Introduction

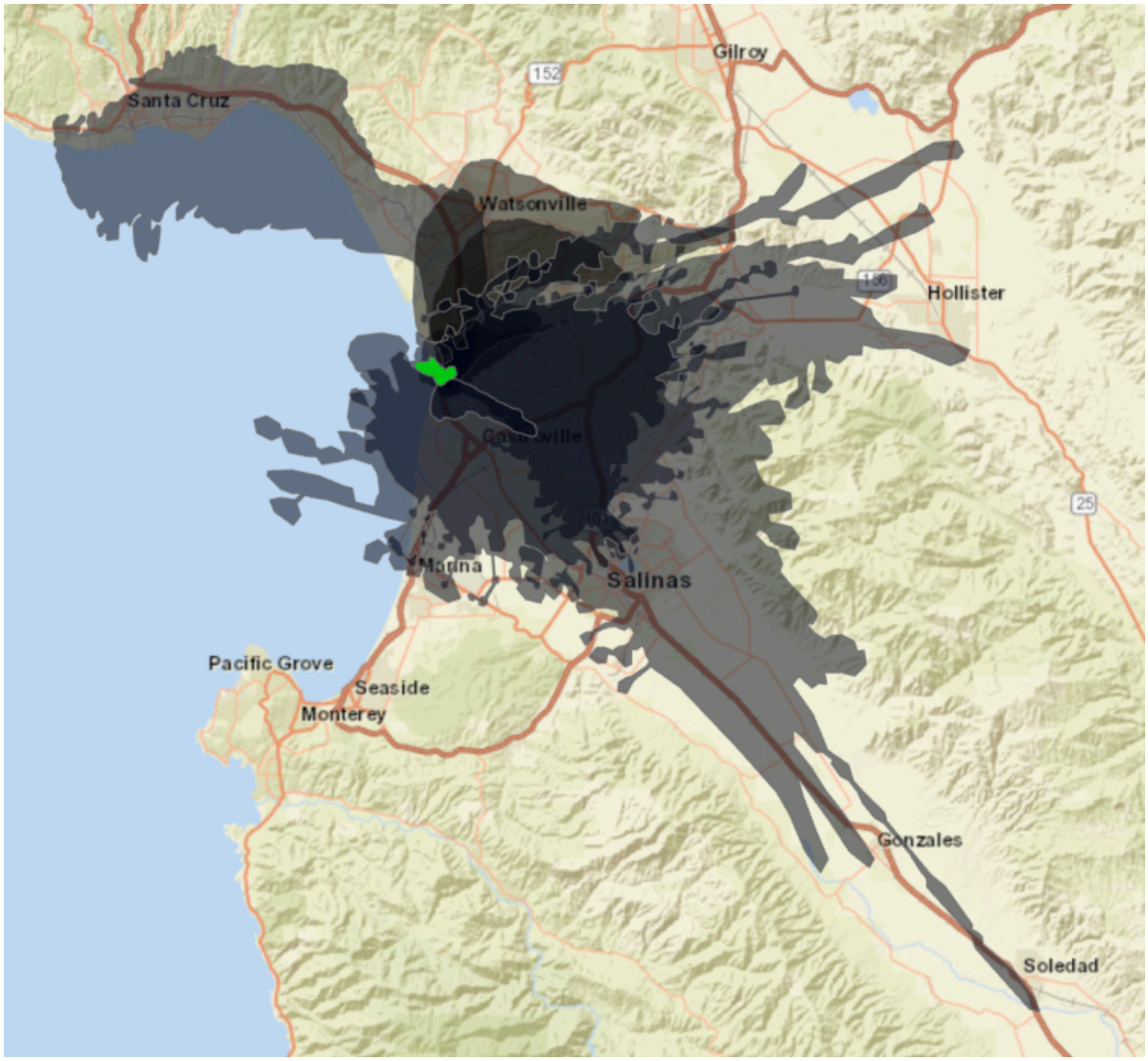
The goal of my final GIS project is to import and analyze data obtained through the California Public Records Act (CPRA) to uncover the full extent of the Vistra Moss Landing battery fire; particularly information that may have been withheld or downplayed by Monterey County. My primary focus is on plume modeling, air sampling data, and the potential exposure of cropland within the plume's path. A major challenge throughout the project was data acquisition. While the County publicly referenced certain records in Board of Supervisors meetings, they denied possession of them in response to CPRA requests. The released documents appeared incomplete, prompting me to file Freedom of Information Act (FOIA) requests with federal agencies. These responses, received as late as May 23, 2025, were still missing key documents, and additional requests will be necessary to fill those gaps.

