EXCEPTIONAL EVENTS DEMONSTRATION FOR 2022, 2023, AND 2024 $PM_{2.5}$ EXCEEDANCES AT JEFFERSON COUNTY

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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SECTION 1: INTRODUCTION AND EXCEPTIONAL EVENT CRITERIA

1.1 OVERVIEW

Exceptional events are unusual or naturally occurring events that affect air quality and are not reasonably controllable or preventable. An exceptional event may also be caused by human activity that is unlikely to recur at a particular location. Under §319 of the federal Clean Air Act (FCAA), states are responsible for identifying air quality monitoring data affected by an exceptional event and requesting the United States (U.S.) Environmental Protection Agency (EPA) exclude the data from consideration when determining whether an area is in attainment or nonattainment of a National Ambient Air Quality Standard (NAAQS). EPA has promulgated an exceptional events rule, 40 Code of Federal Regulations (CFR) §50.14, as well as guidance to implement the requirements of the FCAA regarding exceptional events. States are required to identify air quality monitoring data potentially affected by exceptional events by flagging the data submitted into the EPA Air Quality System (AQS) database. If EPA concurs with this demonstration, the flagged data will not be eligible for consideration when making NAAQS compliance determinations.

This document discusses the Texas Commission on Environmental Quality's (TCEQ) proposed exceptional event day flags for fine particulate matter ($PM_{2.5}$) occurring on various dates in 2022, 2023, and 2024 in Jefferson County (Port Arthur Memorial School monitor). This demonstration shows that concentrations of $PM_{2.5}$ at this air monitoring site in Jefferson County were impacted by exceptional events on 58 days from 2022 through 2024.

The particulate matter measurements on the proposed exceptional event days are listed below in Table 1-1: *Proposed Exceptional Events from 2022 through 2024 at the Port Arthur Memorial School Monitor*. The event days are also categorized into groups by event type. A map of Texas with the referenced monitor is shown in Figure 1-1: *Map of Texas with the Port Arthur Memorial School Monitor Identified for Exceptional Events* and Table 1-2: *Monitor Details* provides additional information for the monitoring site.

Table 1-1: Proposed Exceptional Events from 2022 through 2024 at the Port Arthur Memorial School Monitor

EE Group	Date	Exceedance Concentration (µg/m³)	Type of Event	Tier
1	1/17/2022	18.7	Prescribed Fire	2
2	5/8/2022	17.5	Fire – Mexico/Central America	2
3	6/12/2022	32.2	African Dust	1
3	6/13/2022	38.8	African Dust	1
3	6/14/2022	28.7	African Dust	1
3	6/15/2022	21.8	African Dust	2
3	6/16/2022	23.7	African Dust	2
4	7/16/2022	20.0	African Dust	2
4	7/17/2022	27.7	African Dust	1
5	9/22/2022	18.4	Prescribed Fire	2
5	9/23/2022	18.6	Prescribed Fire	2
6	2/27/2023	19.4	Fire – Mexico/Central America	2

EE Group	Date	Exceedance Concentration (µg/m³)	Type of Event	Tier
6	2/28/2023	18.7	Fire – Mexico/Central America	2
6	3/5/2023	18.2	Prescribed Fire	2
8	5/22/2023	25.1	Fire - Canadian	1
8	5/23/2023	24.2	Fire - Canadian	2
8	5/24/2023	23.8	Fire - Canadian	2
8	5/26/2023	27.2	Fire - Canadian	1
8	5/27/2023	22.0	Fire - Canadian	2
9	6/19/2023	17.6	Fire – Mexico/Central America	2
9	6/20/2023	19.6	Fire – Mexico/Central America	2
10	7/15/2023	22.4	African Dust	2
10	7/16/2023	23.7	African Dust	2
10	7/17/2023	19.5	African Dust	2
11	7/19/2023	18.5	Prescribed Fire	2
12	7/26/2023	18.4	African Dust	2
12	7/29/2023	19.8	African Dust	2
13	8/2/2023	22.8	Prescribed Fire	2
14	8/24/2023	18.9	Wildfire – U.S.	2
14	8/25/2023	18.5	Wildfire – U.S.	2
14	8/28/2023	18.9	Wildfire – U.S.	2
14	8/31/2023	23.8	Wildfire – U.S.	2
14	9/1/2023	18.7	Wildfire – U.S.	2
14	9/2/2023	20.9	Wildfire – U.S.	2
15	10/4/2023	22.2	Wildfire – U.S.	2
16	10/20/2023	18.0	Prescribed Fire	2
17	12/31/2023	31.0	Fireworks	1
17	1/1/2024	21.4	Fireworks	2
18	5/8/2024	23.0	Fire – Mexico/Central America	2
18	5/9/2024	38.0	Fire – Mexico/Central America	1
18	5/13/2024	19.9	Fire – Mexico/Central America	2
19	5/15/2024	24.7	Fire – Mexico/Central America	2
20	5/24/2024	17.6	Fire – Mexico/Central America	2
20	5/25/2024	20.4	Fire – Mexico/Central America	2
21	7/1/2024	17.7	African Dust	2
21	7/3/2024	21.8	African Dust	2
22	7/6/2024	19.4	Other - Weather	2
23	7/30/2024	24.2	African Dust	2

EE Group	Date	Exceedance Concentration (µg/m³)	Type of Event	Tier
23	7/31/2024	32.4	African Dust	1
23	8/1/2024	22.2	African Dust	2
24	8/6/2024	20.8	Wildfire – U.S.	2
24	8/21/2024	20.0	Wildfire – U.S.	2
25	8/22/2024	17.7	Prescribed Fire	2
26	10/10/2024	19.5	Wildfire – U.S.	2
27	10/15/2024	19.0	Fire – Canadian	2
28	10/28/2024	25.0	Prescribed Fire	2
29	10/29/2024	30.7	Prescribed Fire	1
30	11/26/2024	17.8	Prescribed Fire	2

(µg/m³) = micrograms per cubic meter

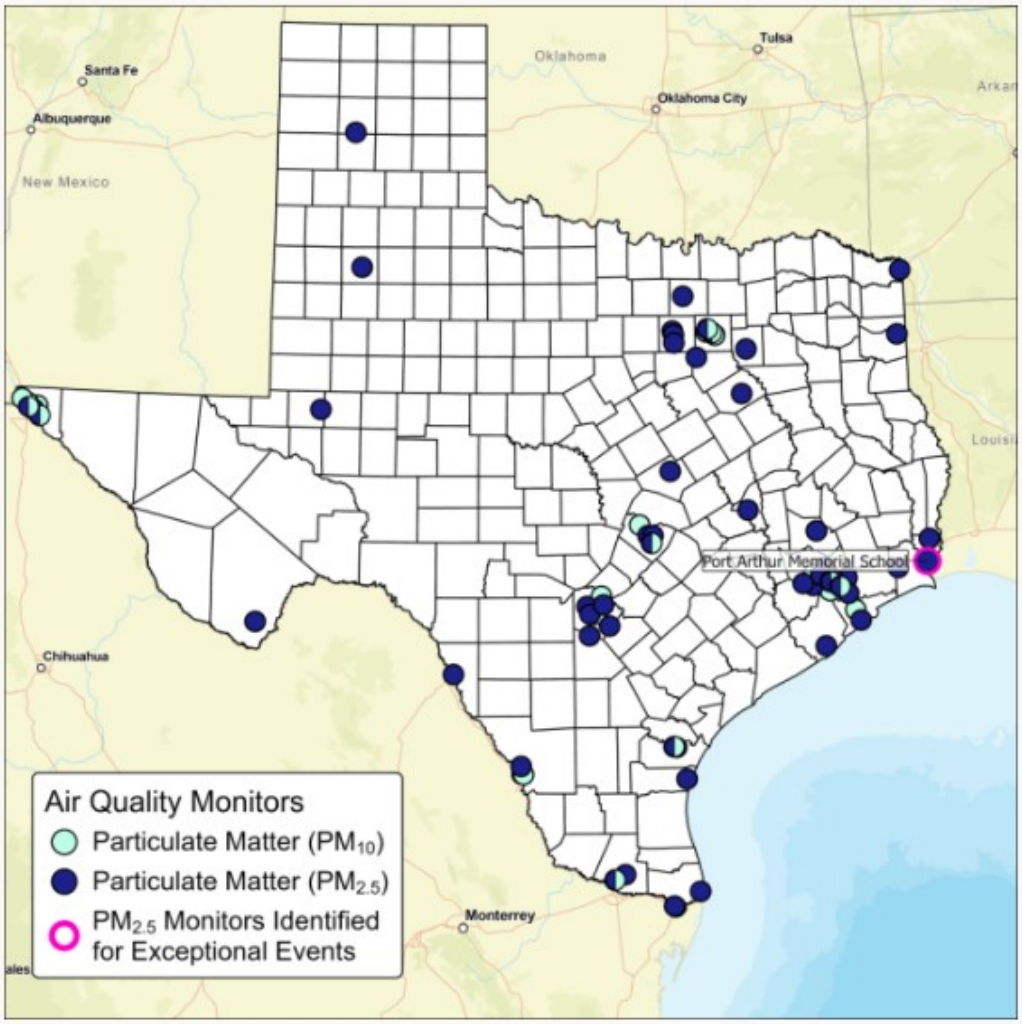

Figure 1-1: Map of Texas with the Port Arthur Memorial School Monitor Identified for Exceptional Events

Table 1-2: Monitor Details

Site Name	Port Arthur Memorial School
Air Quality System (AQS) Number	482450021
Activation Date	March 6, 2000
Address	2200 Jefferson Drive
County	Jefferson
Latitude/Longitude	29.9229228, -93.9089999
Pollutant Instrumentation	$PM_{2.5}$, 1,3-Butadiene, Benzene, Styrene
Meteorological Instrumentation	Wind

1.2 CLEAN AIR ACT REQUIREMENTS

In 2024, EPA promulgated a lower primary annual $PM_{2.5}$ standard of 9.0 µg/m³. The 2024 primary annual $PM_{2.5}$ standard is met when the three-year average of annual weighted quarterly means is less than or equal to 9.0 µg/m³ (40 CFR §50.20).

Texas is submitting this exceptional events demonstration to exclude certain data from the 2022-2024 timeframe.

1.3 EXCEPTIONAL EVENTS RULE REQUIREMENTS

On October 3, 2016, EPA revised its Exceptional Events Rule (EER) (40 Code of Federal Regulations (CFR) §50.14(c)(3)), to specify six fundamental elements that a state's demonstration must contain. Those elements and the parts of this demonstration that fulfill those requirements are shown in Table 1-3: *40 CFR §50.14(c)(3) Exceptional Event Demonstration Requirements*.

Table 1-3: 40 CFR §50.14(c)(3) Exceptional Event Demonstration Requirements

40 CFR §50.14(c)(3) Requirement	Demonstration Section
A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s).	Section 2
A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation.	Section 3
Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times. The Administrator shall not require a State to prove a specific percentile point in the distribution of data.	Section 3
A demonstration that the event was both not reasonably controllable and not reasonably preventable.	Section 4

40 CFR §50.14(c)(3) Requirement	Demonstration Section
A demonstration that the event was caused by human activity that is unlikely to recur at a particular location or was a natural event.	Section 5
Documentation that the submitting air agency followed the public comment process.	Section 7

Compliance with the EER mitigation requirements in 40 CFR §51.930 with respect to public notification, public education, and implementation of appropriate measures to protect health is documented in Table 1-4: *40 CFR §51.930 Exceptional Event Demonstration Requirements*.

Table 1-4: 40 CFR §51.930 Exceptional Event Demonstration Requirements

40 CFR §51.930 Requirement	Demonstration Section
Provide for prompt public notification whenever air quality concentrations exceed or are expected to exceed an applicable ambient air quality standard.	Section 6
Provide for public education concerning actions that individuals may take to reduce exposures to unhealthy levels of air quality during and following an exceptional event.	Section 6
Provide for the implementation of appropriate measures to protect public health from exceedances or violations of ambient air quality standards caused by exceptional events	Section 6

EPA has provided several documents and tools that address exceptional events demonstration requirements, including those listed below.

- The 2016 revisions to the 2007 Exceptional Events Rule (U.S. EPA, 2016a)[1]
- "Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations" (U.S. EPA, 2016b)[2]
- "2016 Revisions to the Exceptional Events Rule: Update to Frequently Asked Questions" (U.S. EPA, 2020)[3]
- "Initial Area Designations for the 2024 Revised Primary Annual Fine Particle National Ambient Air Quality Standard" (U.S. EPA, 2024)[4]
- "$PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document" (U.S. EPA, 2024)[5]
- $PM_{2.5}$ Designations Mapping Tool[6]

[1] https://www.epa.gov/sites/default/files/2018-10/documents/exceptional_events_rule_revisions_2060-as02_final.pdf
[2] https://www.epa.gov/system/files/documents/2023-12/guidance-on-the-preparation-of-ee-wf-ozone.pdf
[3] https://www.epa.gov/sites/default/files/2019-07/documents/updated_faqs_for_exceptional_events_final_2019_july_23.pdf
[4] https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf
[5] https://www.epa.gov/system/files/documents/2024-04/final-pm-fire-tiering-4-30-24.pdf
[6] https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis

1.4 INITIAL NOTIFICATION AND FLAGGING DATA IN AQS

The Exceptional Events Rule at 40 CFR §50.14(c)(2) requires an initial notification by the air agency to EPA of a potential exceptional event for which the agency is considering preparing a demonstration. On July 8, 2025, TCEQ submitted an initial notification to EPA Region 6. On July 15, 2025, an addendum was sent to EPA Region 6 revising event types for certain dates. A copy of the initial notification letter and addendum are provided in Appendix D.

1.5 REGULATORY SIGNIFICANCE

The annual $PM_{2.5}$ design value (DV) is the weighted annual mean concentration averaged over three consecutive years. Removing the days impacted by exceptional events from 2022, 2023, and-2024 data has regulatory significance because those days impact the 2024 annual $PM_{2.5}$ DVs.

Table 1-5: *2024 DVs for the 2024 Annual $PM_{2.5}$ NAAQS* shows the 2024 design value at the Port Arthur Memorial School monitor without EPA concurrence on TCEQ's 2022, 2023, and 2024 exceptional events demonstration and the potential design value if EPA concurs on the proposed exceptional event days.

Table 1-5: 2024 DVs for the 2024 Annual $PM_{2.5}$ NAAQS

Monitoring Site	2024 DV without EPA Concurrence (µg/m³)	2024 DV with EPA Concurrence (µg/m³)
Port Arthur Memorial School (482450021)	9.7	9.0

1.6 ACTION REQUESTED

This document meets all EPA documentation standards for exceptional events, and TCEQ requests EPA concurrence that the dates and concentrations shown in Table 1-1 were caused by exceptional events and should be excluded from regulatory decisions for the 2024 annual $PM_{2.5}$ NAAQS. The data being requested for exclusion have regulatory significance and affect the DVs. This demonstration provides detailed evidence to support concurrence by EPA for the $PM_{2.5}$ exceptional events for the days included in the initial notification letter (Appendix D), which shows "r" flag applied for all types.

SECTION 2: NARRATIVE CONCEPTUAL MODEL

2.1 OVERVIEW

This section satisfies the Exceptional Events Rule Requirement at 40 CFR §50.14(c)(3)(iv)(A): "A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor." Included in this section is a description of the 2022 through 2024 events and the general meteorological conditions that caused smoke and dust to travel to the Port Arthur Memorial School monitoring site. As identified in Table 1-1, events were categorized into 30 distinct groups based on single day events or episodes with types of events (Prescribed Fire, Fire - Mexico/Central America, African Dust, Fire - Canadian, Wildfire - U.S., Fireworks, and Other- Weather). The Fire - Mexico/Central America event type descriptor is used to denote fire related flags in AQS to ensure consistency in the indication of the jurisdictional origin of the fire (Outside of the United States in Mexico and/or Central America). Unless otherwise specified, all the Fire - Mexico/Central America exceptional events represent fires with origin only in Mexico that impacted monitors in Texas in this demonstration.

2.2 JEFFERSON COUNTY BACKGROUND

The Jefferson County area is located in the Coastal Plain Region of East Texas. The county is part of the Beaumont-Port Arthur Metropolitan Statistical Area (MSA) and has a population of approximately 256,526 people.[7] The area covers 1,113 square miles and is geographically characterized by coastal marshy salt grass terrain, prairies, and forests. Jefferson County experiences a subtropical climate with hot, humid summers and mild winters. Rainfall is fairly distributed throughout the year, influenced by warm gulf waters that bring in moist air. [8, 9, 10]

2.3 NARRATIVE FOR EACH GROUP OF EVENT DAYS

All weather maps, graphs, and smoke layer maps are included in Appendix A and are referenced in this chapter as Figure A-#. The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) forecasts are included in Appendix B and are referenced in this chapter as Figure B-#. Imagery and data used for the narrative conceptual model come from multiple sources:

- Weather maps (surface analysis) were downloaded from NOAA NWS Weather Predication Center: https://www.wpc.ncep.noaa.gov/archives/web_pages/wpc_arch/get_wpc_archives.php.
- Weather maps (500 millibar (mb) height) were downloaded from NOAA NWS Storm Predication Center: https://www.spc.noaa.gov/obswx/maps/.
- Upper air soundings were downloaded either from the University of Wyoming or Plymouth State University: https://weather.uwyo.edu/upperair/sounding.html and https://vortex.plymouth.edu/myowxp/upa/raobplt-a.html.
- As part of its Hazard Mapping System (HMS), NOAA produces daily fire and smoke plume maps depicting the location of fires and smoke plumes detected by satellites (NOAA, 2003).

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[7] https://www.census.gov/library/stories/state-by-state/texas.html
[8] https://tpwd.texas.gov/education/hunter-education/online-course/wildlife-conservation/texas-ecoregions
[9] https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/mapping/41/pcp/202206/6/value
[10] https://www.census.gov/quickfacts/fact/table

The KML files were downloaded from NOAA and displayed on Google Earth: https://www.ospo.noaa.gov/products/land/hms.html#data.

- NWS forecasts were downloaded from: https://mesonet.agron.iastate.edu/wx/afos/list.phtml. The NWS Weather Forecasts office primarily used for the Port Arthur Memorial School monitor is the Lake Charles office.
- Reported fire data from Mexico is archived by the Mexican government and is available at: https://monitor_incendios.cnf.gob.mx/incendios_tarjeta_semanal. The data contains information about fires from each Mexican state, such as the cause of fire and acreage burned.

2.3.1 Group 1 – Summary of January 17, 2022, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires in Texas and Louisiana affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on January 17, 2022. The $PM_{2.5}$ concentration reached 131 µg/m^3 at 17:00 local time, as seen on the hourly time series in Figure 2-1: *Hourly $PM_{2.5}$ Concentrations on Days around (January 17, 2022) for the Port Arthur Memorial School Monitor*.

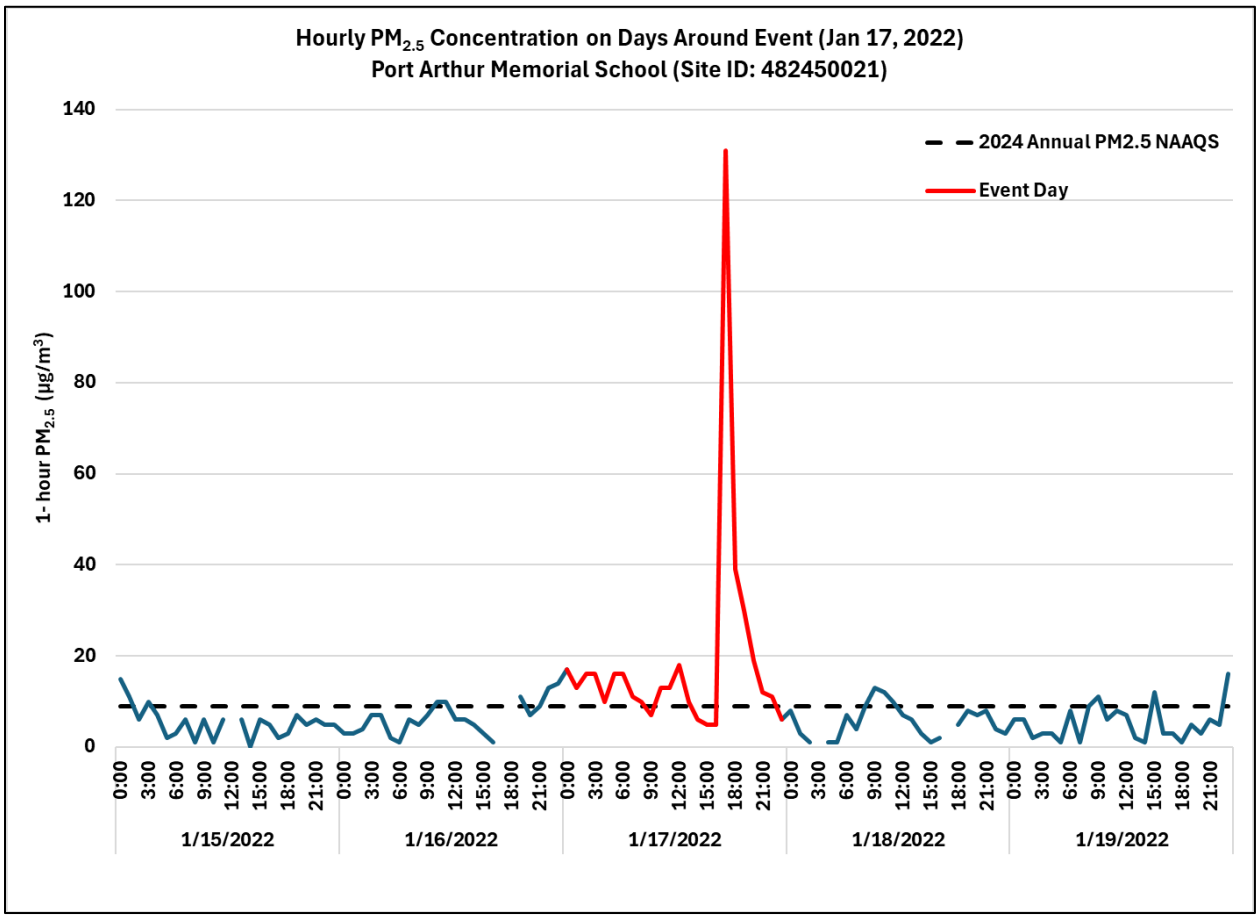

Figure 2-1: Hourly $PM_{2.5}$ Concentrations on Days around (January 17, 2022) for the Port Arthur Memorial School Monitor

On January 17, 2022, high pressure was building over eastern Texas as a deep cold front pushed east over the east coast of the U.S. Winds in the Beaumont-Port Arthur area were light with winds shifting out of the southeast (Figure A-1 and Figure A-2).

Smoke in Jefferson County, on January 17, 2022, from fires in close proximity to the monitor location is indicated in the NOAA HMS fire and smoke map (Figure A-3) in addition to the fires in Louisiana. This smoke travels through the area and continues into the Gulf of America. The fires generating this smoke are unlikely to recur, as discussed in Sections 4 and 5.

2.3.2 Group 2 – Summary of May 8, 2022, Fire (Mexico/Central America) $PM_{2.5}$ Event

$PM_{2.5}$ concentrations were elevated on May 8, 2022, at the Port Arthur Memorial School monitor due to smoke from fires in Mexico and Central America, as shown in Figure 2-2: *Hourly $PM_{2.5}$ Concentrations on Days around (May 8, 2022) for Port Arthur Memorial School Monitor*.

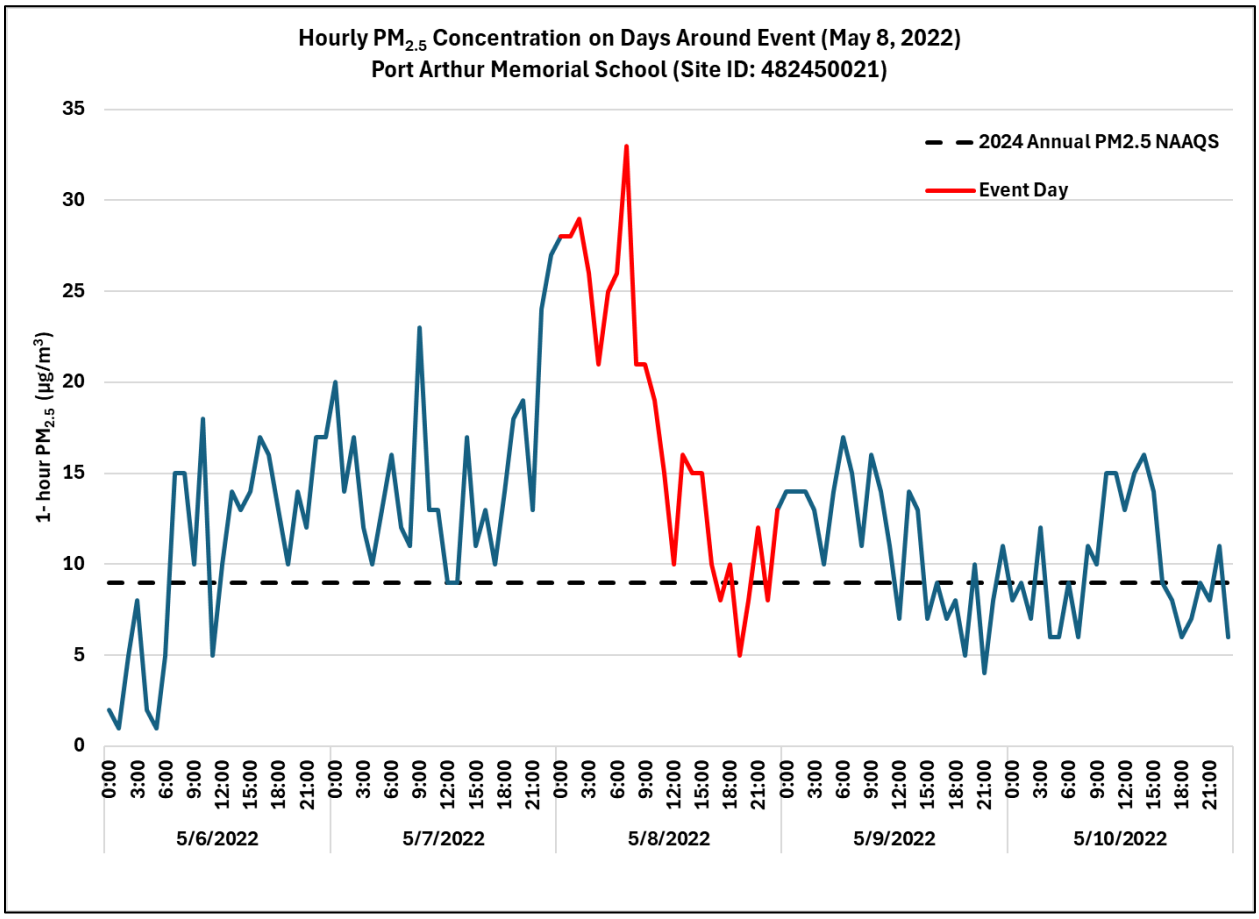

Figure 2-2: Hourly $PM_{2.5}$ Concentrations on Days around (May 8, 2022) for Port Arthur Memorial School Monitor

On May 8, 2022, the surface chart (Figure A-4) shows southerly winds over Texas. The 500 mb chart (Figure A-5) indicates ridging over East Texas with a high height center over Mexico. This high enabled subsidence over the region. Observed soundings from both Del Rio (Figure A-6) and Fort Worth (Figure A-7) also show subsidence inversions, indicating the downward movement of air. These soundings also show a dry atmosphere and southerly winds, which are both factors conducive to $PM_{2.5}$ aggregation from Mexican and Central American sources.

Smoke, on the event day, in East Texas that traveled over the Gulf of America is indicated on the NOAA HMS fire and smoke map (Figure A-8). Figure 2-3: *Percentage of Reported Fire Instances by the Mexican Government, on and around May 8, 2022* shows the percentages of

reported fire instances in Mexico along with their causes, the majority of which are considered to be unlikely to recur (campfires, intentional, and natural).

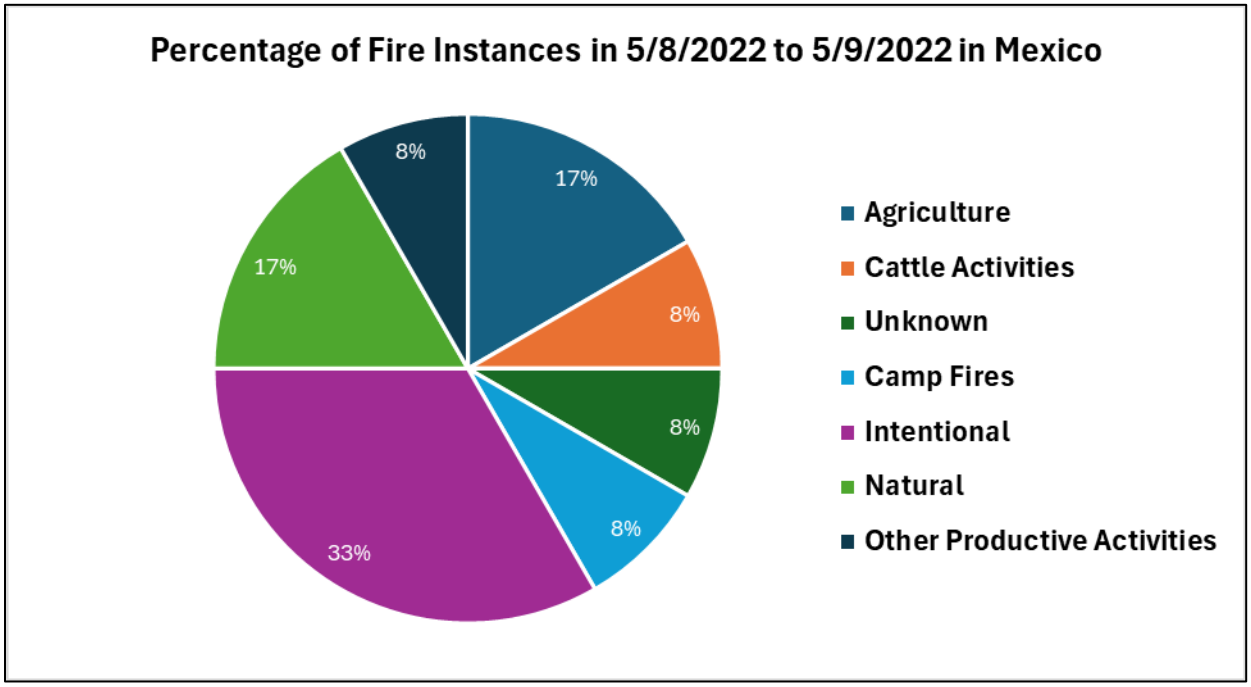

Figure 2-3: Percentage of Reported Fire Instances by the Mexican Government, on and around May 8, 2022

2.3.3 Group 3 – Summary of June 12, 2022, through June 16, 2022, African Dust $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by African dust on June 12, 2022, through June 16, 2022, which led to elevated $PM_{2.5}$ concentrations on these days, as shown in Figure 2-4: *Hourly $PM_{2.5}$ Concentrations on Days around Event (June 12, 2022, through June 16, 2022) for the Port Arthur Memorial School Monitor*.

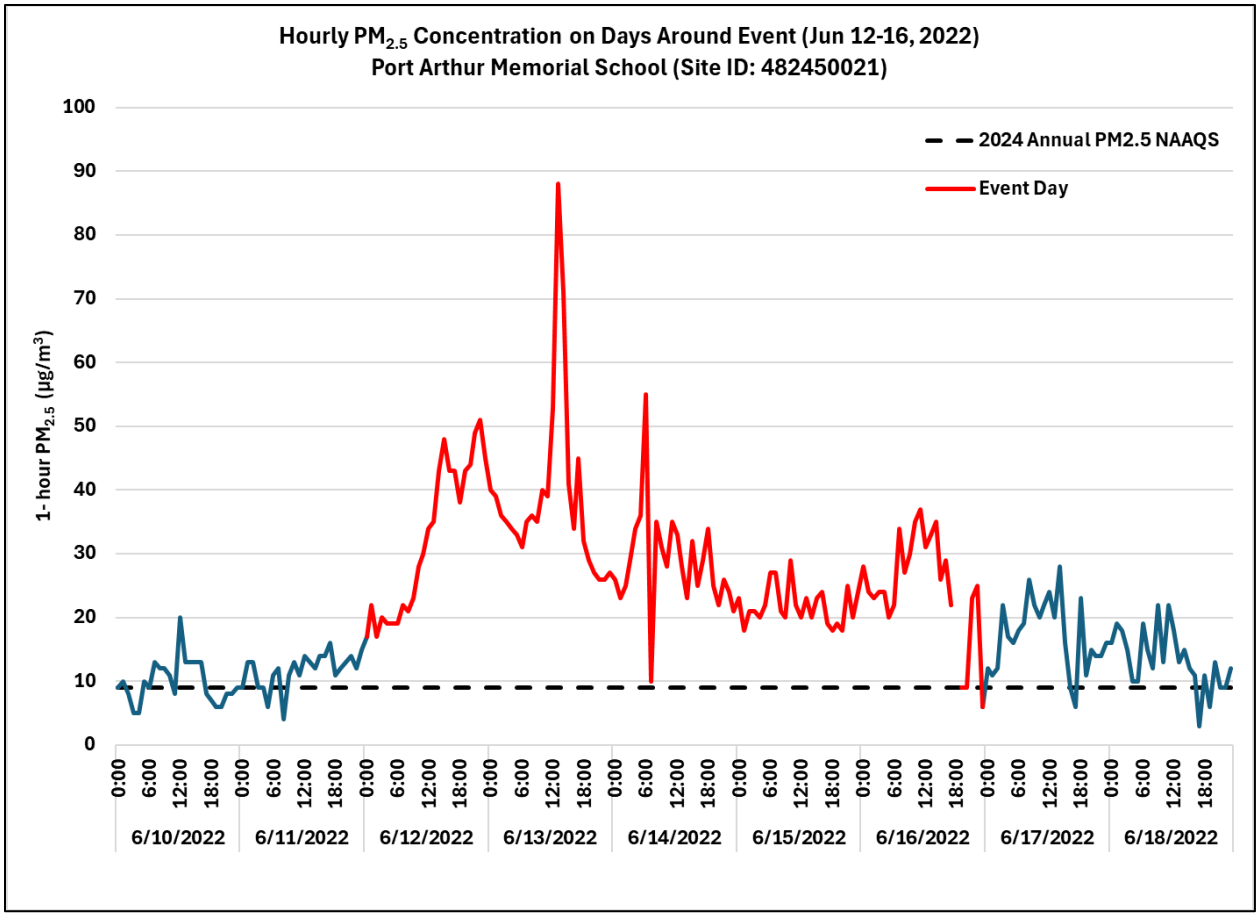

Figure 2-4: Hourly $PM_{2.5}$ Concentrations on Days around Event (June12, 2022, through June16, 2022) for the Port Arthur Memorial School Monitor

Excerpts from NWS forecasts (Figure B-1) mention Saharan dust and hazy conditions. Moderate Resolution Imaging Spectroradiometer (MODIS) combined Terra and Aqua Multi-Angle Implementation of Atmospheric Correction (MAIAC) Land Aerosol Optical Depth (AOD) images (Figure A-8) show a pulse of Saharan dust reached the Americas and Texas, in particular. In association with this dust, the $PM_{2.5}$ concentrations increased at the Port Arthur Memorial School monitoring site. MODIS Combined Aqua and Terra MAIAC AOD images (Figure A-9 through A-12) corroborate the high concentration of dust seen on all areas with flow from Africa.

The surface chart and 500 mb chart (Figure A-13 and A-14) show coastal winds from the south at 10 nautical miles per hour (kts). On June 12, 2022, the longwave pattern over the continental U.S. was meridional with ridging over the Four Corners states and East Texas. The continental-tropical airmass over the southwest (high-height center) provided relative atmospheric stability over Texas through its subsidence. It also brought dry air to the region. As the high progressed over Texas on June 12, 2022, the associated stability along with dry air from the continental tropical air mass led to a lack of precipitation that could have reduced any particulate matter in the atmosphere. Winds remained southerly at the surface in Jefferson County.

The surface chart, 500 mb chart, and soundings (Figure A-15 through A-18) show that on June 13th, a meridional pattern was present over the continental U.S. with ridging over Texas and the southeastern U.S.. Winds at this level were from the southeast over the coast of Texas, which aided the transport of Saharan dust in the upper atmosphere coming from the subtropical jet.

Both observed rawinsondes (soundings) from Corpus Christi and Shreveport (Figure A-17 and Figure A-18) from June 13th, showed backing winds throughout the atmospheric column. Backing winds, which shift counterclockwise with height, are associated with dynamic sinking. This effect likely aided vertical mixing, bringing the upper-level Saharan dust particles down towards the surface, where they could affect the monitor.

On June 14, the ridging at 500 mb had progressed over the eastern U.S. with continued southeasterly winds over East Texas (Figure A-19). This flow continued to aid the transport of upper-level Saharan dust from the tropical jet to Texas. Winds at the surface over East Texas were southerly from 15 to20 kts, indicating that gradient-level winds were mixing down to the ground level (Figure A-20). The sounding from Corpus Christi (Figure A-21) showed backing winds, which are associated with downward mixing. The subsidence inversion present on both soundings (Figure A-21 and Figure A-22) also indicates sinking air, which likely aided the transport of Saharan dust to the surface.

On June 15, the ridging over the eastern U.S. strengthened and began to resemble a blocking pattern in the form of a sharp amplitude ridge (Figure A-23). The high-height center at 500 mb stacks down to the surface high pressure center over Mississippi, which provided relative high pressure and atmospheric stability to Texas. This stability led to a lack of any significant precipitation over Texas that might have reduced Saharan dust in the lower atmosphere (Figure A-24). Backing winds are seen in the lower atmosphere from the Corpus Christi sounding (Figure A-25), which continued downward mixing along the Texas coast, including Jefferson County.

On June 16, the ridging and semi-blocking pattern progressed slightly downstream over the eastern U.S. Similar to June 15, high heights stack down to the surface over Mississippi providing relative high pressure to Texas (Figure A-26 and Figure A-27). The vertical profile from rawinsonde data at Shreveport (Figure A-28) shows backing winds in the lower portion of the atmosphere, which are associated with downward mixing. The presence of a deep surface-based layer of static stability also indicates subsidence. These factors likely aided the transportation of Saharan dust in the upper atmosphere to the surface and contributed to elevated $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor.

2.3.4 Group 4 – Summary of July 16, 2022, and July 17, 2022, African Dust $PM_{2.5}$ Event

African dust impacted the Port Arthur Memorial School monitoring site on July 17, 2022, and July 18, 2022. NWS forecasts from various NWS offices in Texas (Figure B-2) mention the presence of Saharan dust. MODIS Combined Aqua and Terra MAIAC AOD images (Figure A-29 and A-30) corroborate the high concentration of dust seen in these areas with flow from Africa.

Figure 2-5: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 16, 2022, and July 17, 2022) for the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations increased substantially on event days as the African dust reached the monitors. As seen in Figure 2-5, the hours on July 16 and 17, 2022, are highlighted in red.

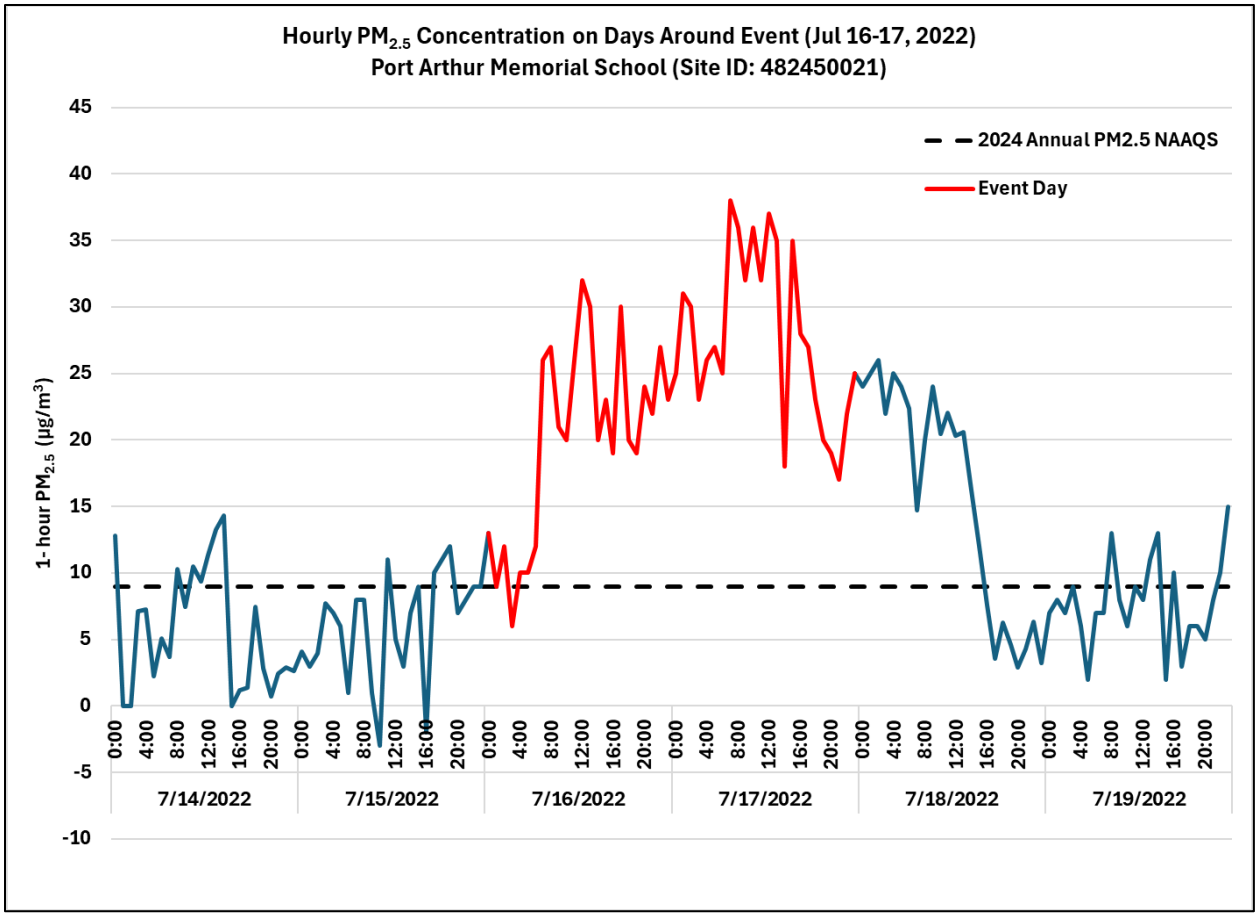

Figure 2-5: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 16, 2022, and July 17, 2022) for the Port Arthur Memorial School Monitor

The surface chart 500 mb chart, and soundings (Figures A-31 through A-33**)** show that on July 16, 2022 a longwave ridge was in place over the central Continental United States. There is a large high center over the four corner states and North Texas at the surface level. There is evidence of a shortwave trough moving just downstream of the ridge peak. This trough stacks down to the low-pressure center over western Kansas. The dominant feature over the southern coast of Texas is high pressure and subsidence. This led to a lack of precipitation that day that might have reduced atmospheric PM. Additionally, light variable winds are seen along the coast of Texas. The lack of precipitation and the light variable winds could create conditions that are conducive for PM to remain high in the atmosphere The rawinsonde sounding at 12Z (6:00 a.m. CDT) showed veering winds in the lower atmosphere from the surface up to 750 mb, then backing winds from 750 mb up to the tropopause. There was a radiation inversion at 12Z (6:00 a.m. CDT), which is typical during morning hours. This inversion, or cap, likely broke around 7:00 a.m. CDT or 8:00 a.m. CDT as the surface temperature reached 28˚C, allowing for winds to mix down and bring Saharan dust to the surface, where the dust impacted the monitor.

The surface chart shows light variable winds over Texas on July 17, 2022 (Figure A-34). On this date, the longwave pattern over the U.S. was similar to that on July 16, 2022, and the major short-wave trough progressed downstream by roughly 1-2 degrees. Ridging, high pressure, and subsidence were the major features over Texas (Figure A-35). Both soundings from Corpus Christi and Shreveport (Figure A-36 and Figure A-37) show radiation inversions and backing winds in the lower atmosphere. These inversions likely broke when daytime heating occurred, and Saharan dust from the upper atmosphere was able to be mixed down to the surface.

Backing winds and subsidence from the high pressure and ridging contributed to this downward mixing, aiding in dust being transported to the monitor.

2.3.5 Group 5– Summary of September 22, 2022, and September 23, 2022, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires predominantly in the Mississippi River Valley affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on September 22, 2022, and September 23, 2022. Hourly $PM_{2.5}$ concentrations were consistently above 15 µg/m^3 during the event days of September 22, 2022, and September 23, 2022. $PM_{2.5}$ concentrations on September 20, 2022, through September 25, 2022, can be seen on the hourly time series in Figure 2-6: *Hourly $PM_{2.5}$ Concentrations on Days around Event (September 22, 2022, and September 23, 2022) for the Port Arthur Memorial School Monitor.*

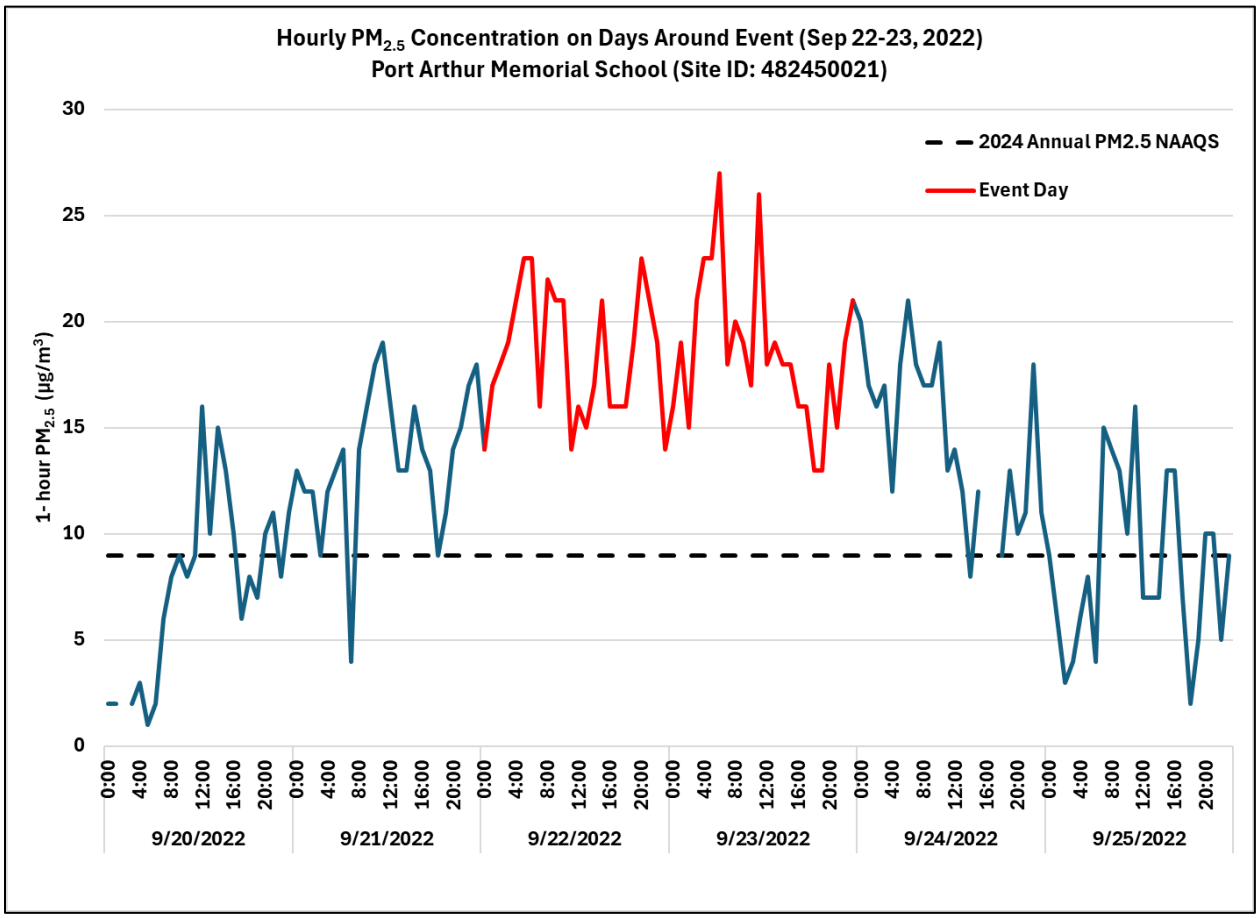

Figure 2-6: Hourly $PM_{2.5}$ Concentrations on Days around Event (September 22, 2022, and September 23, 2022) for the Port Arthur Memorial School Monitor

Weather in Jefferson County on September 22, 2022 (Figure A-39) was influenced by a weak area of low pressure in the central Gulf of America. As a result, Jefferson County experienced light to moderate surface winds out of the northeast. These winds, as well as southwesterly winds over Louisiana, aided in the transport of smoke from agricultural fires in the southern Mississippi River Valley towards Jefferson County.

The 500 mb heights chart for September 22, 2022 (Figure A-40) shows a mid-level high pressure system over Texas with mid-level winds from the north-northeast over southeastern Texas and

Louisiana. These winds also aided the transport of smoke into the area from the Mississippi River Valley. Similar mid-level conditions remained on September 23, 2022.

Smoke in Jefferson County is indicated in the NOAA HMS fire and smoke map NOAA HMS maps (Figure A-41 and Figure A-42). As viewable in these figures, smoke was present in Jefferson County and surrounding areas on September 22, 2022, and September 23, 2022. The prescribed fires generating this smoke are unlikely to recur, as explained in Section 5.

2.3.6 Group 6 – Summary of February 27, 2023, and February 28, 2023, Fire (Mexico/Central America) $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was impacted by smoke from fires in Mexico and Central America on February 27, 2023, and February 28, 2023. Elevated $PM_{2.5}$ concentrations on this day are shown in Figure 2-7: *Hourly $PM_{2.5}$ Concentrations on Days around Event (February 27, 2023, and February 28, 2023) for the Port Arthur Memorial School Monitor.*

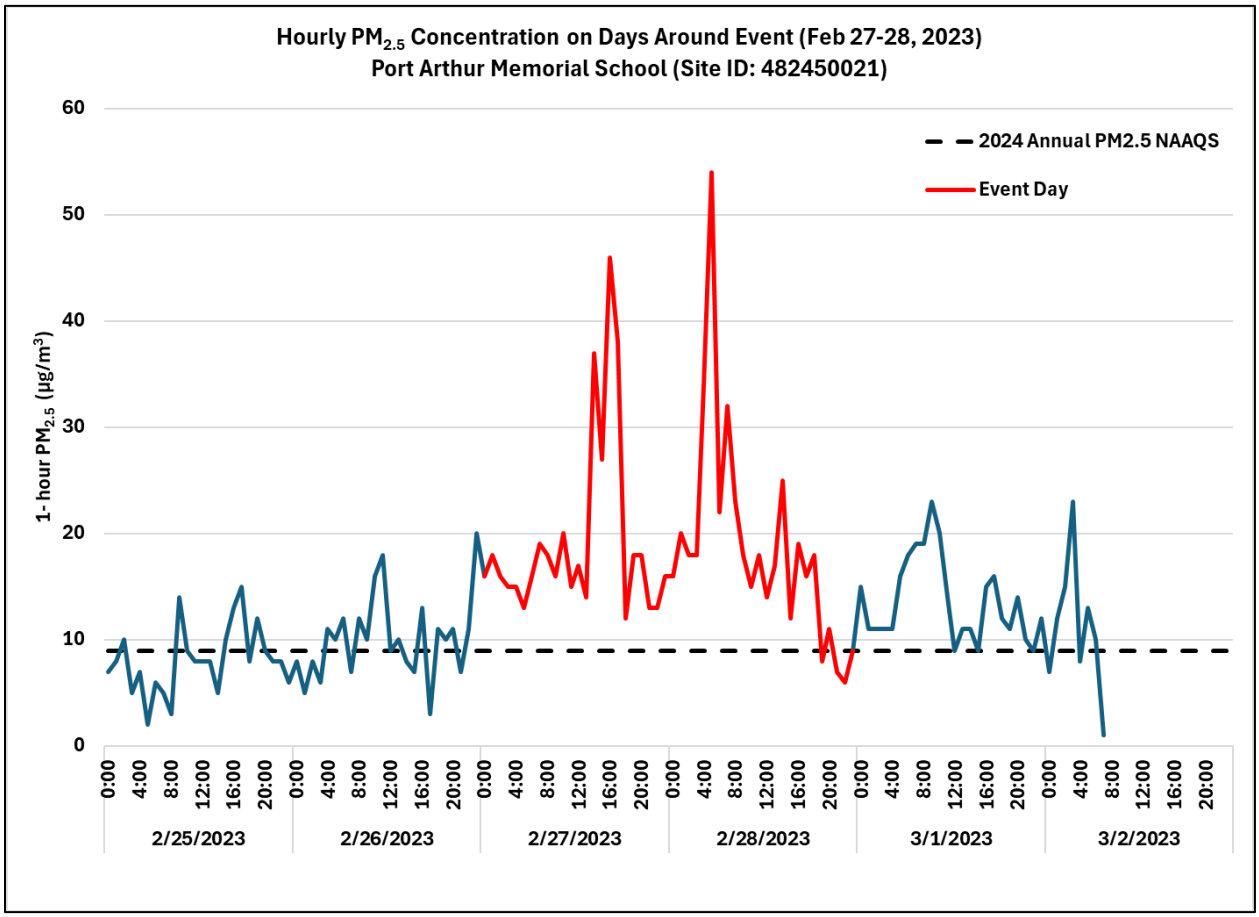

Figure 2-7: Hourly $PM_{2.5}$ Concentrations on Days around Event (February 27, 2023, and February 28, 2023) for the Port Arthur Memorial School Monitor

On February 27, 2023, the 500 mb pattern was zonal with troughing over the western coast of the U.S. and weak ridging over the central U.S. (Figure A-43). The flow at this level was from the southwest, which possibly aided the transport of smoke from fires in Mexico and Central America to the Port Arthur Memorial School monitor. There was a low height center over Missouri that was already downstream of the area affected by fires. This low height center does not stack down to the surface on the surface chart (Figure A-44); however, there was a cold

front just upstream of the monitor, with high pressure building in behind it. The observed sounding (Figure A-45) at Lake Charles shows sustained winds at 15 kts, indicating a strong wind event with gusts exceeding 25 kts. This is expected due to gradient winds at 925 mb being 30 kts, with 90% of these winds potentially mixing to the surface in the form of gusts. Additionally, the sounding also shows a subsidence inversion at 850 mb, indicating the downward movement of air. These conditions were conducive to blowing dust, and the subsidence likely trapped this dust near the lower levels of the atmosphere and the monitor. In addition to smoke from fires in Mexico, the subsidence also likely pushed any smoke and dust towards the surface that was transported from fires in Cuba (Figure A-48 and Figure A-49) or a New Mexican dust storm (Figure B-3).

On February 28, 2023, the 500 mb pattern remained similar to that on February 27, 2023, with no major changes to the flow over Texas (Figure A-46). The southwest flow at this level continued to aid the transport of smoke from Central American fires towards East Texas. The surface chart (Figure A-47) shows high pressure that had moved over Texas and the Port Arthur Memorial School monitor site, indicating the downward movement of air. This high pressure likely pushed any particulate matter in the mid-levels towards the surface.

Figure 2-8: *Percentage of Reported Fire Instances by the Mexican Government, on and around February 27, 2023*, shows the reported fire instances and causes in Mexico, with around half considered to be unlikely to recur (Intentional).

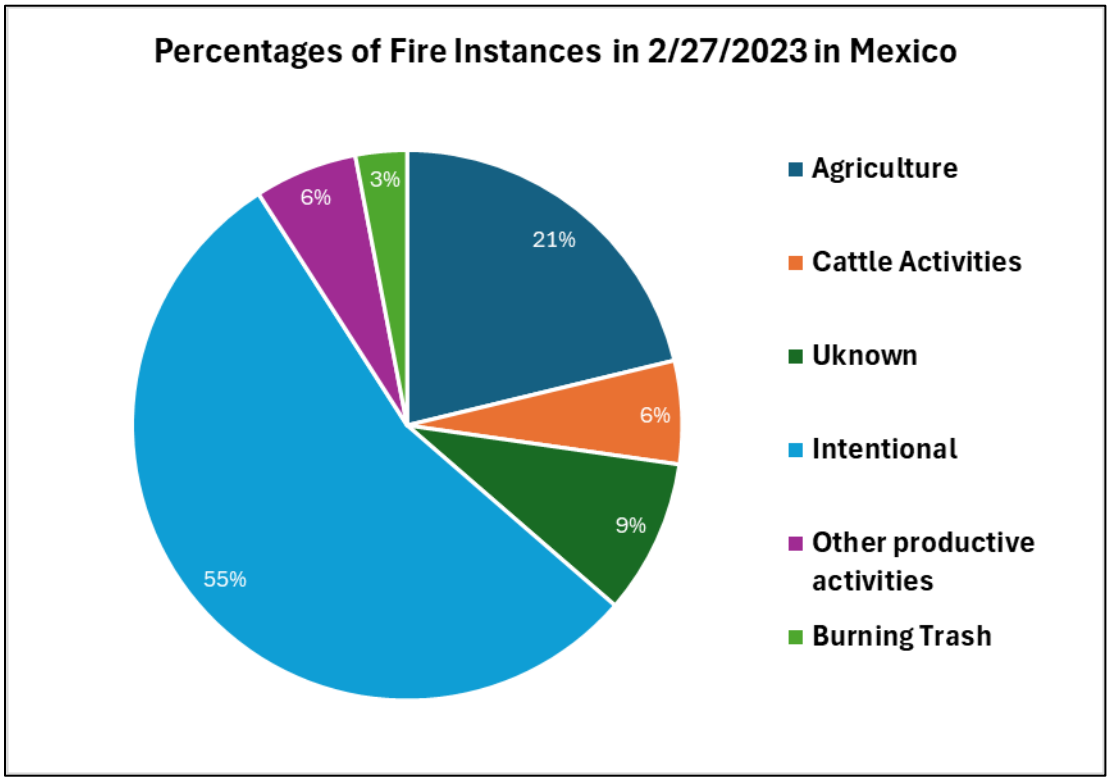

Figure 2-8: Percentage of Reported Fire Instances by the Mexican Government, on and around February 27, 2023

2.3.7 Group 7 – Summary of March 5, 2023, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires in the southern U.S. states, including East Texas, Louisiana, and the Mississippi River Valley, affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School

monitor area on March 5, 2023. The $PM_{2.5}$ concentration reached 30 µg/m^3 at 20:00 local time, as seen on the hourly time series in Figure 2-9: *Hourly $PM_{2.5}$ Concentrations on Days around Event (March 5, 2023) for the Port Arthur Memorial School Monitor*.

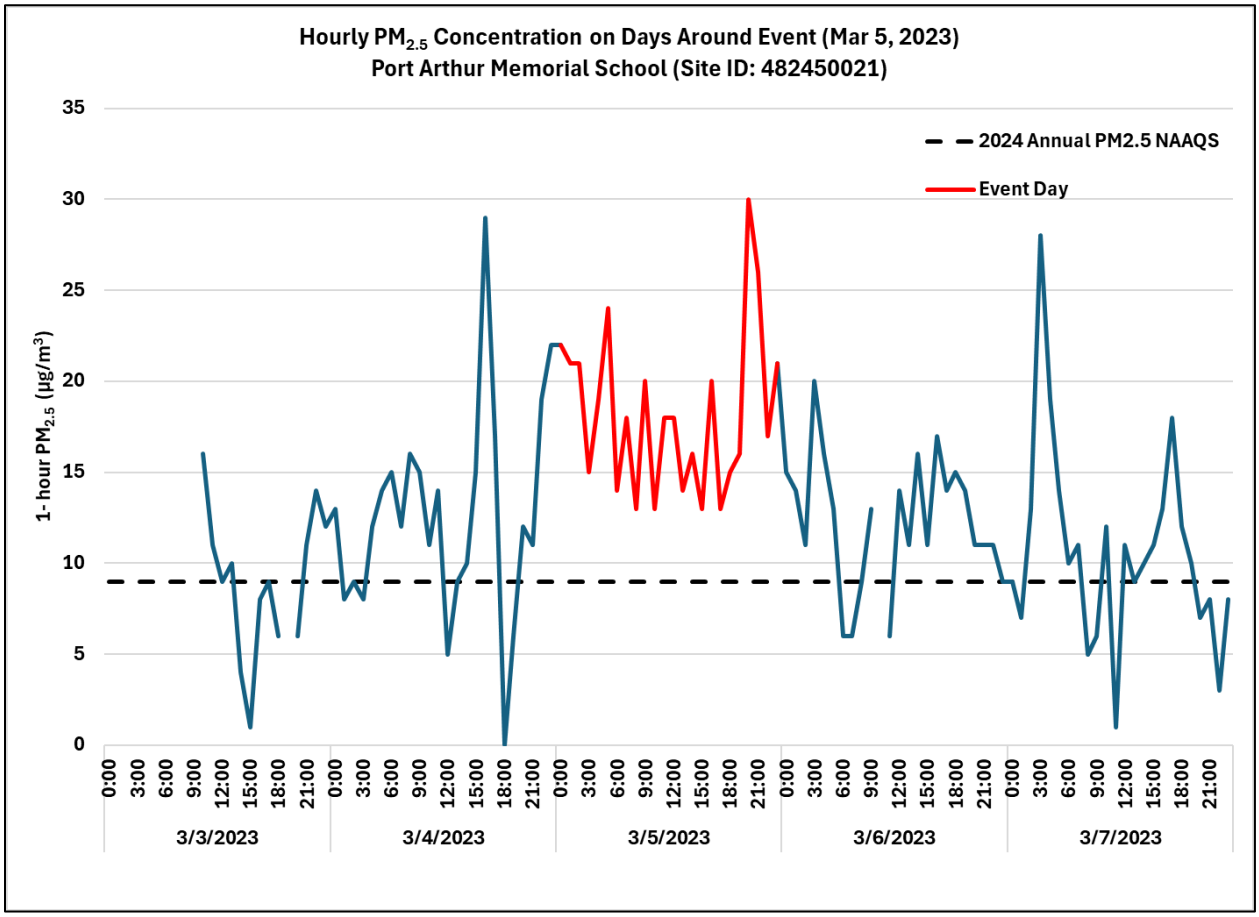

Figure 2-9: Hourly $PM_{2.5}$ Concentrations on Days around Event (March 5, 2023) for the Port Arthur Memorial School Monitor

On March 5, 2023, there was a longwave trough over the west coast of the U.S. with weak ridging over the central U.S. and Texas. There was high pressure over Port Arthur at 1018 mb with winds from the east (Figure A-50 and Figure A-51). The observed sounding from Lake Charles shows subsidence and a strong radiation inversion at the surface (Figure A-52). These conditions are conducive for keeping any particulate matter in the area from dissipation into the upper atmosphere.

Smoke in Jefferson County from fires in close proximity to the Port Arthur Memorial School monitor, in addition to several fires in East Texas, Louisiana, the Mississippi River Valley, and most southern states, is indicated in the NOAA HMS fire and smoke map (Figure A-53). This smoke travels through the area and continues into the Gulf of America. The fires generating this smoke are unlikely to recur, as described in Sections 4 and 5.

2.3.8 Group 8 – Summary of May 22, 23, 24, 26, and 27, 2023 Fire - Canadian $PM_{2.5}$ Event

Smoke from Canadian wildfires affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on May 22, 23, 24, 26, and 27, 2023. Excerpts from NWS forecasts (Figure B-4) mention hazy conditions. The $PM_{2.5}$ concentration reached 51 µg/m^3 at 07:00 local time on May

26, 2023, and concentrations were consistently above 20 µg/m^3 on other days included in this grouping, as seen on the hourly time series in Figure 2-10: *Hourly $PM_{2.5}$ Concentrations on Days around Event (May 22, 23, 24, 26, and 27, 2023) for the Port Arthur Memorial School Monitor*.

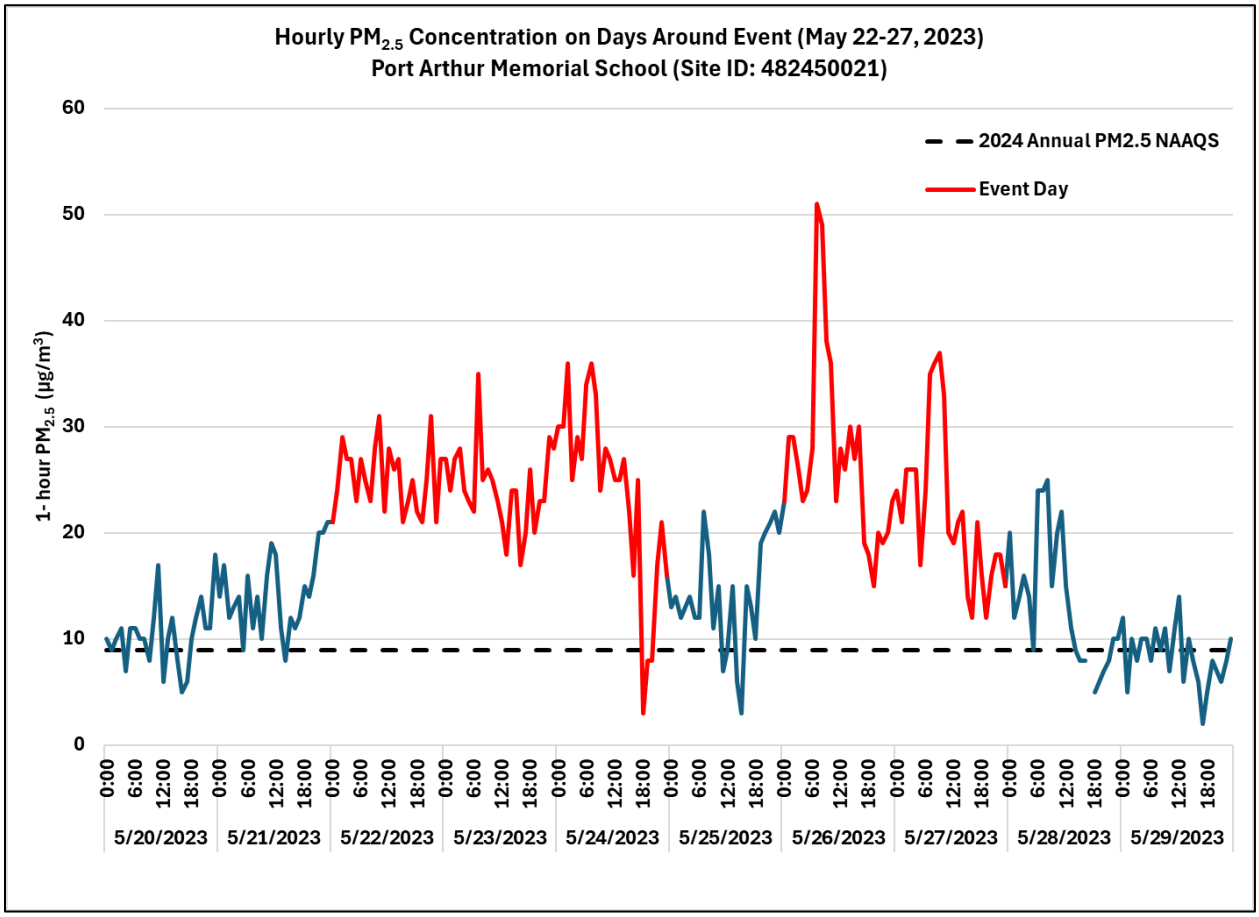

Figure 2-10: Hourly $PM_{2.5}$ Concentrations on Days around Event (May 22, 23, 24, 26, and 27, 2023) for the Port Arthur Memorial School Monitor

Beginning on May 22, 2023, a sharp amplitude ridge began to build at 500 mb over the central U.S. and Texas, creating a blocking pattern over the next six days. This ridge remained stationary over the central U.S. during the next five days. This anticyclonic rotation of winds over Wyoming and Montana resulted in southwesterly winds over the central U.S. that facilitated the transport of particulate matter from Canadian wildfires toward the Port Arthur Memorial School monitor. The ridging resulted in high pressure and subsidence over Texas that brought this particulate matter towards the surface. Maps depicting weather conditions discussed in this paragraph are presented in Figure A-54 and Figure A-55.

Smoke in Jefferson County from Canadian wildfires is indicated in NOAA HMS fire and smoke maps (Figure A-56 through Figure A-60). The fires generating this smoke are unlikely to recur, as explained in Sections 4 and 5.

2.3.9 Group 9 – Summary of June 19, 2023, and June 20, 2023, Fire (Mexico/Central America) $PM_{2.5}$ Event

$PM_{2.5}$ concentrations were elevated on June 19, 2023, and June 20, 2023, at the Port Arthur Memorial School monitor due to smoke from fires in Mexico and Central America, as shown in

Figure 2-11: *Hourly $PM_{2.5}$ Concentrations on Days around Event (June 19, 2023, and June 20, 2023) for Port Arthur Memorial School Monitor.*

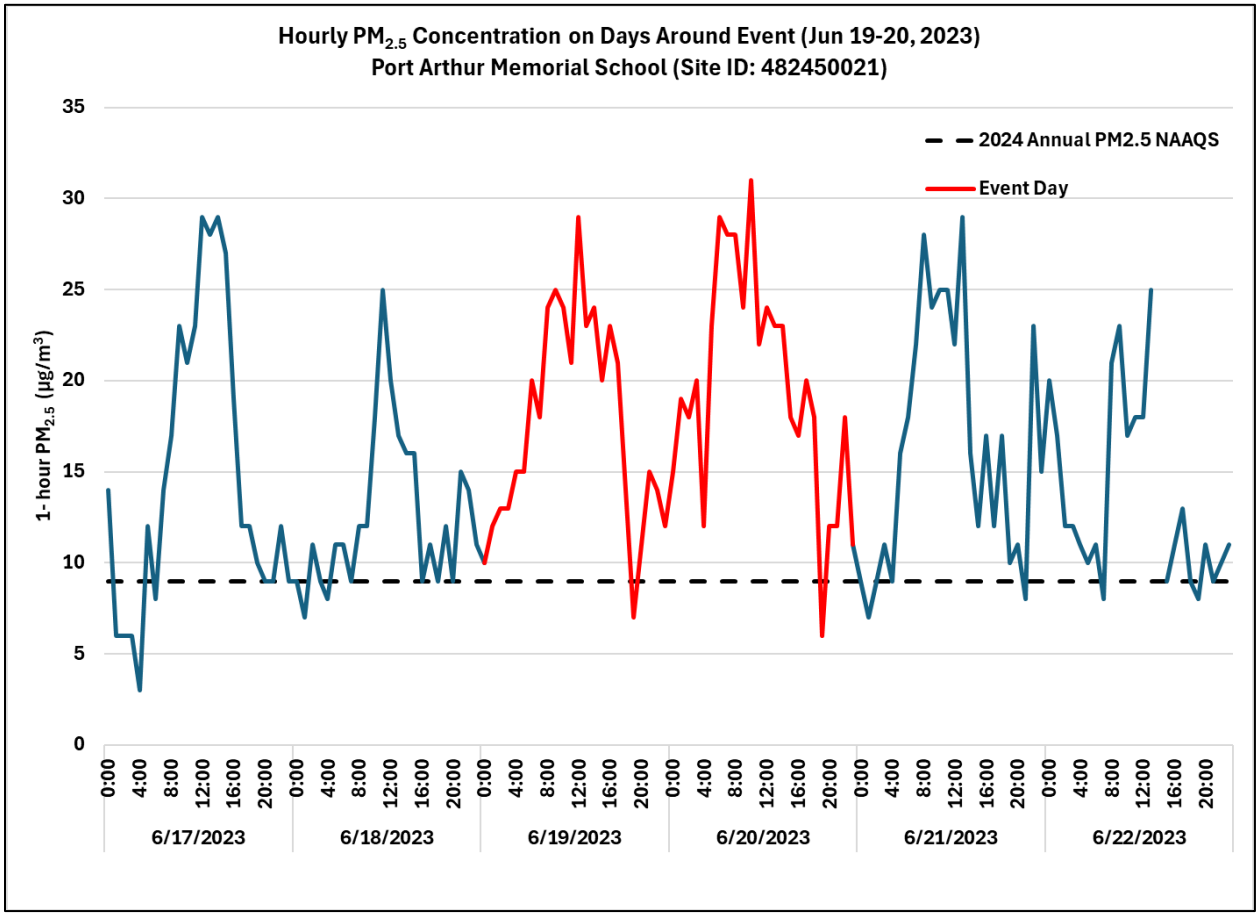

Figure 2-11: Hourly $PM_{2.5}$ Concentrations on Days around Event (June 19, 2023, and June 20, 2023) for Port Arthur Memorial School Monitor

On June 19, 2023, a stationary front was present over north and northeast Texas associated with a low-pressure system over the Texas Panhandle. A dryline extended from the surface low down into central and western portions of Texas. Along the coast, including portions of Jefferson County, conditions were warm and humid with light to moderate buildup of smoke from agricultural burning in Mexico and Central America lingering over the area. This smoke resulted in increased $PM_{2.5}$ concentrations, particularly in the Jefferson County area and at several monitors east of the county all the way through the Florida Panhandle. Weather conditions on June 19, 2023, are presented in maps in Figure A-61 and Figure A-62.

