



# Superior Refinery Fire ER

EPA - DAVID MORRISON, KRISTINA MILLER, JIM MITCHELL, JACOB HASSAN

WI DNR – JOHN SAGER, JASON LOWERY



*Photo:  
Courtesy of  
Bob King,  
Duluth News Tribune*

# NRC Report, Superior Refinery Explosion Superior, Wisconsin



- ▶ Report came in ~10:30 am on Thursday 4/26
- ▶ Initial report for air release of an "unknown hydrocarbon that was released to the air after an explosion during the shutdown of equipment"



Submit Action Report

Spill Summary Report

NATIONAL RESPONSE CENTER [1-800-424-8802](tel:1-800-424-8802)

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Incident Report # 1210367

INCIDENT DESCRIPTION

\*Report taken by NRC at 11:26 on 26-APR-18

Incident Type: FIXED

Incident Cause: UNKNOWN

Affected Area:

Incident occurred on 26-APR-18 at 10:00 local incident time.

Affected Medium: AIR ATMOSPHERE

REPORTING PARTY

Name: DAVID BEATTIE

Organization: SUPERIOR REFINING COMPANY

Address: 2407 STINSON AVE

SUPERIOR, WI 54880

Email Address: david.beattie@huskyenergy.com

PRIMARY Phone: (218)3489051

Type of Organization: PRIVATE ENTERPRISE

SUSPECTED RESPONSIBLE PARTY

Name: DAVID BEATTIE

Organization: SUPERIOR REFINING COMPANY

SUPERIOR, WI 54880

PRIMARY Phone: (218)3489051

Type of Organization: PRIVATE ENTERPRISE

INCIDENT LOCATION

2407 STINSON AVE County: DOUGLAS

City: SUPERIOR State: WI Zip: 54880

RELEASED MATERIAL(S)

CHRIS Code: UNK Official Material Name: UNKNOWN MATERIAL

Also Known As: UNKNOWN MATERIAL (HYDRO CARBON)

Qty Released: 0 UNKNOWN AMOUNT

DESCRIPTION OF INCIDENT

CALLER STATED THAT AN UNKNOWN HYDROCARBON WAS RELEASED TO THE AIR AFTER AN EXPLOSION DURING THE SHUT DOWN OF EQUIPMENT. EXACT MATERIAL IS UNKNOWN, CAUSE IS UNKNOWN.

INCIDENT DETAILS

Package: N/A

Building ID:

Type of Fixed Object: REFINERY

Power Generating Facility: NO

Generating Capacity:

Type of Fuel:

NPDES:



# Timeline

- ▶ 1000 CST: initial explosion occurred; shrapnel damaged tank 101 asphalt (50,400 barrels)
- ▶ 1100 CST: small initial fire extinguished
- ▶ 1200 CST: second fire began in breached tank 101
  - ▶ Refinery evacuated
  - ▶ Fire later spread to process units, ground fires, a vac tower, a crude unit, multiple tanks
- ▶ 1300 CST: community evacuation ordered
  - ▶ Concern over HF tank
- ▶ 1842 CST: bulk of fire extinguished
- ▶ 2355 CST: hot spots extinguished
- ▶ Community evacuation lifted next morning at 6 am



*Photo from Wisconsin Public Radio*



*Photo from KSTP*

# Chemical Safety Board Review



▶ <https://www.youtube.com/watch?v=OU0dIK5EJYI>

- ▶ To date the CSB has determined the following:
- ▶ The explosion took place during a planned maintenance shutdown of the refinery FCCU.
- ▶ The incident occurred during a scheduled break time and many workers previously in the unit before the explosion had moved either into blast resistant buildings or away from the process unit.
- ▶ One piece of debris from the explosion flew about 200 feet, and struck a large, nearby, aboveground storage tank containing about 50,000 barrels of asphalt. The side of the tank was punctured, resulting in the release of over 15,000 barrels of hot asphalt into the refinery.
- ▶ Approximately two hours after the release, the asphalt ignited, resulting in a large fire.
- ▶ As a result of the explosion, thirty-six people sought medical attention, including eleven refinery and contract workers who sustained OSHA recordable injuries. In addition, a large portion of Superior, Wisconsin was evacuated.