Data and Methods

The primary data source for plume analysis was the series of HYSPLIT models included in Emergency Operation Plans (EOPs) 2, 3, 4, and 5. To supplement gaps, particularly for the morning of January 18, 2025, I incorporated HYSPLIT modeling conducted by a UCSC researcher. This timeframe is significant because the county failed to release air modeling data for that morning, despite repeated requests. Although the county ignored those requests, I located a summary in an internal email indicating hazardous levels of PM2.5 during that period. Notably, the air monitor used to estimate hydrogen fluoride (HF) levels was non-functional that morning in the areas with high PM. This malfunction was not an isolated incident: HF data was missing approximately 40% of the time.

Results

By mapping the emergency plume models, I was able to compare them to the IMAAC soot plume model released by the County of Monterey. The differences between the two were striking.



The IMAAC Soot plume model encompasses 1,139 acres.

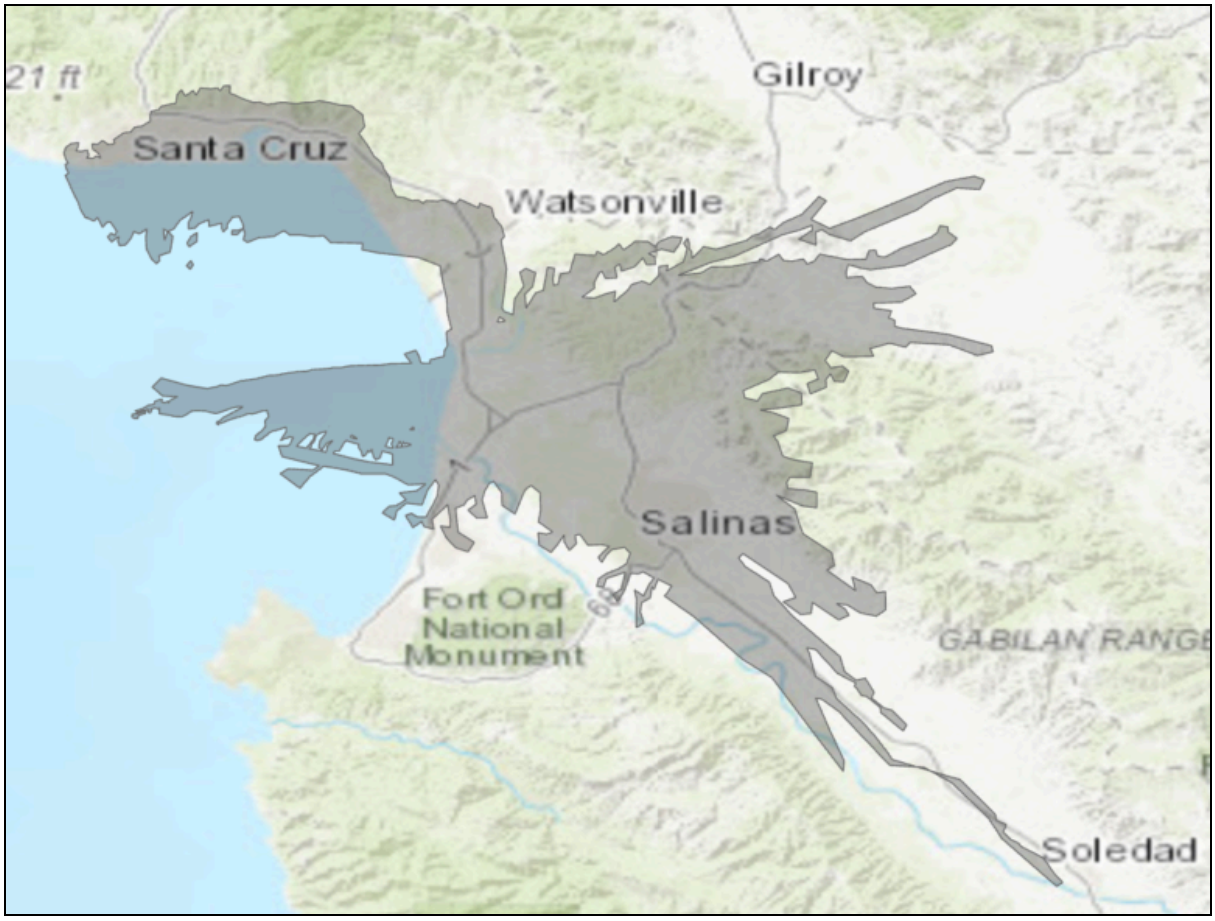
IMAAC_Soot_Plume | PlumeJan16_17_18_21

Field: Add Calculate | Selection: Select By Attributes Zoom

	OBJECTID *	Shape *	Shape_Length	Shape_Area	Acres	areabygeo
1	1	Polygon	10551.406073	4608287.30876	1139	729

Click to add new row

While the Plume models from the Emergency Action Operation Plans encompasses 269,154 acres. I redid the plume modeling with WGS_1984_Web_Mercator_Auxiliary_Sphere since the tiffs are able to align better than the NAD coordinate system. I should note it appears that 1/21/25 image was either generated using a different coordinate system or it was the image was distorted. Either way it was georeferenced as close as possible.

