


# IMAAC

## Interagency Modeling and Atmospheric Assessment Center

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# IMAAC: OPERATIONAL CONCEPT

**Emergency Officials**
IMAAC Agency reps; Incident Commanders; Designated State/Local/Tribal/Territories officials

RFI Request

RFI Response

**IMAAC TECHNICAL OPERATIONS HUB**
*Single Point of Contact for the Interagency Community*

Collaborative Technical Analysis

*Collaborative, Net-Centric Information Environment*

**Request for Information**

IMAAC Hub

Requestor

THE IMAAC COMMUNITY

Technical SMEs

HSIN

**Response**

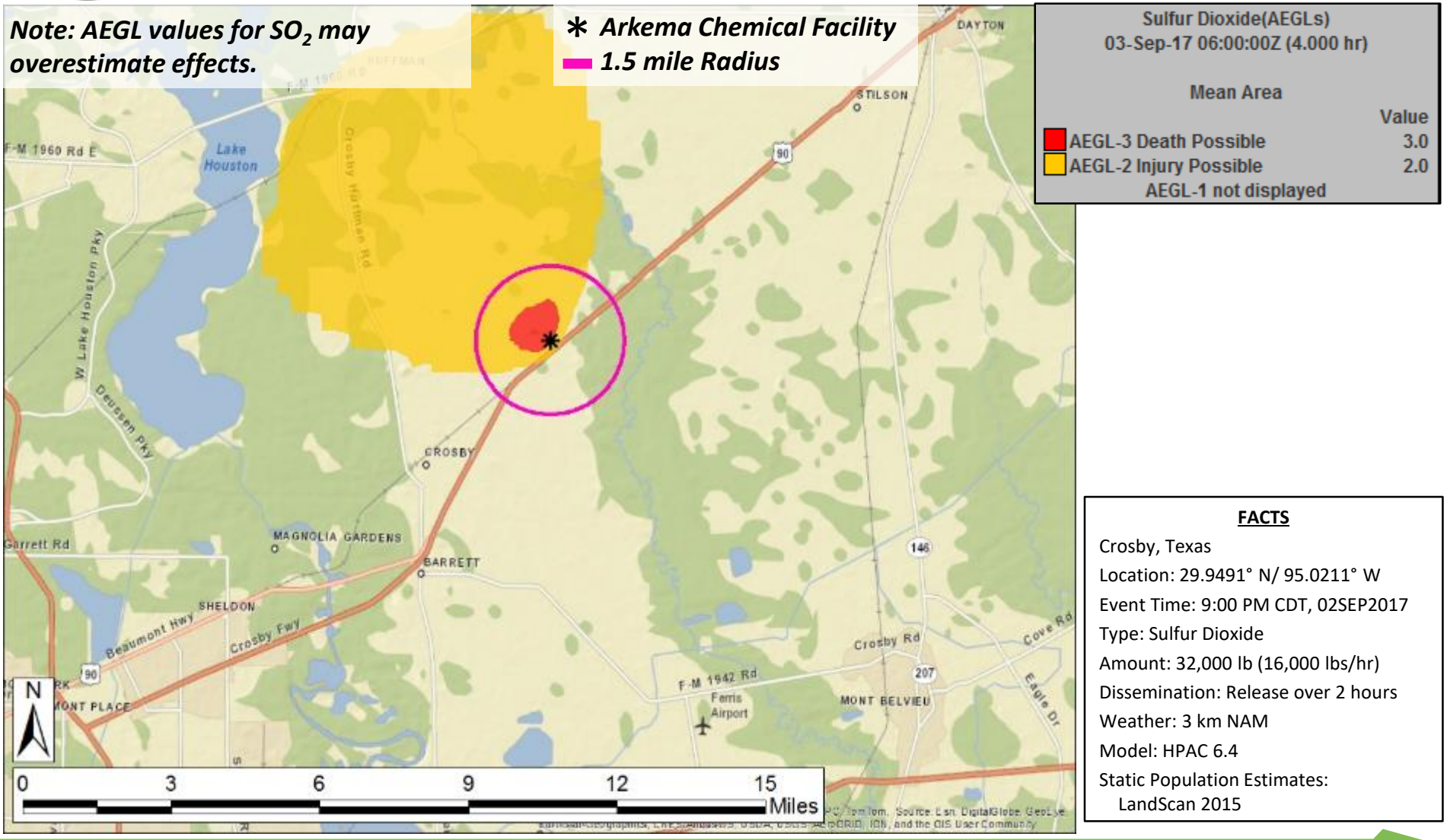
# JUST THE PLUME

- Incident: Aug 29 – Sep 3, 2017; Arkema Chemical Plant, Crosby, TX
- Activated by: EPA Region 6
- Interagency participation: FEMA (IMAAC Dir., National Watch, Region 6), EPA (Region 6 and HQ), NOAA (SDM, Emer. Response Div.), DHS-CSAC, NORTHCOM, JTF-CS, U.S. Dept H&HS, TRANSCOM

Due to Hurricane Harvey, plant was inundated w/ several feet of water.

Organic peroxides at the site required cooling to prevent spontaneous “instability”. Inundation caused cooling systems to fail.