Conditions on June 20, 2023, were similar to the previous day with the stationary front only moving slightly to the south over northern Texas. At the mid-levels, conditions were light, allowing for lingering smoke from the agricultural fires in Mexico and Central America to continue to cause elevated $PM_{2.5}$ concentrations. Weather conditions on June 20, 2023, are presented in maps in Figure A-63 and Figure A-64.

Smoke in East Texas that had traveled over the Gulf of America is indicated on NOAA HMS fire and smoke maps (Figure A-65 and Figure A-66), Figure 2-12: *Percentage of Reported Fire Instances by the Mexican Government on June 19, 2023, and June 20, 2023* shows the

percentages of reported fire instances and causes in Mexico, most of which are considered to be unlikely to recur (campfires, intentional, and natural).

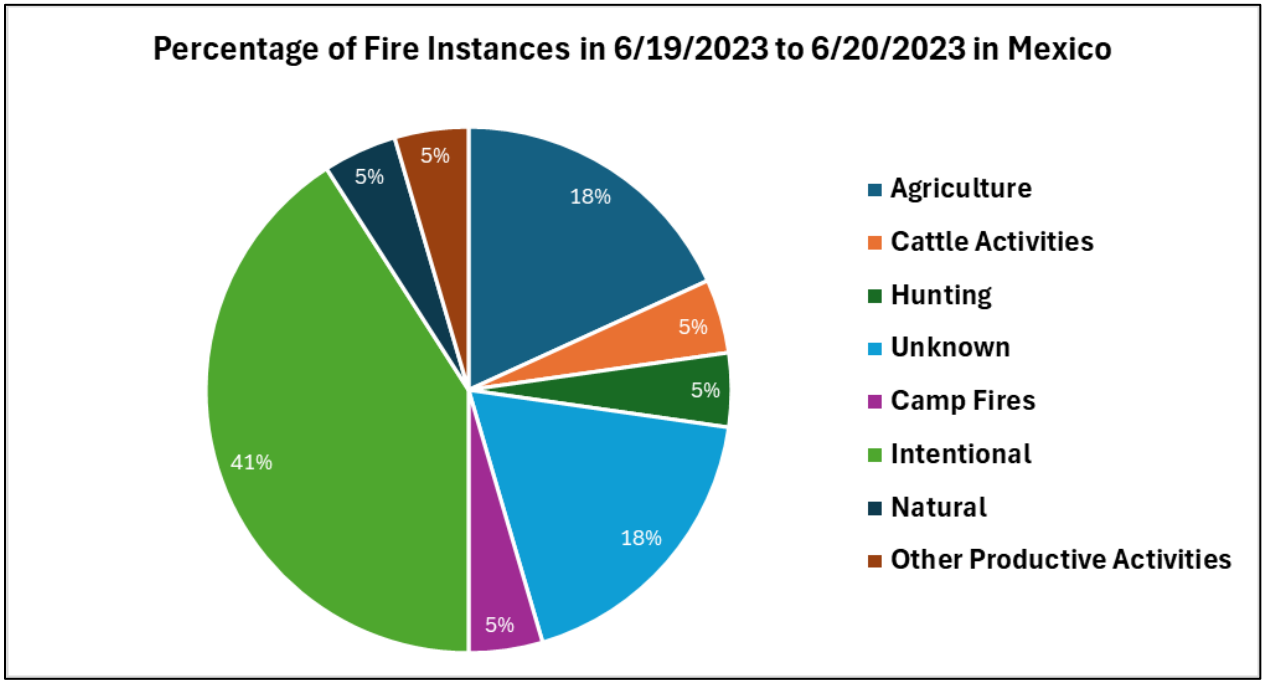

Figure 2-12: Percentage of Reported Fire Instances by the Mexican Government on June 19, 2023, and June 20, 2023

2.3.10 Group 10 – Summary of July 15, 2023, through July 17, 2023, African Dust $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by African dust on July 15, 2023, through July 17, 2023. Excerpts from NWS forecasts (Figure B-5) mention Saharan dust. This dust contributed to elevated $PM_{2.5}$ concentrations, as shown in Figure 2-13: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 15, 2023, through July 17, 2023) for the Port Arthur Memorial School Monitor*.

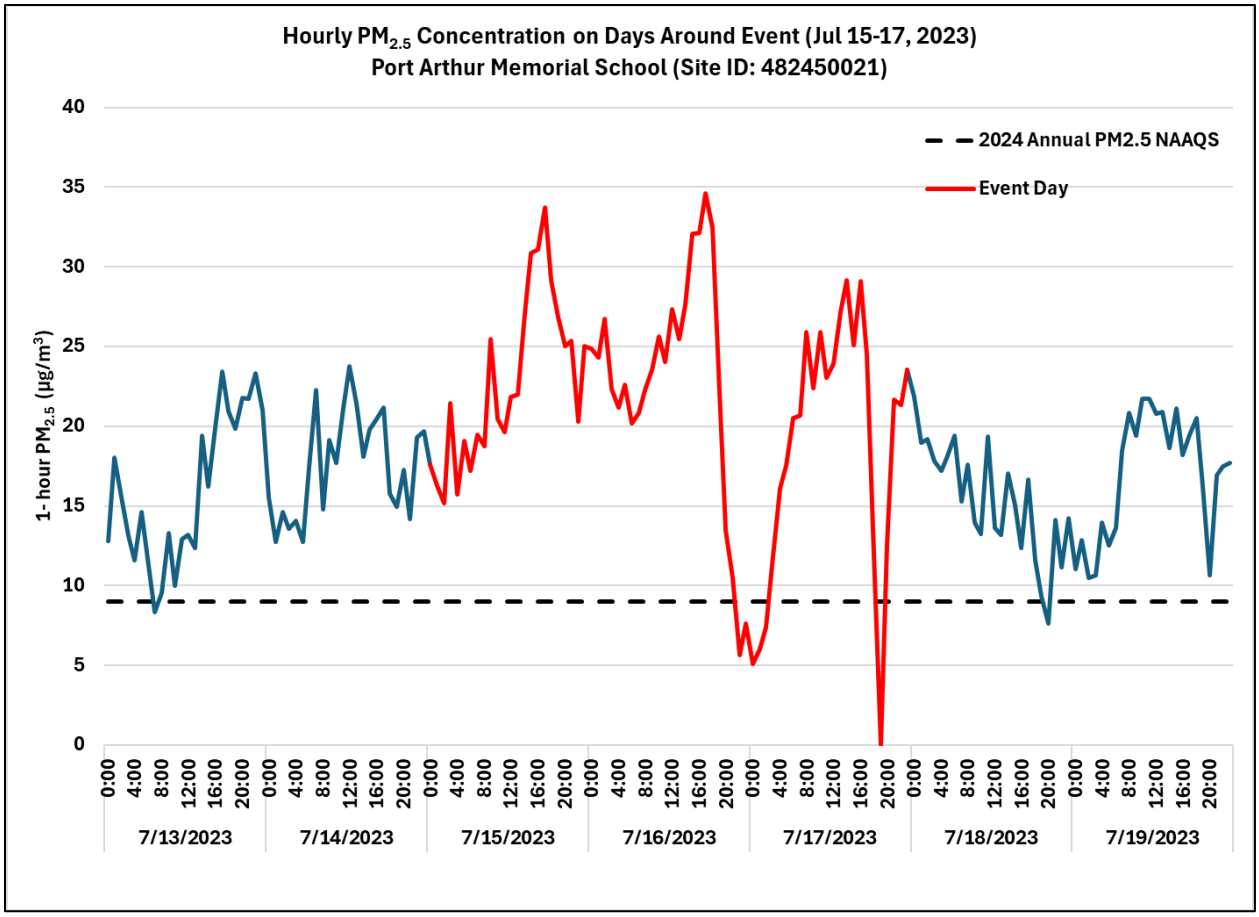

Figure 2-13: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 15, 2023, through July 17, 2023) for the Port Arthur Memorial School Monitor

From July 15, 2023, through July 17, 2023, high pressure was present over the Gulf of America. This high pressure resulted in light to moderate winds off the coast into the coastal areas of Texas including Jefferson County. Surface high pressure along with the onshore flow resulted in warm temperatures, high humidity, and subsidence over the area. The anticyclonic flow around the mid-level high pressure system over the Gulf of America helped transport African dust into the coastal plains, South Texas, and southeast Texas. These conditions combined to result in elevated surface particulate matter at the Port Arthur Memorial School monitor in Jefferson County. Maps depicting these weather conditions are presented in Figure A-67 through Figure A-72.

2.3.11 Group 11 – Summary of July 19, 2023, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires in Louisiana affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on July 19, 2023. Agricultural burning in the Mississippi River Valley and Texas also contributed. Additionally, African dust was present and an additional contributing factor to $PM_{2.5}$ concentrations on July 19, 2023, as mentioned in the TCEQ forecast for the day (Table C-11). At the Port Arthur Memorial School monitor on July 19, 2023, the recorded $PM_{2.5}$ concentration reached 29 µg/m^3 at 10:00 local time, as seen on the hourly time series in Figure 2-14: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 19, 2023) for the Port Arthur Memorial School Monitor.*

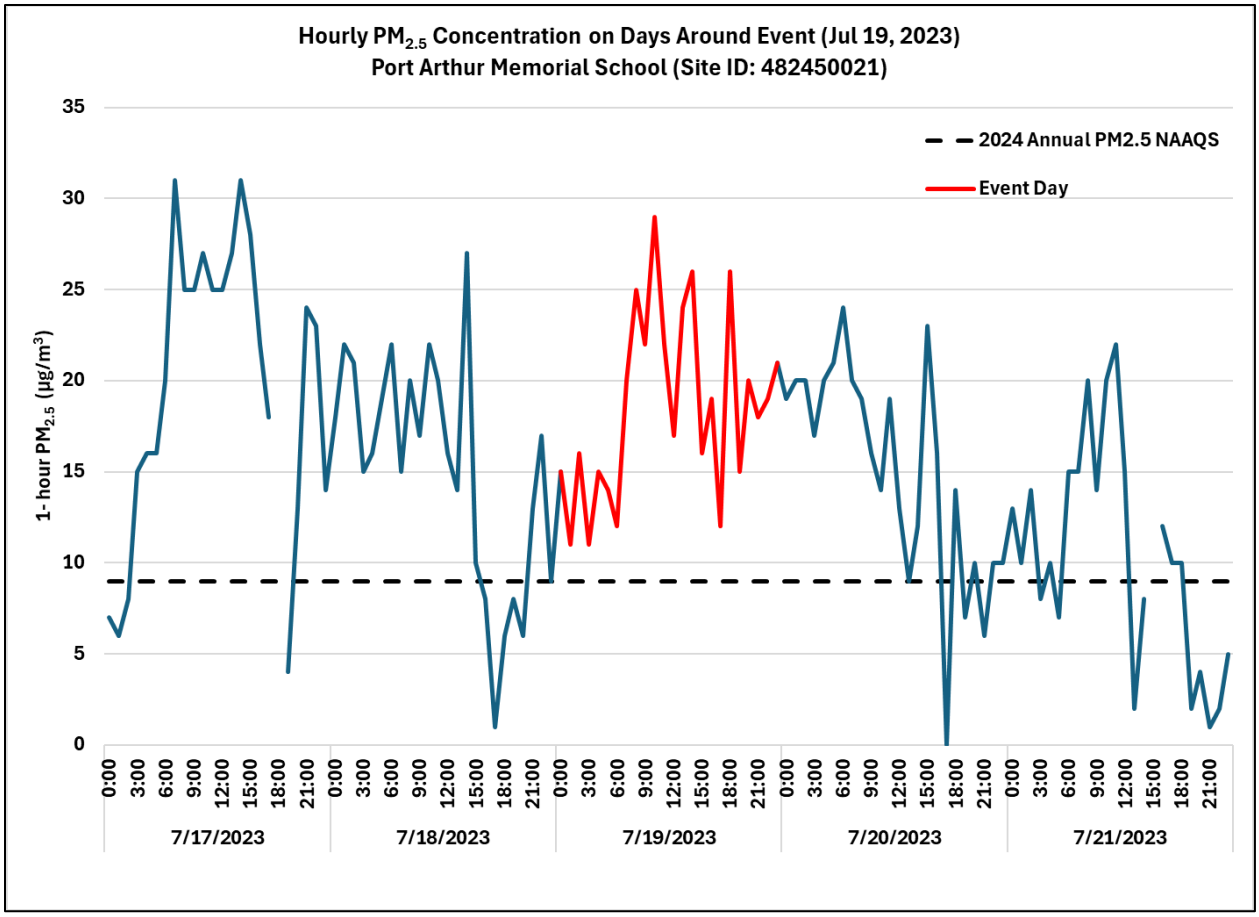

Figure 2-14: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 19, 2023) for the Port Arthur Memorial School Monitor

A broad area of ridging was present over southeast Texas on July 19, 2023, resulting in mostly stagnant conditions with subsidence and light winds. Smoke from agricultural burning over the southern Mississippi River Valley remained in the area with subsidence keeping it near the surface level. Light winds in combination with African dust transported into the area from over the southern Gulf of America and the aforementioned smoke resulted in elevated $PM_{2.5}$ concentrations in Jefferson County. Maps depicting these weather conditions are presented in Figure A-73 and Figure A-74.

Smoke in Jefferson County from fires both in close proximity to the monitor location and Louisiana is indicated in the NOAA HMS fire and smoke map (Figure A-75). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.12 Group 12 – Summary of July 26, 2023, and July 29, 2023, African Dust $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by African dust on July 26, 2023, and July 29,2023, which caused elevated $PM_{2.5}$ concentrations, as shown in Figure 2-15: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 26, 2023. and July 29, 2023) for the Port Arthur Memorial School Monitor.*

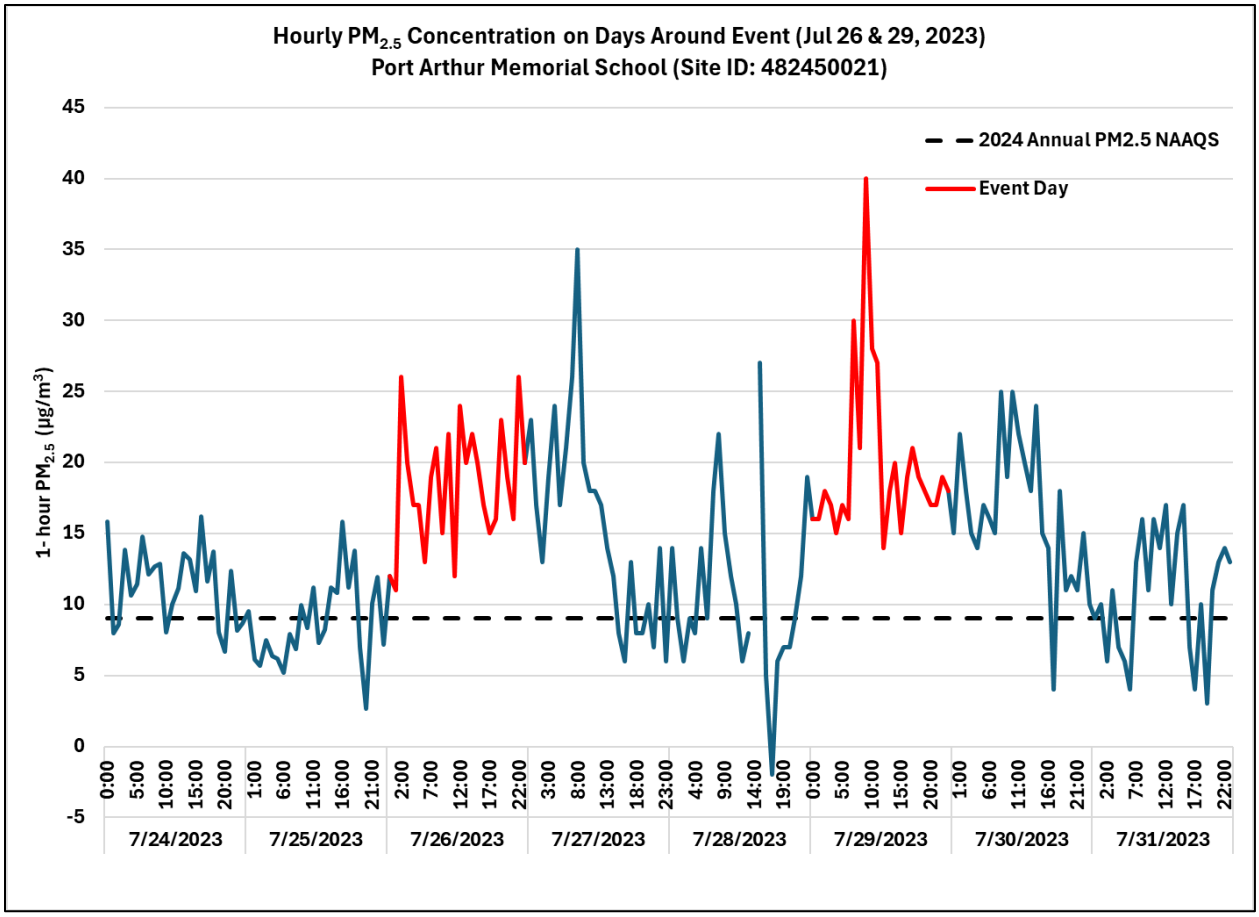

Figure 2-15: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 26, 2023. and July 29, 2023) for the Port Arthur Memorial School Monitor

Excerpts from NWS forecasts (Figure B-6) reference Saharan dust. As seen in the surface weather charts (Figure A-76 and Figure A-77), surface high pressure was present over the north-central Gulf of America. Clockwise circulation around the high-pressure system brought onshore flow along the Texas coast, including Jefferson County.

The 500 mb heights maps (Figure A-78 and Figure A-79) show higher pressure along the central northern coast of the Gulf of America. On July 29, 2023, this high pressure weakened slightly as a mid-level low-pressure system formed over the Bay of Campeche in the southwest Gulf of America. Circulation between these systems helped enhance the transport of Saharan dust over the southern and western Gulf of America and to the coast of Texas from Hidalgo County to Jefferson County. The transport of Saharan dust, in addition to the warm, humid conditions and subsidence, resulted in increased particulate matter at the Port Arthur Memorial School monitor in Jefferson County.

2.3.13 Group 13 – Summary of August 2, 2023, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires from Mississippi River Valley affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on August 2, 2023. The $PM_{2.5}$ concentration reached 173 µg/m^3 at 15:00 local time, as seen on the hourly time series in Figure 2-16: *Hourly $PM_{2.5}$ Concentrations on Days around Event (August 2, 2023) for the Port Arthur Memorial School Monitor.*

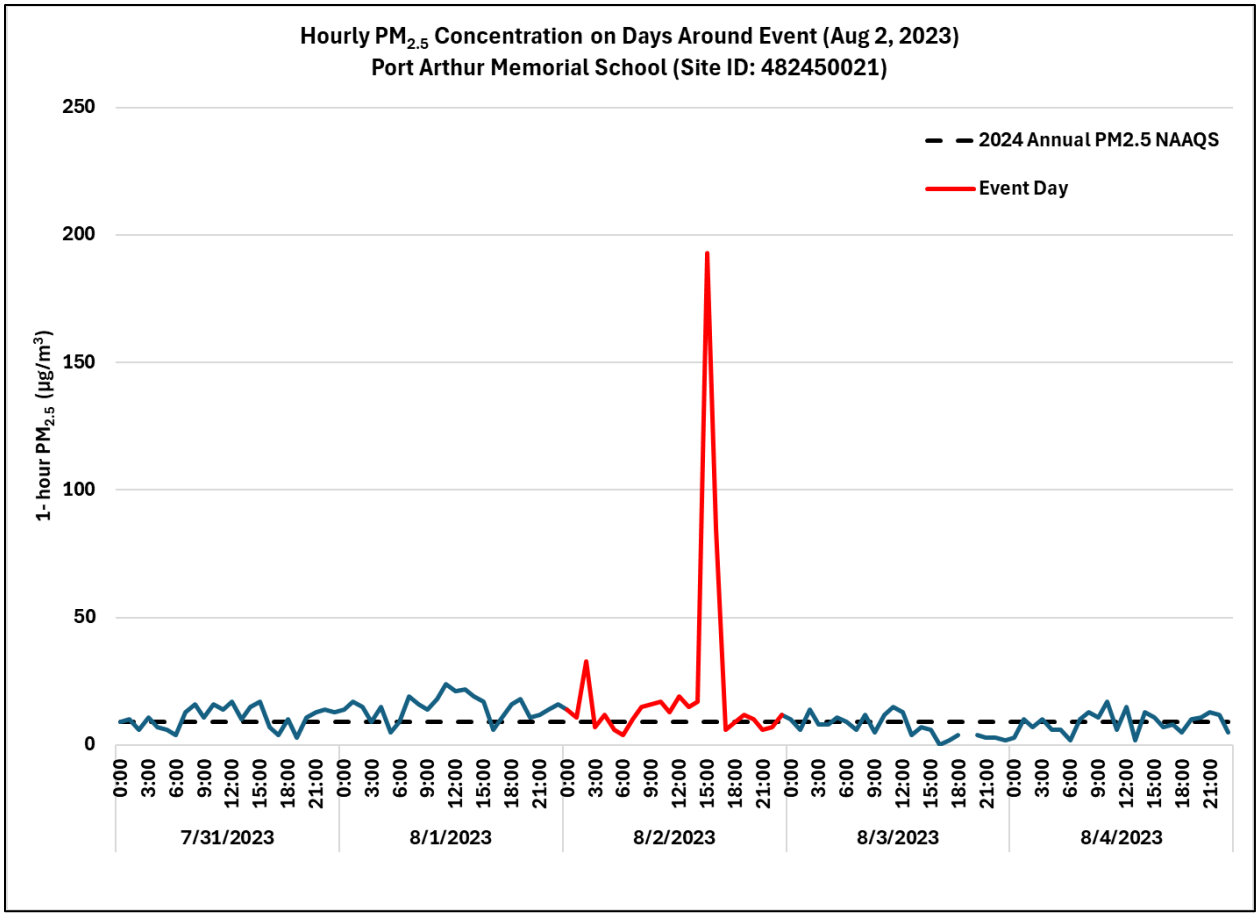

Figure 2-16: Hourly $PM_{2.5}$ Concentrations on Days around Event (August 2, 2023) for the Port Arthur Memorial School Monitor

High pressure stretching into southeast Texas was prevalent over Jefferson County on August 2, 2023. Light winds associated with the high pressure helped to transport smoke from agricultural burning over the southern Mississippi River Valley into Jefferson County. These light winds combined with subsidence and warm, moist air over the area allowed for an increase in particulate matter near the surface. Weather conditions on August 2, 2023, are presented in maps in Figure A-80 and Figure A-81.

Smoke in Jefferson County is indicated in the NOAA HMS fire and smoke map (Figure A-82). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.14 Group 14 – Summary of August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023, Wildfire-U.S. $PM_{2.5}$ Event

Smoke from multiple U.S. wildfires in Texas, Louisiana, and Mississippi River Valley affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023. Excerpts from NWS forecasts (Figure B-7) mention wildfires. The $PM_{2.5}$ concentration exceeded 25 µg/m³ on each of the dates identified as event days and reached 79 µg/m³ at 16:00 local time on September 2, 2023, as seen on the hourly time series in Figure 2-17: *Hourly $PM_{2.5}$ Concentrations on Days around Event (August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023) for the Port Arthur Memorial School Monitor.*

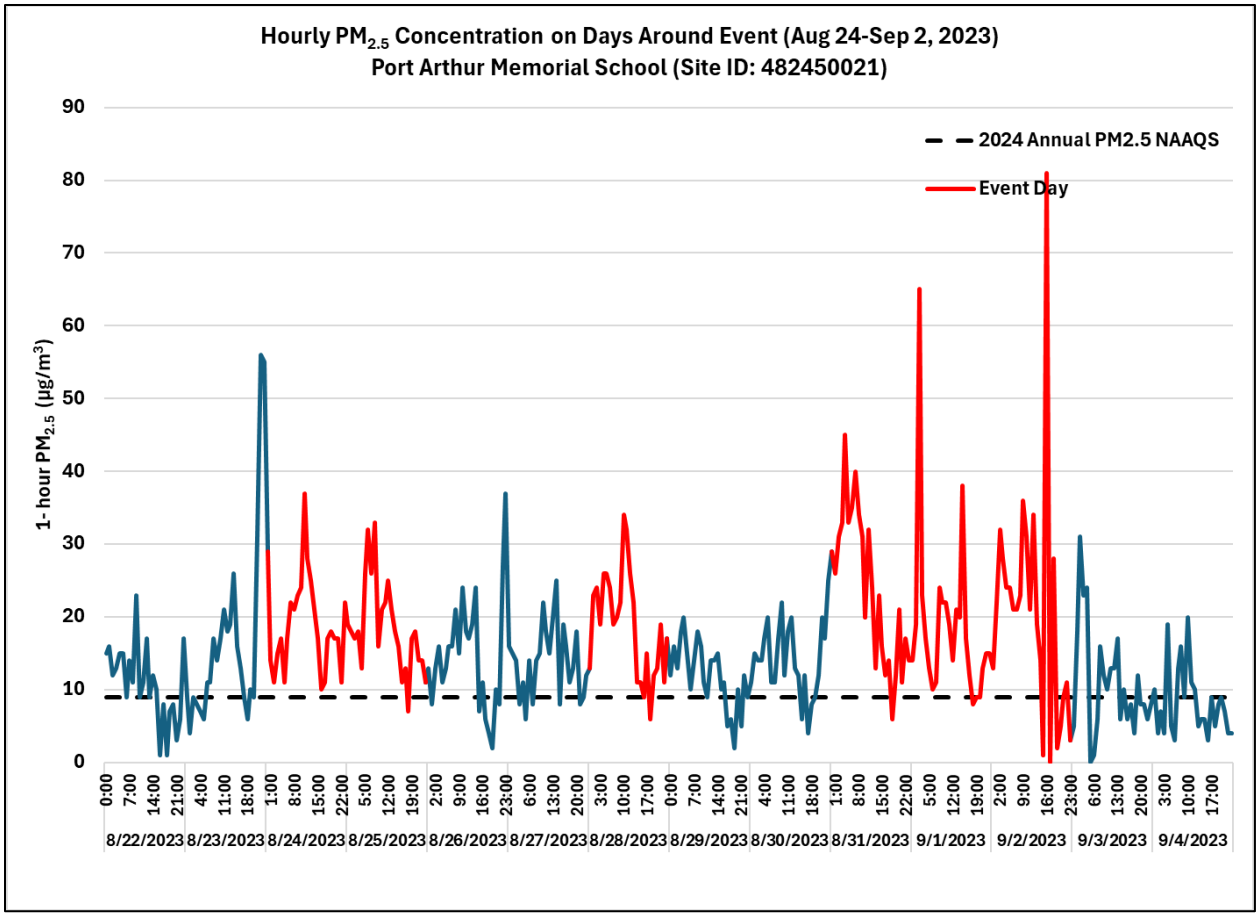

Figure 2-17: Hourly $PM_{2.5}$ Concentrations on Days around Event (August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023) for the Port Arthur Memorial School Monitor

On August 24 and 25, 2023, surface weather maps indicate a stationary front off the southeast coast of Texas. These conditions continue through August 28, 2023, as the outer edges of Tropical Storm Idalia moved northeast over the southern Gulf of America. On August 31, 2023, through September 2, 2023, a weak stationary front was again present over the northern coast of the Gulf of America, including southeast Texas.

Surface winds as well as mid-level high pressure seen in 500 mb heights charts over the midwestern U.S, helped funnel smoke from wildfires in the southeast U.S. into southeast Texas and Jefferson County. The presence of the smoke helped enhance concentrations of $PM_{2.5}$ over the area including at the Port Arthur Memorial School monitor site.

Weather conditions on event dates are presented in maps in Figure A-83 through Figure A-94. Smoke in Jefferson County is indicated in the NOAA HMS fire and smoke maps (Figure A-95 through Figure A-100). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.15 Group 15 – Summary of October 4, 2023, Wildfire-U.S. $PM_{2.5}$ Event

Smoke from U.S. wildfires affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on October 4, 2023. Excerpts from an NWS forecast (Figure B-8) reference haze likely from a fire. The $PM_{2.5}$ concentration reached 33 µg/m^3 at 16:00 local time on October 4, 2023, as

seen on the hourly time series in Figure 2-18: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 4, 2023) for the Port Arthur Memorial School Monitor.*

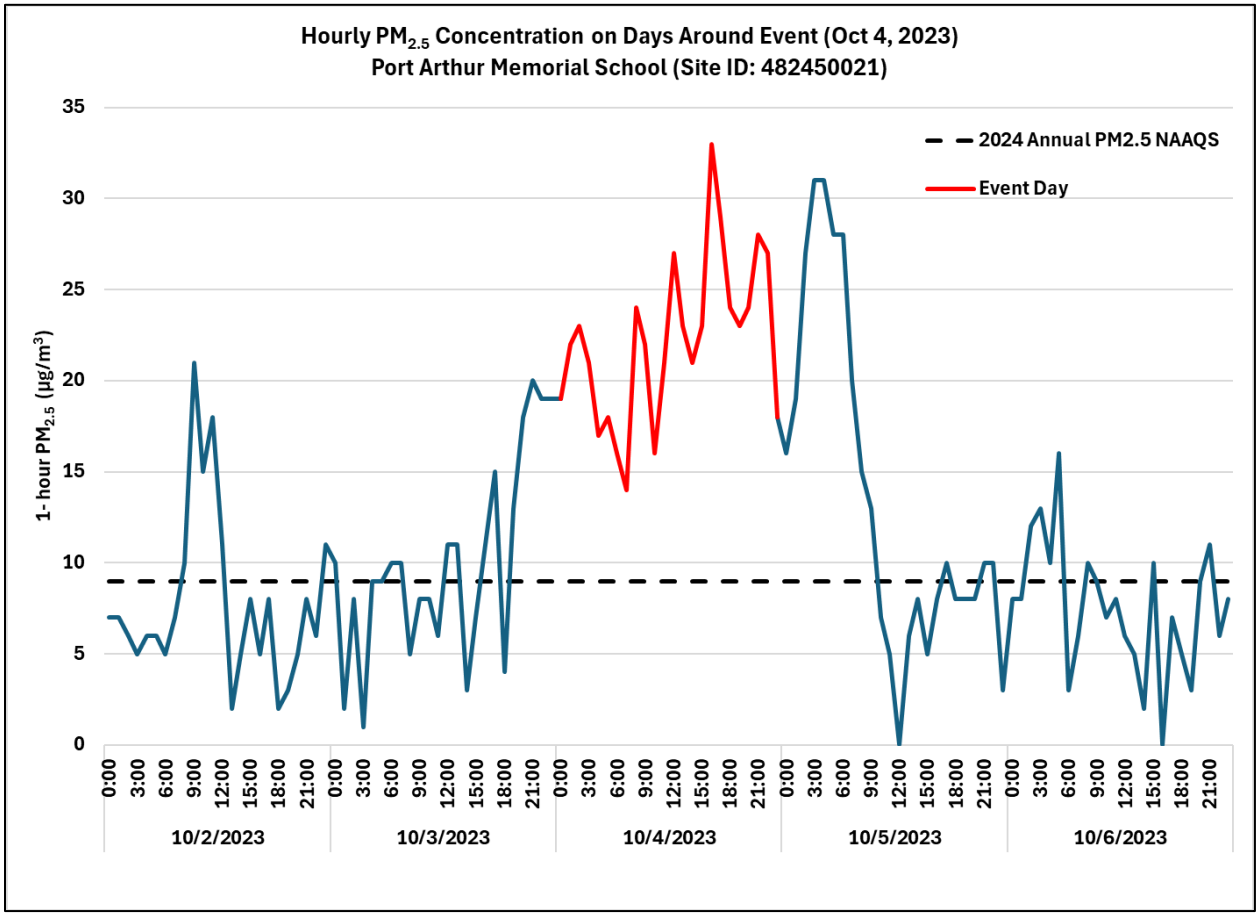

Figure 2-18: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 4, 2023) for the Port Arthur Memorial School Monitor

On October 4, 2023, Jefferson County was located on the southwest edge of a ridge of surface high pressure stretching along the east coast and into the central coast of the Gulf of America. Winds in Jefferson County at the surface were generally moderate out of the southeast (Figure A-101). A mid-level high pressure system was centered over the western Gulf of America. The southeasterly winds over the area helped transport smoke from wildfires along the coast in southeast Texas into Jefferson County. This resulted in higher than typical $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor site. Weather conditions on event dates are presented in maps in Figure A-99 and A-100.

Smoke in Jefferson County is indicated in the NOAA HMS fire and smoke maps (Figure A-103). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.16 Group 16 – Summary of October 20, 2023, Prescribed Fire $PM_{2.5}$ Event

Smoke from prescribed fires in Texas, affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor area on October 20, 2023. The $PM_{2.5}$ concentration reached 75 µg/m^3 at 07:00 local time, as seen on the hourly time series in Figure 2-19: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 20, 2023) for the Port Arthur Memorial School Monitor.*

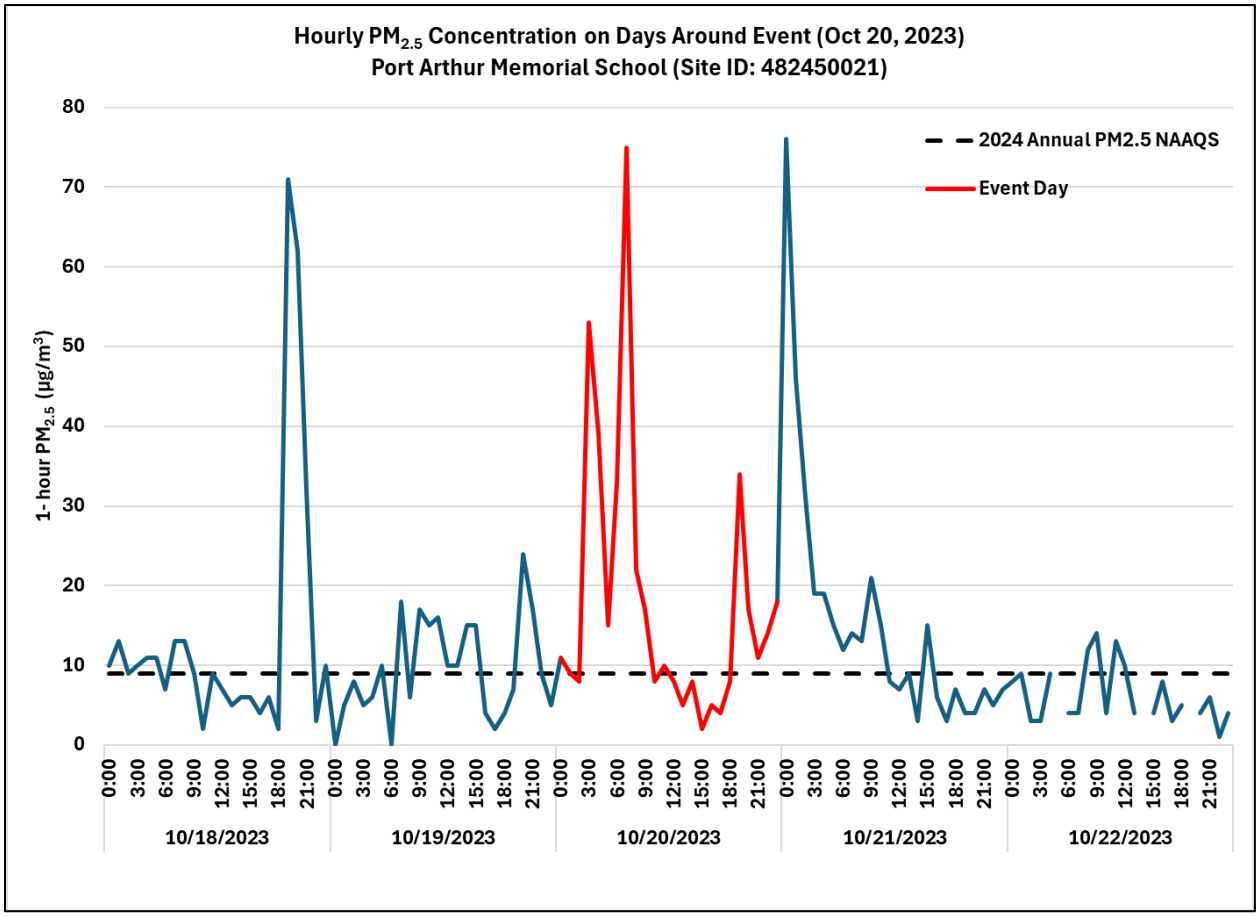

Figure 2-19: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 20, 2023) for the Port Arthur Memorial School Monitor

On October 20, 2023, a surface, cold front was moving from north to south across southeast Texas and Jefferson County with winds shifting from the south to the north throughout the day. As seen in the 500 mb heights chart, Jefferson County was on the eastern edge of a strong ridge of high pressure. As the cold front pushed into the area, it brought smoke from north of the area and from the Arkansas area into Jefferson County. Subsidence building behind the cold front helped trap pollutants near the surface, which resulted in elevated $PM_{2.5}$ at the Port Arthur Memorial School monitor. Weather conditions on October 20, 2023, are presented in maps in Figure A-104 and Figure A-105.

Smoke in Jefferson County is indicated in the NOAA HMS fire and smoke map (Figure A-106). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.17 Group 17 – Summary of December 31, 2023, and January 1, 2024, Fireworks $PM_{2.5}$ Event

Smoke from New Year's Eve fireworks affected the Port Arthur Memorial School monitor during the night of December 31, 2023, and in the early morning hours on January 1, 2024. It is during this time that it would be expected that $PM_{2.5}$ from fireworks would be detected at the monitor. Excerpts from an NWS forecast (Figure B-9) noted the prospect of smoke from fireworks. The $PM_{2.5}$ concentration at the monitor reached 141 µg/m^3 at 21:00 local time on December 31, 2023 and 132 µg/m^3 at 00:00 local time on January 1, 2024, as seen on the hourly time series in

Figure 2-20: *Hourly $PM_{2.5}$ Concentrations on Days around Event (December 31, 2023, and January 1, 2024) for the Port Arthur Memorial School Monitor.*

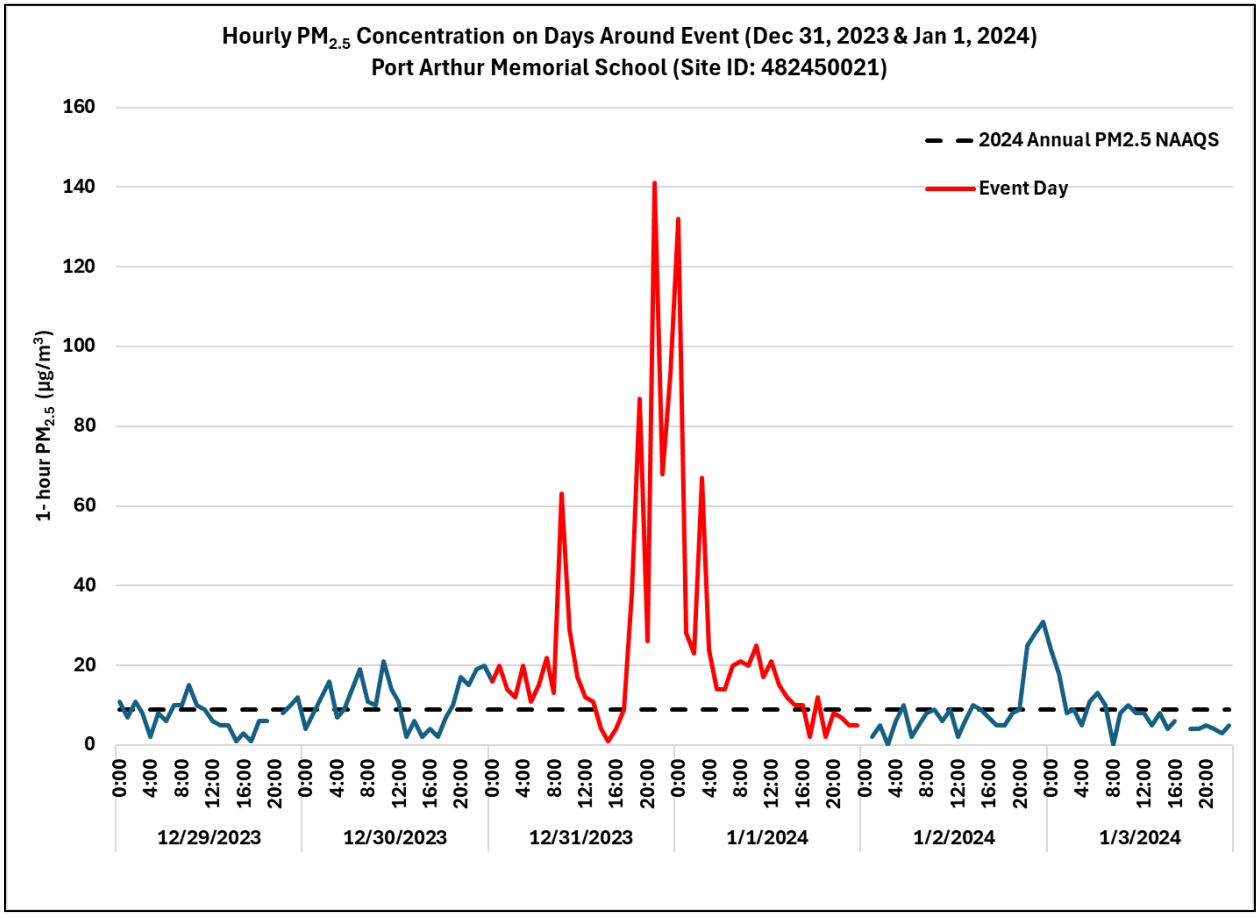

Figure 2-20: Hourly $PM_{2.5}$ Concentrations on Days around Event (December 31, 2023, and January 1, 2024) for the Port Arthur Memorial School Monitor

On December 31, 2023, a zonal flow was prevalent over much of Texas, as seen in the 500 mb heights map (Figure A-107). In southeast Texas, winds were light to moderate out of the south-southeast (Figure A-108). As night fell and temperatures cooled, more subsidence was present. Due to this subsidence, smoke and particulate matter associated with celebratory fireworks for New Year's Eve lingered in the near surface layer and resulted in elevated $PM_{2.5}$ at the Port Arthur Memorial School monitor in Jefferson County.

On January 1, 2024, there was ridging at 500 mb over the central U.S that stacks down to a high-pressure center over Kansas at the surface (Figure A-109). This resulted in subsidence over East Texas that increased the downward movement of winds in the region (Figure A-110). The observed sounding at Lake Charles shows a strong radiation inversion in the morning that likely capped mid-level winds from mixing to the surface and subdued any potential vertical diffusion of particulate matter from fireworks near the Port Arthur sensor (Figure A-111).

The NOAA HMS fire and smoke map would not be expected to show smoke from a local fireworks display, and, predictably, it does not. Despite this fact, the map is available for reference (Figure A-112).

2.3.18 Group 18 – Summary of May 8, 2024, May 9, 2024, and May 13, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was impacted by smoke from fires in Mexico and Central America on May 8, 2024, May 9, 2024, and May 13, 2024. Excerpts from NWS forecasts (Figure B-10) reference haze and smoke from Mexico and Central America. Elevated $PM_{2.5}$ concentrations on these days are shown in Figure 2-21: *Hourly $PM_{2.5}$ Concentrations on Days around Event (May 8, 2024, May 9, 2024, and May 13, 2024) for the Port Arthur Memorial School Monitor.*

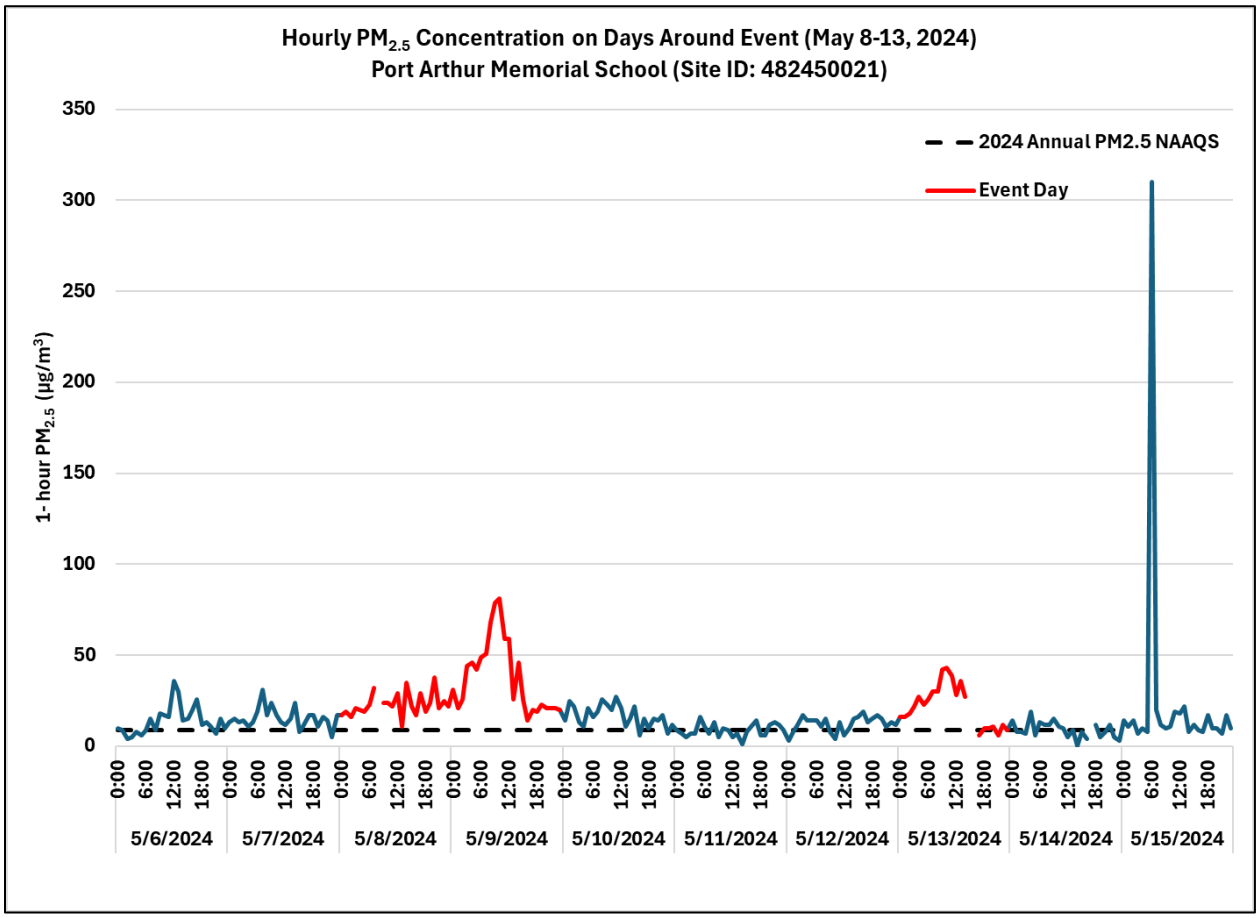

Figure 2-21: Hourly $PM_{2.5}$ Concentrations on Days around Event (May 8, 2024, May 9, 2024, and May 13, 2024) for the Port Arthur Memorial School Monitor

On May 7, 2024, there was longwave troughing at 500 mb over the central U.S. that stacked down to a low-pressure center over the Dakotas (Figure A-113). This trough created winds over Texas that enabled the transport of smoke from fires in Mexico and Central America to monitors in Texas (Figure A-114). Through May 13, 2024, the low-pressure center weakened and moved downstream; however, the flow at 500 mb over Texas remained from the southwest (Figure A-115 and Figure A-116).

Smoke in Jefferson County on event dates is indicated in NOAA HMS fire and smoke maps (Figure A-117, Figure A-118, and Figure A-119). The fires generating this smoke are unlikely to recur.

Figure 2-22: *Percentage of Reported Fire Instances by the Mexican Government, on and around February 8, 2024, February 9, 2024, and February 13, 2024*, shows the reported fire instances and causes in Mexico, with approximately 38% considered to be unlikely to recur (campfires, smokers, intentional, and natural).

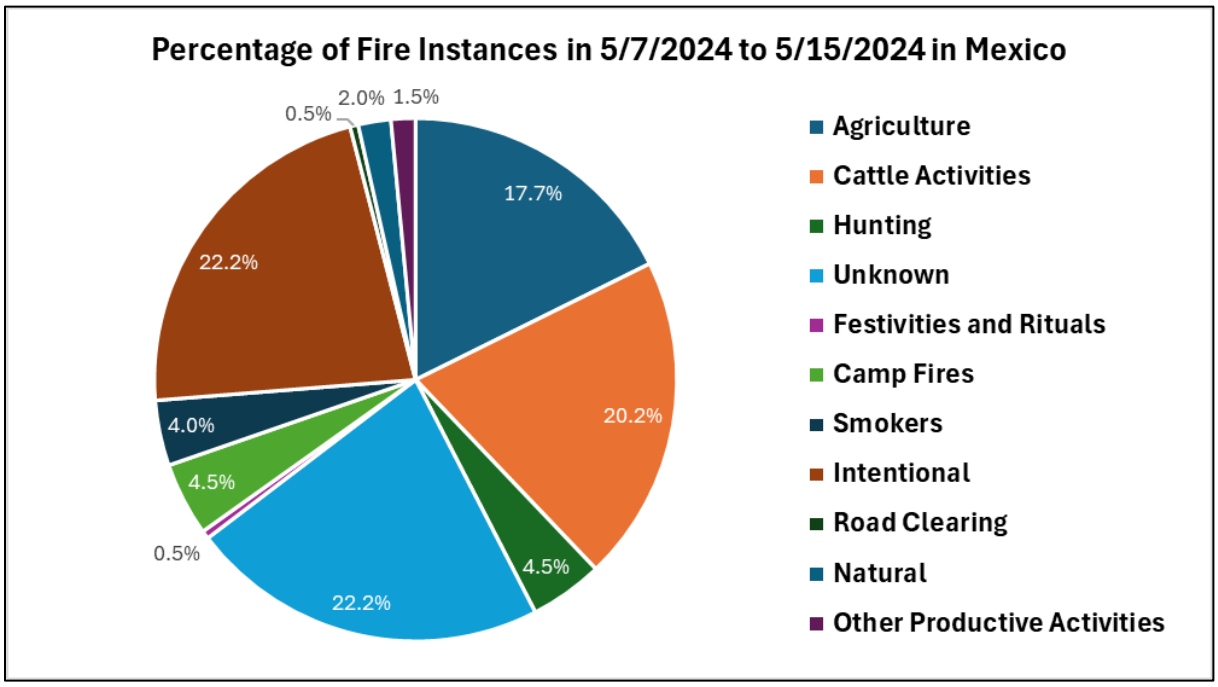

Figure 2-22: Percentage of Reported Fire Instances by the Mexican Government, on and around February 8, 2024, February 9, 2024, and February 13, 2024

2.3.19 Group 19 – Summary of May 15, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

Smoke from fires in Mexico and Central America affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on May 15, 2024. Excerpts from an NWS forecast (Figure B-11) reference hazy conditions, southerly winds, and burning in Mexico and Central America. The $PM_{2.5}$ concentration reached 310 µg/m^3 at 06:00 local time on May 15, 2024, as seen on the hourly time series in Figure 2-23: *Hourly $PM_{2.5}$ Concentrations on Days around Event (May 15, 2024) for the Port Arthur Memorial School Monitor*.

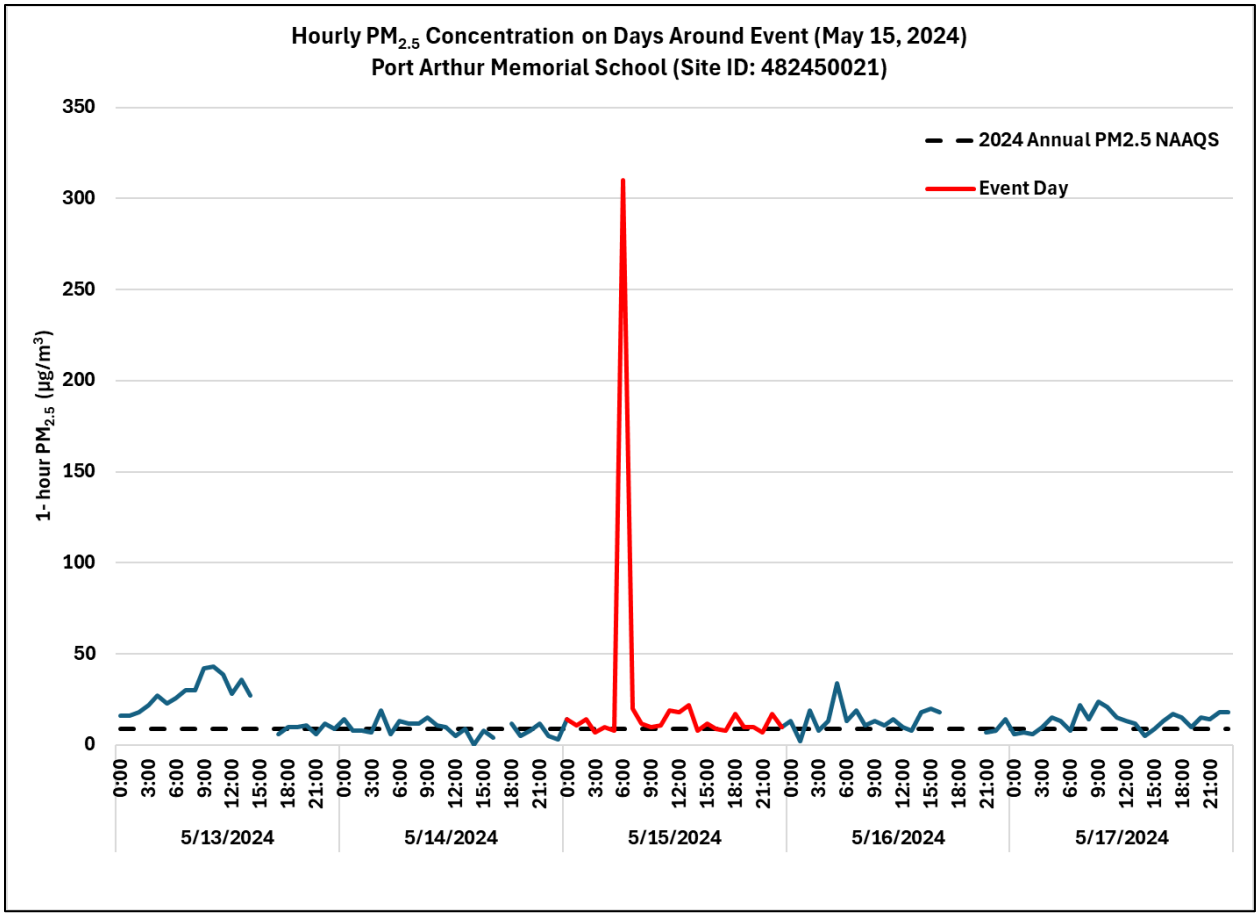

Figure 2-23: Hourly $PM_{2.5}$ Concentrations on Days around Event (May 15, 2024) for the Port Arthur Memorial School Monitor

On May 15, 2024, there was weak 500 mb ridging over Texas with winds from the west over southern Texas and winds from the northwest in East Texas (Figure A-120). While these winds enabled the transport of smoke in the upper atmosphere to Texas, ridging and higher pressure created subsidence which pushed the particulate matter towards the surface (Figure A-121).

Smoke from Canadian wildfires can be seen north of Jefferson County in the NOAA HMS fire and smoke map (Figure A-122). Based on meteorological conditions, it is possible that this smoke made its way to Jefferson County to join residual smoke from fires in Mexico and Central America. The fires generating smoke on May 15, 2024, are unlikely to recur based on the causes shown in Figure 2-22.

2.3.20 Group 20 – Summary of May 24, 2024, and May 25, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was impacted by smoke from fires in Mexico and Central America on May 24, 2024, and May 25, 2024. Elevated $PM_{2.5}$ concentrations on these days are shown in Figure 2-24: *Hourly $PM_{2.5}$ Concentrations on Days around Event (May 24, 2024, and May 25, 2024) for the Port Arthur Memorial School Monitor*. Excerpts from NWS forecasts (Figure B-12) reference smoke and burning in Mexico.

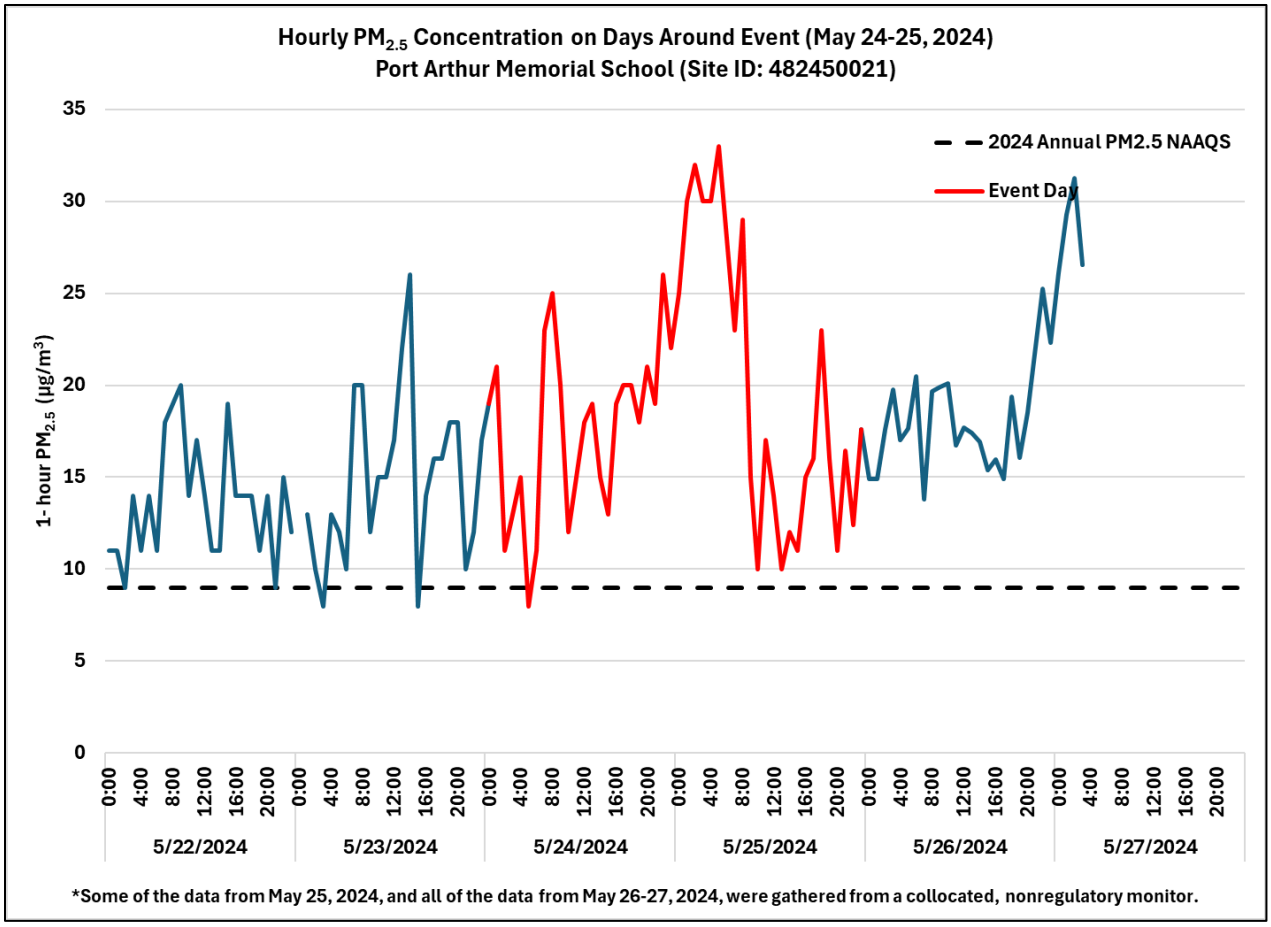

Figure 2-24: Hourly $PM_{2.5}$ Concentrations on Days around Event (May 24, 2024, and May 25, 2024) for the Port Arthur Memorial School Monitor

On May 18, 2024, the longwave pattern at 500 mb over the U.S. is troughing over the west with a ridge over the east (Figure A-121). There is a major shortwave trough over East Texas at this level, but the flow is from the southwest over south Texas (Figure A-122). This flow facilitated the transport of smoke from Mexican and Central American fires to Texas. Throughout the next week, the pattern shifted as both the longwave trough and major shortwave troughs moved downstream; however, the flow over southern Texas remained from the southwest at 500 mb. By May 28, 2024, ridging had progressed over the western U.S. and Texas with high heights over south Texas and Mexico resulting in subsidence. This subsidence likely pushed any particulate matter in the upper atmosphere towards the surface and kept any residual pollutants from dissipating upward. Relevant weather conditions on May 23, 2024, and May 28, 2024, are presented in maps in Figure A-123, Figure A-124, Figure A-125, and Figure A-126.

Smoke in Jefferson County on event dates is indicated in NOAA HMS fire and smoke maps (Figure A-127 and Figure A-128). The fires generating this smoke are unlikely to recur.

Figure 2-25: *Percentage of Reported Fire Instances by the Mexican Government, on and around May 24, 2024, and May 25, 2024*, shows the reported fire instances in Mexico, with approximately 37% considered to be unlikely to recur (campfires, smokers, hunters, intentional, forest harvesting waste, and natural).

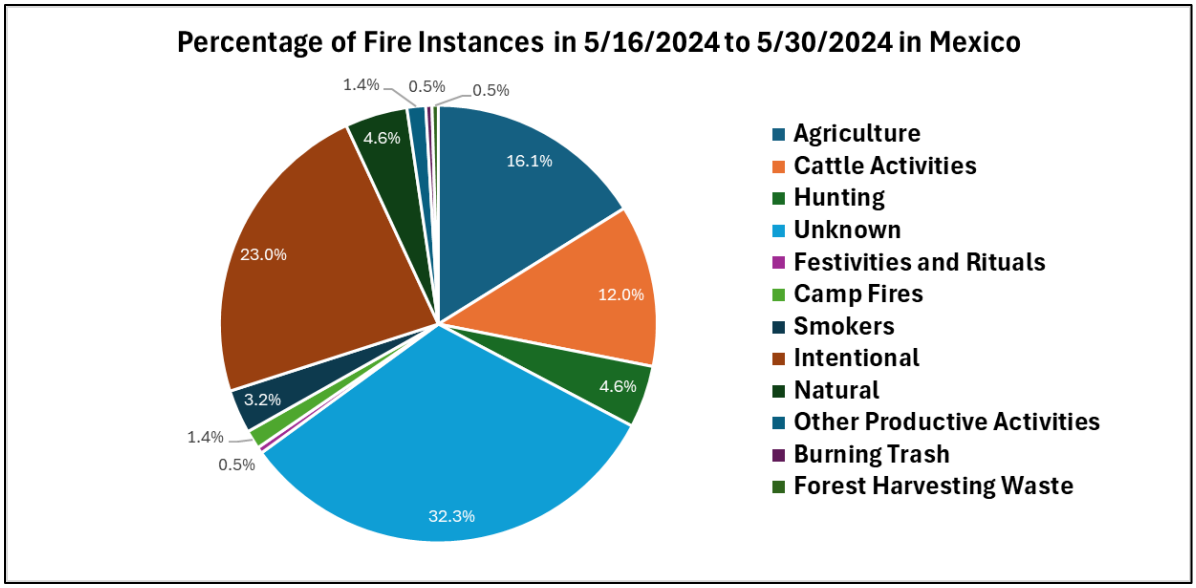

Figure 2-25: Percentage of Reported Fire Instances by the Mexican Government, on and around May 24, 2024, and May 25, 2024

2.3.21 Group 21 – Summary of July 1, 2024, and July 3, 2024, African Dust $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by African dust on July 1, 2024, and July 3, 2024, which caused elevated $PM_{2.5}$ concentrations, as shown in Figure 2-26: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 1, 2024, and July 3, 2024) for the Port Arthur Memorial School Monitor*. Excerpts from NWS forecasts (Figure B-13) reference Saharan dust.

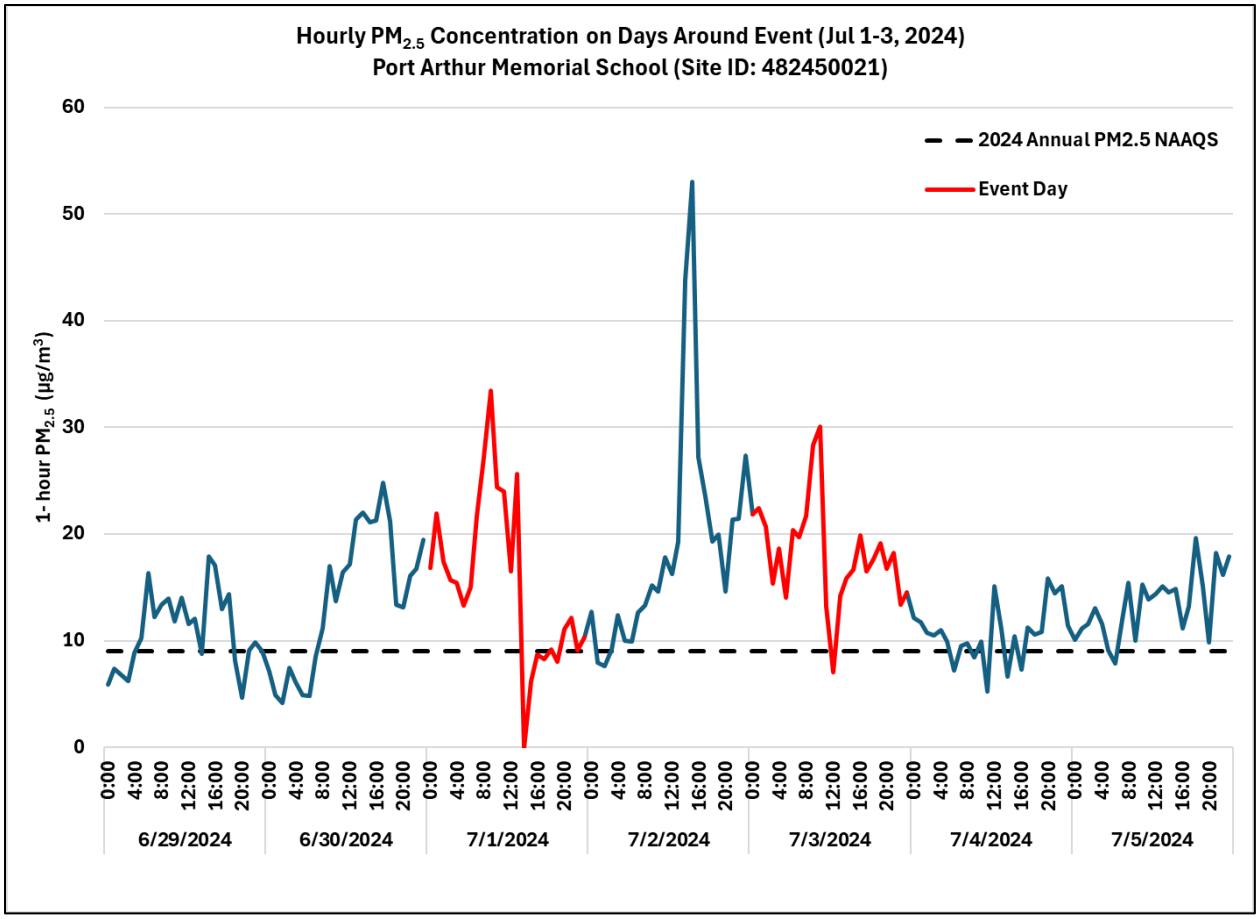

Figure 2-26: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 1, 2024, and July 3, 2024) for the Port Arthur Memorial School Monitor

On July 1, 2024, high pressure at the surface and a pressure system at the mid-levels of the atmosphere were present over the Texas coast. As a result, the coastal area of Texas including Jefferson County experienced onshore flow. This onshore flow and upper-level easterly winds helped transport African dust along the coast. As a result, the Port Arthur Memorial School monitor in Jefferson County measured elevated $PM_{2.5}$ concentrations. Weather conditions on July 1, 2024, are presented in maps in Figure A-129 and Figure A-130.

On July 3, 2024, surface high pressure over the northwestern Gulf of America and a mid-level high pressure system over the southeastern U.S. resulted in onshore flow over Jefferson County in southeast Texas. These conditions combined with moderate winds, high humidity, and subsidence helped transport African dust to the Port Arthur Memorial School monitor site and resulted in elevated $PM_{2.5}$ concentrations on July 3, 2024. Weather conditions on July 3, 2024, are presented in maps in Figure A-131 and Figure A-132.

2.3.22 Group 22 – Summary of July 6, 2024, Other –Weather $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by weather conditions resulting from the proximity of Tropical Storm Beryl on July 6, 2024. These conditions contributed to elevated $PM_{2.5}$ concentrations, as shown in Figure 2-27: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 6, 2024) for the Port Arthur Memorial School Monitor*. Excerpts from an NWS forecast (Figure B-14) reference the movement of Tropical Storm Beryl into the Gulf of America.