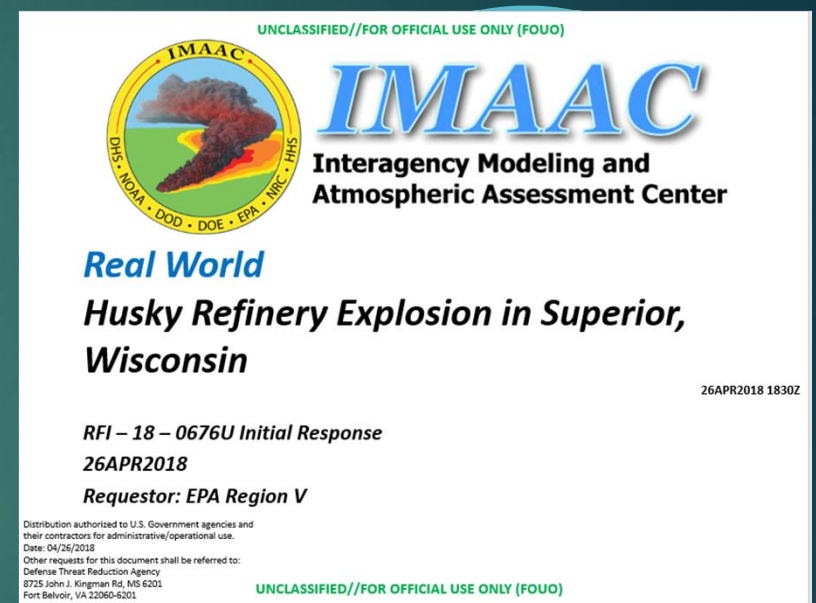


# Initial Actions

- ▶ EPA Morrison mobilized to scene.
- ▶ Request IMAAC Model Run
  - ▶ Initial and revised model
- ▶ Ensure Notifications
  - ▶ Tribal, state, trustees
- ▶ Contact ATSDR, going to need assistance.
- ▶ Coast Guard
  - ▶ MSU Duluth mobilized
- ▶ Additional OSCs mobilized (Miller, Mitchell, Hassan)
- ▶ First day: EPA deployed 4 OSCs, 1 ERT member, 2 SERAS personnel, and 7 START to the incident.

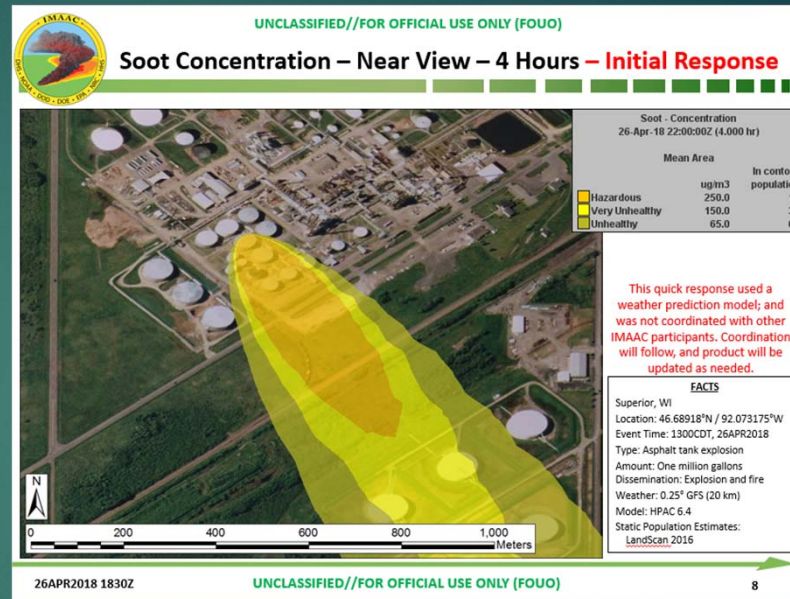
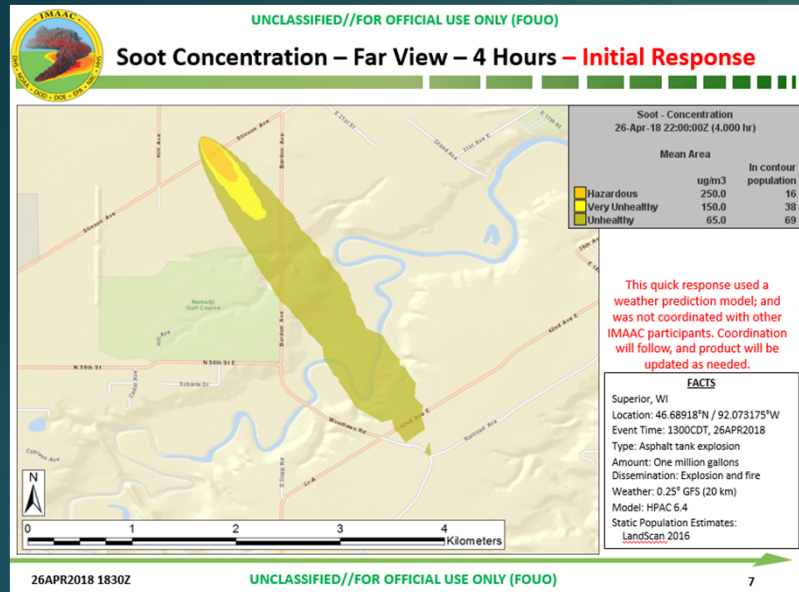


- Early in the response, EPA requested air plume modeling analysis support from the Inter-Agency Modeling and Atmospheric Assessment Center (IMAAC).
  - The first model run was to determine plume and likely soot deposition.
  - The second run was to include the hazardous substances.
- The OSCs also received the EPCRA Tier II report of chemicals at the facility. The Tier II information was used to identify the EHS chemicals such as ammonia, Hydrofluoric Acid (HF) and chlorine that were on site.
- The FRP was also sent for oil spill response information.