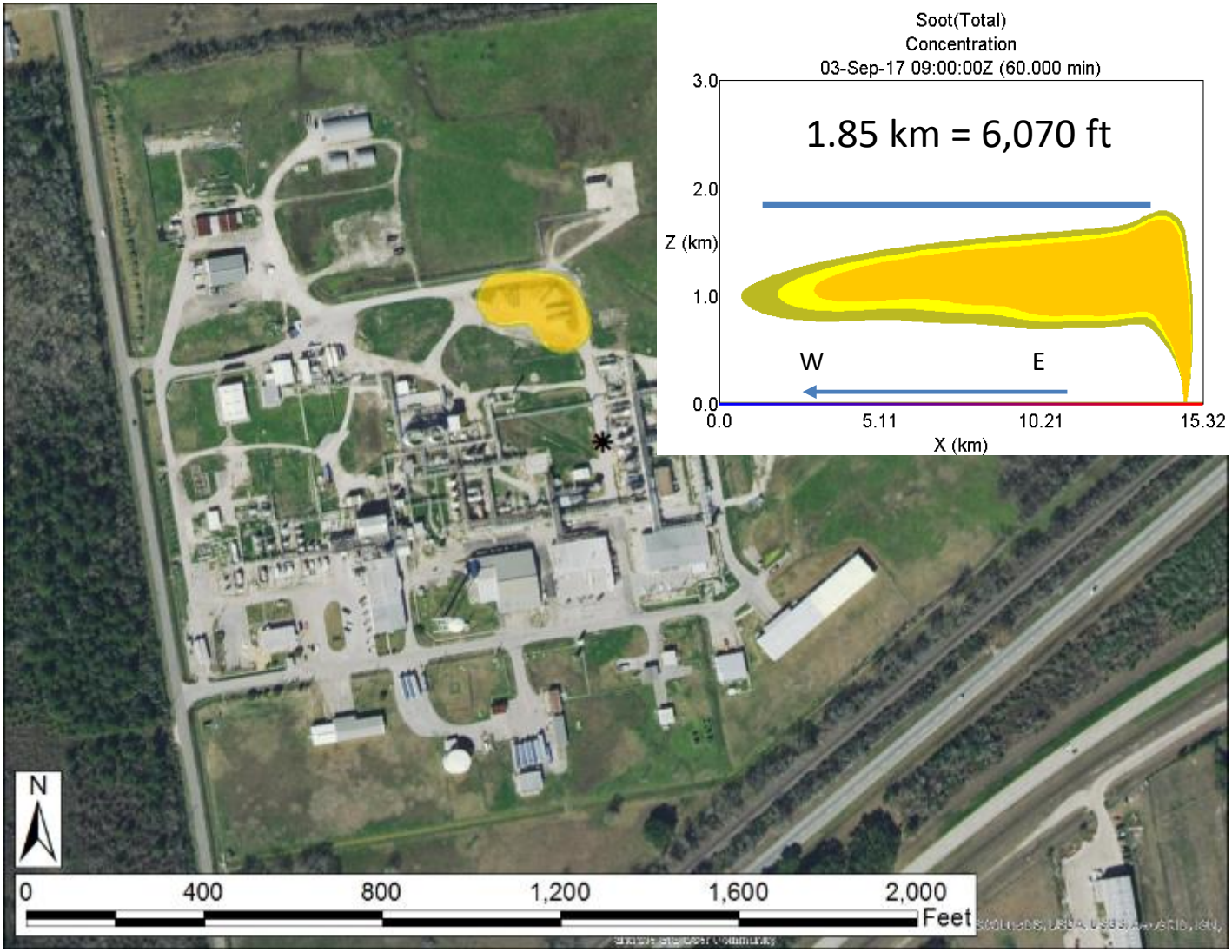
# $SO_2$ (Release Starting @ 02 SEP 9:00 PM CDT) – Update #8




**FACTS**

Crosby, Texas
Location: 29.9491° N/ 95.0211° W
Event Time: 9:00 PM CDT, 02SEP2017
Type: Sulfur Dioxide
Amount: 32,000 lb (16,000 lbs/hr)
Dissemination: Release over 2 hours
Weather: 3 km NAM
Model: HPAC 6.4
Static Population Estimates:
LandScan 2015

# Soot – Burning Trailer – (Starting @ 03 SEP 3:00 AM CDT) – Update #8







| Soot(Total) 03-Sep-17 09:00:00Z (60.000 min) | |
|---|---|
| Mean Area | ug/m3 |
| Hazardous | 250.0 |
| Very Unhealthy | 150.0 |
| Unhealthy | 65.0 |

**Note**: Hazard is from estimated incidental material burning (e.g. tires, trailer, insulation). The combustion products from organic peroxide constitute minimal atmospheric hazards.

**FACTS**

Crosby, Texas
Location: 29.948086° N/ 95.019951° W
Event Time: 3:00 AM CDT, 03SEP2017
Type: Organic Peroxide
Amount: 6 containers (38,000 lb each)
Dissemination: Release over 1 hour
Weather: 3 km NAM
Model: HPAC 6.4
Static Population Estimates:
LandScan 2015

# JUST THE PLUME BUT IN THE FUTURE

- Incident: 30 Jun – 26 Jul, 2016; Anhydrous Ammonia Leak, Vineland, New Jersey
- Activated by: EPA Region 2
- Interagency participation: Planning Only


Planned demolition of a old ice plant.

The plant's anhydrous ammonia storage is connected to the main building with a 1" pipe and is estimated to contain ~4,700 lbs.

The storage container is degraded and possibly unstable.

# Ammonia – Estimated AEGL-2 Populations

FACTS

Vineland, NJ

Location: 39.489696°N/75.023344°W

Beginning Incident Time:
0000 EST 22JUL2016

Hazard: Ammonia ($NH_3$)

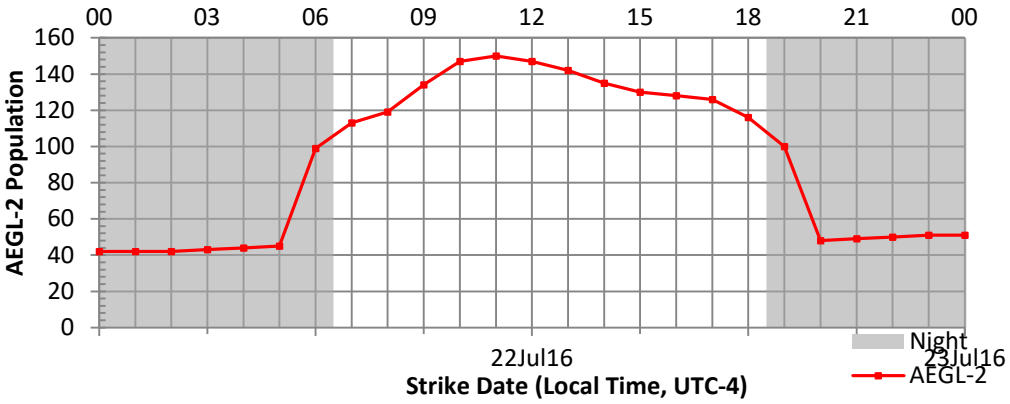
Amount: 4,700 lb

Incident: Continuous release

Weather: 12 km NAM

Model: HPAC 6.3

Static Population Estimates:
LandScan 2014




| Day | Night |
|---|---|

Exposure to high concentrations of **ammonia** in air causes immediate burning of the nose, throat and respiratory tract. This can cause bronchiolar and alveolar edema, and airway destruction resulting in respiratory distress or failure. Inhalation of lower concentrations can cause coughing, and nose and throat irritation.

**Minimum Population Affected – 42**


| Value |
|---|
| AEGL-3 |
| AEGL-2 |

| | Strike Date / Time (Day/Night) | Estimated AEGL-2 Population |
|---|---|---|
| Min | 22JUL2016 / 00:00 EST (Night) | 42 |
| Max | 22JUL2016 / 11:00 EST (Day) | 150 |

**Maximum Population Affected – 150**

# THERE JUST ISN'T A PLUME

- Incident: 01 Jul, 2017; Spill of 3,000 gallons of light crude oil, Plainfield, Illinois
- Activated by: EPA Region 5
- Interagency participation: FEMA (IMAAC Dir., National Watch), EPA (Region 5 and HQ), NOAA SDM

Assessment of the potential downwind hazard due to 3,000 gallons of crude oil spilled from a ruptured rail car.