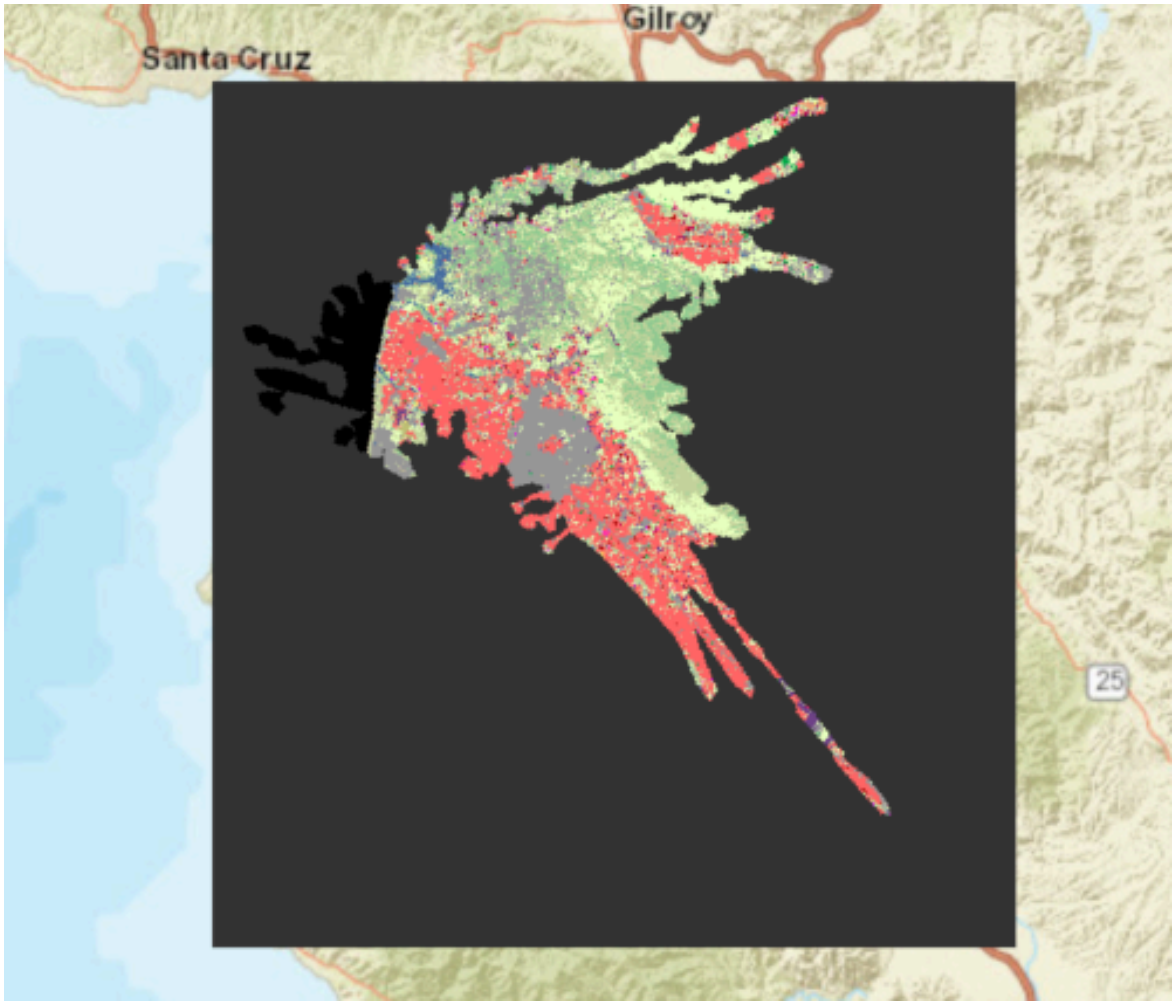


OBJECTID *	Shape *	Shape_Length	Shape_Area	acres
1	Polygon	0.270322	0.000701	1723
2	Polygon	0.021483	0.000006	16
3	Polygon	0.016306	0.000016	39
4	Polygon	0.027955	0.000042	102
5	Polygon	0.021935	0.000018	45
6	Polygon	6.376365	0.109194	267229
Total				**269154**

Please note that the total acreage encompasses the full plume, including the area over the Pacific Ocean.

Next, I utilized the emergency plume data to evaluate the exposure of adjacent cropland to potentially harmful conditions. This spatial analysis indicates a significantly broader impact area than what is officially recognized.

Before modifying the coordinates of my plume model, I successfully created a clip of US cropland based on the dissolved plume models. The accompanying map and table display the cropland acreage, with each pixel equivalent to one square meter.



Next steps include gathering satellite images to determine the number of farms that were actively growing crops during the fire.

Class_Names	Acres_Farm		Class_Names	Acres_Farm
Background	636		Citrus	8
Misc Vegs & Fruits	544		Other Crops	7
Shrubland	462		Sod/Grass Seed	7
Grassland/Pasture	415		Woody Wetlands	7
Evergreen Forest	219		Barren	6
Developed/Med Intensity	198		Avocados	6
Developed/Open Space	186		Chick Peas	4
Developed/Low Intensity	128		Apricots	4
Strawberries	65		Walnuts	3
Developed/High Intensity	60		Deciduous Forest	3
Mixed Forest	59		Plums	3
Grapes	38		Peppers	2
Open Water	32		Oats	1
Dry Beans	13		Alfalfa	1
Tomatoes	11		Other Hay/Non Alfalfa	1
Fallow/Idle Cropland	10		Onions	1
Apples	10		Peaches	1
Herbaceous Wetlands	9		Other Tree Crops	1
Cherries	8			

*The table above shows the acres of US cropland within the plume from the emergency action plans.