# IMAAC Initial Soot Model



# First things First. Responder safety

- EPA worked with the Refinery and their consultant GHD to establish a three-tiered air monitoring network and was involved with the review/development of the air monitoring plan. Air monitors were immediately deployed throughout the community to assess risks to first responders (Police enforcing evacuations and closures), at the facility fence line to assess on-going emissions from the damaged facility, and inside the refinery to protect workers from new releases and dangerously unstable situations immediately following the fire.



First air monitoring data map,  
Where are the police deployed ?

- EPA worked overnight to collect air data in support of lifting the evacuation order on the 27<sup>th</sup>.



Local HM team involved in fire, did not develop air monitoring .

Refinery HM teams air monitors deployed after explosion, inaccessible after second fire.



Air monitoring in Hot Zone



Air monitoring at Fenceline

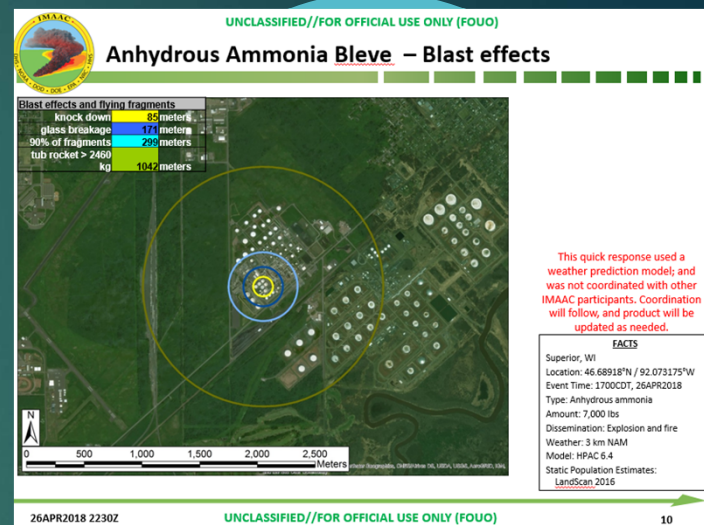
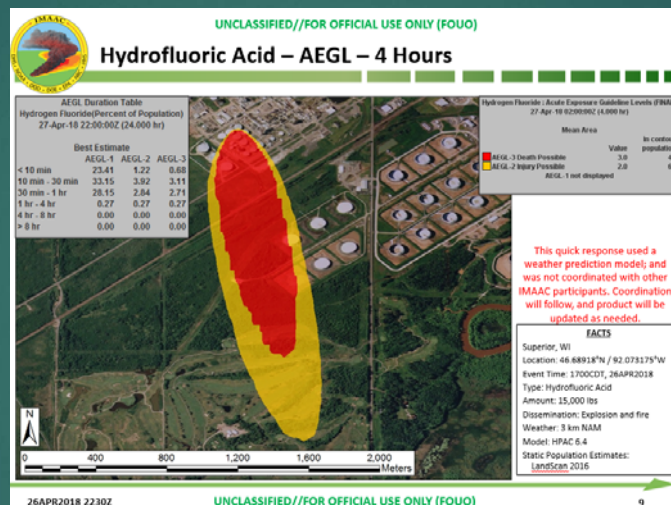
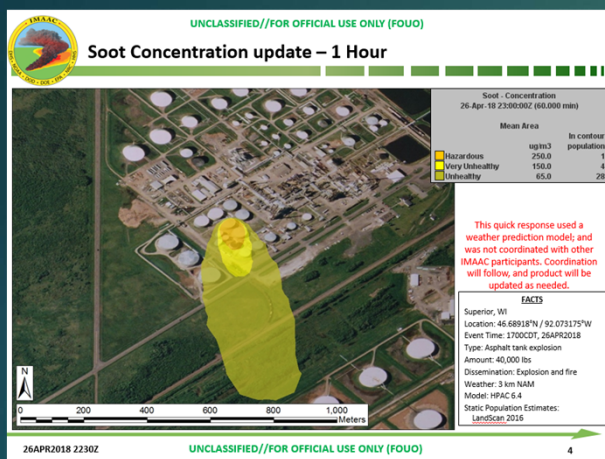


Air monitoring in Community



# IMAAC model update 01

## Inter-Agency Modeling and Atmospheric Assessment Center





# Water Impacts

- ▶ Oil and firefighting foam in Newton Creek
  - ▶ Leads to Lake Superior
- ▶ MSU Duluth assisted with initial booming oversight in creek, check on Bay
- ▶ Sheen noted in Creek
- ▶ WDNR taking the lead on all water issues
  - ▶ Water sampling
  - ▶ Cleanup of oil and firefighting foam
  - ▶ Treatment





The control structure near the refinery was closed after explosion, but some portion of 21 million gallons of oily-foamy fire fighting water made its way to the bay.