No fire!

# Modeling Summary

- Known Information: 3,000 gallons Bakken crude oil spilled out of a ruptured rail car due to a train derailment. There is no fire at the scene.

- Modeling Assumptions: Source term is represented as pooled Bakken crude oil evaporating over time. There is no ignition.

- **Results: Models do not predict a downwind hazard meeting the AEGL-1 threshold level of concern over the next 24 hours. This assumes that no fire is involved.**

# THERE JUST ISN'T A PLUME, REALLY

- Incident: 01 Feb, 2018; Chemical solutions in cold storage in a sub-basement, St. Thomas, US VI
- Activated by: US EPA
- Interagency participation: EPA Region 5, CSAC

-n-Butillithium (CAS # 109-72-8) was discovered in a faulty refrigerator in universities sub basement.

What are the possible outcomes and how do we handle this issue?

# The Request

From: US EPA, N-IMAT
Sent: Thursday, February 1, 2018 3:09 PM
To: DTRA Ft Belvoir R and D Mailbox Reachback
Subject: [Non-DoD Source] Request for IMMAC model (REAL LIFE SITUATION)!!!

Please, run IMAAC model for the situation, involving the following:

Chemical of concern -n-Butillithium (CAS # 109-72-8) (currently working
Concentration/amount: 1.6 M in Hexanes solution/ 2 x 800 mL (in brown glass jars) 2.6 M in Hexane solution/ 130 g (in a very corroded metallic jar - no inner container info available)

All three containers are inside, lacked refrigerator that is working and has substantial ice accumulations inside.

All this is taking place inside the university building in sub-basement lab .

Please, respond ASAP and let me know if you have question.

# The Response

From: DTRA Mailbox Reachback
Sent: Thursday, February 1, 2018 4:02 PM
To: S&T CSAC Reachback
Subject: Request for IMAAC model (REAL LIFE SITUATION)!!!

- This scenario should not produce a large airborne hazard (mostly CO and CO2). Material is highly flammable and in contact with water or air will emit flammable gases which may ignite spontaneously. We conclude that the primary hazard from these agents is a fire or perhaps a small explosion (but that seems less likely than the fire).

- Given the potential risks of a fire, we recommend assistance from the local fire department and/or first responders trained to quench chemical fires and decontamination. Options that can be considered, and executed only by trained hazmat personnel, is the use of flame retardant gases such as Halon. Halon robs the surrounding area of oxygen. Do not employing standard methods to such as employing carbon dioxide as in metal fires, to include organometals which will react with CO2 generating a great deal of heat and therefore feeding any fire.

DHS S&T CSAC concurs with the above.

# THERE IS A PLUME BUT IT IS IN THE WATER!

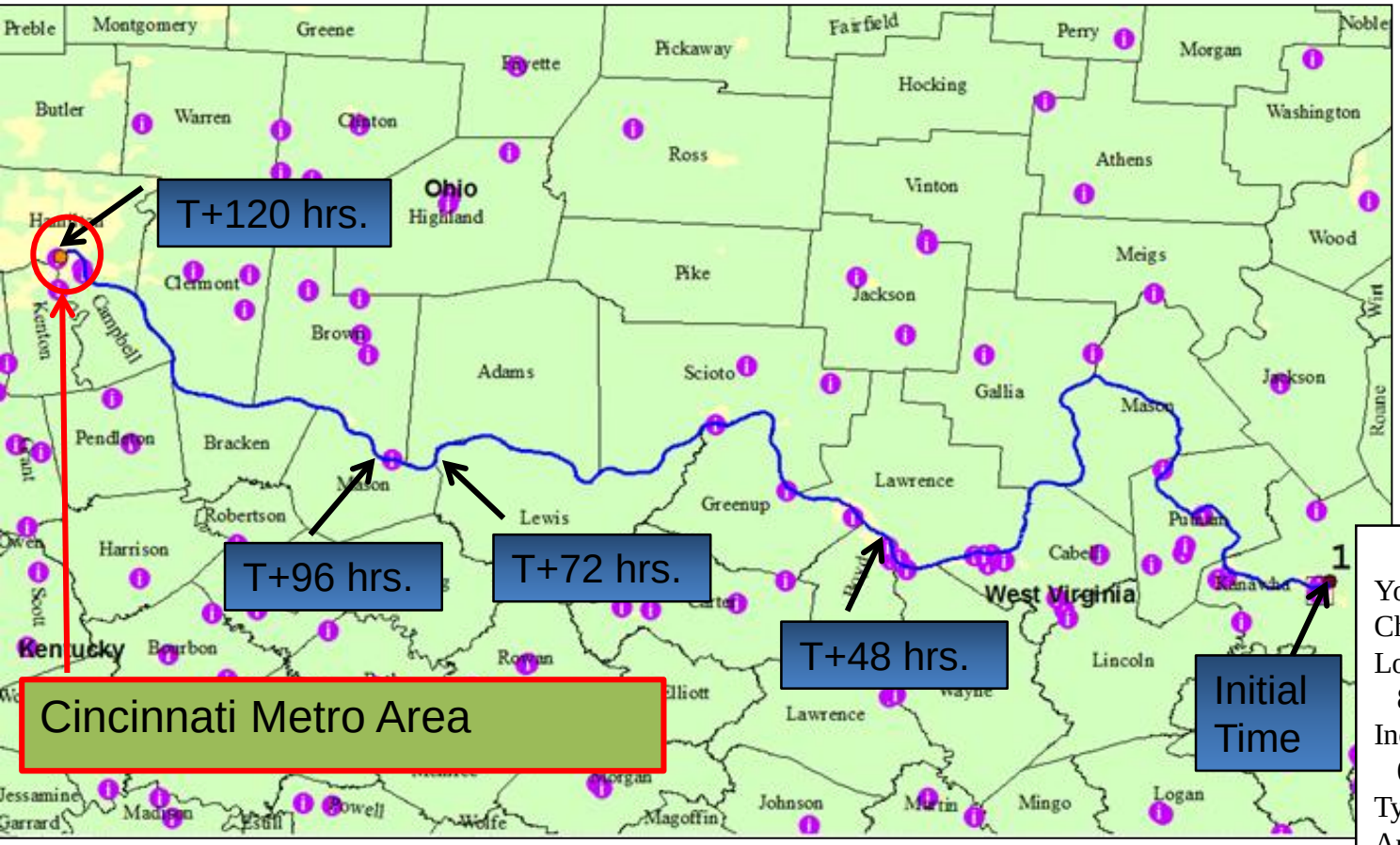
- Incident: 9 Jan, 2013; Methanol Leak at Young's Industrial Park in Charleston, WV.
- Activated by: DHS NOC vis FEMA Region 3
- Interagency participation: Post event analysis


4-methylcyclohexane released, but modeled as methanol and only as an airborne hazard at first.

