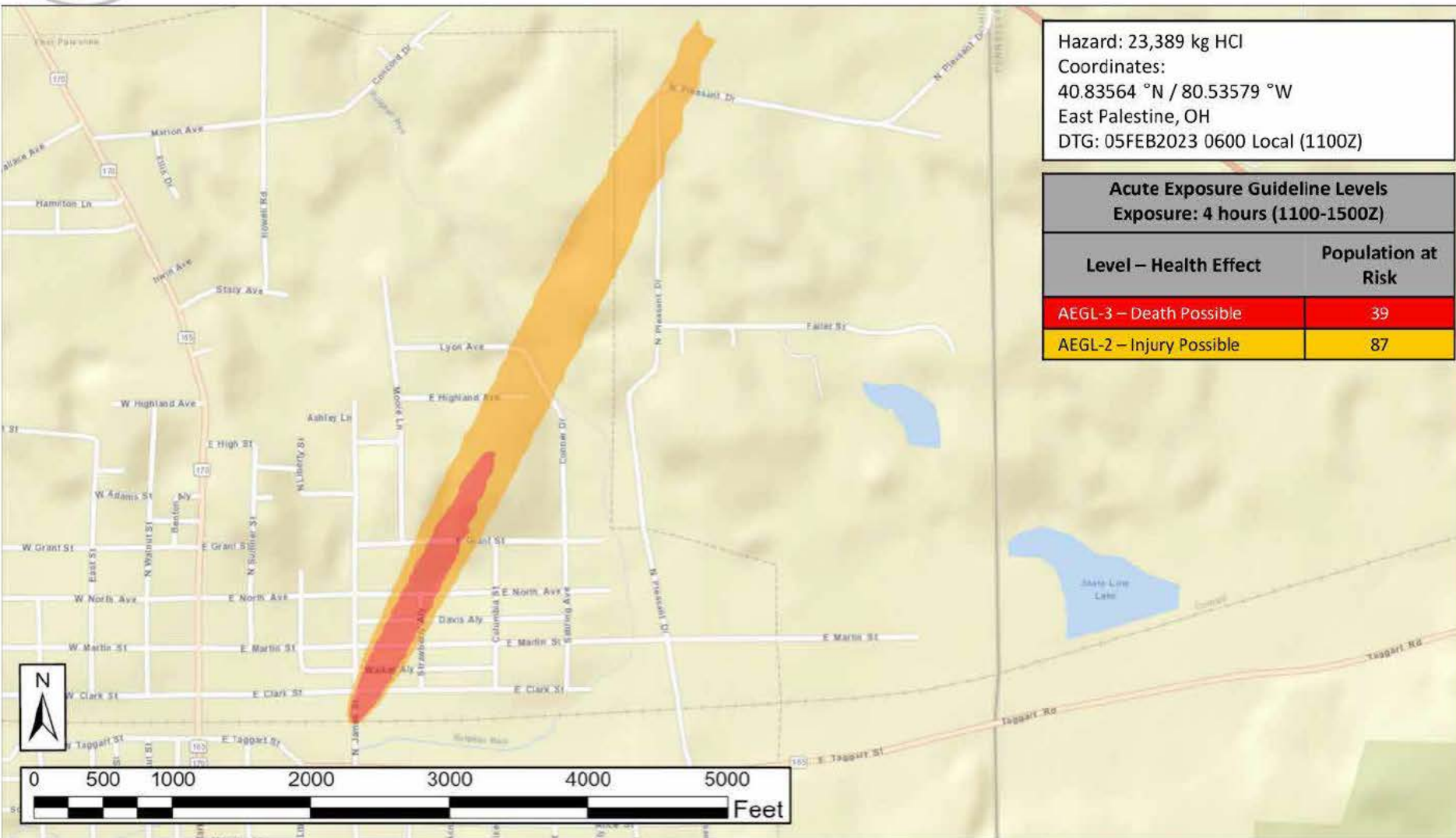
RFI 22-0081cU

Hydrogen Chloride – 0600 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	39
AEGL-2 – Injury Possible	87



CUI



CUI

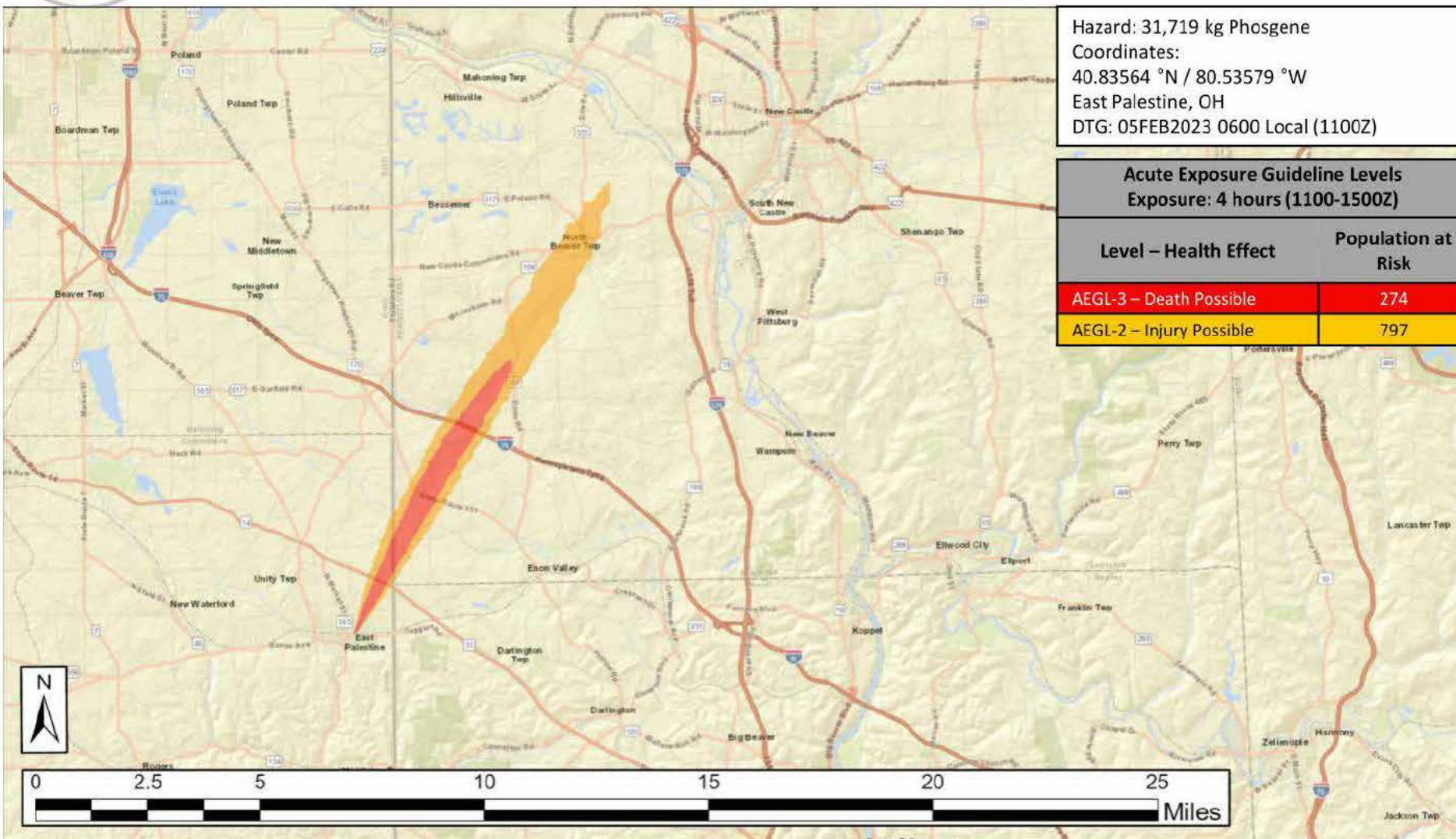
RFI 22-0081cU

Phosgene – 0600 Local

Hazard: 31,719 kg Phosgene
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 4 hours (1100-1500Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	274
AEGL-2 – Injury Possible	797



CUI



Soot- 0600 Local

Hazard: Railcars on fire
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0600 Local (1100Z)

Soot Surface Dosage
Exposure: 2 hours (1100Z – 1300Z)

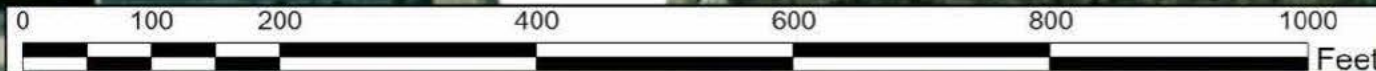
Hazardous

Very Unhealthy

Unhealthy

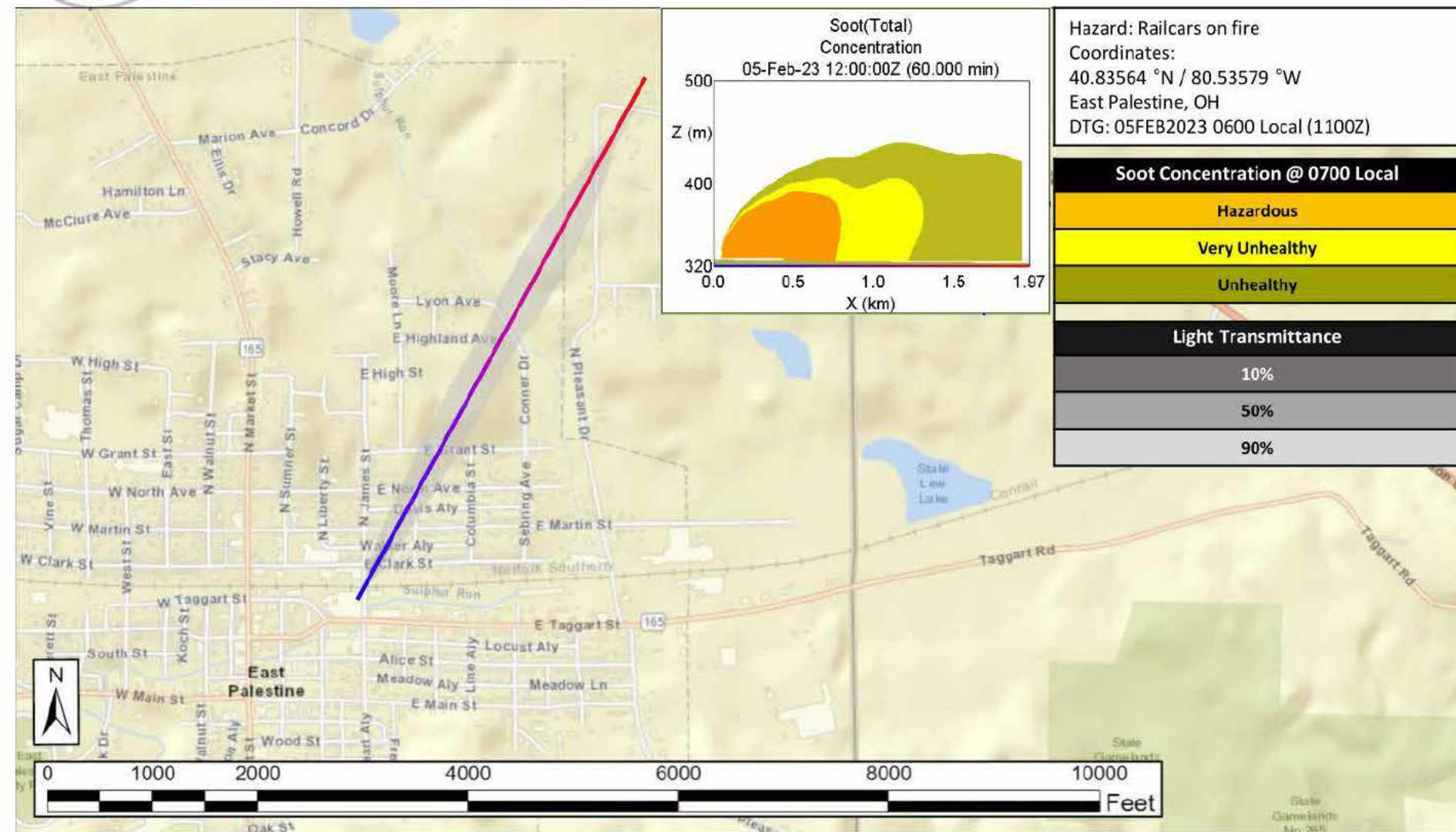
Population Within Contours

Hazardous	0
Very Unhealthy	1
Unhealthy	6





Soot – 0600 Local



1200 Local (1700Z)

05FEB2023



CUI

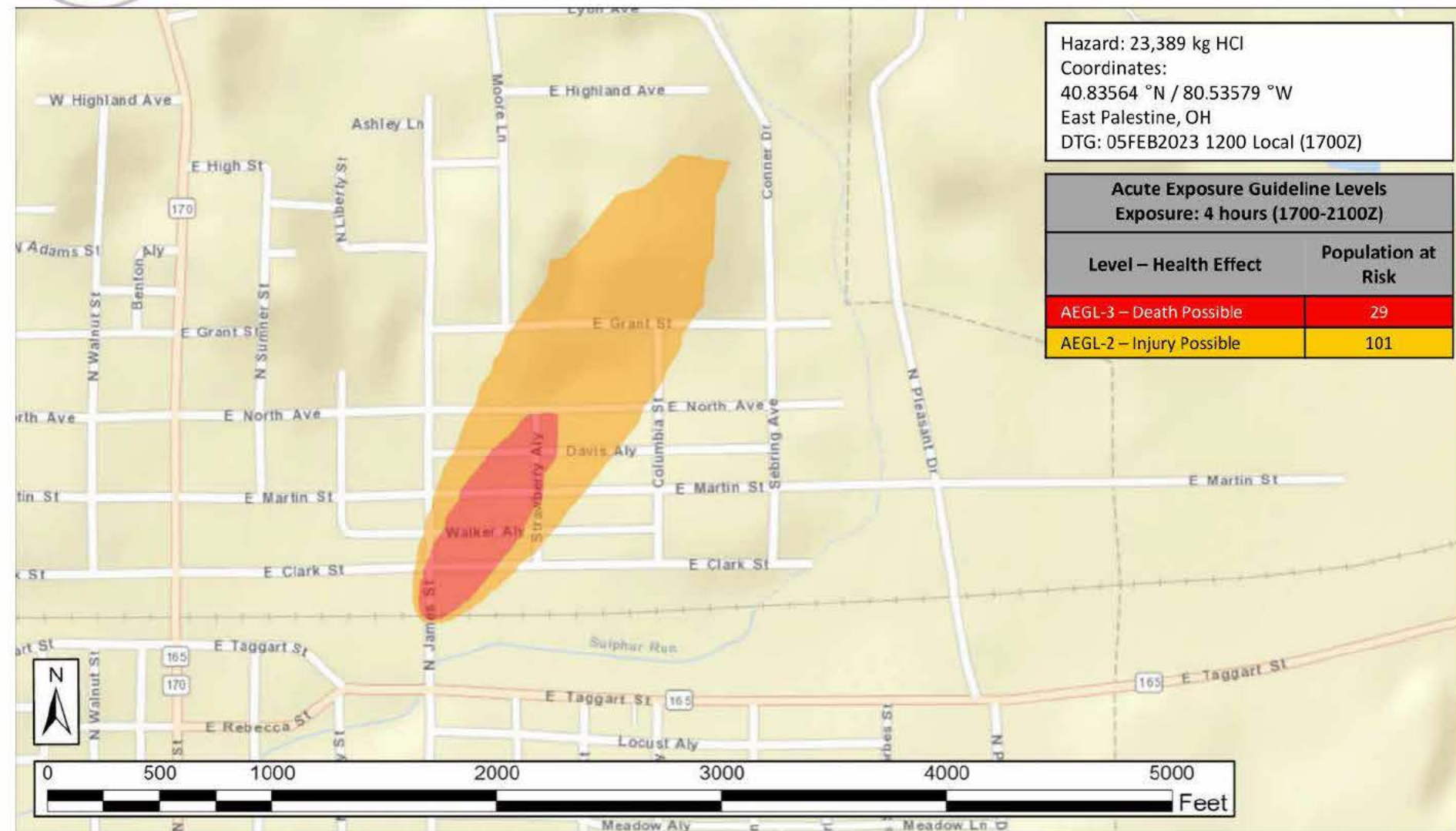
RFI 22-0081cU

Hydrogen Chloride – 1200 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 4 hours (1700-2100Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	29
AEGL-2 – Injury Possible	101



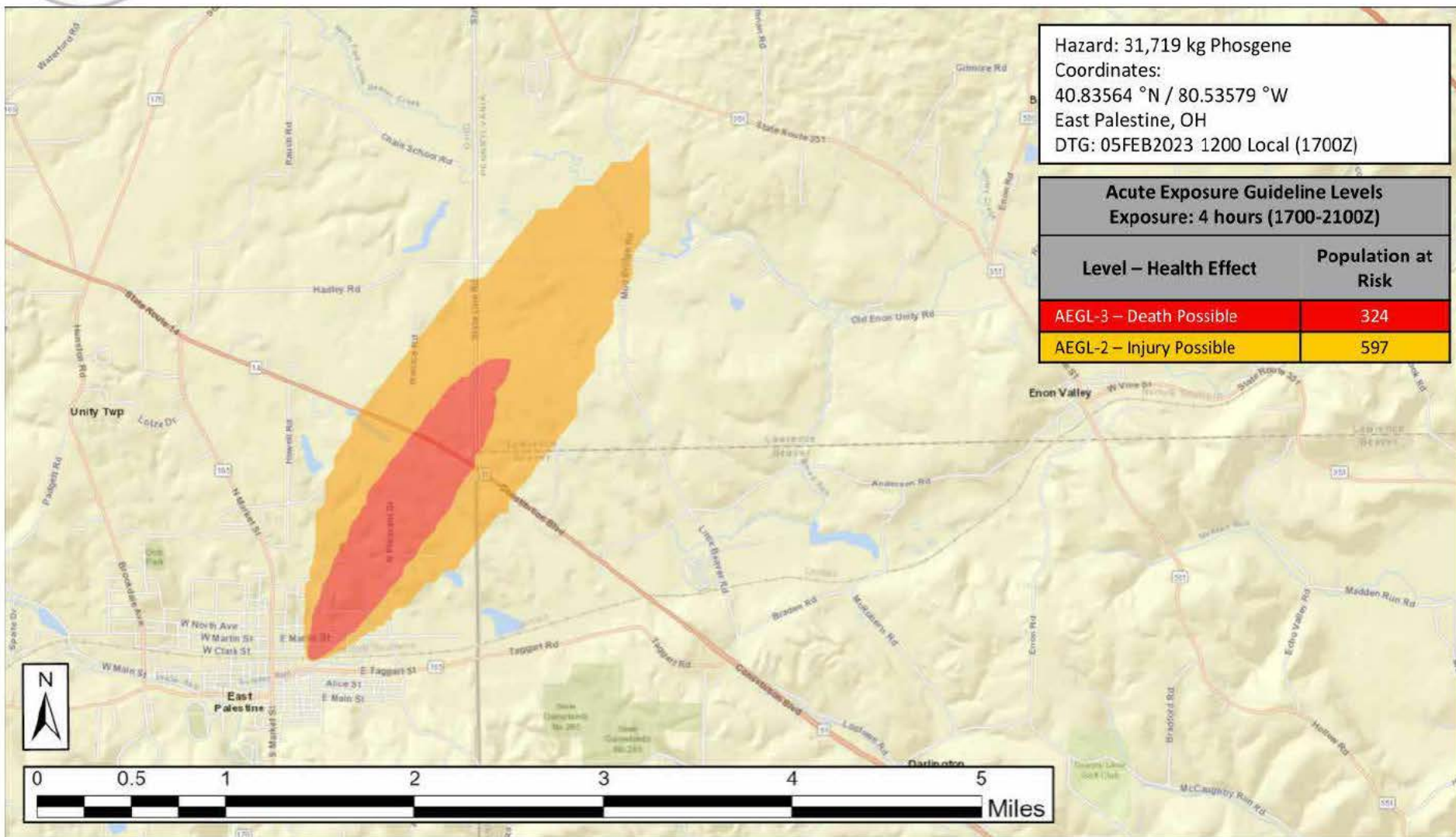
CUI



CUI

RFI 22-0081cU

Phosgene – 1200 Local



CUI



Soot- 1200 Local

Hazard: Railcars on fire

Coordinates:

40.83564 °N / 80.53579 °W

East Palestine, OH

DTG: 05FEB2023 1200 Local (1700Z)

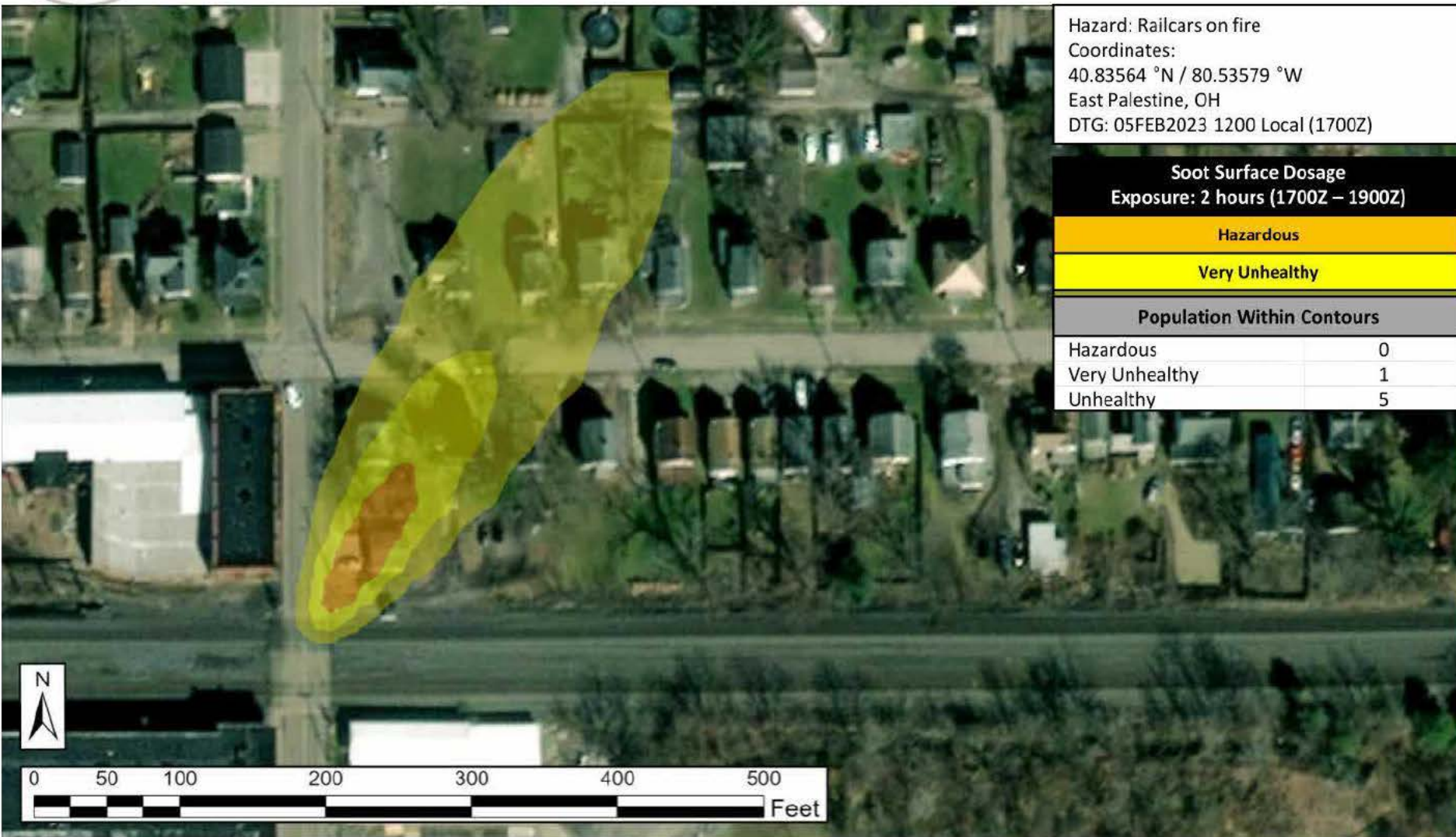
Soot Surface Dosage
Exposure: 2 hours (1700Z – 1900Z)

Hazardous

Very Unhealthy

Population Within Contours

Hazardous	0
Very Unhealthy	1
Unhealthy	5

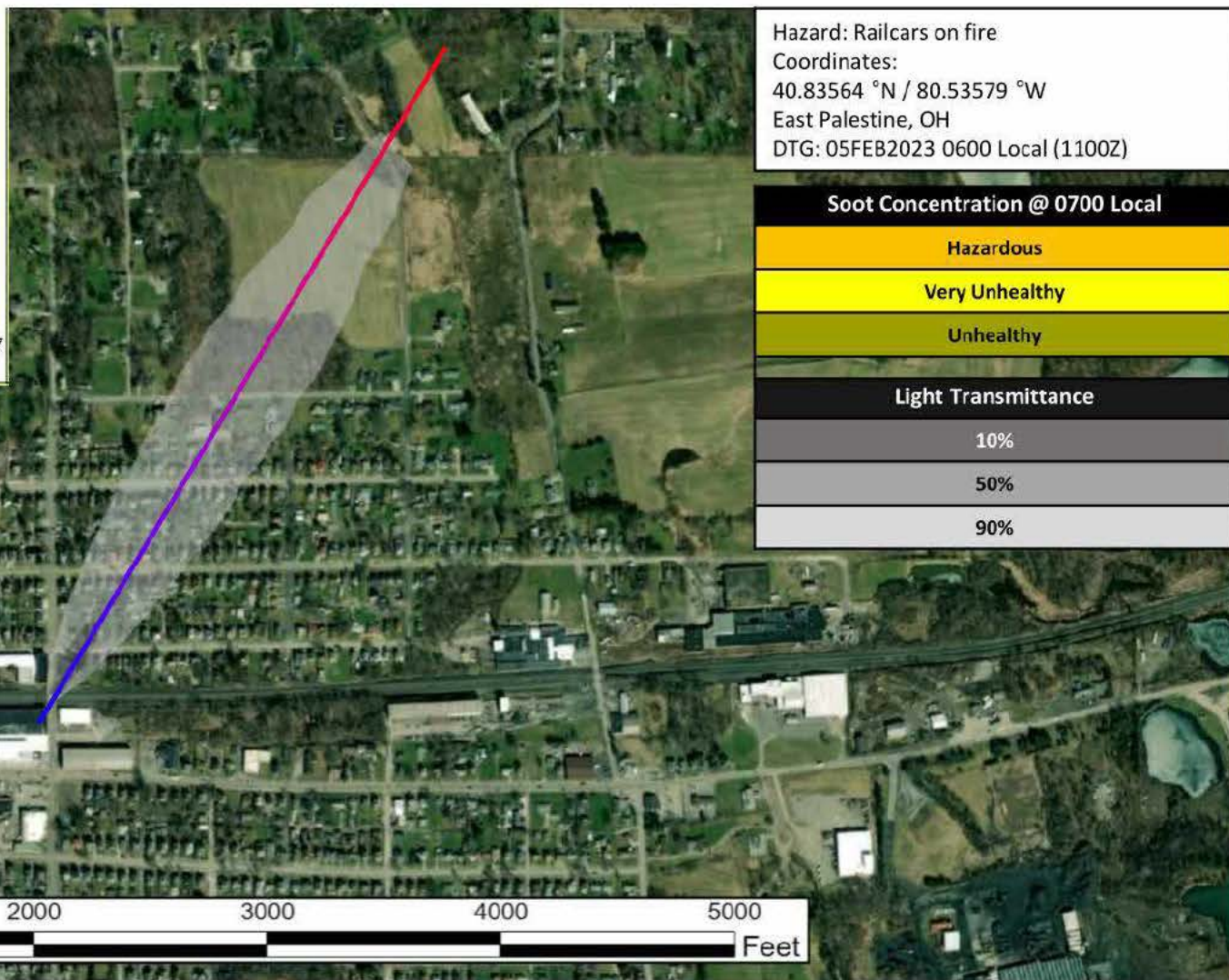
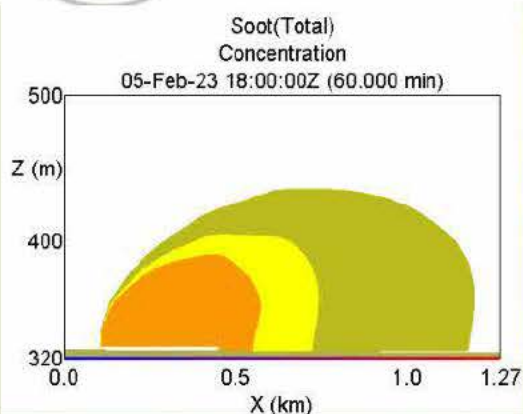




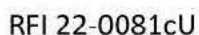
~~CUI~~

RFI 22-0081cU

Soot – 0600 Local



~~CUI~~



INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

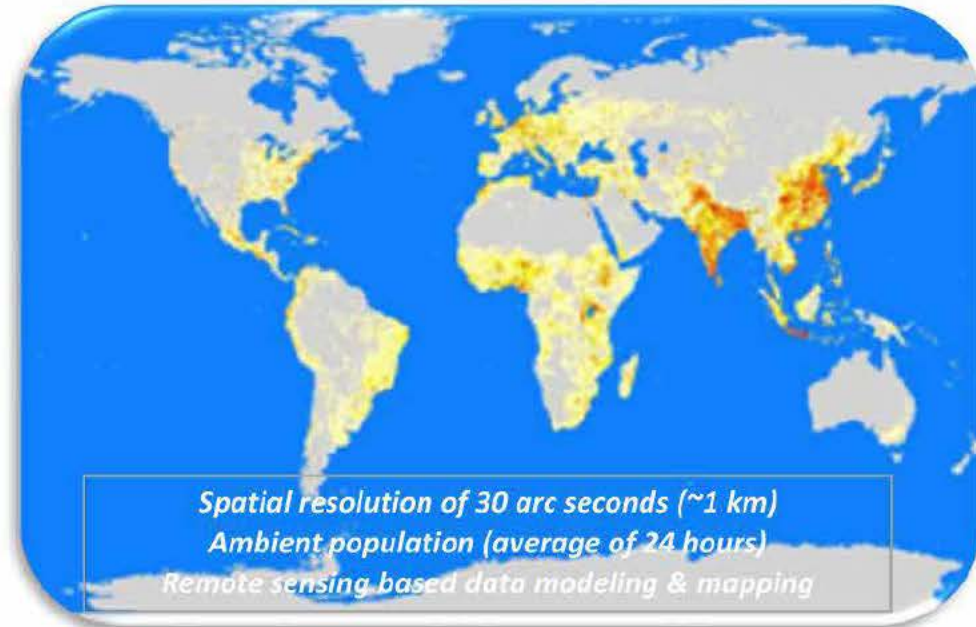


Population Data

~~CUI~~

RFI 22-0081cU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

~~CUI~~

Date: 04FEB2023 2300Z

Version: Revision B

Changes: Updated weather



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081bU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.83564 °N / 80.53579 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1800 04FEB2023 Local (2300Z) 2. 0000 05FEB2023 Local (0500Z)
Executive Summary	• For phosgene at 0000 Local, 1153 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 348 people may be exposed to hazard levels that could possibly result in death. (1800 local model shows slightly fewer at risk. • For HCl at 0000 Local, 118 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 57 people may be exposed to hazard levels that could possibly result in death. (1800 local model shows slightly fewer at risk.) • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- No additional information was provided on the fire that continues to burn and no changes were made on the modeled amounts and fire intensity. As a result, populations at risk in this update may be overstated.
- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

- Worst case situations are modeled, in which all of the vinyl chloride is consumed in the fire and converts completely to either hydrogen chloride or to phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decompose to phosgene. Amounts modeled likely over-state the expected hazard and be considered as an absolute worst case hazard (upper bound)

1800 Local (2300Z)

04FEB2023



CUI

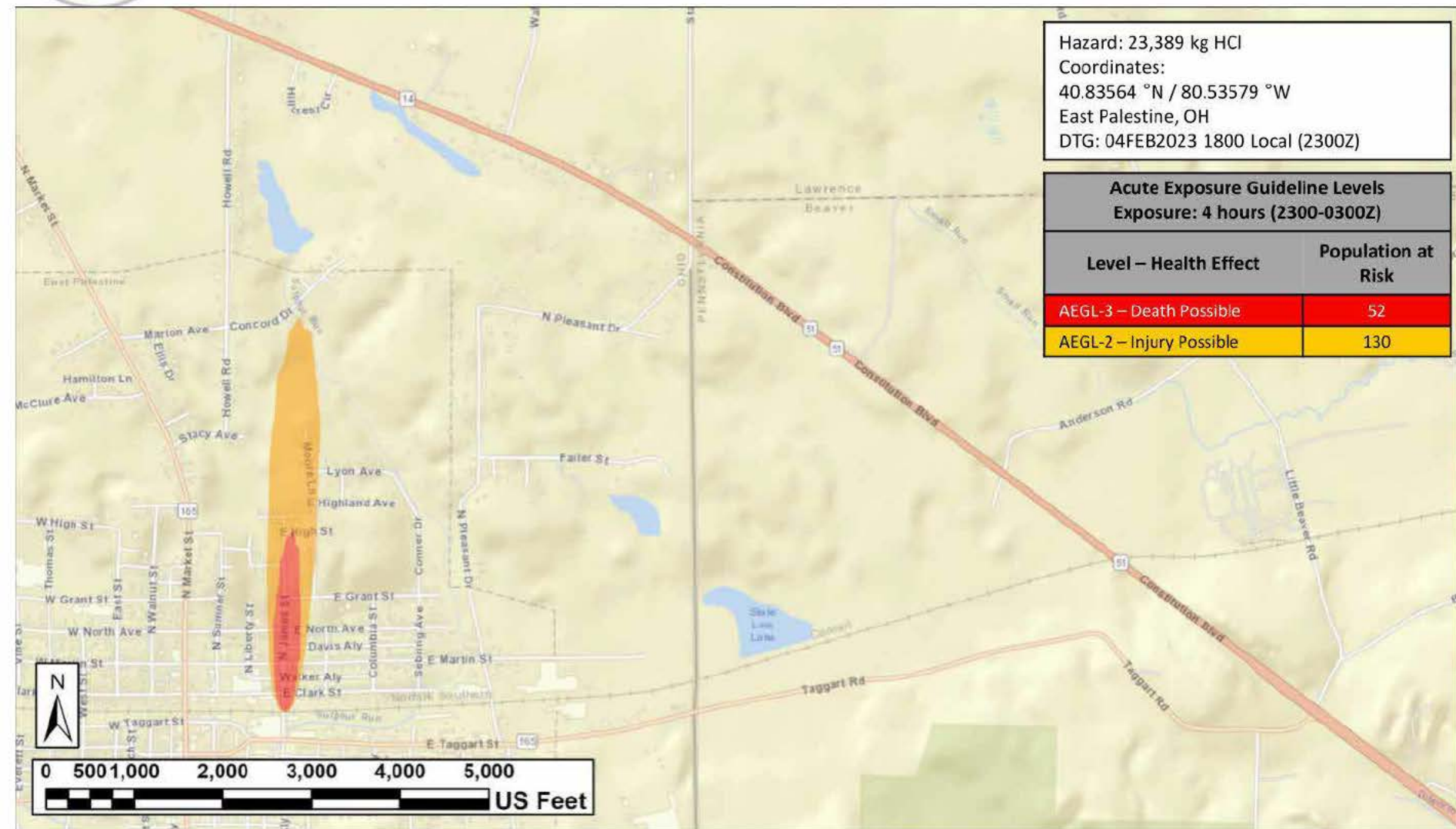
RFI 22-0081bU

Hydrogen Chloride – 1800 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 04FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 4 hours (2300-0300Z)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	52
AEGL-2 – Injury Possible	130