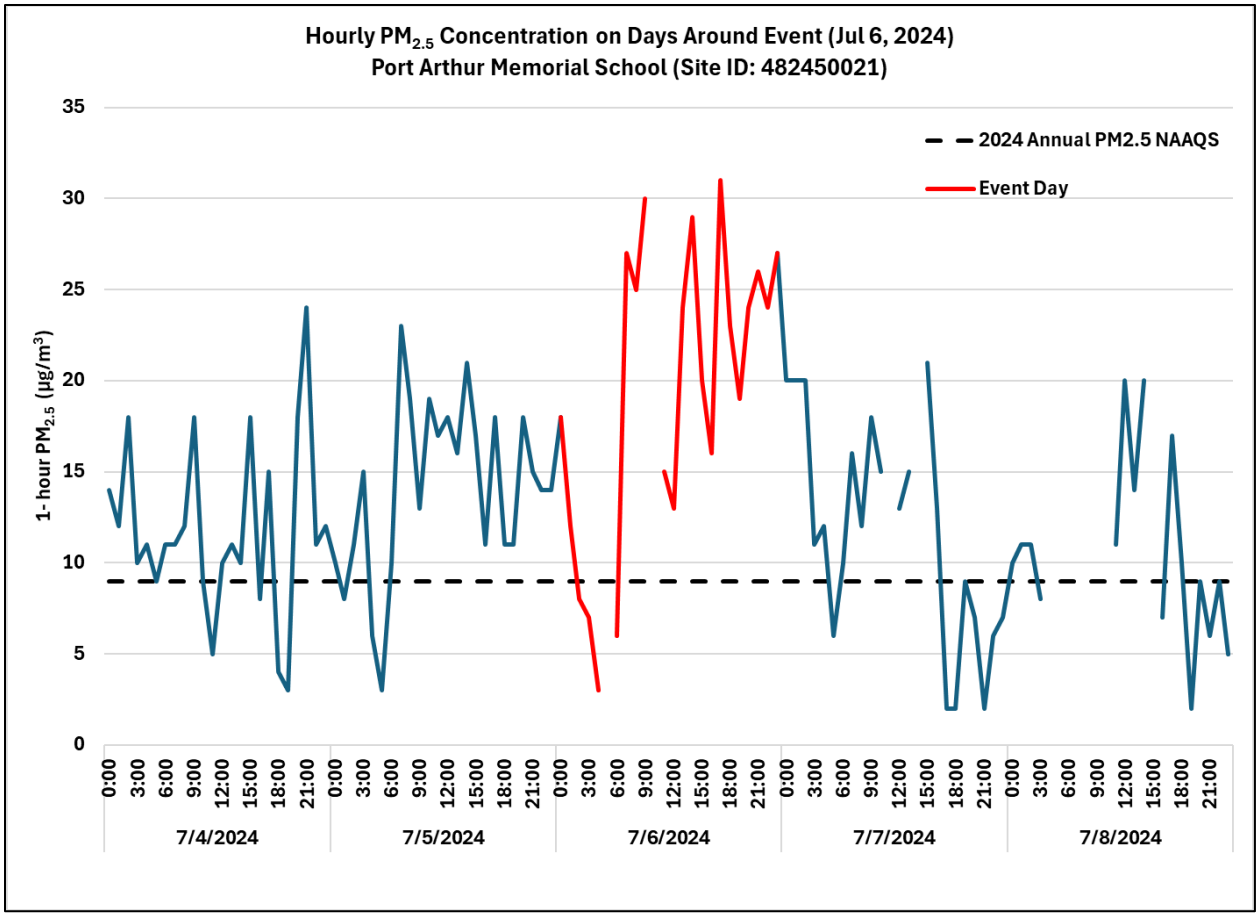

Figure 2-27: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 6, 2024) for the Port Arthur Memorial School Monitor

Unsettled weather was present on July 6, 2024, in Jefferson County due to the outer reaches of Tropical Storm Beryl in the Gulf of America and a stationary front located just north of the area. Temperatures were hot with high humidity levels. The high humidity and gusty winds associated with outflow from scattered strong thunderstorms in the area resulted in localized high $PM_{2.5}$ concentrations in the area due to residual Saharan dust, including at the Port Arthur Memorial School monitor site. Weather conditions on July 6, 2024, are presented in maps in Figure A-133 and Figure A-134.

2.3.23 Group 23 – Summary of July 30, 2024, July 31, 2024, and August 1, 2024, African Dust $PM_{2.5}$ Event

The Port Arthur Memorial School monitor was affected by African dust on July 30, 2024 and July 31, 2024, and August 1, 2024, which caused elevated $PM_{2.5}$ concentrations, as shown in Figure 2-28: *Hourly $PM_{2.5}$ Concentrations on Days around Event (July 30, 2024, July 31, 2024, and August 1, 2024) for the Port Arthur Memorial School Monitor*. Excerpts from NWS forecasts (Figure B-15) reference Saharan dust.

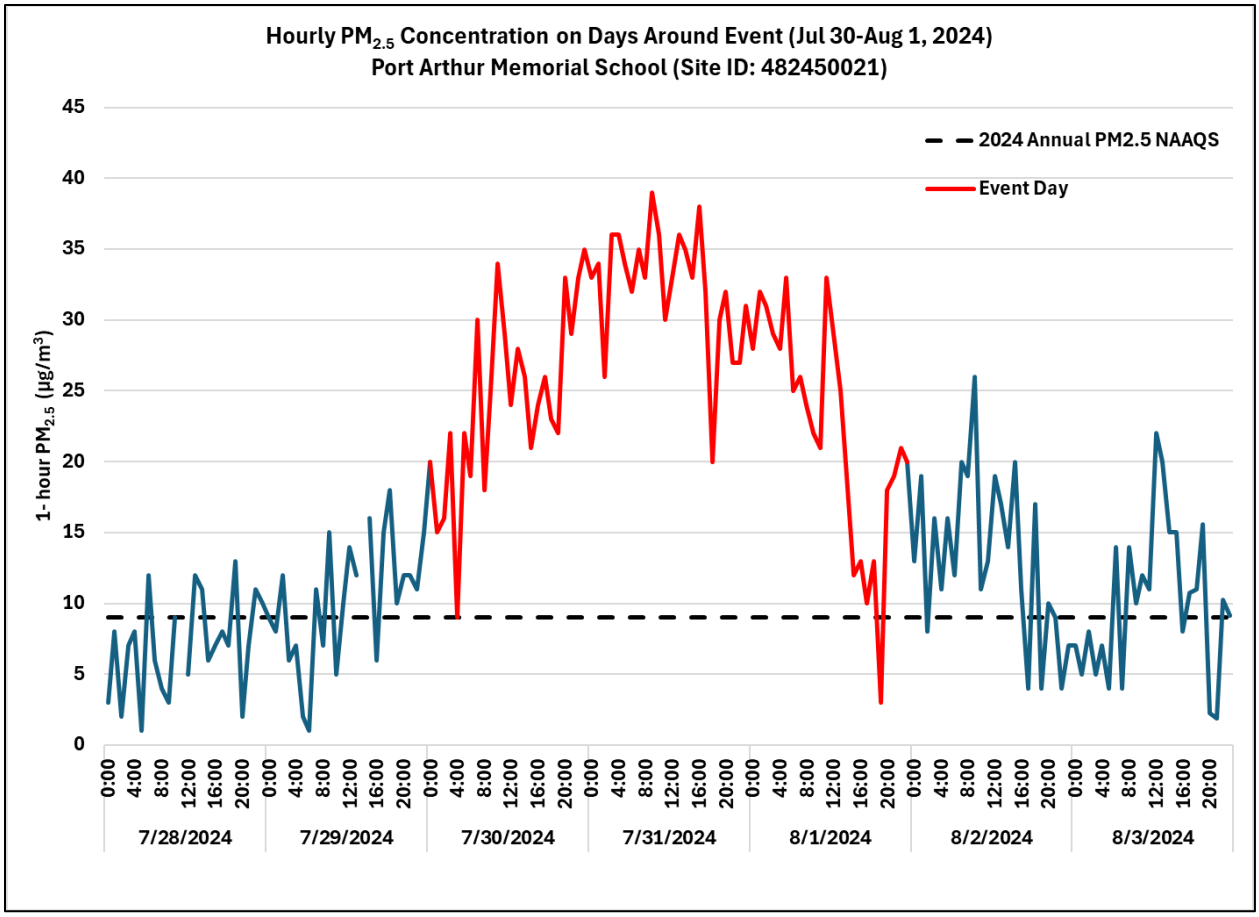

Figure 2-28: Hourly $PM_{2.5}$ Concentrations on Days around Event (July 30, 2024, July 31, 2024, and August 1, 2024) for the Port Arthur Memorial School Monitor

July 30, 2024, through August 1, 2024, depicted the typical pattern seen with large African dust events in Texas. Near the surface, there was onshore flow over much of the coast of Texas continuing with winds out of the south and southeast over much of the state. Similar situations were present at mid-levels with a broad area of high pressure centered over northern Texas. These conditions bring African dust west across the southern Gulf of America before moving north and northeast into Texas. As a result of this large, broad African dust event, elevated $PM_{2.5}$ concentrations were measured in Jefferson County at the Port Arthur Memorial School monitor. Weather conditions on July 30, 2024, through August 1, 2024, are presented in maps in Figure A-135 through Figure A-140.

2.3.24 Group 24 – Summary of August 6, 2024, and August 21, 2024, Wildfire-U.S. $PM_{2.5}$ Event

Smoke from multiple U.S. wildfires affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on August 6, 2024, and August 21, 2024. The $PM_{2.5}$ concentrations on each of the dates identified as event days can be seen as hourly time series in Figure 2-29: *Hourly $PM_{2.5}$ Concentrations on Days around Event (August 6, 2024) for the Port Arthur Memorial School Monitor* and Figure 2-30: *Hourly $PM_{2.5}$ Concentrations on Days around Event (August 21, 2024) for the Port Arthur Memorial School Monitor.*

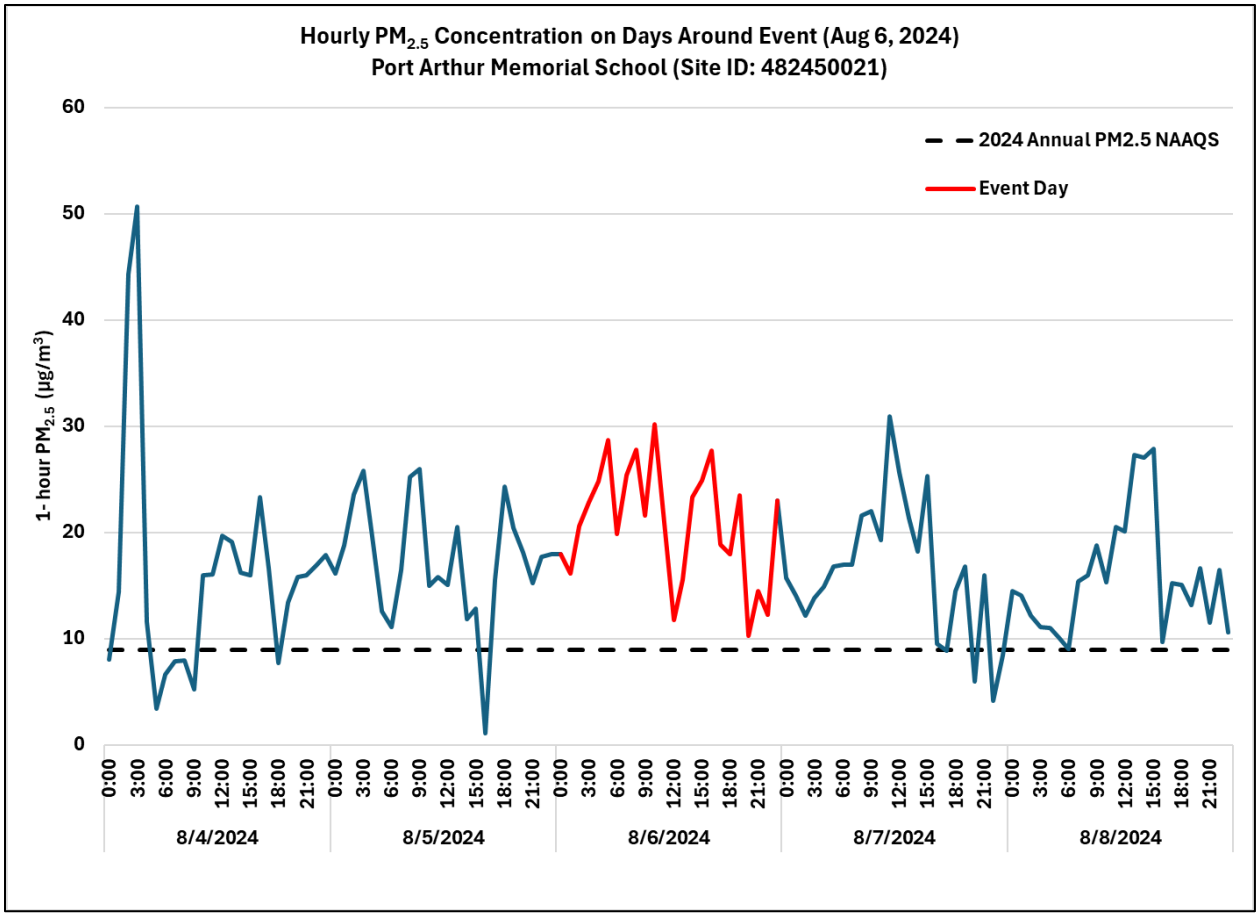

Figure 2-29: Hourly $PM_{2.5}$ Concentrations on Days around Event (August 6, 2024) for the Port Arthur Memorial School Monitor

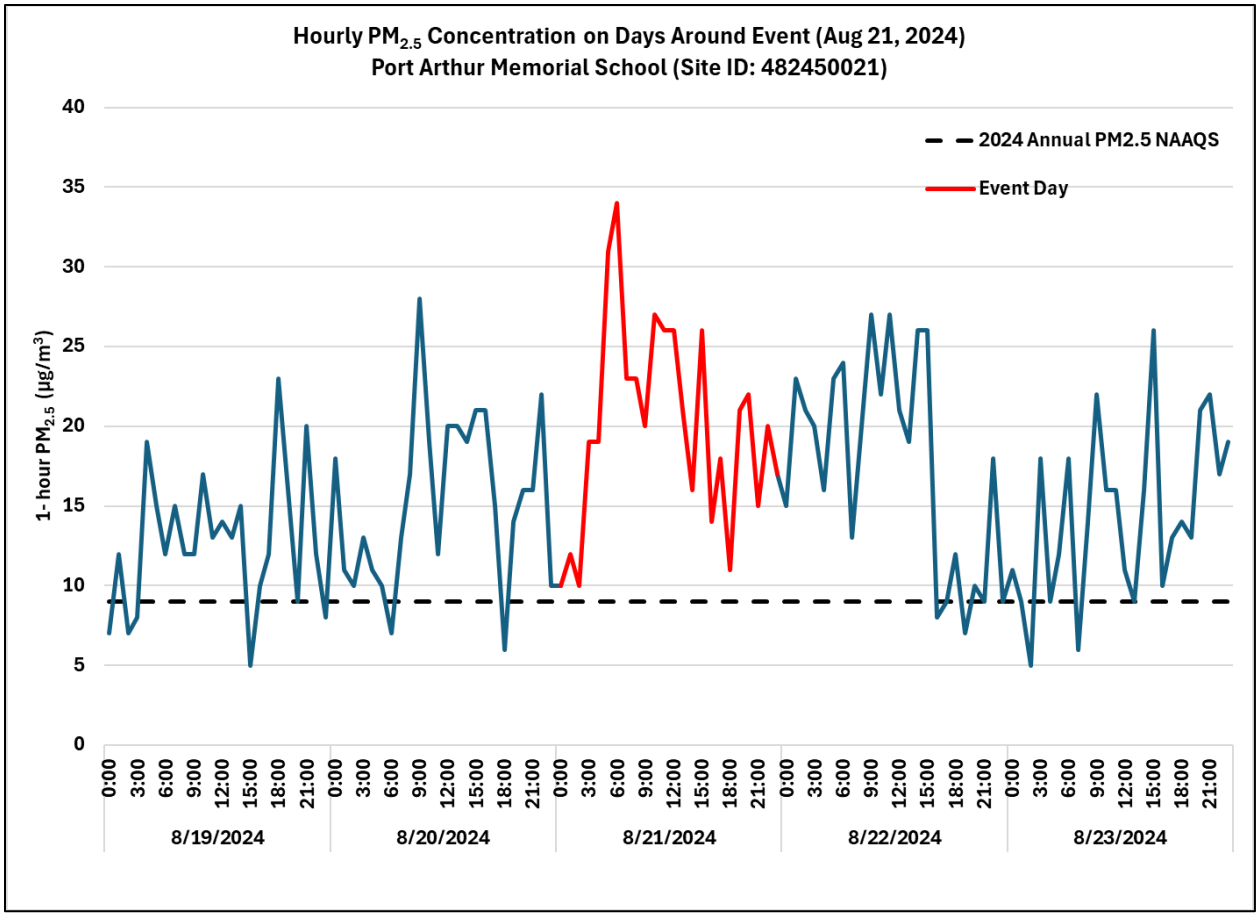

Figure 2-30: Hourly $PM_{2.5}$ Concentrations on Days around Event (August 21, 2024) for the Port Arthur Memorial School Monitor

High pressure and warm temperatures prevailed over Jefferson County on August 6, 2024. These conditions also brought subsidence to the area. At the mid-levels, winds were out of the north over Jefferson County due to the circulation around a high-pressure system centered over the Texas and Oklahoma panhandles. The mid-level circulation brought smoke into the area from fires in the Mississippi River Valley. This smoke settled over the area due to the subsidence and light surface winds. Due to this, the Port Arthur Memorial School monitor measured elevated concentrations of $PM_{2.5}$. Weather conditions on August 6, 2024, are presented in maps in Figure A-141 and Figure A-142.

On August 21, 2024, Jefferson County was influenced by a stationary frontal boundary over southeastern Texas and southern Louisiana. At the 500 mb level, a high-pressure system was centered over the southern Texas Panhandle, with circulation around that system bringing northerly winds aloft to the area. Winds at the surface were light and generally out of the east-northeast. High pressure also resulted in subsidence, which helped trap smoke near the surface in Jefferson County. These conditions allowed for the transport of wildfire smoke transport from the Mississippi River Valley into Jefferson County and the Port Arthur Memorial School monitor. Weather conditions on August 21, 2024, are presented in maps in Figure A-143 and Figure A-144.

Smoke in Jefferson County on the event dates is indicated in the NOAA HMS fire and smoke maps (Figure A-145 and Figure A-146). The fires generating this smoke are unlikely to recur, as discussed in Section 4 and 5.

2.3.25 Group 25 – Summary of August 22, 2024, Prescribed Fire $PM_{2.5}$ Event

High $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor were due to prescribed fires and wildfires from the Mississippi River Valley on August 22, 2024. The maximum concentration on this day was 23 µg/m^3, occurring at 06:00, as shown in Figure 2-31: *Hourly $PM_{2.5}$ Concentrations on Days around Event (August 22, 2024) for the Port Arthur Memorial School Monitor*.

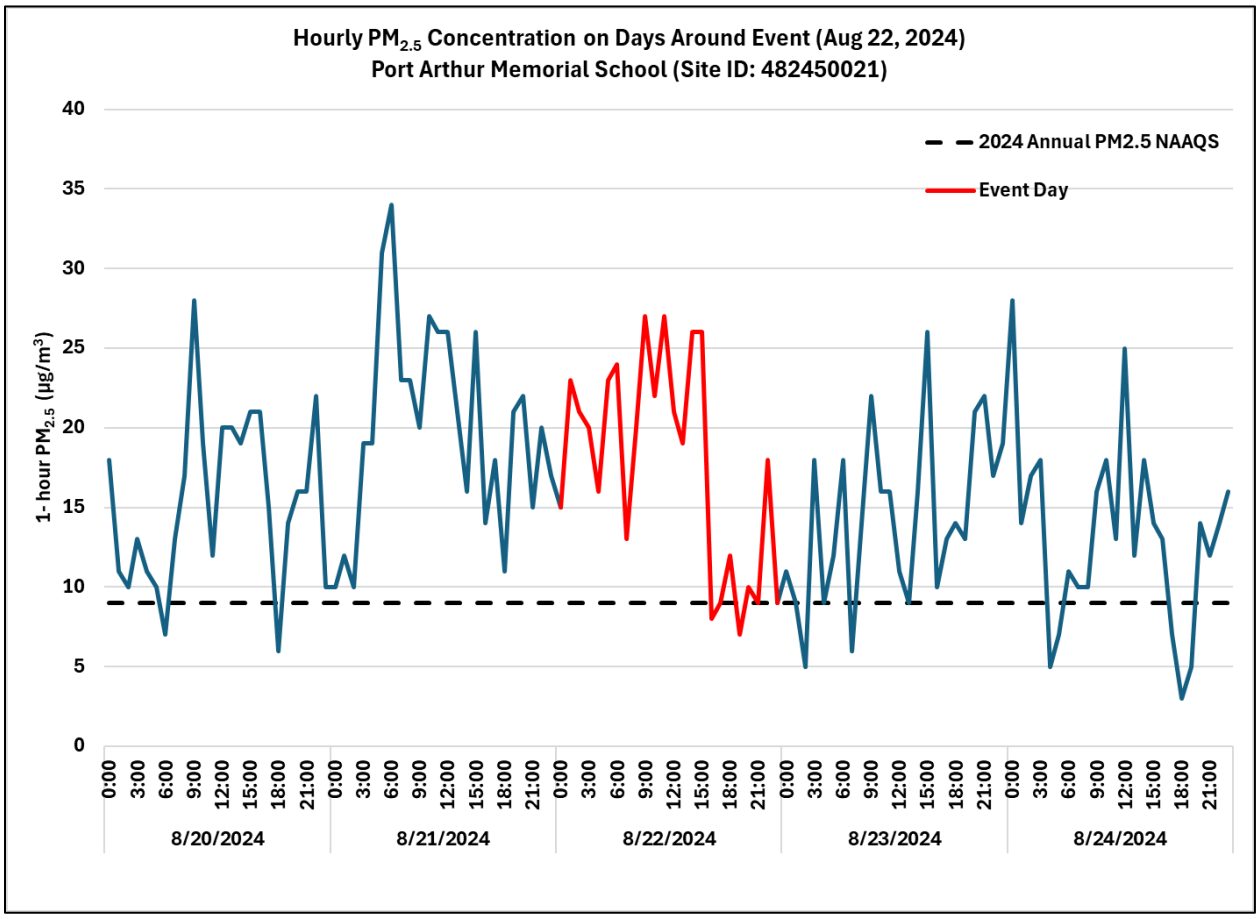

Figure 2-31: Hourly $PM_{2.5}$ Concentrations on Days around Event (August 22, 2024) for the Port Arthur Memorial School Monitor

On August 22, 2024, Jefferson County was influenced by stationary frontal boundary over southeastern Texas and southern Louisiana. At the 500 mb level, a high-pressure system was centered over the southern Texas Panhandle, with circulation around that system bringing northerly winds aloft to the area. Winds at the surface were light and generally out of the east-northeast. These conditions allowed for wildfire smoke transport from the Mississippi River Valley into Jefferson County and the Port Arthur Memorial School monitor. Weather conditions on August 21, 2024, are presented in maps in Figure A-147 and Figure A-148.

Smoke in Jefferson County on August 22, 2024, is indicated in the NOAA HMS fire and smoke map (Figure A-149). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.26 Group 26 – Summary of October 10, 2024, Wildfire – U.S. $PM_{2.5}$ Event

High $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor were due to wildfires in Louisiana, the midwestern U.S., and the Mississippi River Valley on October 10, 2024. The maximum concentration on this day was 32 µg/m^3, occurring at 00:00 local time, as shown in Figure 2-32: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 10, 2024) for the Port Arthur Memorial School Monitor* . An excerpt from an NWS forecast (Figure B-16) references that high pressure continued to ridge southward across East Texas and Louisiana. Although the forecast doesn't specifically reference wildfires, high pressure areas tend to create stagnant air conditions, which can lead to accumulation of pollutants.

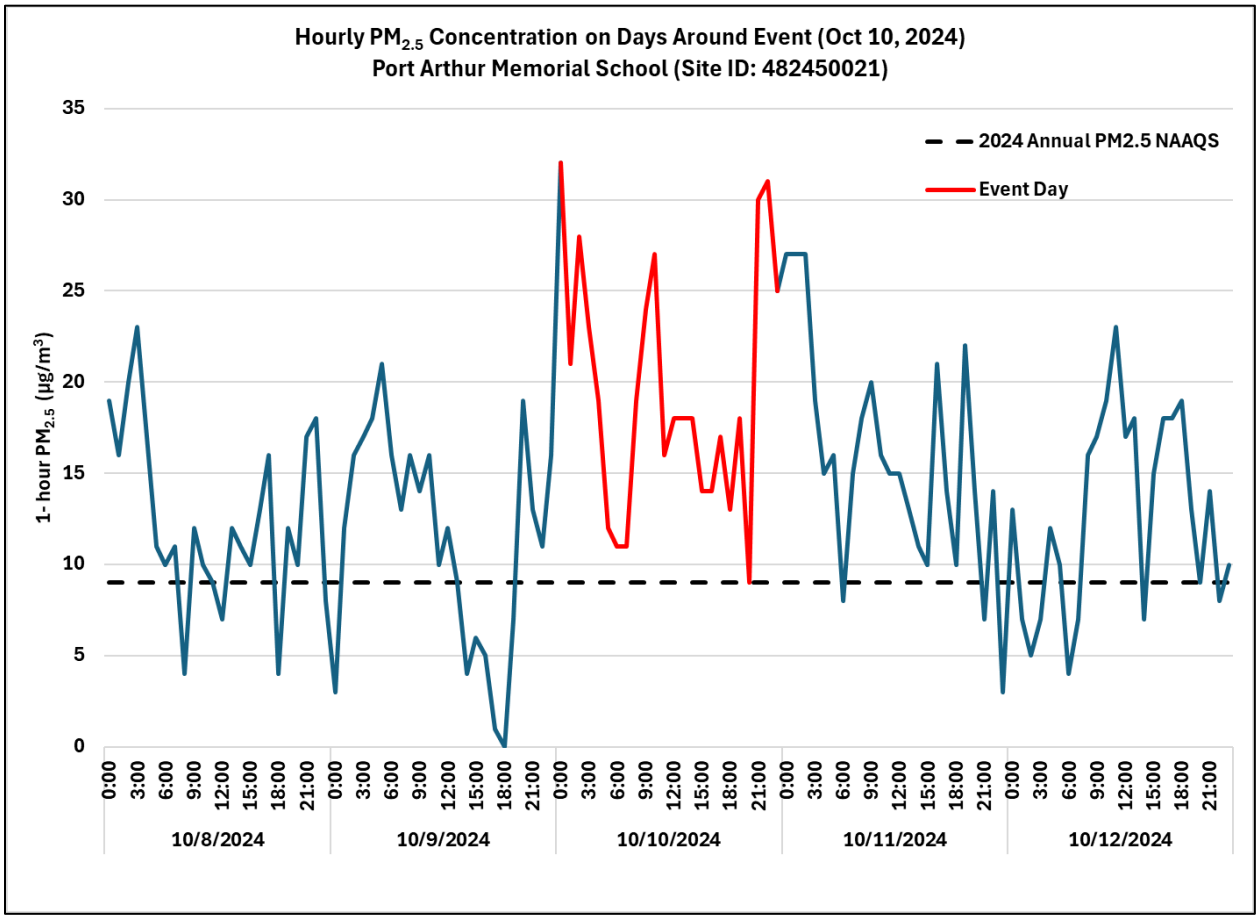

Figure 2-32: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 10, 2024) for the Port Arthur Memorial School Monitor

On October 10, 2024, a broad area of high pressure was over much of Texas. Winds at the surface were generally light to moderate over much of the state. At the mid-levels, as seen in the 500 mb heights map (Figure A-150), there was an area of high pressure over Arizona and New Mexico. This resulted in winds out of the north at the transport level over Jefferson County (Figure A-151). These conditions allowed for smoke transport from fires in Louisiana, the Midwest and Mississippi River Valley into the Jefferson County area, and enhanced $PM_{2.5}$ at the Port Arthur Memorial School monitor.

Smoke in Jefferson County on October 10, 2024, is indicated in the NOAA HMS fire and smoke map (Figure A-152). The fires generating this smoke are unlikely to recur as discussed in Sections 4 and 5.

2.3.27 Group 27 – Summary of October 15, 2024, Fire – Canadian $PM_{2.5}$ Event

Smoke from Canadian Wildfires affected $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor on October 15, 2024. The $PM_{2.5}$ concentration reached 23 µg/m³ at 17:00 local time on October 15, 2024, as seen on the hourly time series in Figure 2-33: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 15, 2024) for the Port Arthur Memorial School Monitor.* An excerpt from an NWS forecast (Figure B-17) references high pressure in Canada that will move south and send a cold front that will reach the Gulf of America.

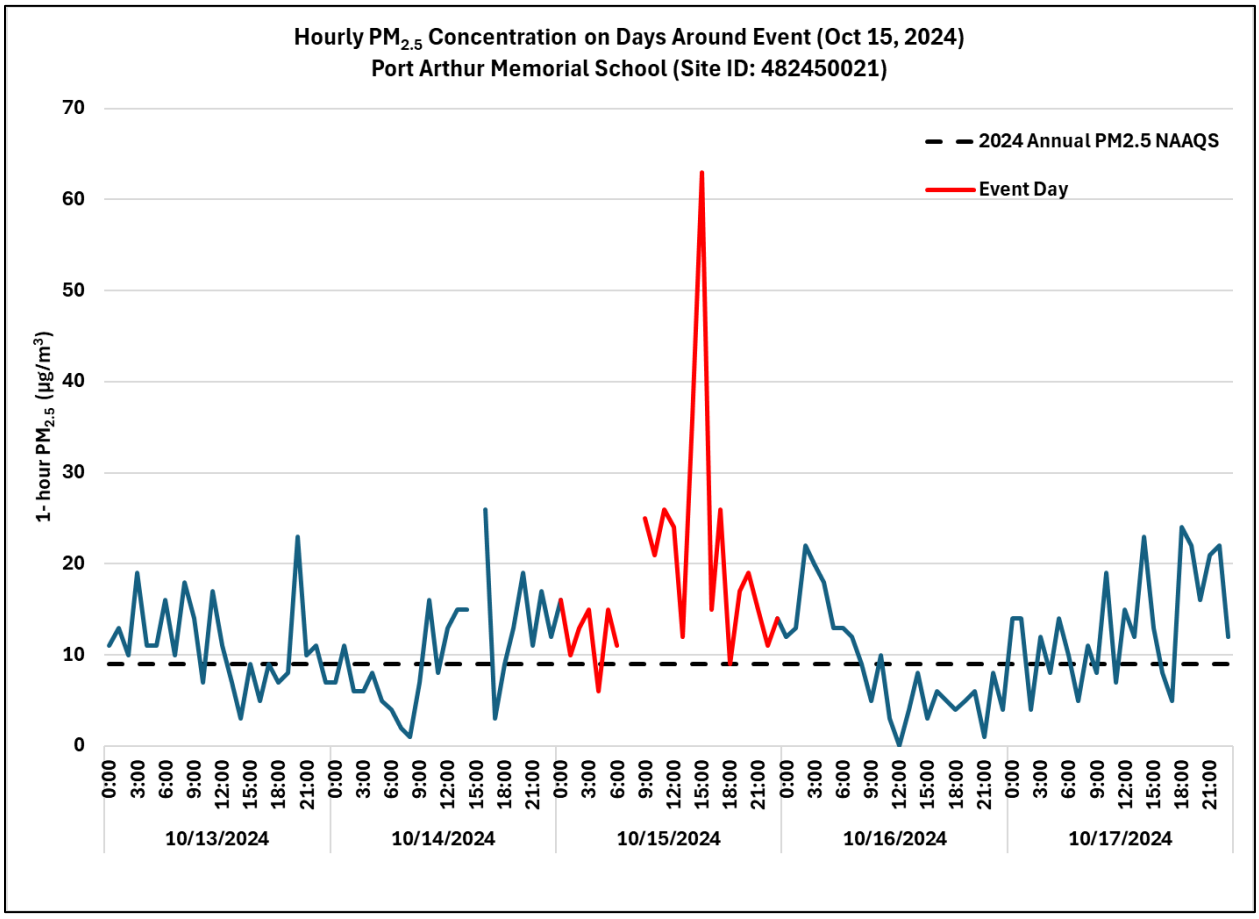

Figure 2-33: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 15, 2024) for the Port Arthur Memorial School Monitor

On October 15, 2024, a weak stationary front was located to the northeast of the Jefferson County area. High pressure over the Gulf of America was the prevailing feature, influencing conditions in Jefferson County and at the monitor site. Winds were light out of the north at the surface with hot temperatures for the time of year. Aloft, a trough of low pressure was moving east with mid-level winds out of the northwest over Jefferson County. These mid-level transport winds along with surface high pressure and light winds allowed smoke from fires in the midwestern U.S. to settle in the area and result in increased $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor site. Weather conditions on October 15, 2024, are presented in maps in Figure A-153 and Figure A-154.

Smoke from wildfires can be seen in Jefferson County in the NOAA HMS fire and smoke map (Figure A-155). The fires generating smoke on October 15, 2024, are unlikely to recur as discussed in Sections 4 and 5.

2.3.28 Group 28 – Summary of October 28, 2024, Prescribed Fire $PM_{2.5}$ Event

High $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor were due to prescribed fires in the Lower Mississippi River valley on October 28, 2024. $PM_{2.5}$ concentrations on this day are shown in Figure 2-34: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 28, 2024) for the Port Arthur Memorial School Monitor*.

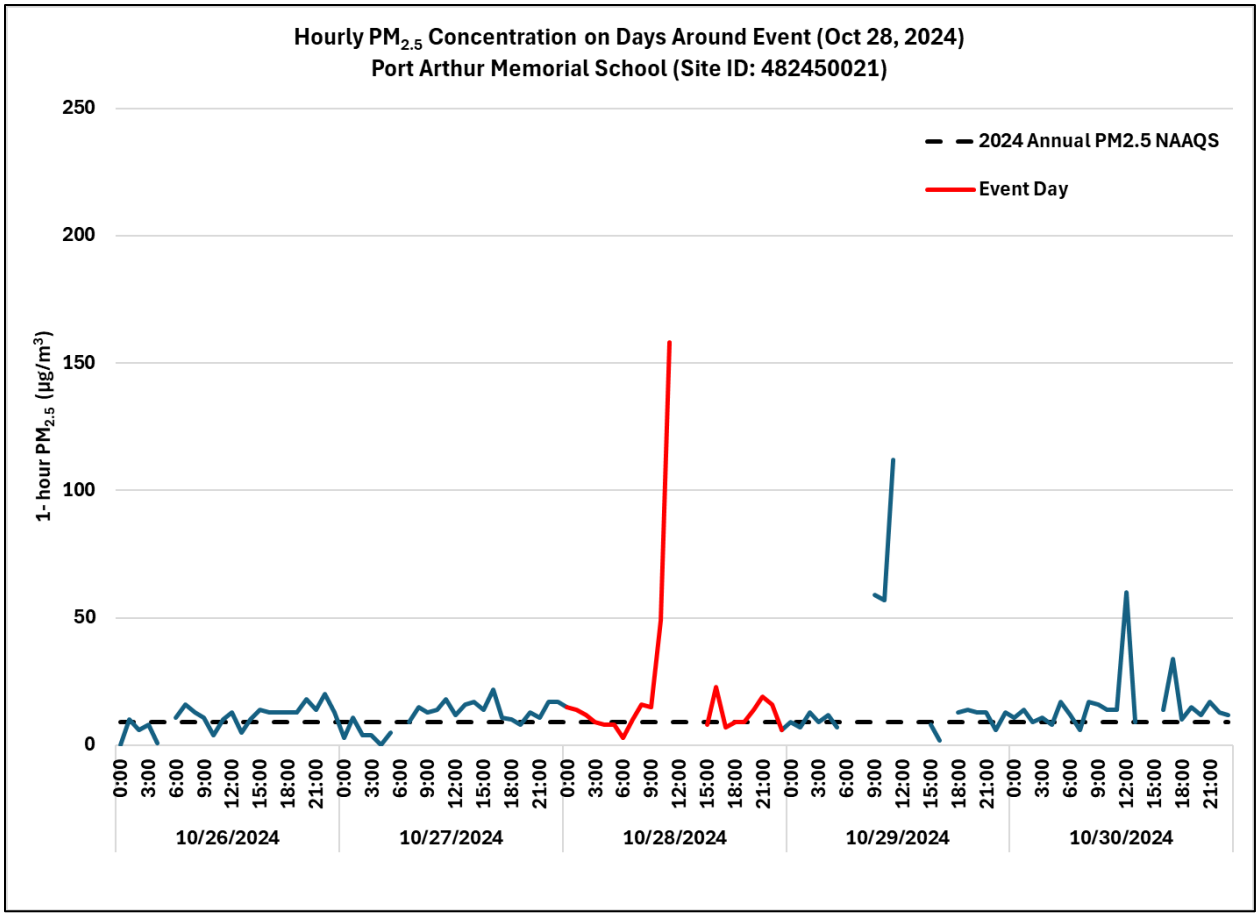

Figure 2-34: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 28, 2024) for the Port Arthur Memorial School Monitor

On October 28, 2024, Jefferson County experienced a weak ridge of high pressure with light to moderate winds out of the southeast. Winds at the midlevel on October 28, 2024, were light out of the north. These conditions allowed for smoke from agricultural fires along the Lower Mississippi River Valley to slowly spread into Jefferson County and over the Port Arthur Memorial School monitor, where elevated $PM_{2.5}$ was recorded. Weather conditions on October 28, 2024, are presented in maps in Figure A-156 and Figure A-157. Subsidence associated with the ridge of high pressure helped trap smoke near the surface.

Smoke in Jefferson County on October 28, 2024, is indicated in the NOAA HMS fire and smoke map (Figure A-158). The fires generating this smoke are unlikely to recur.

2.3.29 Group 29 – Summary of October 29, 2024, Prescribed Fire $PM_{2.5}$ Event

High $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor were due to prescribed fires in the Lower Mississippi River Valley on October 28, 2024. $PM_{2.5}$ concentrations on this day

are shown in Figure 2-35: *Hourly $PM_{2.5}$ Concentrations on Days around Event (October 29, 2024) for the Port Arthur Memorial School Monitor.*

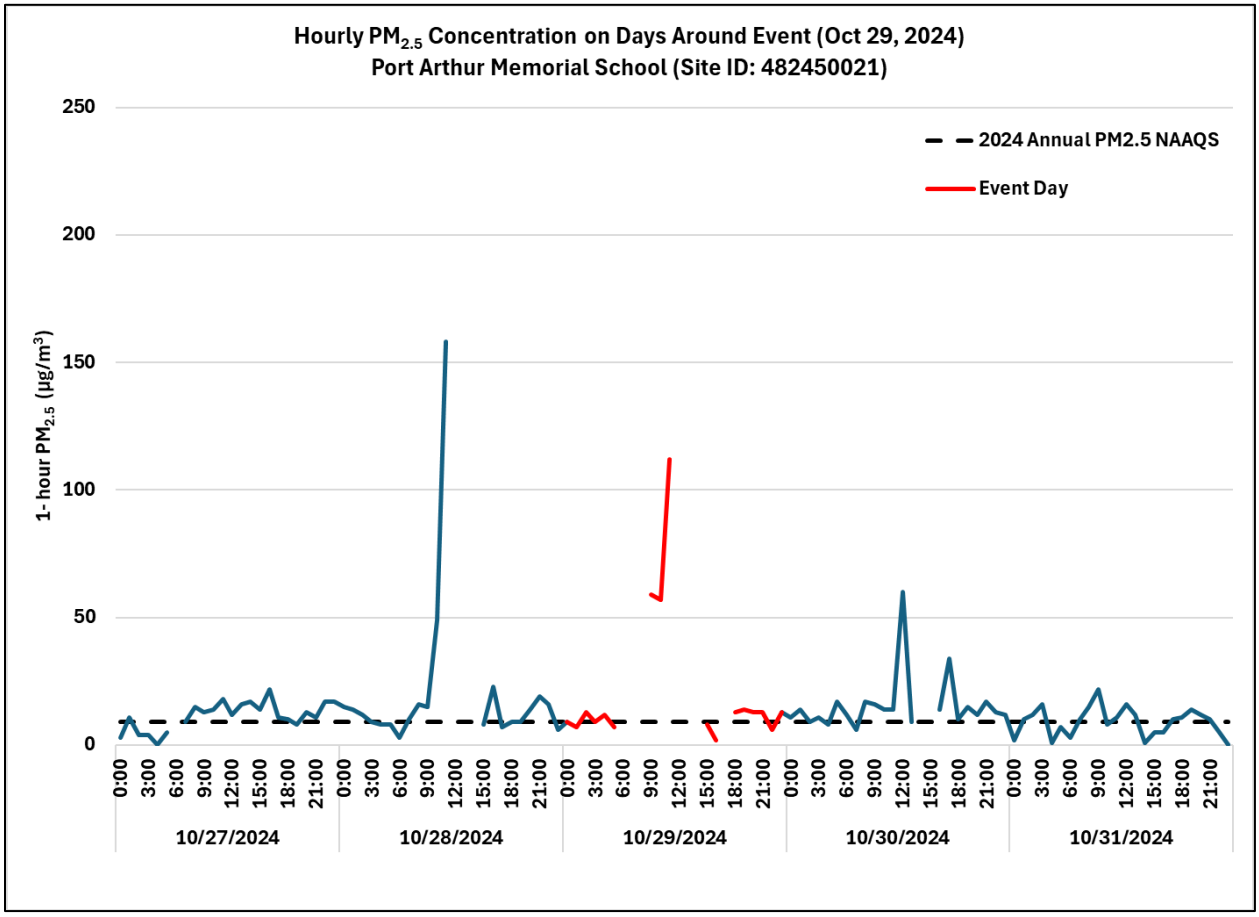

Figure 2-35: Hourly $PM_{2.5}$ Concentrations on Days around Event (October 29, 2024) for the Port Arthur Memorial School Monitor

On October 29, 2024, Jefferson County experienced a weak ridge of high pressure with light to moderate winds out of the southeast. Winds at the midlevel were light out of the north and slowed relative to winds on the previous day. These conditions allowed for smoke from agricultural fires along the lower Mississippi River Valley to slowly spread into Jefferson County and over the Port Arthur Memorial School monitor, where elevated $PM_{2.5}$ was recorded. Weather conditions on October 29, 2024, are presented in maps in Figure A-159 and Figure A-160.

Smoke in Jefferson County on October 29, 2024, is indicated in the NOAA HMS fire and smoke map (Figure A-161).

2.3.30 Group 30 – Summary of November 26, 2024, Prescribed Fire $PM_{2.5}$ Event

High $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor were due to prescribed fires in Louisiana on November 26, 2024. $PM_{2.5}$ concentrations on this day are shown in Figure 2-36: *Hourly $PM_{2.5}$ Concentrations on Days around Event (November 26, 2024) for the Port Arthur Memorial School Monitor.*

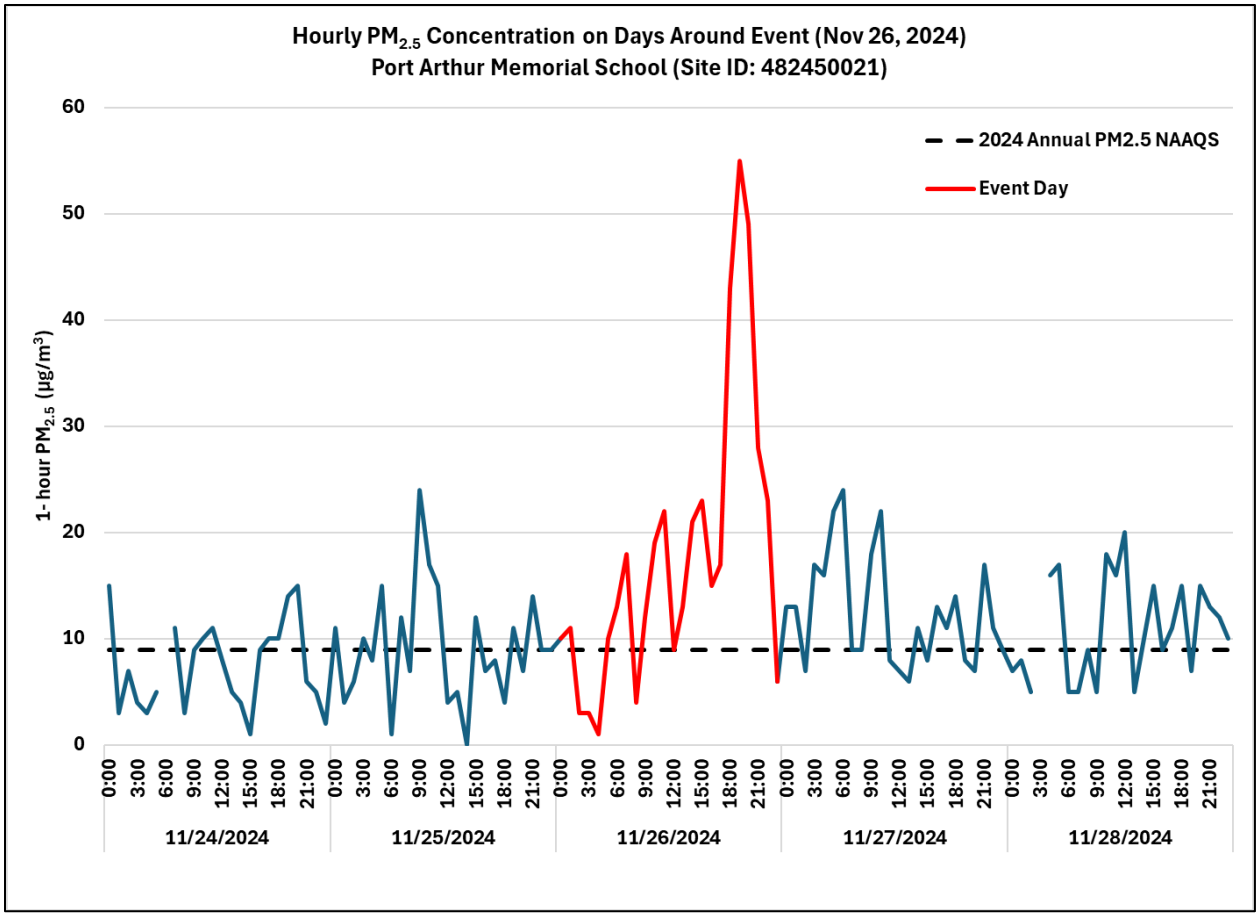

Figure 2-36: Hourly $PM_{2.5}$ Concentrations on Days around Event (November 26, 2024) for the Port Arthur Memorial School Monitor

On November 26, 2024, a cold front moved just off the coast of Jefferson County before stalling and retreating back northwest slightly into the evening hours. This pattern resulted in light to moderate winds with variation in direction throughout the day. Aloft, a strong zonal flow prevailed. The variable winds allowed for smoke from a wildfire in far southwest Louisiana to travel the short distance to Jefferson County and enhanced the $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor. Weather conditions on November 26, 2024, are presented in maps in Figure A-162 and Figure A-163.

Smoke in Jefferson County on October 28, 2024, is indicated in the NOAA HMS fire and smoke map (Figure A-164). The fires generating this smoke are unlikely to recur, as discussed in Sections 4 and 5.

SECTION 3: CLEAR CAUSAL RELATIONSHIP

3.1 OVERVIEW

This section satisfies the Exceptional Events Rule Requirements at 40 CFR §50.14(c)(3)(iv)(B) and 40 CFR §50.14(c)(3)(iv)(C): "The event affected air quality in such a way that there exists a clear, causal relationship between the specific event and the monitored exceedance(s) or violations(s); and analyses comparing the claimed event-influenced concentrations to concentrations at the same monitoring site(s) at other times."

The analyses presented in this section vary depending on the event type (Prescribed Fire, Wildland Fire, African Dust, and High Winds Events) as well the tier level, based on observed concentrations, associated with each event day. The analyses include a comparison of the event-related concentration to historical concentrations, evidence that the emissions from the events were transported to the monitor, and evidence that the events related emissions affected the monitor.

TCEQ determined the tier levels for the event days using EPA's *$PM_{2.5}$ Tiering Tool - for Exceptional Events Analysis.*[11] Tiering thresholds, established for each site, are used to classify event days as Tier 1 or Tier 2 or Tier 3 days. All 2023 event days are Tier 1 or Tier 2 days.

- Tier 1 event days are those when monitored $PM_{2.5}$ exceedances or violations are clearly influenced by causal events. Tier 1 event days require fewer pieces of evidence to establish the clear causal relationship. This tier is associated with a $PM_{2.5}$ concentration that is greater than or equal to 1.5x the tiering threshold.
- Tier 2 event days are those with $PM_{2.5}$ concentrations that are less extreme than Tier 1 days but still higher than concentrations on most non-event related concentrations, typically between 1 to 1.5x the tiering threshold. Tier 2 event days require more evidence than Tier 1 days to establish the clear causal relationship.

The determination of the appropriate tiering level began with an analysis of the measured $PM_{2.5}$ air quality associated with the candidate event in relation to historical concentrations. Distinct high levels of monitored 24-hour $PM_{2.5}$ concentrations were compared to historical monthly or annual 24-hour levels of $PM_{2.5}$. TCEQ compared the concentration of each event day to the lesser value with all "Request Exclusion" (R) qualifiers excluded of either (a) the most recent 5-year month-specific 98th percentile for 24-hour $PM_{2.5}$ data, or (b) the minimum annual 98th percentile for 24-hour $PM_{2.5}$ data for the most recent 5-year period.

Figure 3-1: *24-Hour $PM_{2.5}$ Concentrations, 2022, 2023, and 2024 Event days and Tier 1 and Tier 2 Thresholds for the Port Arthur Memorial School Monitor* illustrates the 24-hour $PM_{2.5}$ concentrations on 2022, 2023, and 2024 event days compared to non-event days relative to the Tier levels for the monitor.

[11] https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis

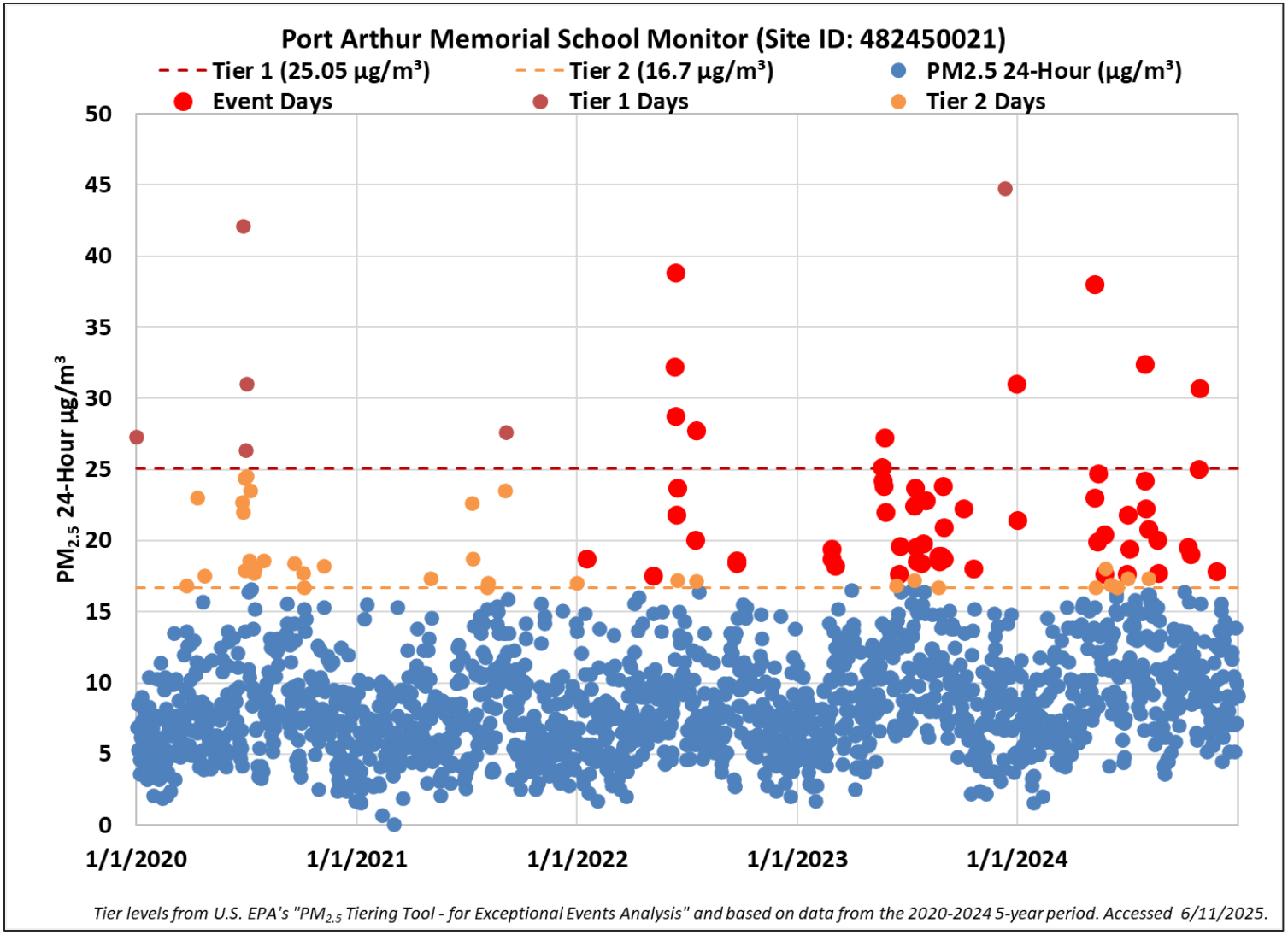

Figure 3-1: 24-Hour $PM_{2.5}$ Concentrations, 2022, 2023, and 2024 Event days and Tier 1 and Tier 2 Thresholds for the Port Arthur Memorial School Monitor

3.2 CLEAR CAUSAL EVIDENCE

In addition to Figure 3-1, which shows 24-hour $PM_{2.5}$ concentrations on event and non-event days at the monitor, additional data are used to demonstrate a clear causal relationship between the $PM_{2.5}$ concentrations observed on an event day and the identified exceptional event. Imagery and data used for the clear causal evidence come from the following sources:

- Air parcel trajectories were produced using the National Oceanic and Atmospheric Administration (NOAA) Applied Research Laboratory (ARL) HYSPLIT model available on the ARL HYSPLIT webpage: https://www.arl.noaa.gov/hysplit/. HYSPLIT models simulate the dispersion and trajectory of substances transported and dispersed through the atmosphere over local to global scales. The backward trajectory analyses presented in this document were used to determine the origin of air masses and establish source-receptor relationships.
  - For the combined trajectory and fire maps, these trajectories show the modeled path of the air mass from 72 hours arriving at different heights (100 meters, 500 meters, 800 meters above ground level (AGL)) to the monitor and arriving at the hour with the highest concentration on the relevant date. The meteorological data input used for these trajectories comes from the Global Data Assimilation System (GDAS), which is run by the National Weather Service's National Centers for Environmental Prediction (NCEP). Additional information is available at: https://www.ready.noaa.gov/gdas1.php.
  - For the dust trajectories from Africa, forward trajectories were started from a matrix that was placed over western Africa. With the matrix utility, the user specifies the southwest point and northeast point of a four-sided polygon as well as the time at which trajectories are to be generated. When the matrix utility is run, trajectories for all points within the polygon are simultaneously initiated. In this application, there were approximately 200 trajectory starting points. The duration of each trajectory was 240 to 360 hours (10 to 15 days) depending on how long it took for the air parcels to reach Texas. The meteorological data input used is also GDAS.
  - For forward trajectories on days impacted by fires in Mexico/Central America, trajectories were started 72 hours ahead of the event day at 500 meters AGL using the GDAS meteorological data.
  - For forward trajectories on days impacted by, Prescribed Fires or Wildfires in the U.S., trajectories were started 12,24, 48, or 72 hours ahead of the event day based on event type at 500 meters AGL using the GDAS meteorological data.
- Hourly $PM_{2.5}$ event concentrations were compared with typical concentrations (Tier 3 median) for each hour. A "typical" concentration was defined as the median hourly $PM_{2.5}$ concentration at a particular monitor for all Tier 3 dates that had available data from 2020 through 2024. Tier 1 and Tier 2 dates were not included in this dataset because these two classifications are commonly associated with exceptional events and were therefore not considered as "typical." Tiering classifications were based on 2020 through 2024 data available via the EPA's tiering tool: https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis. Data are from Texas Air Monitoring System (TAMIS) files sourced from EPA's Air Quality System (AQS) Raw Data Report: https://www.epa.gov/outdoor-air-quality-data. Data were downloaded on June 2, 2025.
- Smoke plume maps are from the AirNow Fire and Smoke Map: https://fire.airnow.gov/.[12] This map also shows the Air Quality Index (AQI) for each monitor. Additional information about AQI is available on the AirNow website: https://www.airnow.gov/aqi/aqi-basics/.

[12] AirNow is a partnership of the U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration (NOAA), National Park Service, NASA, Centers for Disease Control, and tribal, state, and local air quality agencies.

- Media reports and TCEQ forecast discussions are provided in Appendix C. Media report links are referenced with the figure. TCEQ forecasts for event days are archived and available at: https://amdaftp.tceq.texas.gov/exceptional_events/.
- Satellite imagery from NASA Worldview: https://worldview.earthdata.nasa.gov/ was captured using Corrected Reflectance (True Color) layers from the MODIS (Moderate Resolution Imaging Spectroradiometer) instrument on either Aqua or Terra satellites. The Terra satellite travel north to south across the equator in the late morning where the Aqua satellite travels south to north across the equator in the early afternoon. The satellites used for each event date were chosen based on the best representation of potential evidence.

3.2.1 Group 1 – Evidence for January 17, 2022, Prescribed Fire $PM_{2.5}$ Event

January 17, 2022, was identified as a Tier 2 day at the Port Arthur Memorial School monitor due to smoke from prescribed fires in Texas and Louisiana. The 24-hour concentration was 18.7 µg/m^3 with the highest hourly value recorded at 17:00, as shown in Figure 3-2: *Hourly $PM_{2.5}$ Concentrations on January 17, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor*.

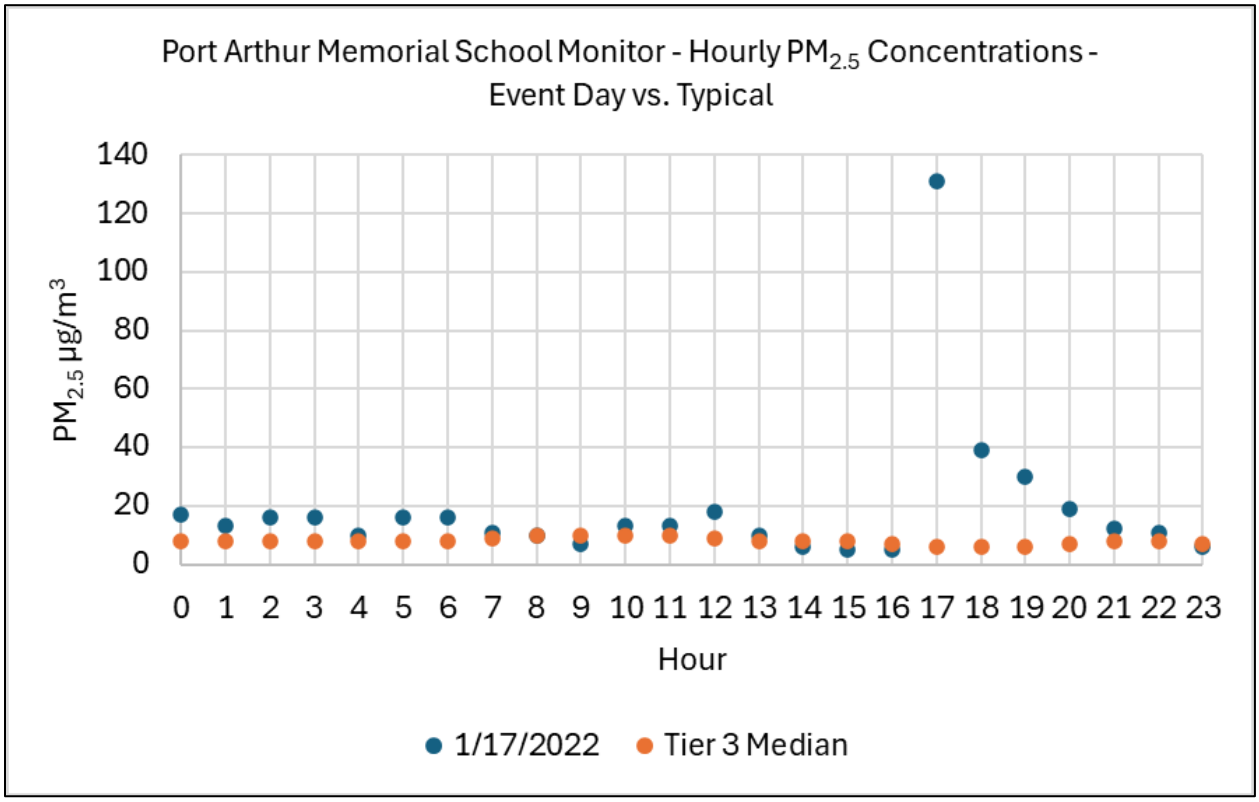

Figure 3-2: Hourly $PM_{2.5}$ Concentrations on January 17, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

The TCEQ forecast discussion mentions seasonal burning activity across the southeastern U.S., including eastern Texas (Table C-1). The smoke plume from AirNow (Figure 3-3: *AirNow HMS Smoke Plume for January 17, 2022* Figure 3-3:) shows smoke in the vicinity of Jefferson County in southeast Texas and near the Texas/Louisiana border. Satellite imagery (Figure 3-4: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from January 17, 2022, Showing Smoke in the Gulf of America near the Louisiana Border in Jefferson County*) displays smoke primarily visible where Jefferson County meets the Gulf of America. Back trajectories (Figure 3-5: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port*

Arthur Memorial School Monitor on January 17, 2022) indicate transport along the Texas/Louisiana border and beyond through multiple fire locations. HYSPLIT forward trajectories (Figure 3-6: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Texas and Louisiana with Fires, Starting on January 14, 2022*) show winds traveling from areas in southern Louisiana where there were multiple fires to the north where they ultimately shift to the south and go through additional fires prior to reaching Jefferson County and continuing into the Gulf of America.

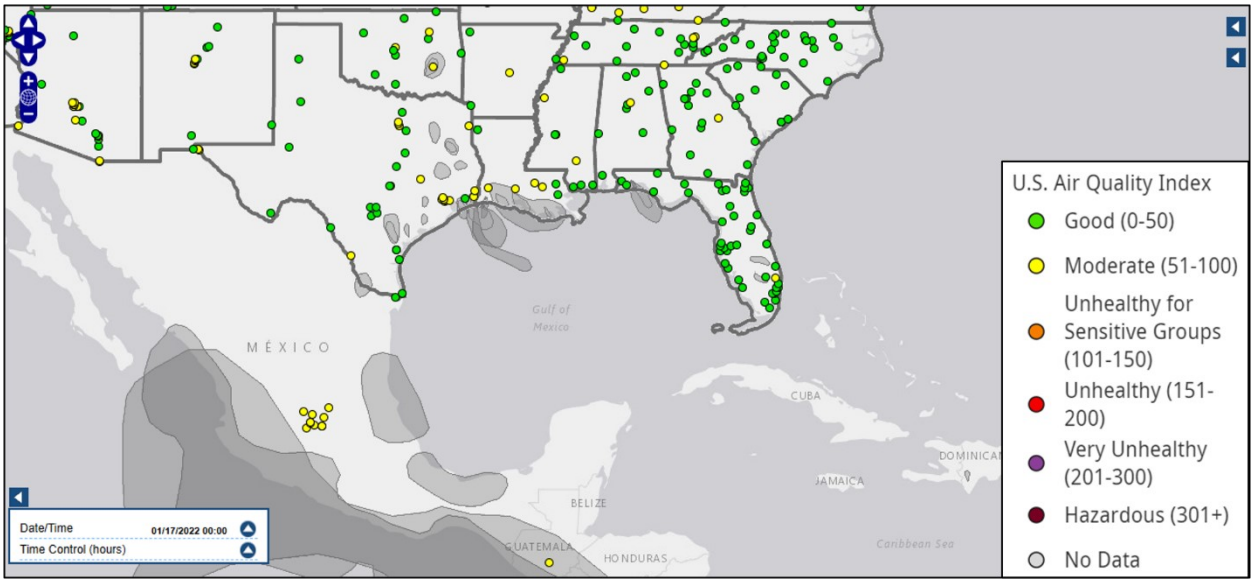

Figure 3-3: AirNow HMS Smoke Plume for January 17, 2022

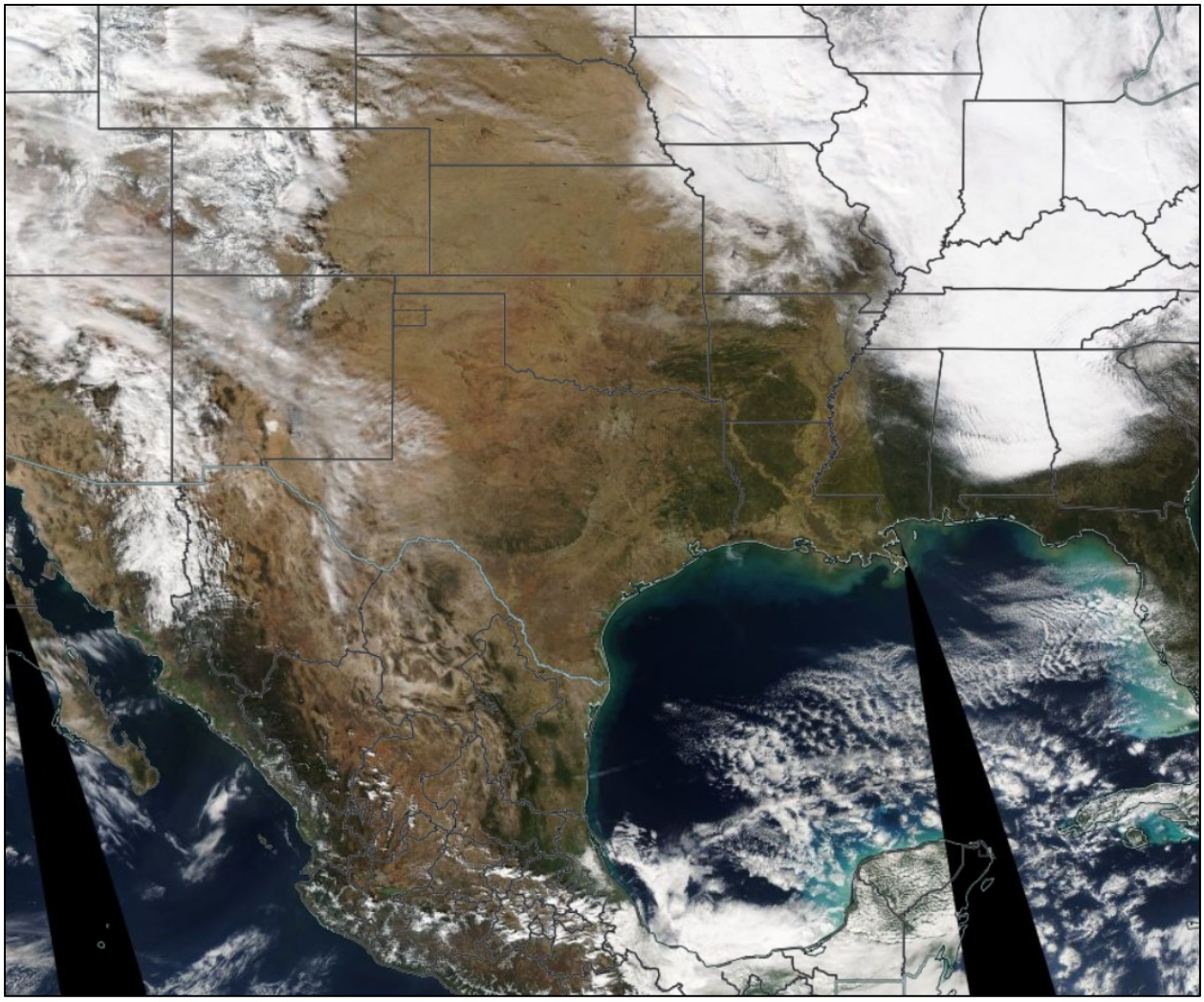

Figure 3-4: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from January 17, 2022, Showing Smoke in the Gulf of America near the Louisiana Border in Jefferson County

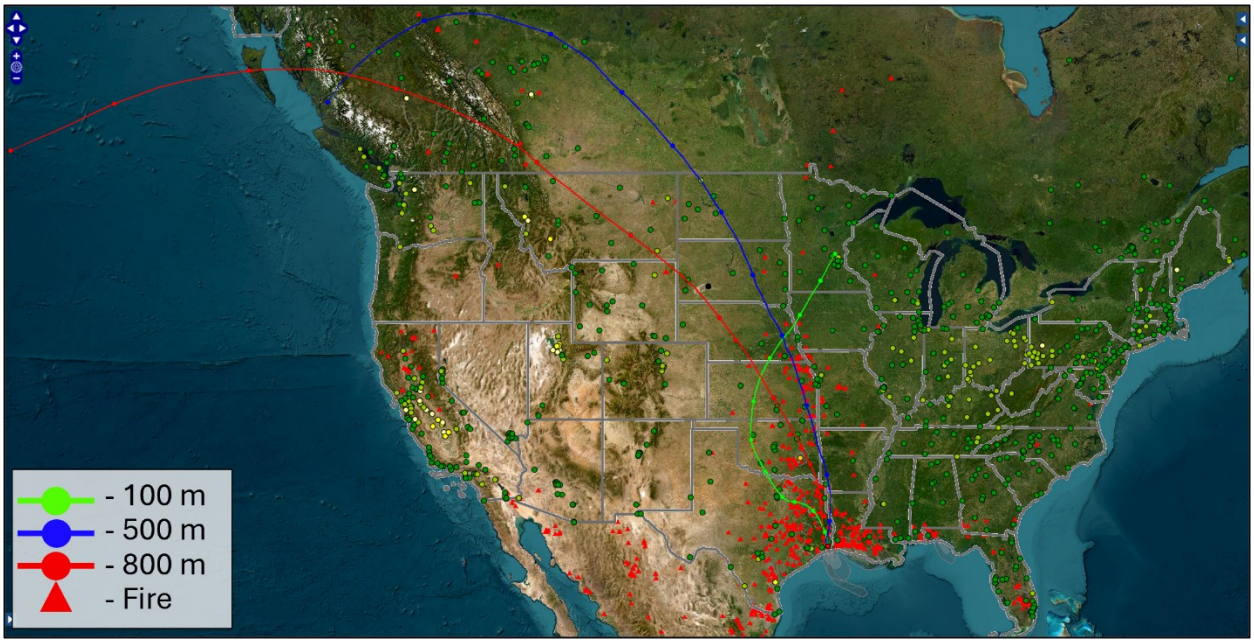

Figure 3-5: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on January 17, 2022

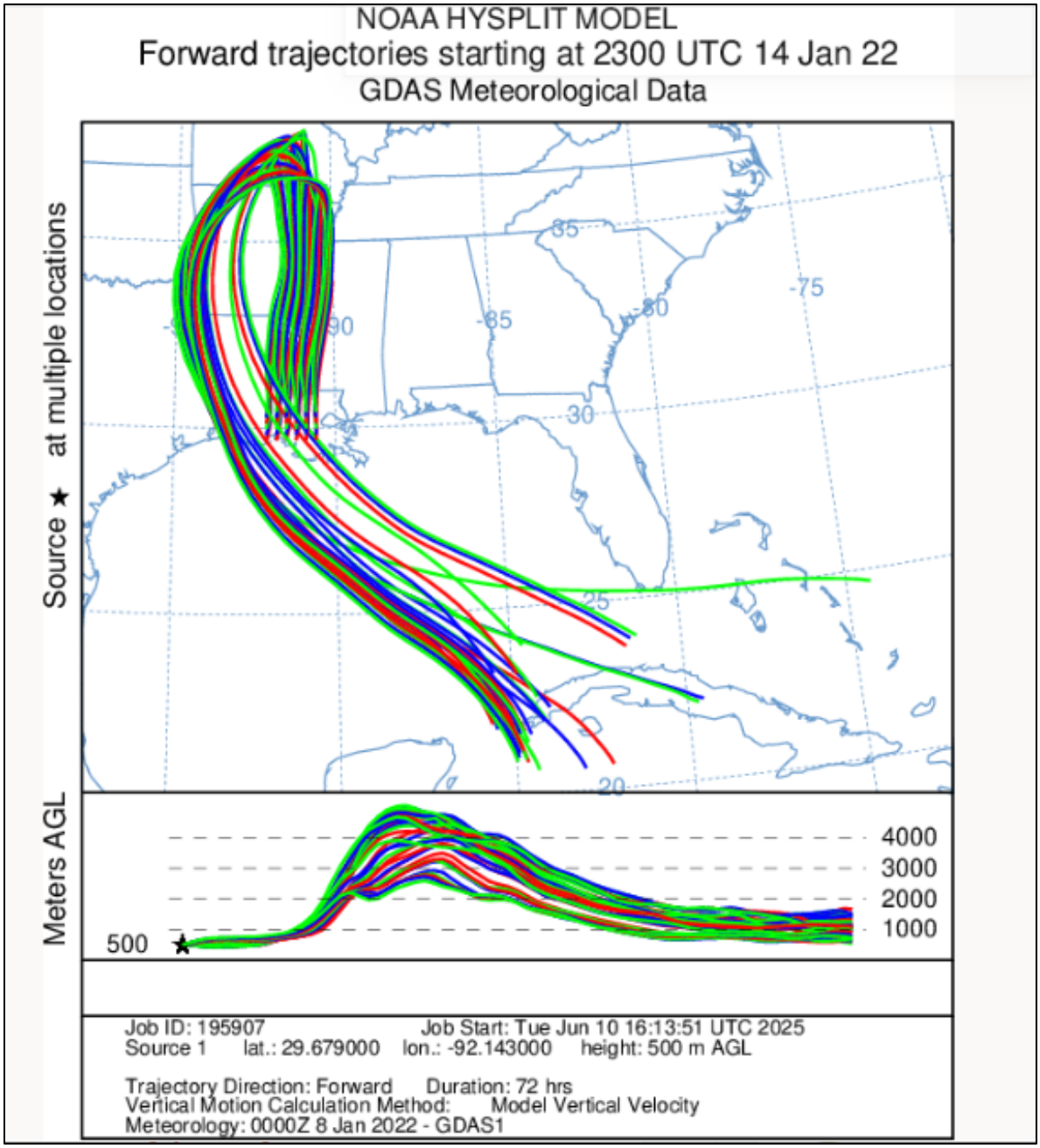

Figure 3-6: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Texas and Louisiana with Fires, Starting on January 14, 2022

3.2.2 Group 2 – Evidence for May 8, 2022, Fire (Mexico/Central America) $PM_{2.5}$ Event

May 8, 2022, was identified as a Tier 2 day at the Port Arthur Memorial School Monitor due to smoke from fires in Mexico and Central America. The 24-hour exceedance concentration was 17.5 µg/m^3, with the highest concentrations of $PM_{2.5}$ recorded in the first half of the day, as seen on the hourly concentration graph Figure 3-7: *Hourly $PM_{2.5}$ Concentrations on May 8, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor*).