Mouth of Newton Creek

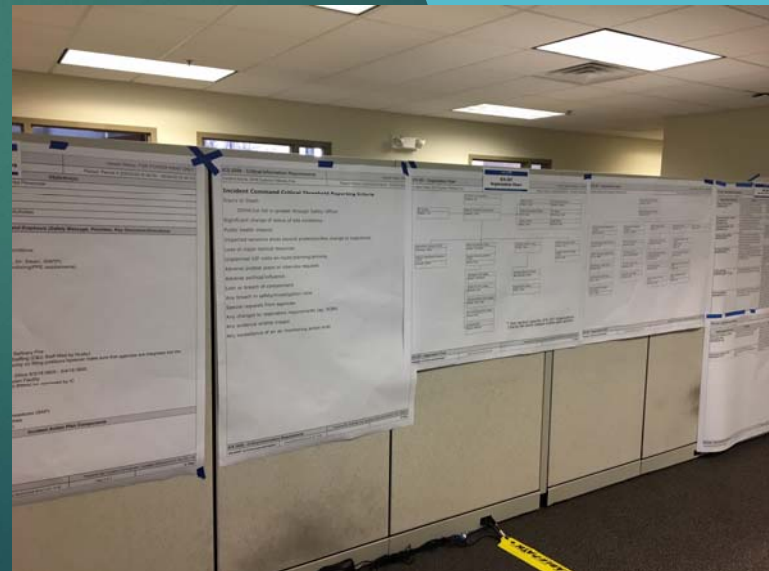


In addition to 17,000 barrels of asphalt oil from tank 101, No. 6 fuel oil was released from a tank along with every kind of leaking liquid from perforated/broken piping at the refinery.





Incident Command Post, moved four times.





## More on Air Monitoring

- ▶ EPA worked with Refinery's Consultant GHD to develop an air monitoring plan.
- ▶ EPA developed a Web viewer to manage and share data and information and established the capability for a data push to EPA VIPER servers in case of another incident so stakeholders had immediate access to the data.
- ▶ At the end of each day, all air monitoring data was summarized and provided to the Wisconsin State Health Department and the Douglas County Department of Health and made available to the public through their web-site.
- ▶ EPA later collected independent air samples for chemicals of concern.



# Community Air Monitoring

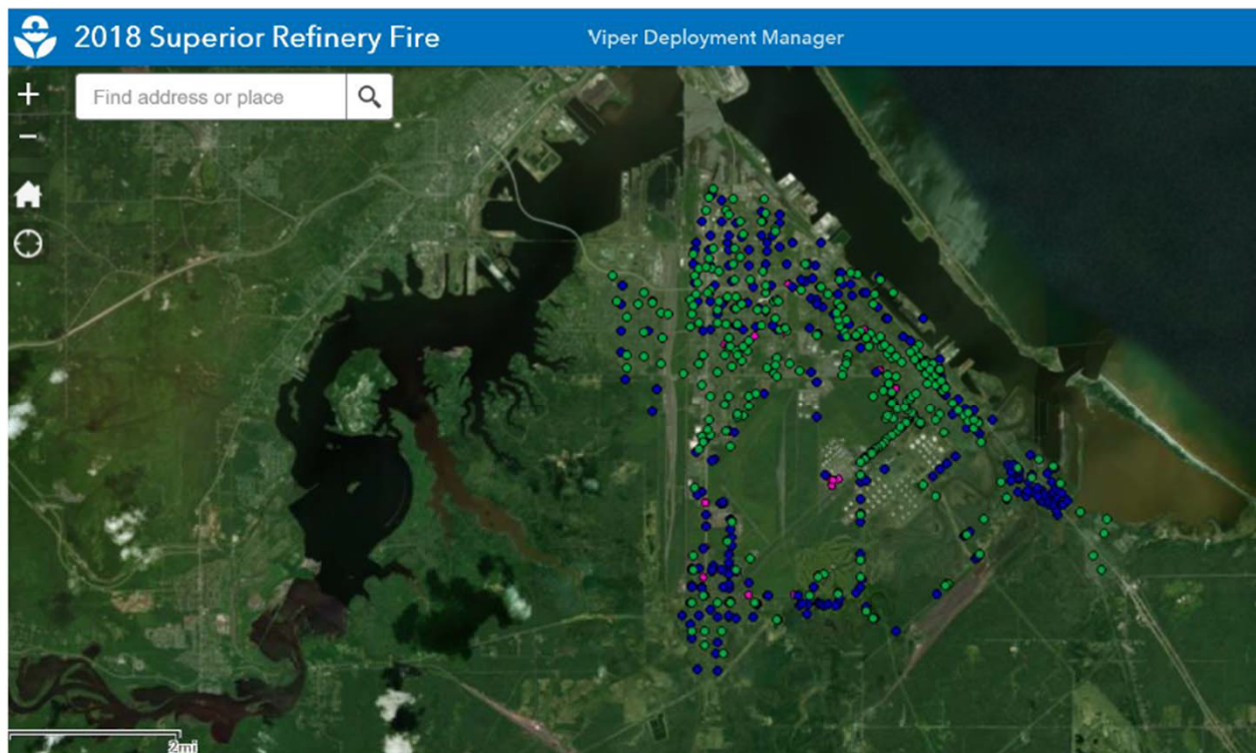
- ▶ START conducted air monitoring overnight until fire had been out for 24+ hours
- ▶ ERT on site
- ▶ Data uploaded to internal viewer
- ▶ Receiving data from refinery contractor
- ▶ Will be able to view data live with push of a button in event of another fire or release