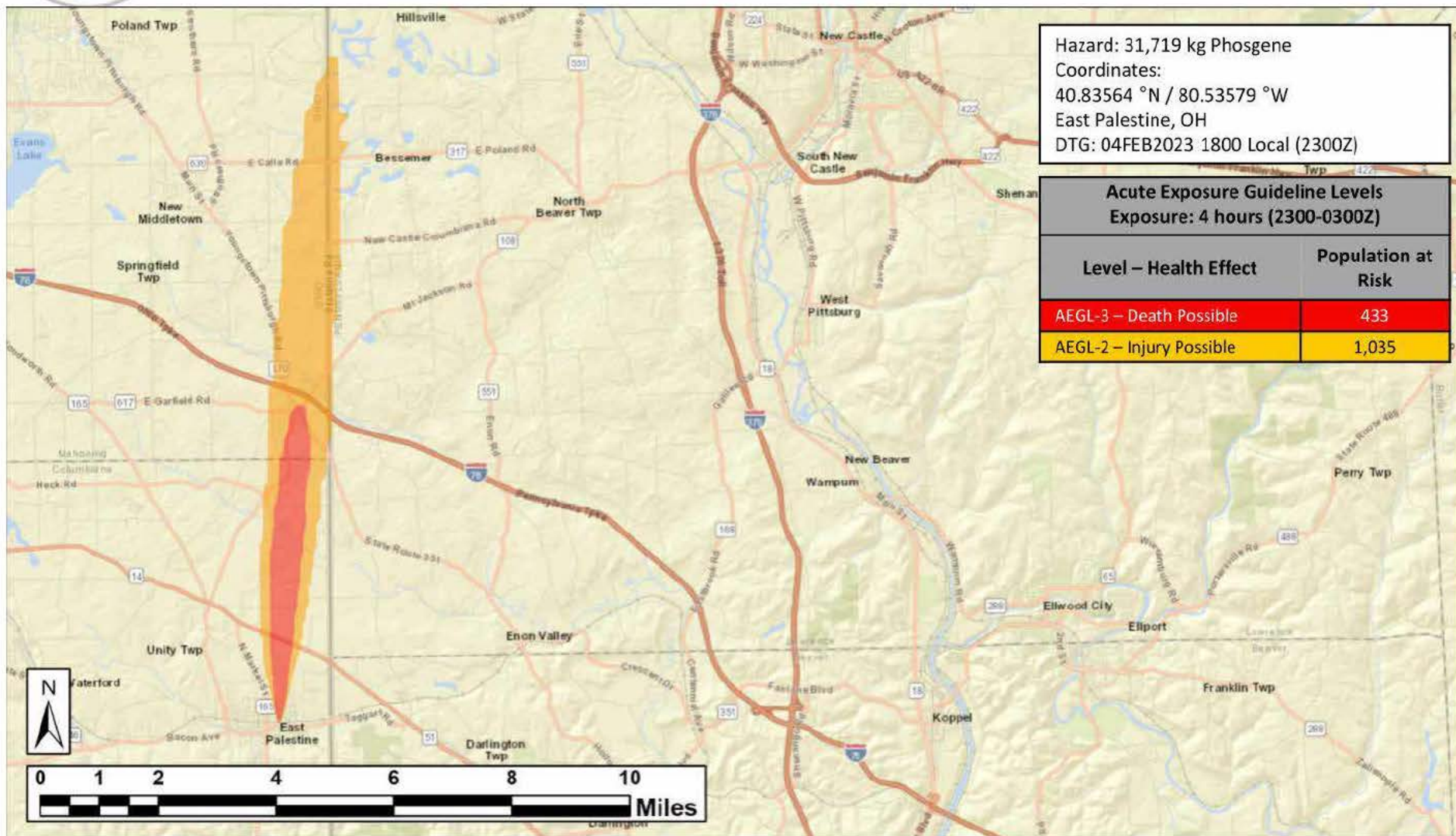
CUI



~~CUI~~

RFI 22-0081bU

Phosgene – 1800 Local



~~CUI~~



~~CUI~~

RFI 22-0081bU

Soot– Surface Dosage- 1800 Local

Hazard: Railcars on fire

Coordinates:

40.83564 °N / 80.53579 °W

East Palestine, OH

DTG: 04FEB2023 1800 Local (2300Z)

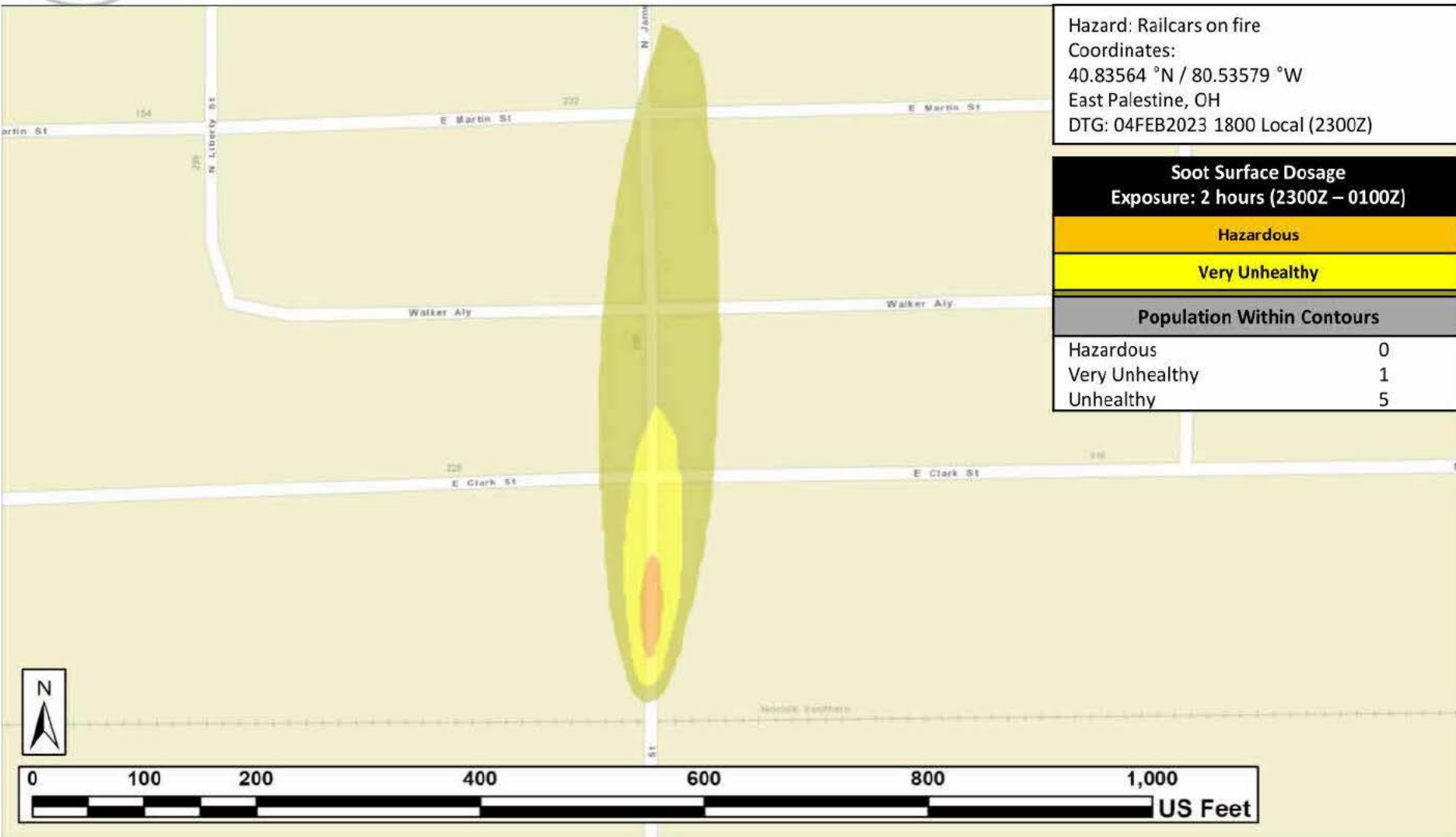
Soot Surface Dosage
Exposure: 2 hours (2300Z – 0100Z)

Hazardous

Very Unhealthy

Population Within Contours

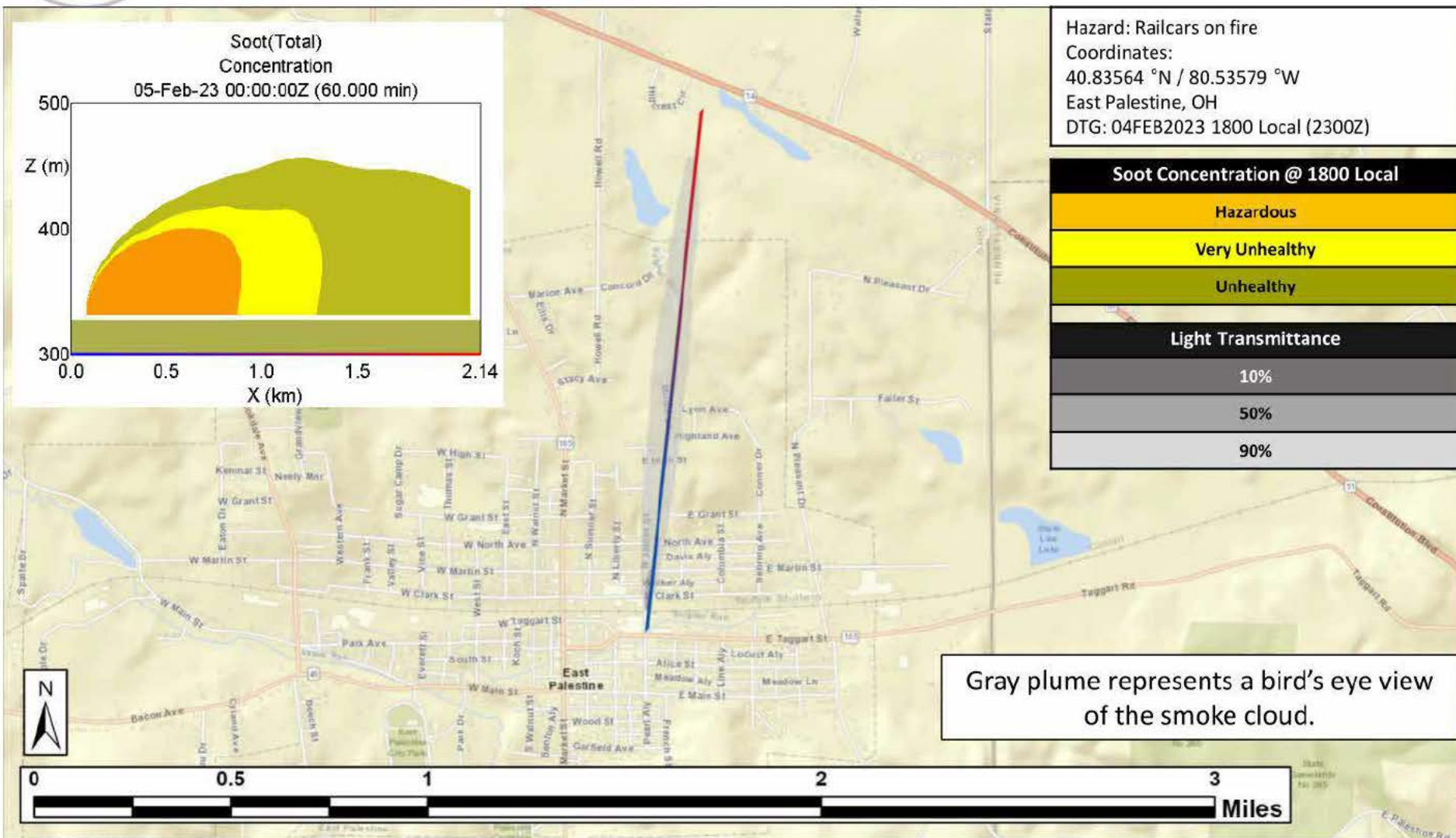
Hazardous	0
Very Unhealthy	1
Unhealthy	5



~~CUI~~



Soot – Vertical Profile-1800 Local



0000 Local (0500Z)

05FEB2023



CUI

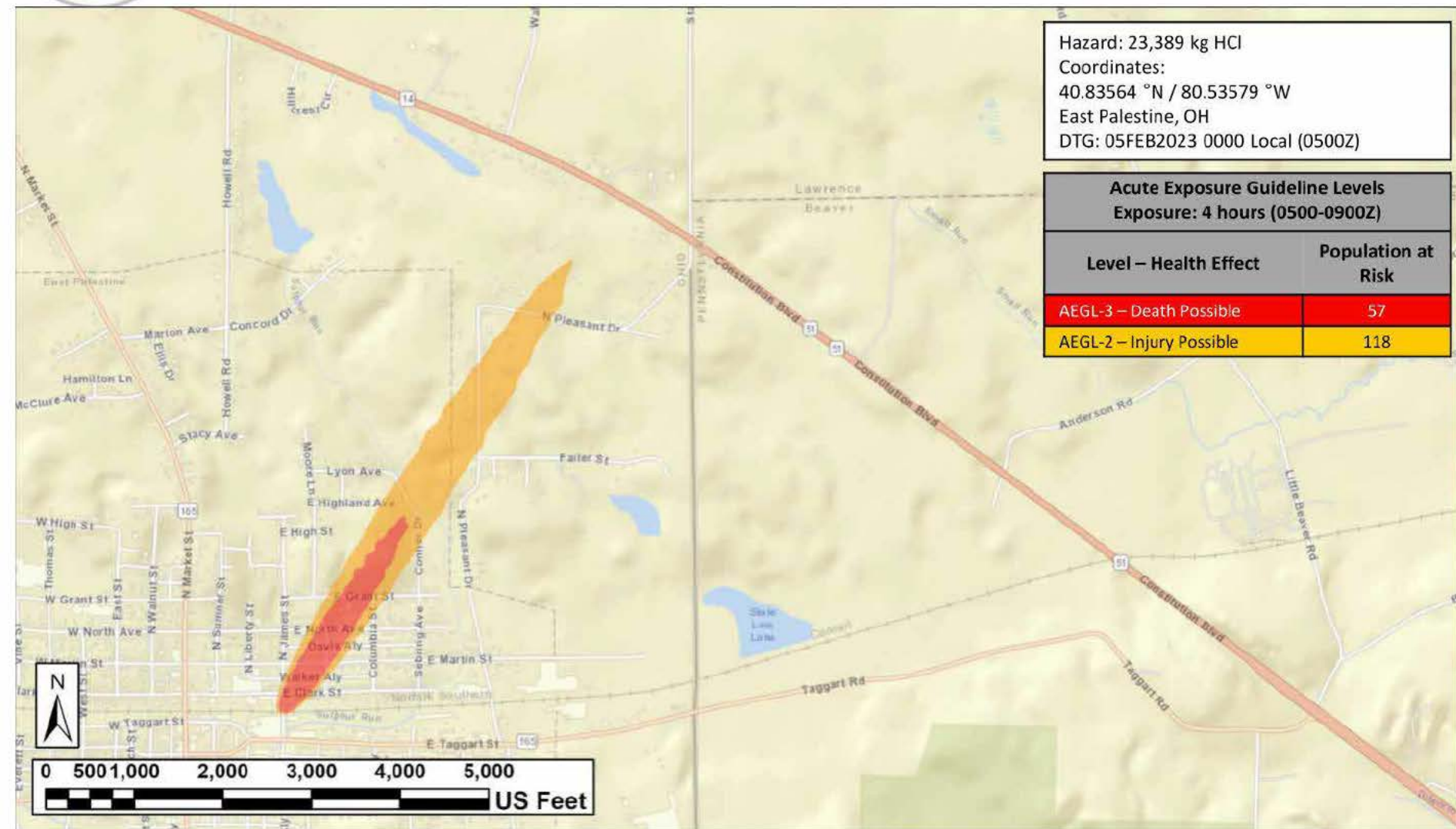
RFI 22-0081bU

Hydrogen Chloride – 0000 Local

Hazard: 23,389 kg HCl
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0000 Local (0500Z)

Acute Exposure Guideline Levels Exposure: 4 hours (0500-0900Z)

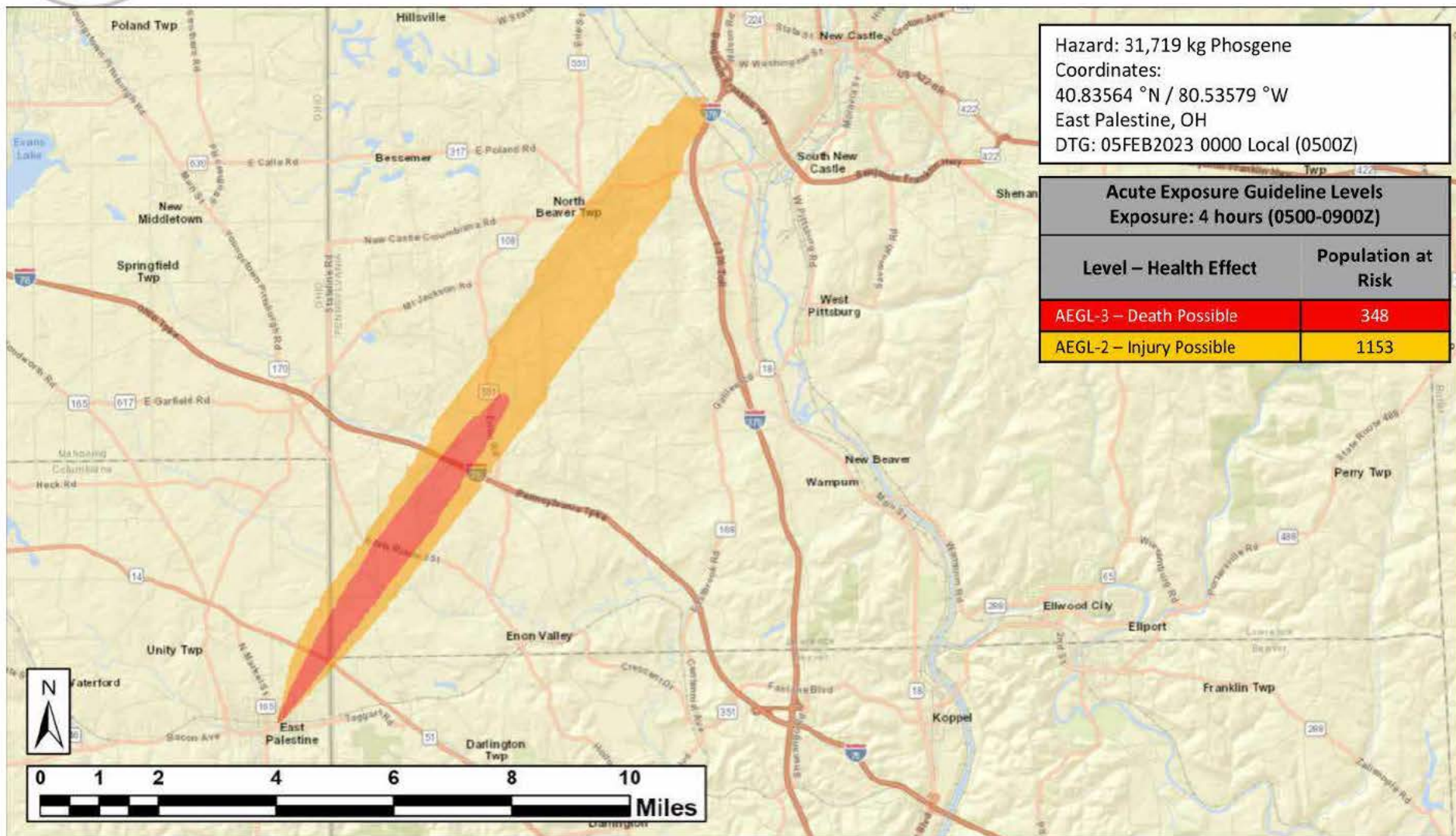
Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	57
AEGL-2 – Injury Possible	118



CUI



Phosgene – 0000 Local





CUI

RFI 22-0081bU

Soot– Surface Dosage- 0000 Local

Hazard: Railcars on fire

Coordinates:

40.83564 °N / 80.53579 °W

East Palestine, OH

DTG: 05FEB2023 0000 Local (0500Z)