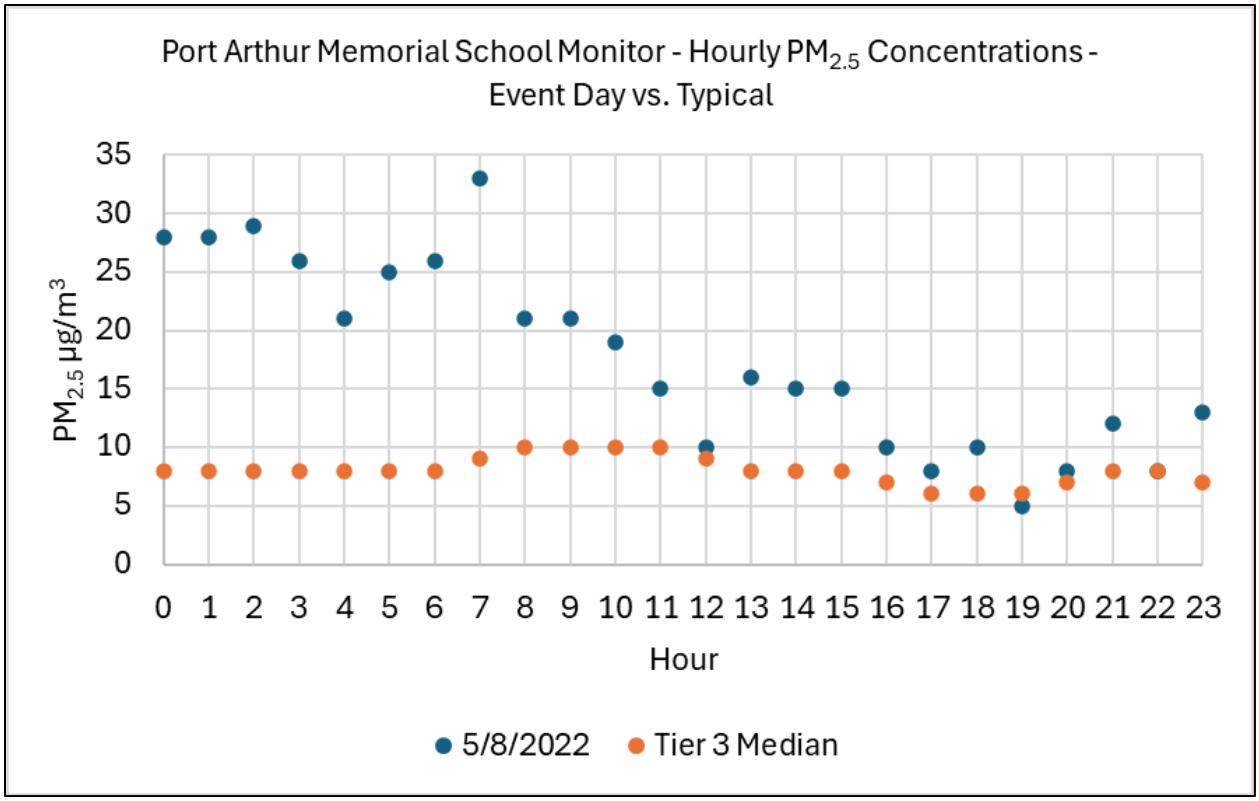

Figure 3-7: Hourly $PM_{2.5}$ Concentrations on May 8, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

The TCEQ forecast (Table C-2) describes residual smoke in southeast Texas from agricultural burning in Mexico. The smoke plume from AirNow (Figure 3-8: *AirNow HMS Smoke Plume for May 8, 2023*) shows smoke over the Gulf of America that continues into East Texas. Satellite imagery Figure 3-9: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 8, 2022, Showing Haze from Smoke over the Gulf of America* displays hazy conditions from smoke over the Gulf of America that continues into Texas. Back trajectories from the Port Arthur Memorial School monitor (Figure 3-10: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 8, 2022*) indicate transport from Mexico over the Gulf of America and into Texas. Figure 3-11: *NOAA HYSPLIT 72-Hour Forward Trajectories from Areas in Mexico with Fires, Starting on May 5, 2022*) shows winds traveling from the Yucatan Peninsula in Mexico, the site of multiple fires, over the Gulf of America and into Texas.

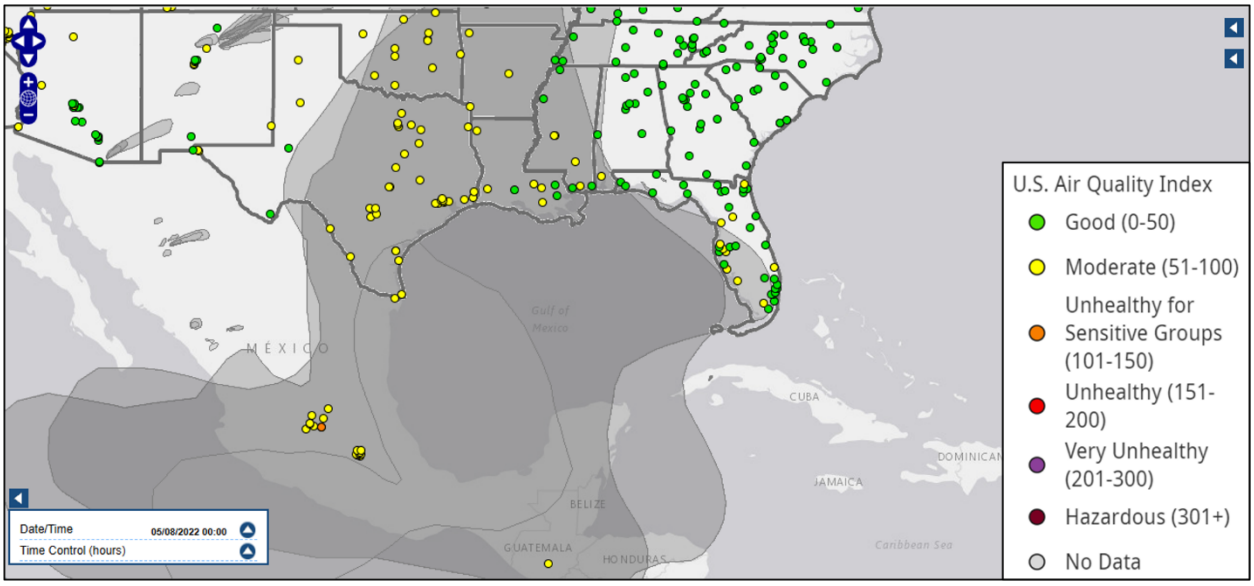

Figure 3-8: AirNow HMS Smoke Plume for May 8, 2022

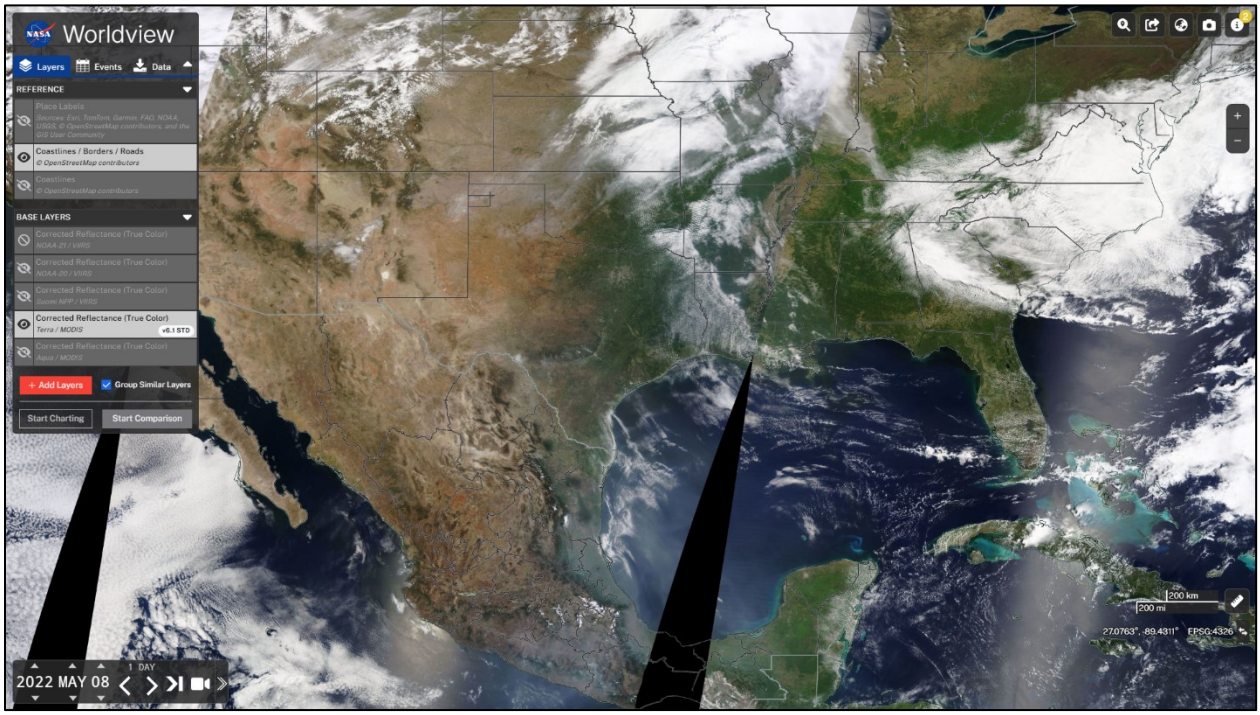

Figure 3-9: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 8, 2022, Showing Haze from Smoke over the Gulf of America

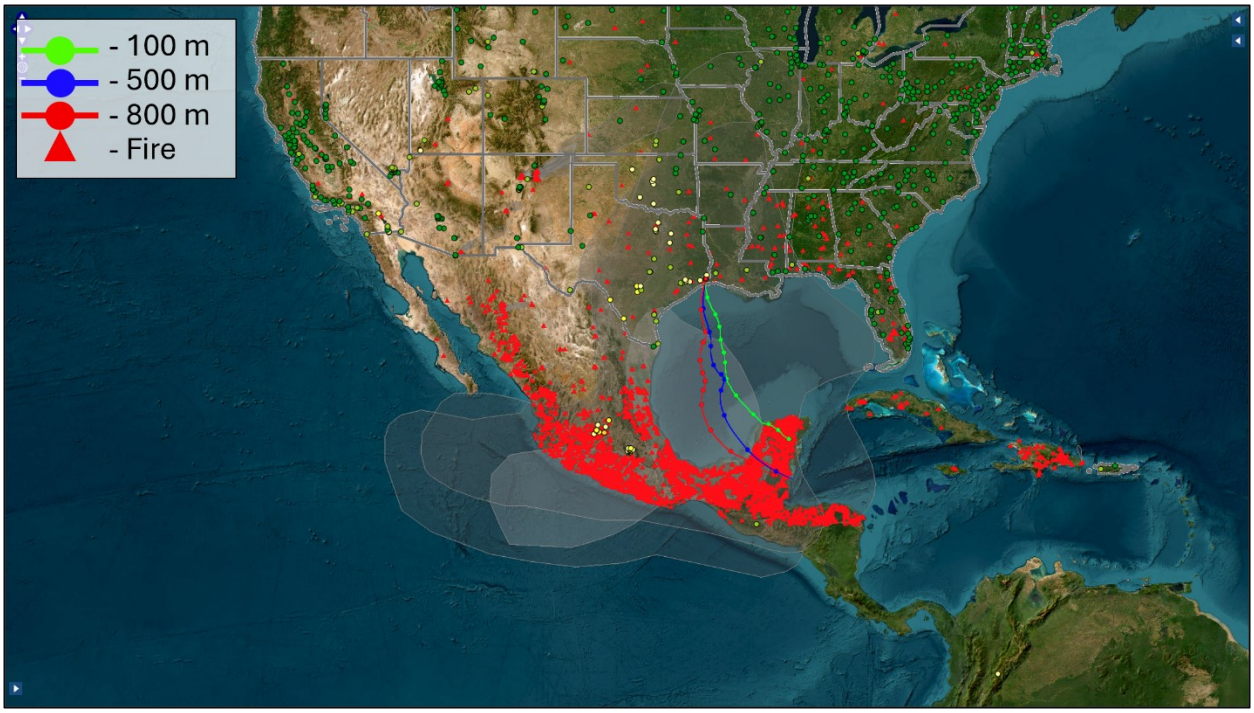

Figure 3-10: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 8, 2022

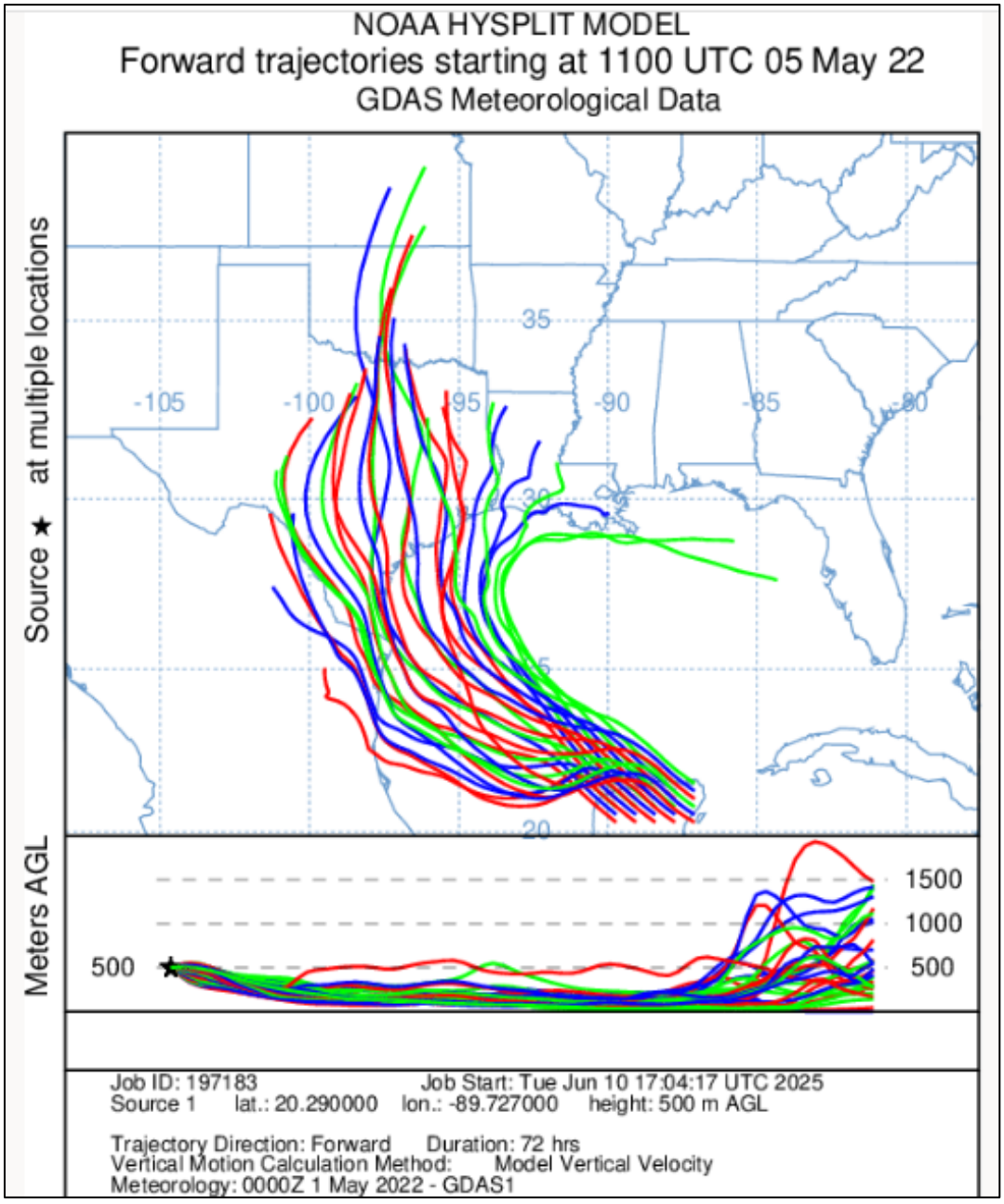

Figure 3-11: NOAA HYSPLIT 72-Hour Forward Trajectories from Areas in Mexico with Fires, Starting on May 5, 2022

3.2.3 Group 3 – Evidence for June 12, 2022, through June 16, 2022, African Dust $PM_{2.5}$ Event

June 12, June 13, and June 14, 2022, were identified as Tier 1 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 32.2 µg/m^3, 38.8 µg/m^3, and 28.7 µg/m^3, respectively. June 15 and June 16, 2022, were identified as Tier 2 days with respective 24-hour $PM_{2.5}$ concentrations of 21.8 µg/m^3 and 23.7 µg/m^3. These elevated concentrations were a result of African dust.

The TCEQ forecast for June 12, 2022 (Table C-3) mentions Saharan dust moving north and west into Texas in addition to residual smoke from seasonal burning in southeast Texas. The

forecast further mentions the prospect of smoke in south Texas from seasonal burning and gas flaring in Mexico and Central America. Figure 3-12: *Hourly $PM_{2.5}$ Concentrations on June 12, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations were always above those classified as typical at this monitor, and concentrations were at their highest in the afternoon and the night. The aerosol optical depth map (Figure 3-13: *AirNow Tech Aerosol Optical (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 12, 2022*) shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. *Figure 3-14: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 12, 2022, Showing Haze from Dust in the Gulf of America* shows hazy conditions in the Gulf of America. Figure 3-15: *AirNow Tech HYSPLIT Backward Trajectories Originating from the Port Arthur Memorial School Monitor on June 12, 2022,* shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-16: *NOAA HYSPLIT 15-Day Trajectories Originating from the Saharan Desert Starting on May 28, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-1) from San Antonio published on June 11, 2022, mentions the expectation that African dust would impact Texas on June 12, 2022.

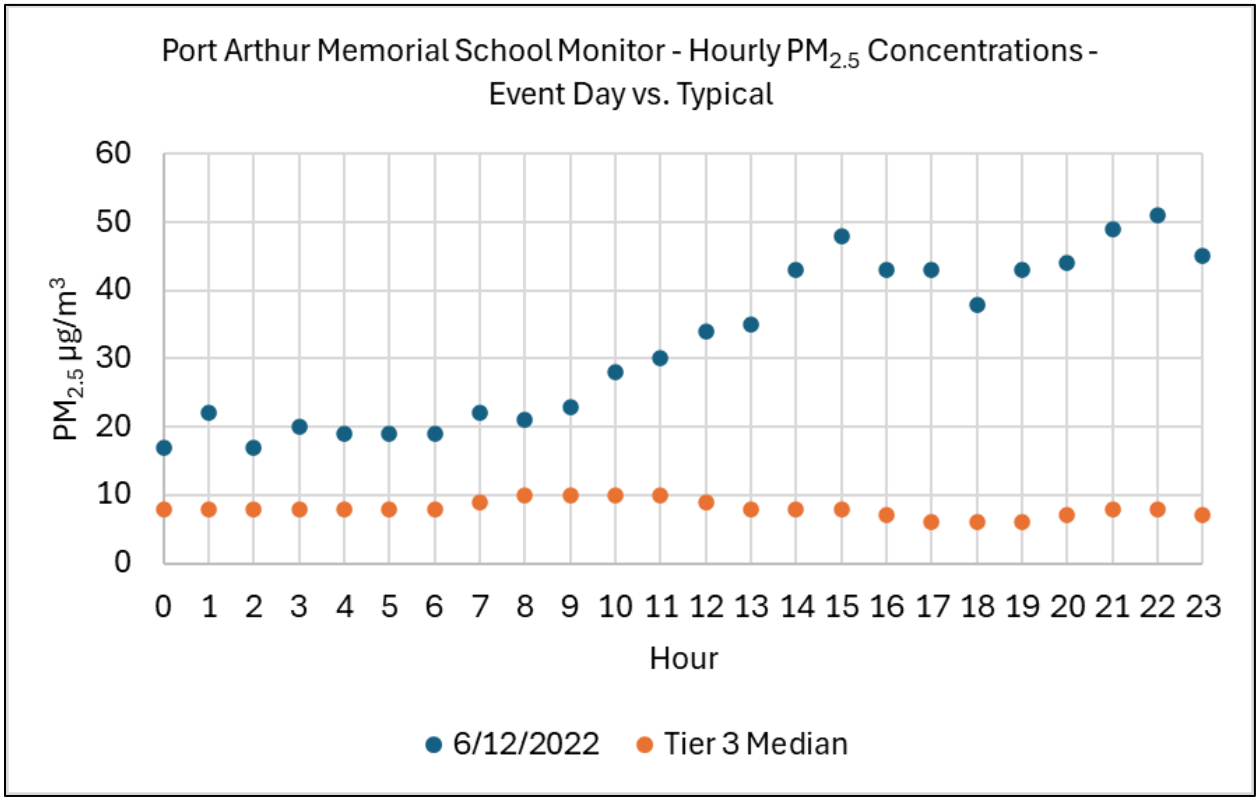

Figure 3-12: Hourly $PM_{2.5}$ Concentrations on June 12, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

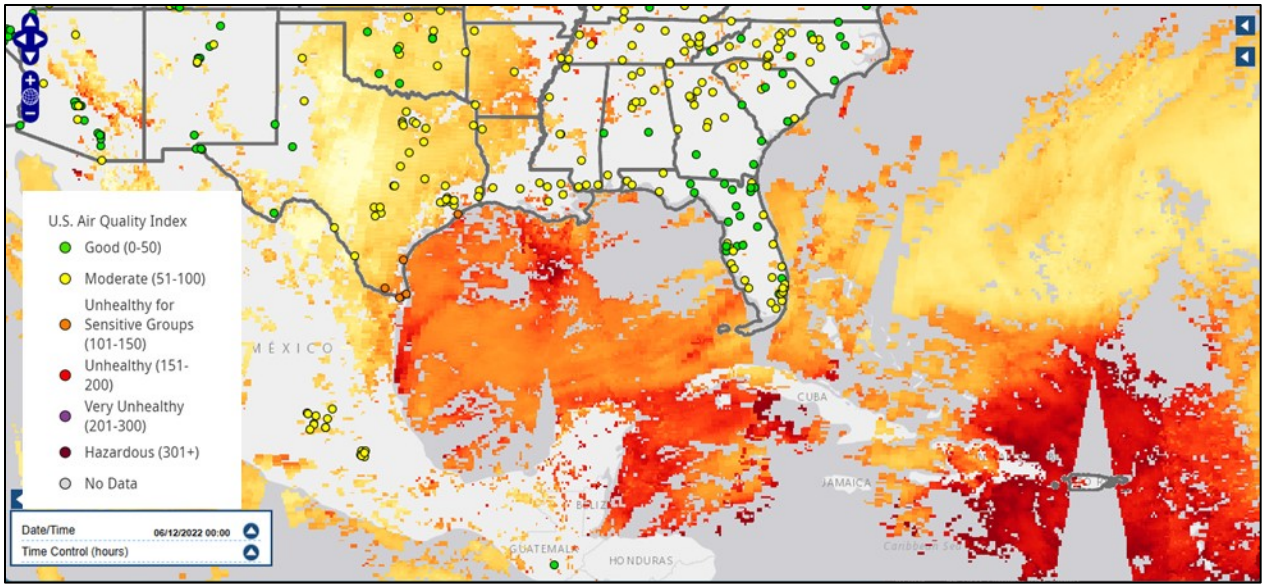

Figure 3-13: AirNow Tech Aerosol Optical (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 12, 2022

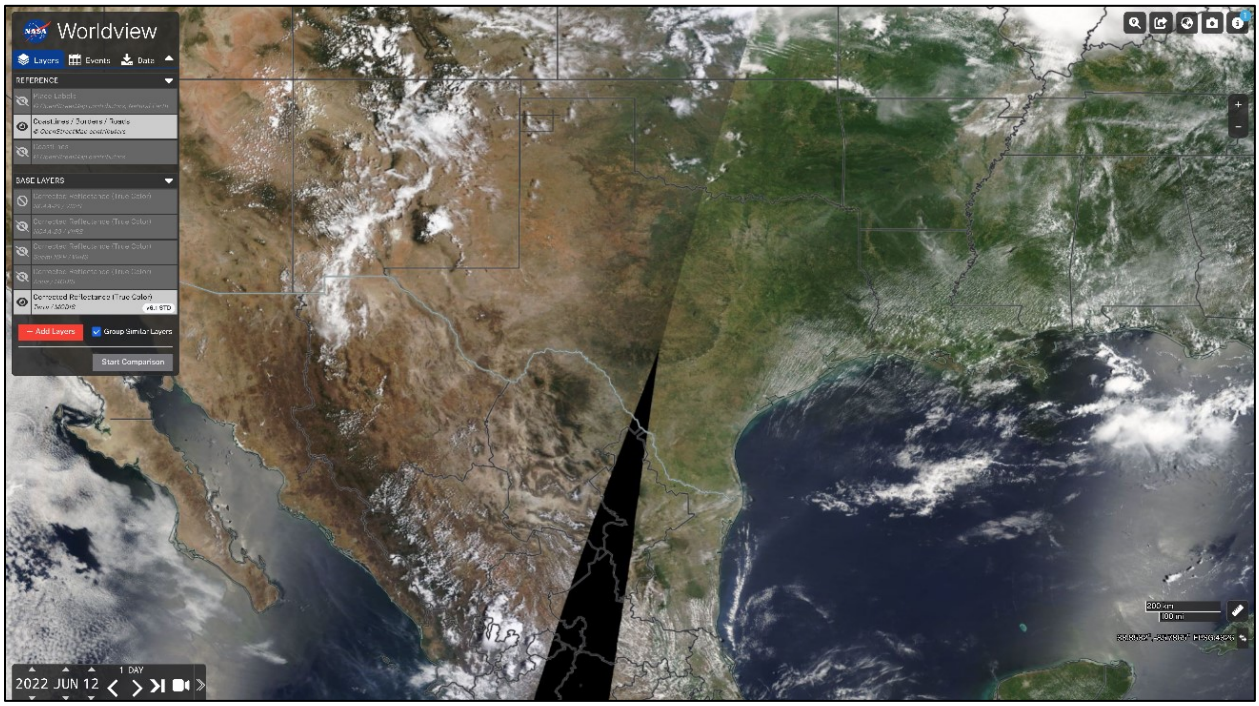

Figure 3-14: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 12, 2022, Showing Haze from Dust in the Gulf of America

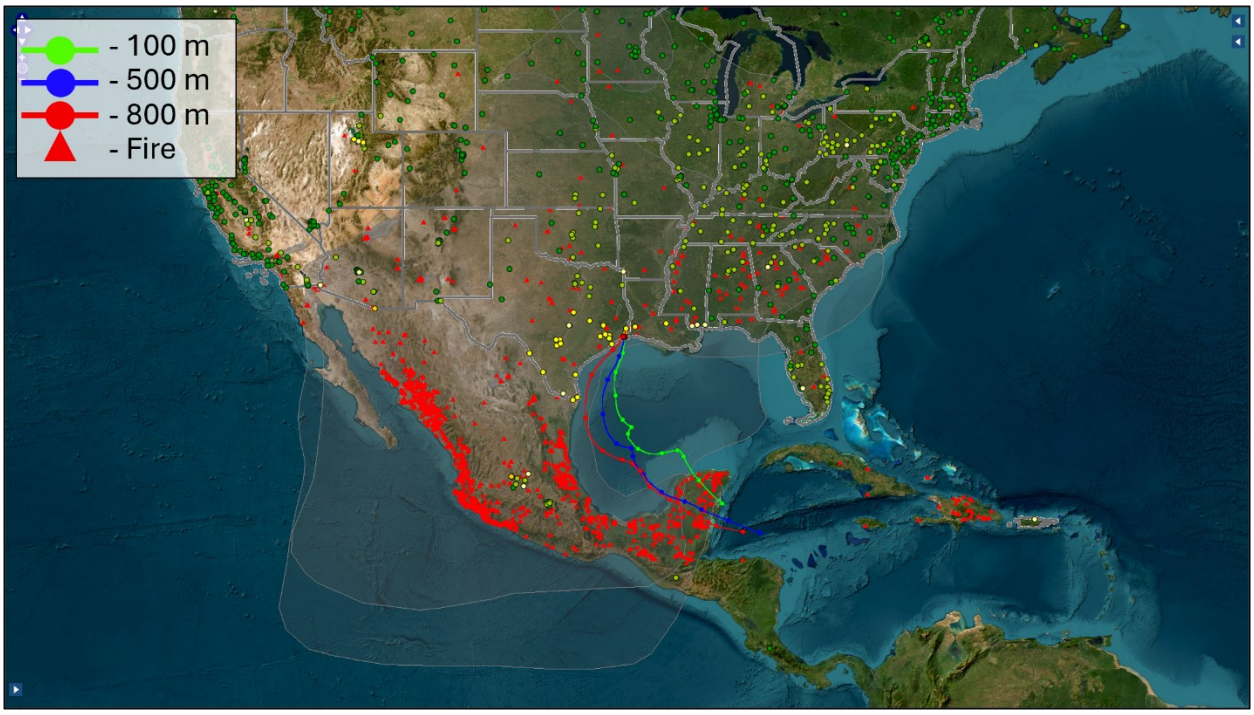

Figure 3-15: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on June 12, 2022

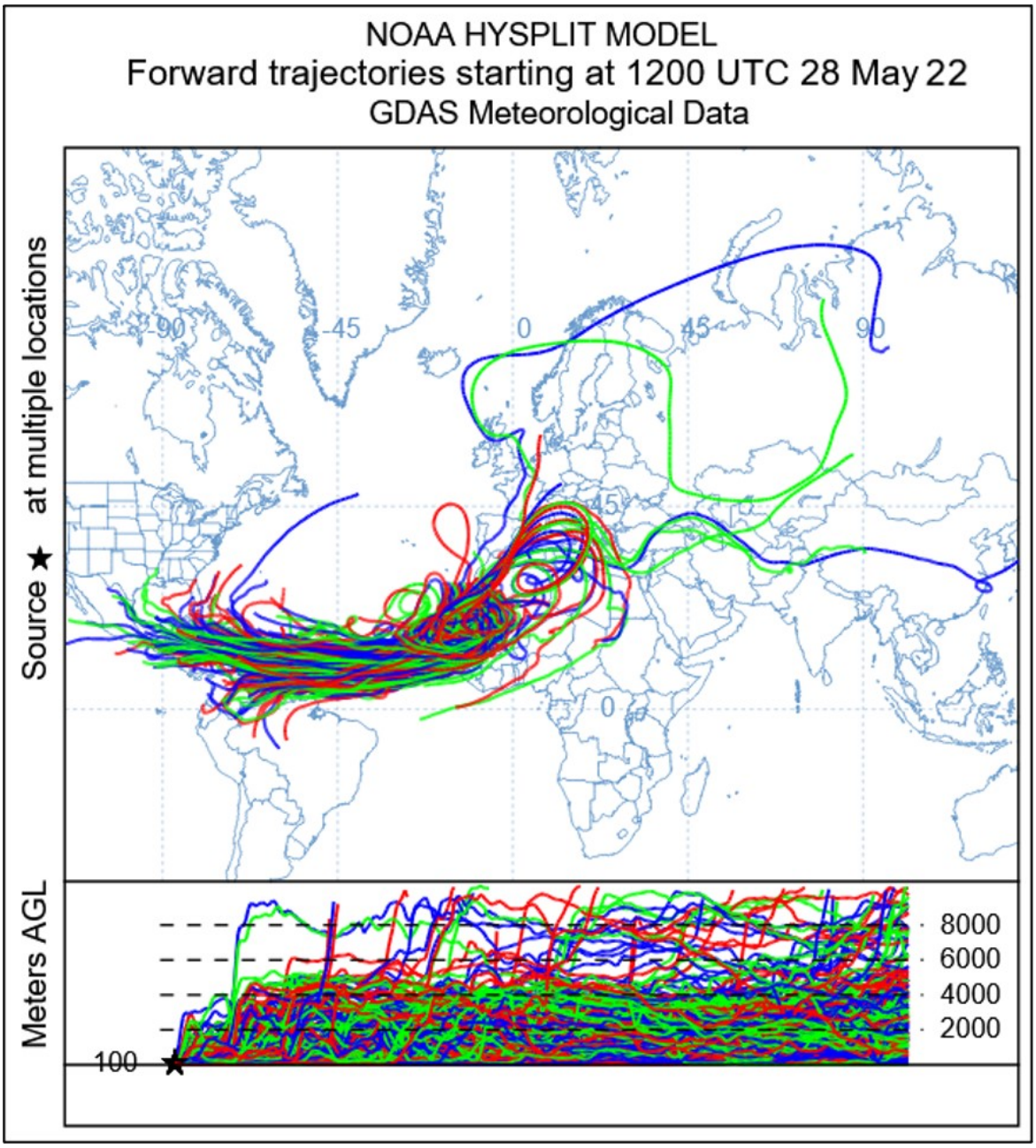

Figure 3-16: NOAA HYSPLIT 15-Day Forward Trajectories Originating from the Saharan Desert Starting on May 28, 2022

The TCEQ forecast for June 13, 2022 (Table C-3) references heavy Saharan dust filtering throughout the majority of the state, with the exception of the Texas Panhandle and far west Texas. Figure 3-17: *Hourly $PM_{2.5}$ Concentrations on June 13, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations were always above those classified as typical at this monitor, and concentrations were at their highest at 13:00 local time. The aerosol optical depth map (Figure 3-18: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua* Satellite *Layers on June 13, 2022*) shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with Unhealthy for Sensitive Groups AQI levels in East Texas. Figure 3-19: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 13, 2022, Showing Haze from Dust in Gulf of America* shows

hazy conditions in the Gulf of America. Figure 3-20: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on June 13, 2022,* shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-21: *NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on May 29, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-2) published on June 13, 2022, from a north Texas news outlet, mentions the expectation that African dust would impact Texas during the week. Similarly, a media report from Austin (Figure C-3) published on June 13, 2022, references that Saharan dust had returned and was expected to remain for the next week and contribute to hazy views and a drop in air quality.

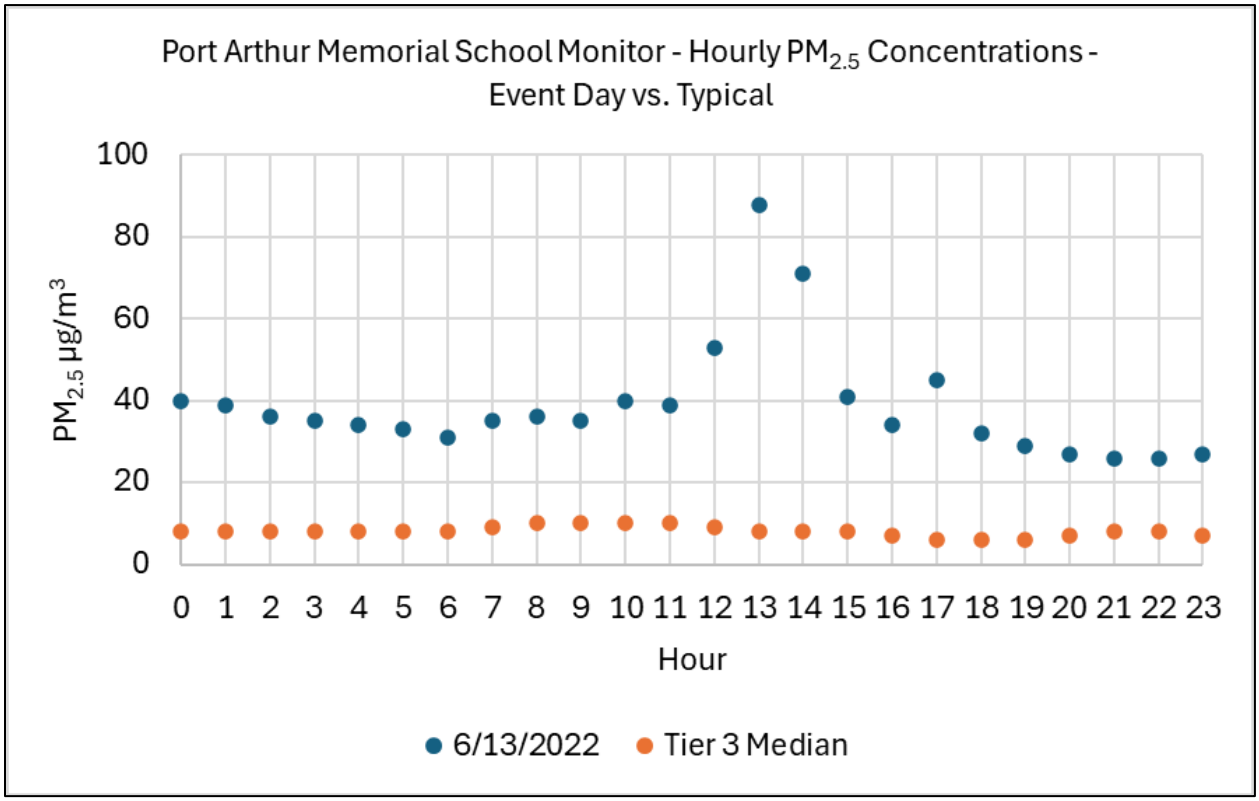

Figure 3-17: Hourly $PM_{2.5}$ Concentrations on June 13, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

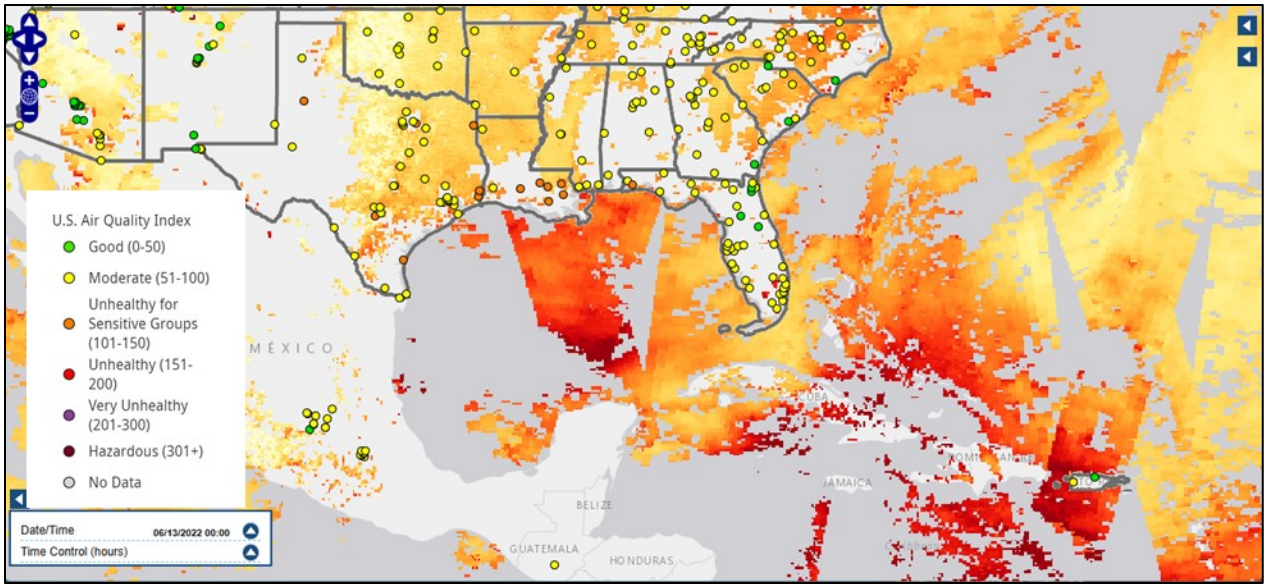

Figure 3-18: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 13, 2022

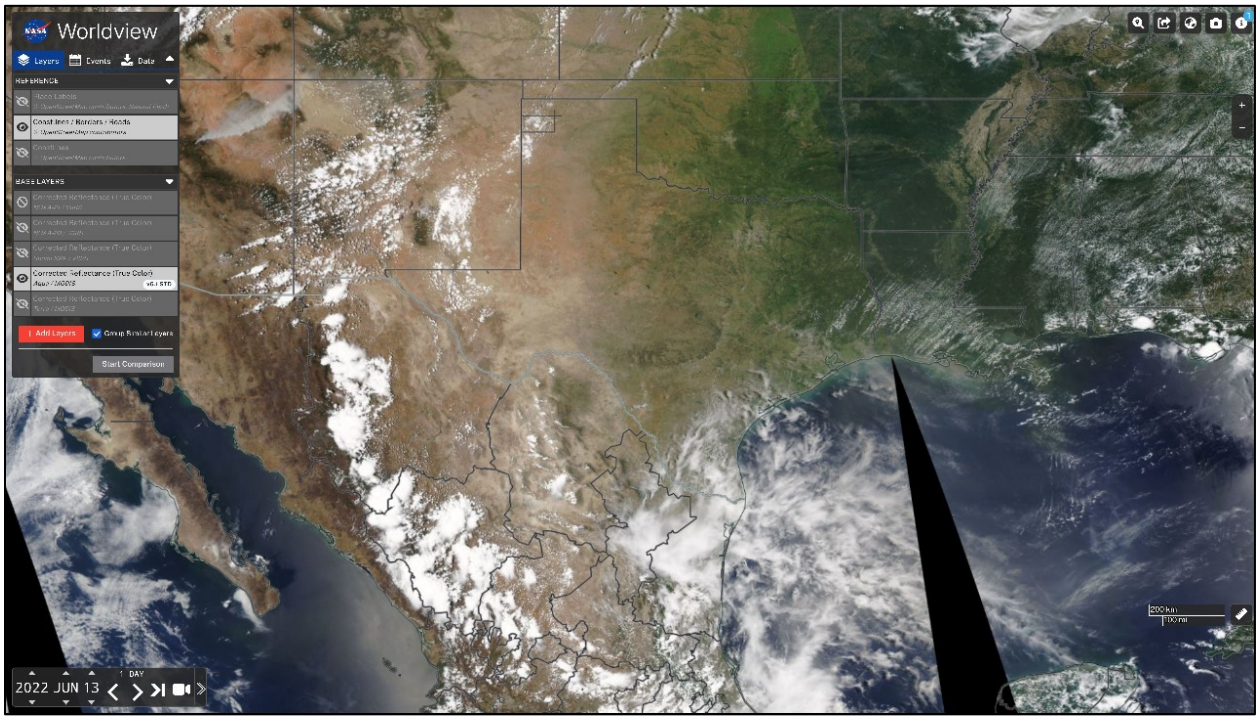

Figure 3-19: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 13, 2022, Showing Haze from Dust in Gulf of America

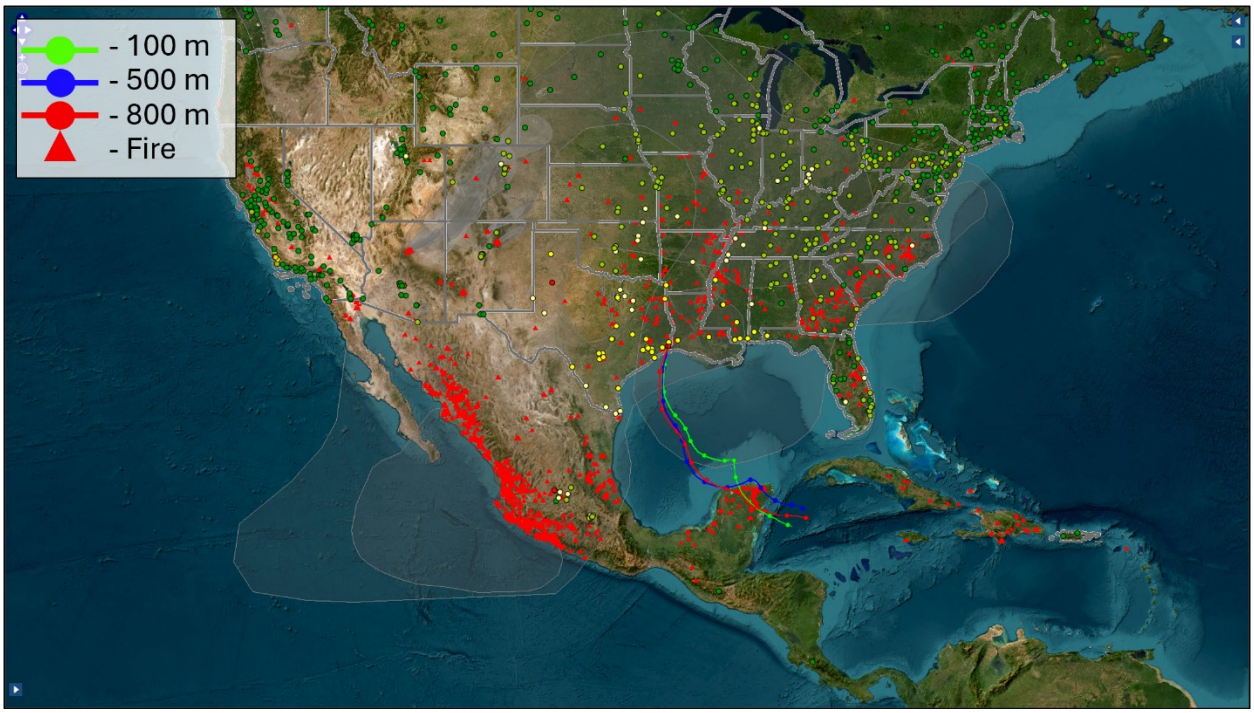

Figure 3-20: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on June 13, 2022

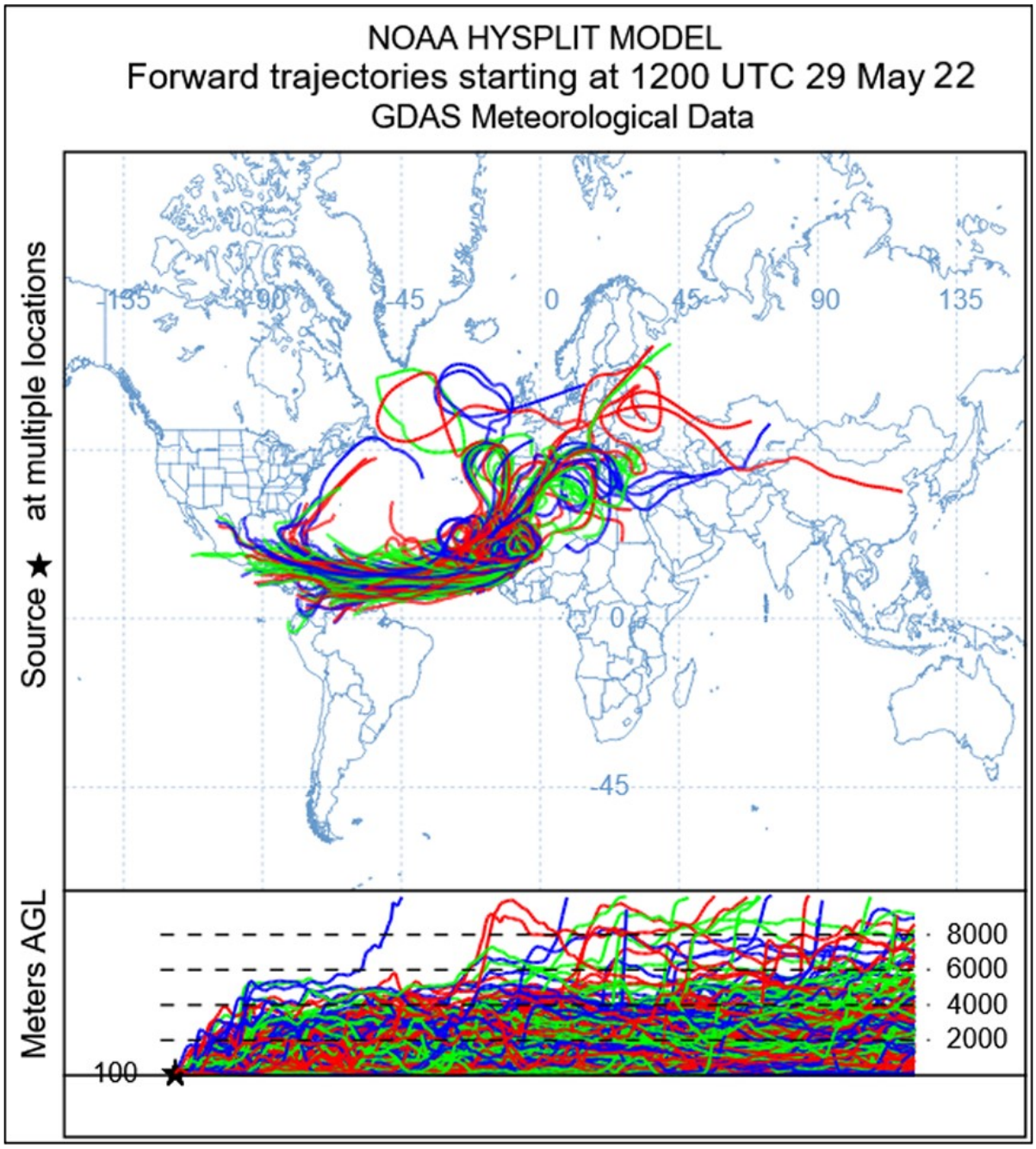

Figure 3-21: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on May 29, 2022

The TCEQ forecast for June 14, 2022 (Table C-3), references a dense Saharan dust plume expected to continue filtering through Texas. Figure 3-22: *Hourly $PM_{2.5}$ Concentrations on June 14, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations were always above those classified as typical at this monitor, and concentrations were at their highest at 06:00 local time. The aerosol optical depth map (Figure 3-23: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 14, 2022*) shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-24: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 14, 2022, Showing Haze from Dust in Gulf*

of America shows hazy conditions in the Gulf of America. Figure 3-25: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on June 14, 2022*, shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-26: *NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on May 31, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-4) published on June 14, 2022, from a Waco news outlet, references hazy conditions and Saharan dust in Texas.

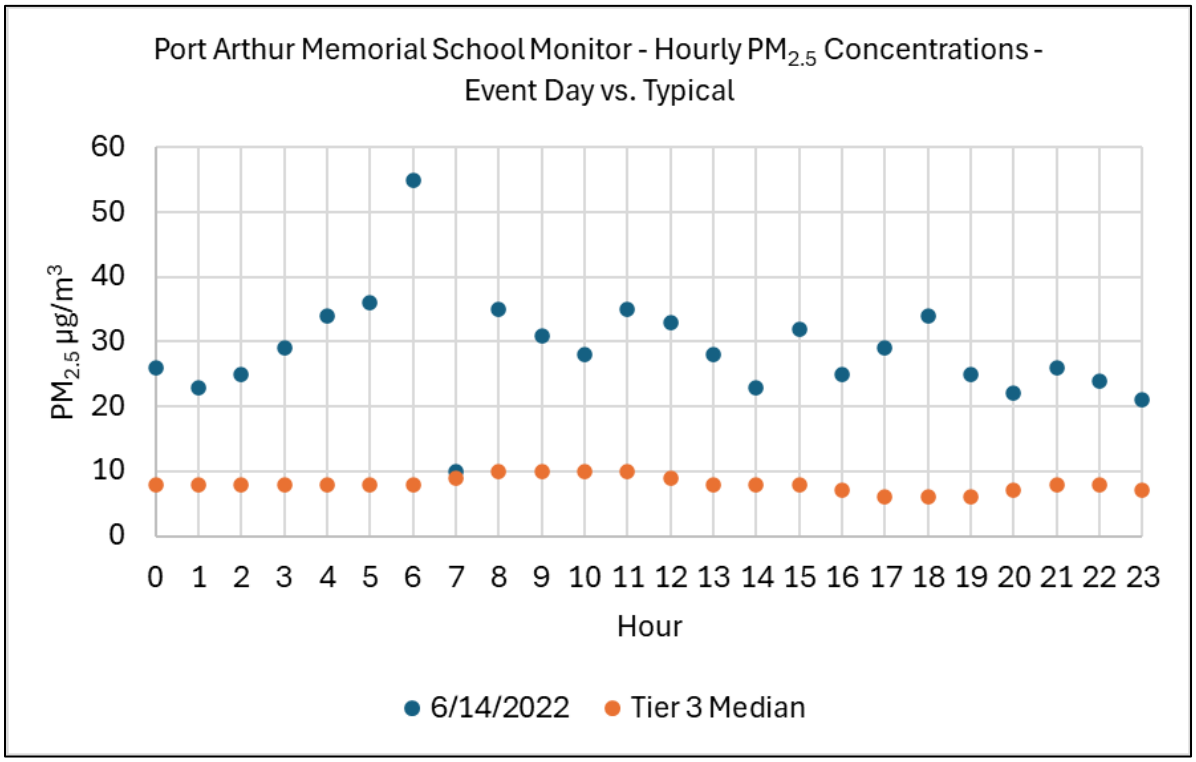

Figure 3-22: Hourly $PM_{2.5}$ Concentrations on June 14, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

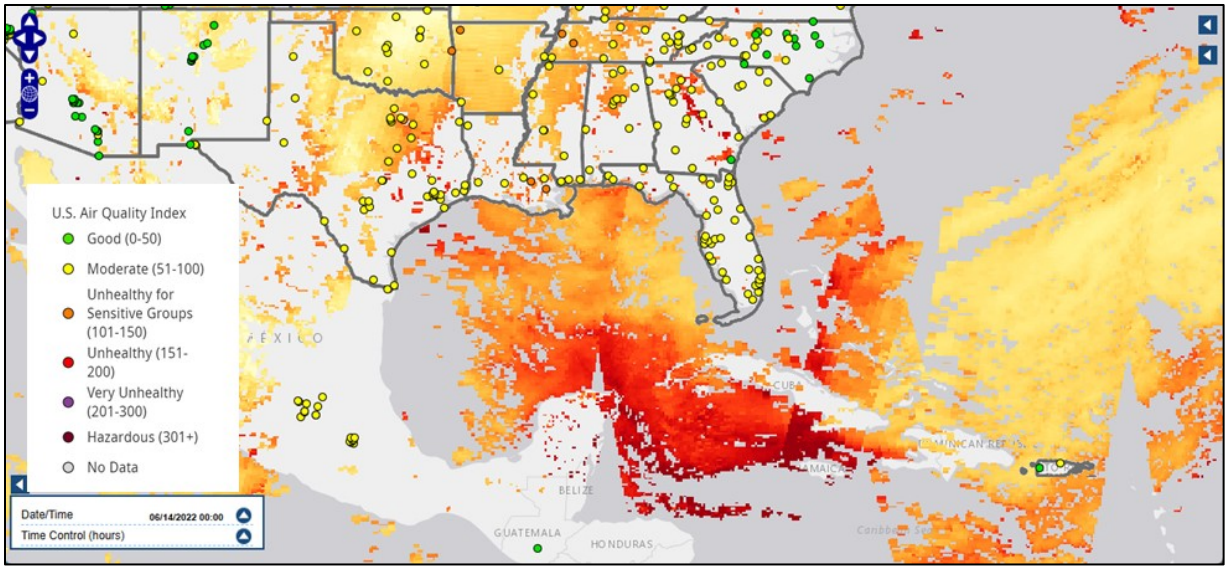

Figure 3-23: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 14, 2022

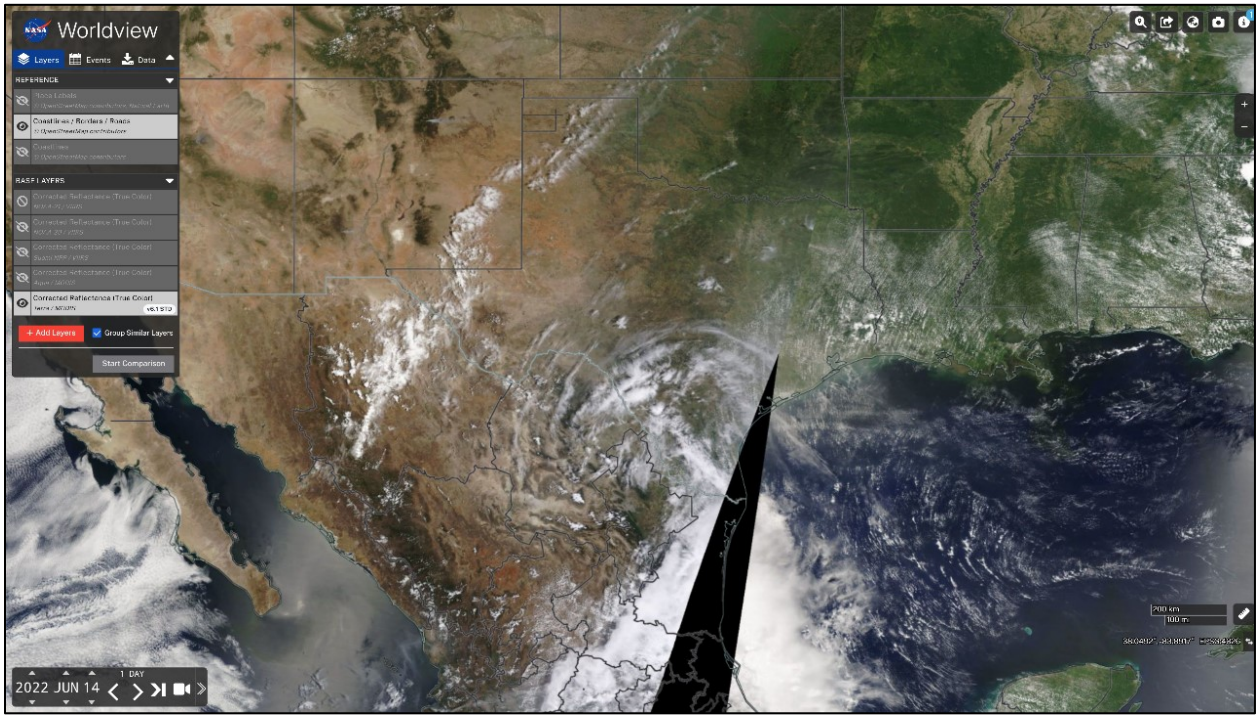

Figure 3-24: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 14, 2022, Showing Haze from Dust in Gulf of America

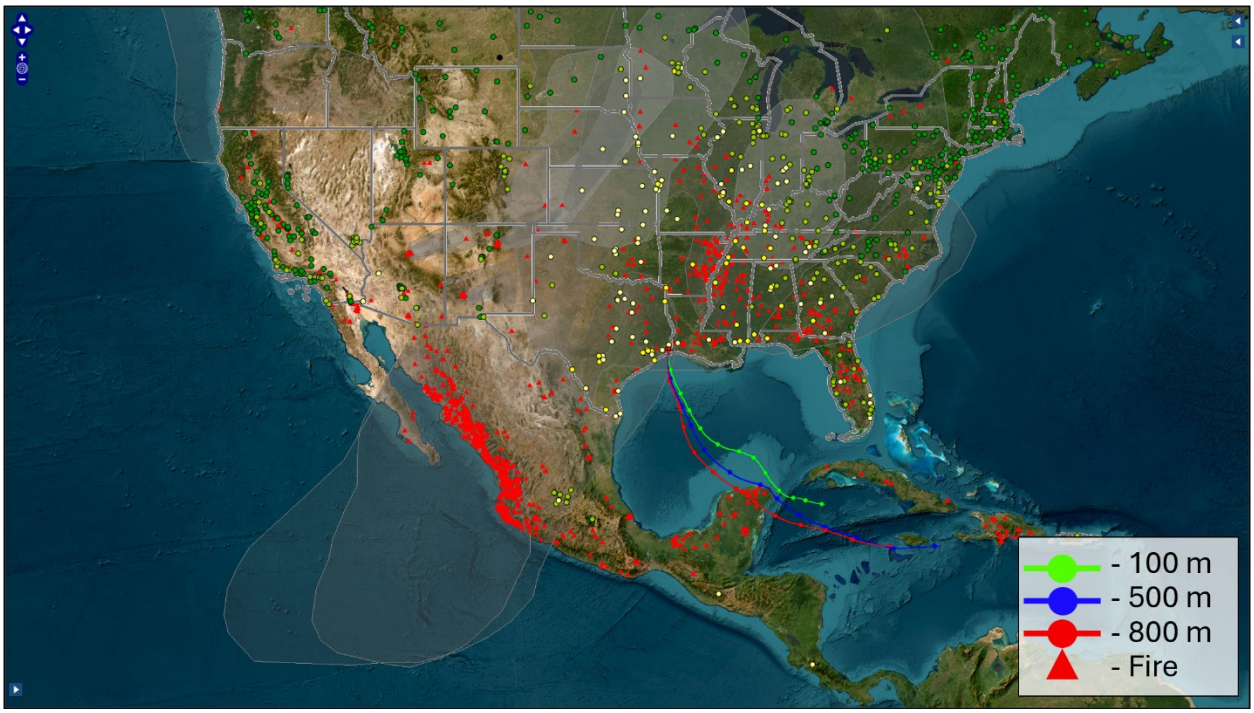

Figure 3-25: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on June 14, 2022

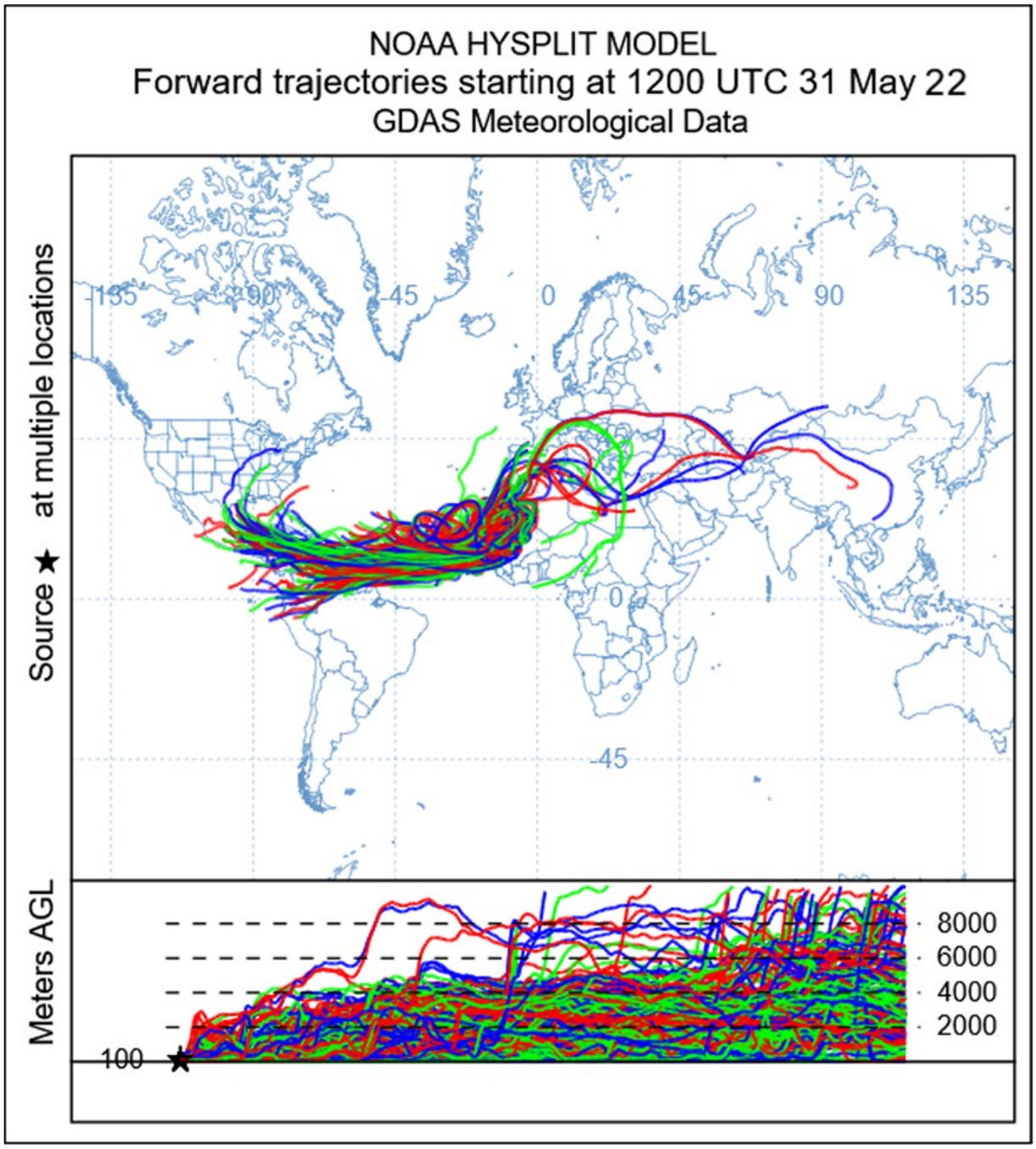

Figure 3-26: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on May 31, 2022

The TCEQ forecast for June 15, 2022 (Table C-3), references the prevalence of plumes of Saharan dust. Figure 3-27: *Hourly $PM_{2.5}$ Concentrations on June 15, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations were always above those classified as typical at this monitor, and concentrations were at their highest at 10:00 local time. The aerosol optical depth map (Figure 3-28: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua* Satellite *Layers on June 15, 2022*) shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-29: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from*

June 15, 2022, Showing Haze from Dust in the Gulf of America shows hazy conditions in the Gulf of America. Figure 3-30: *AirNow Tech HYSPLIT 72-Hour Back trajectories from the Port Arthur Memorial School Monitor on June 15, 2022*, shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-31: *NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on June 1, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-5) published on June 15, 2022, from a Rio Grande Valley news outlet, referenced that a "massive" Saharan dust cloud began creeping over Texas on Sunday (June 12, 2022) and that how long it would endure was "pretty much anyone's guess."