Later (15 Jan) requested to model when the hazard would reach the water intakes downstream from the leak.

# 5-Day Water Transport

Public_Water_Supplies: Intakes




FACTS

Young's Industrial Park
Charleston, WV
Location: 38.365078° N/
81.609888° W
Incident Time: 2230Z
09JAN2014
Type: Methanol
Amount: 7,500 gallons
Incident: Leak
Model: ICWater 3.2

Distance from incident location to Cincinnati: 265 km

# THERE IS A PLUME BUT ITS UNDER WATER!

- Incident: 5 Nov 2015; Barge ARGO recovery efforts in Lake Erie.
- Activated by: NOAA's Office of Response and Restoration

SAULT STE. MARIE, MICHIGAN, FRIDAY, OCTOBER 22, 1937.

NO TIME FOR NIN

Necessary "As Things L

ıer Men to efore Jury

ıhn Defense Loses Fight to Exclude Testimony.

INCINNATI, Oct. 22. (AP)—The ıecution of Anna Marie Hahn ı charge of murdering 78-year- Jacob Wagner won the right y to present testimony concern- the deaths of a number of r aged men it charges were ims of slayings for gain.

ımmon Pleas Judge Charles S. 's decision came after a day arguments by rival attorneys after Prosecutor Dudley M. ıalt declared the state's evi- e was complete in Wagner's h, which he said that as a re- of the ruling, he had many witnesses to be heard.

dge Bell said:

BARGE IS DOWN WITH 100,000 GALLONS OF OIL

Feared Victim of Storm in Erie; Canada Steamship Lines Ship Safe.

WHITEFISH FLEET MOVES

Oil on the surface of Lake Erie waters caused Coast Guards to believe that the barge Argo which loaded 100,000 gallons of benzol in the Canadian Sault this week, lies at the bottom of the lake, in 40 feet of water.

The barge, in tow of the tug Syosset, was headed for New Jersey when it became the victim of the winter storm that swept the lakes this week.

Lanark Is Safe.

He Answers Questions at Press Meeting

Profits and Capital Gains Taxes Being Studied.

WASHINGTON, Oct. 22. (AP)—President Roosevelt, answering a press conference question today, said it had not been determined whether congress would have to enact new taxes. He added, however, that as things look now, such levies will not be necessary.

The president remarked that treasury studies are being made and that he hoped they would be in shape for use by congressional committees meeting in November to consider tax revisions.

In answer to other queries, Mr. Roosevelt said the undistributed profits tax and the capital gains tax are being given attention by

A sunken barge in Lake Erie (the Argo) has been at the bottom of the lake for 78 years.

It has 8 tanks holding 30,000 gallons each, thought to be benzene/toluene mixture (sensors have also detected xylene).

# Summary of Inputs

- Known Information: A sunken barge in Lake Erie (the Argo) has been at the bottom of the lake for 78 years. It has 8 tanks holding 30,000 gallons each. Unknown what product, but thought to be benzene/toluene mixture (sensors have also detected xylene).

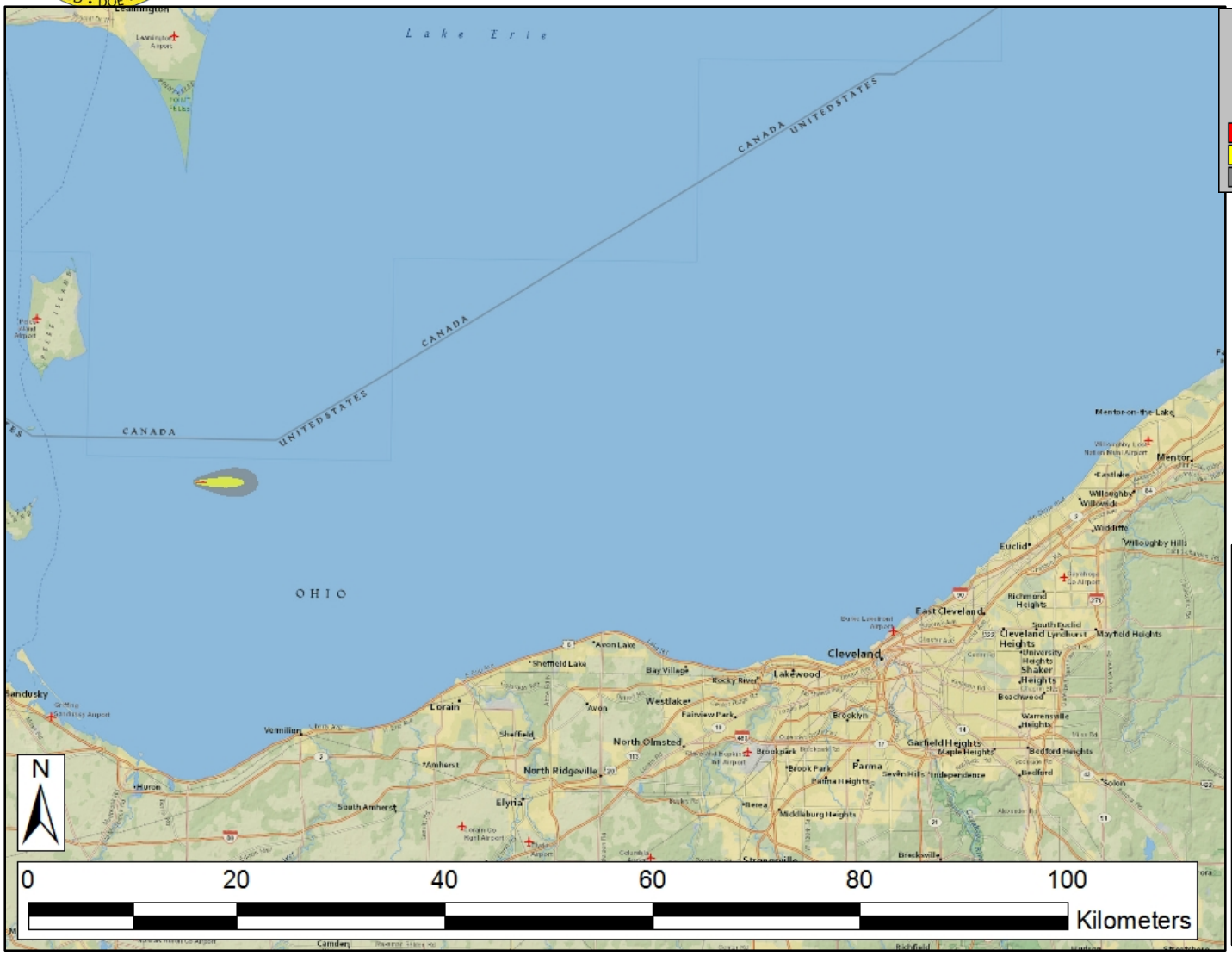
- Modeling Assumptions:
  - 30,000 gallons benzene released instantaneously in ~ 45 ft water
  - 30,000 gallons is approx. 99,000 kg benzene
  - Floats to the surface (less dense than water) and evaporates in ~ 25 minutes (this number arrived at in consultation with NOAA and ALOHA)
  - Winds from West at 8 knots, slightly stable atmosphere
  - Request concentrations of 500 ppm, 50 ppm, and 0.5 ppm
  - Assumed incident time of 1800Z 05 NOV 2015