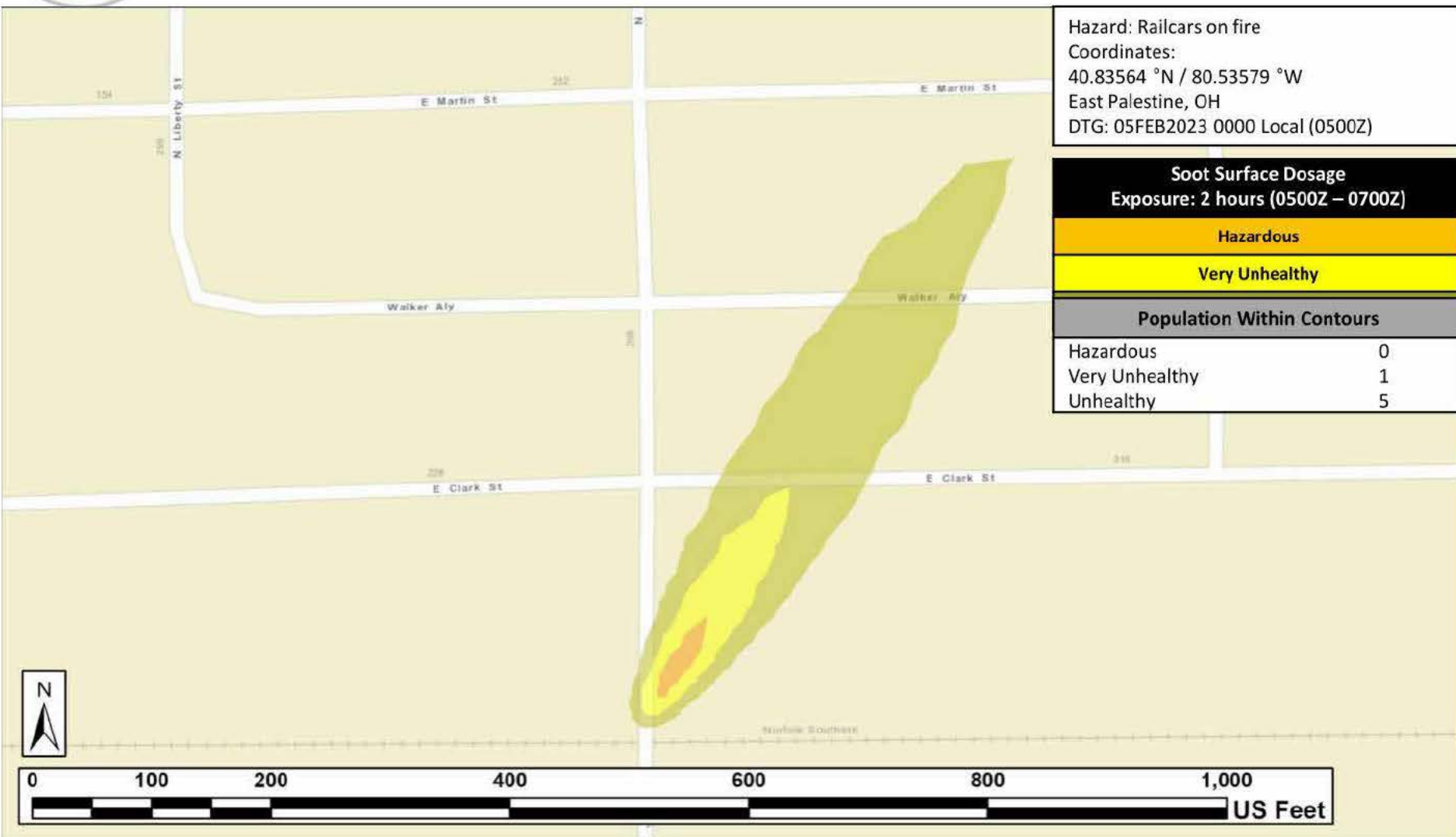
Soot Surface Dosage
Exposure: 2 hours (0500Z – 0700Z)

Hazardous

Very Unhealthy

Population Within Contours

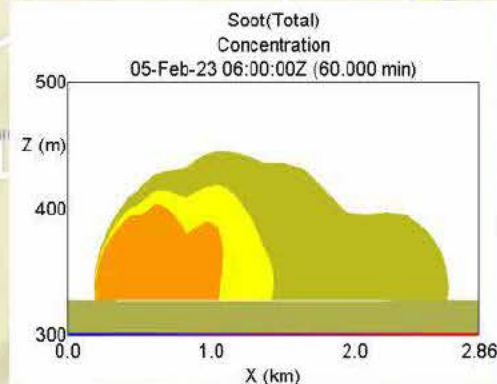
Hazardous	0
Very Unhealthy	1
Unhealthy	5



CUI



Soot – Vertical Profile-0000 Local



Hazard: Railcars on fire
Coordinates:
40.83564 °N / 80.53579 °W
East Palestine, OH
DTG: 05FEB2023 0000 Local (0500Z)

Soot Concentration @ 0000 Local

Hazardous

Very Unhealthy

Unhealthy

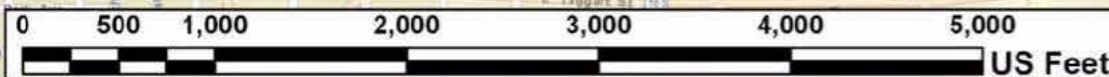
Light Transmittance

10%

50%

90%

Gray plume represents a bird's eye view of the smoke cloud.





Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

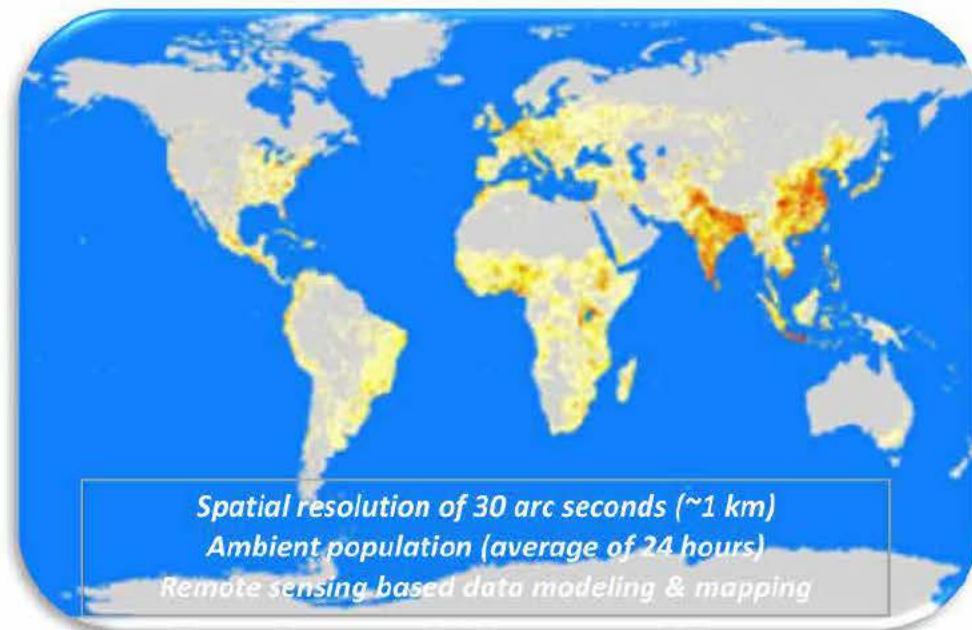


Population Data

CUI

RFI 22-0081bU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081aU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 04FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6) (b) (6)
Request	Model railcars filled with vinyl chloride in fire.
Employment	Real World
Hazards	Combustion products of 5 railcars on fire, filled with vinyl chloride resulting in releases of: • 23,389 kg hydrogen chloride (HCl) • 31,719 kg phosgene (CCl₂O)
Location	East Palestine, OH 40.83564 °N / 80.53579 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	0800 04FEB2023 Local (1300Z)
Executive Summary	• For phosgene, 840 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 517 people may be exposed to hazard levels that could possibly result in death. • For hydrogen chloride, 175 people are estimated to be exposed to hazard levels that could possibly result in at least severe injury. Of this group, 53 people may be exposed to hazard levels that could possibly result in death. • Note: AEGLs are conservative safety levels and assume an unsheltered general population (to include susceptible individuals).



Assumptions / Comments

- Model assumes 5 railcars of vinyl chloride burning.
- Quantity per railcar from requestor (178,000 lb ~ 81,000 kg).

(b)(3)10USC130

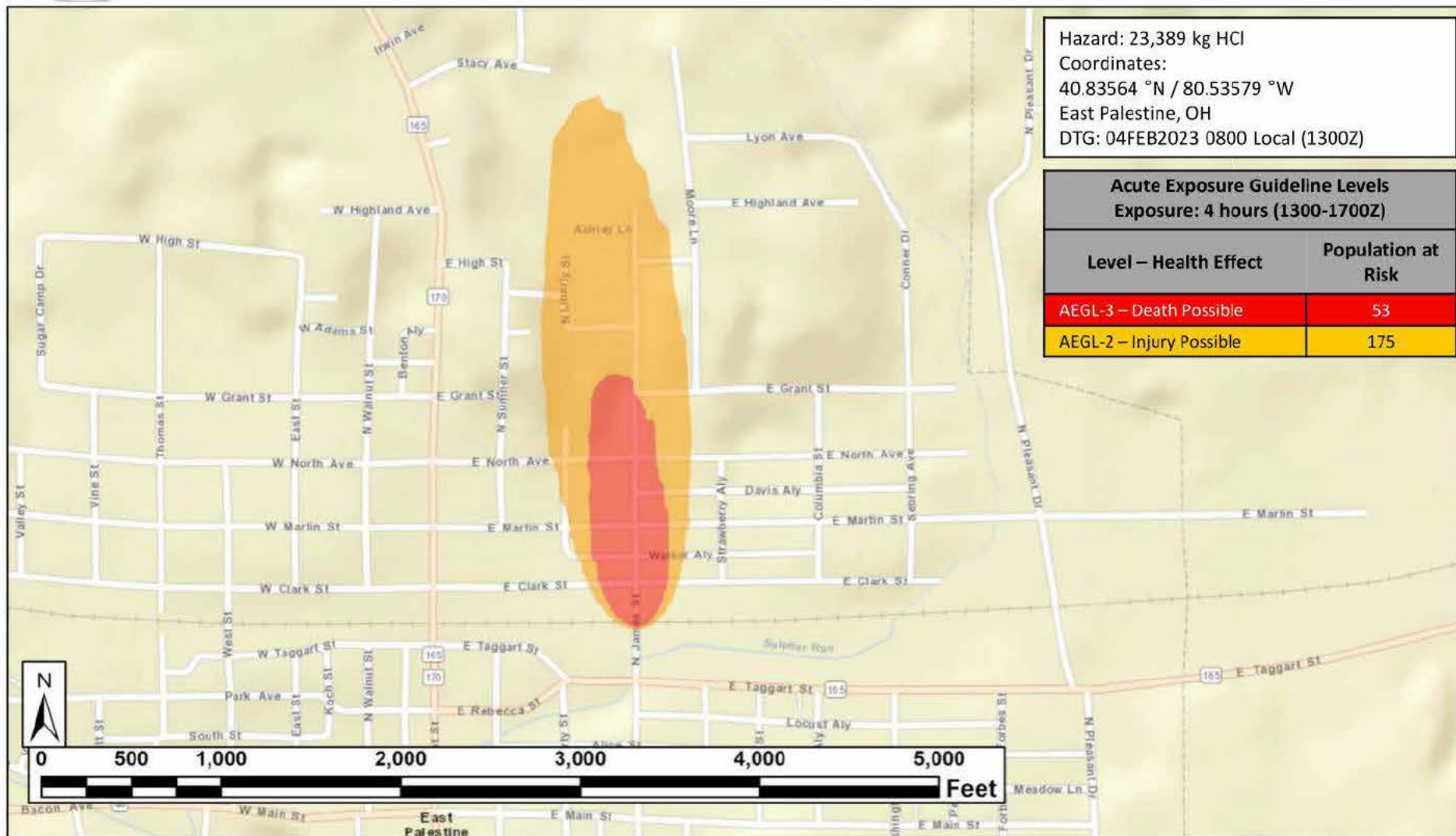
- Worst case situations are modeled, in which all of the vinyl chloride is consumed in the fire and converts completely to either hydrogen chloride or to phosgene.
- Hydrogen chloride is a combustion byproduct of vinyl chloride.
- Reports exist of vinyl chloride decompose to phosgene.
Amounts modeled likely over-state the expected hazard and be considered as an absolute worst case hazard (upper bound)