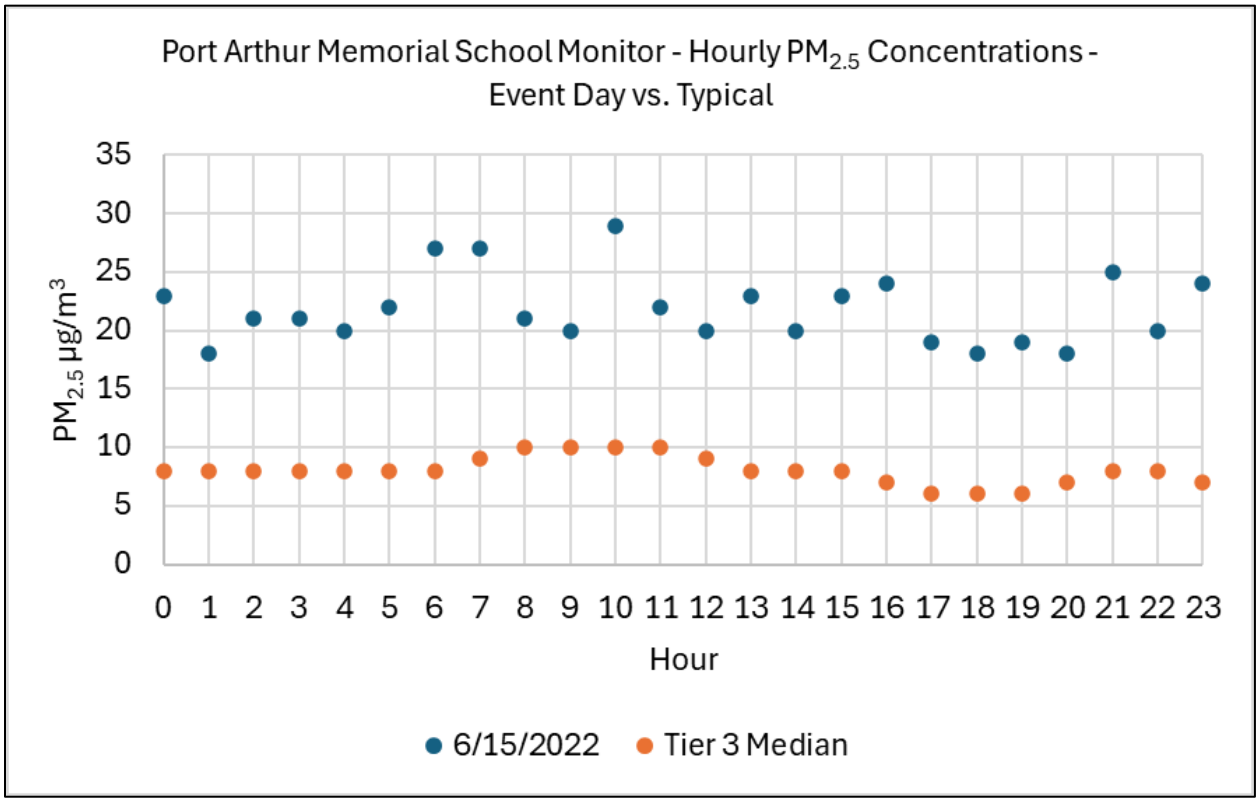

Figure 3-27: Hourly $PM_{2.5}$ Concentrations on June 15, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

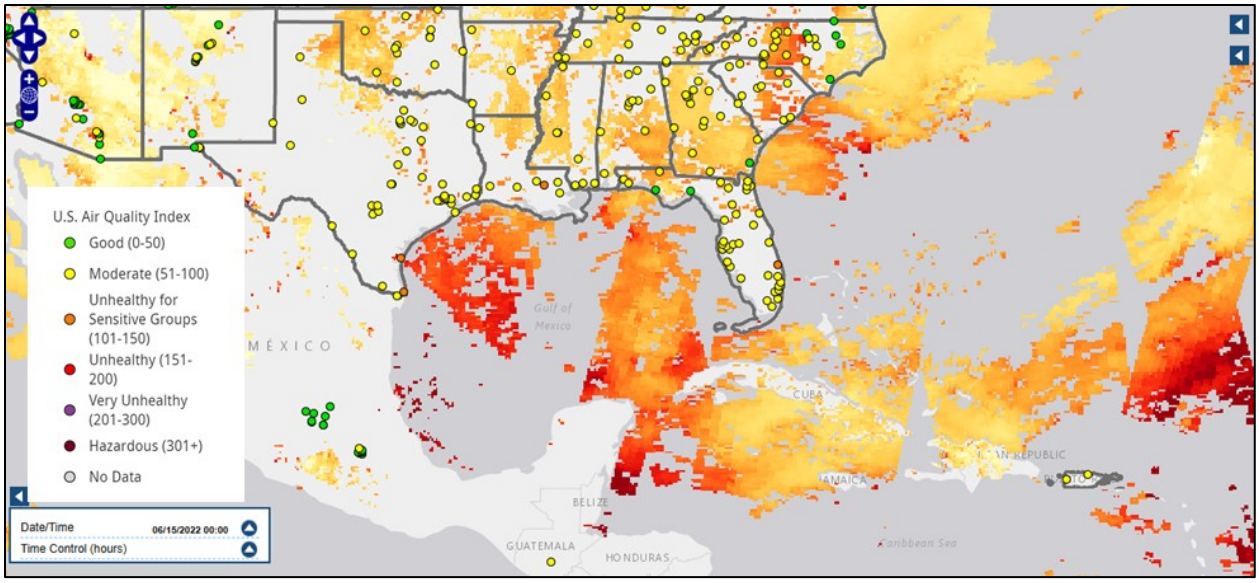

Figure 3-28: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 15, 2022

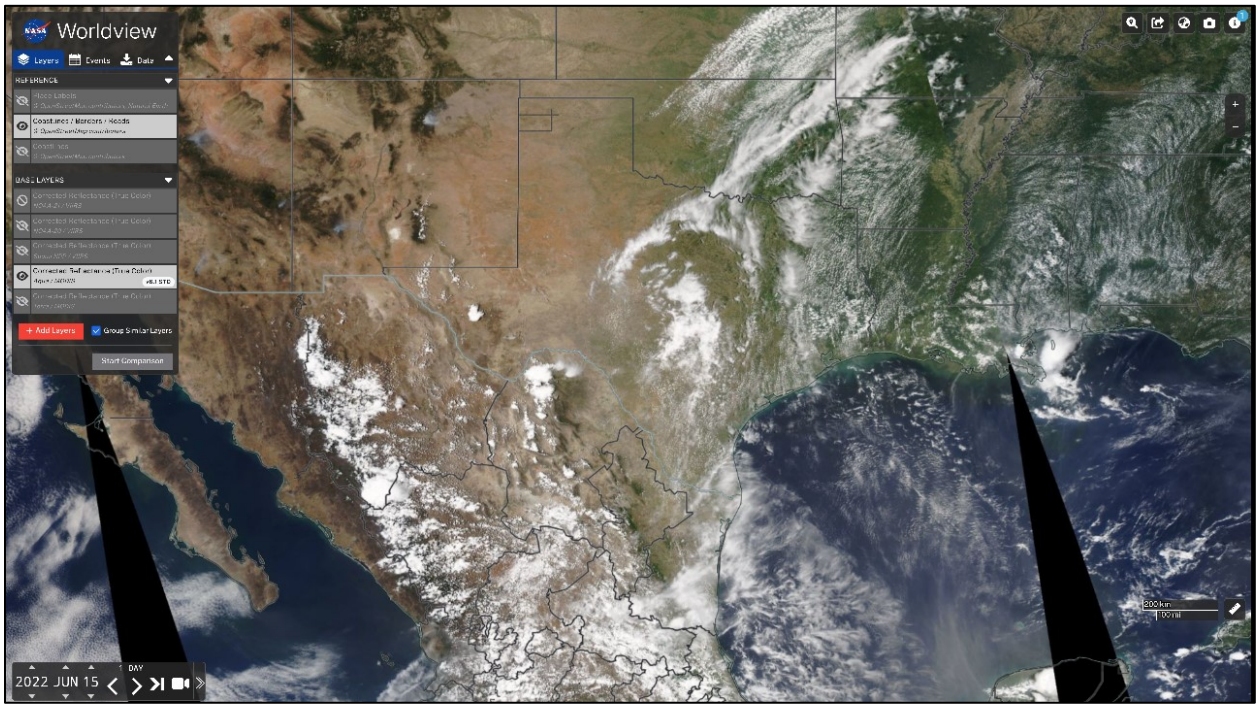

Figure 3-29: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 15, 2022, Showing Haze from Dust in the Gulf of America

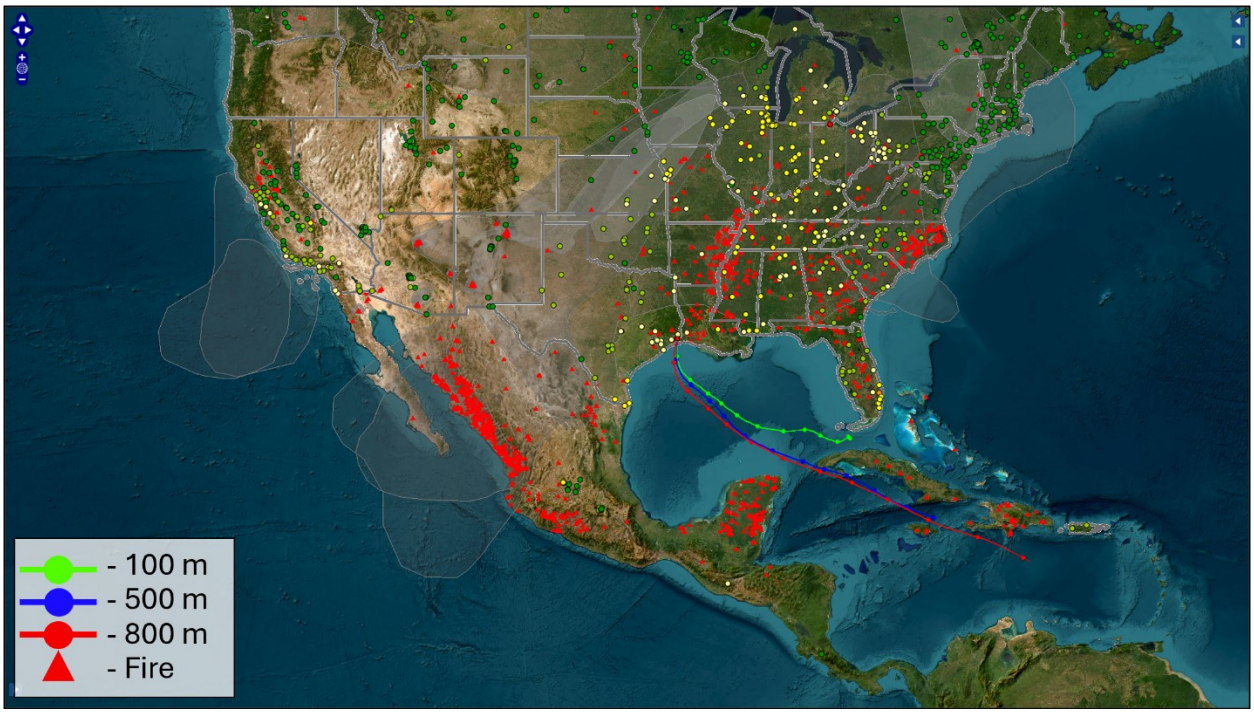

Figure 3-30: AirNow Tech HYSPLIT 72-Hour Back trajectories from the Port Arthur Memorial School Monitor on June 15, 2022

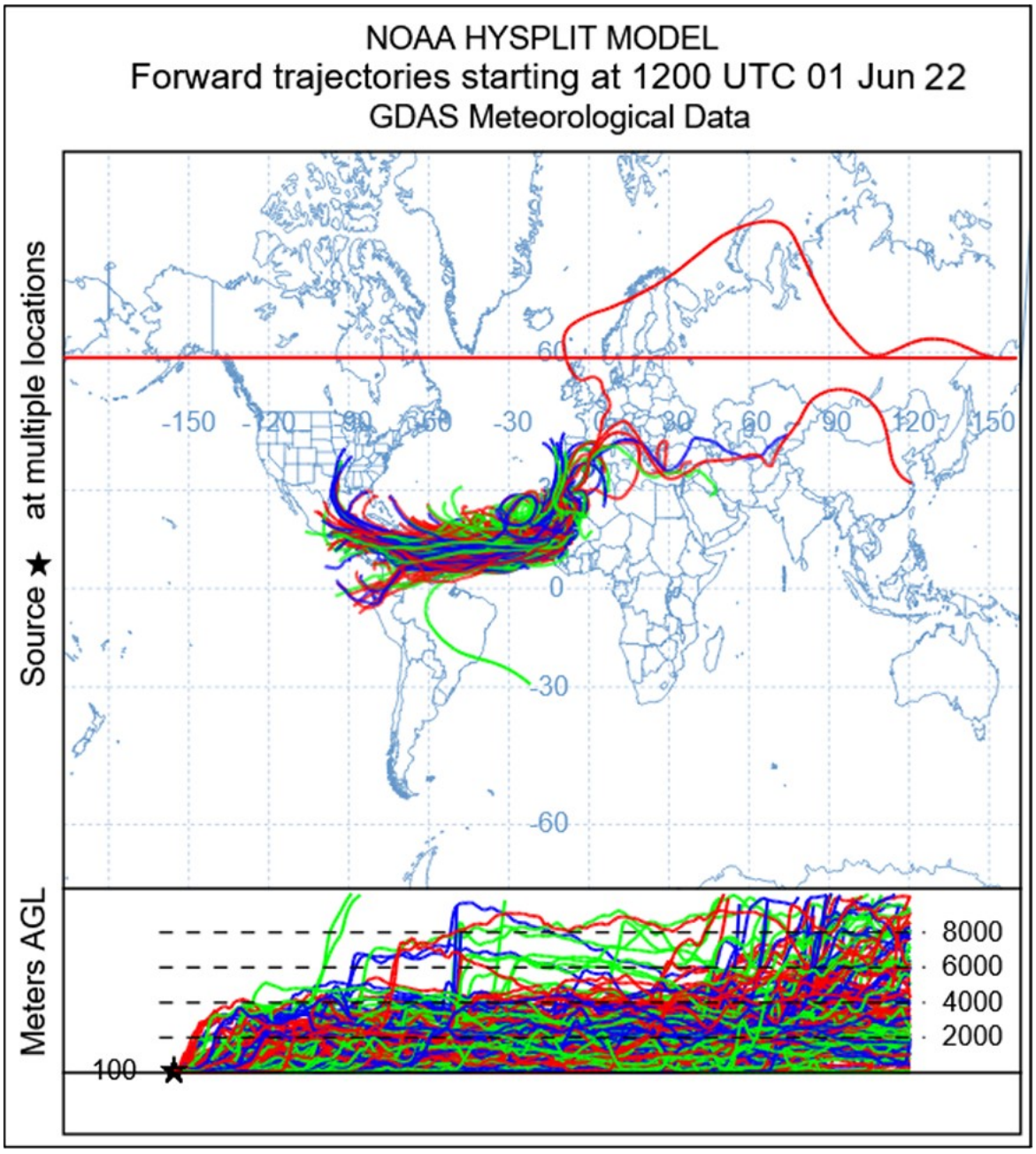

Figure 3-31: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on June 1, 2022

The TCEQ forecast for June 16, 2022 (Table C-3), references that another heavy pulse of Saharan dust was expected to arrive in south Texas and reach across most of the state. Figure 3-32: *Hourly $PM_{2.5}$ Concentrations on June 16, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations were almost always above those classified as typical at this monitor, and concentrations were at their highest at 11:00 local time. Figure 3-33: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 16, 2022*, shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-34: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 16, 2022, Showing Haze in the Gulf of America* shows hazy conditions in the Gulf of America. Figure 3-35: *AirNow Tech*

HYSPLIT Back Trajectories from the Port Arthur Memorial School monitor on June 16, 2022, shows movement of air primarily from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-36: *NOAA HYSPLIT 13-Day Forward Trajectories Originating from the Saharan Desert Starting on June 3, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-6) published on June 16, 2022, from a Houston news outlet stated that this round of dust was predicted to be the densest concentration in the last 50 years.

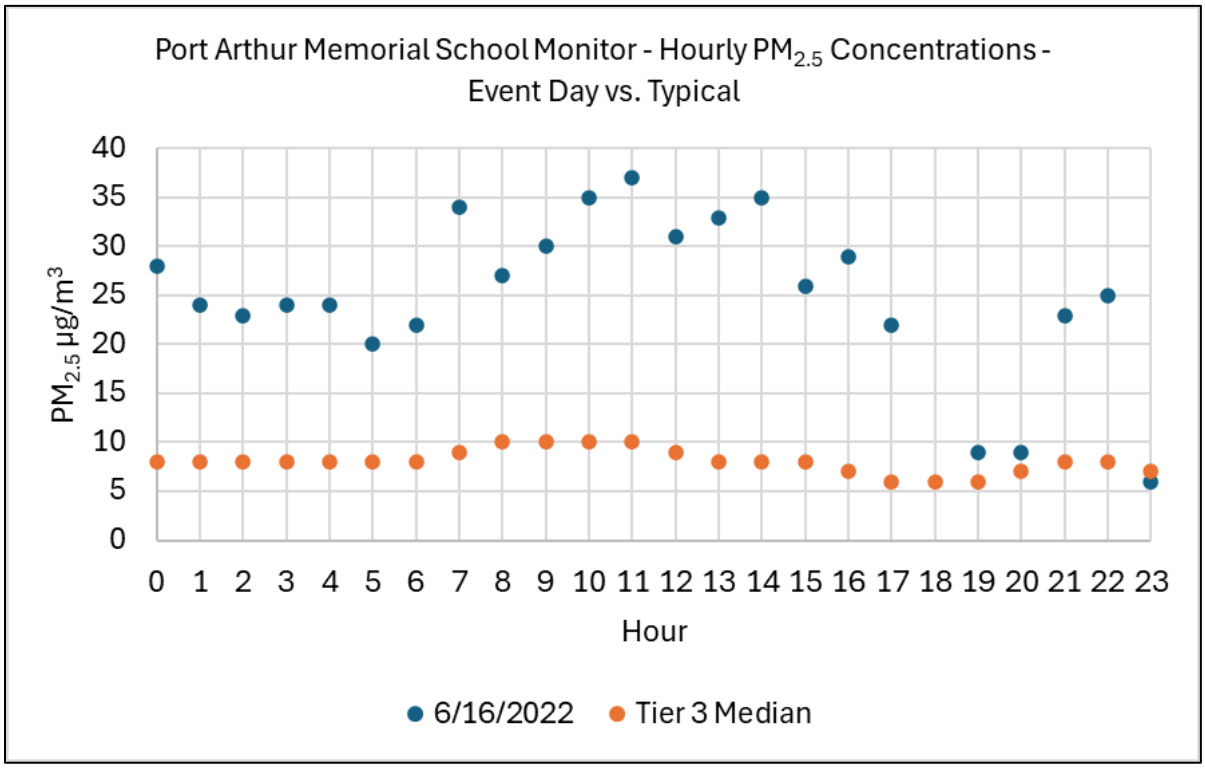

Figure 3-32: Hourly $PM_{2.5}$ Concentrations on June 16, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

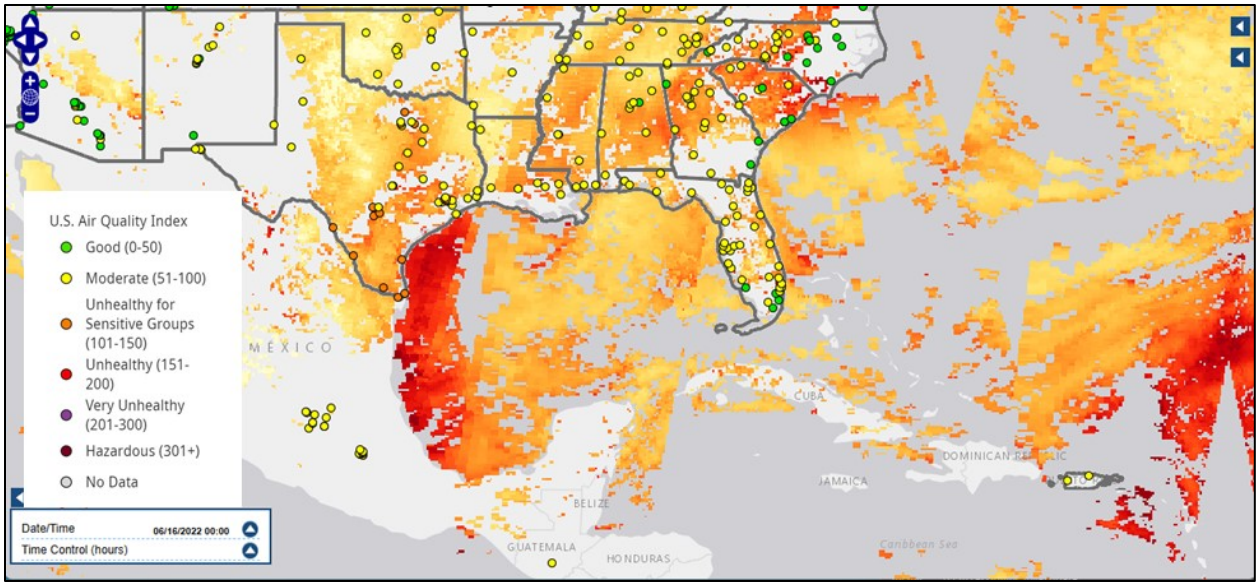

Figure 3-33: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on June 16, 2022

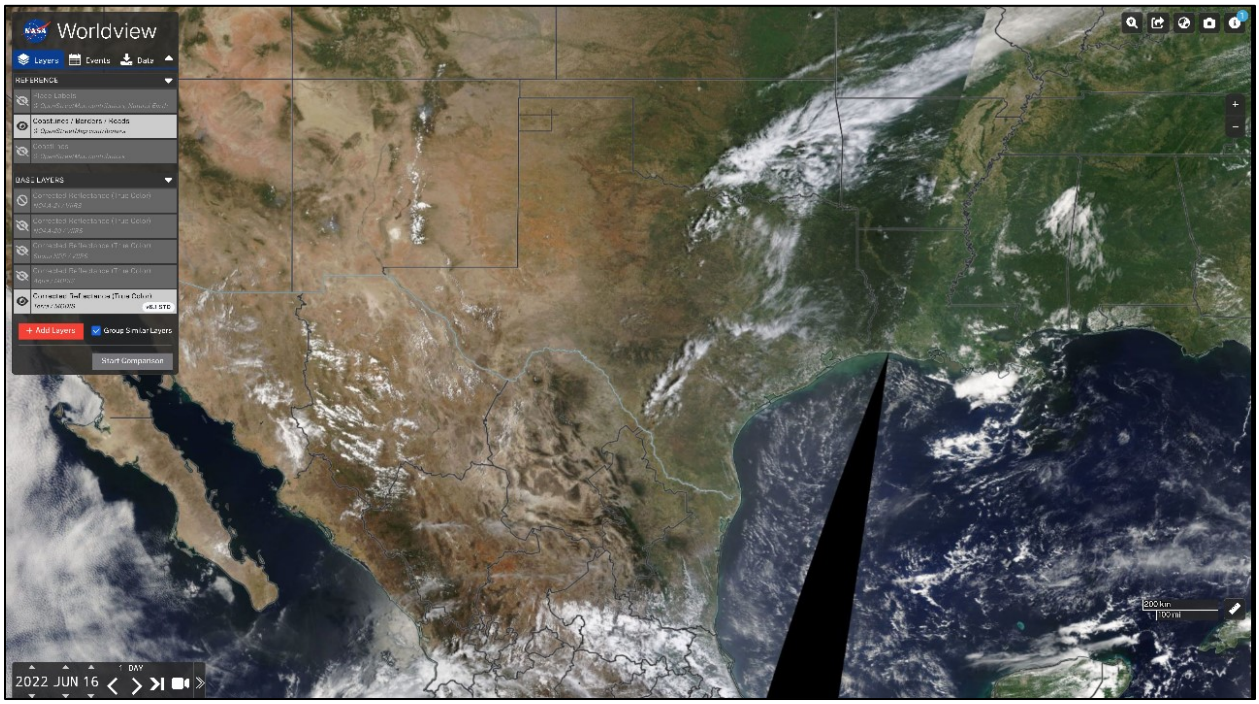

Figure 3-34: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 16, 2022, Showing Haze in the Gulf of America

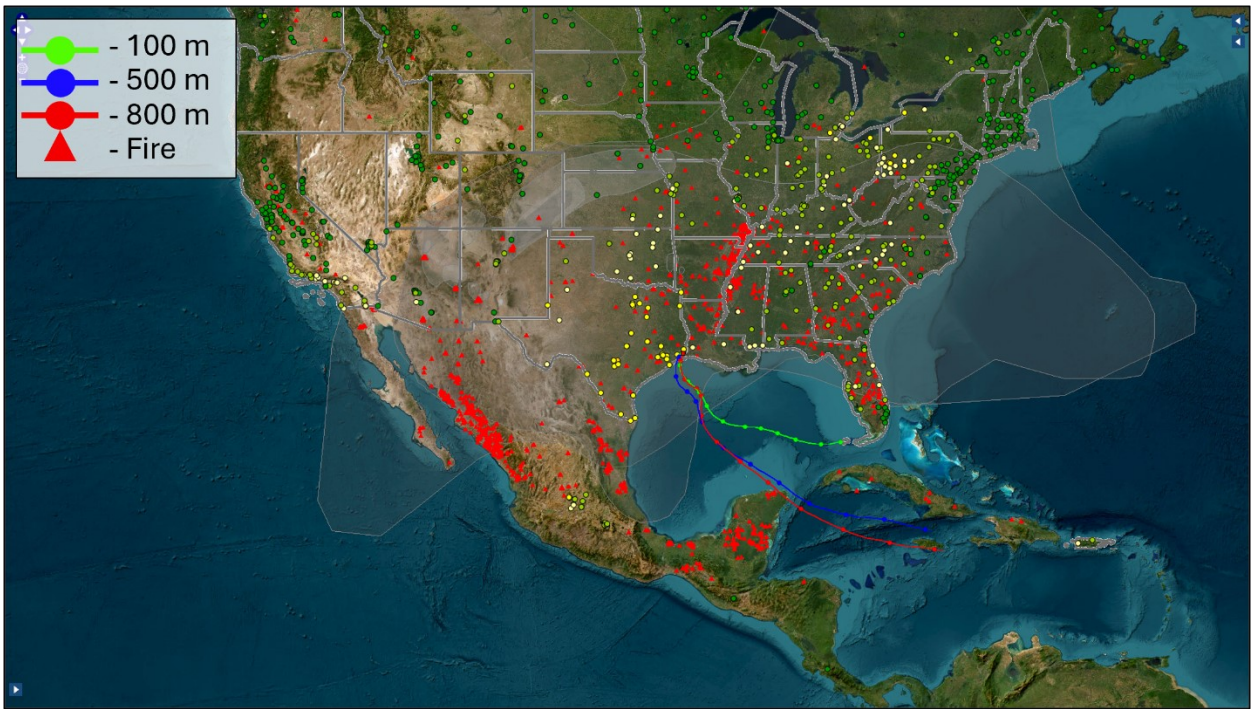

Figure 3-35: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School monitor on June 16, 2022

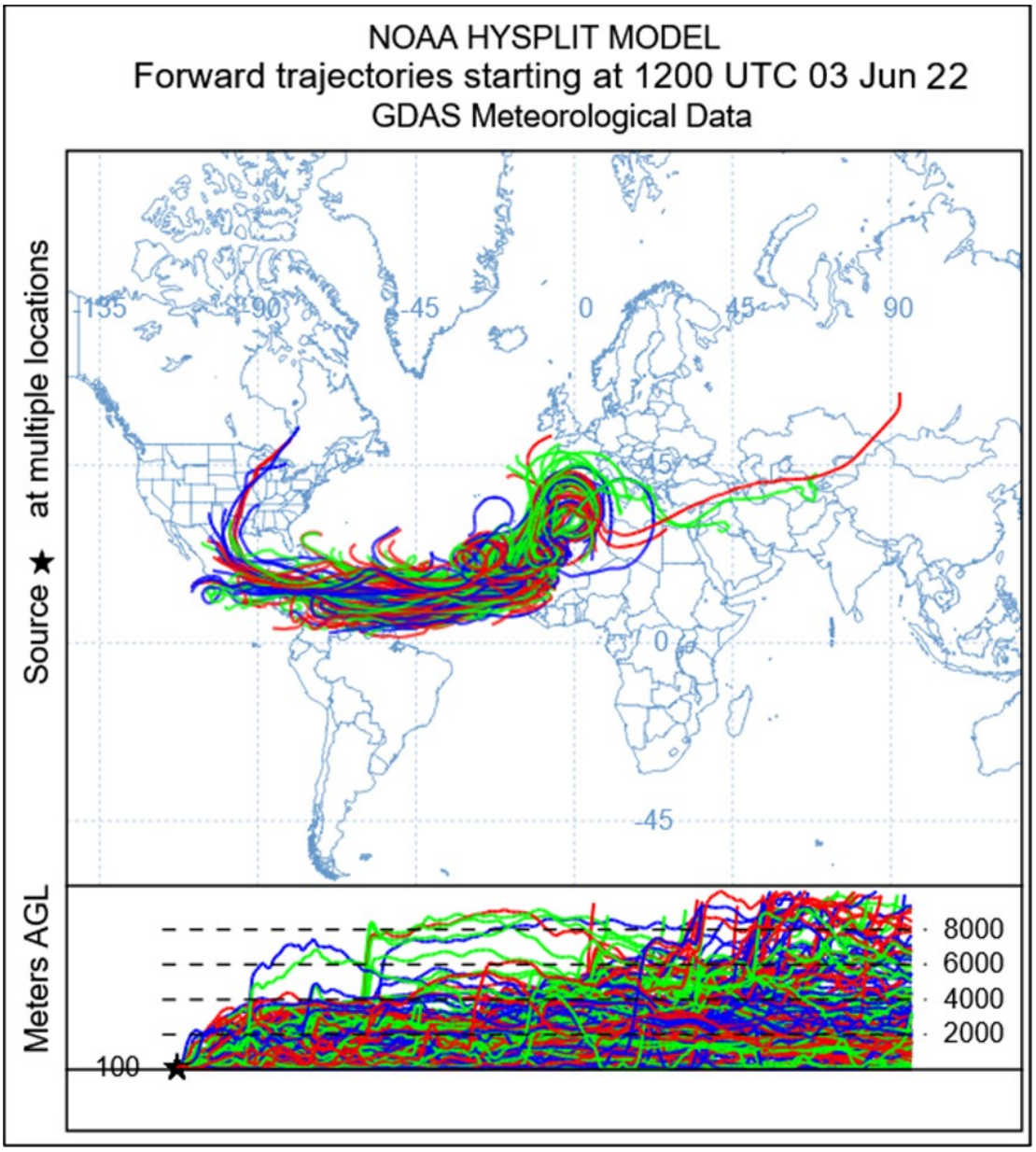

Figure 3-36: NOAA HYSPLIT 13-Day Forward Trajectories Originating from the Saharan Desert Starting on June 3, 2022

3.2.4 Group 4 – Evidence for July 16, 2022, and July 17, 2022, African Dust $PM_{2.5}$ Event

July 16, 2022, was identified as a Tier 2 day, and July 17, 2022, was identified as a Tier 1 day at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 20.0 µg/m^3 and 27.7 µg/m^3, respectively. These elevated concentrations were a result of African dust.

The TCEQ forecast for July 16, 2022 (Table C-4), references that a moderate density plume of Saharan dust would continue spreading inland through Texas, possibly impacting spots at varying intensities generally along and south of a line from Del Rio to Waco to Beaumont. A media outlet based in Houston also published a forecast on July 17, 2022, indicating that Saharan dust would impact most of the state (Figure C-7). Figure 3-37: *Hourly $PM_{2.5}$ Concentrations on July 16, 2022, Compared to Typical Concentrations at the Port Arthur*

Memorial School Monitor shows that starting at 07:00 local time through the remainder of the day, hourly $PM_{2.5}$ concentrations were typically 10 µg/m^3 higher than those classified as typical at this monitor, and concentrations were at their highest at 12:00 local time. Figure 3-38: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 16, 2022*, shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-39: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 16, 2022, Showing Haze from Dust in the Gulf of America* shows hazy conditions in the Gulf of America. Figure 3-40: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 16, 2022*, shows movement of air from the direction of the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-41: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert Starting on July 2, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas.

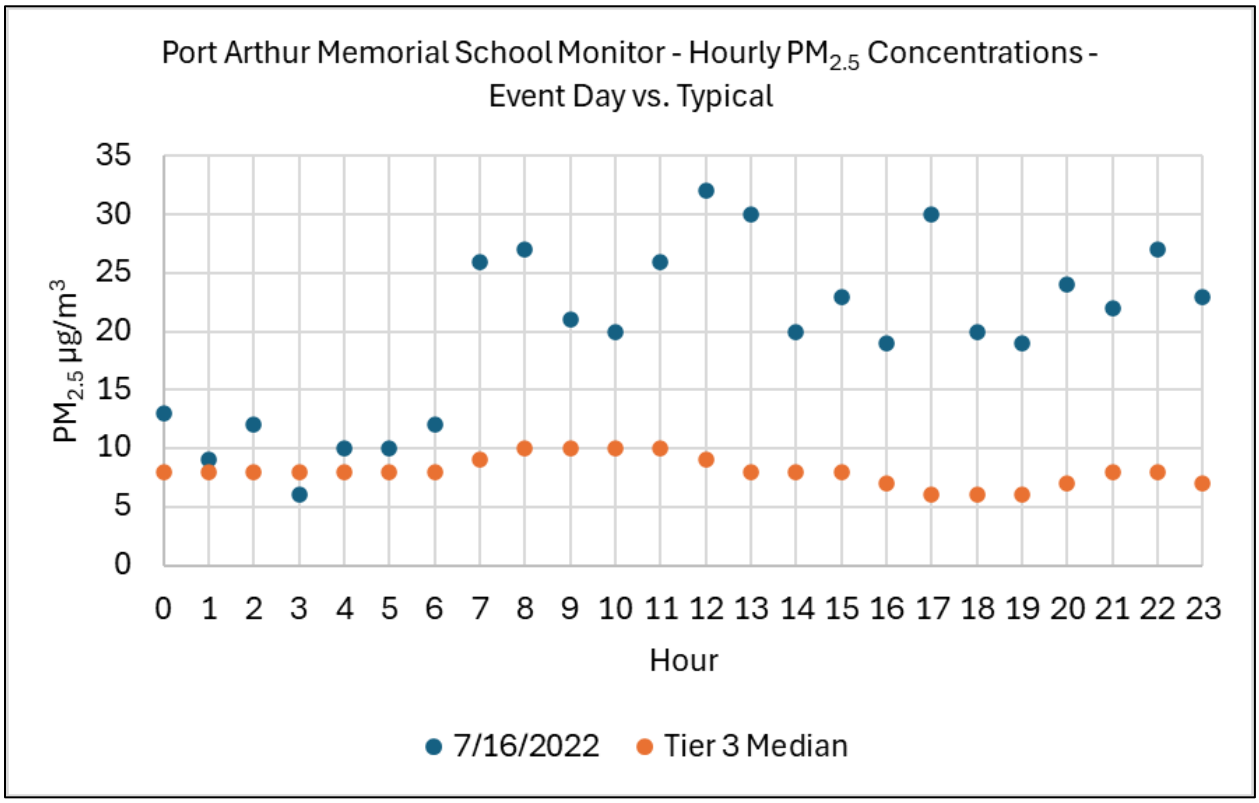

Figure 3-37: Hourly $PM_{2.5}$ Concentrations on July 16, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

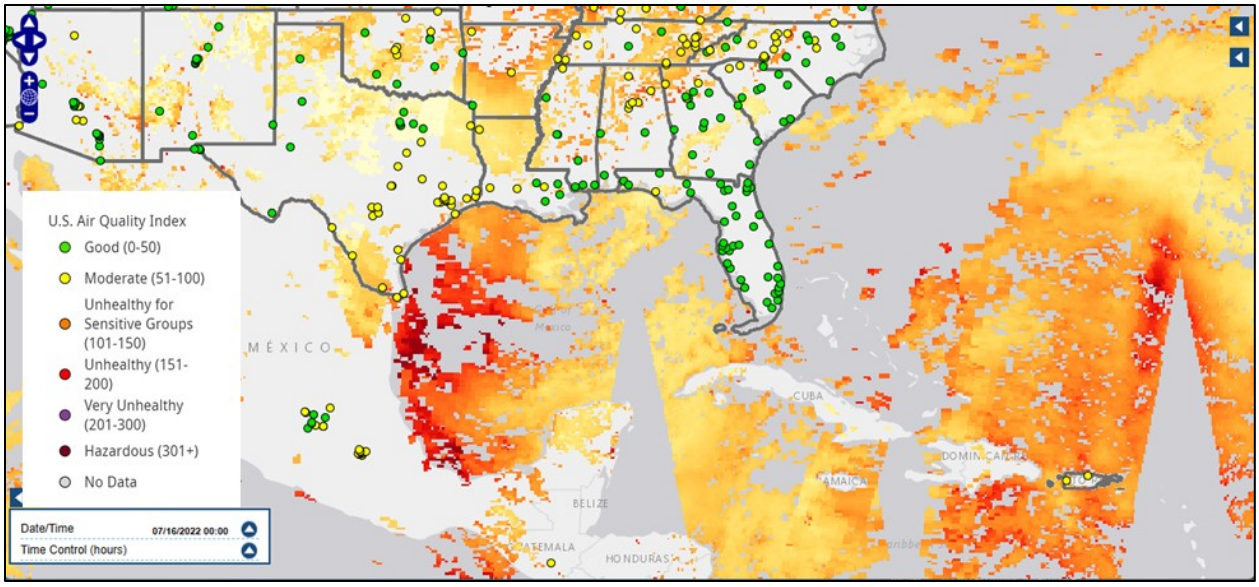

Figure 3-38: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 16, 2022

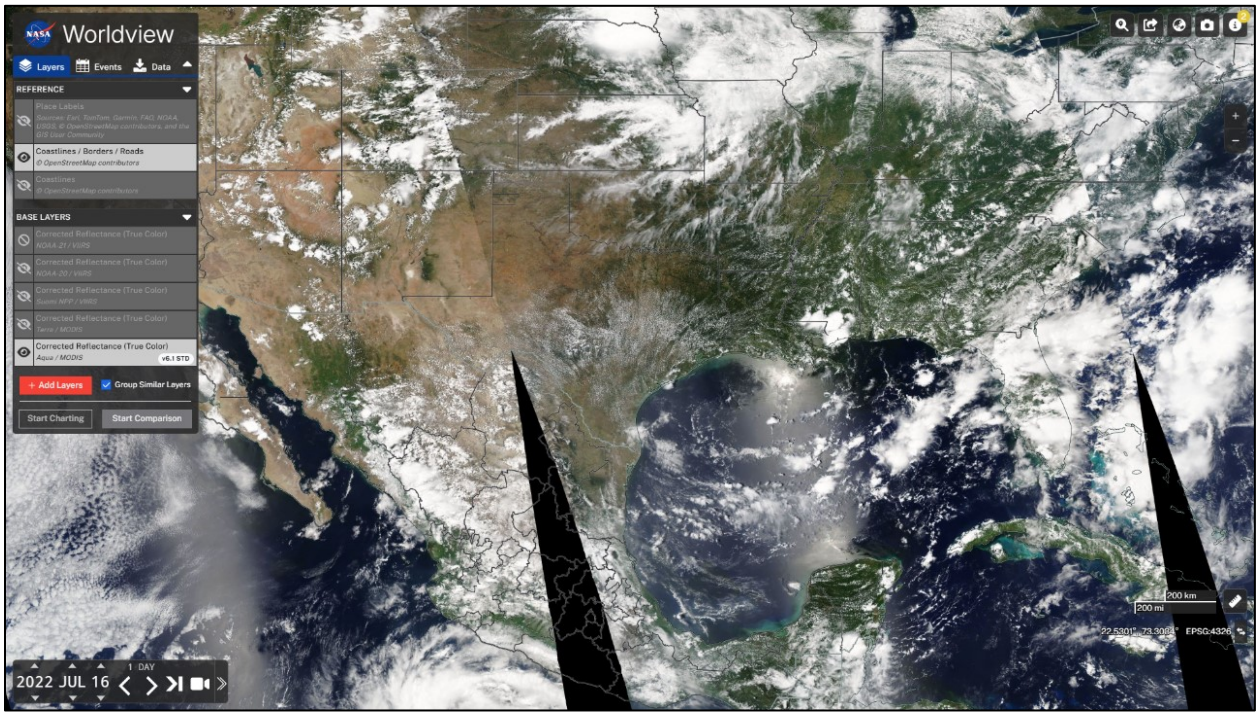

Figure 3-39: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 16, 2022, Showing Haze from Dust in the Gulf of America

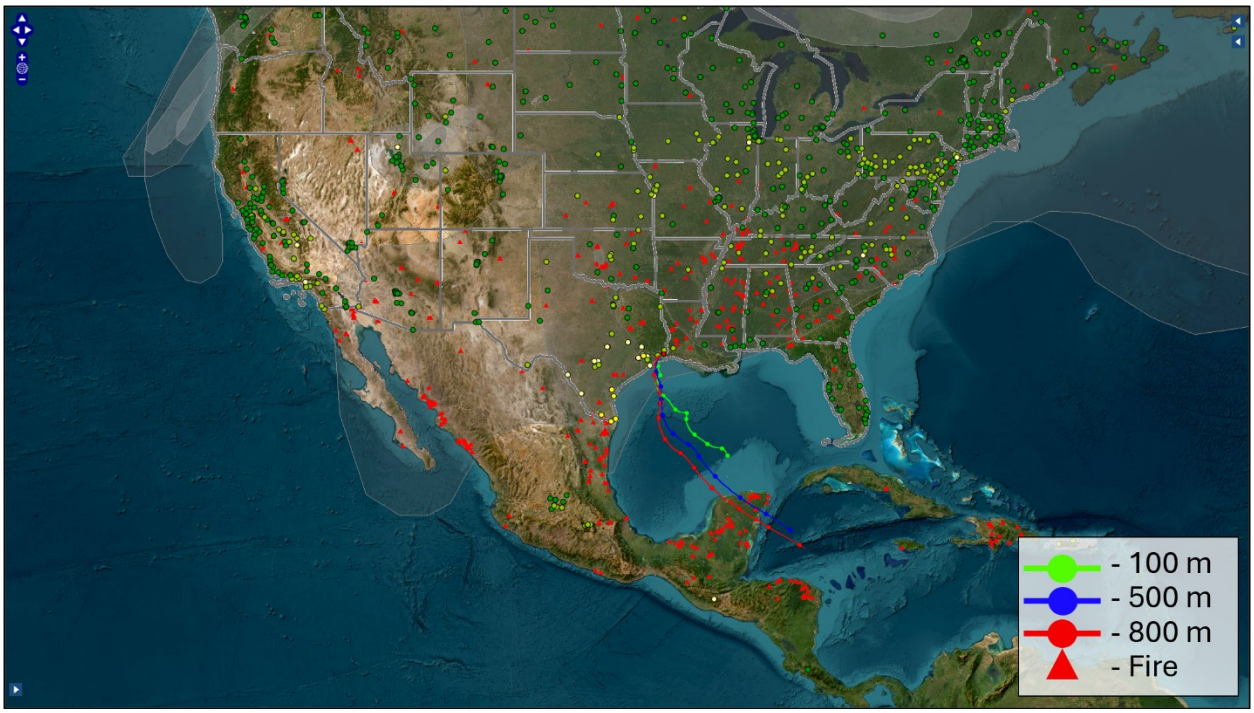

Figure 3-40: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 16, 2022

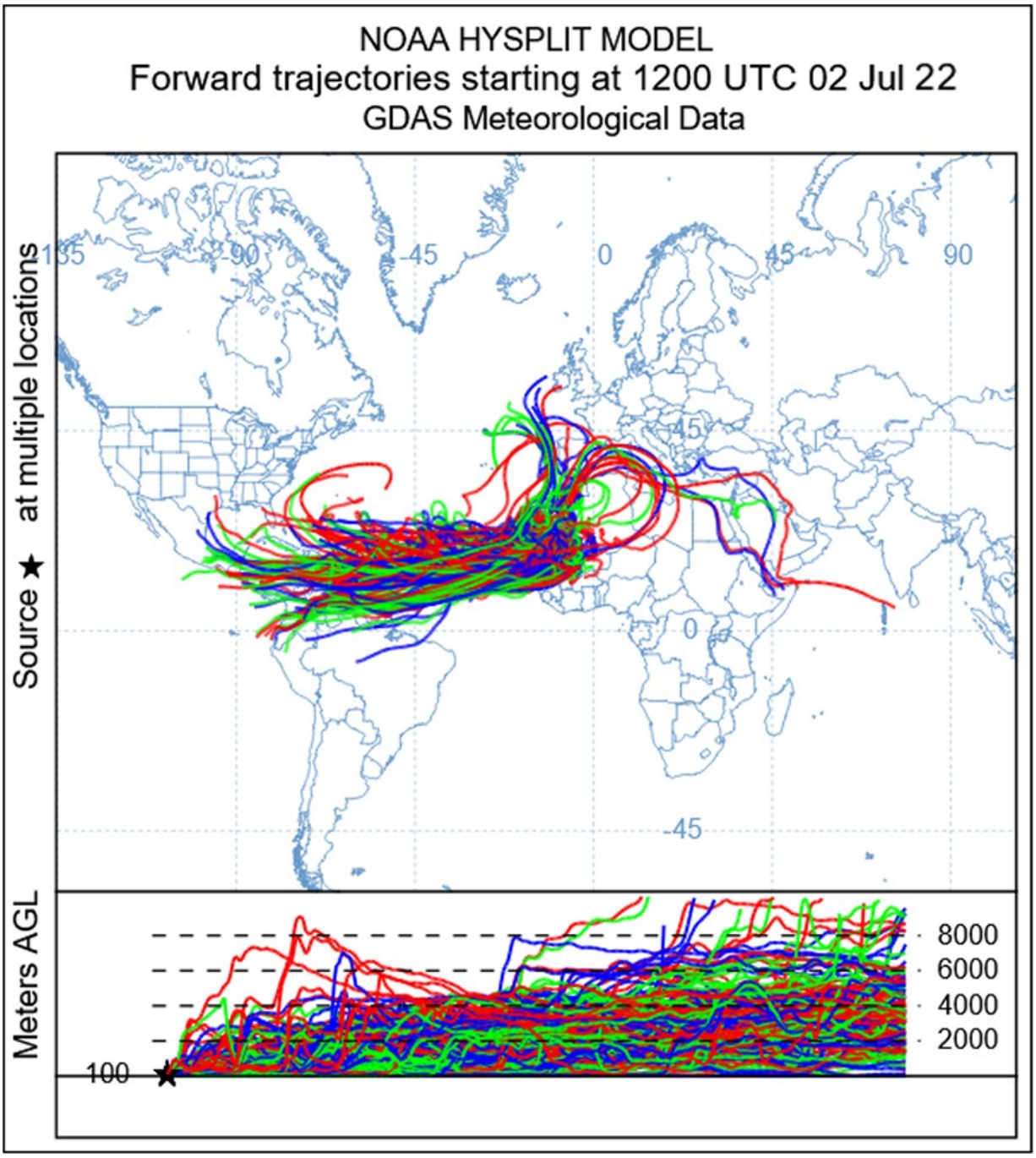

Figure 3-41: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on July 2, 2022

The TCEQ forecast for July 17, 2022 (Table C-4), references that Saharan dust was expected to continue to build and spread from south to north, possibly impacting most parts of the state with the exception of far west Texas and the upper Texas Panhandle. Figure 3-42: *Hourly $PM_{2.5}$ Concentrations on July 17, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that for most hours of the day, hourly $PM_{2.5}$ concentrations were 10 µg/m^3 higher than those classified as typical at this monitor, and concentrations were at their highest at 17:00 local time. Figure 3-43: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua* Satellite *Layers on July 17, 2022*, shows high readings of aerosols

in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-44: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 17, 2022, Showing Haze from Dust in the Gulf of America* shows hazy conditions in the Gulf of America. Figure 3-45: *AirNow Tech HYSPLIT Back Trajectories from the Port Arthur Memorial School Monitor on July 17, 2022* shows movement of air from the direction of the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. Figure 3-46: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert Starting on July 3, 2022*, shows that winds traveled from these locations into the Gulf of America and into Texas. A media report (Figure C-7) published on July 17, 2022, from a Houston news outlet included a map indicating that almost the entirety of Texas was predicted to be impacted by African dust on Monday, July 18, 2022, the day following the date discussed in this paragraph.

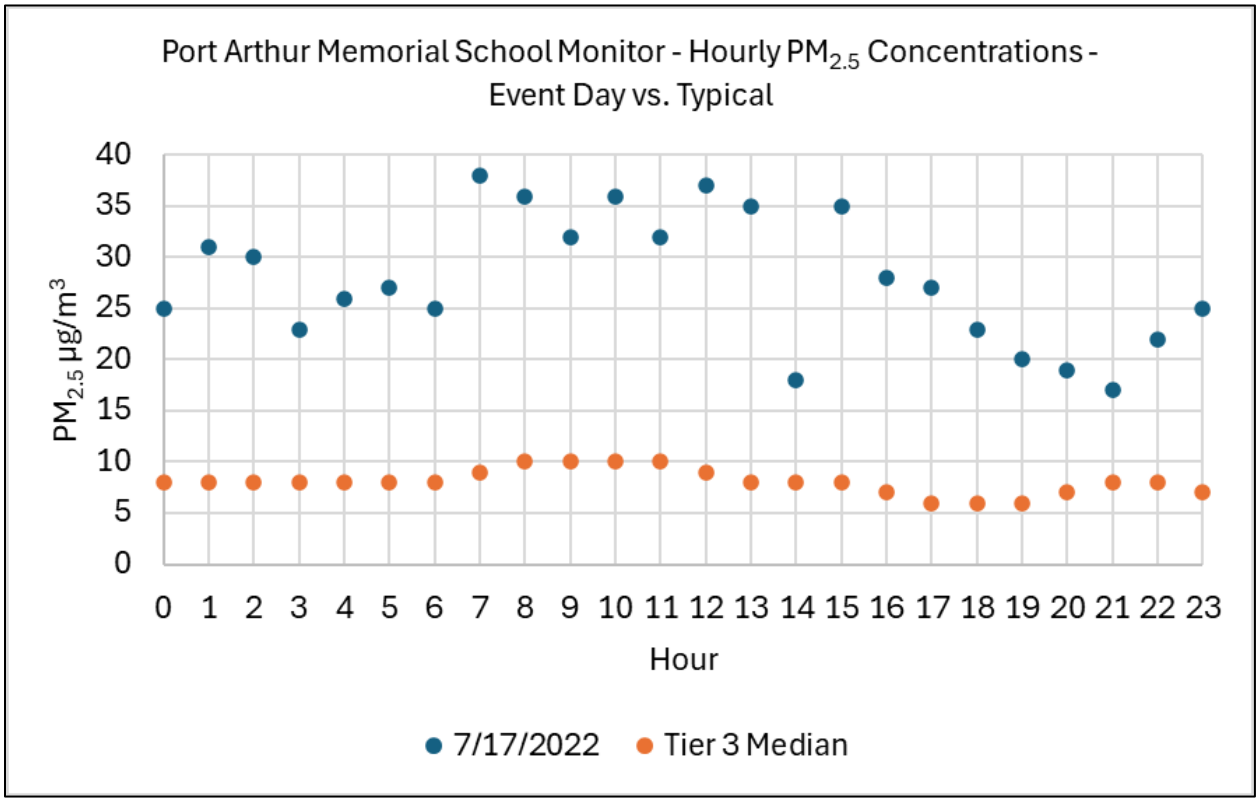

Figure 3-42: Hourly $PM_{2.5}$ Concentrations on July 17, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

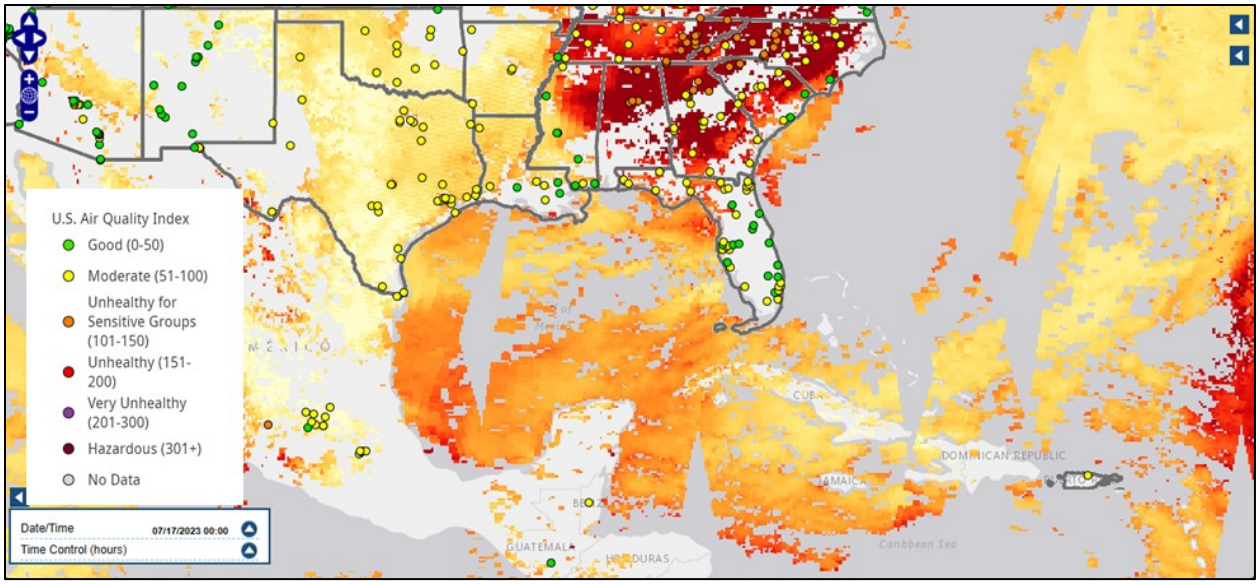

Figure 3-43: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 17, 2022

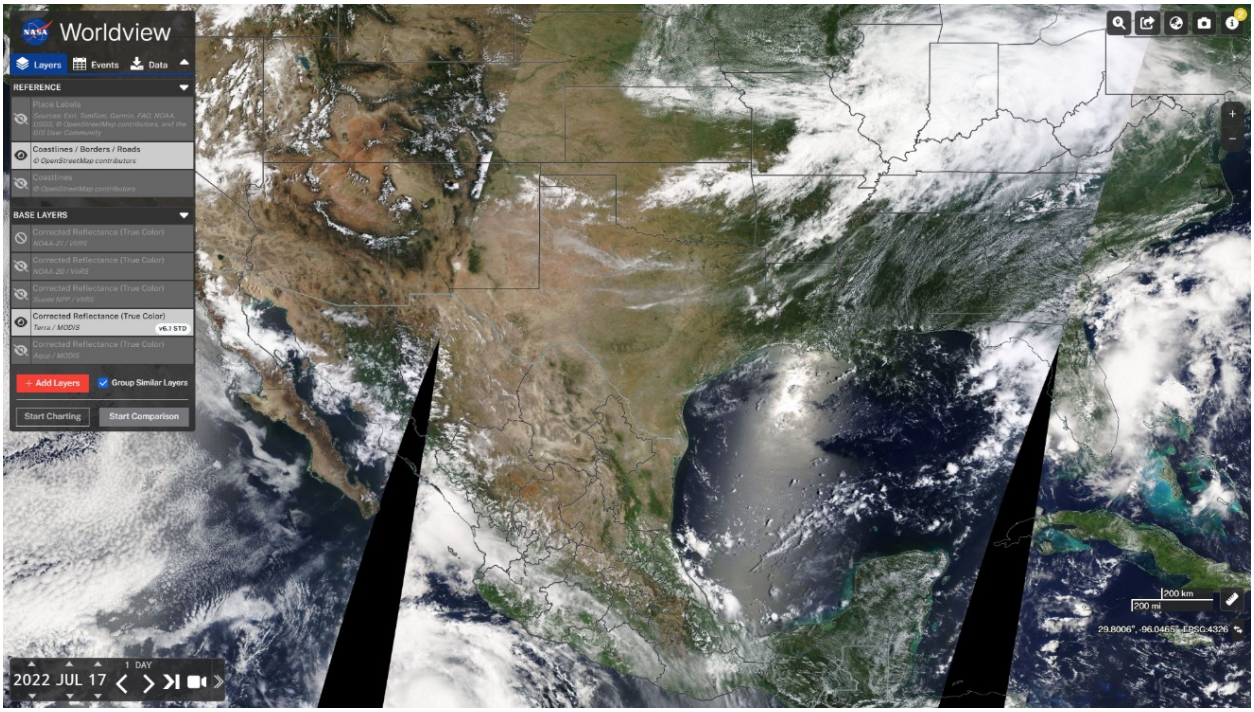

Figure 3-44: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 17, 2022, Showing Haze from Dust in the Gulf of America

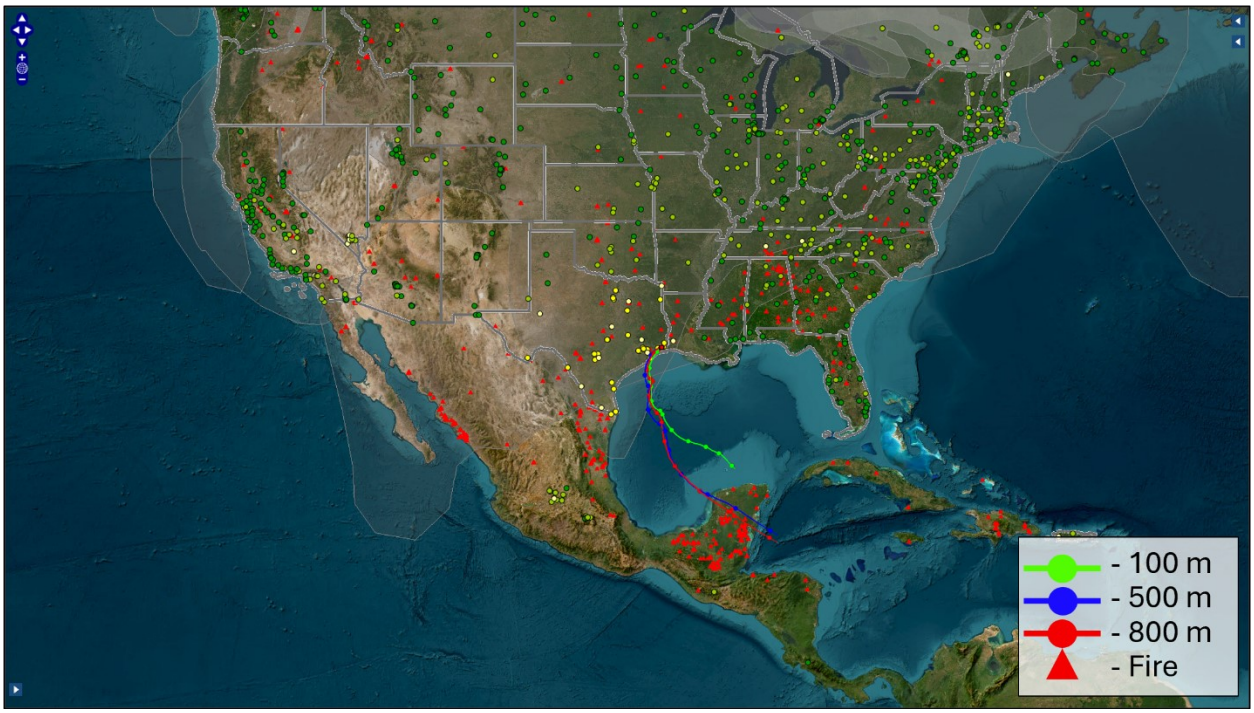

Figure 3-45: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on July 17, 2022

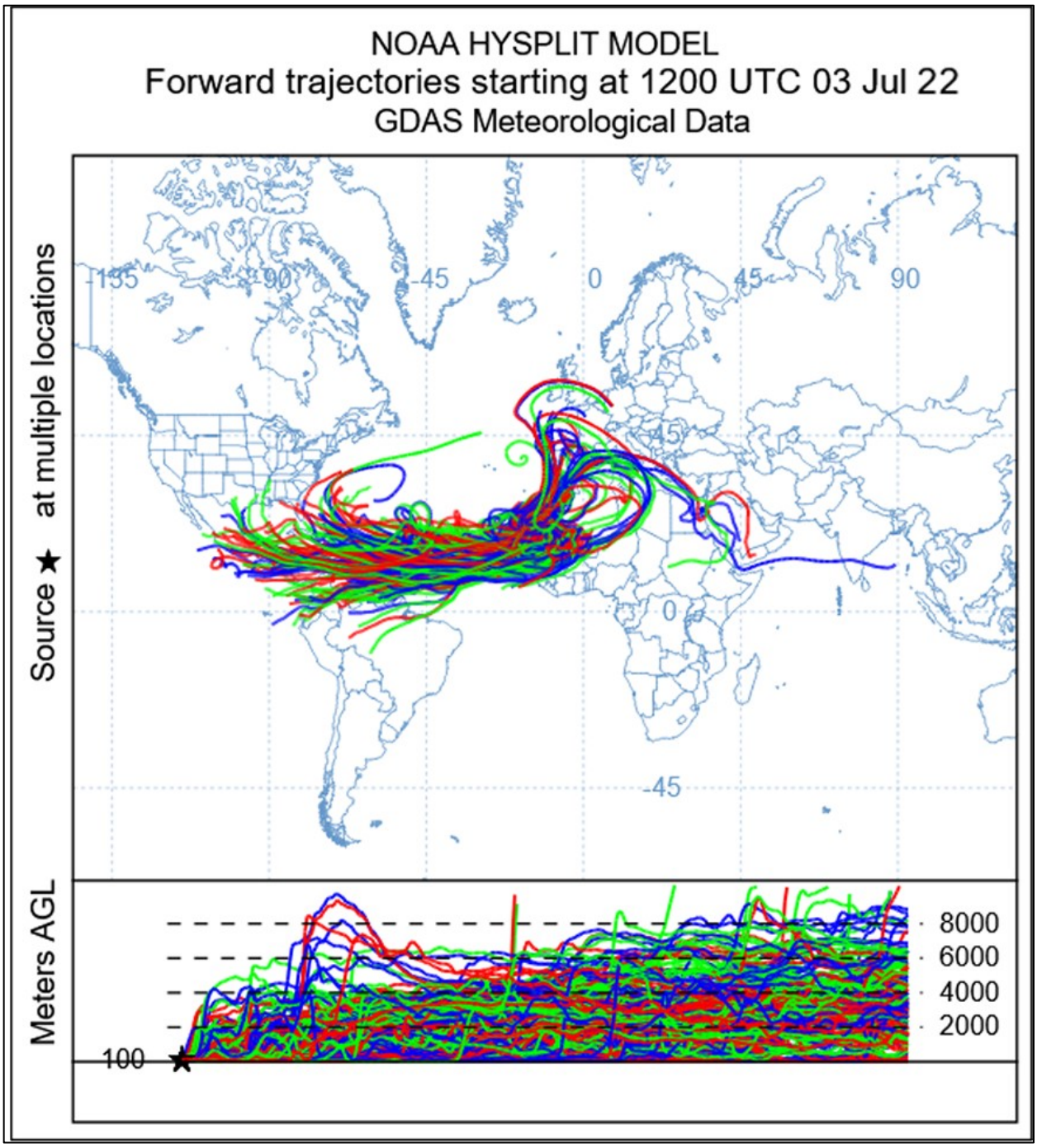

Figure 3-46: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert Starting on July 3, 2022

3.2.5 Group 5 – Evidence for September 22, 2022, and September 23, 2022, Prescribed Fire $PM_{2.5}$ Event

September 22, 2022, and September 23, 2022, were identified as Tier 2 days at the Port Arthur Memorial School monitor with 24-hour $PM_{2.5}$ concentrations of 18.4 µg/m^3 and 18.6 µg/m^3, respectively. These elevated concentrations were a result of smoke from prescribed fires predominantly in Mississippi River Valley.

The TCEQ forecast for September 22, 2022 (Table C-5) references that seasonal fires with associated residual smoke across portions of East Texas and the southeast U.S., in addition to continental haze, may continue to contribute to the overall fine particulate background levels across the eastern two-thirds of Texas. Figure 3-47: *Hourly $PM_{2.5}$ Concentrations on September 22, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor, and concentrations were at their highest both early and late in the day. Figure 3-48: *AirNow HMS Smoke Plume for September 22, 2022*, shows smoke in the vicinity of Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-49: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 22, 2022, Showing Haze from Fires Over East Texas and the Gulf of America along the Coast of East Texas* shows hazy conditions over East Texas and the Gulf of America along the coast of East Texas. Figure 3-50: Figure 3-50: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 22, 2022*, shows movement of air through smoke plumes on the Texas/Louisiana border and from within the Mississippi River Valley. Figure 3-51: *NOAA HYSPLIT 48 Hour Forward Trajectories Originating from Texas/Louisiana Border with Fires, on September 20, 2022* shows through 48-hour trajectories that winds traveled from locations of fires into Jefferson County.

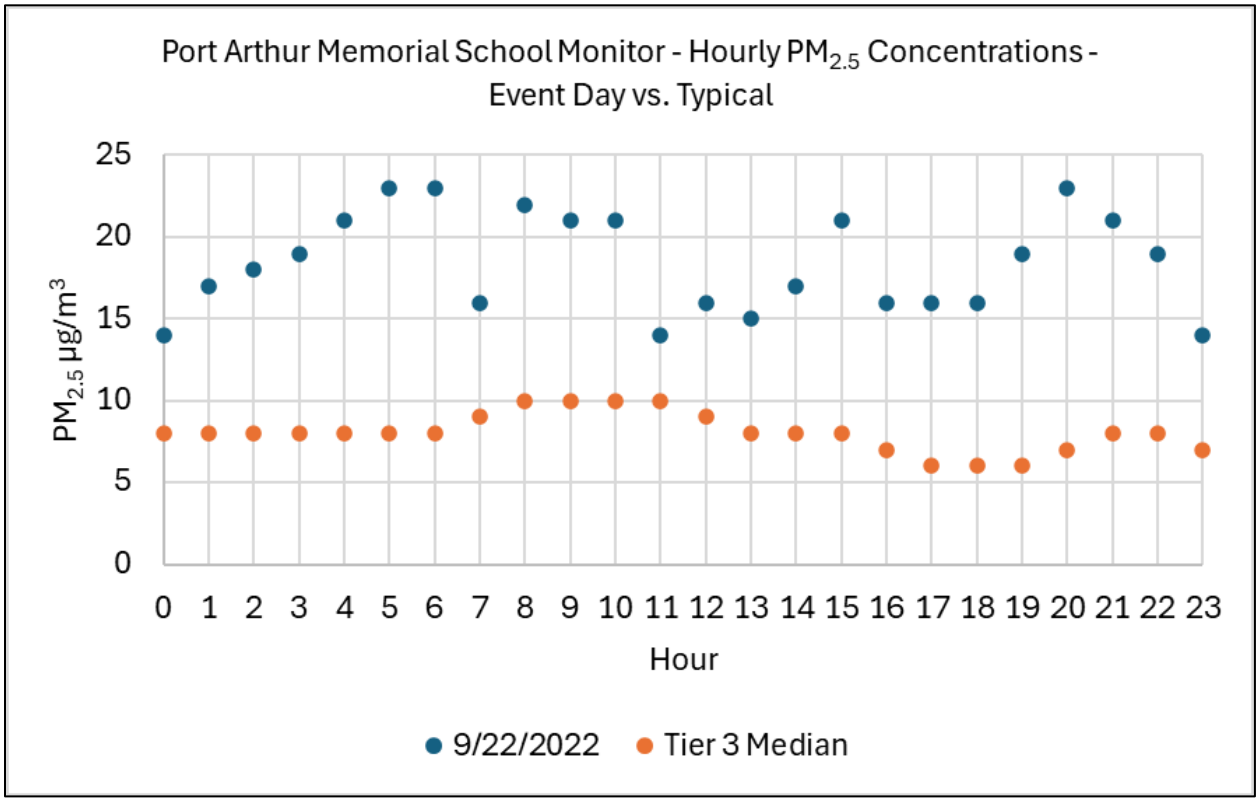

Figure 3-47: Hourly $PM_{2.5}$ Concentrations on September 22, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

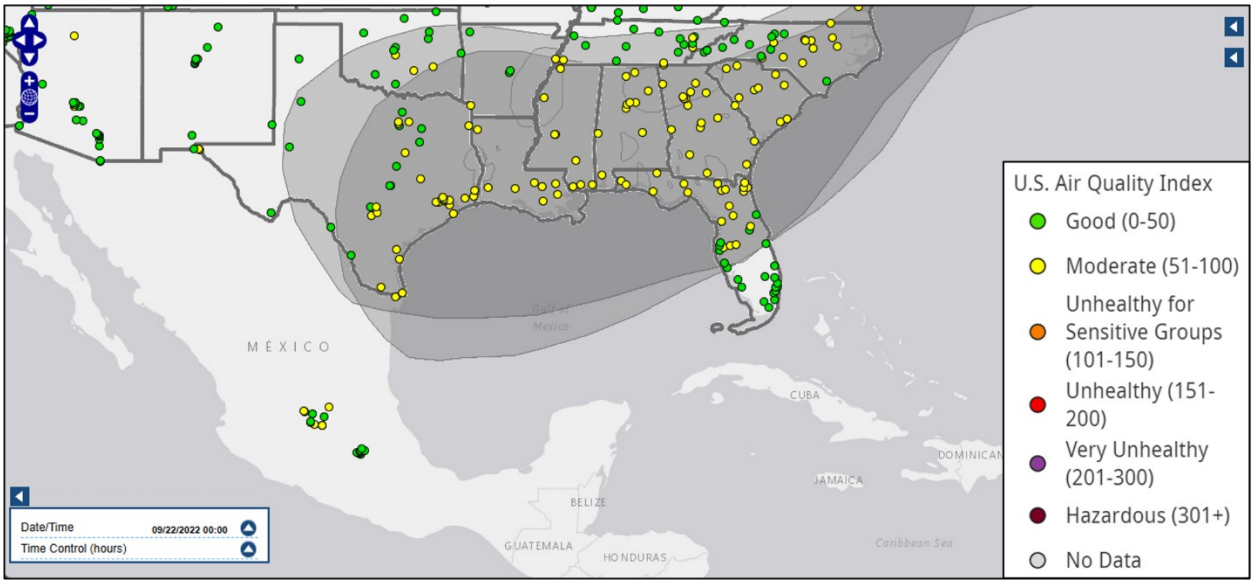

Figure 3-48: AirNow HMS Smoke Plume for September 22, 2022

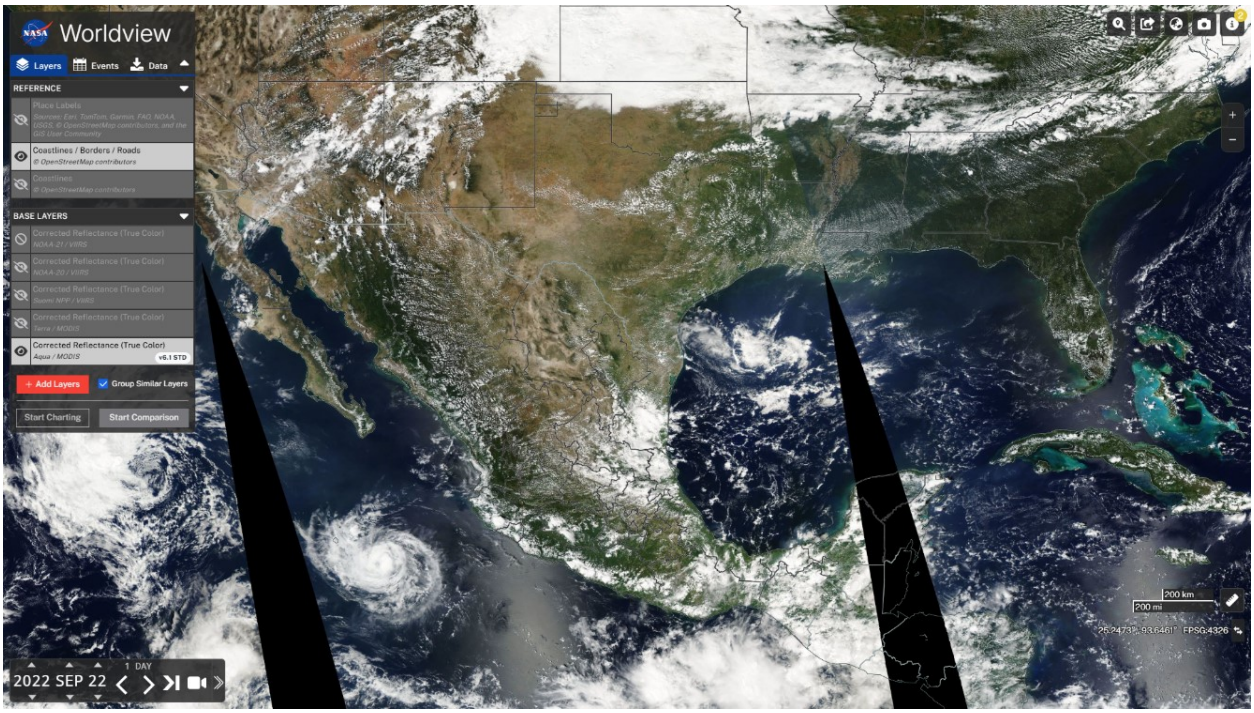

Figure 3-49: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 22, 2022, Showing Haze from Fires Over East Texas and the Gulf of America along the Coast of East Texas

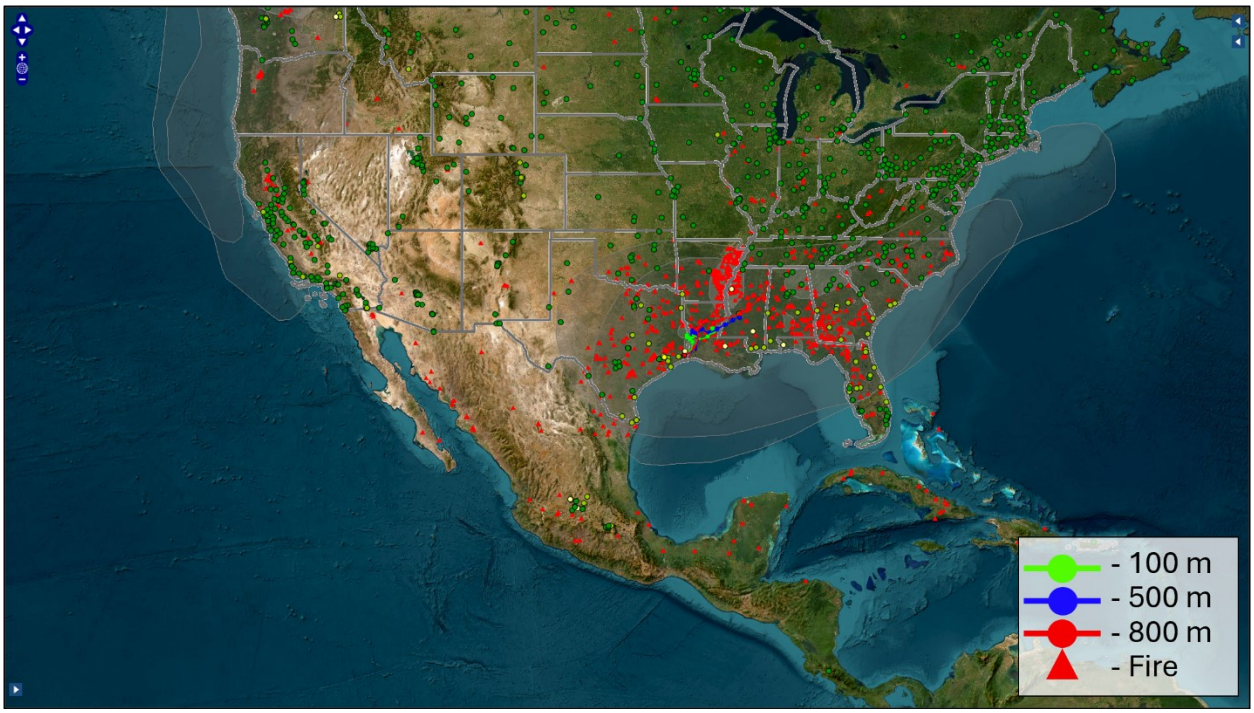

Figure 3-50: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 22, 2022

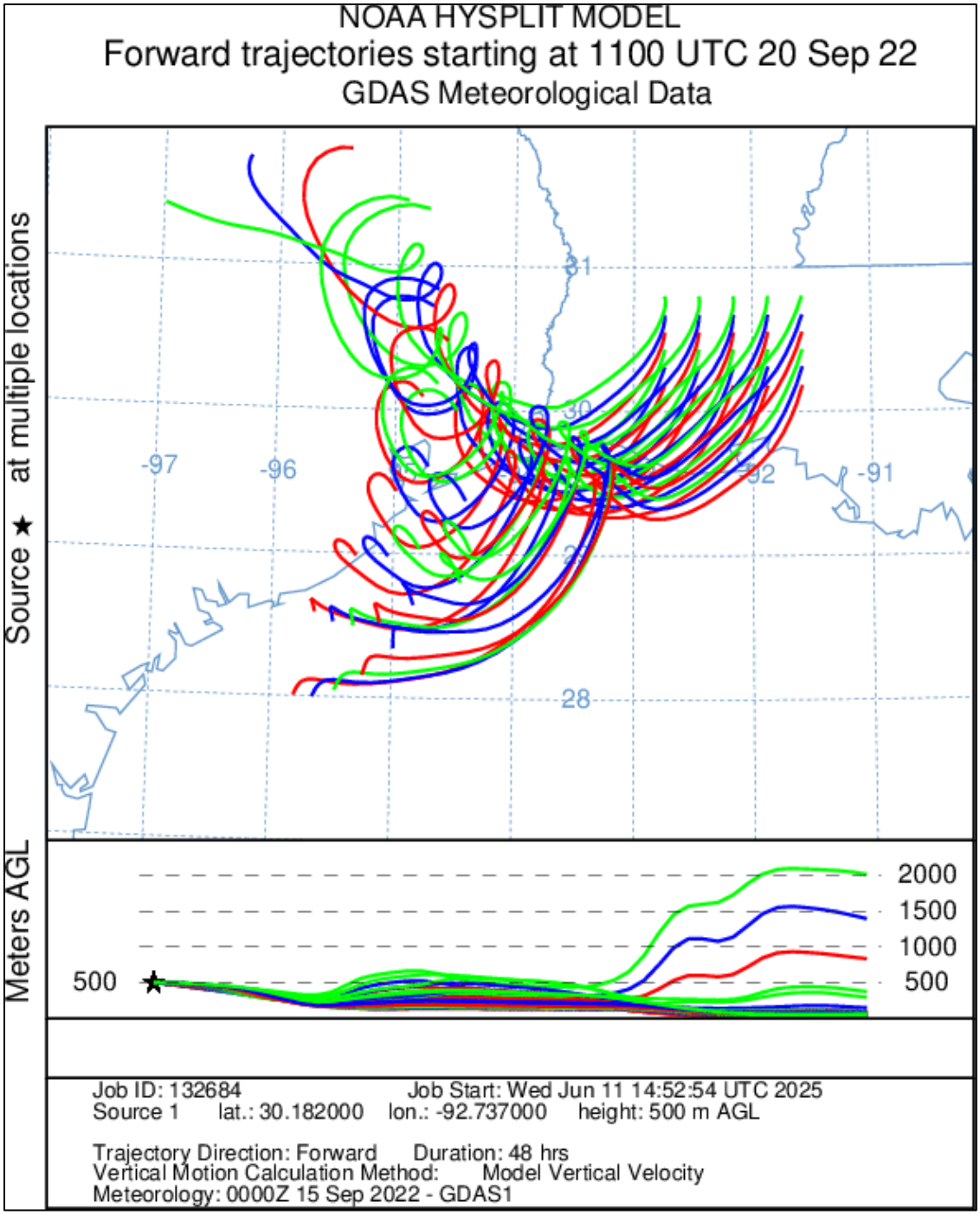

Figure 3-51: NOAA HYSPLIT 48-Hour Forward Trajectories Originating from Texas/Louisiana Border with Fires, on September 20, 2022

The TCEQ forecast for September 23, 2022 (Table C-5), references the presence of seasonal fire activity across the southeast U.S. and East Texas, in addition to continental haze over the more urban areas in east and southeast, with the highest concentrations across east and southeast Texas. Figure 3-52: *Hourly $PM_{2.5}$ Concentrations on September 23, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor, and concentrations were at their highest early in the day and just prior to noon local time. Figure 3-53: *AirNow HMS*

Smoke Plume for September 23, 2022 shows smoke in the vicinity of Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-54: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 23, 2022, Showing Haze from Fires Over East Texas and the Gulf of America along the Coast of East Texas* shows hazy conditions over East Texas and the Gulf of America along the coast of East Texas. Figure 3-55: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on September 23, 2022* shows movement of air through smoke plumes on the Texas/Louisiana border and from within the Mississippi River Valley. Figure 3-56: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Texas/Louisiana Border with Fires, Starting on September 20, 2022* shows through 72-hour trajectories that winds traveled from locations of fires into Jefferson County.