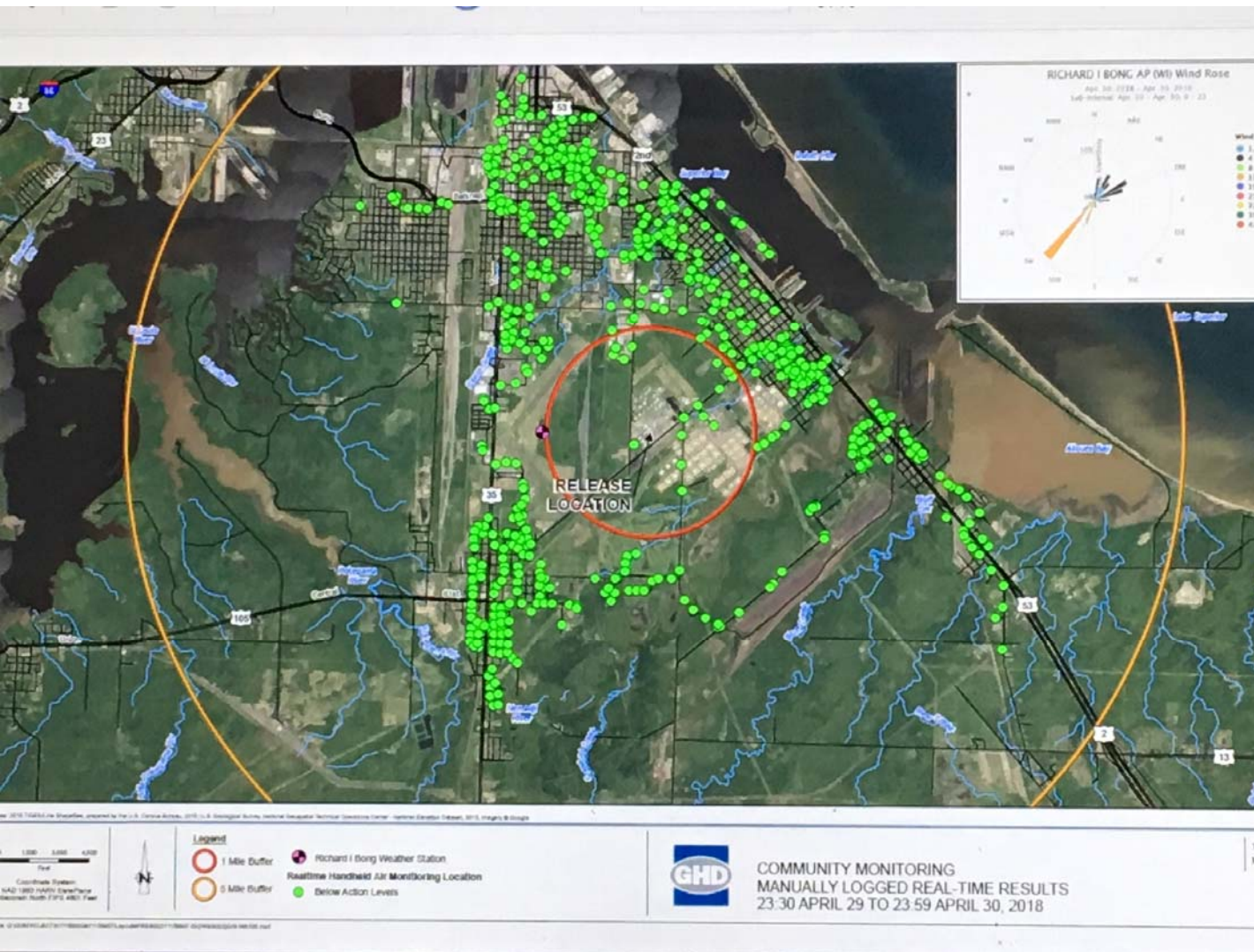




# EPA/START Data pushed to web viewer

EPA Air Monitoring Data Platform





In addition to monitoring conducted by the EPA, the company's environmental consultant eventually collected more than 20 million air quality readings in the community and at the refinery at approximately 5,600 individual locations. The results of the community monitoring program can be found on the Douglas County Department of Health and Human Services website.

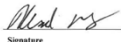
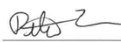




# Portable Vapor Combustion Units (VCUs)

- ▶ Needed to de-inventory process equipment, main flare damaged
- ▶ Permit request run through ICS
- ▶ Expedited permitting approvals by WI DNR.
- ▶ Add SO<sub>2</sub> and H<sub>2</sub>S as priority air monitoring targets going forward.