CUI

RFI 22-0081aU

Hydrogen Chloride – 0800 Local



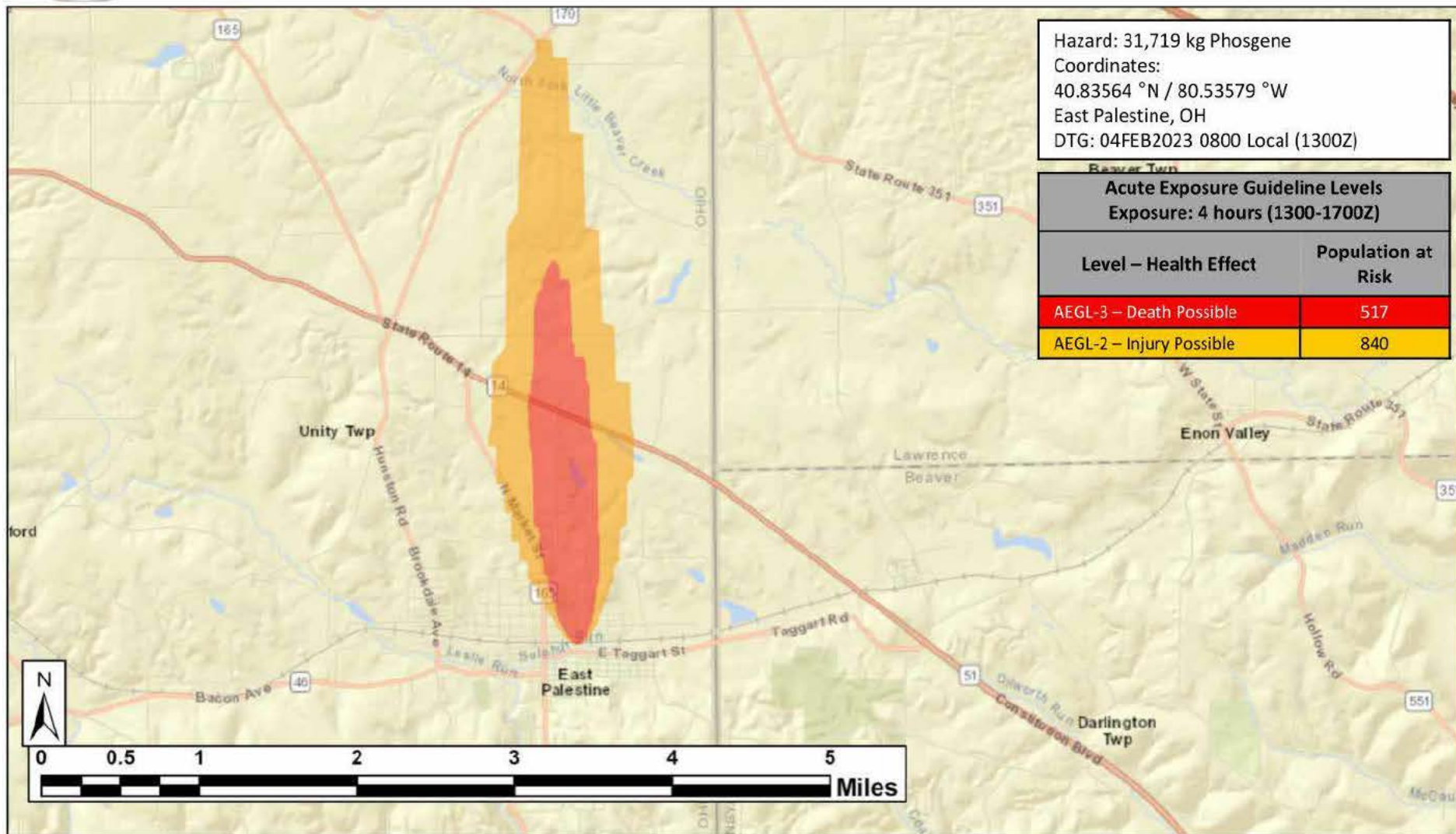
CUI



CUI

RFI 22-0081aU

Phosgene – 0800 Local



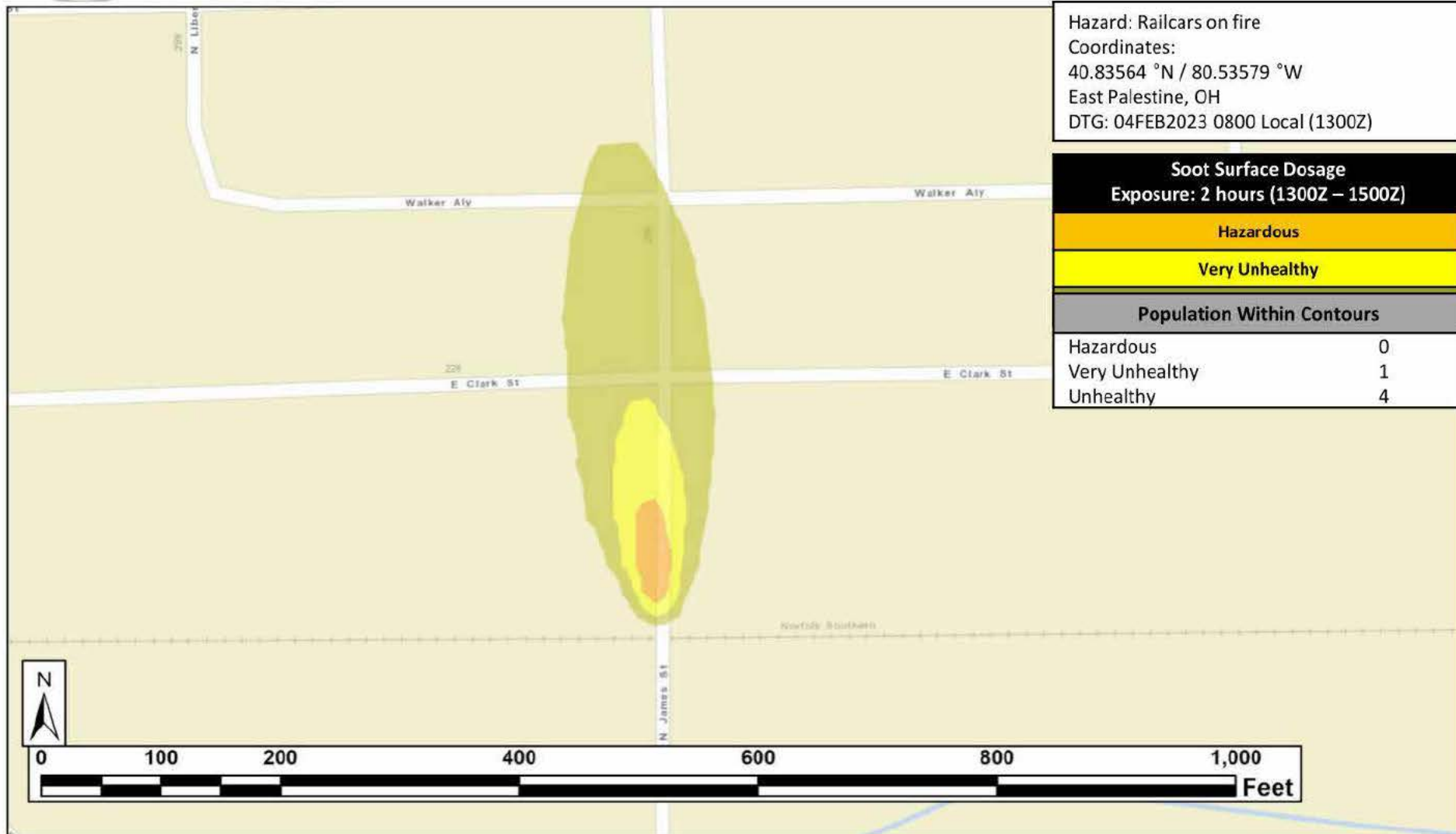
CUI



CUI

RFI 22-0081aU

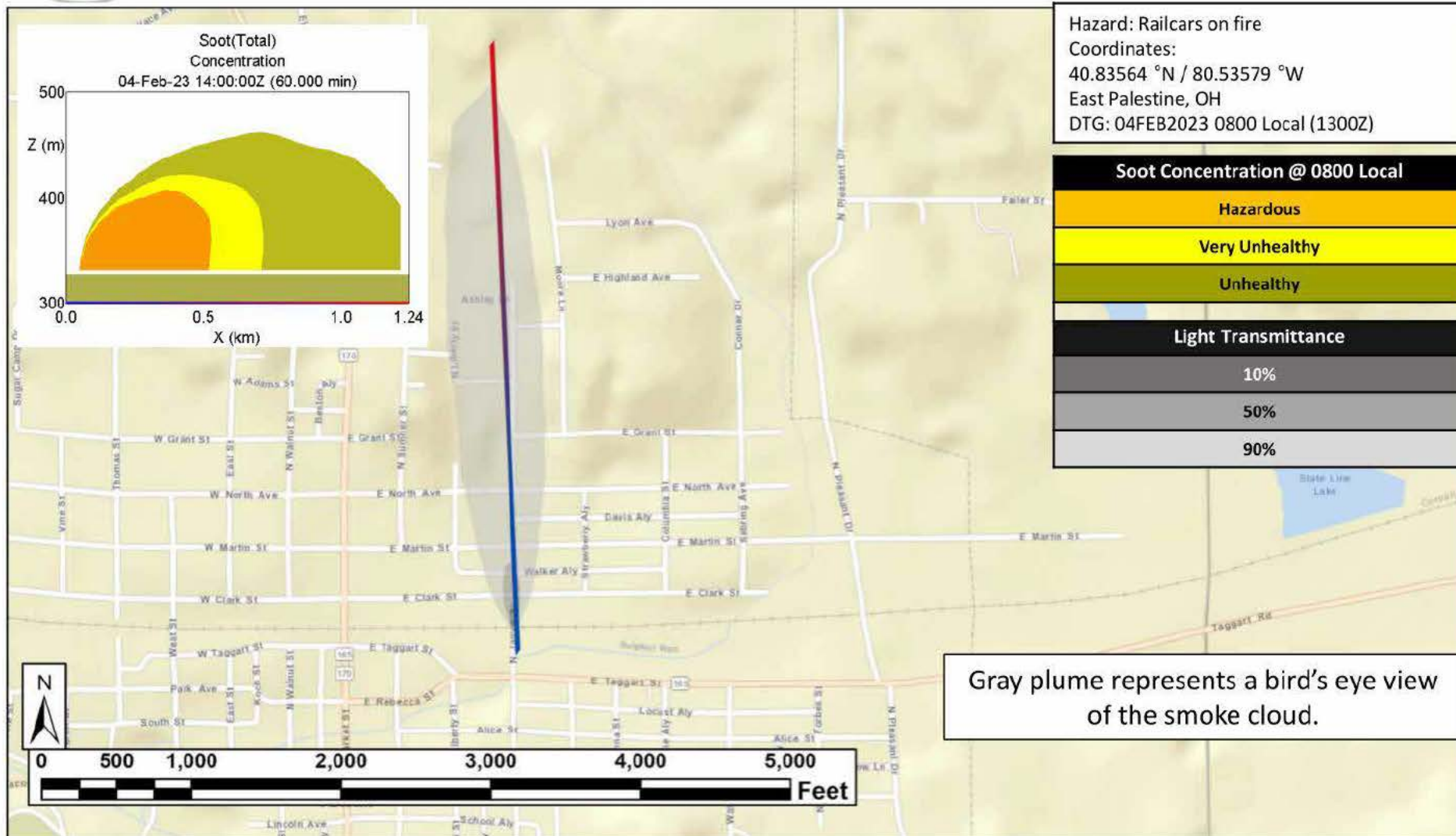
Soot– Surface Dosage- 0800 Local

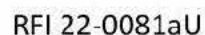


CUI



Soot –Vertical Profile- 0800 Local





INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

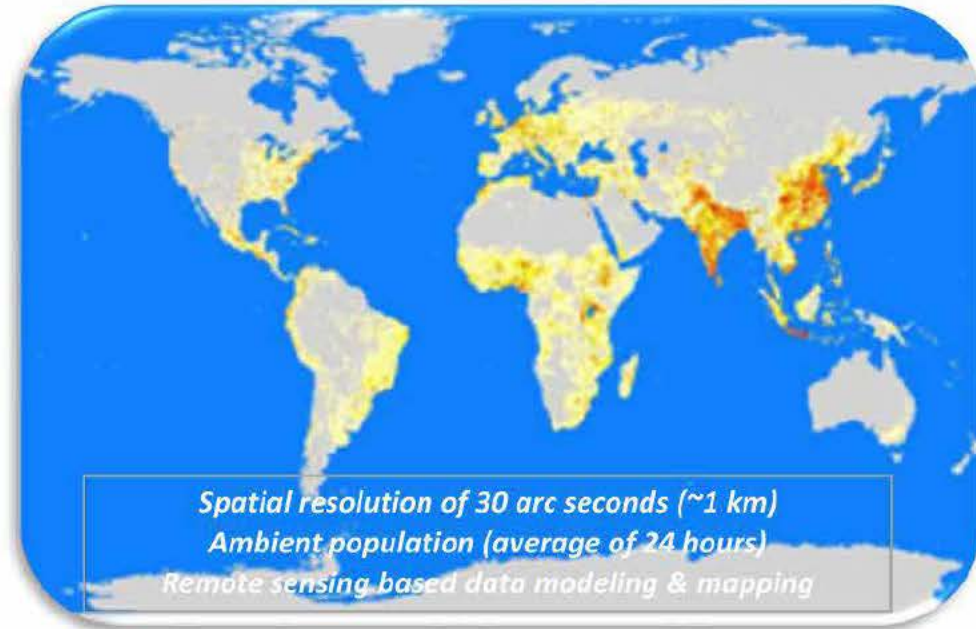


Population Data

~~CUI~~

RFI 22-0081aU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 21:33:02 +0000
To: fema-nwc@fema.dhs.gov
Cc: (b) (6); DTRA Ft Belvoir RD Mailbox Reachback
Subject: RE: IMAAC RFIs
Attachments: RFI_23-0081hU_IMAAC.pdf, smime.p7s

FEMA NWC -

Attached is the latest update. I will send the previous update in another email.

Respectfully,
(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
RD Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Monday, February 6, 2023 4:26 PM
To: fema-nwc@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)
Subject: IMAAC RFIs

CUI

Good Afternoon,

Please see the updates attached for the IMAAC. The most recent is version h (RFI 23-0081hU_IMAAC.pdf). I will send another email with others that were done over the weekend.

Respectfully,
(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3445/8 (427-)
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
Research and Development Directorate, Technical Reachback Division

Controlled by: Defense Threat Reduction Agency

Controlled by: Research and Development

CUI Category: CTI

Distribution/Dissemination Statement: C

POC: RD-OPR, 703-767-3445

CUI

~~CUI~~

Date: 06FEB2023 1745Z

Version: Revision H

Changes: Planned breach model; adjusted amounts (see Slide #3)



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081hU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 5 railcars, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1530 06FEB2023 Local (2030Z) 2. 1800 06FEB2023 Local (2030Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3) 10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081hU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



3:30PM Breach (2030Z) 06 FEB 2023

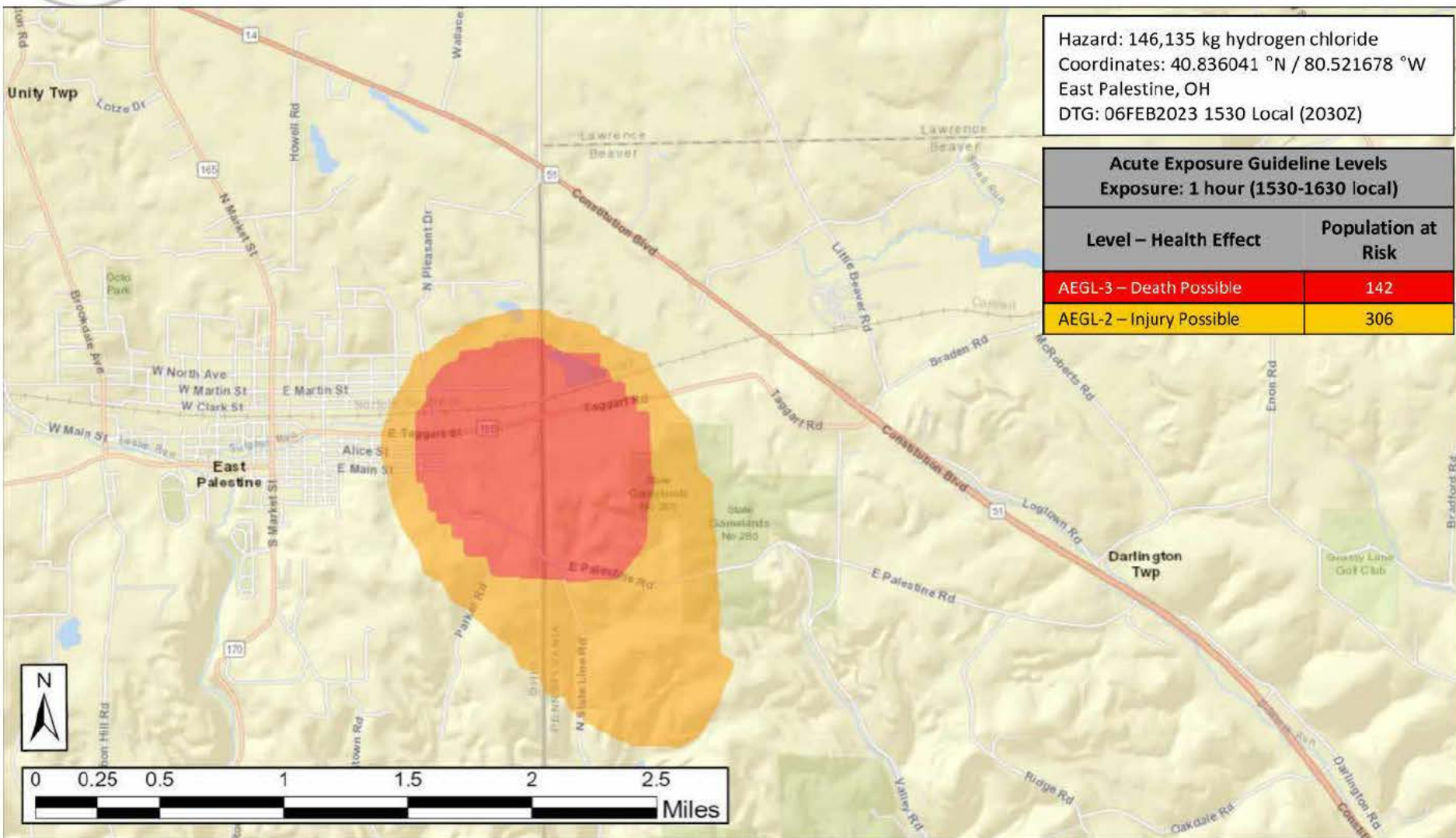


Hydrogen Chloride – 1530 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



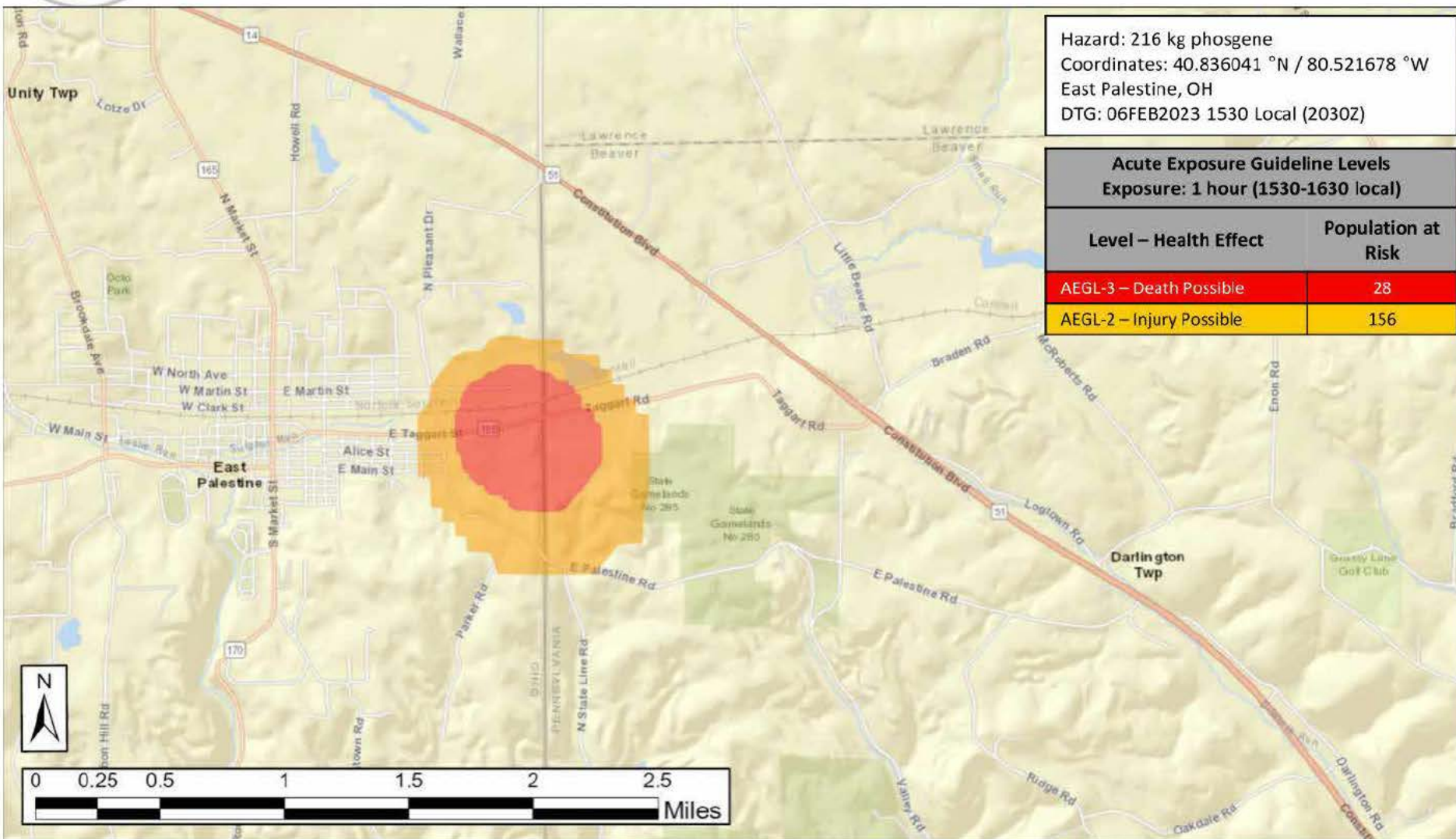


Phosgene – 1530 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156





CUI

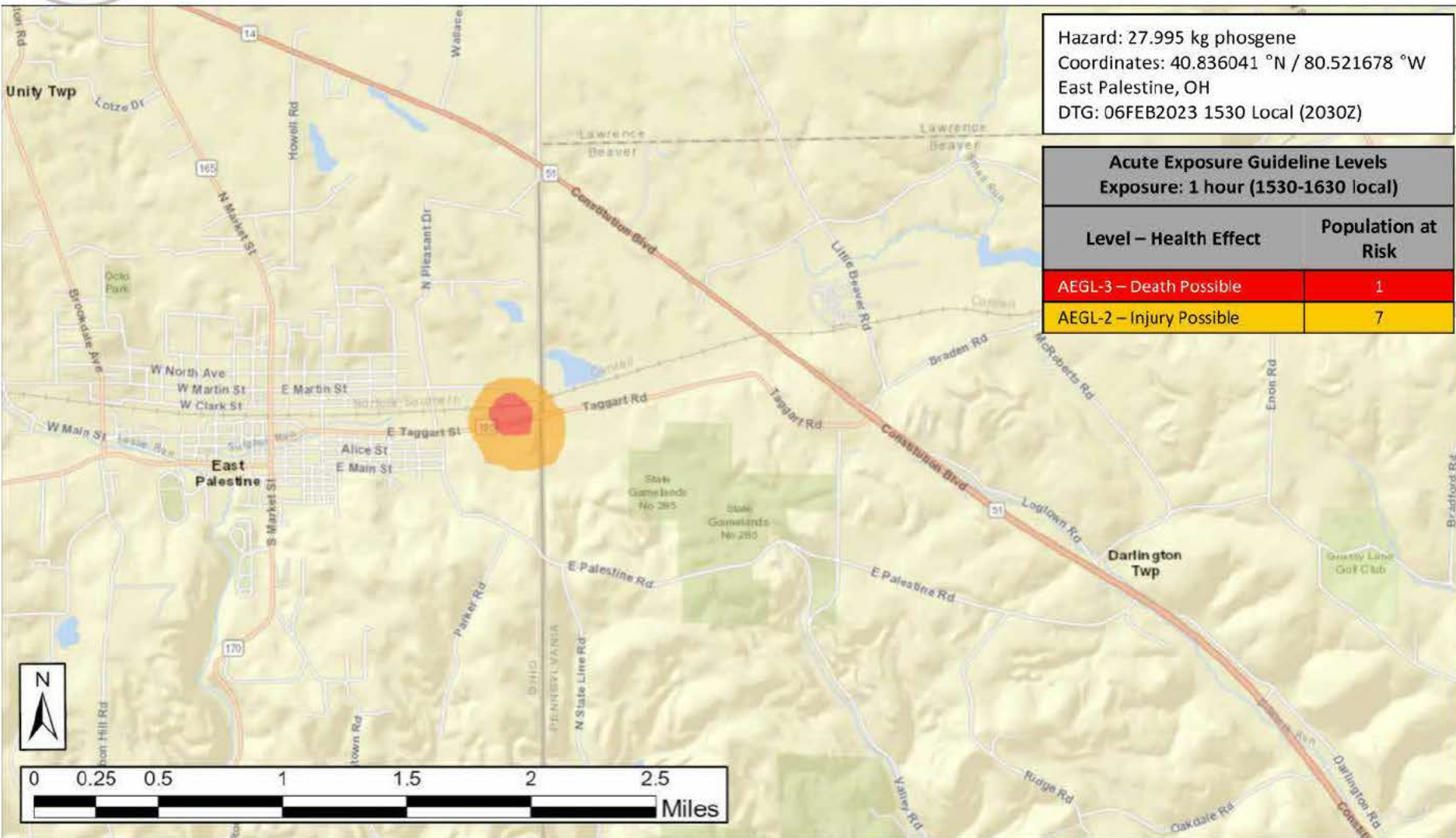
RFI 22-0081hU

Vinyl Chloride – 1530 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1530 Local (2030Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1530-1630 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