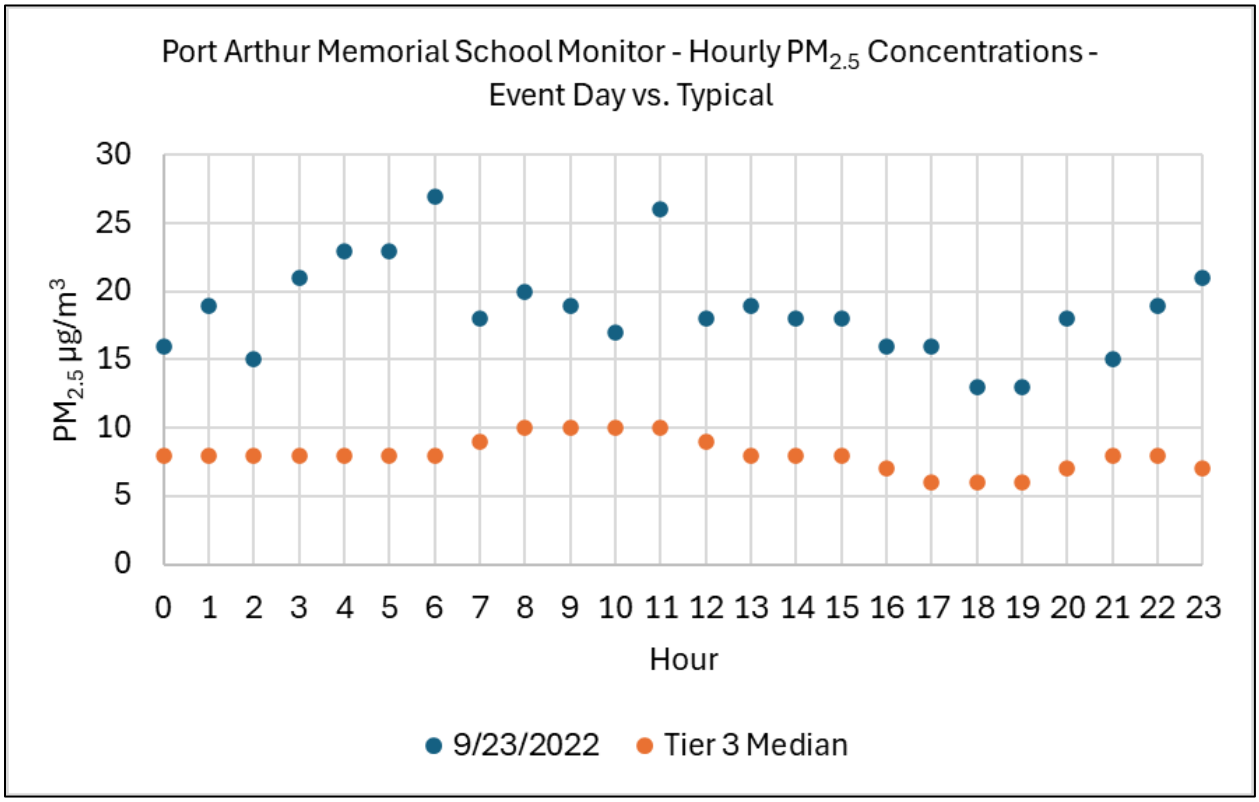

Figure 3-52: Hourly $PM_{2.5}$ Concentrations on September 23, 2022, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

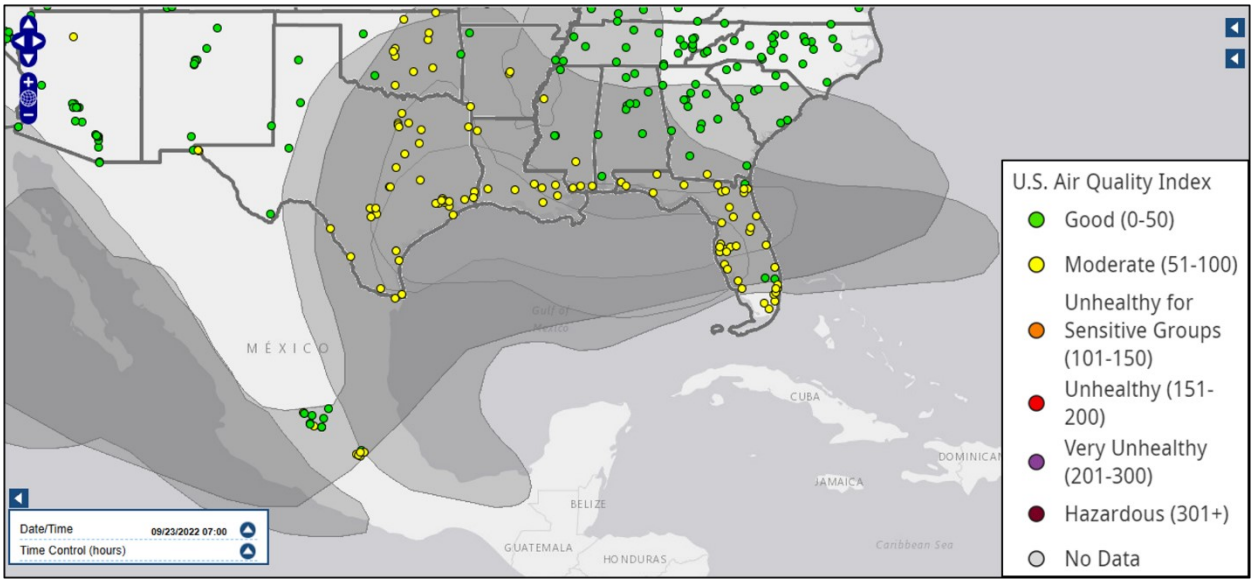

Figure 3-53: AirNow HMS Smoke Plume for September 23, 2022

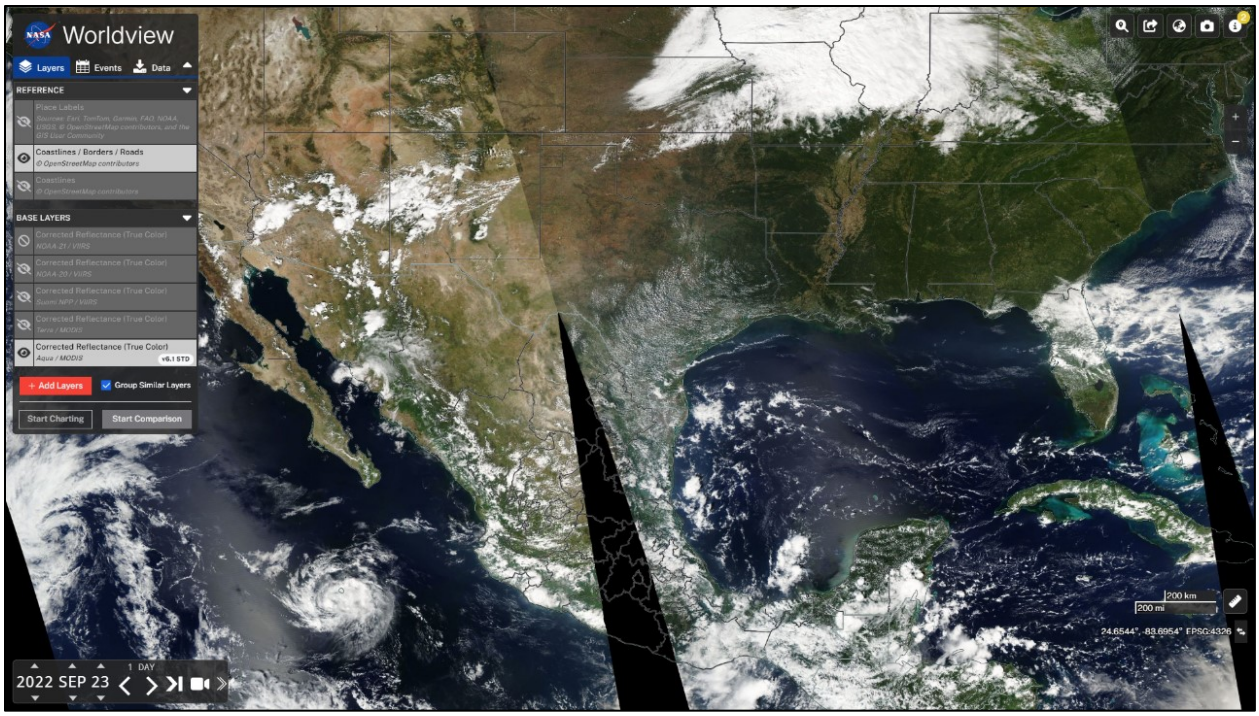

Figure 3-54: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 23, 2022, Showing Haze from Fires Over East Texas and the Gulf of America along the Coast of East Texas

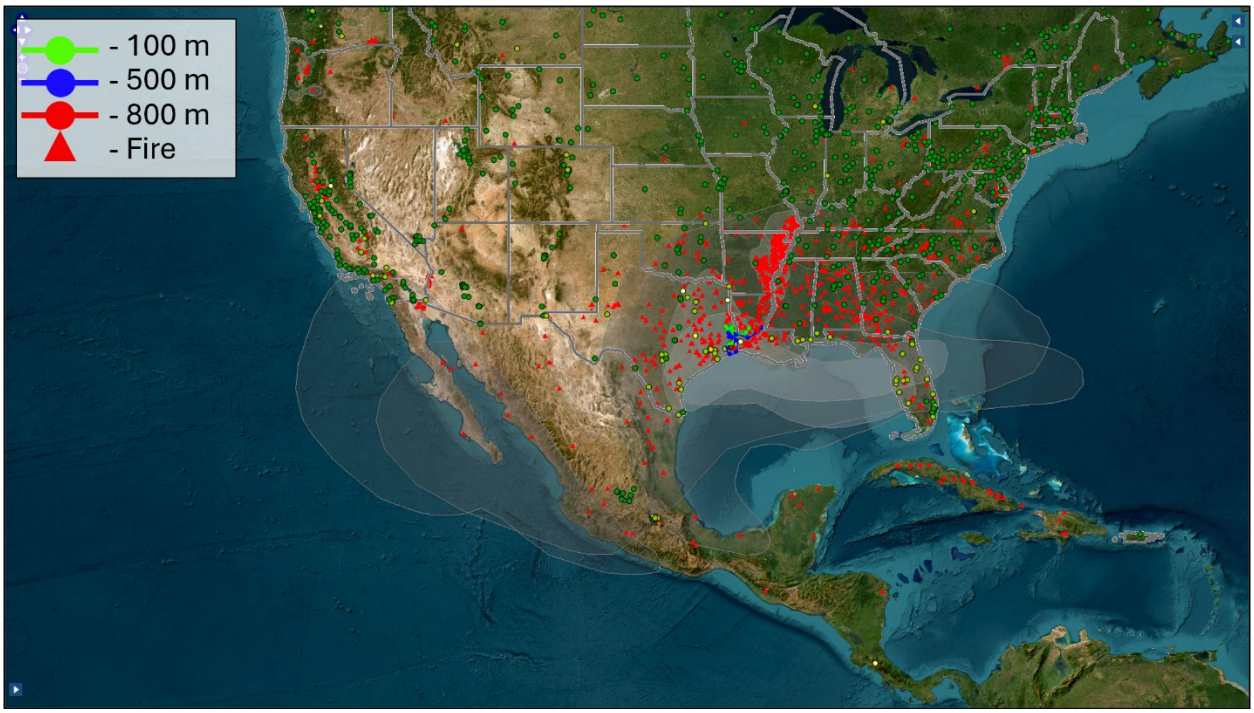

Figure 3-55: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on September 23, 2022

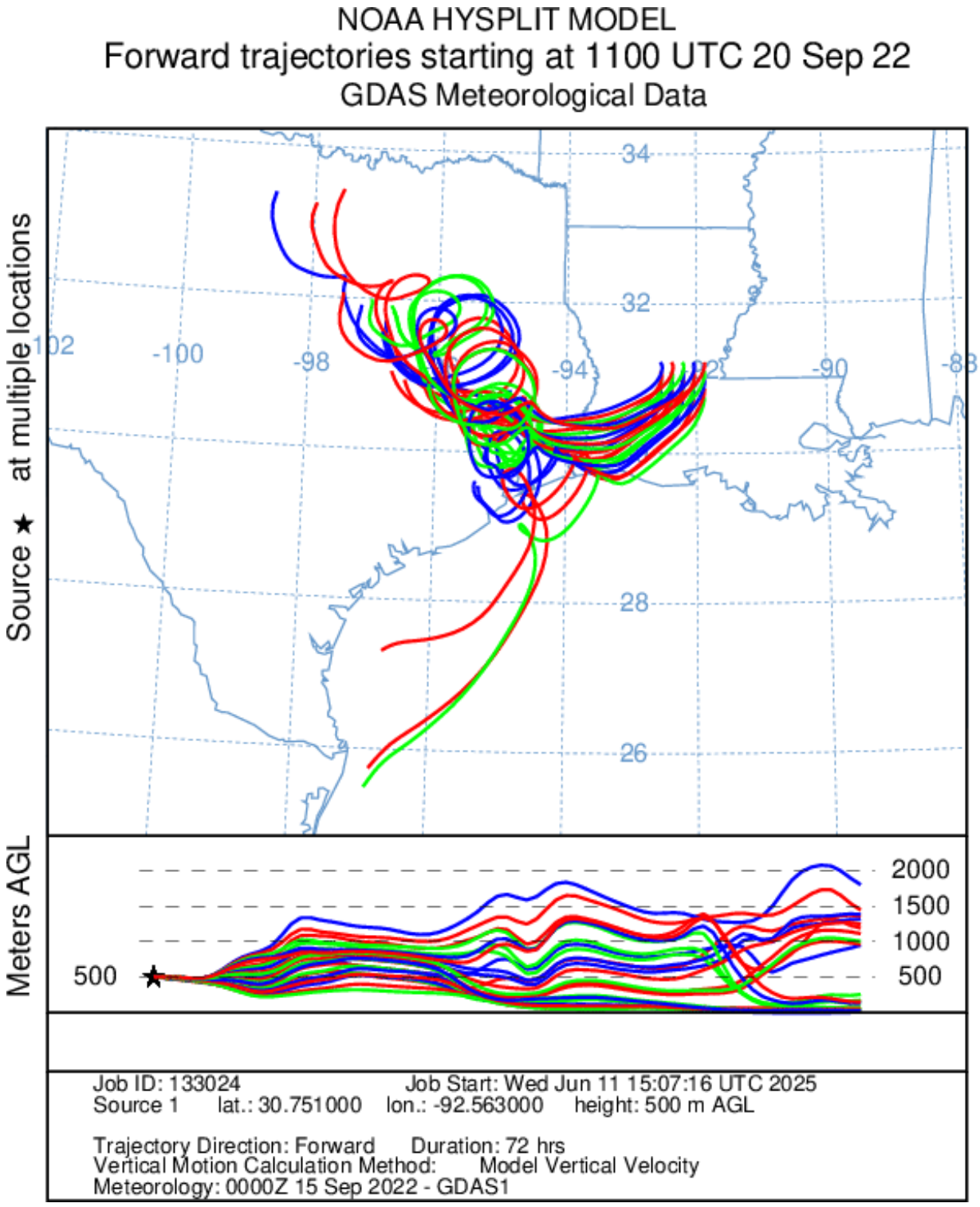

Figure 3-56: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Texas/Louisiana Border with Fires, Starting on September 20, 2022

3.2.6 Group 6 – Evidence for February 27, 2023, and February 28, 2023, Fire (Mexico/Central America) $PM_{2.5}$ Event

February 27, 2023, and February 28, 2023, were identified as Tier 2 days at the Port Arthur Memorial School monitor with 24-hour $PM_{2.5}$ concentrations of 19.4 µg/m^3 and 18.7 µg/m^3, respectively. These elevated concentrations were primarily a result of smoke from fires in Mexico and Central America.

The TCEQ forecast for February 27, 2023 (Table C-6), references smoke from seasonal fire activity in Mexico/Central America and across western and central Texas, Oklahoma, Arkansas, and the southeast U.S., combined with high humidity and southerly winds. These conditions were expected to elevate fine particulate levels. Figure 3-57: *Hourly $PM_{2.5}$ Concentrations on February 27, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor, and concentrations were at their highest from 14:00 through 17:00 local time. Figure 3-58: *AirNow HMS Smoke Plume for February 27, 2023* shows smoke in the Gulf of America that continued to Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-59: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from February 27, 2023, Showing Hazy Conditions Over the Gulf of America and East Texas* shows hazy conditions over the Gulf of America and East Texas. Figure 3-60: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on February 27, 2023*, shows movement of air through smoke plumes in the Gulf of America. *Figure 3-61: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on February 24, 2023*, shows through 72-hour trajectories that winds traveled from locations of smoke from fires in Mexico and Central America to Jefferson County.

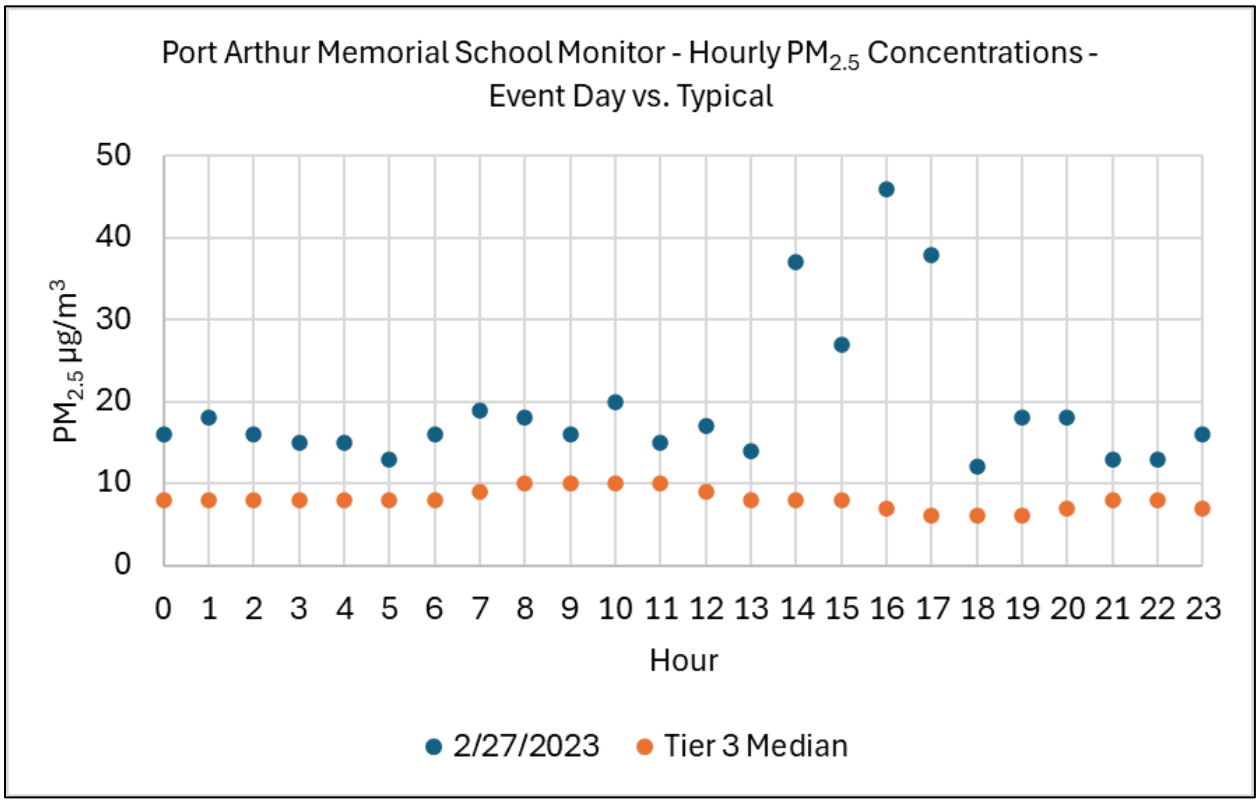

Figure 3-57: Hourly $PM_{2.5}$ Concentrations on February 27, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

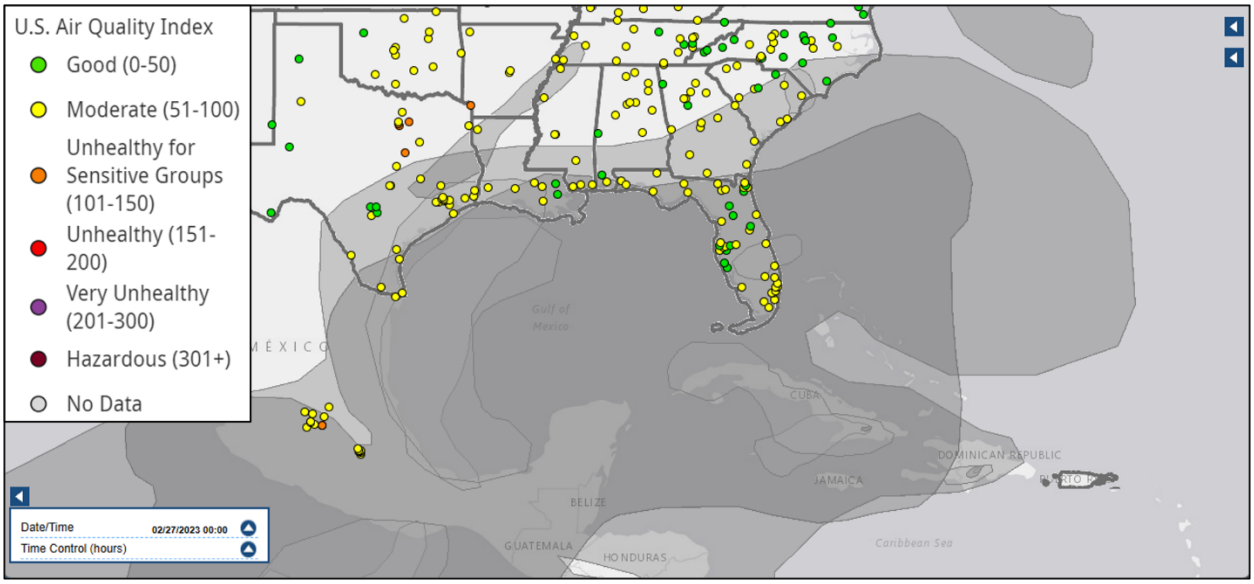

Figure 3-58: AirNow HMS Smoke Plume for February 27, 2023

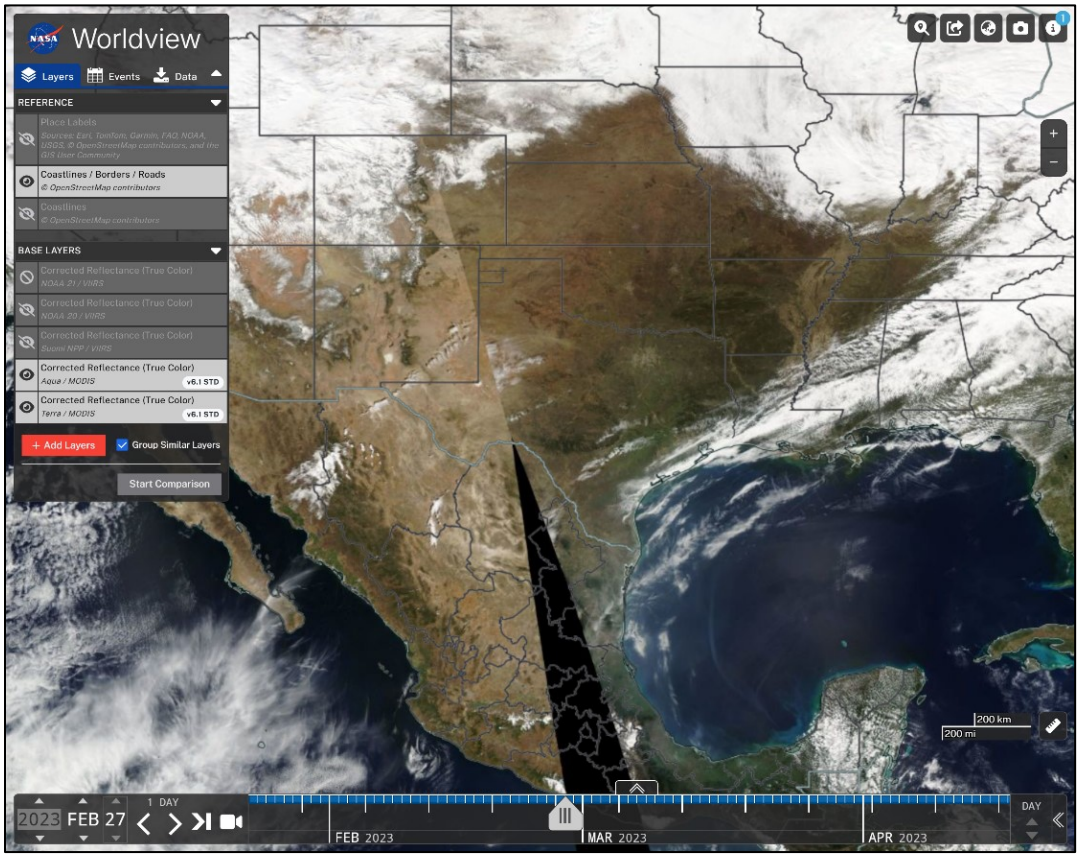

Figure 3-59: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from February 27, 2023, Showing Hazy Conditions Over the Gulf of America and East Texas

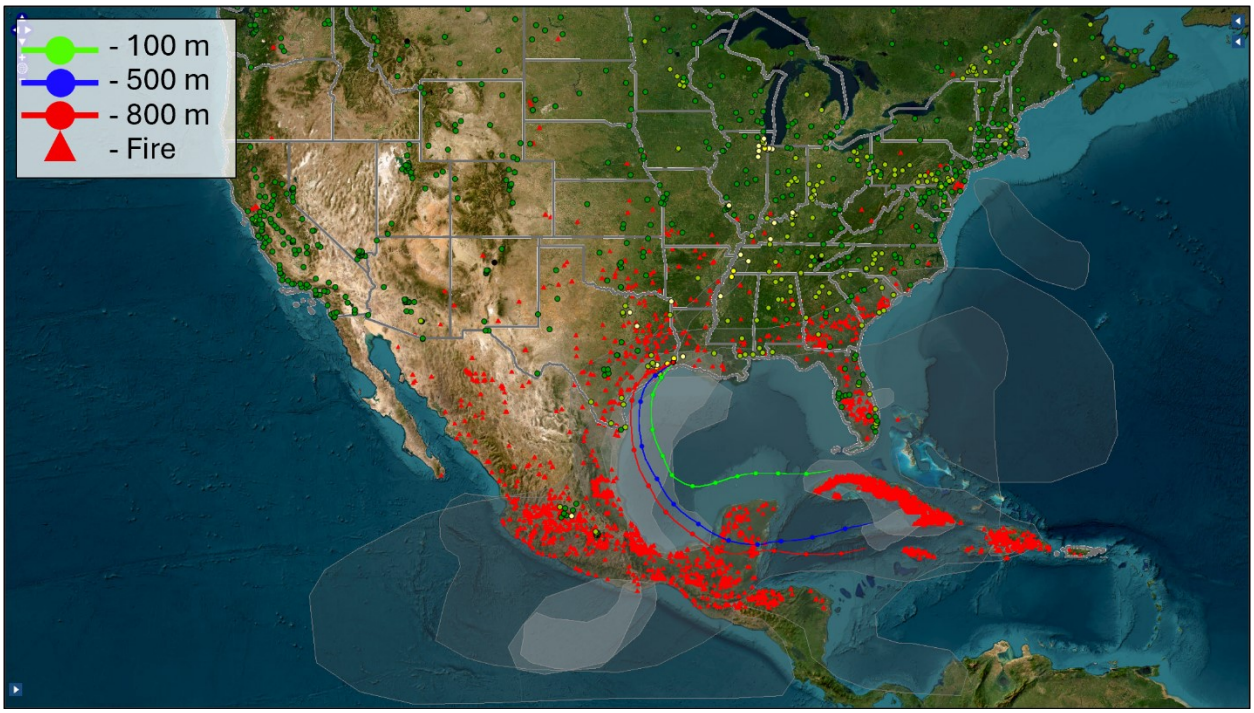

Figure 3-60: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on February 27, 2023

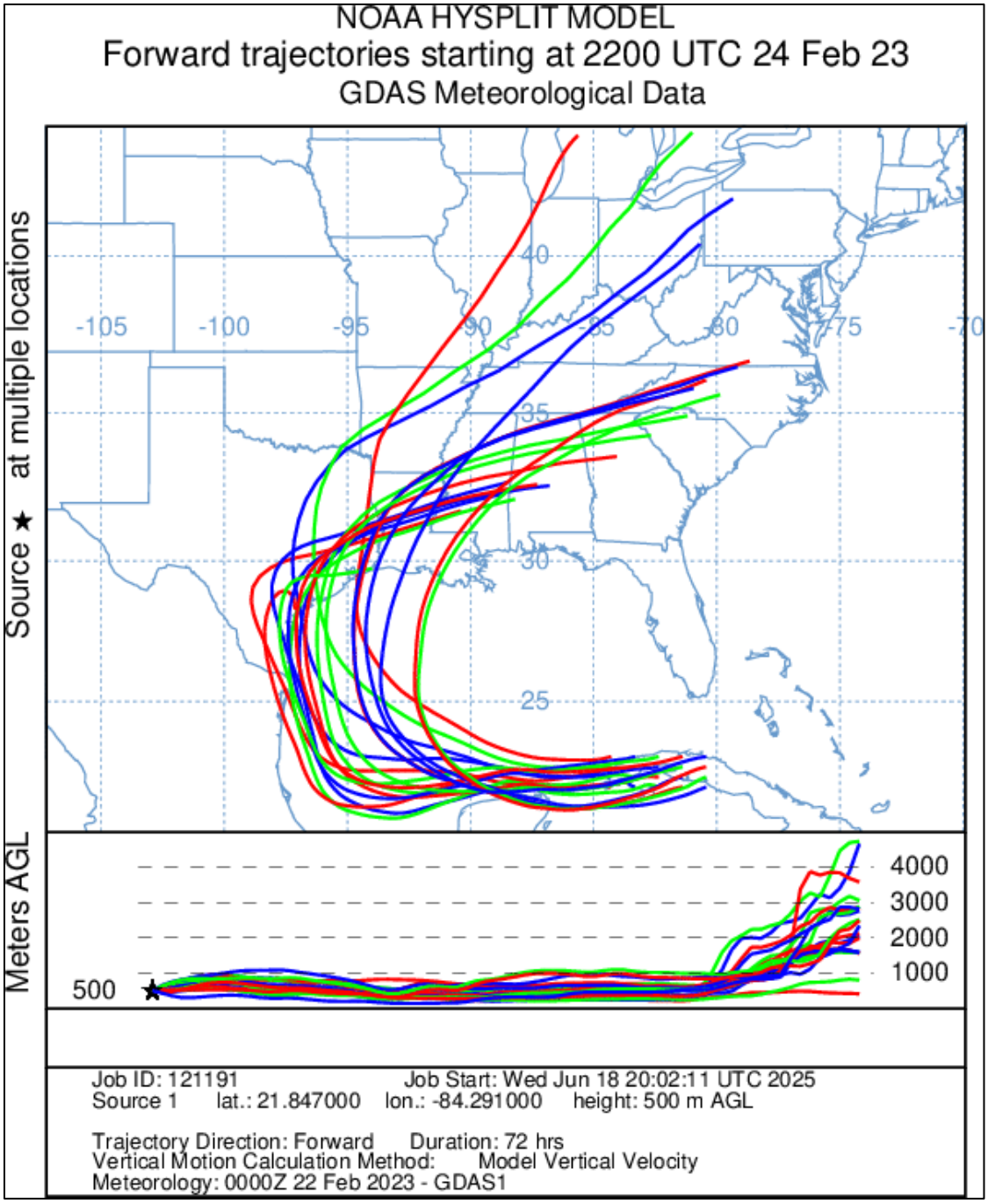

Figure 3-61: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on February 24, 2023

The TCEQ forecast for February 28, 2023 (Table C-3), references that southerly winds associated with a transitioning frontal boundary would continue to filter residual smoke/aerosols from seasonal fires and industrial activity in southern Mexico, Central America, and Cuba over the eastern two-thirds of Texas. Light amounts of patchy residual smoke associated with seasonal fires across portions of south and southeast Texas as well as the Coastal Bend would also contribute to slightly higher fine particulate background levels across these parts of Texas. Additionally, light fine particulates from a dust storm on February 26, 2023, lingered over the east and southeast portions of the state and contributed to elevated

$PM_{2.5}$ levels on February 28, 2023. Media reports for February 27, 2023, and February 28, 2028 (Figure C-8 and Figure C-9), discuss dust in Texas due to dust storms from West Texas. The evidence presented for shows smoke from Mexico and Central America to be the primary cause of elevated $PM_{2.5}$ concentrations on February 28, 2023. Figure 3-62: *Hourly $PM_{2.5}$ Concentrations on February 28, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations until 21:00 local time were higher than those classified as typical at this monitor, and concentrations were at their highest from 04:00 through 07:00. Figure 3-63: *AirNow HMS Smoke Plume for February 28, 2023*, shows smoke in the Gulf of America that continued to Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-64: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from February 28, 2023, Showing Hazy Conditions Over the Gulf of America and East Texas* shows hazy conditions over the Gulf of America and East Texas. Figure 3-65: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on February 28, 2023* shows movement of air through smoke plumes in the Gulf of America from the trajectory at the lowest height. Trajectories at higher elevations are from the west on February 28, 2023. Figure 3-66: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on February 25, 2023* shows through 72-hour trajectories that winds traveled from locations of smoke from fires in Mexico to Jefferson County.

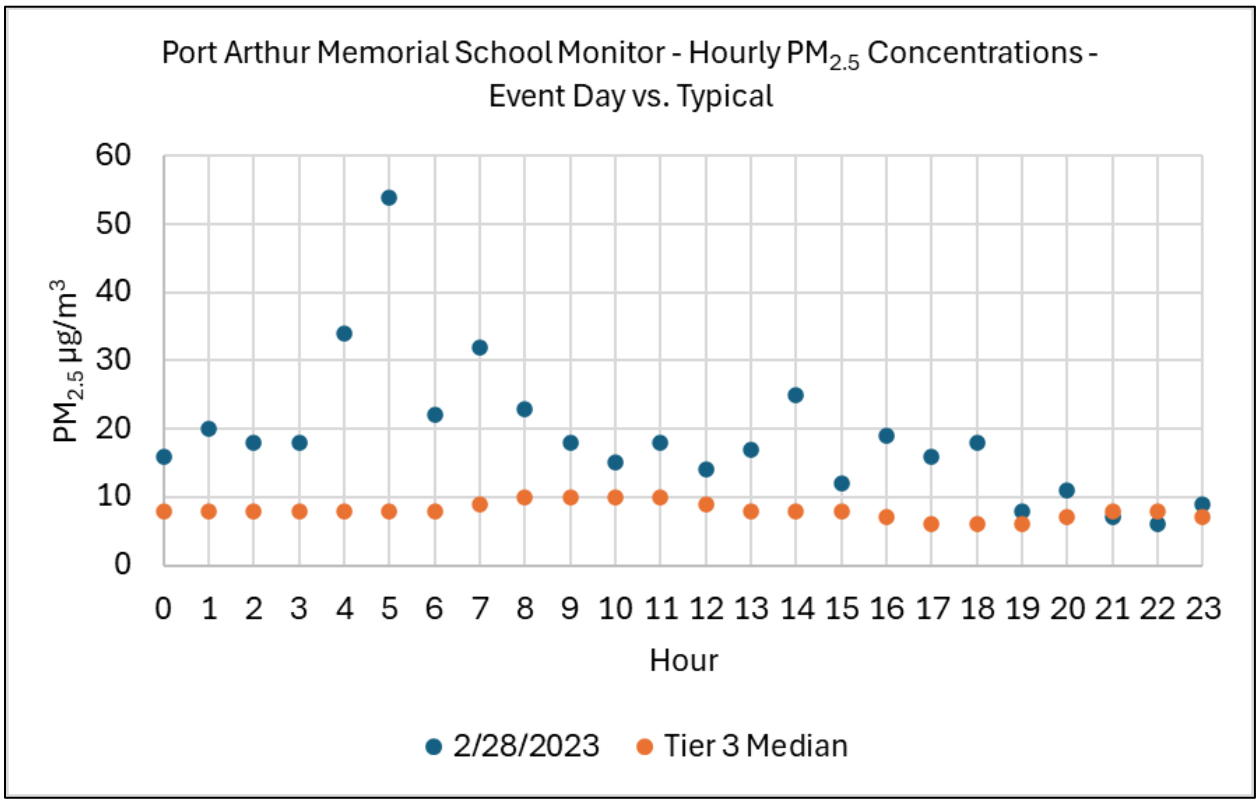

Figure 3-62: Hourly $PM_{2.5}$ Concentrations on February 28, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

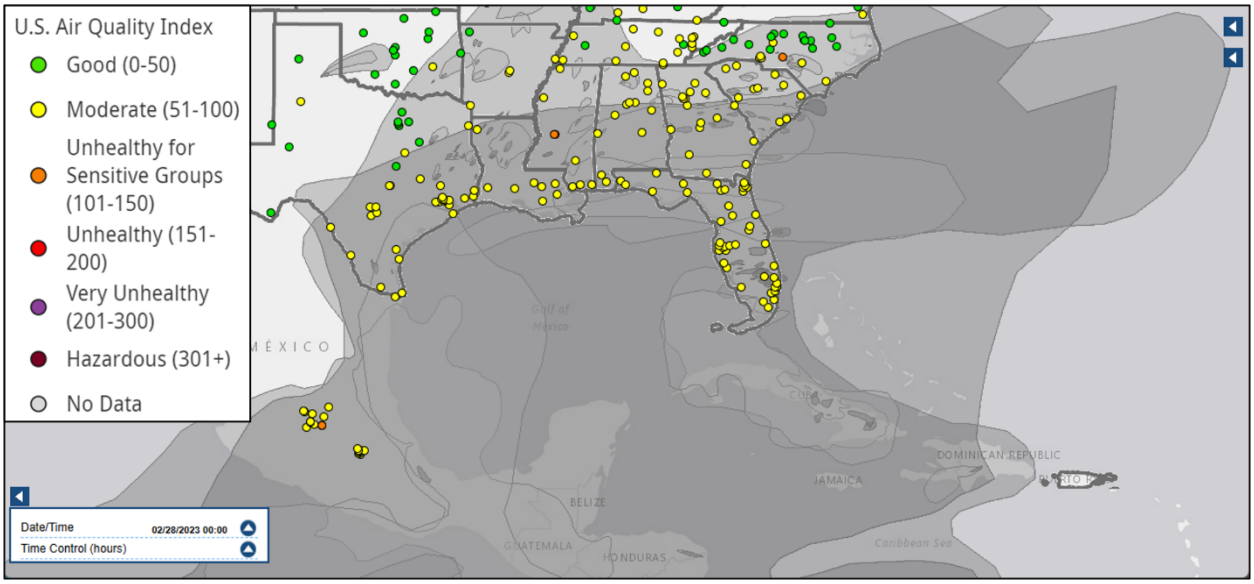

Figure 3-63: AirNow HMS Smoke Plume for February 28, 2023

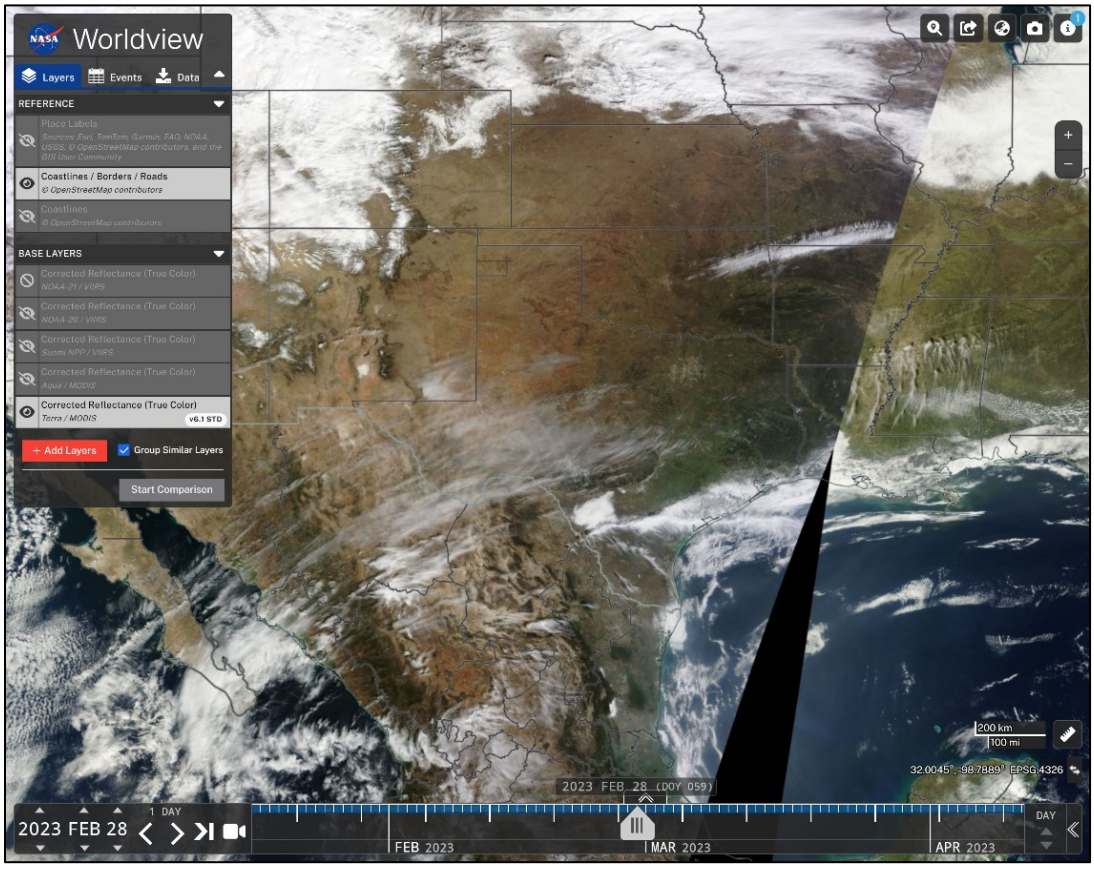

Figure 3-64: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from February 28, 2023, Showing Hazy Conditions Over the Gulf of America and East Texas

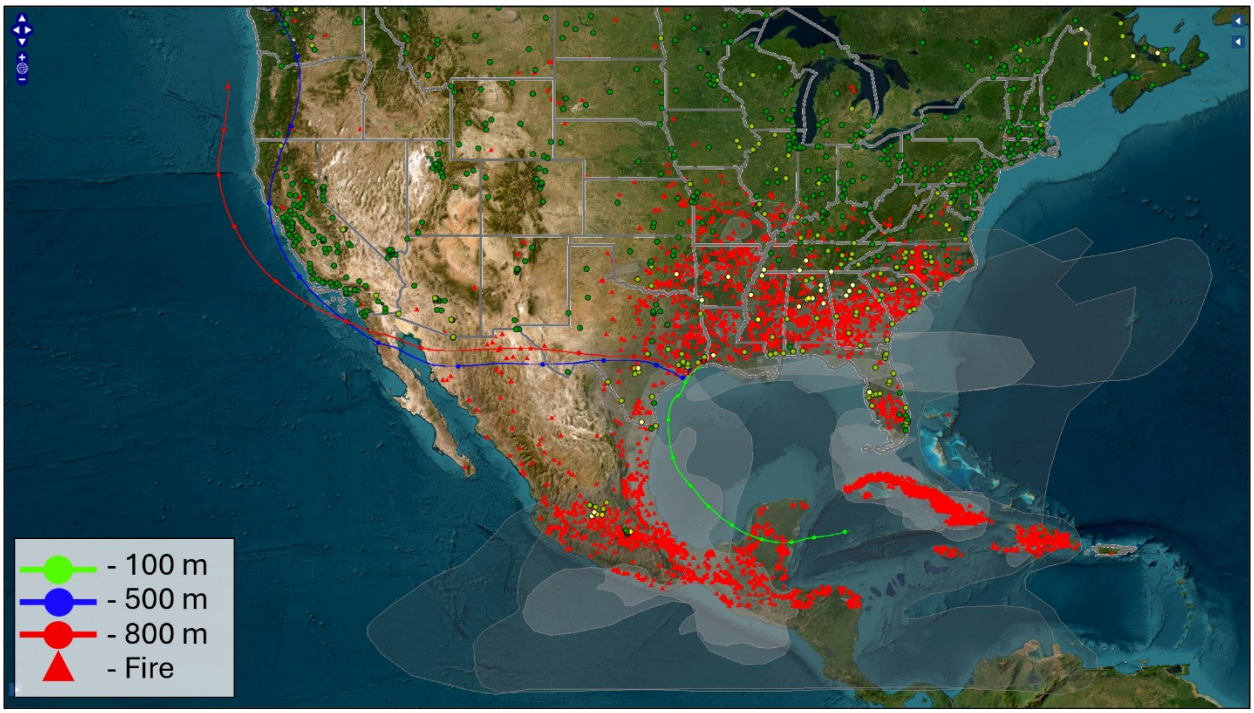

Figure 3-65: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on February 28, 2023

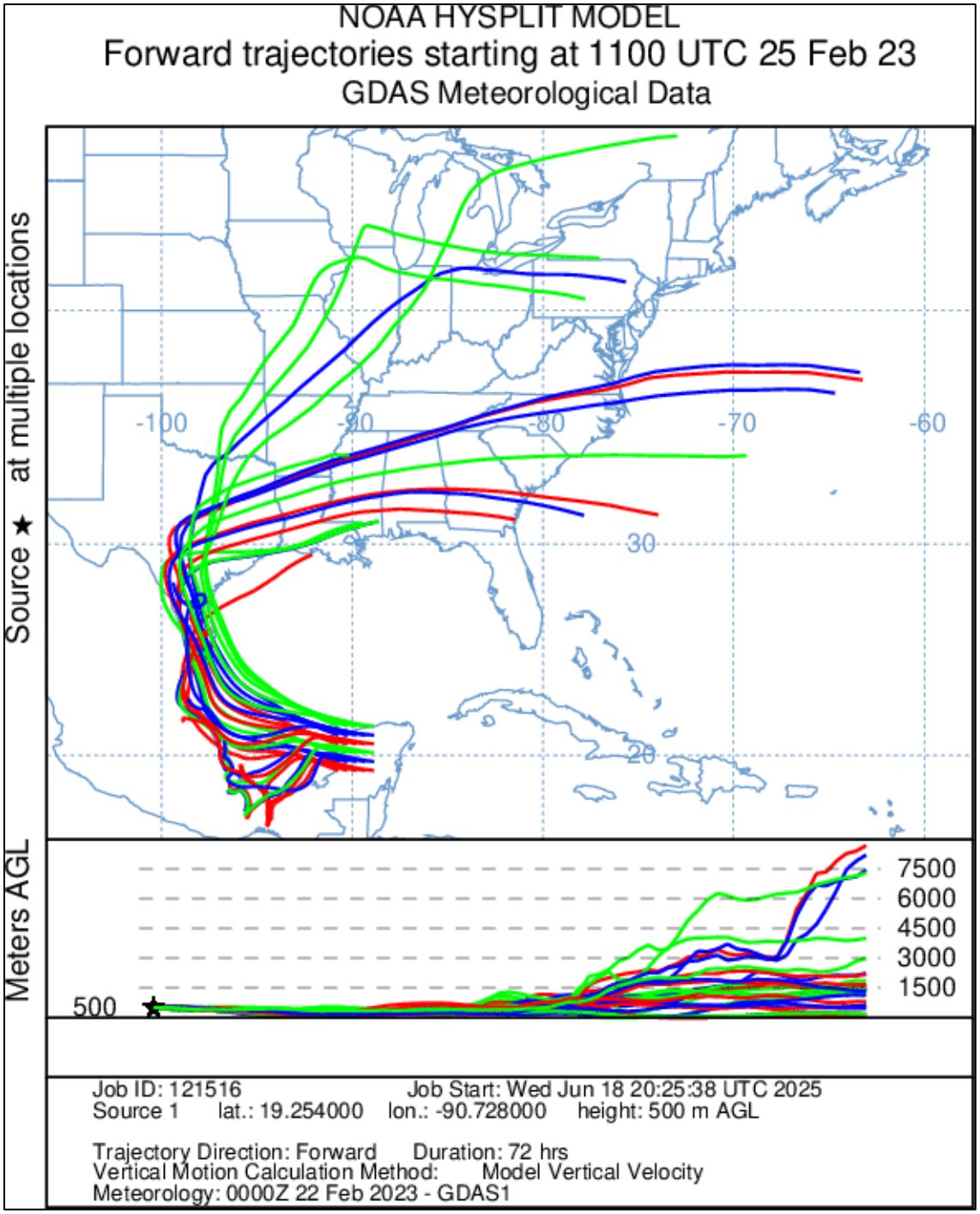

Figure 3-66: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on February 25, 2023

3.2.7 Group 7 – Evidence for March 5, 2023, Prescribed Fire $PM_{2.5}$ Event

The TCEQ forecast for March 5, 2023 (Table C-7), references light smoke from seasonal burning activity in Louisiana, Mississippi River Valley, and East Texas contributing to increased $PM_{2.5}$ levels across East Texas and the Coastal Bend. Figure 3-67: *Hourly $PM_{2.5}$ Concentrations on March 5, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor*

shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor, and concentrations were at their highest at 20:00 local time. Figure 3-68: *AirNow HMS Smoke Plume for March 5, 2023*, shows smoke in Jefferson County and sporadic small smoke plumes in the area, with a Moderate AQI in East Texas. Figure 3-69: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from on March 5, 2023, Showing Hazy Conditions Over the Gulf of America* shows hazy conditions over the Gulf of America just off the coast in East Texas. Figure 3-70: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on March 5, 2023* shows movement of air through smoke plumes in East Texas, Louisiana, and the Mississippi Valley. Figure 3-71: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas with Fires, Starting on March 3, 2023* shows through 72-hour trajectories that winds traveled through smoke through fires in various locations in East Texas, Louisiana, and the Mississippi River Valley prior to reaching Jefferson County.

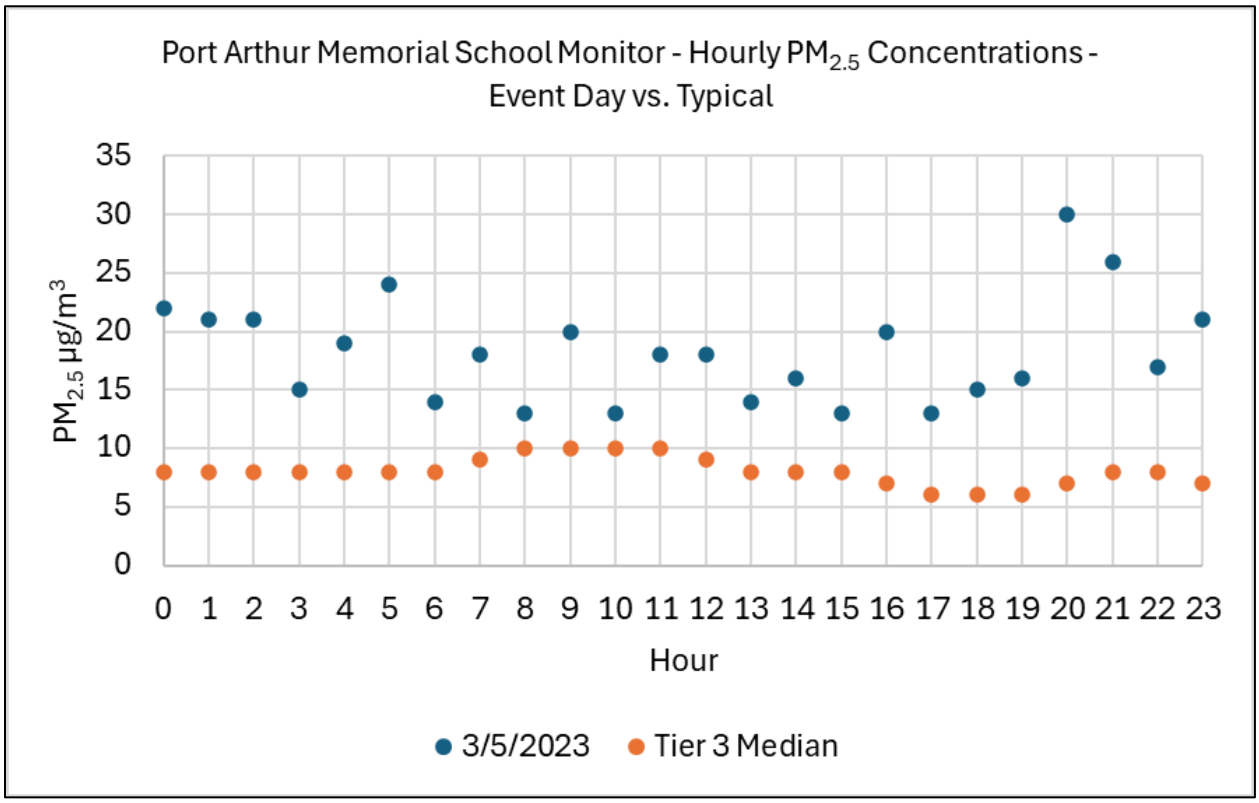

Figure 3-67: Hourly $PM_{2.5}$ Concentrations on March 5, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

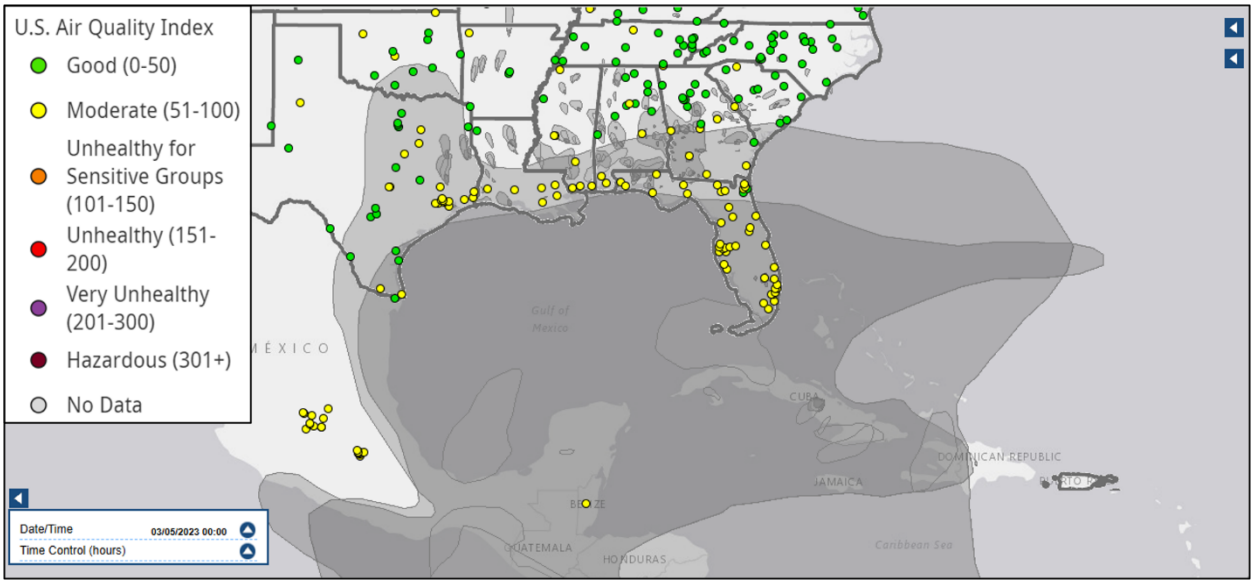

Figure 3-68: AirNow HMS Smoke Plume for March 5, 2023

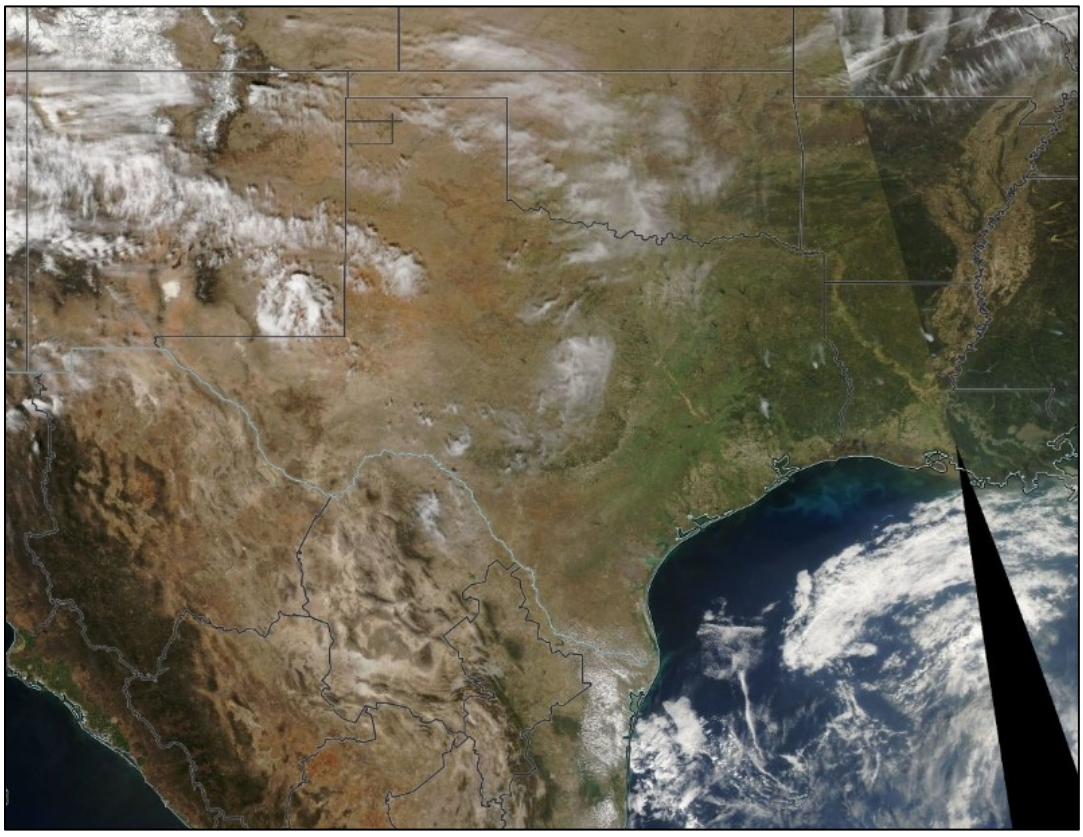

Figure 3-69: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from on March 5, 2023, Showing Hazy Conditions Over the Gulf of America

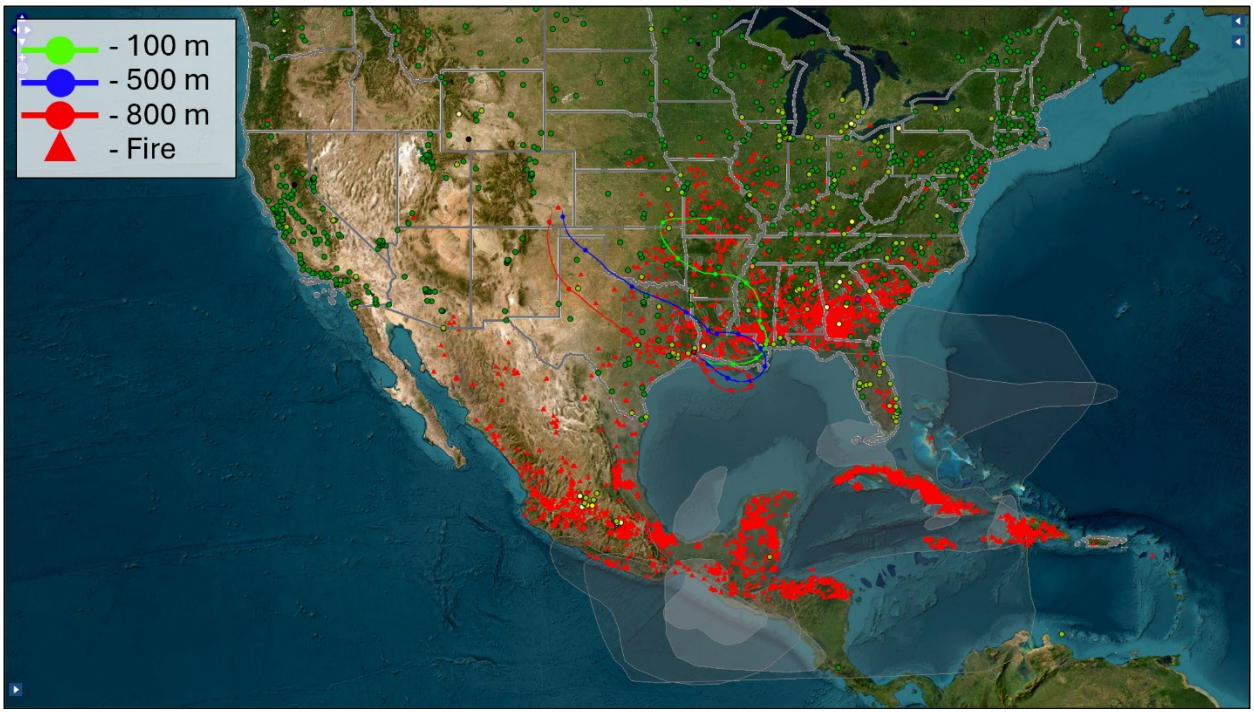

Figure 3-70: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on March 5, 2023

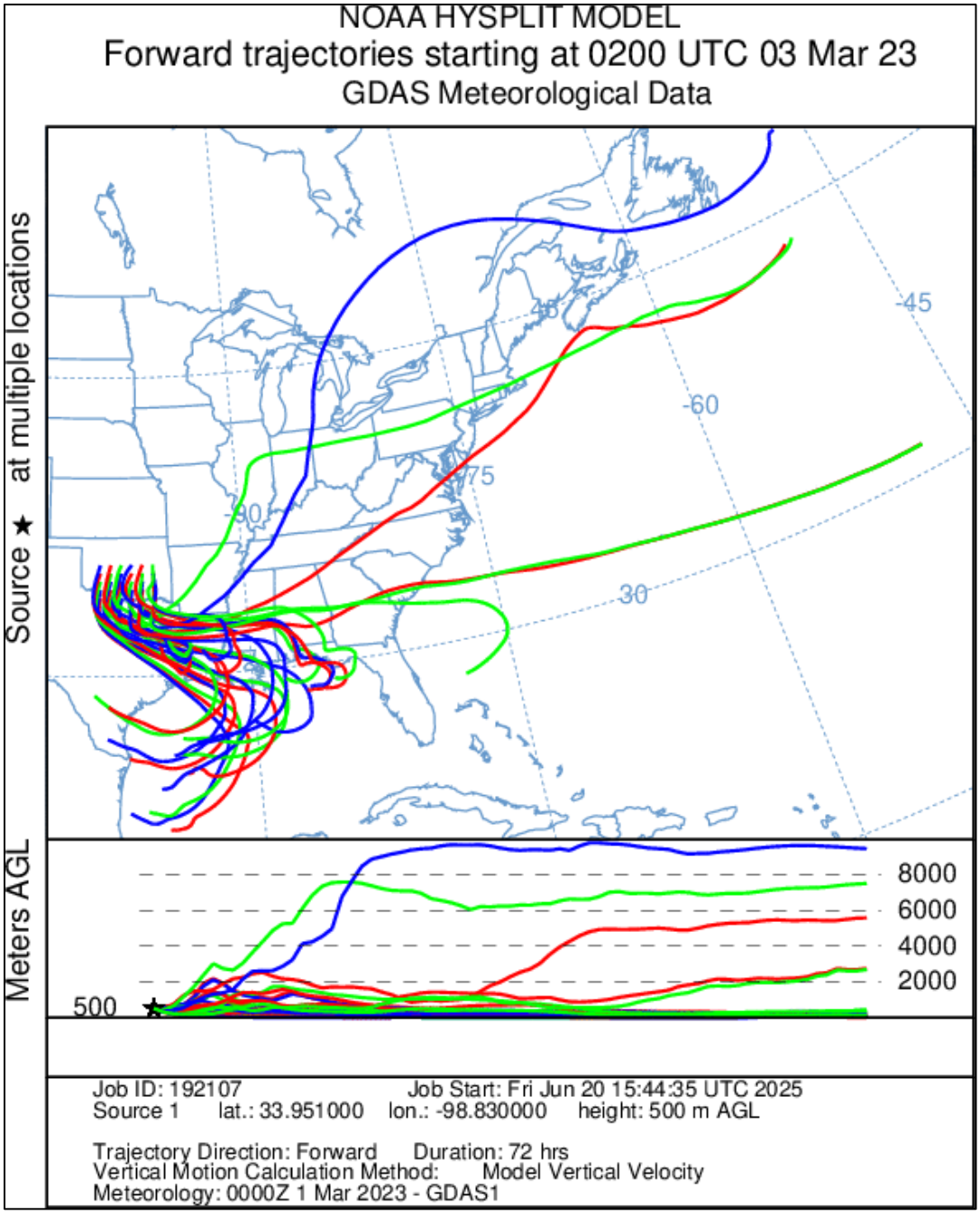

Figure 3-71: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas with Fires, Starting on March 3, 2023

3.2.8 Group 8 – Evidence for May 22, 23, 24, 26, and 27, 2023 Fire - Canadian $PM_{2.5}$ Event

May 22, 2023, and May 26, 2023, were identified as Tier 1 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 25.1 µg/m^3 and 27.2 µg/m^3, respectively. May 23, 2023, May 24, 2023, and May 27, 2023, were identified as Tier 2 days with respective 24-hour $PM_{2.5}$ concentrations of 24.2 µg/m^3, 23.8 µg/m^3, and 23.7 µg/m^3. These elevated concentrations were primarily a result of smoke from Canadian wildfires.