**NR 436 Request  
VCU Authorization for  
De-Inventory Activities  
2018 Superior Refinery Fire**

Environmental Leader, Mark Darby  
5/7/2018

Environmental Unit Leader		5/7/18
	Signature	Date
Operations Section Chief		5/7/18
	Signature	Date
Planning Section Chief		5/7/18
	Signature	Date
Incident commander		5/7/18
	Signature	Date

State of Wisconsin  
DEPARTMENT OF NATURAL RESOURCES  
2811 Fish Hatchery Road  
Fitchburg, WI 53711-5387

Scott Walker, Governor  
Daniel L. Meyer, Secretary  
Telephone 608-266-2001  
Toll Free 1-888-636-7403  
TTY Access via relay - 711

  
FID: 816009590

May 8, 2018

Mark Darby  
Superior Refining Company LLC  
2407 Stinson Avenue  
Superior, Wisconsin 54880

Subject: Re: NR 436.03 Request  
Bypass of Flare System to Depressurize and De-Inventory Process Units

Dear Mr. Darby,

The purpose of this letter is to acknowledge receipt of the Superior Refining Company exception request (s. NR 436.03(2), Wis. Adm. Code) submitted on May 7, 2018. Superior is requesting temporary approval of routing vent gases to two portable vapor combustion units and periodically combusting gases that might deviate from sulfur dioxide emission limits per section I.A.1.a.(1) in air pollution control permit 12-DCF-256 and section I.A.1.a.(1) of operation permit 816009590-F01.

The exception request meets the approval requirements for s. NR 417.05, Wis. Adm. Code. The correction schedule includes a maximum 28-day emissions estimate, and an explanation that the necessary emergency operation is due to safety. In addition, the ch. NR 417 requirements are covered within the scope of s. NR 436.03(2).

The department has no authority to grant an exception to the federal NSPS and NESHAP limits, because the department has no delegated authority to do so, and such limits are not covered by s. NR 436.03(2), Wis. Adm. Code.

The department also understands Superior will take every precaution to minimize emissions during this time. Please note that this approval does not preclude or affect action that USEPA or private citizens may take in relation to this matter.

If there are questions or concerns with this decision, please contact Susan Lindem at 608-999-0978.

Sincerely,



# Radiation Source Accounting

NRC licensed and exempt sources,  
All accounted for.



# Soot, Debris and Asbestos

- ▶ EPA worked with the refinery to address concerns related to soot deposition and debris from the fire that may contain suspect asbestos.
- ▶ EPA worked with ATSDR, Wisconsin Department of Health and the Douglas County Health Department to provide information to the public. WI DHS created a fact sheet on gardening and PAHs which were a prevalent concern at community meetings.



# Searching for Soot deposition, following the plume models.





Asbestos Plan developed  
and Completed with input  
from OSHA

- Addressing suspect ACM  
on-site and off-site.





Debris  
outside of  
fence line



Searching for debris (tank insulation)  
and suspect asbestos in community.  
- "A search and clean" mission