# Summary of Outputs

- 4-hr AEGLs and Concentration plots at multiple times provided

- Results (based on assumptions of release and weather):
  - 500 ppm downwind distance effects ~ 2 km
  - 50 ppm downwind distance effects ~ 10 km
  - 0.5 ppm downwind distance effects ~ 80 km

# Benzene Conc @ 15 Min – Far View




| Benzene(Total) Concentration 05-Nov-15 18:15:00Z (15.000 min) | kg/m3 | In contour area (km²) |
|---|---|---|
| 500 ppm (IDLH) | 0.0017 | 0.360 |
| 50 ppm | 1.72E-04 | 4.039 |
| 0.5 ppm | 1.72E-06 | 11.965 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

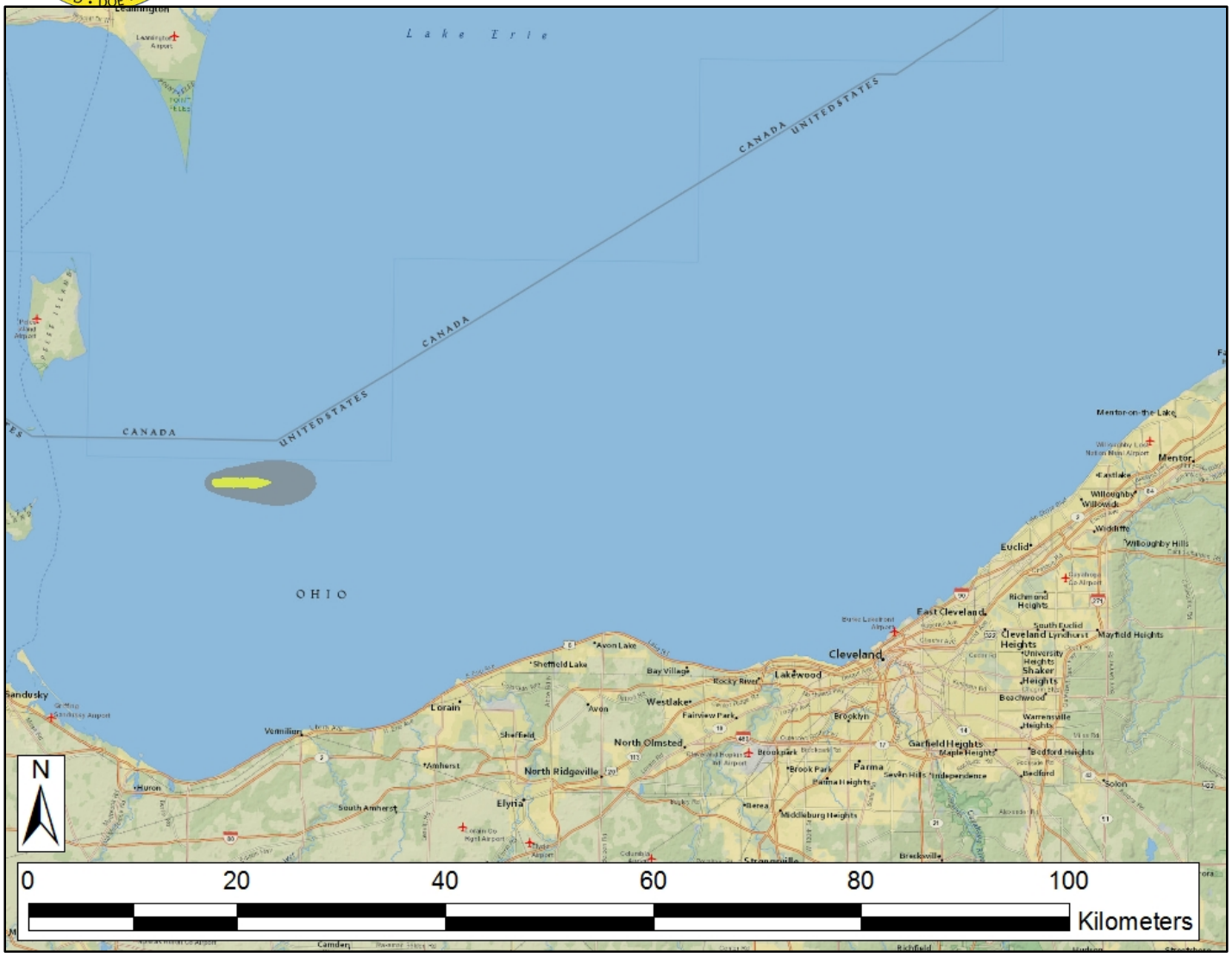
Dissemination: Evaporation from fresh water surface

Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# Benzene Conc @ 30 Min – Far View




| Benzene(Total) Concentration 05-Nov-15 18:30:00Z (30.000 min) | kg/m3 | In contour area (km²) |
|---|---|---|
| 50 ppm | 1.72E-04 | 5.559 |
| 0.5 ppm | 1.72E-06 | 33.612 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