Conclusion

Preliminary findings suggest a deliberate effort to downplay the scope and severity of the battery fire's impact. Several hypotheses have emerged that merit further investigation:

Plume Model Accuracy: I have reason to believe the IMAAC soot plume model was created on January 17, and assumed 1,300 batteries burned uniformly over 24 hours.

See Figure 1 Plume modeling from January 17th for 100% of 1300 batteries burning at a fixed rate for 24 hours

However, Vistra's March 2022 notes that battery fires peak sharply rather than burn evenly. Additionally, the EPA's presentation further demonstrates that batteries don't burn evenly over time.

See **Figure 2** *Slides from the Moss Landing March 2022 presentation showing the timeline after thermal runaway.

See **Figure 3** Additional evidence from the EPA that li-ion batteries do not burn equally over time.

The number of affected batteries was likely closer to 100,000 or 12.8 million pounds. I suspect this underestimated model was used to justify lifting the evacuation order prematurely. The fire doubled in size the day after the evacuation was lifted on the night of January 16, and I suspect there was no effort made to reassess the decision to lift the evacuation. I will continue investigating my suspicions until I find answers.

See **Figure 4** EMERGENCY OPERATIONS CENTER ACTION PLAN OP3 stating the evacuation was lifted 1/16/25 at 16:13

See **Figure 5** The Soot Plume model was used to inform the location of the EPA air monitoring station, further proving that it was generated long before 2/14/2025

Air Quality Standards: The Monterey Bay Air Resources District (MBARD) identified the appropriate HF safety standard as 0.02 ppm in a January 17th email.