CUI



6:00PM Breach (2300Z) 06 FEB 2023



CUI

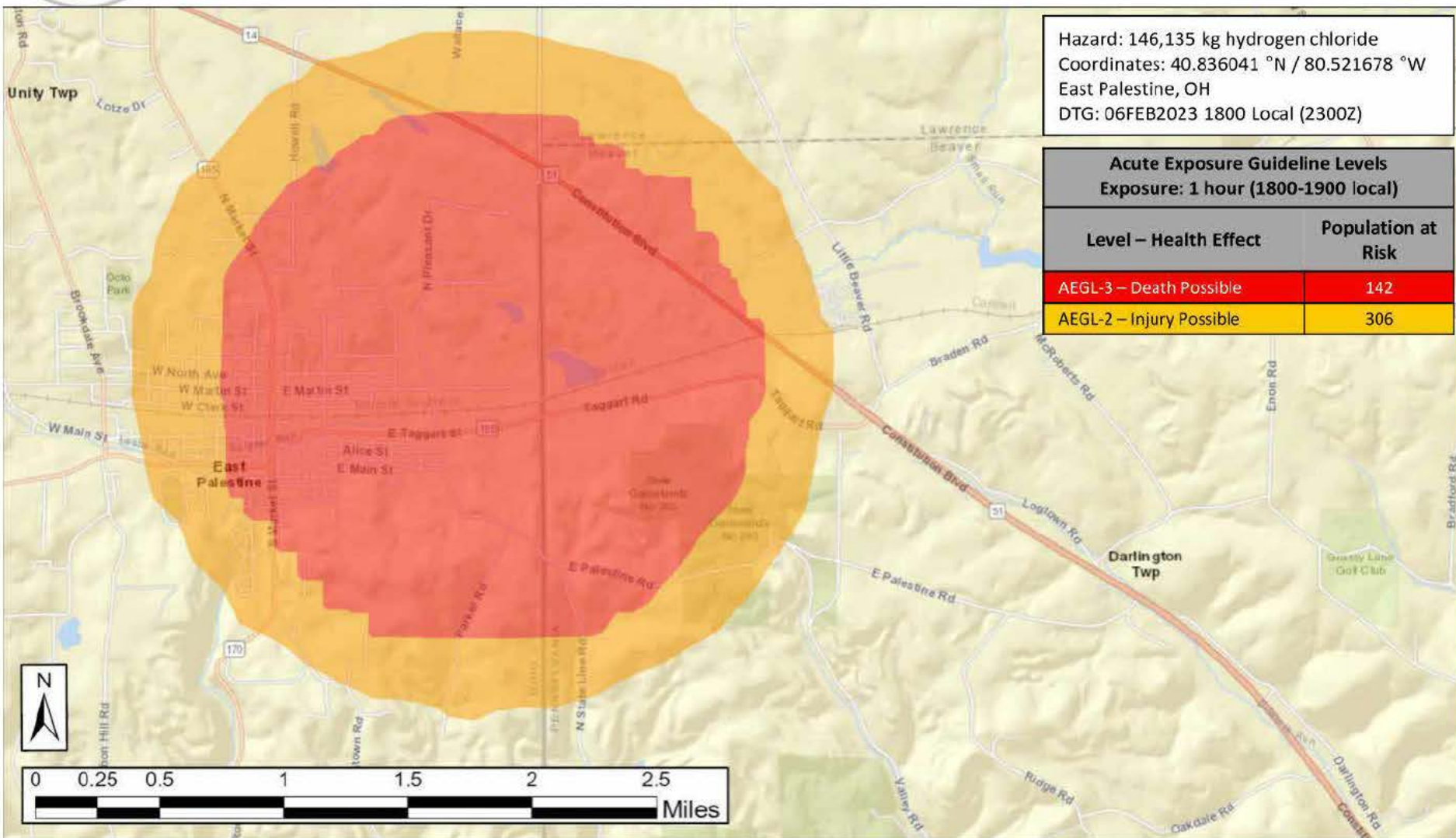
RFI 22-0081hU

Hydrogen Chloride – 1800 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



CUI



CUI

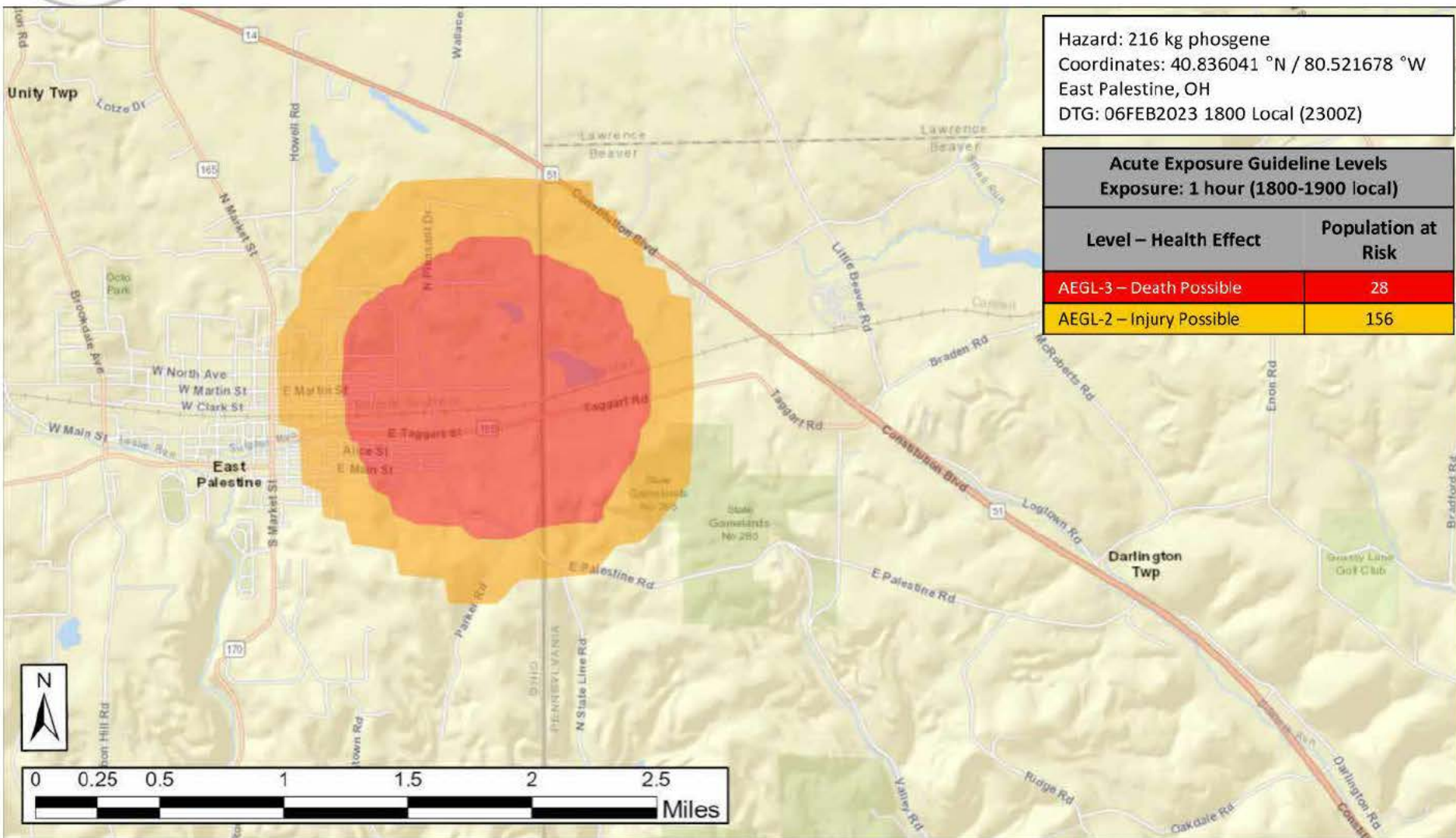
RFI 22-0081hU

Phosgene – 1800 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1800 Local (2300Z)

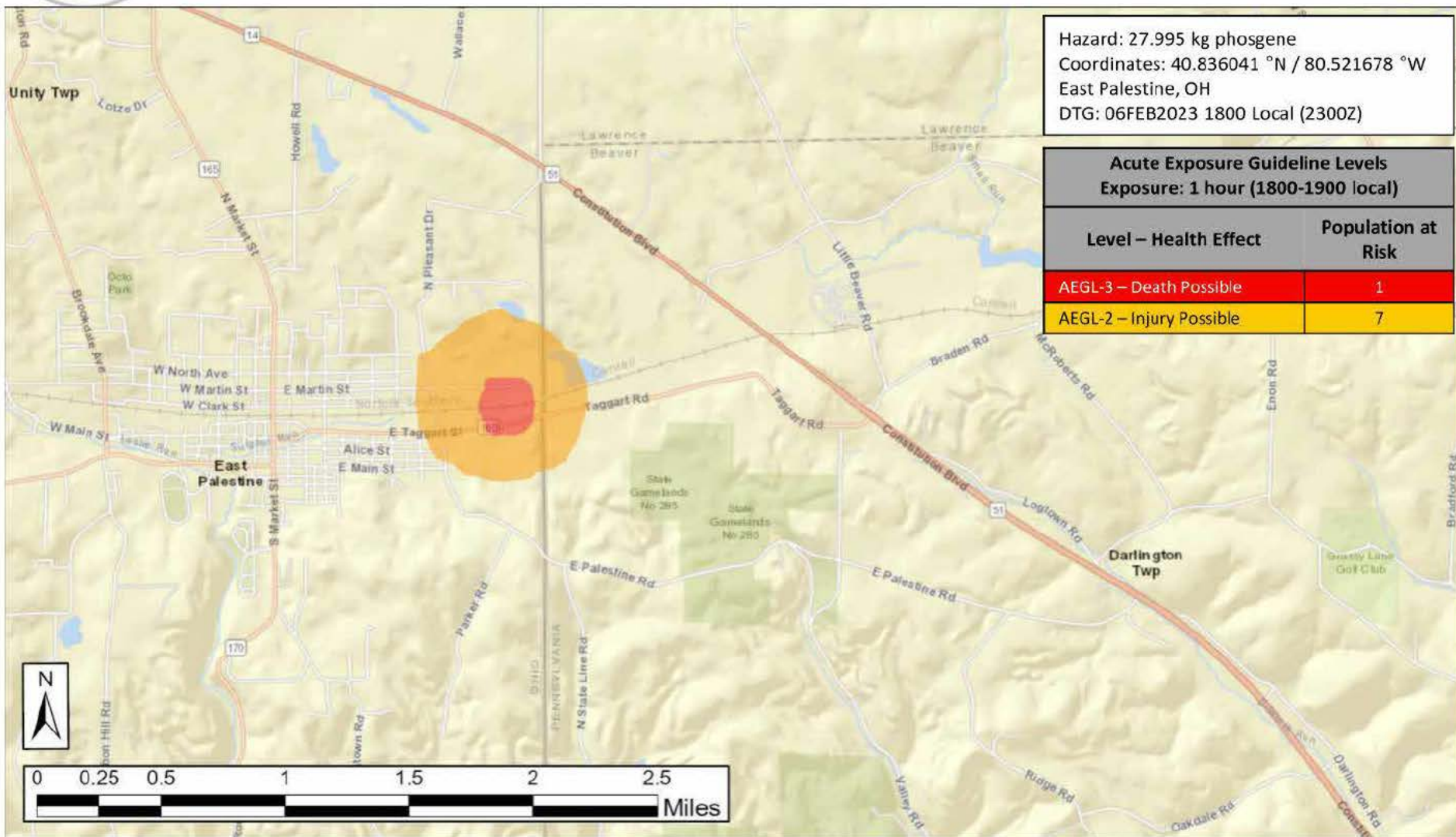
Acute Exposure Guideline Levels Exposure: 1 hour (1800-1900 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI

Vinyl Chloride – 1800 Local





Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "*Facility damages and personnel injury from explosive blast*", Montgomery & Ward, 1993; "*The effects of nuclear weapons*", 3rd edition, Glasstone & Dolan, **1977**

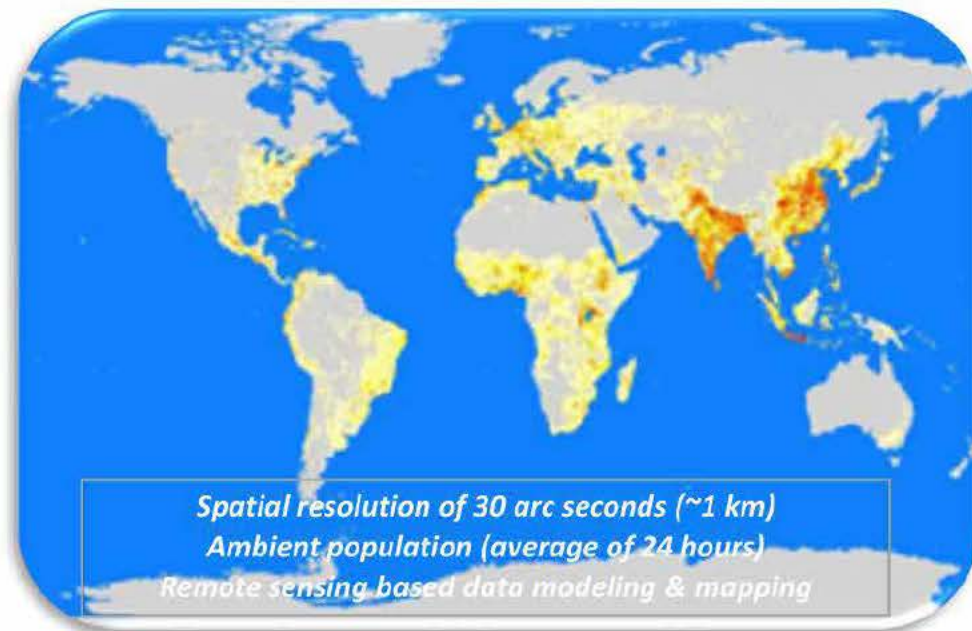


Population Data

CUI

RFI 22-0081hU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Mon, 6 Feb 2023 21:36:20 +0000
To: fema-nwc@fema.dhs.gov
Cc: (b) (6); DTRA Ft Belvoir RD Mailbox Reachback
Subject: RE: IMAAC RFIs
Attachments: RFI_23-0081gU_IMAAC.pdf, smime.p7s

FEMA NWC -

Attached is the "g" update. The "h" product is the latest update.

All previous updates to "g" are posted on the Chem Responder site.

Respectfully,

(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
RD Directorate
Technical Reachback Division

-----Original Message-----

From: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>
Sent: Monday, February 6, 2023 4:26 PM
To: fema-nwc@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback
<dtra.belvoir.rd.mbx.reachback@mail.mil>; (b) (6)
Subject: IMAAC RFIs

CUI

Good Afternoon,

Please see the updates attached for the IMAAC. The most recent is version h (RFI 23-0081hU_IMAAC.pdf). I will send another email with others that were done over the weekend.

Respectfully,

(b) (6)
Defense Threat Reduction Agency
COM: (703) 767-3445/8 (427-)
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
Research and Development Directorate, Technical Reachback Division

Controlled by: Defense Threat Reduction Agency

Controlled by: Research and Development

CUI Category: CTI

Distribution/Dissemination Statement: C

POC: RD-OPR, 703-767-3445

CUI



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081gU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 06FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 1 single railcar, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 1400 06FEB2023 Local (1900Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five containers of vinyl chloride is considered. This results in some level of combustion/explosion. Based on reports from shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a planned breach of the container.
- A BLEVE, as a result of or during the breach, is possible. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130

- Blast effects from a BLEVE is provided.



Caveats

~~CUI~~

RFI 22-0081gU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



CUI

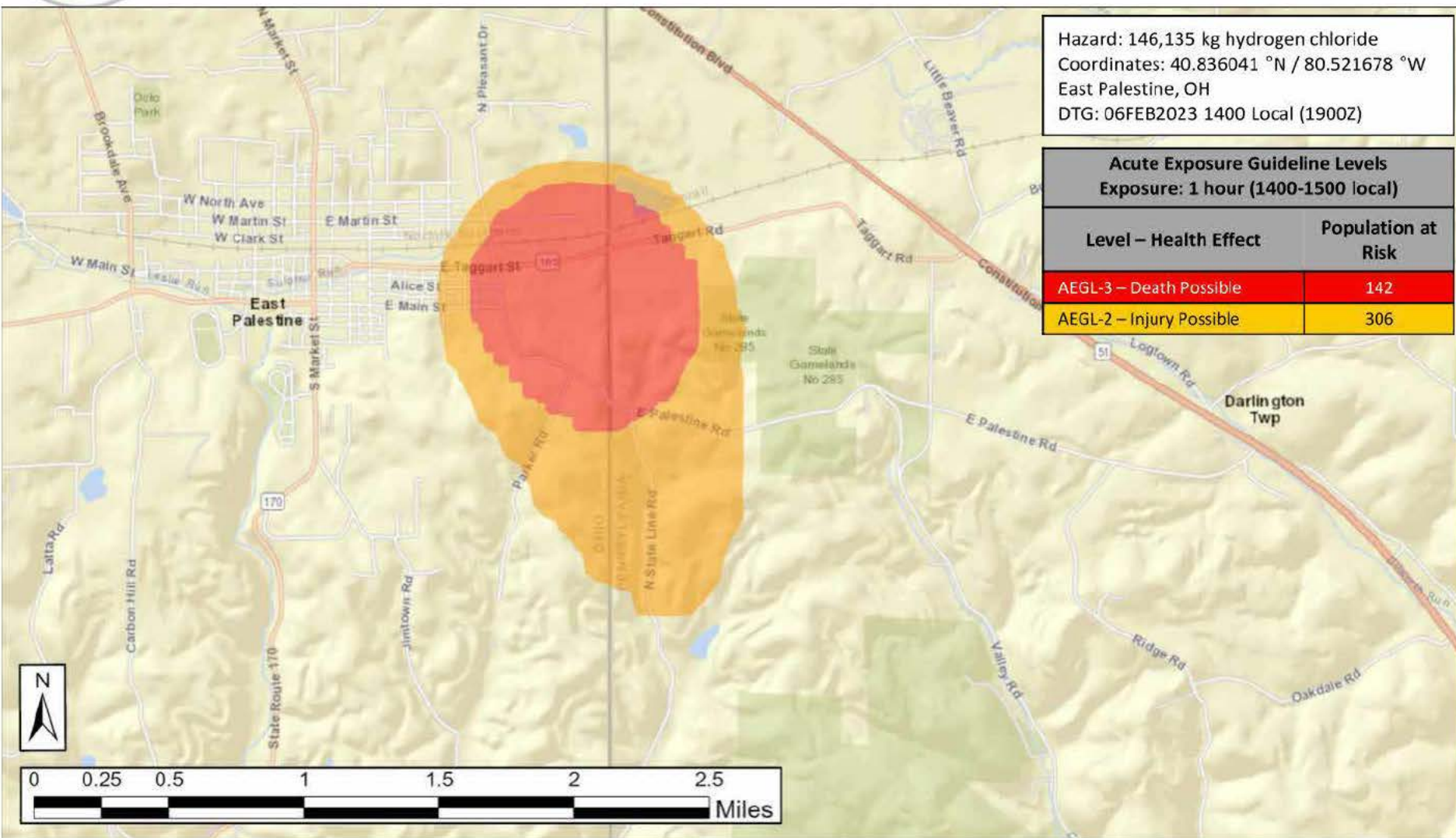
RFI 22-0081gU

Hydrogen Chloride – 1400 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	142
AEGL-2 – Injury Possible	306