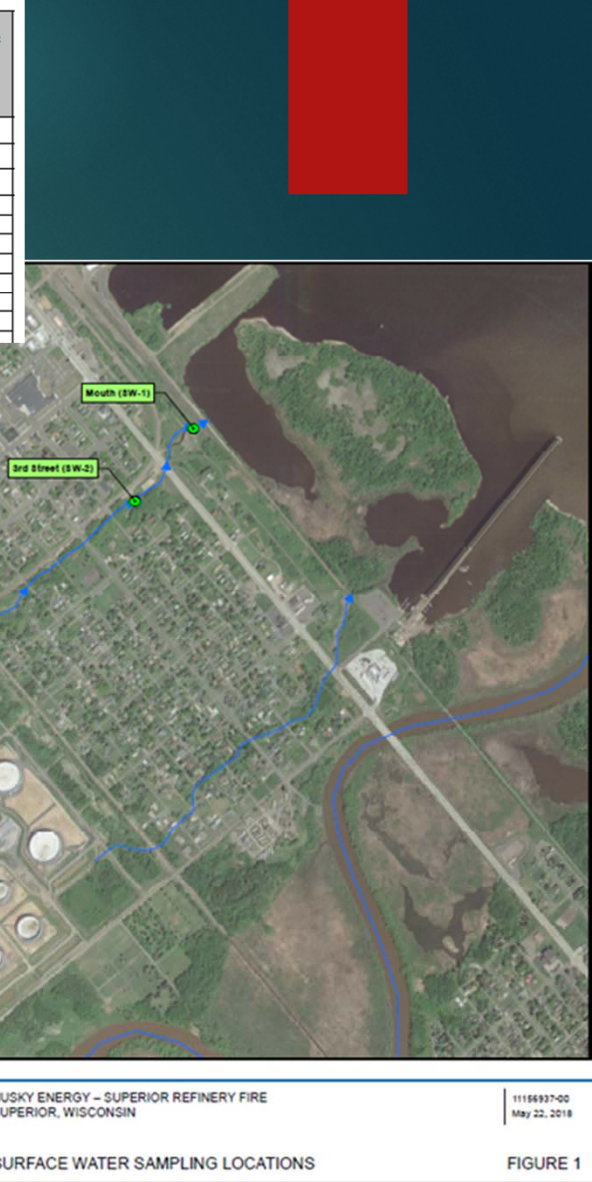




# WWTP & PFAS/PFOA

- ▶ Initial firefighting water discharged to Newton Creek. By 7pm the facility started to contain the firefighting water on-site in 2 ponds. Eventually hired Clean Harbors (after 1 to 2 weeks) to treat the water. They set up 2 parallel treatment series. Each one had two 10,000 lb. cannisters of activated carbon followed by two cannisters of ion exchange resin. Run water through one while changing out the cannisters in the other one. This is still going on. Water is then discharged to Newton Creek. WWTP was already capable of treating water for asphalt contamination and is still doing that.
- ▶
- ▶ Initial PFAS concentrations in Newton Creek (due to initial discharge) was in the 1,000s of PPT (> 1ppb). It has been continuously monitored since that time and now appears to be fluctuating over a stable range and probably averages around 50ppt. This is causing some issues because it is near several different standards that have been published. Not sure why concentrations aren't going down to what should have been a lower baseline concentration (there was no initial baseline to compare to though).

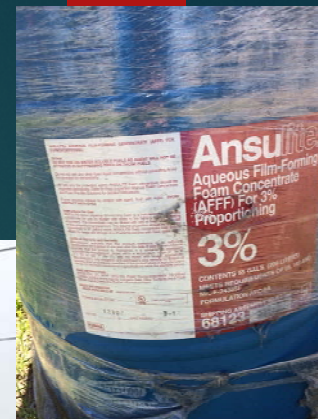
Parameter	Benzene	Ethyl benzene	Toluene	Xylene, total	Methyl tertiary butyl ether (MTBE)	1,2,4-Trimethyl benzene	1,3,5-Trimethyl benzene	Naphthalene	Total PAHs	GRO	DRO	ORO	Oil and Grease	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l	mg/l	mg/l	ng/l	ng/l
Life Protection Screening Level	None	None	None	None	None	None	None	None	None	None	None	None	30	None <sup>a</sup>	None <sup>a</sup>
Human Health Screening Level	610	2920	15359	8300	None	330	4200	1200	None	None	None	None	None	None <sup>a</sup>	None <sup>a</sup>
Date	Sample Type														
4/26/2018		55.9	7.0	73.9	42.6	< 0.40	17.2	4.0	12.0	46 a <sup>1</sup>	474	5.6	6.3	11.1	--
4/27/2018		33.7	4.7	40.2	29.0	< 0.40	15.2	3.7	8.2	ND	510	--	13.1	5.3	--
4/28/2018		18.4	2.5	22.2	16.5	< 0.40	9.0	2.3	4.9	ND	330	--	10.3	2.4 j	--
4/29/2018		< 0.34	< 0.14	< 0.17	< 0.24	< 0.40	< 0.14	< 0.18	< 0.42	1.2 a <sup>2</sup>	< 8.9	5.7	5.0	1.9 j	410
4/30/2018		< 0.34	< 0.14	< 0.17	< 0.24	< 0.40	< 0.14	< 0.18	< 0.42	ND	< 8.9	0.14	0.15	< 1.4	< 10
5/02/2018		< 0.34	< 0.14	< 0.17	< 0.24	< 0.40	< 0.14	< 0.18	< 0.42	ND	< 8.9	0.081 b	0.080	< 1.4	< 10
5/02/2018		< 0.34	< 0.14	< 0.17	< 0.24	< 0.40	< 0.14	< 0.18	< 0.42	ND	< 8.9 *	0.076 b	0.073	< 1.4	20
5/04/2018		< 0.34	< 0.14	< 0.17	< 0.24	< 0.40	< 0.14	< 0.18	< 0.42	ND	< 8.9	0.075 b	0.072	< 1.4	< 10







## Fire Water Recovery, AFFF foam





## PFOS/PFOA Carbon and Ion Resin Treatment systems







## On-Site oil cleanup









# Wildlife Management

- ▶ This started 1 to 2 days after the fire when a deer wandered into the asphalt area and got contaminated. Husky hired a company called "Focus Wildlife" to conduct the rehab. In a heated building away from the spill. Rehab appears to be done but mostly involved birds; mostly geese. Some animals couldn't be saved but many could. To prevent hatching of geese eggs, they "oiled" the eggs. To keep animals out of the asphalt contamination they used both lasers and border collies. Mostly chasing the birds. They also set up flags, which apparently scare the birds away.