See **Figure 6**. The email shows that the MRL of HF is 0.02 ppm was known on 1/17/2025

Despite knowing the MRL to be 0.02 ppm, a higher threshold of 0.3 ppm from OHEAA was applied, which, according to emails, was rounded up.

Given that the fire burned for multiple days, using a one-hour exposure standard was highly inadequate.

See **Figure 7.** The Email stating the OEHHA limit is 293 ppb, which was rounded up to 0.3 ppm

Instrumentation used by CTEH had a limit of detection of <0.5 ppm, which is insufficient for detecting levels of 0.3 ppm or lower.

See **Figure 8** Table 1 from CTEH Moss Landing Incident Preliminary Air Monitoring Summary, January 18, 2025. Note the LOD is 0.5 ppm.

Available data indicate that the 0.02 ppm limit was exceeded on multiple occasions, with the highest exceedance recorded on January 18th at 0.071 ppm.

On January 22, the day EPA dismantled its air quality monitoring setup, HF levels rose at the harbor station, which was 5 meters below the fire site elevation. The decision to dismantle monitoring at a time when data indicated worsening conditions is worth questioning. Temperature data from January 22 through February 15 indicates that conditions were well above the threshold for hexafluorophosphate to be catalyzed, giving me reason to believe that HF levels likely continued to rise after monitoring was dismantled. A May 2025 presentation by PG&E revealed that they had continuous HF monitoring equipment operating throughout the incident. This data was not shared with the county or MBARD but was provided to the fire department, an agency to which PG&E has historically made charitable contributions. One of my goals is to make this critical PG&E air monitoring data publicly available.

Community Impact: A local resident collected symptom data from individuals experiencing health issues during the incident. Preliminary mapping suggests the geographic distribution of reported symptoms closely mirrors the emergency plume model. I plan to obtain and analyze this dataset to assess potential exposure patterns alignment.

The goal of this project was to highlight the significance of GIS in identifying environmental and public health risks, particularly when official narratives contradict available data. Continued data collection, FOIA requests, and bringing that data into GIS for spatial analysis are crucial to providing an accurate account of what occurred during the Moss Landing battery fire. Next steps will also include incorporating satellite images from January 16 through February 20, 2025.

Figure 1: Plume modeling from 1/17 for 100% of 1300 batteries burning equally for 24 hours.

Comments/Assumptions

- The fire burns and the batteries are consumed at a fixed rate over 24 hours, beginning at 1500 local 16JAN.
- The fire is based on ~1300 batteries totaling 300 MWh.
  - Battery assumptions are notional and may not reflect the actual mass of material on site or involved in the fire.
  - Release duration is highly dependent on the number of batteries.
- The burning of batteries can include numerous chemical hazards:
  - Hydrogen fluoride (HF), hydrogen chloride (HCl), sulfur dioxide (SO_2), hydrogen cyanide (HCN)
  - **Hydrogen fluoride is the most dangerous hazard and produces the largest plume. All other hazards are inside the HF contour.**