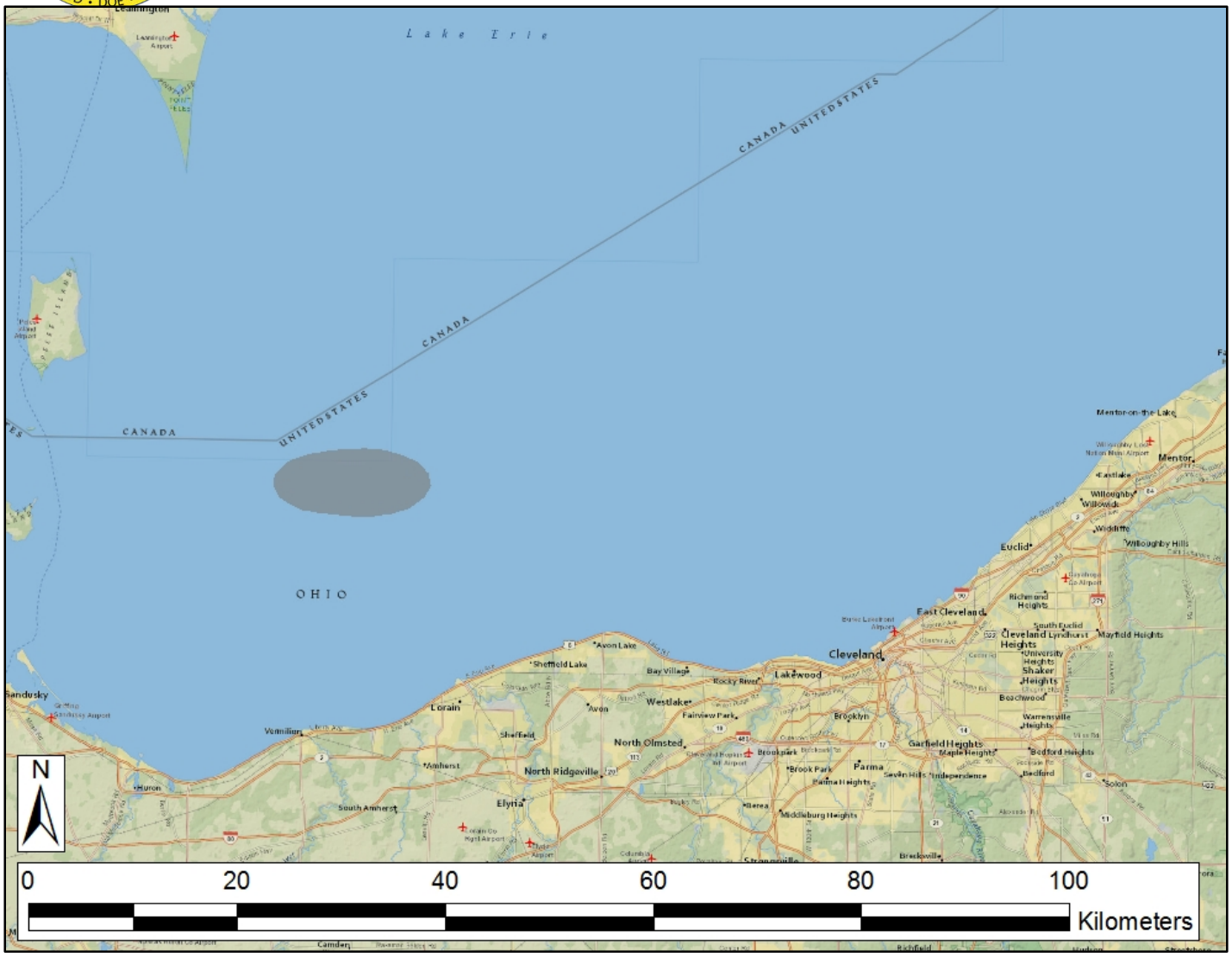
Dissemination: Evaporation from fresh water surface

Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# Benzene Conc @ 1 Hr – Far View




| Benzene(Total) Concentration 05-Nov-15 19:00:00Z (60.000 min) | kg/m3 | In contour area (km²) |
|---|---|---|
| 0.5 ppm | 1.72E-06 | 77.270 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

Dissemination: Evaporation from fresh water surface

Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# Benzene Conc @ 2 Hr – Far View


| Benzene(Total) Concentration 05-Nov-15 20:00:00Z (2.000 hr) | kg/m3 | In contour area (km²) |
|---|---|---|
| 0.5 ppm | 1.72E-06 | 129.954 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

Dissemination: Evaporation from fresh water surface

Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# Benzene Conc @ 3 Hr – Far View


| Benzene(Total) Concentration 05-Nov-15 21:00:00Z (3.000 hr) | kg/m3 | In contour area (km²) |
|---|---|---|
| 0.5 ppm | 1.72E-06 | 124.568 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

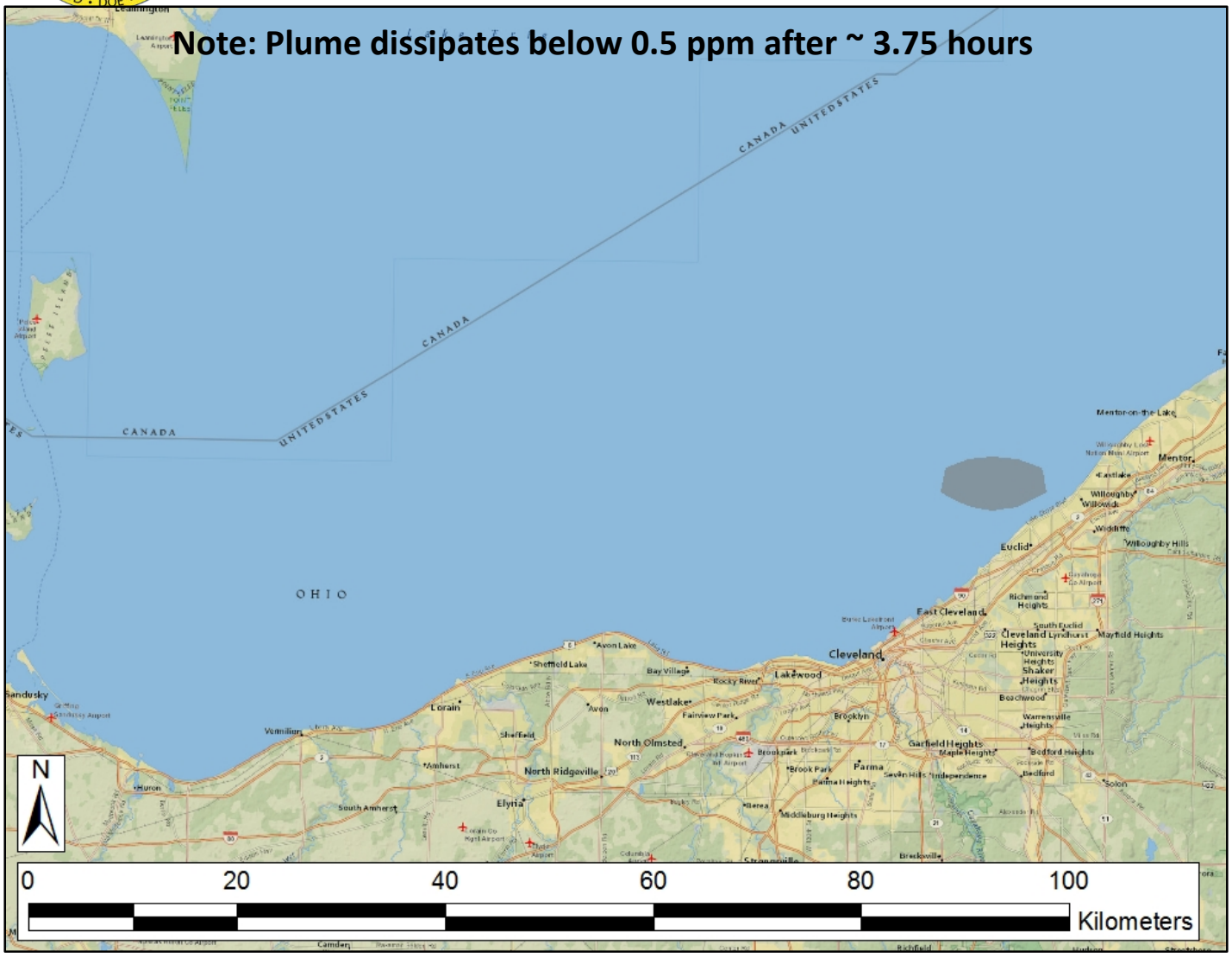
Dissemination: Evaporation from fresh water surface

Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# Benzene Conc @ 3.75 Hr – Far View




| Benzene(Total) Concentration 05-Nov-15 21:45:00Z (3.750 hr) | kg/m3 | In contour area (km²) |
|---|---|---|
| 0.5 ppm | 1.72E-06 | 39.320 |

**FACTS**

Lake Erie (Argo Wreck approx. location)

Location: USNG 17TLG7562910808

Event Time: 1800Z 05NOV2015

Type: Benzene

Amount: 30,000 gallons (99,000 kg)

Dissemination: Evaporation from fresh water surface

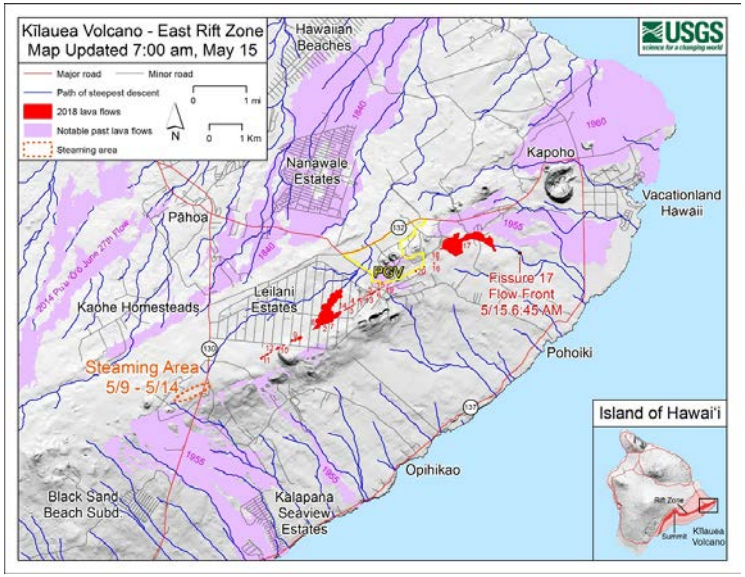
Weather: Winds from W at 8 kts

Model: HPAC 5.3

Static Population Estimates: LandScan 2014

# THERE IS A PLUME AND AN EXPLOSION!

- Incident: 03 – 26 May, 2018; Model sulfur dioxide and Ash release from the Kilauea volcano in Hawaii.
- Activated by: FEMA, HI CST
- Interagency participation: FEMA (IMAAC Dir., National Watch, Region 6), EPA (Region 5 and HQ) Washington VAAC

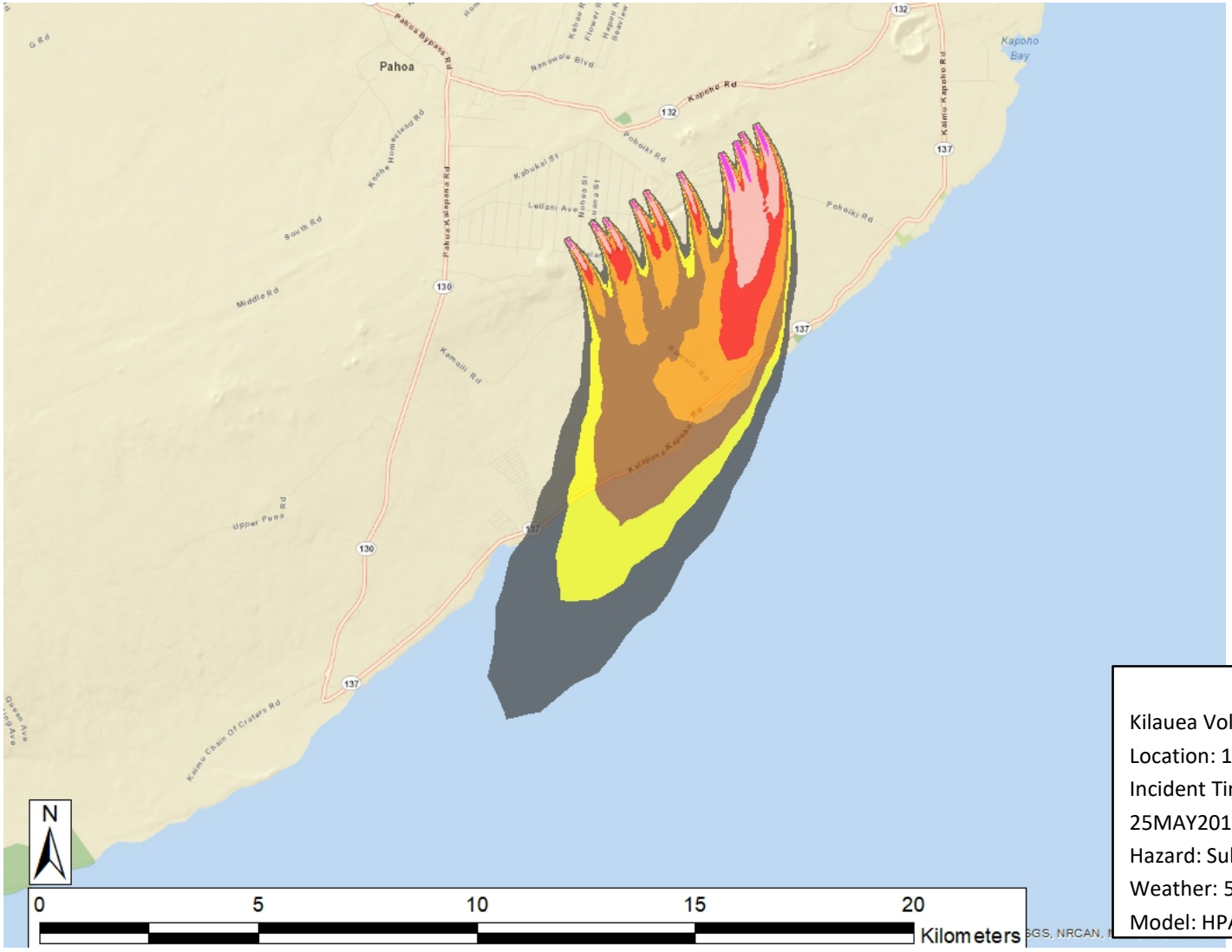



The Kīlauea volcanic began erupting in the late afternoon on May 3, 2018. Lava spatter and gas bubbles erupted from the fissure for about two hours and lava spread a short distance from the fissure.