## Wildlife Capture and Recovery






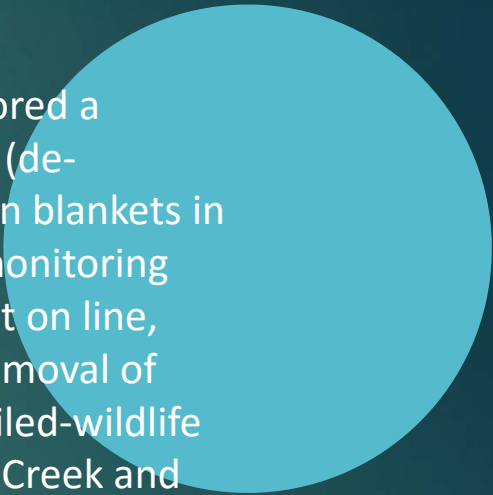
A	B	C	D	E	F	G
1	<b>Wildlife Rehabilitation Annual Report 2018</b>					
2						
3	<b>Report year</b>	<b>2018</b>	<b>License number</b>	<b>Temp-01</b>		
4						
5	<b>Licensee</b>	Chris Battaglia			<b>Daytime Phone Number</b>	310-386-5965 (cell)
6		Focus Wildlife			<b>Alternate Phone Number</b>	800-578-3048
7	<b>Mailing Address</b>					
8	Po Box 944	Anacortes, WA	Skagit County	98221		
9						
10	<b>Facility Address</b>					
11	Husky Refinery Temporary Wildlife Center					
12	4210 Hill Avenue	Superior, WI	Douglas County	54880		

	Date admitted	Species	Number admitted	Sex/Age	Location obtained	Diagnosis/cause	Disposition	Disposition date	Location released/Transferred
14	14-May-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Released	25-May-2018	Douglas County State Wildlife Area
15	14-May-2018	Mallard	1	Adult	Husky Refinery Superior	Oiled	Released	25-May-2018	Douglas County State Wildlife Area
16	16-May-2018	Mallard	1	Adult	Husky Refinery Superior	Oiled	Released	25-May-2018	Douglas County State Wildlife Area
17	17-May-2018	Weasel, Short-tailed	1	Young	Husky Refinery Superior	Oiled	Died < 24hrs	17-May-2018	N/A
18	21-May-2018	Deer, White-tailed	1	Fawn	Husky Refinery Superior	Oiled	DOA	21-May-2018	N/A
19	22-May-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Released	2-Jun-2018	Douglas County State Wildlife Area
20	23-May-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Released	2-Jun-2018	Douglas County State Wildlife Area
21	24-May-2018	Grackle, Common	1	Adult	Husky Refinery Superior	Oiled	DOA	24-May-2018	N/A
22	24-May-2018	Passerine spp. (unidentified)	1	Unknown	Husky Refinery Superior	Oiled (asphalt)	DOA	24-May-2018	N/A
23	25-May-2018	Grackle, Common	1	Adult	Husky Refinery Superior	Oiled	DOA	25-May-2018	N/A
24	25-May-2018	Owl, Snowy	1	Adult	Husky Refinery Superior	Emaciated, dehydrated, poss rodenticide toxicity	Died < 24hrs	26-May-2018	N/A
25	3-Jun-2018	Passerine spp. (unidentified)	1	Unknown	Husky Refinery Superior	Oiled	DOA	3-Jun-2018	N/A
26	6-Jun-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Euth	14-Jun-2018	Douglas County State Wildlife Area
27	8-Jun-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Released	15-Jun-2018	Douglas County State Wildlife Area
28	10-Jun-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Oiled	Released	15-Jun-2018	Douglas County State Wildlife Area
29	13-Jun-2018	Mallard	1	Adult	Husky Refinery Superior	Oiled	Released	18-Jun-2018	Douglas County State Wildlife Area
30	14-Jun-2018	Robin, American	1	Adult	Husky Refinery Superior	Oiled	Died < 24hrs	14-May-2018	N/A
31	17-Jun-2018	Goose, Canada	1	Sub-adult	Husky Refinery Superior	Oiled	Released	17-Jun-2018	Douglas County State Wildlife Area
32	17-Jun-2018	Goose, Canada	1	Sub-adult	Husky Refinery Superior	Oiled	Released	17-Jun-2018	Douglas County State Wildlife Area
33	17-Jun-2018	Goose, Canada	1	Sub-adult	Husky Refinery Superior	Oiled	Released	17-Jun-2018	Douglas County State Wildlife Area
34	17-Jun-2018	Goose, Canada	1	Sub-adult	Husky Refinery Superior	Oiled	Released	17-Jun-2018	Douglas County State Wildlife Area
35	17-Jun-2018	Goose, Canada	1	Sub-adult	Husky Refinery Superior	Oiled	Released	17-Jun-2018	Douglas County State Wildlife Area
36	17-Jun-2018	Goose, Canada	1	Adult	Husky Refinery Superior	Un-oiled (captured with oiled offspring)	Released	17-Jun-2018	Douglas County State Wildlife Area



Laser Deterrent



- 
- 
- ▶ EPA worked with the State of Wisconsin and the Refinery and monitored a multitude of response activities including; site stabilization activities (de-inventorying of damaged equipment and piping, maintaining nitrogen blankets in reactive equipment, oil recovery on-site and off-site, modifying air monitoring parameters as portable Vapor Combustion units (VCUs) were brought on line, PFAS/PFOA fire-fighting water and foam collection and treatment, removal of chlorine and ammonia from the site, WWTP damage and re-start), oiled-wildlife capture-decon and hazing efforts, water quality sampling in Newton Creek and Lake Superior Bay and attending public meetings.

It will Be some time before startup !







Questions ?