Hydrogen Fluoride

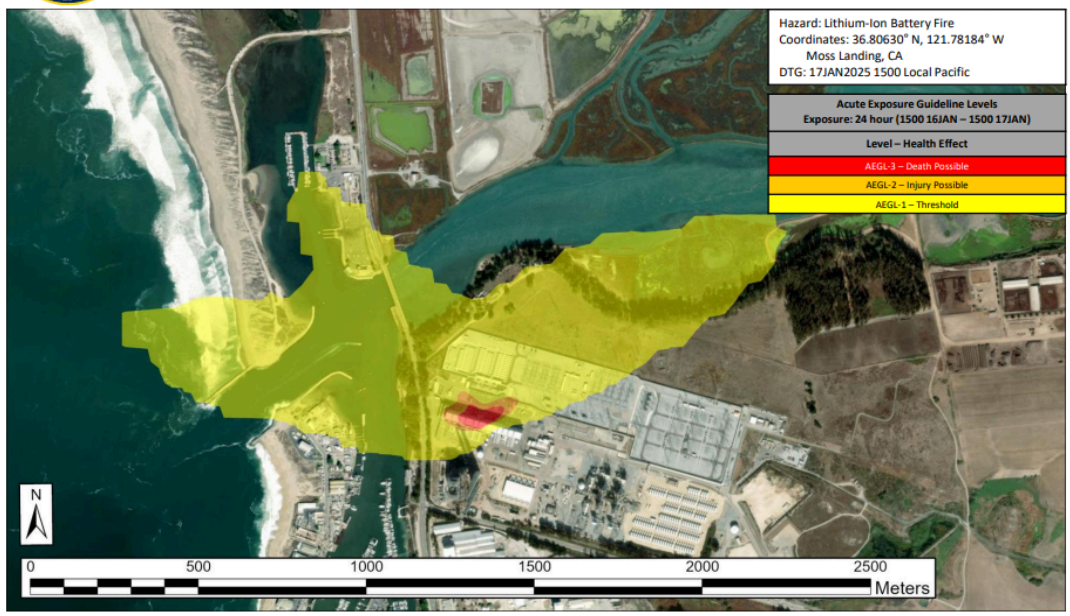
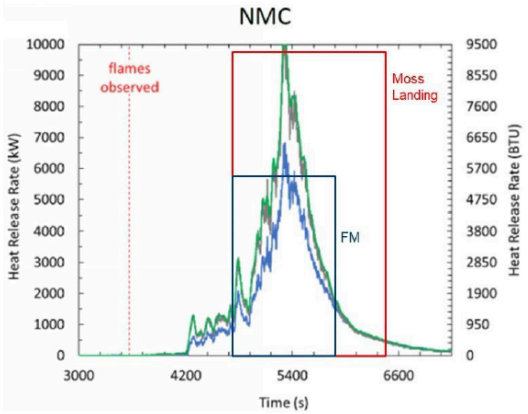


Figure 2: Slide from Moss Landing March 2022 presentation showing the timeline after thermal runaway.

MOSS LANDING MCE: FAR-FIELD MODEL INPUT

- Actual Moss Landing Systems
  - Fire potential is very low
  - Fire protection features designed to mitigate venting and flaming scenarios
- Model development for what-if scenario analysis
  - Moss Landing racks hold 2.6 times the energy
  - 330 kWh vs 125 kWh
  - Scaling FM to Moss Landing
  - FM - 5.5 MW for 20 min.
  - Moss Landing – 9.5 MW for 30 min.
  - Timeline still applies up until full involvement
- **Model Input**
  - **9.5 MW Fire - gas generator**
  - **2.36 kg/sec N_2**
  - **1.0 kg/sec CO_2**
  - **0.09 kg/sec CO**
  - **0.1 kg/sec H_2O vapor**
  - **0.017 kg/sec HF**



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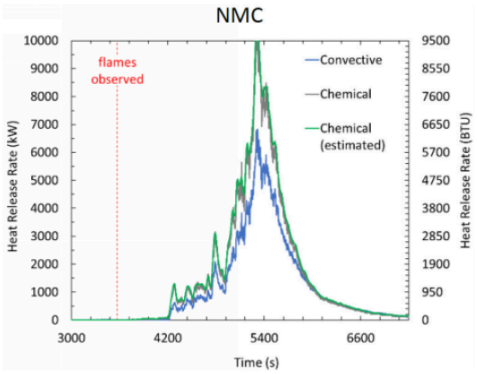
FM GLOBAL DATA USED FOR MCE



- FM Global ESS rack
  - 8 tall rack of modules
  - 2 wide
  - ~ 125 kWh
  - Fire scenario artificially induced using a pool fire initiation under the ESS rack
- Timeline after thermal runaway
  - 0-10 min. very small detectable fire
  - 10-20 min. slow growth up front face
  - ~15 min. sprinklers activated (but no water, intentionally)
  - 20-30 min. rapid growth to full involvement
  - 30-40 min. rapid decay
  - 40-60 min. small smoldering fire
- **Key points:**
  - **Over 20 minutes until rapid growth (i.e., FD response time)**
  - **Sprinklers activated ~ 15 min.**
  - **High intensity burn ~ 5.5 MW for 20 min.**

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Figure 3: Additional evidence from the EPA that li-ion batteries do not burn equally over time.