CUI



CUI

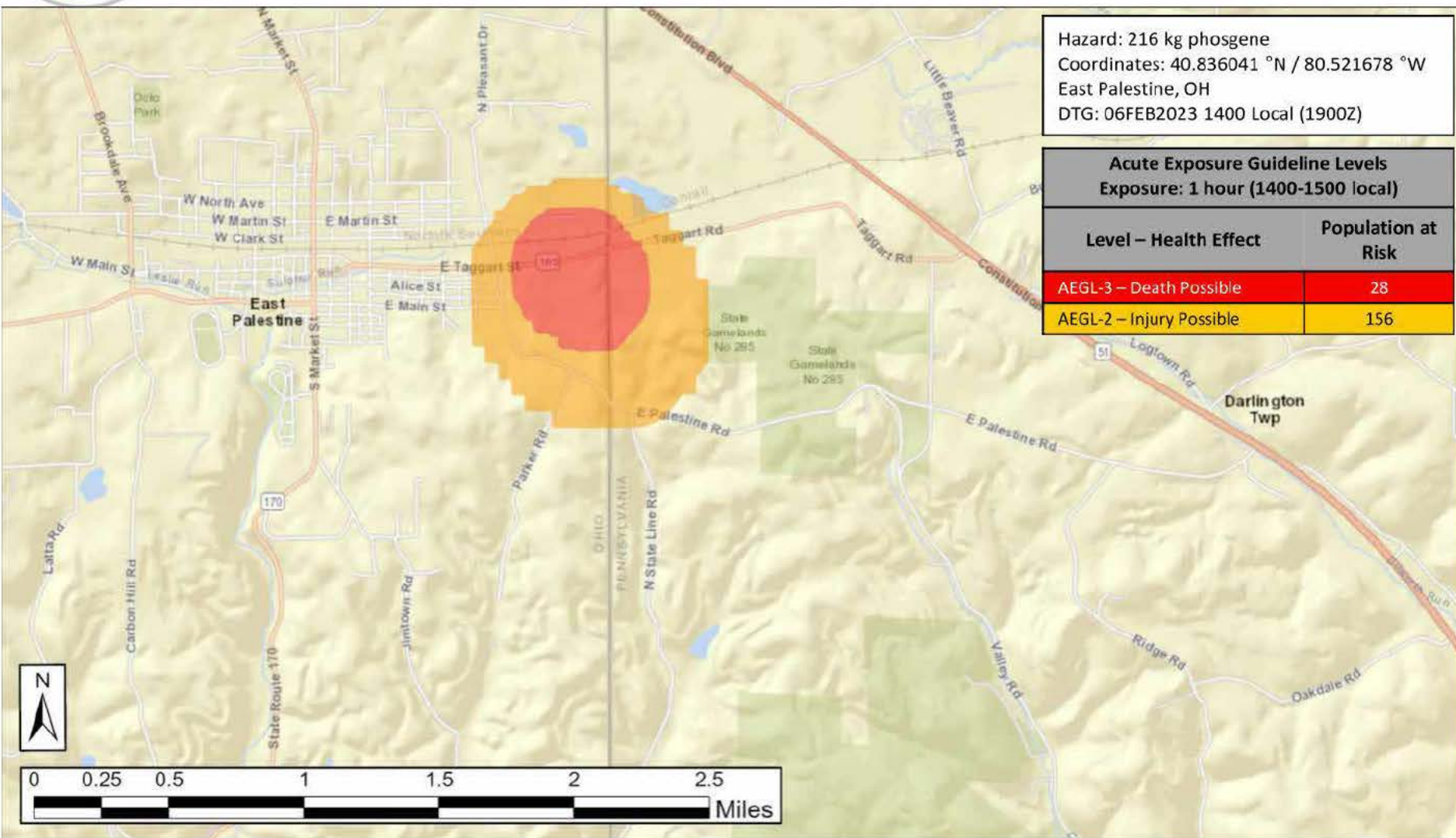
RFI 22-0081gU

Phosgene – 1400 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	28
AEGL-2 – Injury Possible	156



CUI



~~CUI~~

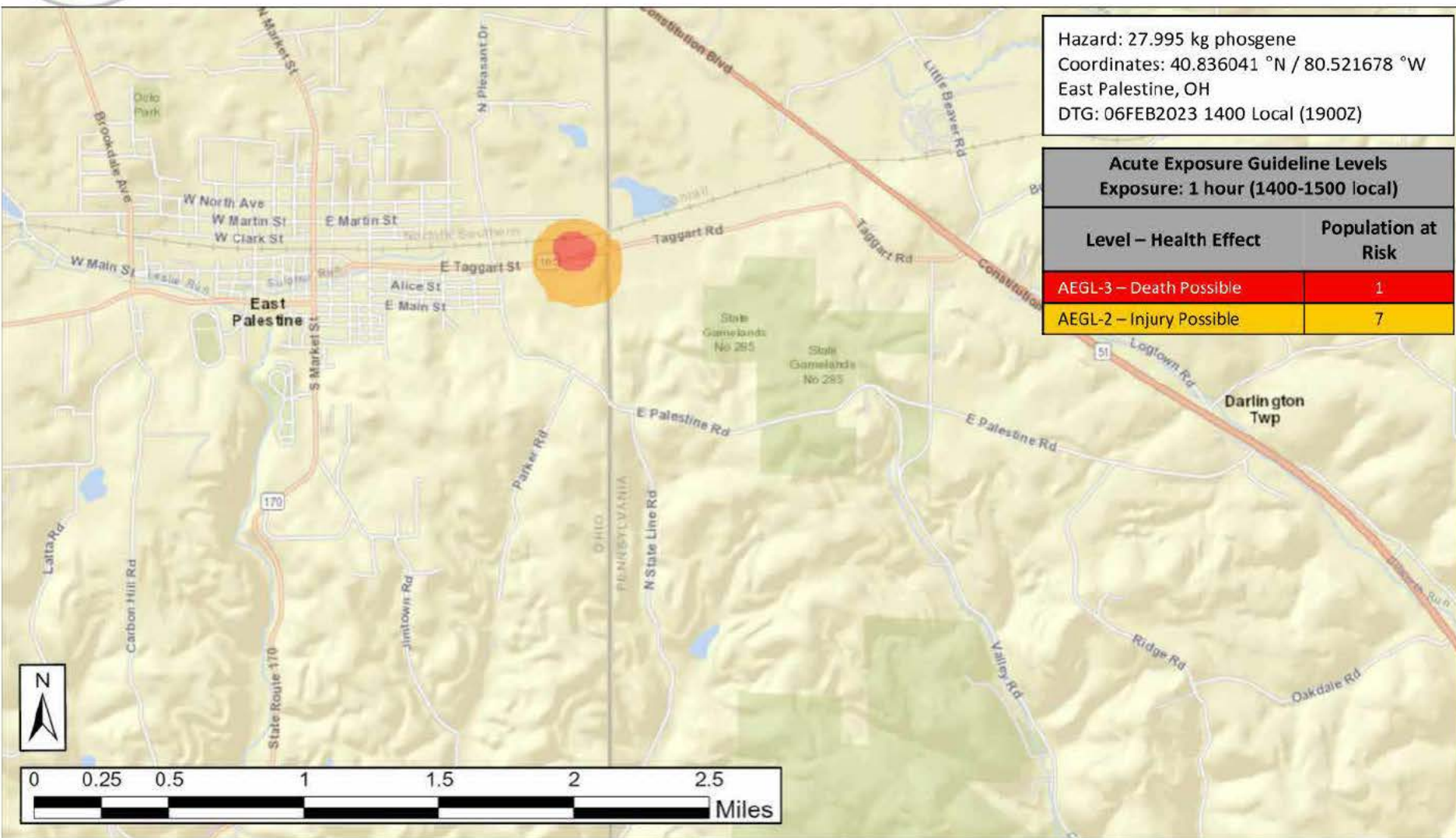
RFI 22-0081gU

Vinyl Chloride – 1400 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 06FEB2023 1400 Local (1900Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1400-1500 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	1
AEGL-2 – Injury Possible	7



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081gU

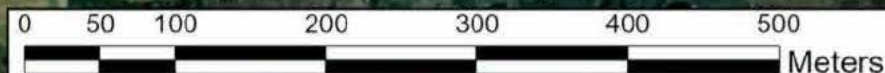
BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



CUI



BLEVE- Boiling Liquid Expanding Vapor Explosion

- ## VCE- Vapor Cloud Explosion

- Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, **1985**; "*Facility damages and personnel injury from explosive blast*", Montgomery & Ward, 1993; "*The effects of nuclear weapons*", 3rd edition, Glasstone & Dolan, **1977**

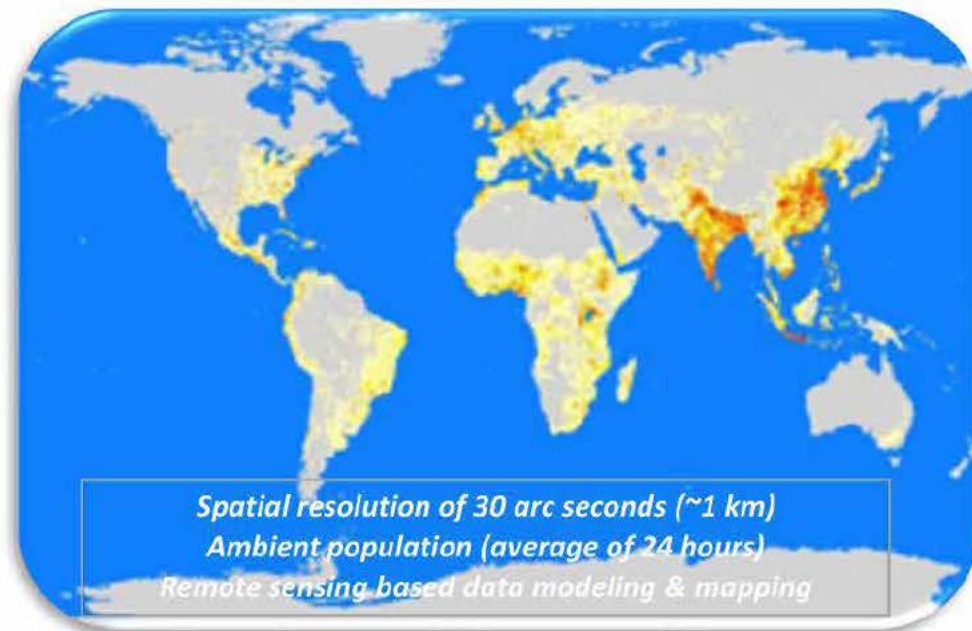


Population Data

~~CUI~~

RFI 22-0081gU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~

OhioTrain.PNG

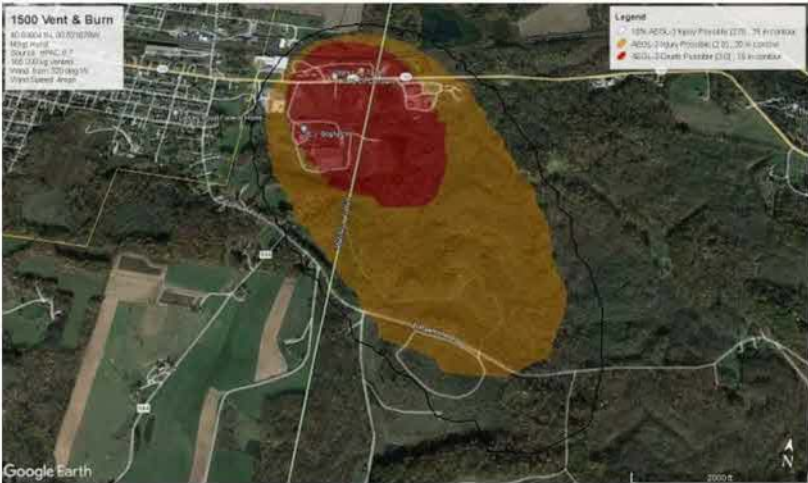
A map shows two areas that will be affected by a burn off of chemicals from a train derailment in East Palestine, Ohio.

1500 Vent & Burn

80-84004 14, 00.021627W
Mighty Wind
Source: 1000 ft
100 000 kg vented
Wind: from 320 deg 14
Wind Speed: 40 mph

Legend

- 10% ACGL - 3 Injury Possible (270 - 75 ft contour)
- ACGL - 3 Injury Possible (270 - 30 ft contour)
- ACGL - 3 Death Possible (270 - 15 ft contour)



A map shows two areas that will be affected by a burn off of chemicals from a train derailment in East Palestine, Ohio.

Ohio Governor's Office

From: (b) (6)
Sent: Mon, 6 Feb 2023 23:19:52 +0000
To: (b) (6)
Subject: RE: learning experience
Attachments: smime.p7s

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)
Subject: [Non-DoD Source] learning experience

Hi (b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

From: (b) (6)
Sent: Mon, 6 Feb 2023 23:22:45 +0000
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience
Attachments: smime.p7s

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)
Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't 😊

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)
Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

From: (b) (6)
Sent: Mon, 6 Feb 2023 23:22:45 +0000
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience
Attachments: smime.p7s

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than

what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)

Sent: Monday, February 6, 2023 6:07 PM

To: (b) (6)

Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

From: (b) (6)
Sent: Mon, 6 Feb 2023 23:43:29 +0000
To: (b) (6)
Subject: RE: learning experience
Attachments: smime.p7s

Well, I'm not completely sure about that. I haven't seen anything out there with an actual IMAAC logo, but we have seen plots during some of the briefings that have shown plumes that look like ours. So perhaps people have used the shapefiles or KMLs in the plots that have been shown in briefings, but we haven't yet seen an IMAAC plot with the CUI label on it. Which is good. I wouldn't be surprised to see it, though, as this is a pretty big event. We've done about 7 or 8 updates now.

I do think my favorite thing so far has been right after we got activated, while I was filling time before the conference call. I saw a video where a news station was talking to a guy that took footage. He said something like, "I just grabbed my phone and started running toward the fire to get some footage." Yikes. If only he had seen our plots first, maybe he wouldn't have done that. Or maybe he would. There are some not-so-bright people out there, as we're all aware.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:23 PM
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)
Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I

see an HPAC in the legend.

Thanks!

(b) (6)

From: (b) (6)
Sent: Mon, 6 Feb 2023 23:47:15 +0000
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience
Attachments: smime.p7s

That's why this is a good test case - it's a really big event. If IMAAC plots were to get out, it wouldn't be a shock.

In our nudet training we're talk about not getting a mushroom cloud selfie - shelter already. Maybe it's kind of a Darwinian thing ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:43 PM
To: (b) (6)
Subject: RE: learning experience

Well, I'm not completely sure about that. I haven't seen anything out there with an actual IMAAC logo, but we have seen plots during some of the briefings that have shown plumes that look like ours. So perhaps people have used the shapefiles or KMLs in the plots that have been shown in briefings, but we haven't yet seen an IMAAC plot with the CUI label on it. Which is good. I wouldn't be surprised to see it, though, as this is a pretty big event. We've done about 7 or 8 updates now.

I do think my favorite thing so far has been right after we got activated, while I was filling time before the conference call. I saw a video where a news station was talking to a guy that took footage. He said something like, "I just grabbed my phone and started running toward the fire to get some footage." Yikes. If only he had seen our plots first, maybe he wouldn't have done that. Or maybe he would. There are some not-so-bright people out there, as we're all aware.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:23 PM
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)
Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

That's why this is a good test case - it's a really big event. If IMAAC plots were to get out, it wouldn't be a shock.

In our nucdet training we're talk about not getting a mushroom cloud selfie - shelter already. Maybe it's kind of a Darwinian thing 😊

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:43 PM
To: (b) (6)
Subject: RE: learning experience

Well, I'm not completely sure about that. I haven't seen anything out there with an actual IMAAC logo, but we have seen plots during some of the briefings that have shown plumes that look like ours. So perhaps people have used the shapefiles or KMLs in the plots that have been shown in briefings, but we haven't yet seen an IMAAC plot with the CUI label on it. Which is good. I wouldn't be surprised to see it, though, as this is a pretty big event. We've done about 7 or 8 updates now.

I do think my favorite thing so far has been right after we got activated, while I was filling time before the conference call. I saw a video where a news station was talking to a guy that took footage. He said something like, "I just grabbed my phone and started running toward the fire to get some footage." Yikes. If only he had seen our plots first, maybe he wouldn't have done that. Or maybe he would. There are some not-so-bright people out there, as we're all aware.

(b) (6)

-----Original Message-----

From: (b) (6)

Sent: Monday, February 6, 2023 6:23 PM

To: (b) (6)

Subject: [Non-DoD Source] RE: learning experience

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ☺

-----Original Message-----

From: (b) (6)

Sent: Monday, February 6, 2023 3:20 PM

To: (b) (6)

Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)

Sent: Monday, February 6, 2023 6:07 PM

To: (b) (6)

Subject: [Non-DoD Source] learning experience

(b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

From:

(b) (6)

Sent:

Mon, 6 Feb 2023 23:47:15 +0000

To:

(b) (6)

Subject: [Non-DoD Source] RE: learning experience
Attachments: smime.p7s

That's why this is a good test case - it's a really big event. If IMAAC plots were to get out, it wouldn't be a shock.

In our nudet training we're talk about not getting a mushroom cloud selfie - shelter already. Maybe it's kind of a Darwinian thing ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:43 PM
To: (b) (6)
Subject: RE: learning experience

Well, I'm not completely sure about that. I haven't seen anything out there with an actual IMAAC logo, but we have seen plots during some of the briefings that have shown plumes that look like ours. So perhaps people have used the shapefiles or KMLs in the plots that have been shown in briefings, but we haven't yet seen an IMAAC plot with the CUI label on it. Which is good. I wouldn't be surprised to see it, though, as this is a pretty big event. We've done about 7 or 8 updates now.

I do think my favorite thing so far has been right after we got activated, while I was filling time before the conference call. I saw a video where a news station was talking to a guy that took footage. He said something like, "I just grabbed my phone and started running toward the fire to get some footage." Yikes. If only he had seen our plots first, maybe he wouldn't have done that. Or maybe he would. There are some not-so-bright people out there, as we're all aware.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:23 PM
To: (b) (6)
Subject: [Non-DoD Source] RE: learning experience

That was my guess - was wondering though if an IMAAC plot had gone public. Glad to hear it didn't ??