Personnel at Pohakula Training Center on the north side of the volcano were experiencing mild effects.

Courtesy: *https://volcanoes.usgs.gov/volcanoes/kilauea/multimedia_maps.html*

# Sulfur Dioxide Concentration – 26 May 1600Z/26 May 0600 HST




| Sulfur Dioxide Concentration |
|---|
| IDLH (100 ppm) |
| 20 ppm |
| NIOSH STEL (10 ppm) |
| 5 ppm |
| 3 ppm |
| NIOSH REL (2 ppm) |
| 1 ppm |

**Most people can smell sulfur dioxide at levels of 0.3 to 1 ppm.**

**FACTS**

Kilauea Volcano, Hawaii – Fissures IVO Leilani Estates
Location: 19.469068° N / 154.897732° W
Incident Time: 26MAY2018 0400Z/
25MAY2018 1800 HST
Hazard: Sulfur dioxide (amount varies by fissure)
Weather: 5 km WRF from NCEP
Model: HPAC 6.4

# Important Caveats

- **Caveats**
  - All modeling products displayed below are hypothetical. They are based on something that may happen, but has not occurred yet. Should an incident occur, please consult the Washington VAAC (see below).

- **VAAC – Washington**
  - ***The Washington Volcanic Ash Advisory Center produces the official guidance and ash advisories for this event. If an actual event occurs, the Washington-VAAC is the official and only guidance to use.*** They can be contacted by email at w-vaac@noaa.gov .
  - Flight restrictions should only be based on VAAC guidance.

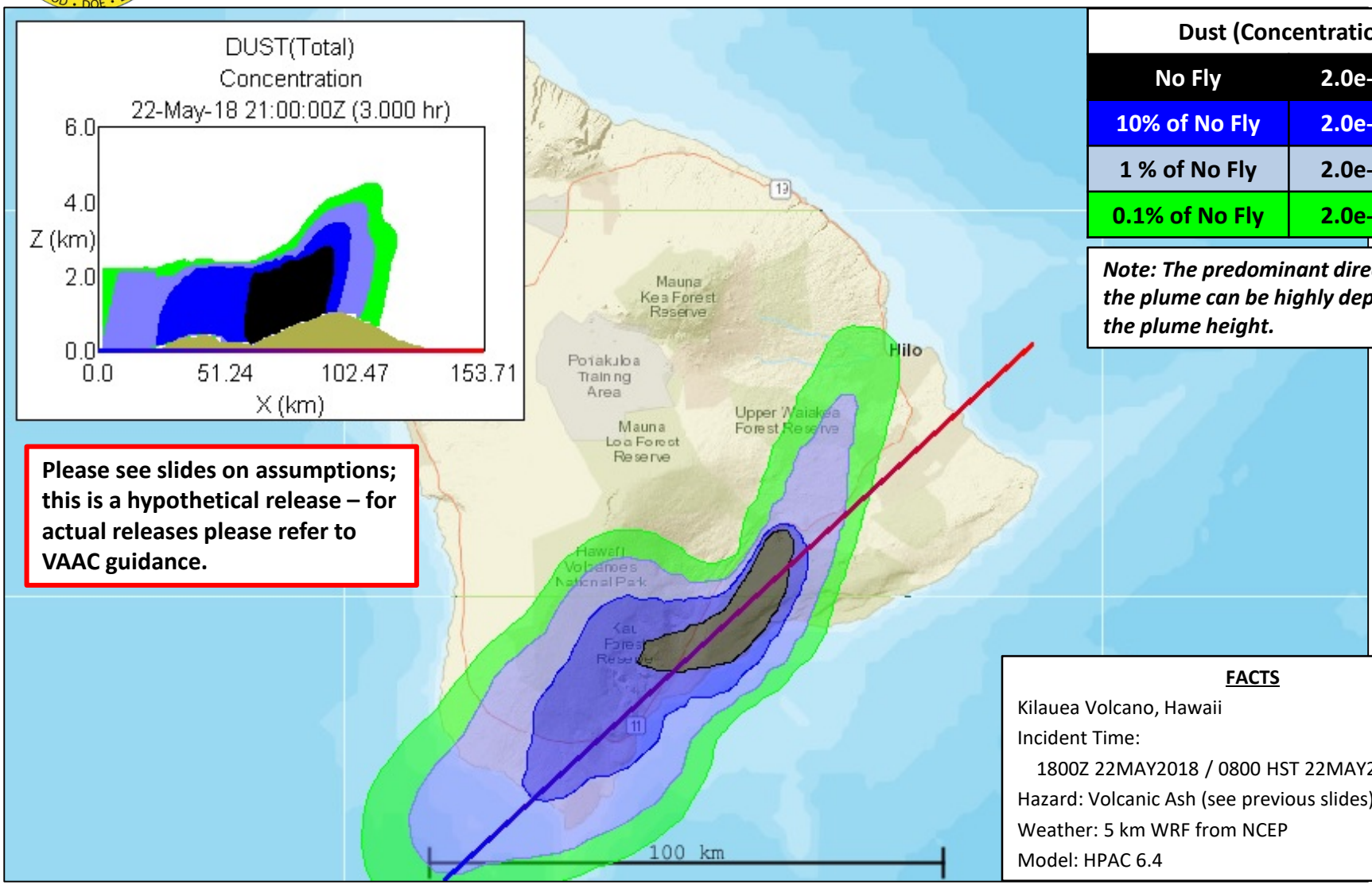
# Eruption 22 May 1800Z / 22 May 0800 HST; Concentration + 3 hours




| Dust (Concentration) | |
|---|---|
| No Fly | 2.0e-6 kg/m³ |
| 10% of No Fly | 2.0e-7 kg/m³ |
| 1 % of No Fly | 2.0e-8 kg/m³ |
| 0.1% of No Fly | 2.0e-9 kg/m³ |

***Note: The predominant direction of the plume can be highly dependent on the plume height.***

**Please see slides on assumptions; this is a hypothetical release – for actual releases please refer to VAAC guidance.**




**FACTS**

Kilauea Volcano, Hawaii

Incident Time:

1800Z 22MAY2018 / 0800 HST 22MAY2018

Hazard: Volcanic Ash (see previous slides)

Weather: 5 km WRF from NCEP

Model: HPAC 6.4

# CONTACT INFORMATION

**For Emergencies**

**IMAAC Operations: (703) 767-2003**
Email: IMAAC@FEMA.DHS.GOV

For general inquiries and exercise support requests, please send an email to IMAACINQUIRIES@FEMA.DHS.GOV

Public website: https://www.dhs.gov/imaac