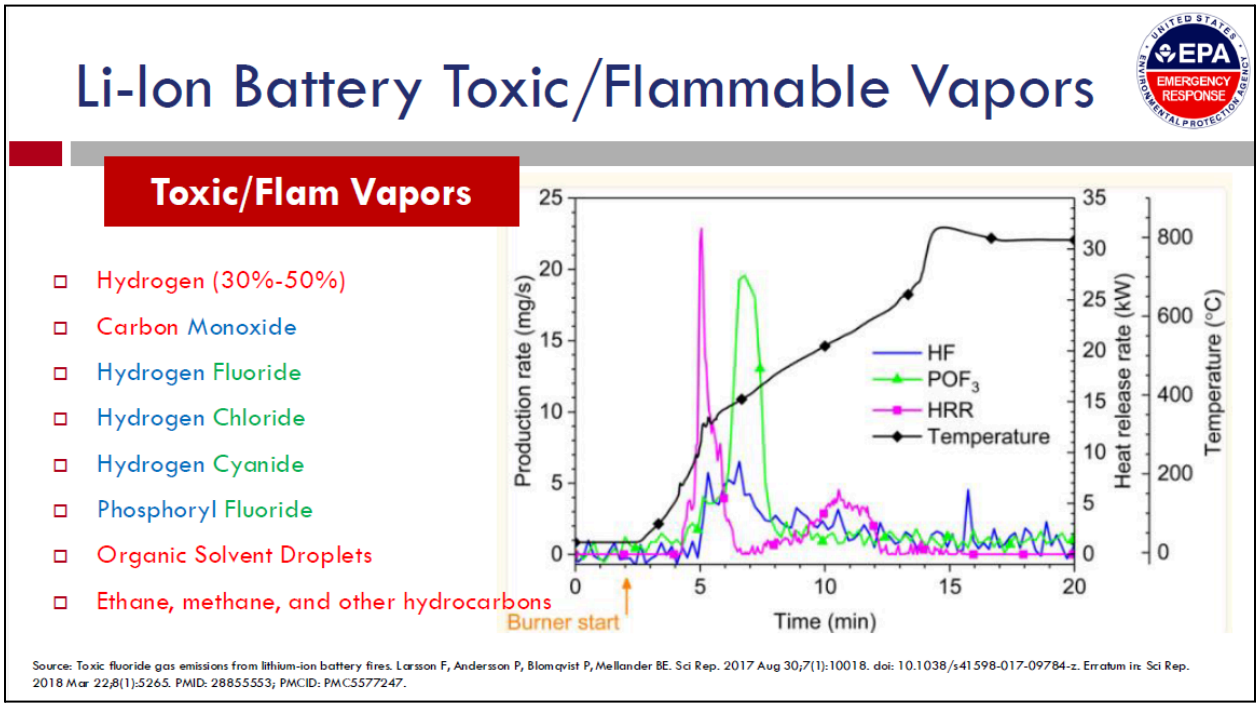

Figure 4: EMERGENCY OPERATIONS CENTER ACTION PLAN OP3 stating the evacuation was lifted 1/16/25 at 16:13

General Situational Awareness

On January 16, 2025, at 15:00, a fire was detected in the 300-MW Phase I energy storage facility at the Moss Landing Vistra Power Plant. At 16:59, the North County Fire Protection District issued an advisory for zones MRY-B047 and MRY-B053. Subsequently, at 19:12, the Monterey County Sheriff issued an evacuation order for zones MRY-B037, MRY-B047, MRY-B050, MRY-B051, MRY-B053, MRY-B058, and MRY-B060. Full road closures are in effect at Dolan Rd. and Castroville Blvd., Highway 1 at Salinas Rd., and Highway 1 at Merritt St. Monterey County Sheriff's lifted all evacuation orders as of 16:13 on 01/16/25. The plume, composed of smoke from burning lithium batteries and building materials, is continuing to drift eastward with a slight northerly shift toward San Benito and Santa Clara Counties.

Figure 5: The Soot Plume model was used to inform the location of the EPA air monitoring station, further proving that it was generated long before 2/14/2025

Soot (Particulate Matter) Air Monitoring Model:

EPA's air monitoring instruments did not detect any readings above the "Moderate" AQI classification throughout the incident.