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 3:20 PM
To: (b) (6)
Subject: RE: learning experience

So, that is the CST running HPAC on his own. It's not much different than what we modeled for 1530 today, though. Pretty close. We've stopped putting out the black uncertainty contour, though, because it doesn't work as well as we'd like. This is the CST guy that we've been working with over the weekend.

(b) (6)

-----Original Message-----

From: (b) (6)
Sent: Monday, February 6, 2023 6:07 PM
To: (b) (6)

Subject: [Non-DoD Source] learning experience

Hi (b) (6)

Just as a learning experience for us - is this from you guys or a CST? I see an HPAC in the legend.

Thanks!

(b) (6)

From: (b) (6)
Sent: Tue, 7 Feb 2023 10:36:15 +0000
To: (b) (6)
Subject: RFI_23_0081U_IMAAC – revl Update
Attachments: RFI_23-0081iU_IMAAC_rev0.pptx, smime.p7s

(b) (6)

See the latest draft update attached.

Respectfully,

(b) (6)
DTRA Reachback Shift Lead - ARA Meteorologist
703-767-3445

(b) (6)

~~CUI~~

Date: 07FEB2023 1100Z

Version: Revision I

Changes: Adjusted buoyancy, Updated Wx



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081iU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 07FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	(b) (6)
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 5 railcars, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl₂O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 07FEB2023 Local (2030Z) 2. 1200 07FEB2023 Local (2030Z)
Executive Summary	• For the largest plume (HCl) the plume extends over one mile downrange for AEGL-2 (serious injury possible) effects. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown • BLEVE scenario can produce minor injuries out to 226 meters.



Modeling Overview

- A breach of five mostly-full (70%) vinyl chloride containers is considered. This results in some level of combustion/explosion. Based on reports from the shipper, the estimated total load is approximately 3.5 cars' worth.
- Modeling is provided in the event of a deliberate breach of the container.
- A BLEVE is possible as a result of, or during, the breach – thus, blast effects are provided. **This analysis does not make recommendations on how to conduct this breach.**
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3) 10USC130



Caveats

~~CUI~~

RFI 22-0081iU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



~~CUI~~

RFI 22-0081iU

6:00 AM Breach (1100Z) 07 FEB 2023

~~CUI~~



~~CUI~~

RFI 22-0081IU

Hydrogen Chloride – 0600 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



0 50 100 200 300 400 500 Feet

~~CUI~~



~~CUI~~

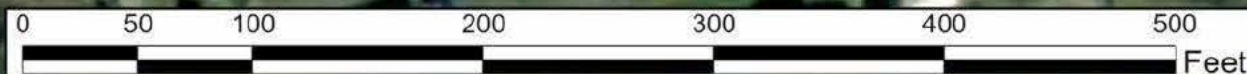
RFI 22-0081IU

Phosgene – 0600 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



CUI

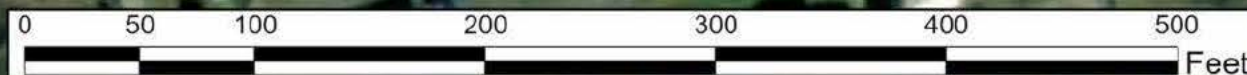
RFI 22-0081IU

Vinyl Chloride – 0600 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



CUI



~~CUI~~

RFI 22-0081iU

**12:00 PM Breach (1700Z)
07 FEB 2023**

~~CUI~~



CUI

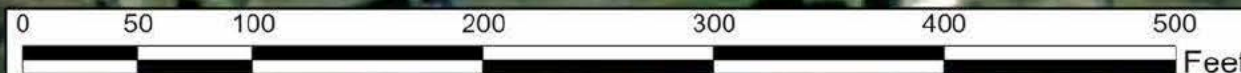
RFI 22-0081IU

Hydrogen Chloride – 1200 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



CUI



~~CUI~~

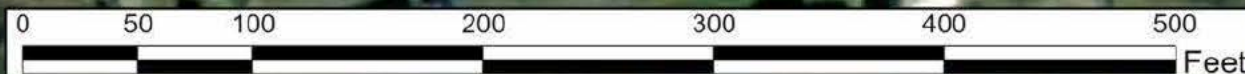
RFI 22-0081IU

Phosgene – 1200 Local

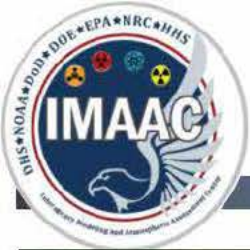
Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



~~CUI~~

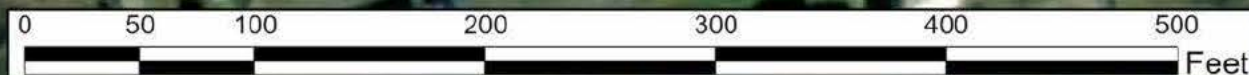
RFI 22-0081IU

Vinyl Chloride – 1200 Local

Hazard: 27.995 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.



CUI

RFI 22-0081IU

BLEVE/VCE Blast Human Injury & Structural Damage Contours

Fuel: Hydrogen Chloride
Estimated Net Explosive Weight (NEW): 398 kg
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH

Overpressure	Distance	Injury / Damage Description
10 psi / 69 kPa	28.5 m	High fatality rate Severe damage/structural components destroyed
5 psi / 34 kPa	42.0 m	Universal injuries Moderate to severe damage to structural components
1 psi / 6.9 kPa	134.2 m	Light injuries occur Non-structural component severe damage
0.5 psi / 3.4 kPa	225.7 m	Temporary eardrum damage Unhardened glass breaks/minor non-structural component damage

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides. The contours produced are representative of open terrain effects.

Blast radii offset to include fireball radius.



0 50 100 200 300 400 500
Meters

CUI



BLEVE/VCE Blast Human Injury & Structural Damage Contours

	Personnel	Glass	Wood	Metal	Steel Frame	Concrete Block	Reinforced Concrete
10 psi / 69 kPa	>50% eardrum rupture, high fatality rate	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Collapse	Collapse	Severe damage / structural components destroyed
5 psi / 34 kPa	Chance eardrum rupture, injuries are universal	Shatters, severe frame failure	Collapse, complete destruction	Siding and interior destroyed	Severe damage	Severe damage	Moderate damage to structural components
1 psi / 6.9 kPa	Temporary eardrum damage, light injuries occur	Shatters	Studs, sheathing cracked	Severe buckling, some panels torn off	Minor damage	Severe damage	N/A
0.5 psi / 3.4 kPa	Temporary eardrum damage	Shatters	Rafters cracked	Moderate buckling, joints separated	N/A	N/A	N/A

BLEVE- Boiling Liquid Expanding Vapor Explosion

- Liquid is heated in a sealed vessel above its boiling point creating pressure. If the vessel fails the fluid vaporizes almost instantly and expands radially with a subsonic blast wave
- Need not be flammable

VCE- Vapor Cloud Explosion

- A flammable material is dispersed through the air which ignites
- Prompt ignition is non-detonable, delayed ignition potentially (though unlikely) detonable
- Fireball and thermal radiation may ignite nearby combustible materials

Shielding from buildings can reduce the hazard-to-effect contour distances shown in the slides; contours are representative of open terrain effects.

Sources: "Explosive shock in air" Kinney & Grahm, 1985; "Facility damages and personnel injury from explosive blast", Montgomery & Ward, 1993; "The effects of nuclear weapons", 3rd edition, Glasstone & Dolan, 1977

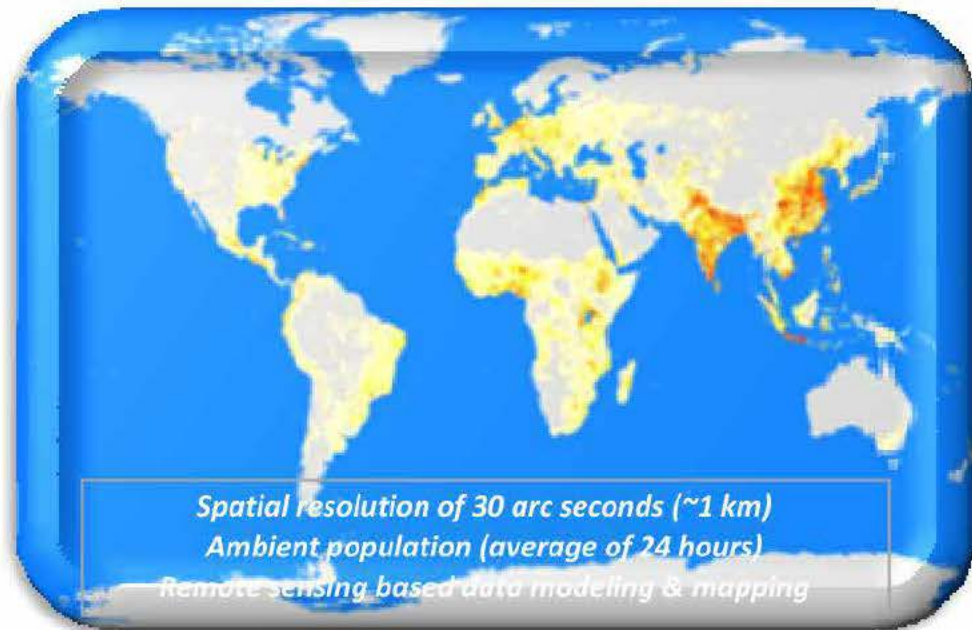


Population Data

CUI

RFI 22-0081iU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

CUI

From: DTRA Ft Belvoir RD Mailbox Reachback
Sent: Tue, 7 Feb 2023 11:01:36 +0000
To: DTRA Ft Belvoir OI Mailbox Joint Ops Center; fema-nwc@fema.dhs.gov; imaac@fema.dhs.gov
Cc: DTRA Ft Belvoir RD Mailbox Reachback
Subject: [URL Verdict: Neutral][Non-DoD Source] (REAL WORLD) IMAAC Updated Product Attached
Attachments: RFI_23-0081iU_IMAAC.pdf, smime.p7s

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

CUI (with attachment)

Please see the attached document(s) regarding the IMAAC activation request for a train derailment and fire in East Palestine, OH. The product is also available on the IMAAC Portal page (Caution-<https://www.cbrnresponder.net/app/index#imaac/modelrequest>).

Please contact us directly with any technical questions you may have.

Respectfully,

JB

Defense Threat Reduction Agency
COM: (703) 767-3448 (DSN 427-)
STE: (703) 767-2138
NIPR: dtra-reachback@mail.mil
SIPR: dtra-reachback@mail.smil.mil
JWICS: reachback@dtra.ic.gov
R&D Directorate
Technical Reachback Division

~~CUI~~

Date: 07FEB2023 1100Z

Version: Revision I

Changes: Adjusted buoyancy, Updated Wx



IMAAC

Interagency Modeling and Atmospheric Assessment Center

REAL WORLD

Train Derailment and Fire in East Palestine, OH

(RFI 23-0081iU)

Warning - This document contains technical data whose export is restricted by the Arms Export Control Act (Section 2751 of Title 22, United States Code) or the Export Control Reform Act of 2018 (Chapter 58 Sections 4801-4852 of Title 50, United States Code). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25 and DoD Instruction 2040.02.

Distribution Statement C: Distribution authorized to U.S. Government agencies and their contractors [Critical Technology; 07FEB2023]. Other requests for this document should be referred to the Defense Threat Reduction Agency/SCR, 8725 John J. Kingman Road, Mail Stop 6201, Fort Belvoir, VA 22060-6201.

Controlled by: Defense Threat Reduction Agency
Controlled by: Research and Development
CUI Category: CTI, EXPT
Distribution/Dissemination Statement: C
POC: RD-OPR, 703-767-3445

~~CUI~~

RD Directorate
Technical Reachback Division
(703) 767-3445, DSN 427-



Request Summary

Requestor	(b) (6), EPA Region 5, Emergency Response Branch
Contact information	[REDACTED]
Request	Model planned breach of railcar filled with vinyl chloride.
Employment	Real World
Hazards	Release from 5 railcars, filled with vinyl chloride resulting in releases of: • 146,135 kg hydrogen chloride (HCl) • 216 kg phosgene (CCl_2O) • 27,995 kg of vinyl chloride • <i>Amounts based on information from Ohio CST via Norfolk Southern</i>
Location	East Palestine, OH 40.836041 °N / 80.521678 °W
Weather	High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS)
Incident Date & Time	1. 0600 07FEB2023 Local (2030Z) 2. 1200 07FEB2023 Local (2030Z)
Executive Summary	• The largest AEGL-2 (serious injury possible) hazard area (HCl) extends about 150 feet away from the fire. • Please note that plume predictions have inherent uncertainty – effects may occur outside the contours shown



Modeling Overview

- A breach of five mostly-full (70%) vinyl chloride containers is considered. This results in some level of combustion/explosion. Based on reports from the shipper, the estimated total load is approximately 3.5 cars' worth.
- Quantity per railcar: 178,000 lb ~ 81,000 kg

(b)(3)10USC130



Caveats

~~CUI~~

RFI 22-0081iU

(b) (5)

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

~~CUI~~



~~CUI~~

RFI 22-0081iU

**6:00 AM Breach (1100Z)
07 FEB 2023**

~~CUI~~



~~CUI~~

RFI 22-0081iU

Hydrogen Chloride – 0600 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels
Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



0 50 100 200 300 400 500 Feet

~~CUI~~



~~CUI~~

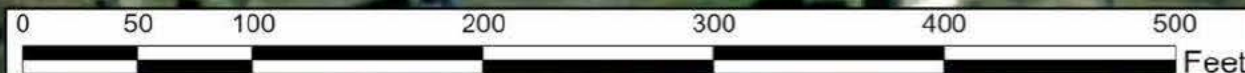
RFI 22-0081iU

Phosgene – 0600 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



~~CUI~~

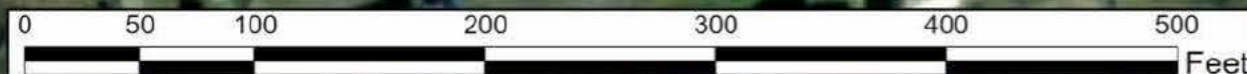
RFI 22-0081iU

Vinyl Chloride – 0600 Local

Hazard: 27.995 kg vinyl chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 0600 Local (1100Z)

Acute Exposure Guideline Levels Exposure: 1 hour (0600-0700 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



~~CUI~~

RFI 22-0081iU

**12:00 PM Breach (1700Z)
07 FEB 2023**

~~CUI~~



~~CUI~~

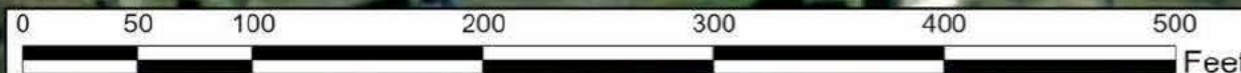
RFI 22-0081iU

Hydrogen Chloride – 1200 Local

Hazard: 146,135 kg hydrogen chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



~~CUI~~

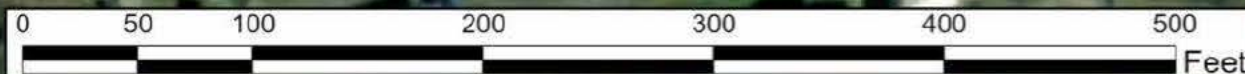
RFI 22-0081iU

Phosgene – 1200 Local

Hazard: 216 kg phosgene
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



~~CUI~~

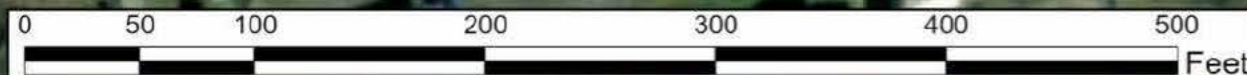
RFI 22-0081iU

Vinyl Chloride – 1200 Local

Hazard: 27.995 kg vinyl chloride
Coordinates: 40.836041 °N / 80.521678 °W
East Palestine, OH
DTG: 07FEB2023 1200 Local (1700Z)

Acute Exposure Guideline Levels Exposure: 1 hour (1200-1300 local)

Level – Health Effect	Population at Risk
AEGL-3 – Death Possible	0
AEGL-2 – Injury Possible	0



~~CUI~~



Acute Exposure Guideline Levels (AEGL)

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.

INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Value	Description
AEGL-3	Death Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	Injury Possible - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	Threshold - the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs are developed by the EPA and represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. These levels are applicable to the general population including infants and children, and other susceptible individuals.

Published AEGL times are 10 min, 30 min, 1 hr, 4 hr and 8 hr. Using these published guidelines, DTRA developed HPAC to plot human effects in a time weighted manner that better estimates the AEGL effects. These effects use extrapolations for very short time exposures.

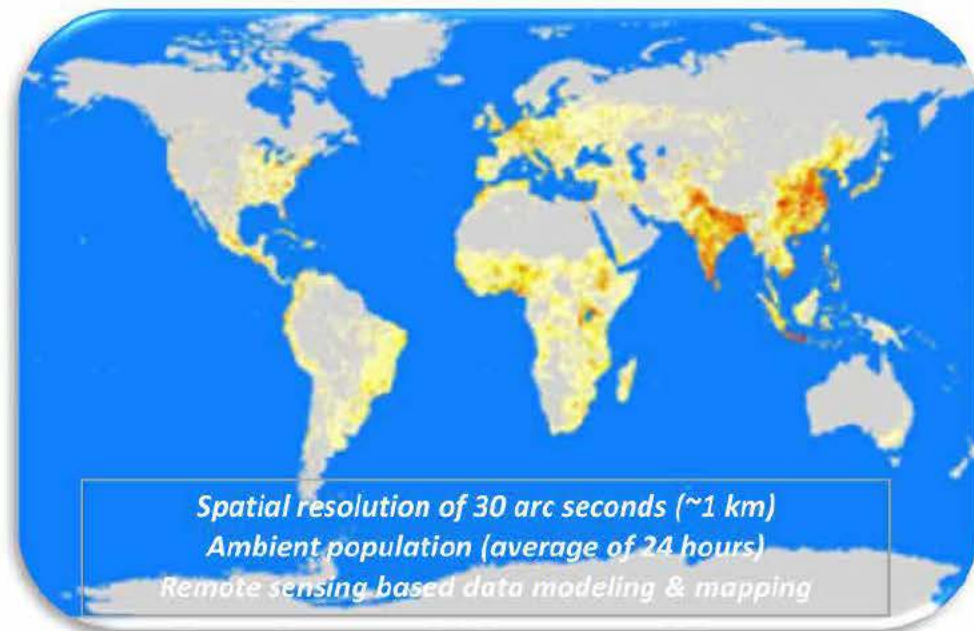


Population Data

~~CUI~~

RFI 22-0081iU

- Population figures are based on LandScan™, a database produced by Oak Ridge National Laboratory.
- LandScan™ is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data. It was updated in 2020 and refreshed annually.
- Reported population numbers are **based upon average day and night** time LandScan™ 2021 data.*
- This population data does not include major shifts in personnel such as relocations, special events, etc. In such cases the population database needs to be amended or population can be added or removed within HPAC.
- For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas.
- More information is available at <https://landscan.ornl.gov>.



*Individual day or individual night data is available upon request for US and specialized OCONUS locations.

~~CUI~~