The TCEQ forecast for May 22, 2023 (Table C-8) references Canadian wildfire smoke continuing to dissipate across Central and Northeast Texas. It further references that thin smoke from fires in Mexico and Central America remained mostly aloft over the Coastal Bend area of Texas. Figure 3-72: *Hourly $PM_{2.5}$ Concentrations on May 22, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were 10 µg/m^3 higher than those classified as typical at this monitor. Figure 3-73: *AirNow HMS Smoke Plume for May 22, 2023*, shows smoke in Jefferson County and all surrounding areas, with a Moderate AQI in East Texas and all surrounding areas. Figure 3-74: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery* from May *22, 2023, Showing Hazy Condition North of Texas Continuing to the Gulf of America* shows hazy conditions over states north of Texas with visible haze continuing all the way to the Gulf of America off the coast of Texas. Figure 3-75: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 22, 2023*, shows movement of air through smoke plumes that extend all the way to Canada and cover the entirety of the central U.S.

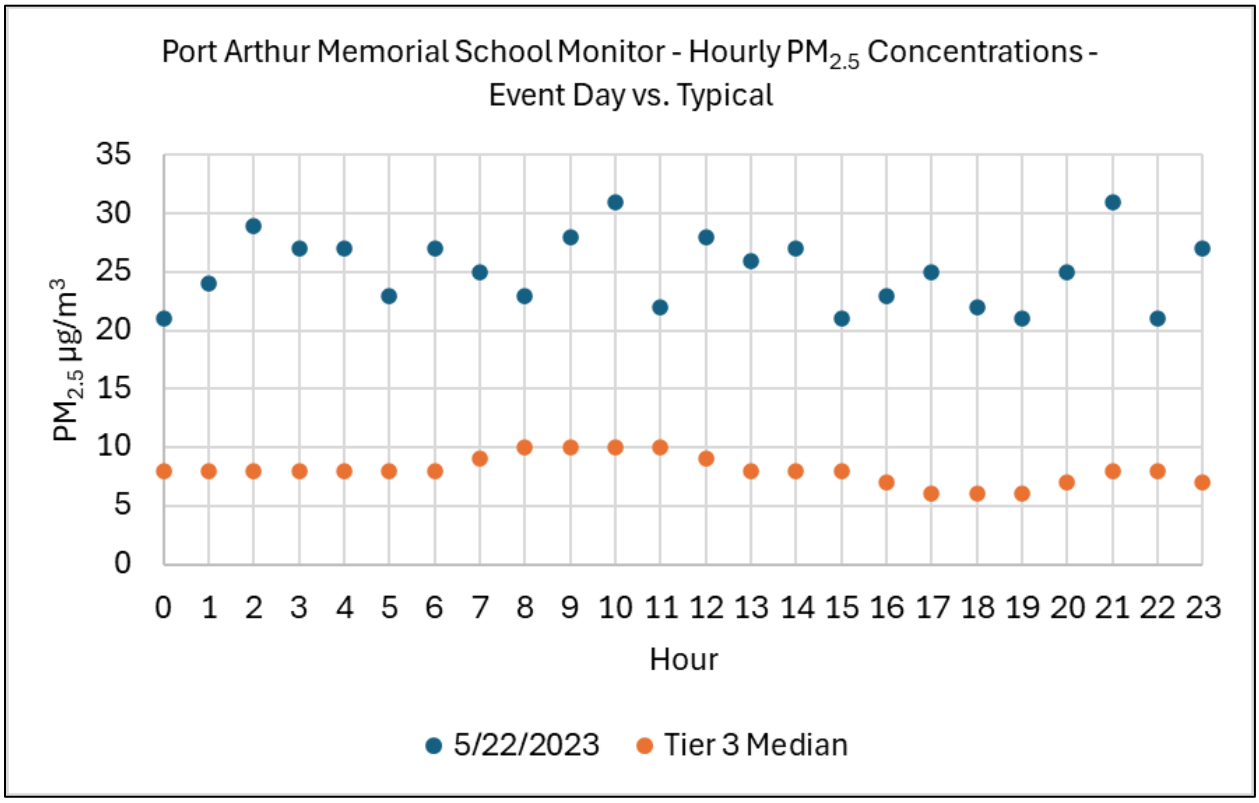

Figure 3-72: Hourly $PM_{2.5}$ Concentrations on May 22, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

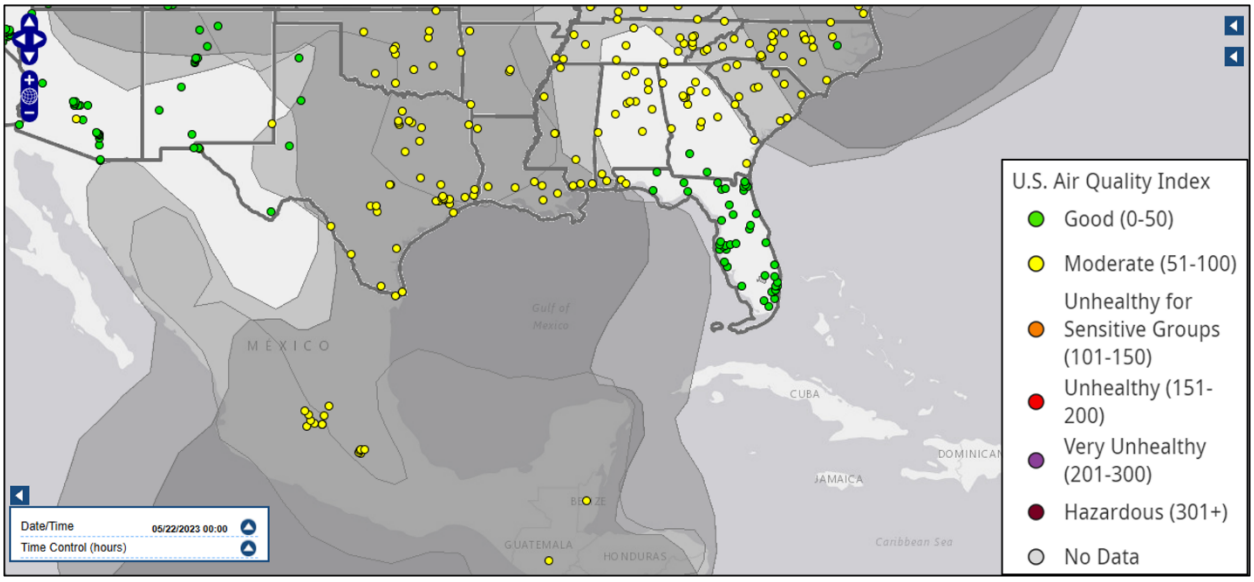

Figure 3-73: AirNow HMS Smoke Plume for May 22, 2023

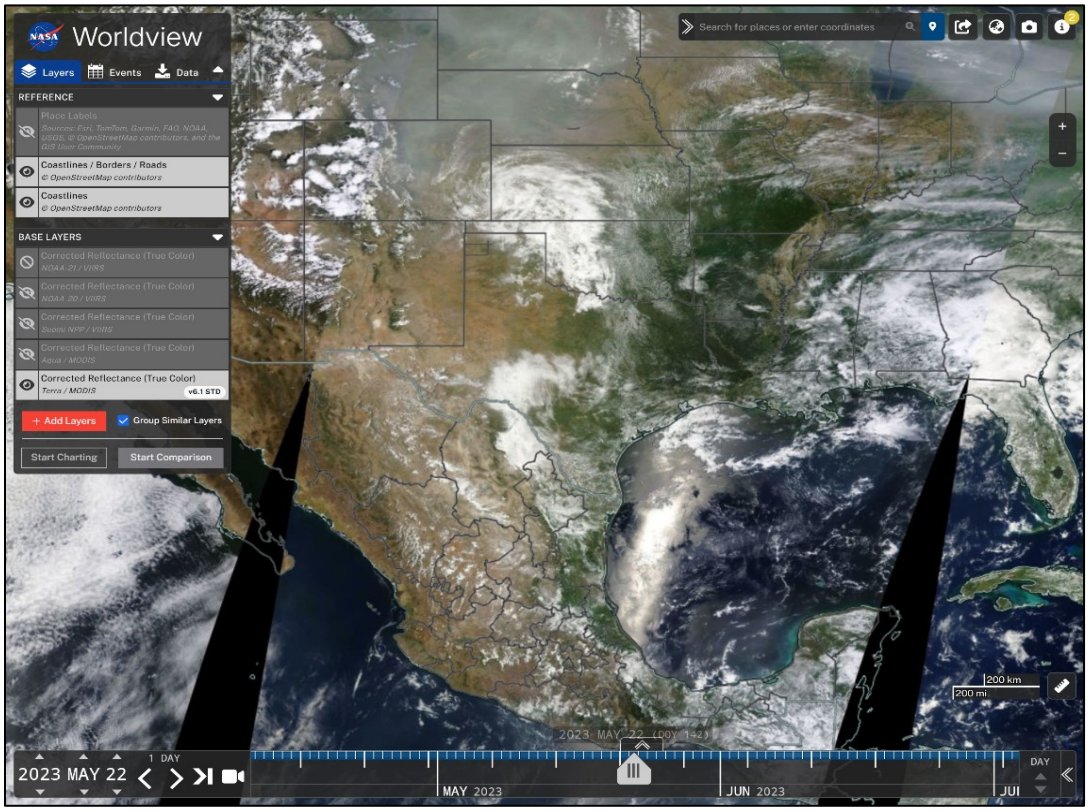

Figure 3-74: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 22, 2023, Showing Hazy Condition North of Texas Continuing to the Gulf of America

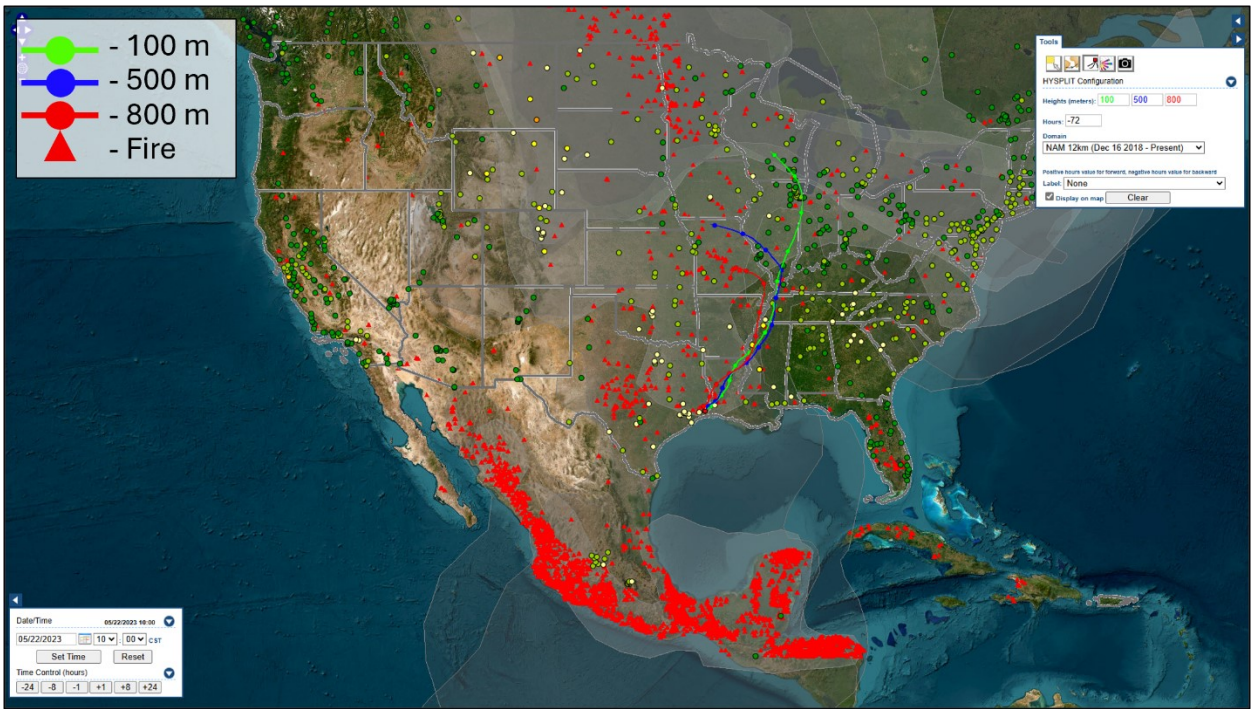

Figure 3-75: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 22, 2023

The TCEQ forecast for May 23, 2023 (Table C-8), references that Canadian wildfire smoke continued over Texas in greater amounts, mixing with urban emissions and continental haze under light winds and limited vertical mixing, and thus raising $PM_{2.5}$ levels. Figure 3-76: *Hourly $PM_{2.5}$ Concentrations on May 23, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were at least 10 µg/m^3 higher than those classified as typical at this monitor. Figure 3-77: *AirNow HMS Smoke Plume for May 23, 2023*, shows smoke in Jefferson County and surrounding areas to the north, with a Moderate AQI in East Texas and all surrounding areas to the north. Figure 3-78: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 23, 2023, Showing Haze in East Texas and Surrounding Areas* shows hazy conditions over East Texas and states to the north of Texas. Figure 3-79: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 23, 2023*, shows movement of air through smoke plumes that extend all the way to Canada and cover the entirety of the central U.S.

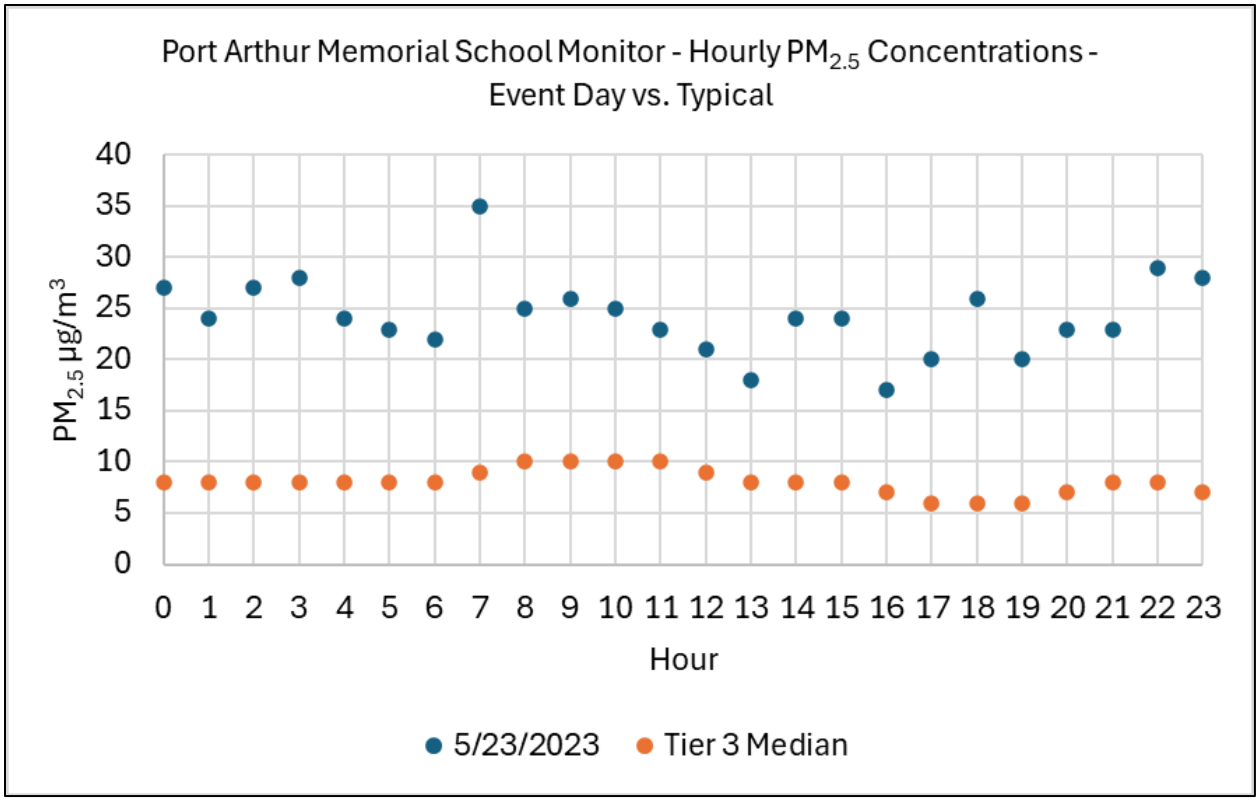

Figure 3-76: Hourly $PM_{2.5}$ Concentrations on May 23, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor

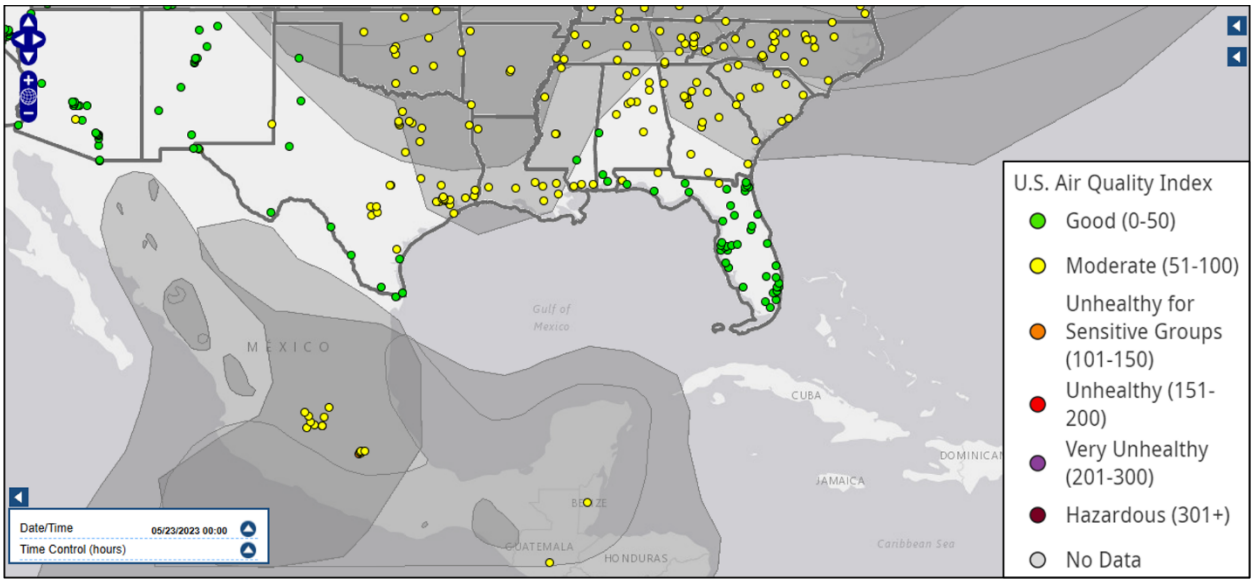

Figure 3-77: AirNow HMS Smoke Plume for May 23, 2023

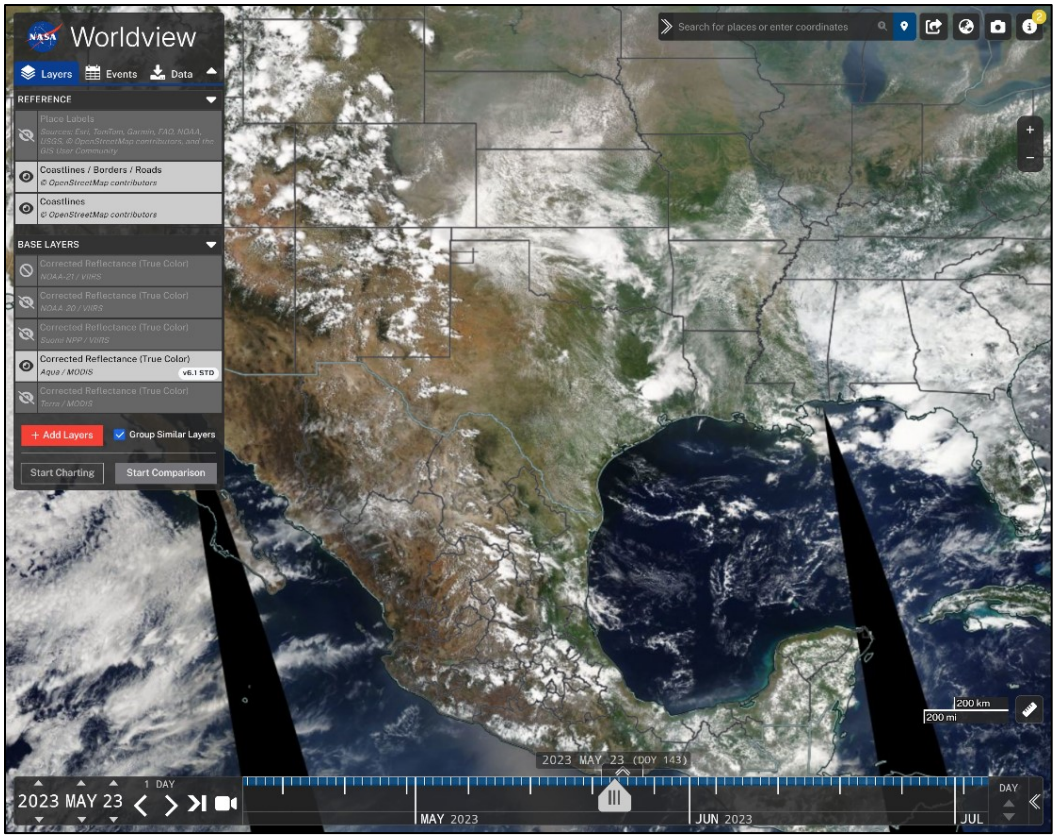

Figure 3-78: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 23, 2023, Showing Haze in East Texas and Surrounding Areas

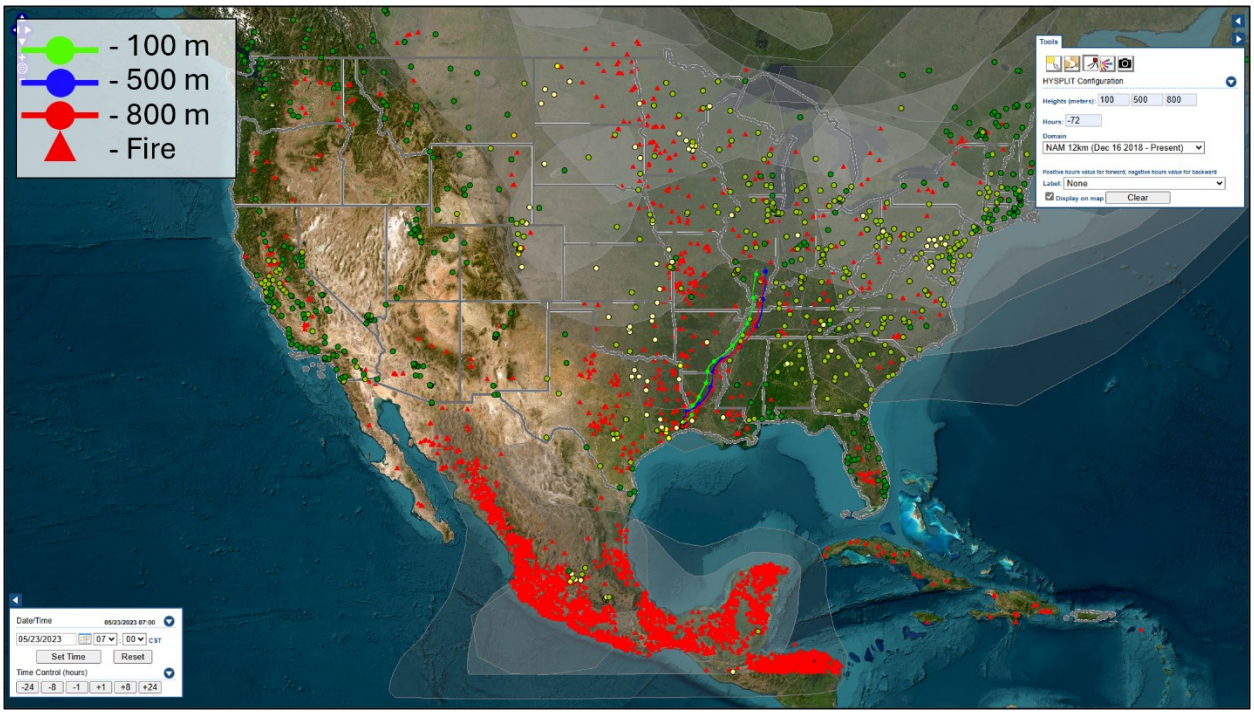

Figure 3-79: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 23, 2023

The TCEQ forecast for May 24, 2023 (Table C-8), references that light winds in east and southeast Texas limited dispersion, allowing Canadian wildfire smoke and local burning to continue elevating $PM_{2.5}$ levels. The forecast further stated that urban emissions and continental haze contribute to elevated $PM_{2.5}$ across the eastern two-thirds of the state. Figure 3-80: *Hourly $PM_{2.5}$ Concentrations on May 24, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that the majority of hourly $PM_{2.5}$ concentrations were at least 10 µg/m³ higher than those classified as typical at this monitor. Figure 3-81: *AirNow HMS Smoke Plume for May 24, 2023*, shows smoke in Jefferson County and surrounding areas to the north, with a Moderate AQI in East Texas and all surrounding areas to the north. Figure 3-82: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 24, 2023, Showing Haze in States North of Texas* shows hazy conditions over states to the north of Texas, but East Texas and Jefferson County are primarily obstructed by cloud cover. Figure 3-83: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 24, 2023* shows movement of air through smoke plumes that extend all the way to Canada and cover the entirety of the central U.S.

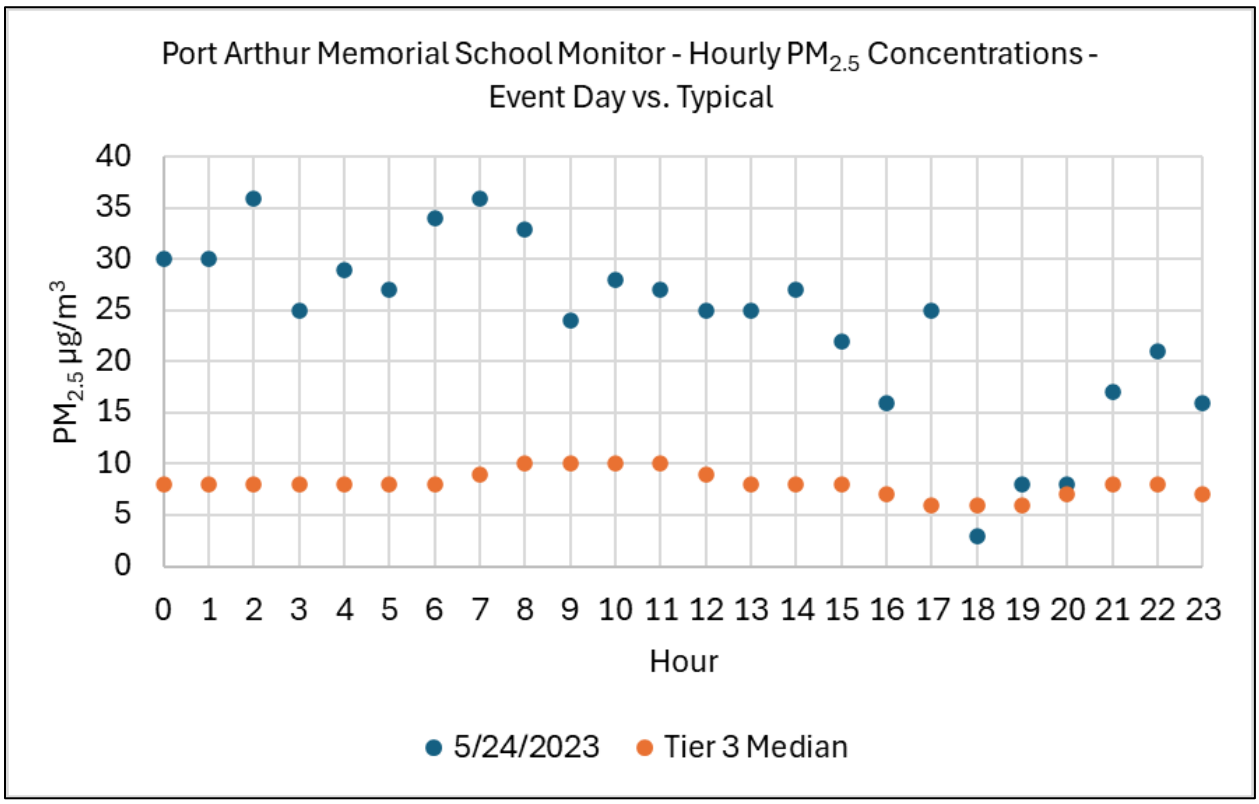

Figure 3-80: Hourly $PM_{2.5}$ Concentrations on May 24, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

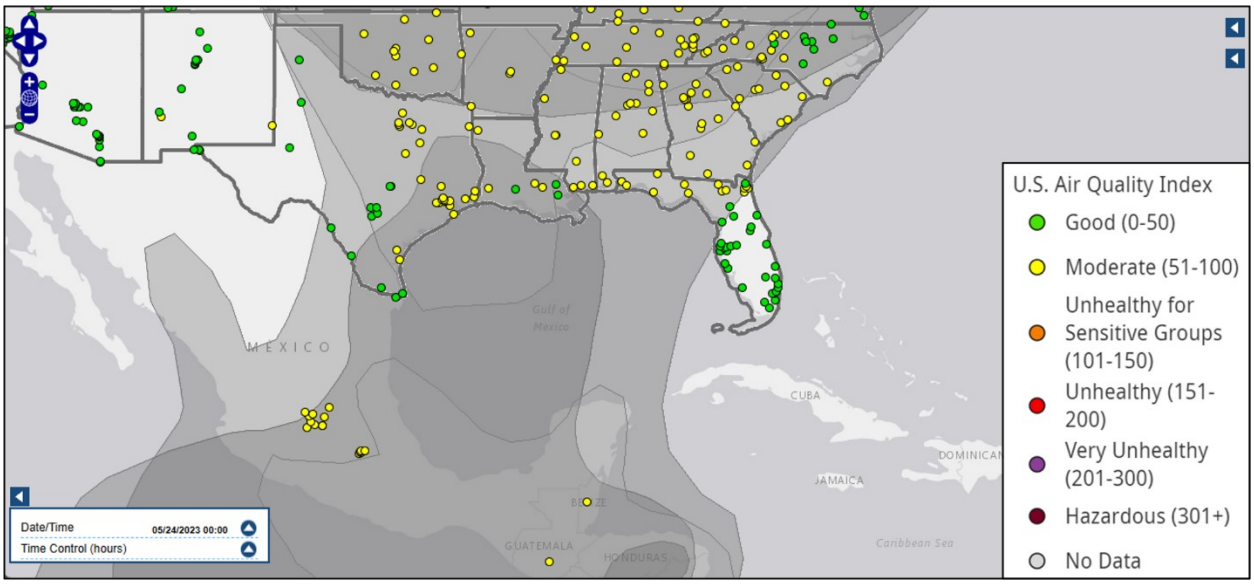

Figure 3-81: AirNow HMS Smoke Plume for May 24, 2023

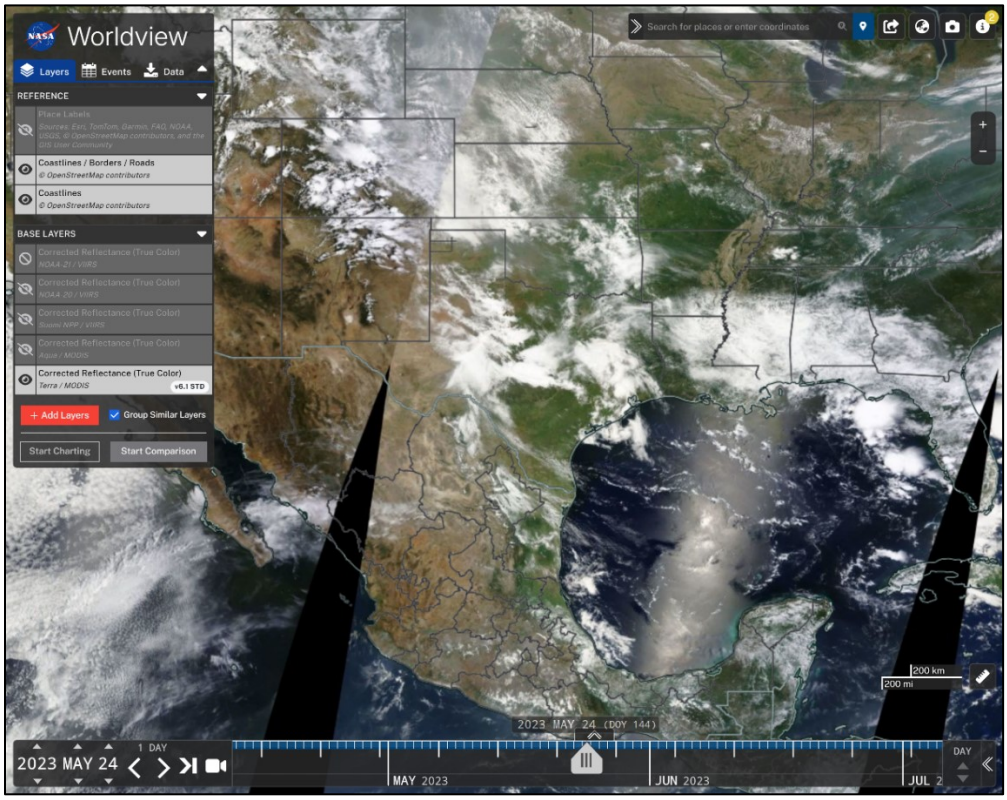

Figure 3-82: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 24, 2023, Showing Haze in States North of Texas

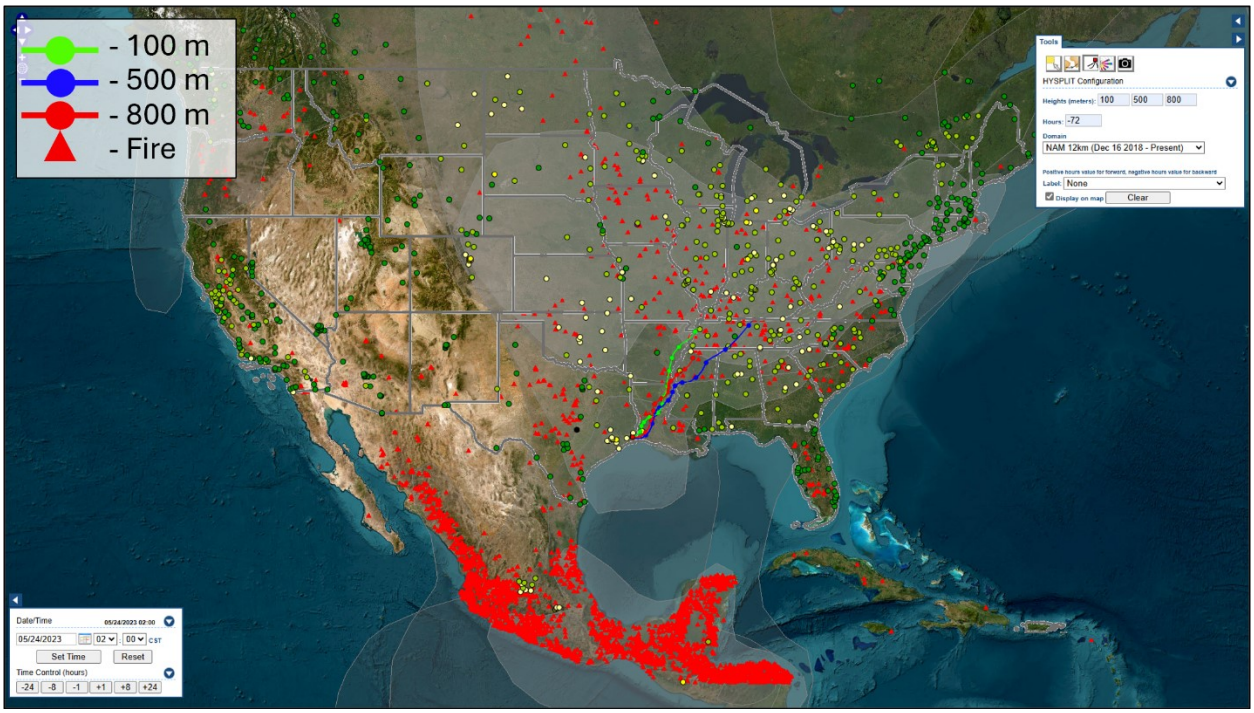

Figure 3-83: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 24, 2023

The TCEQ forecast for May 26, 2023 (Table C-8) references that light winds in east and southeast Texas limited dispersion, allowing Canadian wildfire smoke and local burning to continue to elevate $PM_{2.5}$ concentrations. The forecast additionally stated that urban emissions and continental haze contributed to elevated $PM_{2.5}$ concentrations across the eastern two-thirds of Texas. Figure 3-84: *Hourly $PM_{2.5}$ Concentrations on May 26, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all but one of the hourly $PM_{2.5}$ concentrations were at least 10 µg/m^3 higher than those classified as typical at this monitor. The one hour that had a concentration less than 10 µg/m^3 higher than typical, had a value 9 µg/m^3 higher than typical. Figure 3-85: *AirNow HMS Smoke Plume for May 26, 2023*, shows smoke in Jefferson County and surrounding areas to the north and beyond, with a Moderate AQI in East Texas and all surrounding areas to the north. Figure 3-86: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 26, 2023, Showing Haze in East Texas* shows hazy conditions over East Texas and states to the north of Texas. Figure 3-87: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 26, 2023*, shows movement of air through smoke plumes that extend all the way to Canada and cover the entirety of the central U.S.

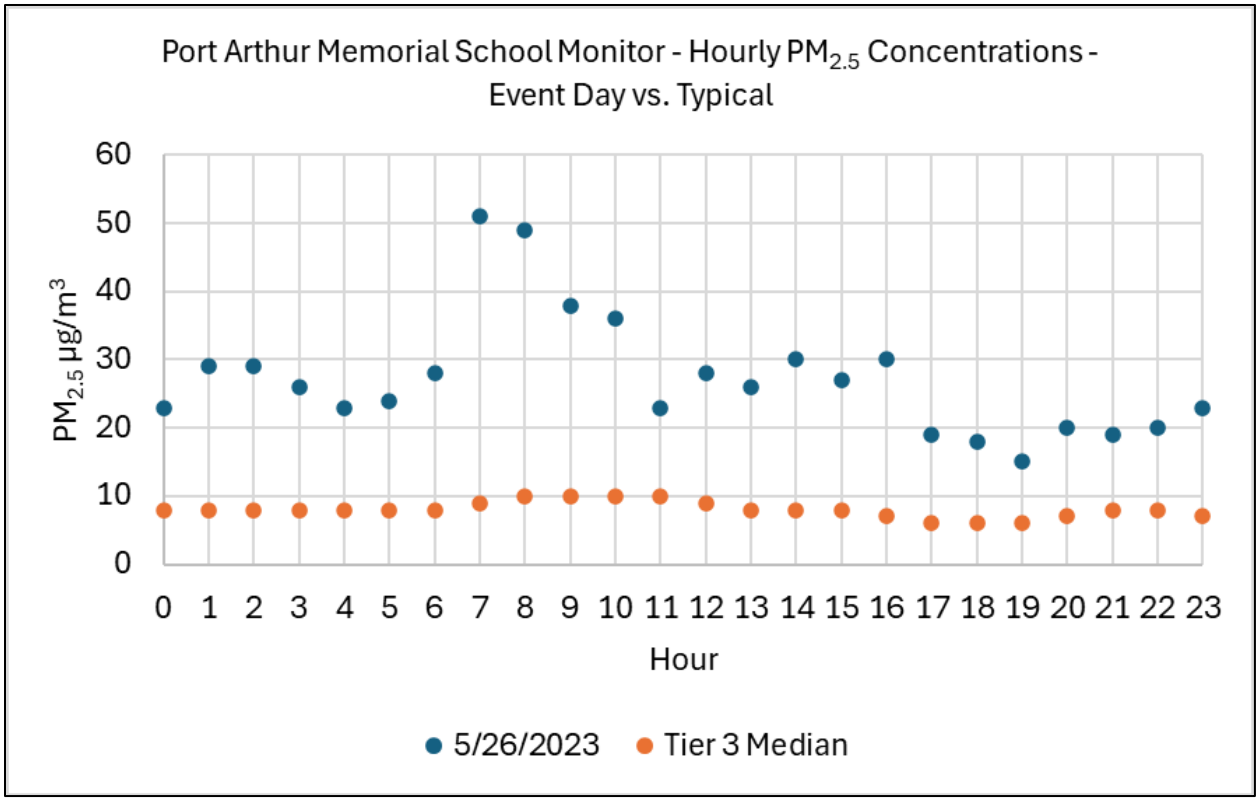

Figure 3-84: Hourly $PM_{2.5}$ Concentrations on May 26, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

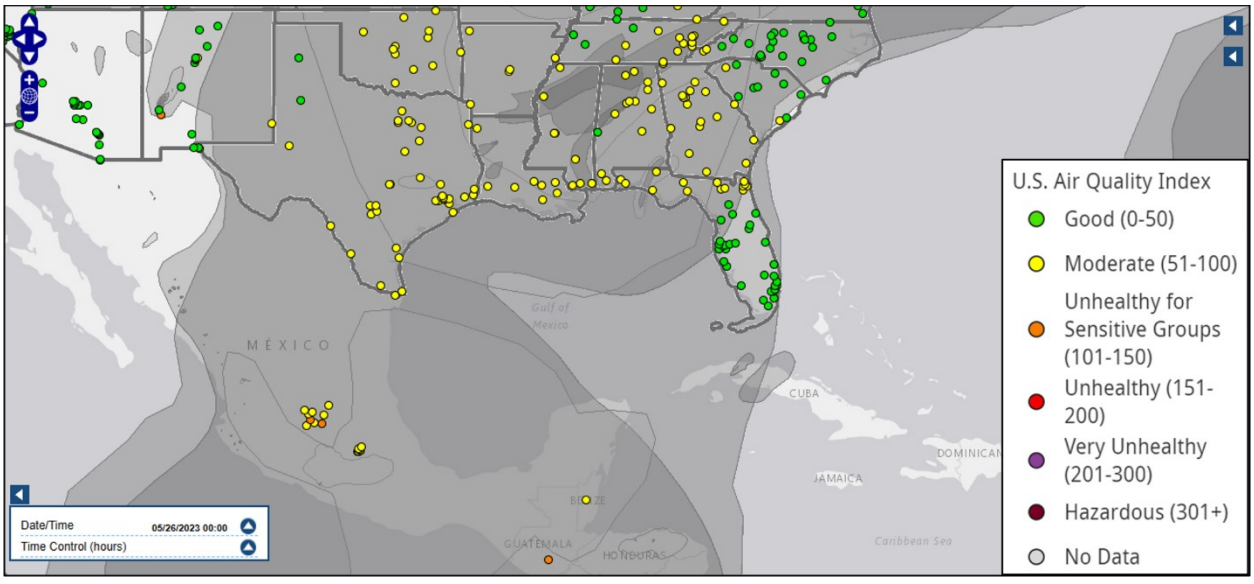

Figure 3-85: AirNow HMS Smoke Plume for May 26, 2023

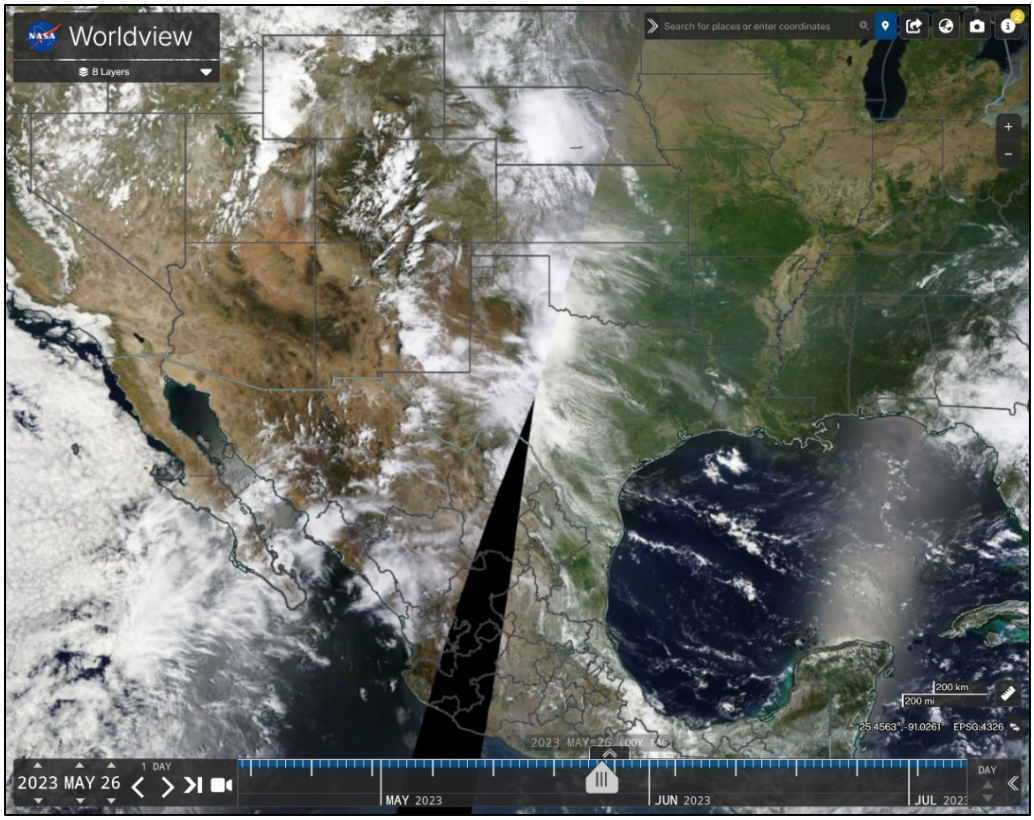

Figure 3-86: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 26, 2023, Showing Haze in East Texas

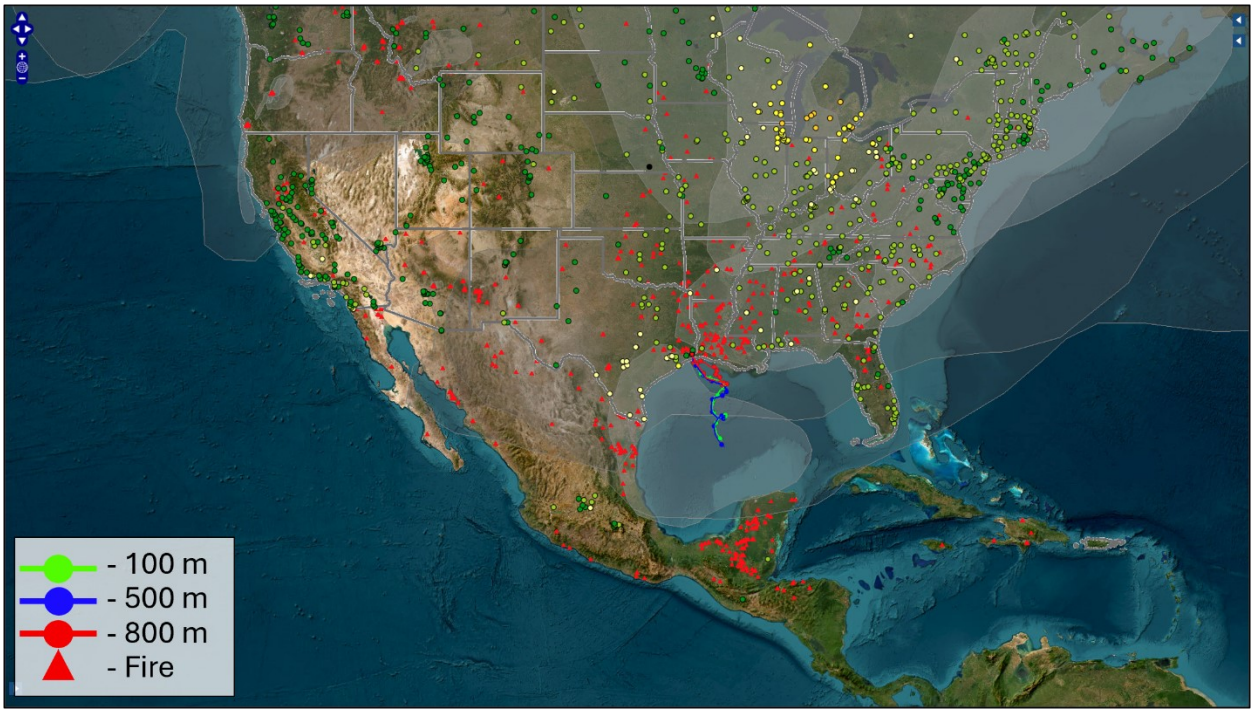

Figure 3-87: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 26, 2023

The TCEQ forecast for May 27, 2023 (Table C-8), references that a plume of incoming fine particulate levels associated with residual smoke from the wildfires in Canada from over the midwestern and southeast U.S. was expected to mix with urban fine particulate background levels associated with continental haze. Additionally, weather model guidance indicated that residual smoke associated with seasonal fire activity across portions of the Lower Mississippi River Valley would continue to contribute fine particulate background levels over east and southeast Texas. Figure 3-88: *Hourly $PM_{2.5}$ Concentrations on May 27, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all the hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-89: *AirNow HMS Smoke Plume for May 27, 2023*, shows smoke in Jefferson County and surrounding areas to the north and beyond, with a Moderate AQI in East Texas and all surrounding areas to the north. Figure 3-90: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 27, 2023, Showing Haze in East Texas and Surrounding Areas* shows hazy conditions over East Texas and states to the north of Texas. Jefferson County is obstructed by cloud cover, but haze can be seen off the Texas coast into the Gulf of America. Figure 3-91: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 27, 2023* shows movement of air through smoke plumes that likely area primarily a result of smoke previously transported from smoke from wildfires in Canada.

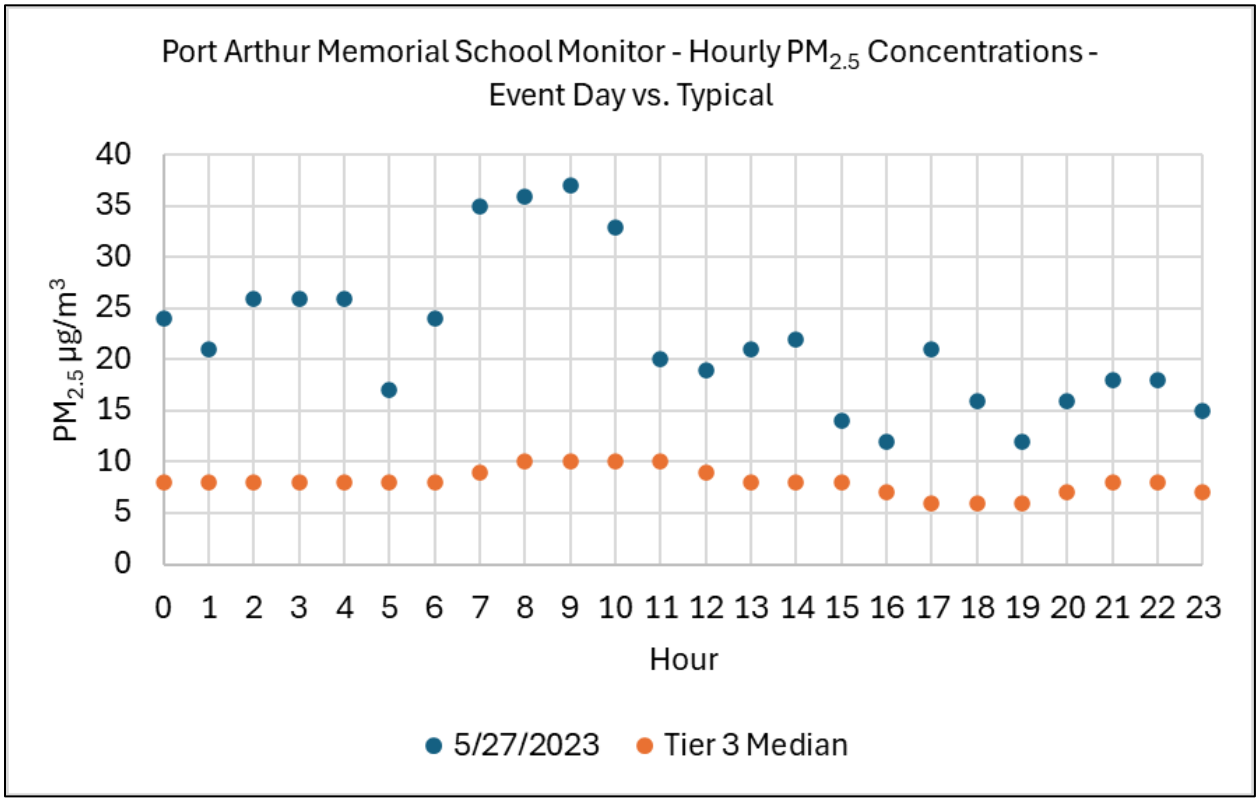

Figure 3-88: Hourly $PM_{2.5}$ Concentrations on May 27, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

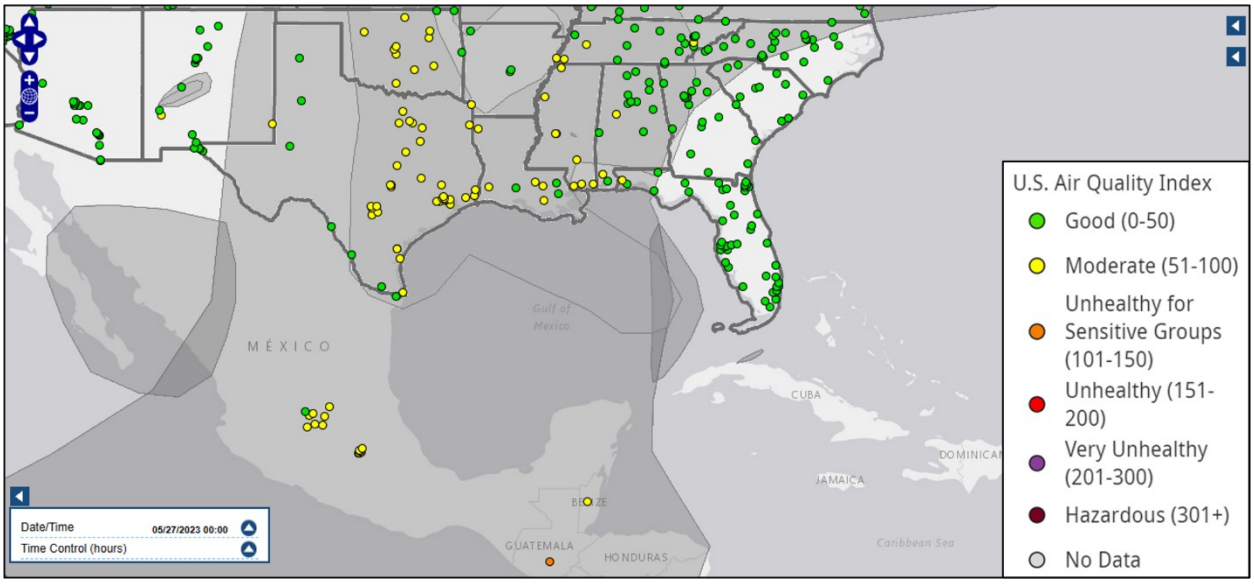

Figure 3-89: AirNow HMS Smoke Plume for May 27, 2023

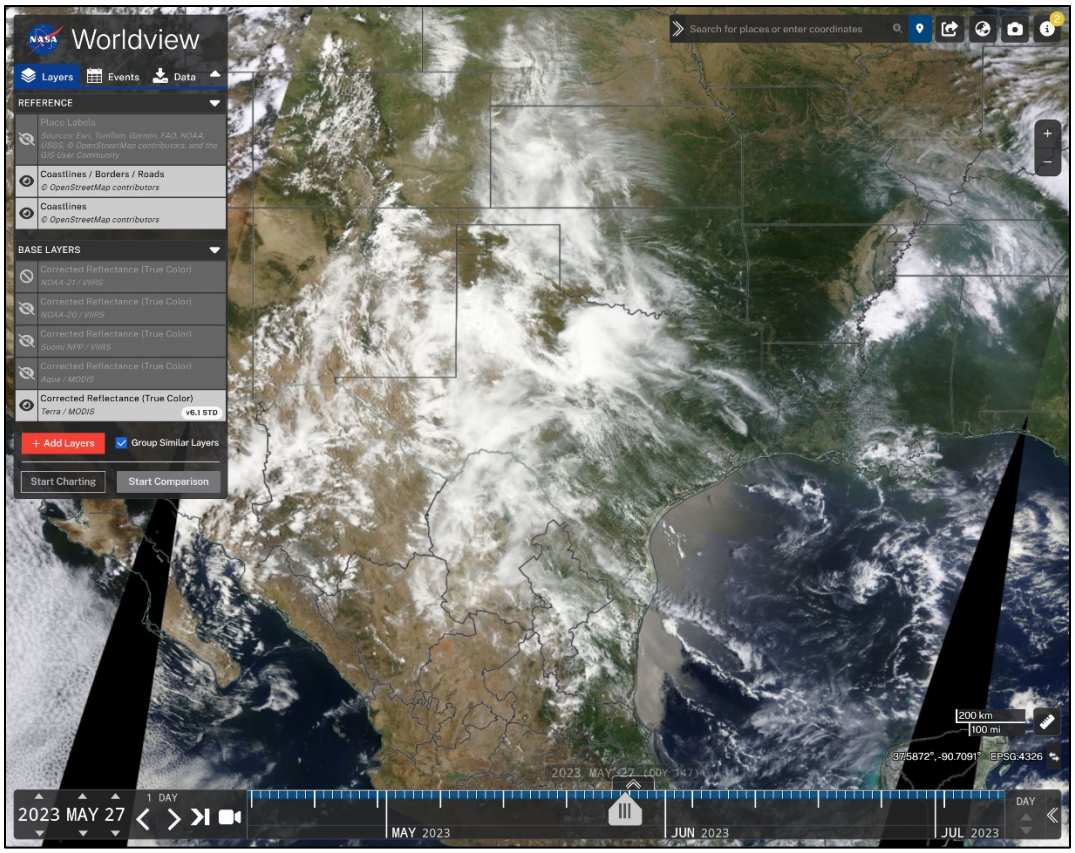

Figure 3-90: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 27, 2023, Showing Haze in East Texas and Surrounding Areas

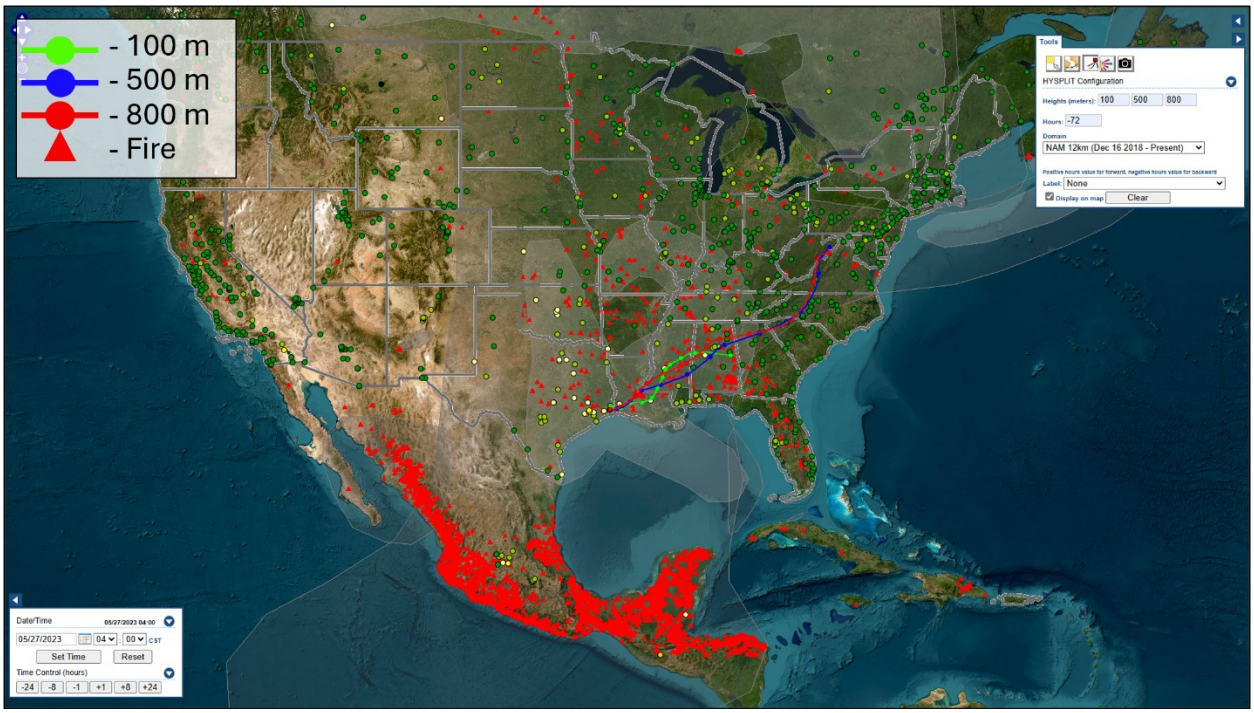

Figure 3-91: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 27, 2023

3.2.9 Group 9 – Evidence for June 19, 2023, and June 20, 2023, Fire (Mexico/Central America) $PM_{2.5}$ Event

June 19, 2023, and June 20, 2023, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 17.6 µg/m^3 and 19.6 µg/m^3, respectively. These elevated concentrations were primarily a result of smoke from fires in Mexico and Central America.

The TCEQ forecast for June 19, 2023 (Table C-9), references that moderate density smoke from seasonal fires and industrial burning from Mexico and Central America filtered over the eastern two-thirds of the state. Additionally, a pulse of Saharan dust was expected to come in through south Texas on this date. Figure 3-92: *Hourly $PM_{2.5}$ Concentrations on June 19, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-93: *AirNow HMS Smoke Plume for June 19, 2023*, shows smoke over the Gulf of America that continues into Jefferson County and surrounding areas, with a Moderate AQI in East Texas and surrounding areas. Figure 3-94: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 19, 2023, Showing Haze Over the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-95: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on June 19, 2023*, shows movement of air through smoke plumes over the Gulf of America and fires located on the Yucatan Peninsula. Figure 3-96: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on June 16, 2023*, shows through 72-hour trajectories that winds traveled from fire source areas in the Yucatan Peninsula into East Texas. Media reports (Figure C-10 and Figure C-11) from Austin and San Antonio, published respectively on June 14, 2023, and June 15, 2023, reference the arrival of smoke from agricultural burning in Mexico and the impact that it has on air quality.

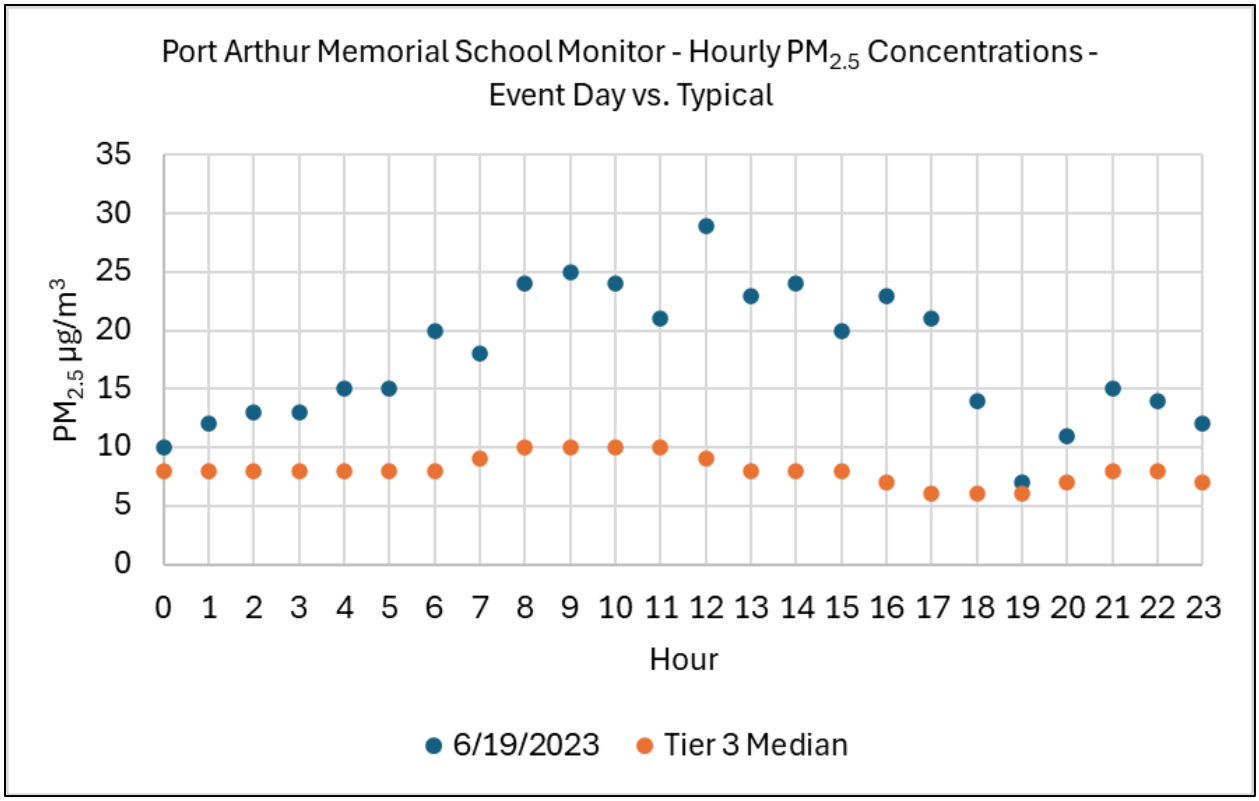

Figure 3-92: Hourly $PM_{2.5}$ Concentrations on June 19, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

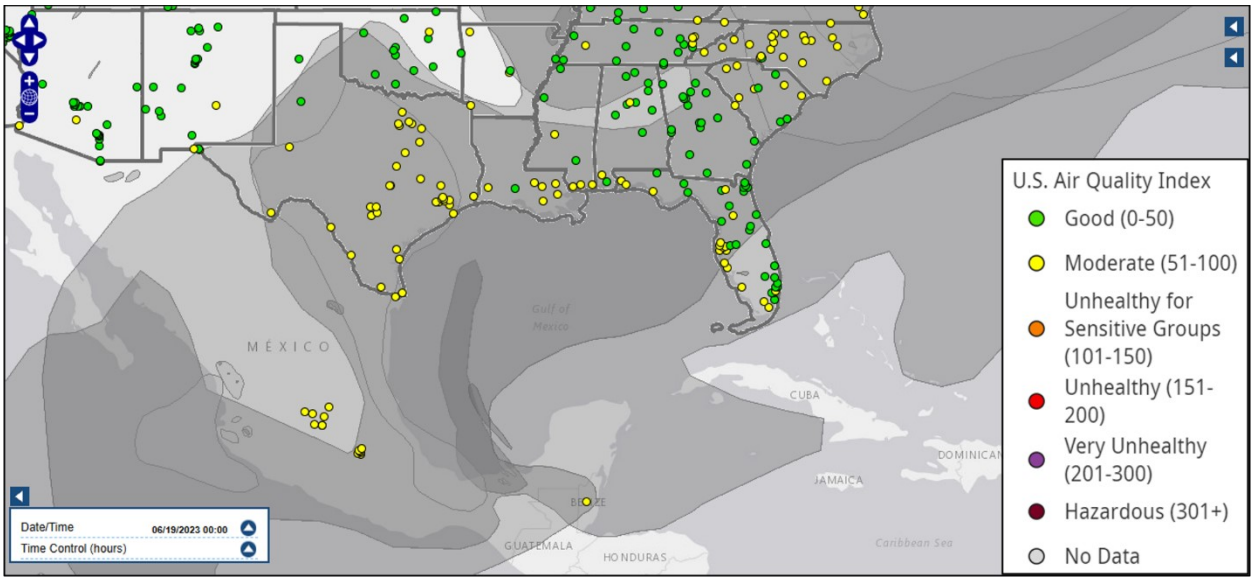

Figure 3-93: AirNow HMS Smoke Plume for June 19, 2023

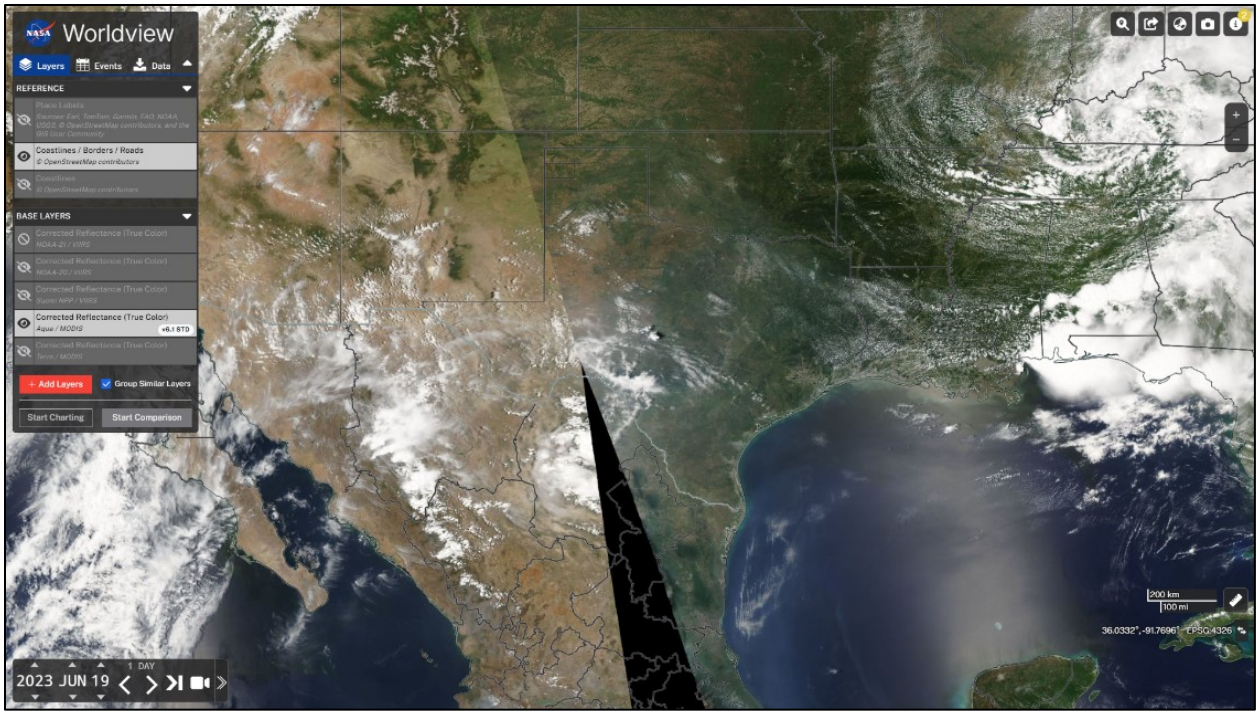

Figure 3-94: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 19, 2023, Showing Haze Over the Gulf of America

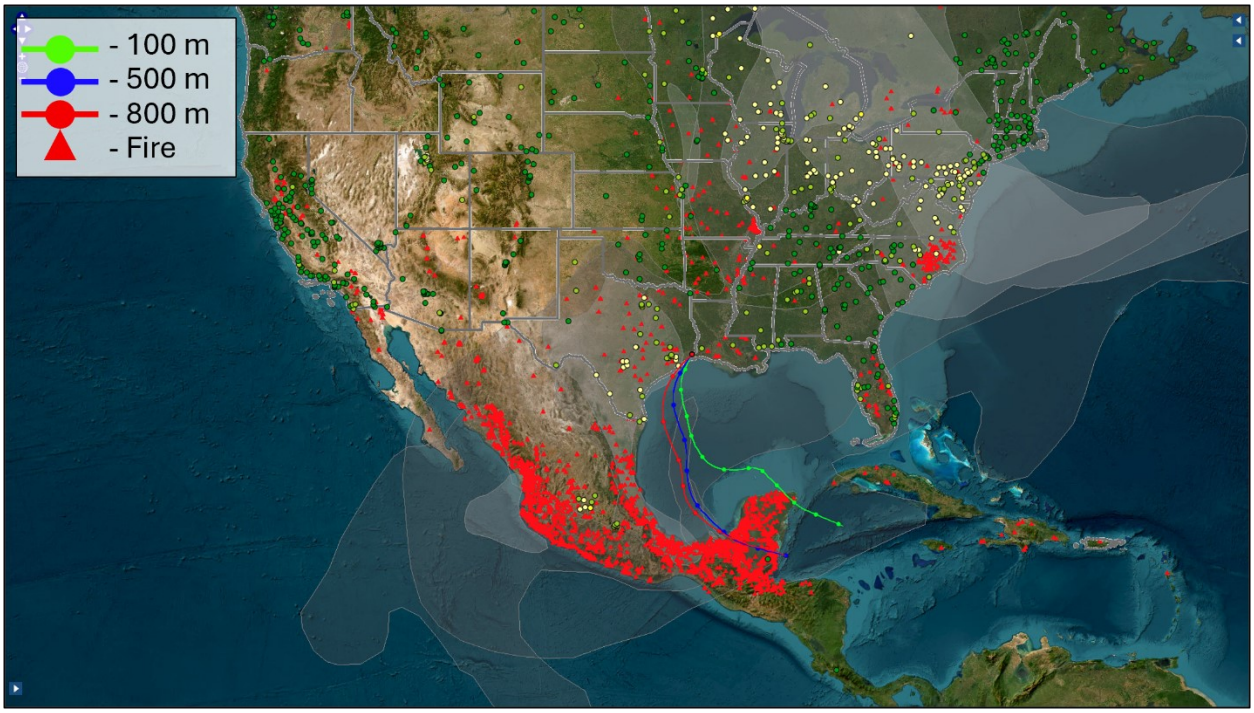

Figure 3-95: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on June 19, 2023

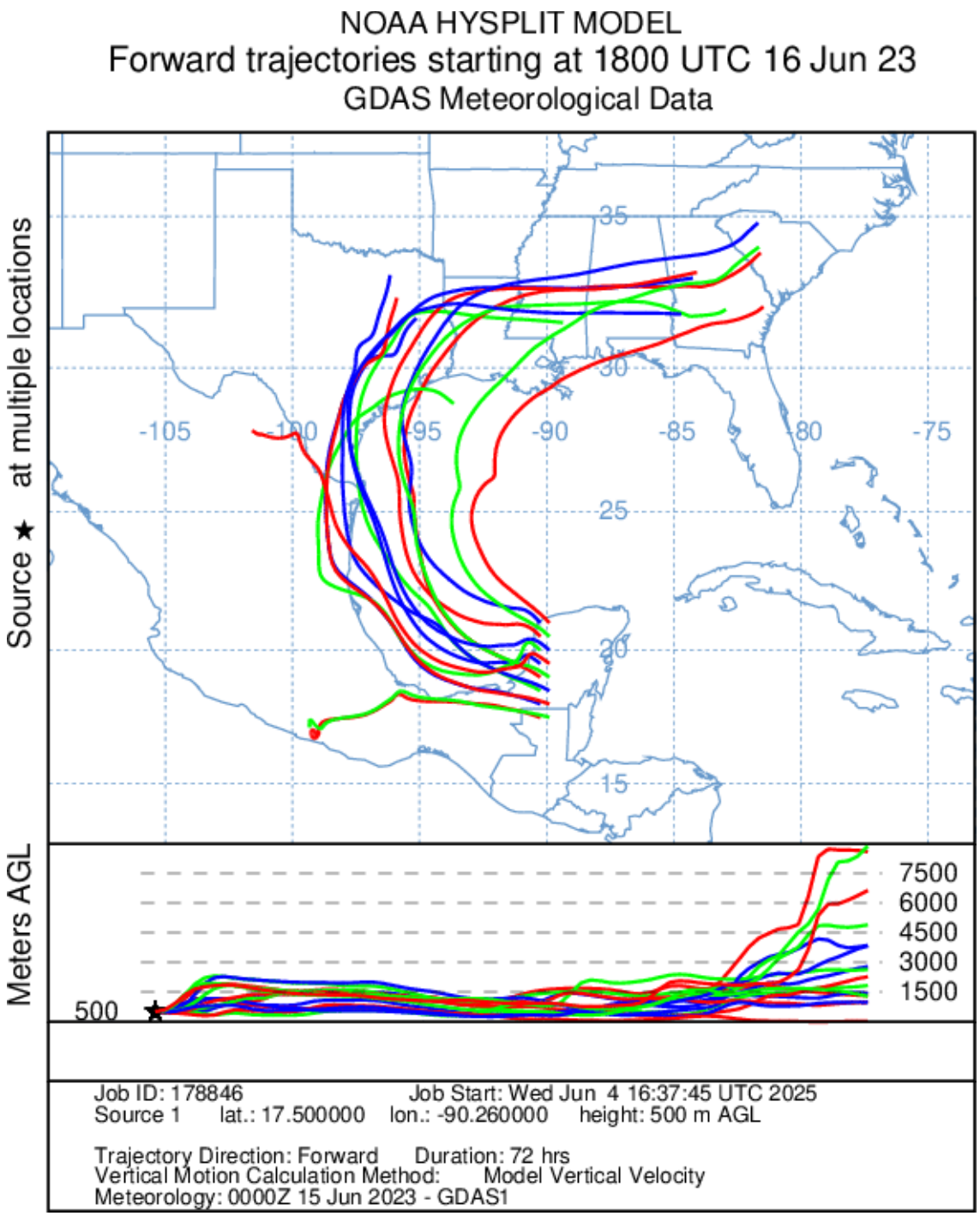

Figure 3-96: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on June 16, 2023

The TCEQ forecast for June 20, 2023 (Table C-9), references that seasonal smoke from Mexico and Central America continued to filter over the state, in addition to a weak pulse of Saharan dust that was expected to linger around the coastline. Figure 3-97: *Hourly $PM_{2.5}$ Concentrations on June 20, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-98: *AirNow HMS Smoke Plume for June 20, 2023*, shows smoke over the Gulf of America that continues into Jefferson County and surrounding areas, with a Moderate

AQI in East Texas and surrounding areas. Figure 3-99: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 20, 2023, Showing Haze in the Gulf of America and East Texas* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-100: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on* June 20, 2023 shows movement of air through smoke plumes over the Gulf of America and fires located on the Yucatan Peninsula. Figure 3-101: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on June 17, 2023*, shows through 72-hour trajectories that winds represented by select trajectories traveled from fire source areas in the Yucatan Peninsula into East Texas.