The soot model, or particulate matter model, was developed to inform the public and responders of the worst-case scenario of soot deposition due to the January 2025 battery fire at Vistra Energy's facility in Moss Landing. The soot model also informed the locations of EPA's air monitoring stations, which were located to account for any changes in wind direction and track any potential drift to nearby communities. This footprint illustrates the general area of concern and does not necessarily indicate adverse health effects unless a person is assumed to be standing still for 24 hours.

Produced by the Interagency Modeling and Atmospheric Assessment Center (IMAAC), the soot model was formulated using real time and predictive weather modeling for three 24-hour periods while the fire was burning, as well as information about the materials involved in the fire. These models were created to be conservative and most protective of public health and were made with the assumption that all the batteries burned.

Throughout the incident, EPA's air monitoring data showed that particulate matter posed no risk to public health. Additional mobile monitoring from Vistra's third-party contractor and from the Monterey Bay Air Resources District further support this conclusion.

Nicholas M. Pasculli *(He/Him)*
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Chief Public Information Officer
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O/M: (831) 796-3094
PasculliN@CountyofMonterey.gov

Figure 6. The email shows that the MRL of HF is 0.02 ppm was known on 1/17/2025

From: Rstedman@mbard.org <Rstedman@mbard.org>
To: Lopez, Christopher M. <undefined>, Askew, Wendy R. <undefined>

1/17/2025, 2:26:53 PM

You don't often get email from rstedman@mbard.org. Learn why this is important

[CAUTION: This email originated from outside of the County. Do not click links or open attachments unless you recognize the sender and know the content is safe.]
Greetings,

Apparently, we asked for and never received a copy of the plan. We reviewed and commented on the air quality modeling analysis.

Attached is a presentation that went along with Vistraâ□□s analysis. It clearly states that the batteries contain cobalt and nickel, along with other heavy metals. These metals are toxic and were not included in the dispersion analysis. In addition to these metals, there may be phosphorus pentafluoride (PF_5) and phosphoryl fluoride (POF_3), both of which can be toxic and are chemical intermediaries in the formation of HF.

Just so you are aware, the minimal risk level (MRL) for acute-duration inhalation of HF is 0.02 ppm. Iâ□□m not sure if we have any data on HF concentrations, but anything below 0.02 ppm would be considered okay from a public health standpoint.

Thanks,

Rich

Richard A. Stedman
Air Pollution Control Officer

Figure 7: Email stating the OEHHA limit is 293 ppb, which was rounded up to 0.3 ppm

Karen,

I also wanted to point out that the monitoring point we have labelled as HF is actually a Mineral Acid Gas sensor. Our instrument we have deployed SPM Flex with mineral acid gas cassettes. We've been supporting OPS responders by making conservative assumptions as if the only constituent was HF. You may already be aware of this distinction, but I thought I would throw this out there again.

I was also wondering if you could confirm the action level you are using? We like to keep track of what action levels the data might be compared against. We had calculated a different action level based on the Acute REL for HF on the OEHHA website (https://oehha.ca.gov/chemicals/hydrogen-fluoride) and I want to know what the difference is for the number you provided below:

Here is our calculation:

Concentration (ppb) = 24.45 x concentration (OEHHA Acute REL HF) (µg/m3) ÷ molecular weight (HF)
OEHHA Acute REL HF = 240 ug/m3
molecular weight (HF) = 20.01 g/mol

Concentration (ppb) = 24.45 x 240 ÷ 20.01 = 293 ppb

Figure 8: Table 1 from CTEH Moss Landing Incident Preliminary Air Monitoring Summary, January 18, 2025. Note the LOD is 0.5 ppm.

Table 1 Handheld Real-Time Air Monitoring Results

Analyte	Count of Measurements	Count of Detections	Range of Measurements
CO	144	0	< 1 ppm
HCl*	103	0	< 0.05 ppm
HCN	112	0	< 0.5 ppm
HF*	200	0	< 0.5 ppm
$PM_{2.5}$	136	136	0.007 - 0.036 mg/m^3

The selected instrument responds to HCl, HF, and other mineral acids. For each measurement, any detections are assumed to consist completely of the indicated acid with internal instrument correction factor applied.

Analytes with no detections are reported as less than (<) the instrument's Limit of Detection (LOD)
ppm=parts-per-million