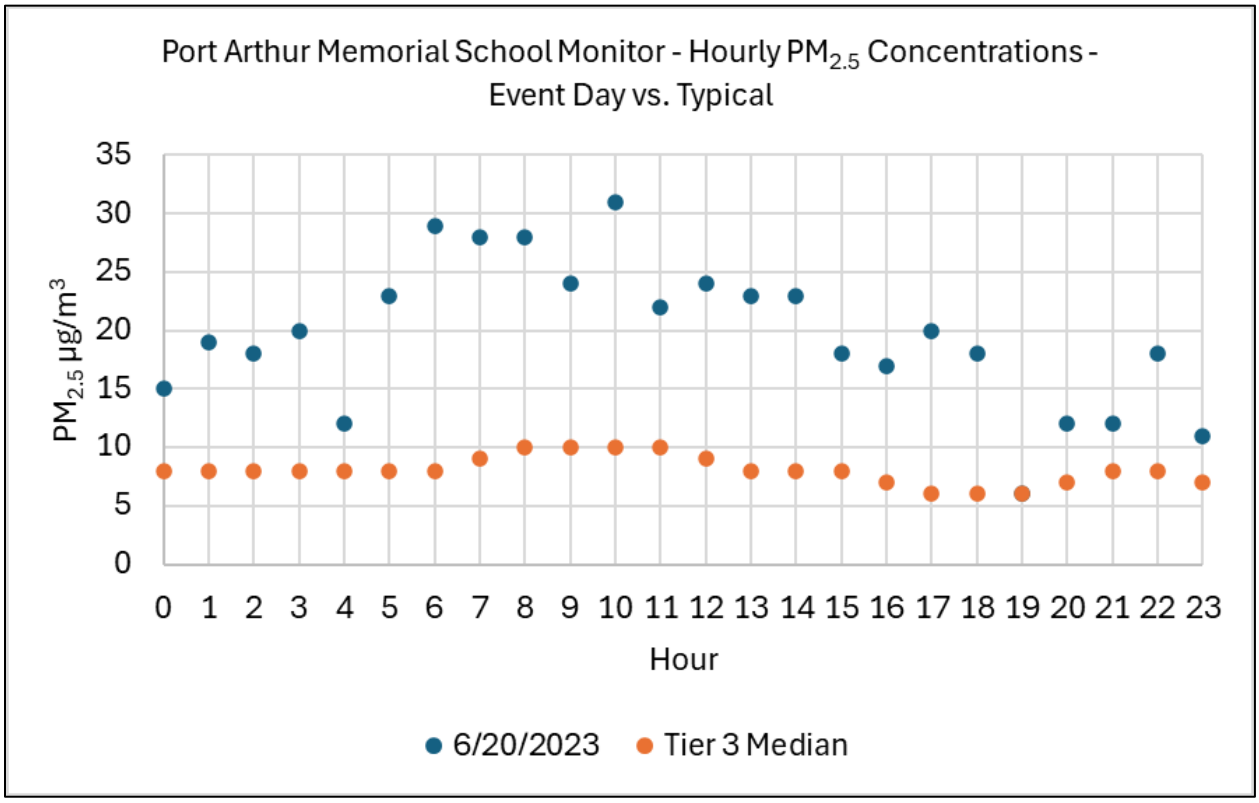

Figure 3-97: Hourly $PM_{2.5}$ Concentrations on June 20, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

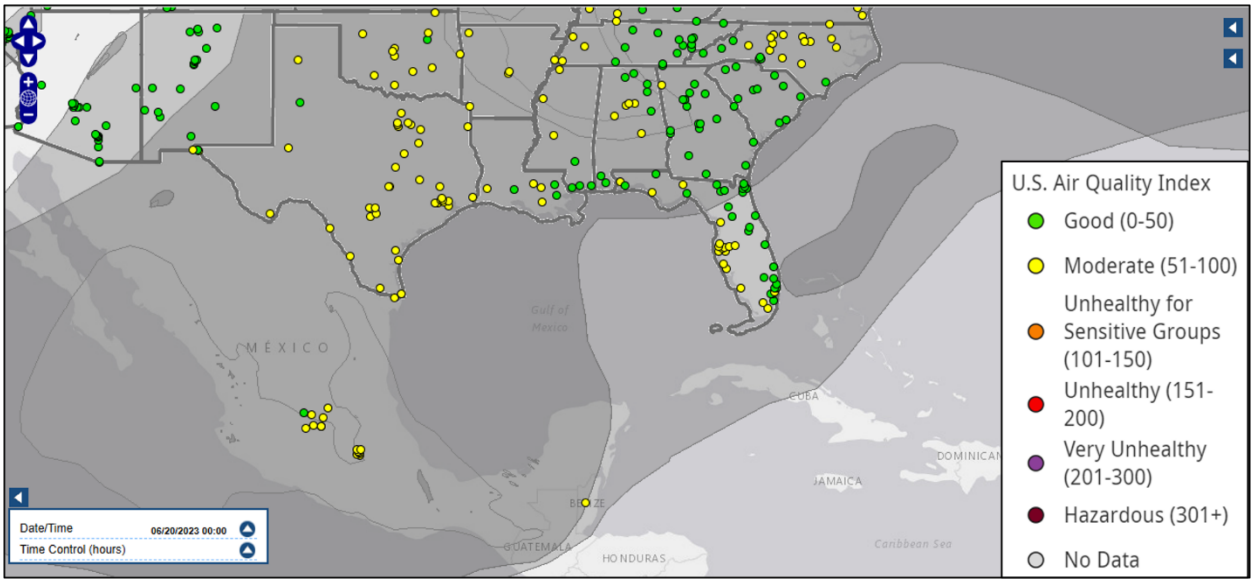

Figure 3-98: AirNow HMS Smoke Plume for June 20, 2023

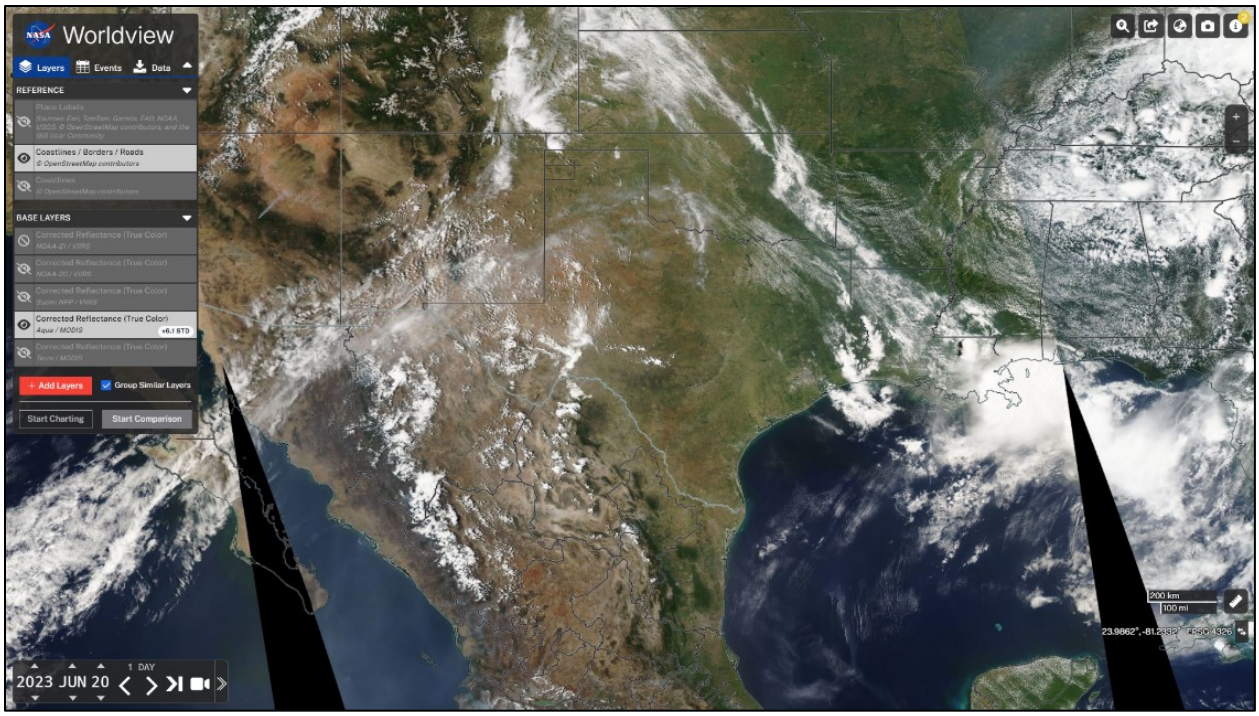

Figure 3-99: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from June 20, 2023, Showing Haze in the Gulf of America and East Texas

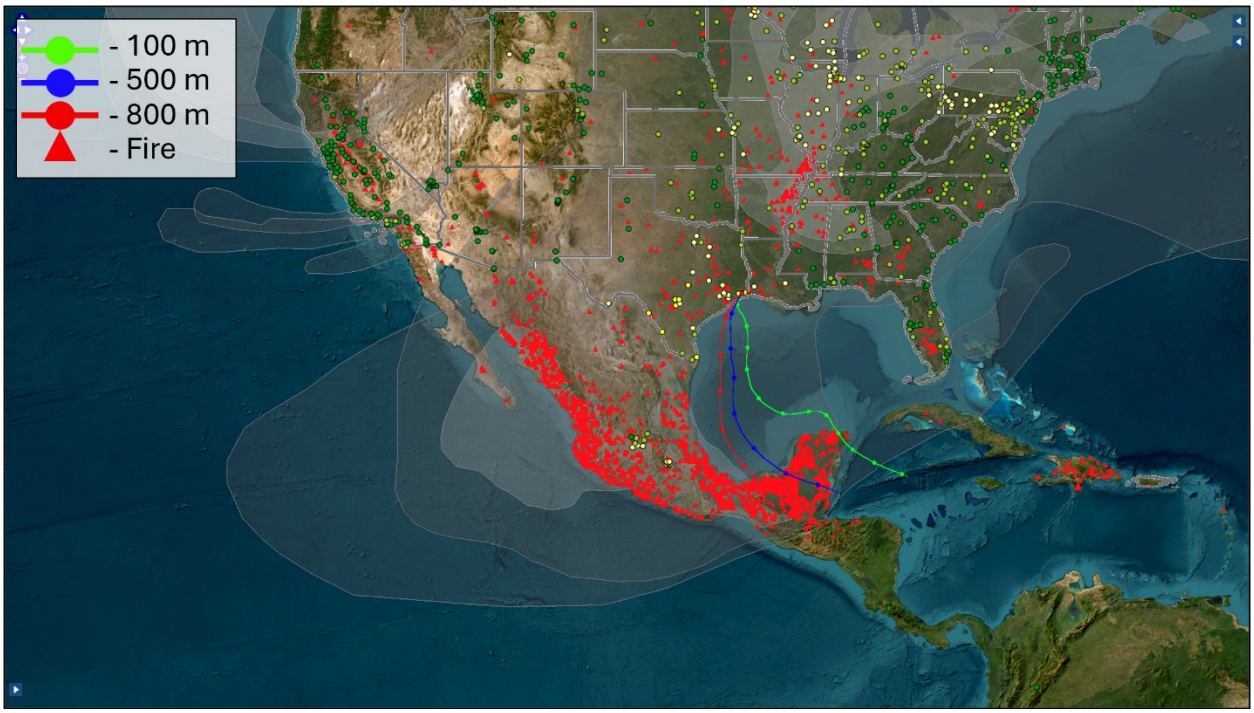

Figure 3-100: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on June 20, 2023

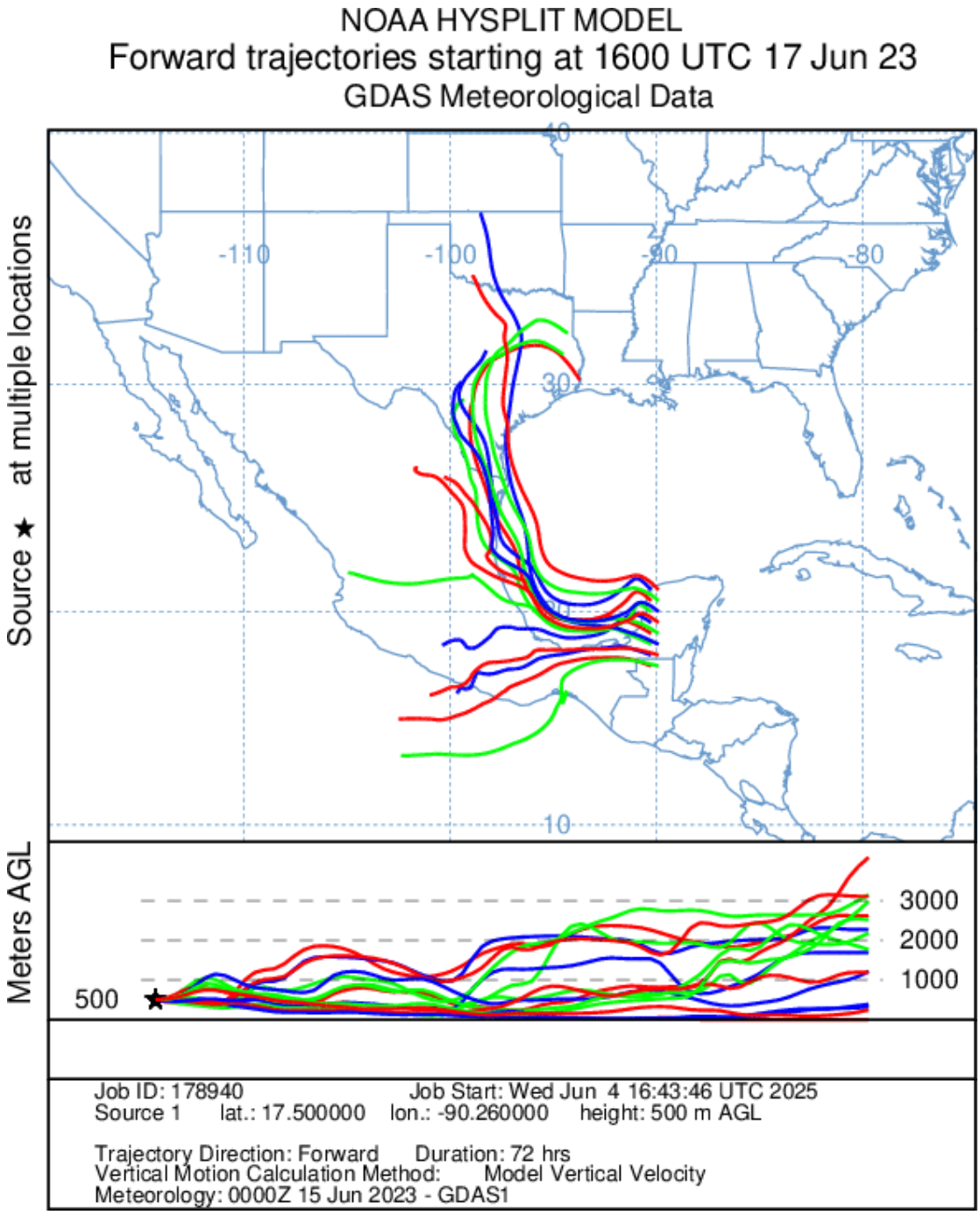

Figure 3-101: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on June 17, 2023

3.2.10 Group 10 – Evidence for July 15, 2023, through July 17, 2023, African Dust $PM_{2.5}$ Event

July 15, 2023, July 16, 2023, and July 17, 2023, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 22.4 µg/m^3, 23.7 µg/m^3, and 19.5 µg/m^3, respectively. These elevated concentrations were a result of African dust.

The TCEQ forecast for July 15, 2023 (Table C-10), references that a plume of Saharan dust was expected to filter throughout Texas. Figure 3-102: *Hourly $PM_{2.5}$ Concentrations on July 15, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-103: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers July 15, 2023*, shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-104: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 15, 2023, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-105: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 15, 2023* shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-106: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on July 1, 2023*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

Media reports (Figure C-12 and Figure C-13) published respectively on July 12, 2023, and July 17, 2023, by a Houston and San Antonio media outlets mention the arrival of African dust in Texas during these time periods.

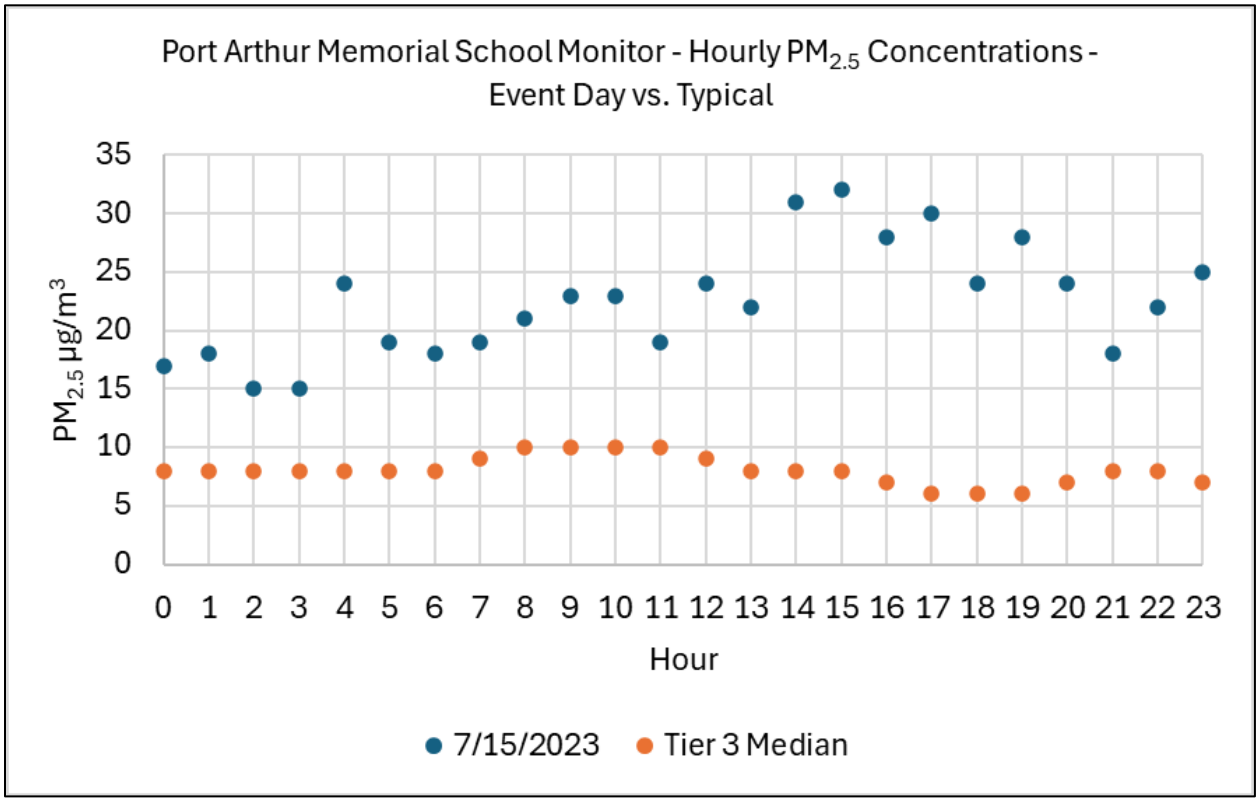

Figure 3-102: Hourly $PM_{2.5}$ Concentrations on July 15, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

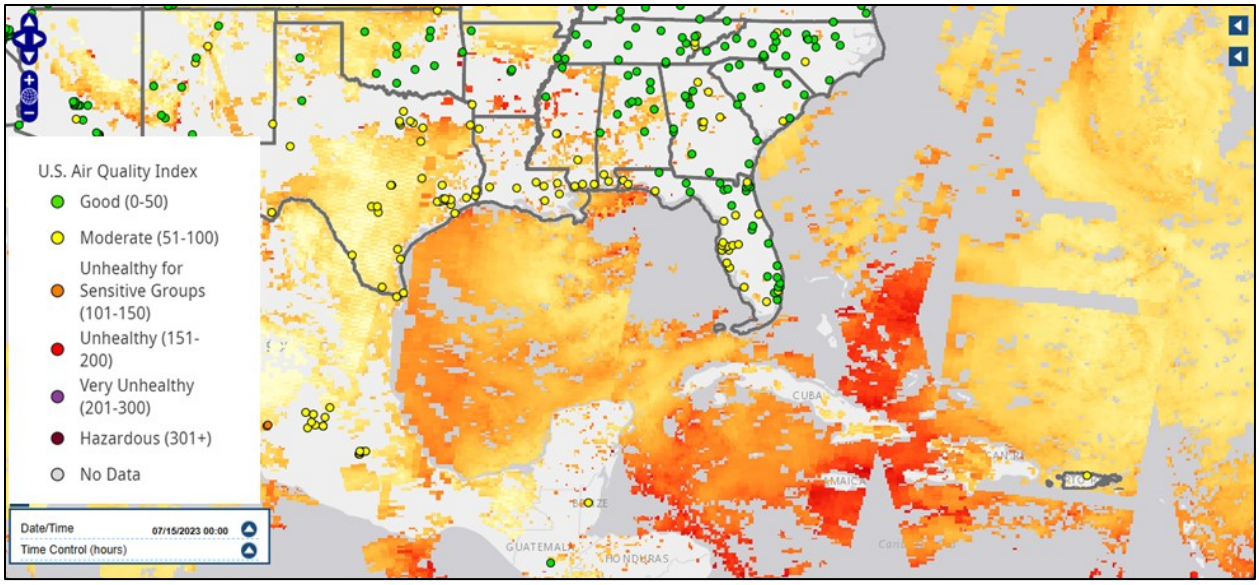

Figure 3-103: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers July 15, 2023

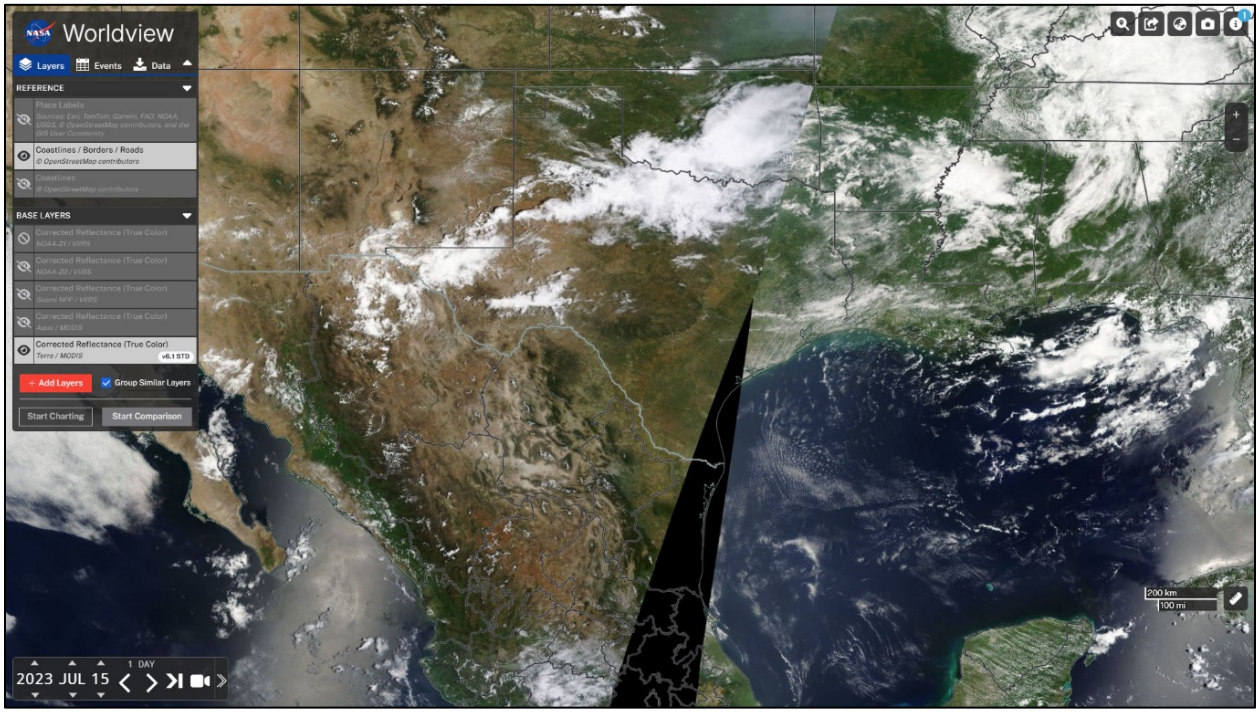

Figure 3-104: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 15, 2023, Showing Haze in the Gulf of America

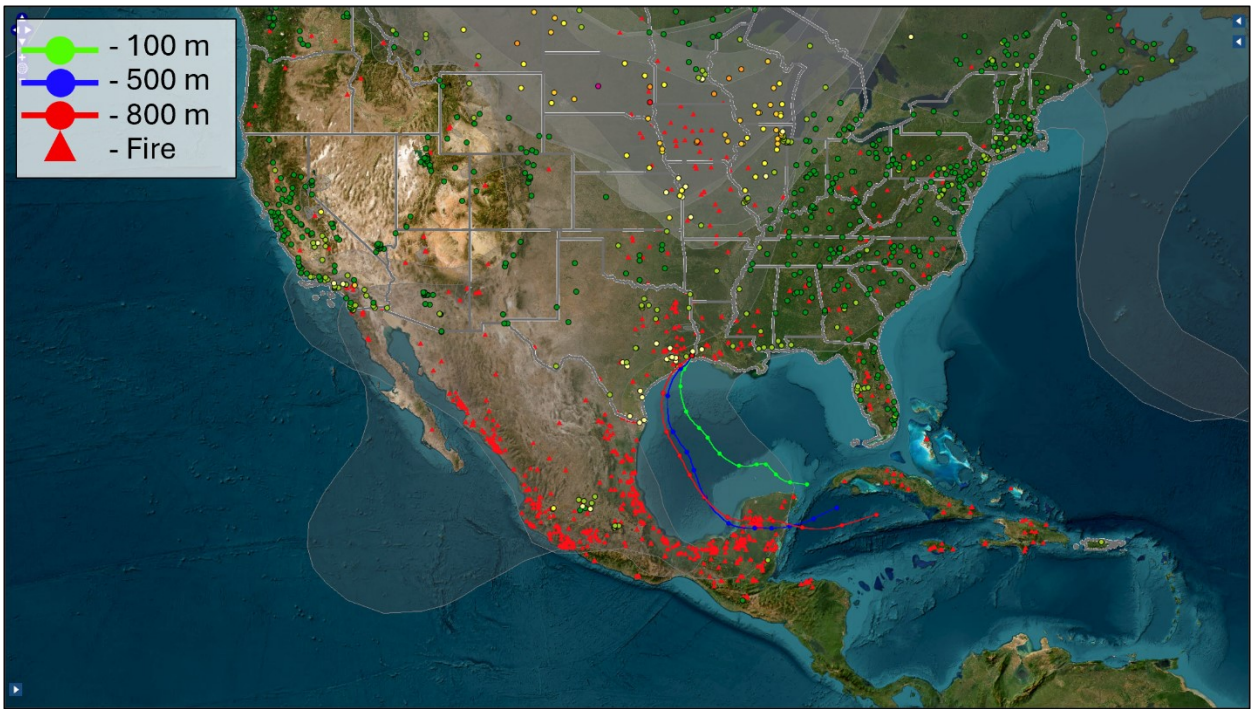

Figure 3-105: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 15, 2023

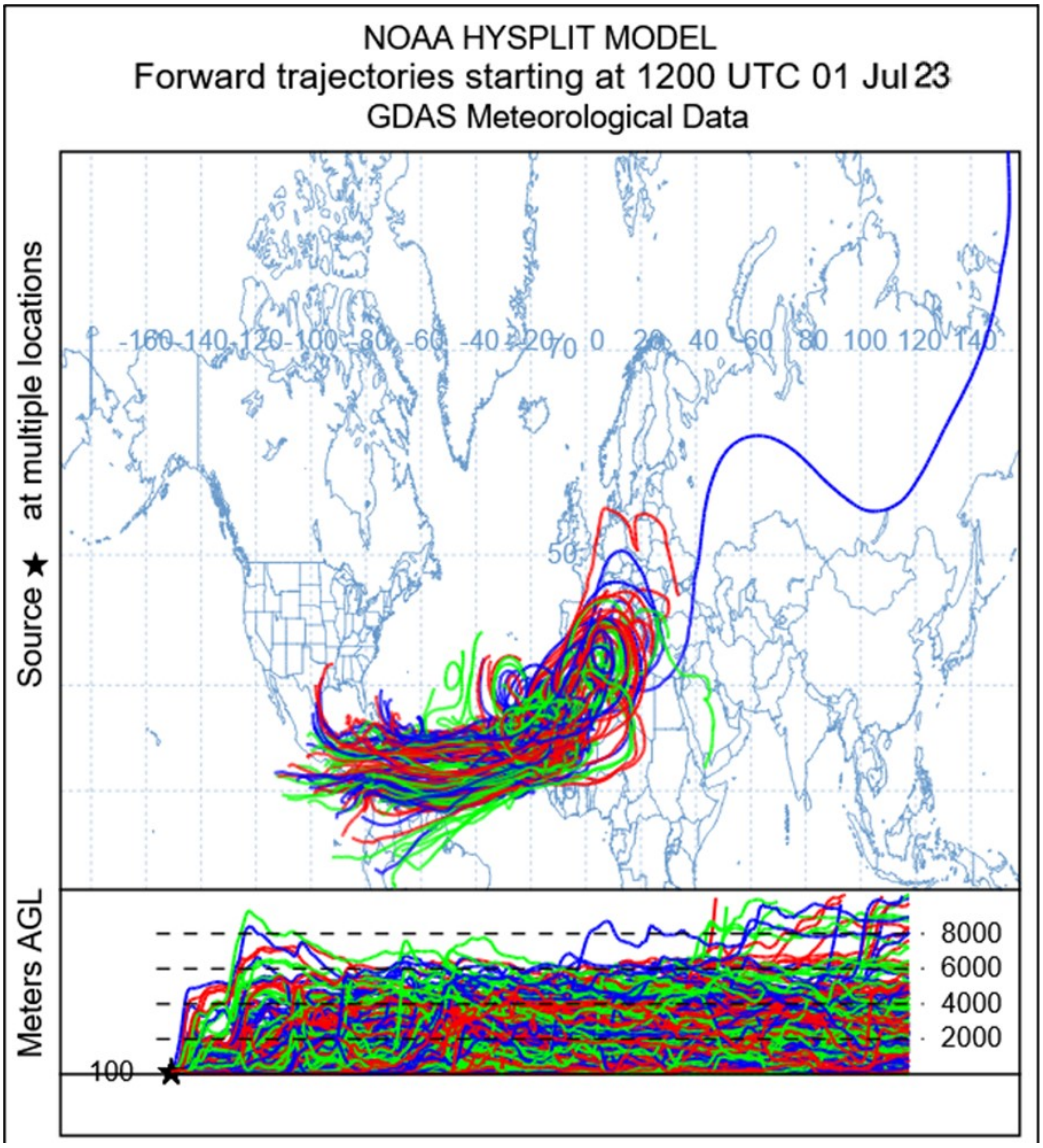

Figure 3-106: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 1, 2023

The TCEQ forecast for July 16, 2023 (Table C-10), references that Saharan dust was expected to continue moving through Texas. Figure 3-107: *Hourly $PM_{2.5}$ Concentrations on July 16, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations were all 10 µg/m^3 or higher than those classified as typical from the start of the day through 20:00 local time. Beginning at 07:00 local time, all hourly $PM_{2.5}$ concentrations were at least 10 µg/m^3 higher than typical concentrations for the remainder of the day. Figure 3-108: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 16, 2023* shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-109: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 16, 2023,* Showing Haze in the Gulf of America and East Texas shows hazy conditions over the Gulf of America and into East Texas. Figure 3-110: *AirNow Tech HYSPLIT Back Trajectories from the Port Arthur Memorial School Monitor on July 16, 2023*, shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-111: *NOAA HYSPLIT 72-Hour Forward Trajectories*

Originating from the Saharan Desert, Starting on July 2, 2023, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

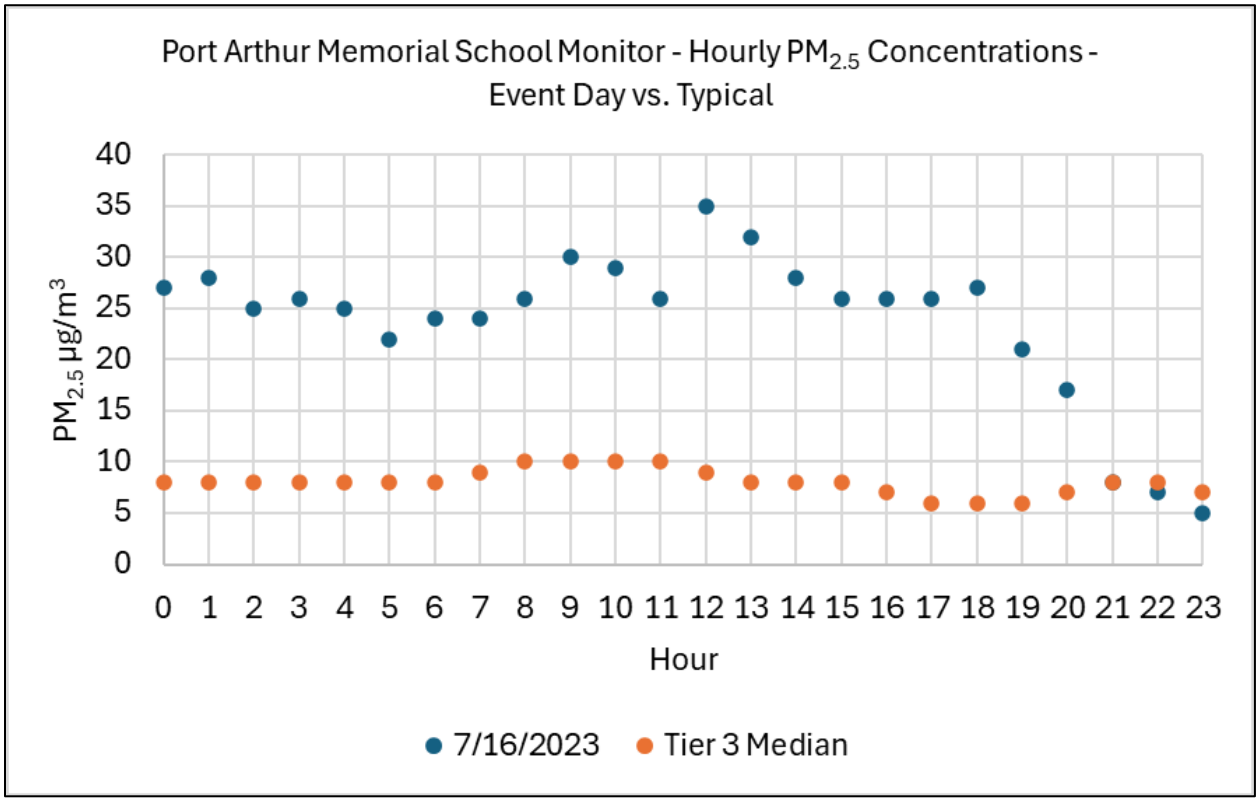

Figure 3-107: Hourly $PM_{2.5}$ Concentrations on July 16, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

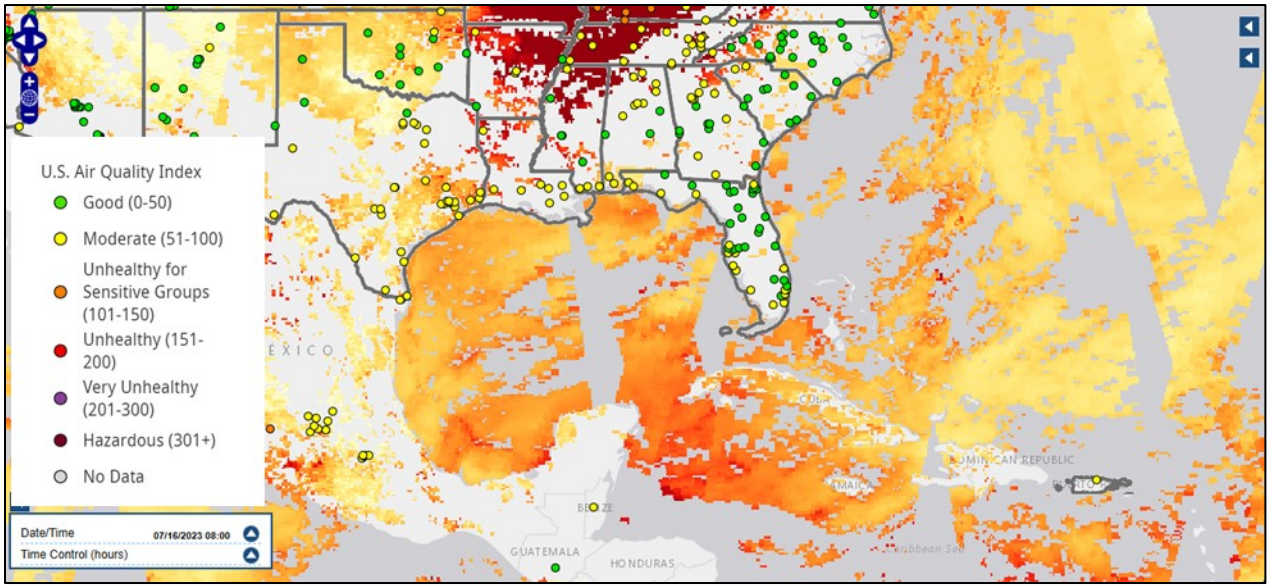

Figure 3-108: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 16, 2023

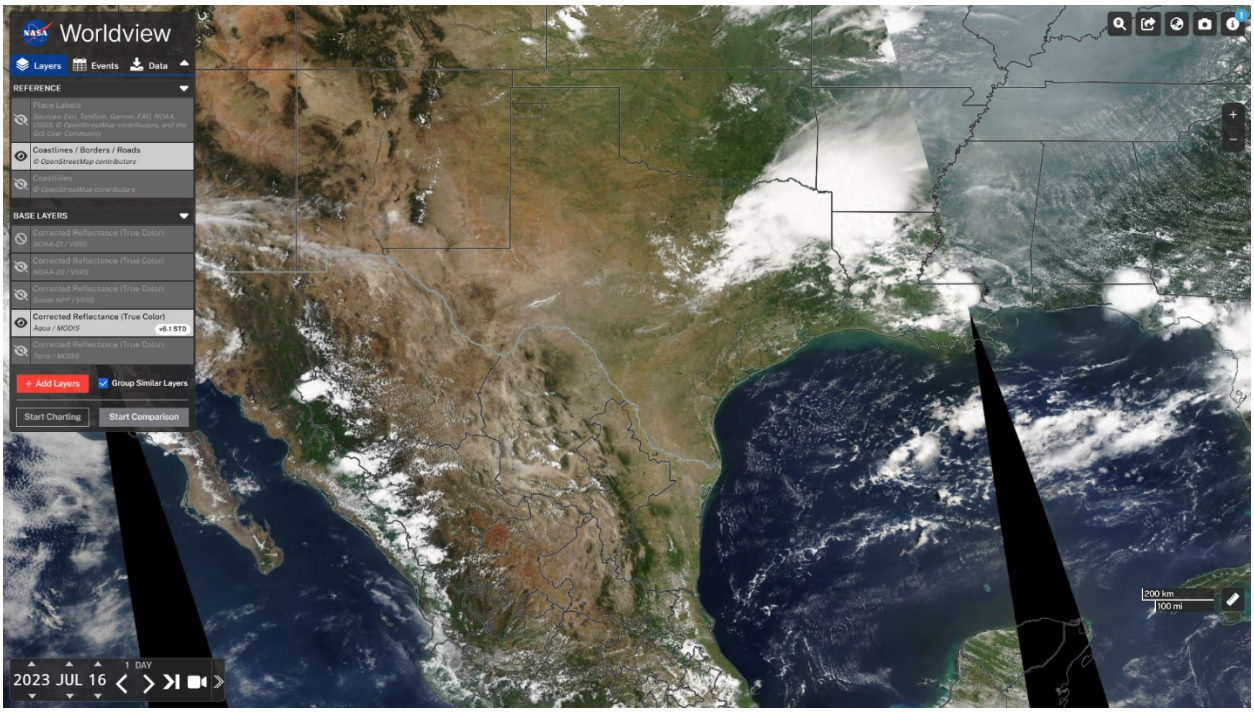

Figure 3-109: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 16, 2023, Showing Haze in the Gulf of America and East Texas

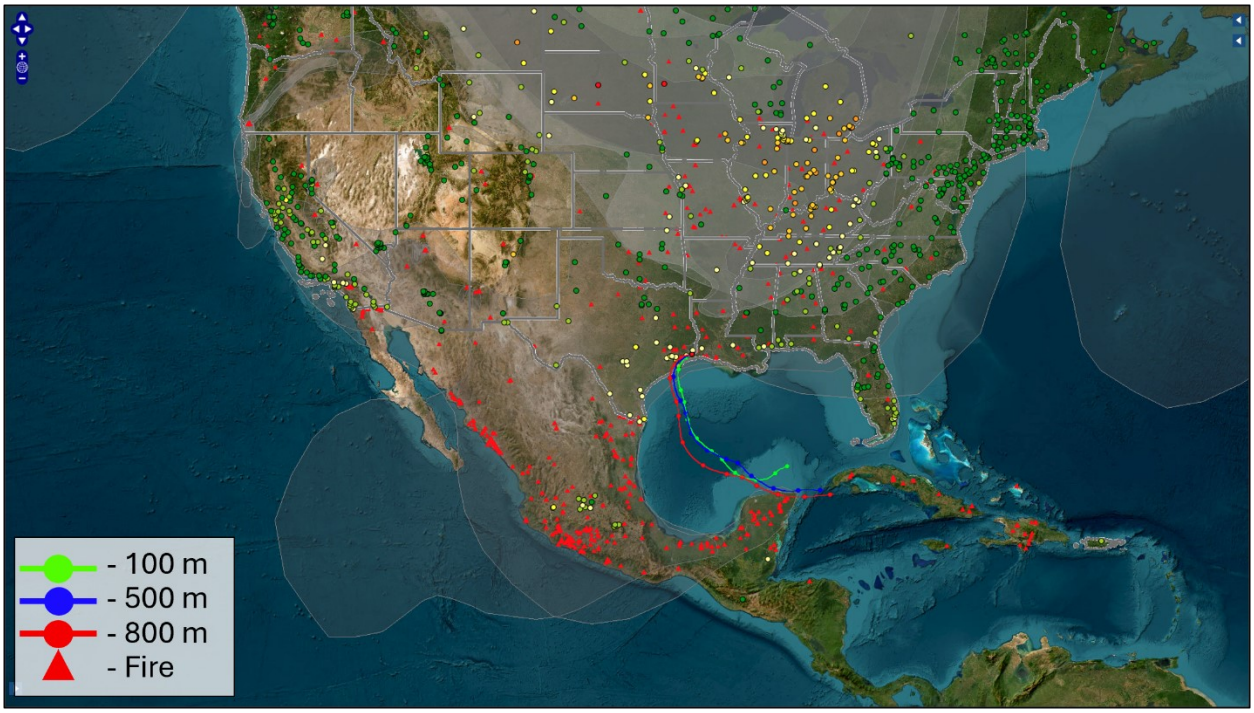

Figure 3-110: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on July 16, 2023

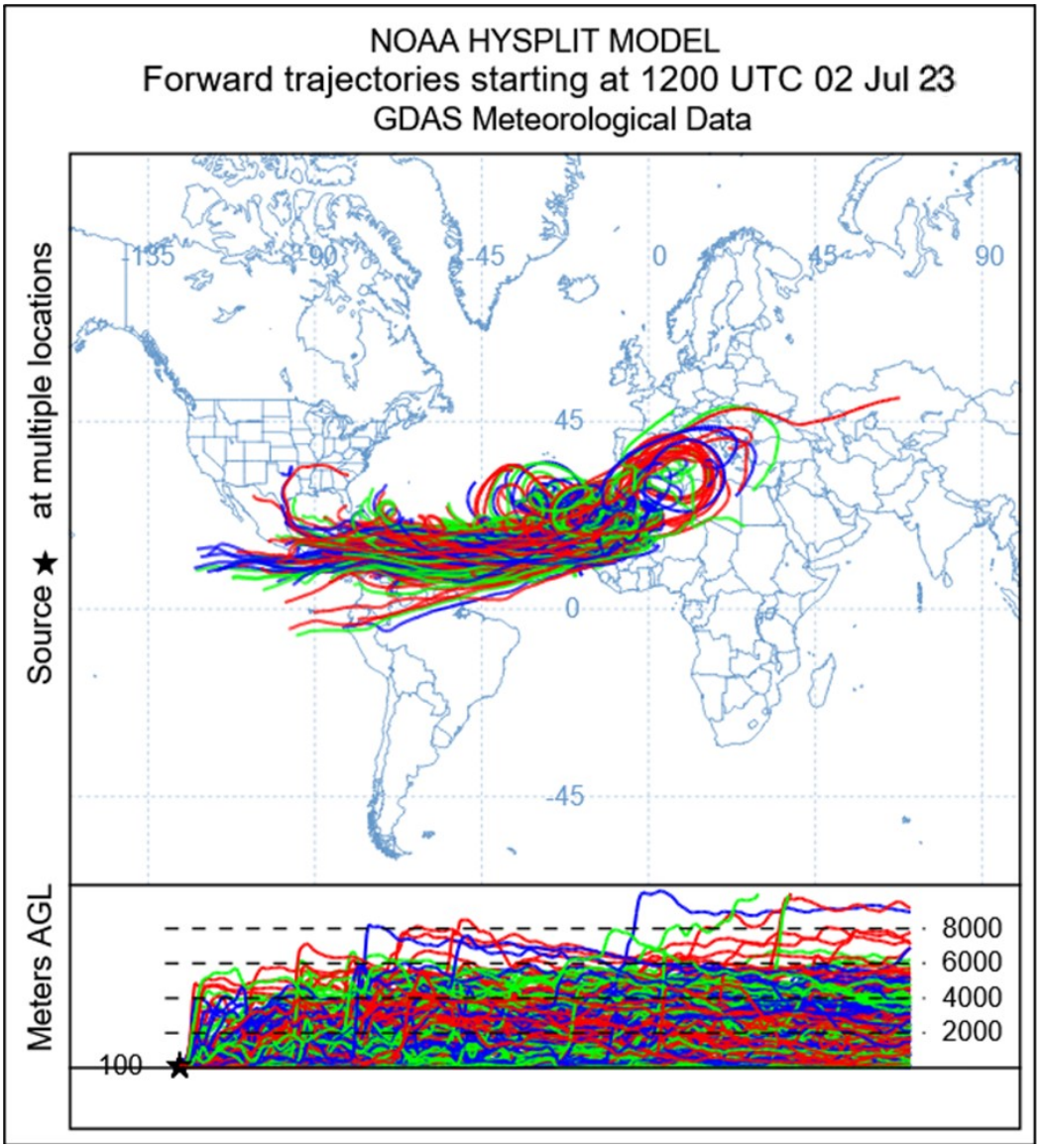

Figure 3-111: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 2, 2023

The TCEQ forecast for July 17, 2023 (Table C-10), references that a plume of Saharan dust was expected to start dissipating. Figure 3-112: *Hourly $PM_{2.5}$ Concentrations on July 17, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that most hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. From 07:00 through 17:00 local time, all hourly $PM_{2.5}$ concentrations were at least 10 µg/m^3 higher than typical concentrations. Figure 3-113: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 17, 2023* shows high readings of aerosols in the Gulf of America and the Atlantic Ocean, with a Moderate AQI in East Texas. Figure 3-114: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 17, 2023, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-115: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on July 17, 2023* shows movement of air from the Gulf of America the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-116: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan*

Desert, Starting on July 3, 2023, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

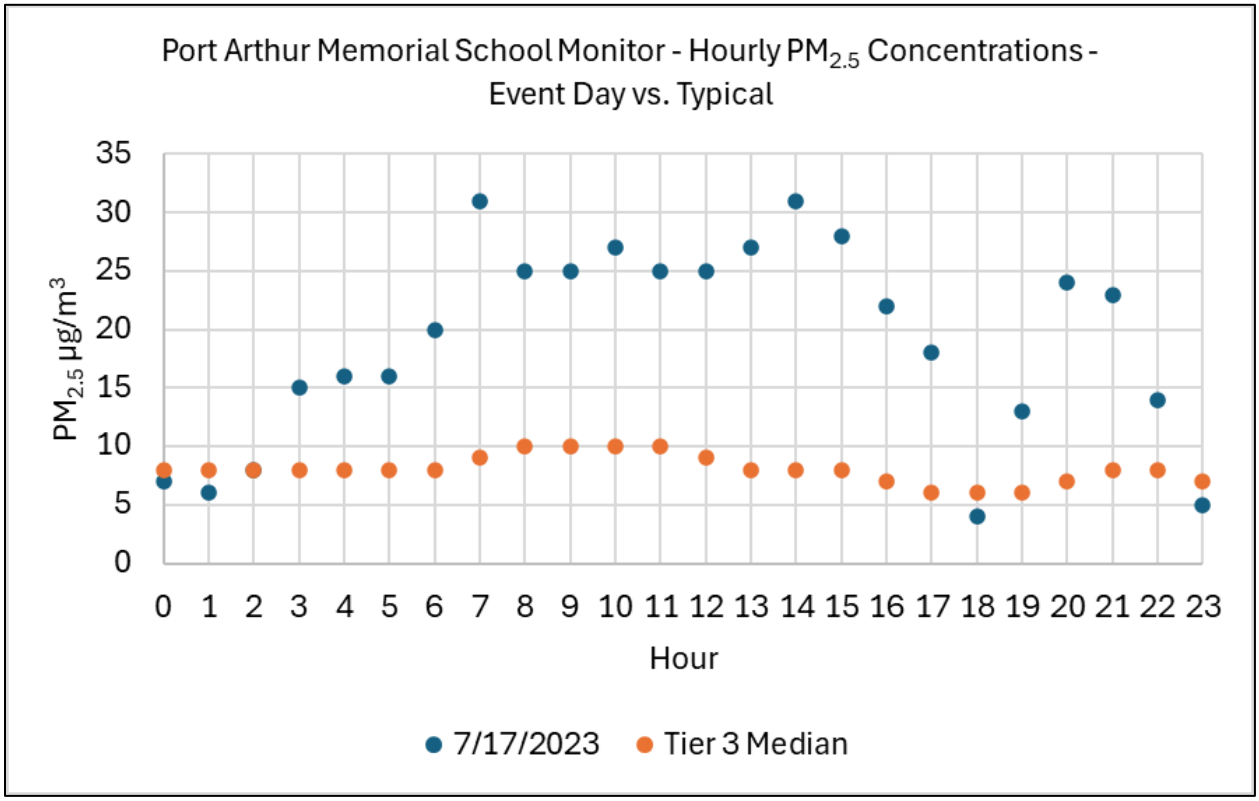

Figure 3-112: Hourly $PM_{2.5}$ Concentrations on July 17, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

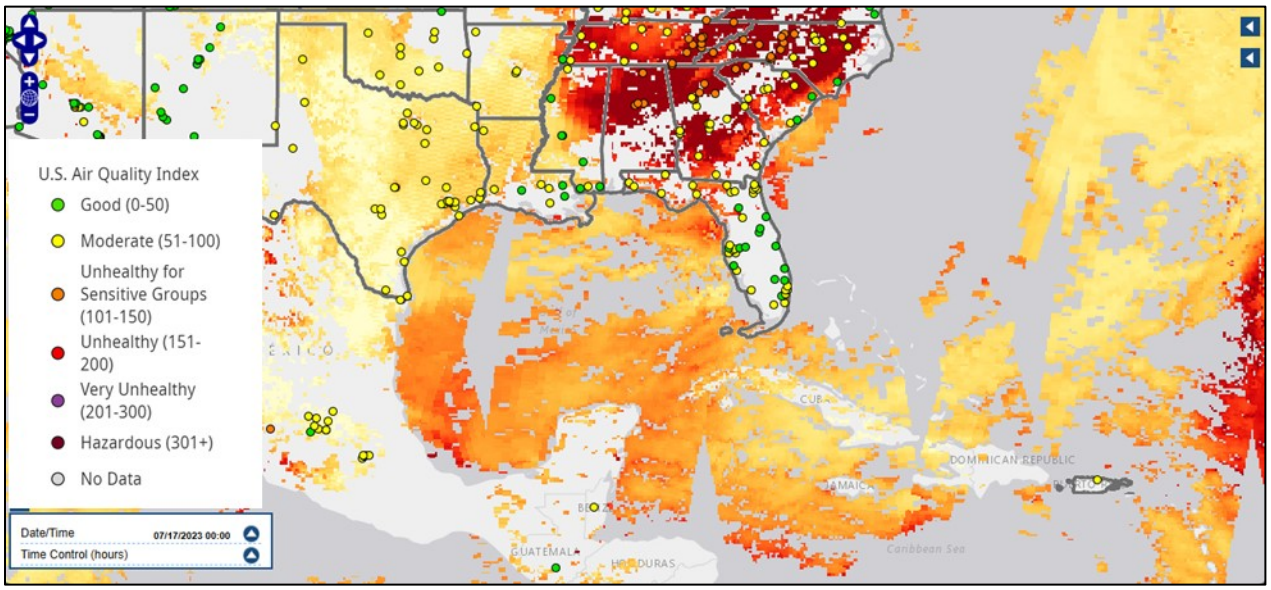

Figure 3-113: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 17, 2023

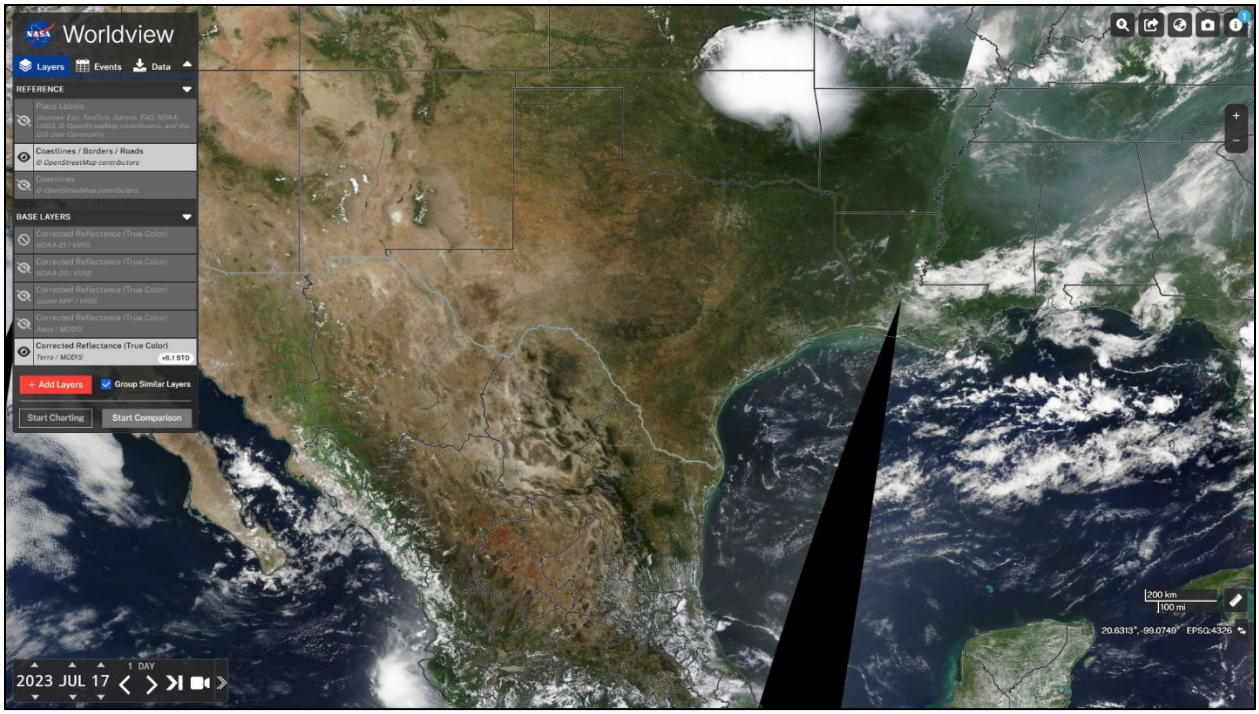

Figure 3-114: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 17, 2023, Showing Haze in the Gulf of America

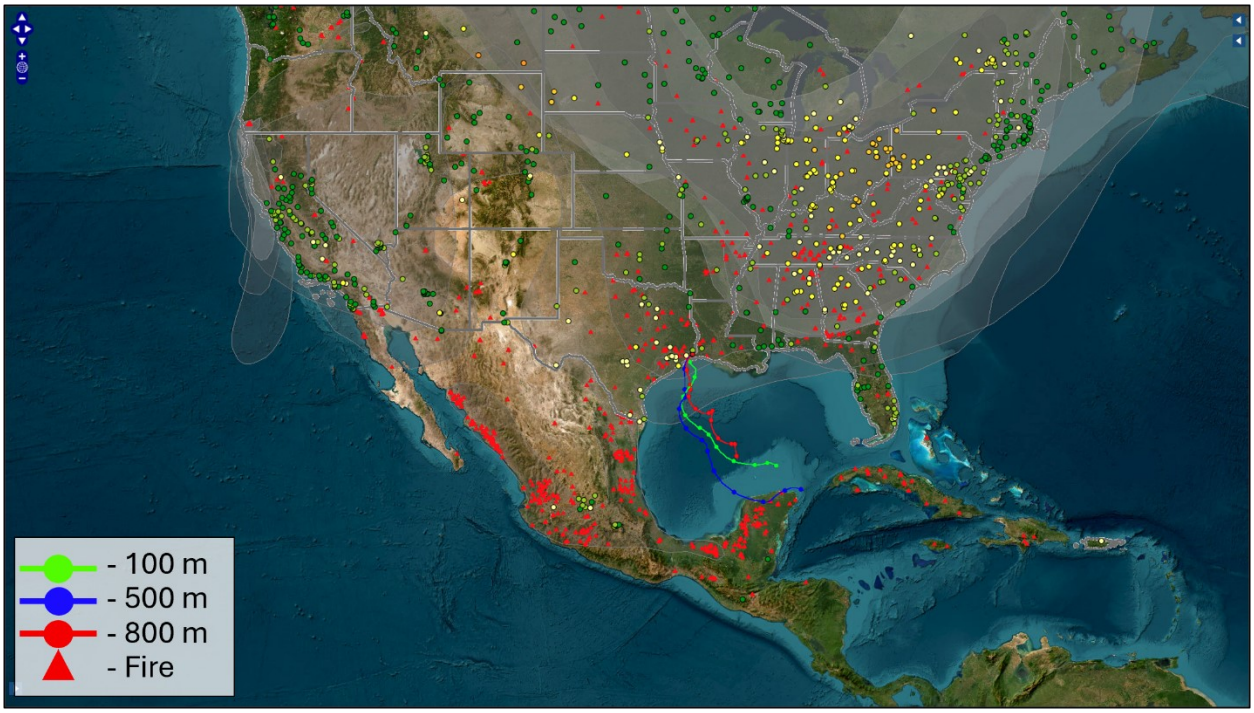

Figure 3-115: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on July 17, 2023

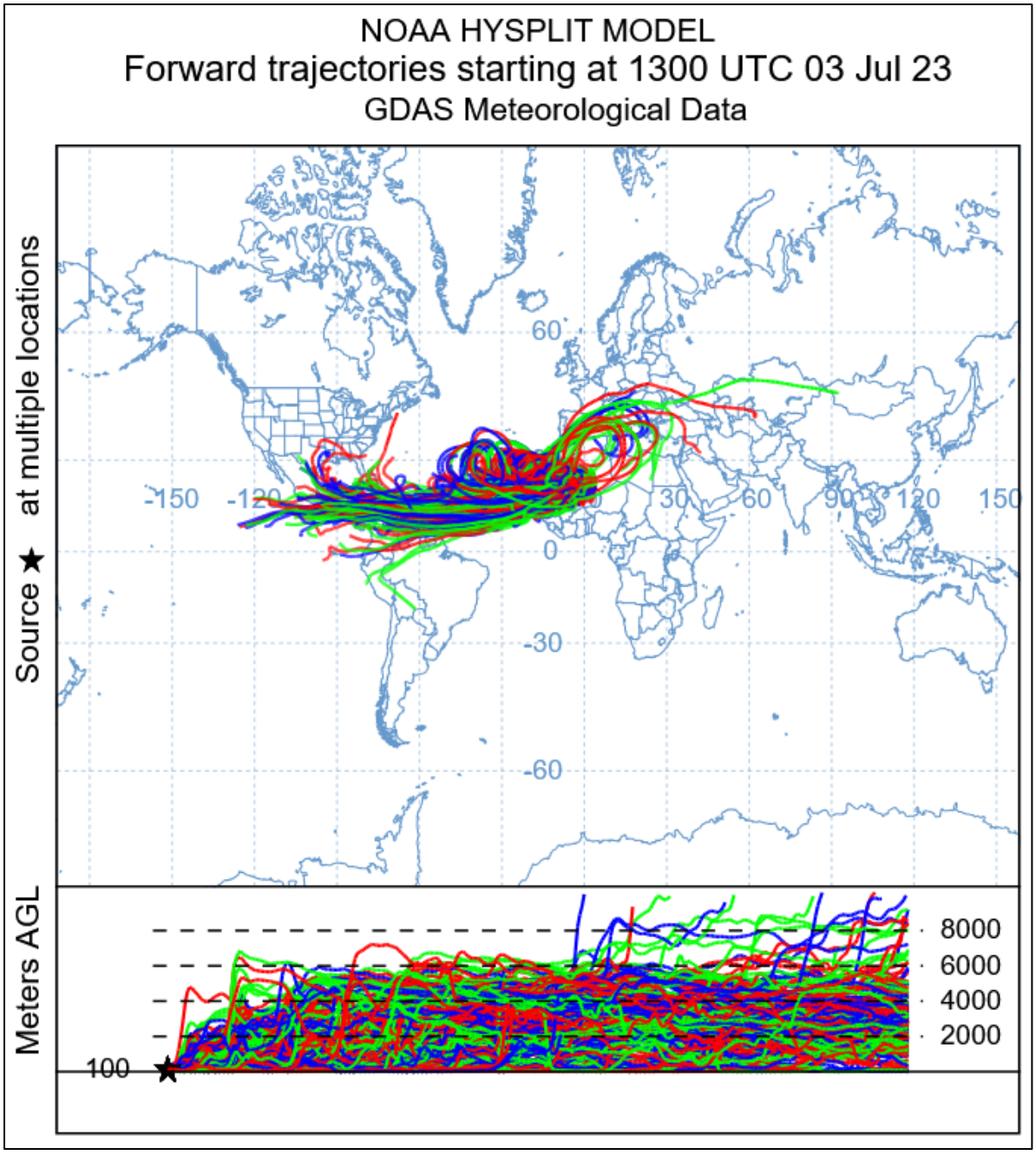

Figure 3-116: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 3, 2023

3.2.11 Group 11 – Evidence for July 19, 2023, Prescribed Fire $PM_{2.5}$ Event

July 19, 2023, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 18.5 µg/m^3. This elevated concentration was a result of smoke from prescribed fires in Louisiana. In addition to fires in Louisiana, agricultural burning in Mississippi River Valley and Texas along with African dust exacerbated $PM_{2.5}$ conditions.

The TCEQ forecast for July 19, 2023 (Table C-11), references light residual smoke from localized burnings in south and East Texas potentially affecting immediate surrounding areas. The forecast additionally mentioned light amounts of Saharan dust affecting the coast and south Texas. Figure 3-117: *Hourly $PM_{2.5}$ Concentrations on July 19, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-118: *AirNow HMS Smoke Plume for July 19, 2023* shows smoke in the vicinity of Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-119: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 19, 2023, Showing Hazy Conditions in Gulf of America* shows hazy conditions over East Texas and the Gulf of America along the coast of Texas. Figure 3-120: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 19, 2023*, shows movement of air through a smoke plume over Jefferson County that extended into Louisiana. Trajectories extend into the Gulf of America where the presence of potential African dust could have exacerbated $PM_{2.5}$ concentrations. Figure 3-121: *NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Louisiana and Mississippi River Valley with Fires, Starting on July 19, 2023*, shows through 24-hour trajectories that winds traveled from potential fire location north over Jefferson County.

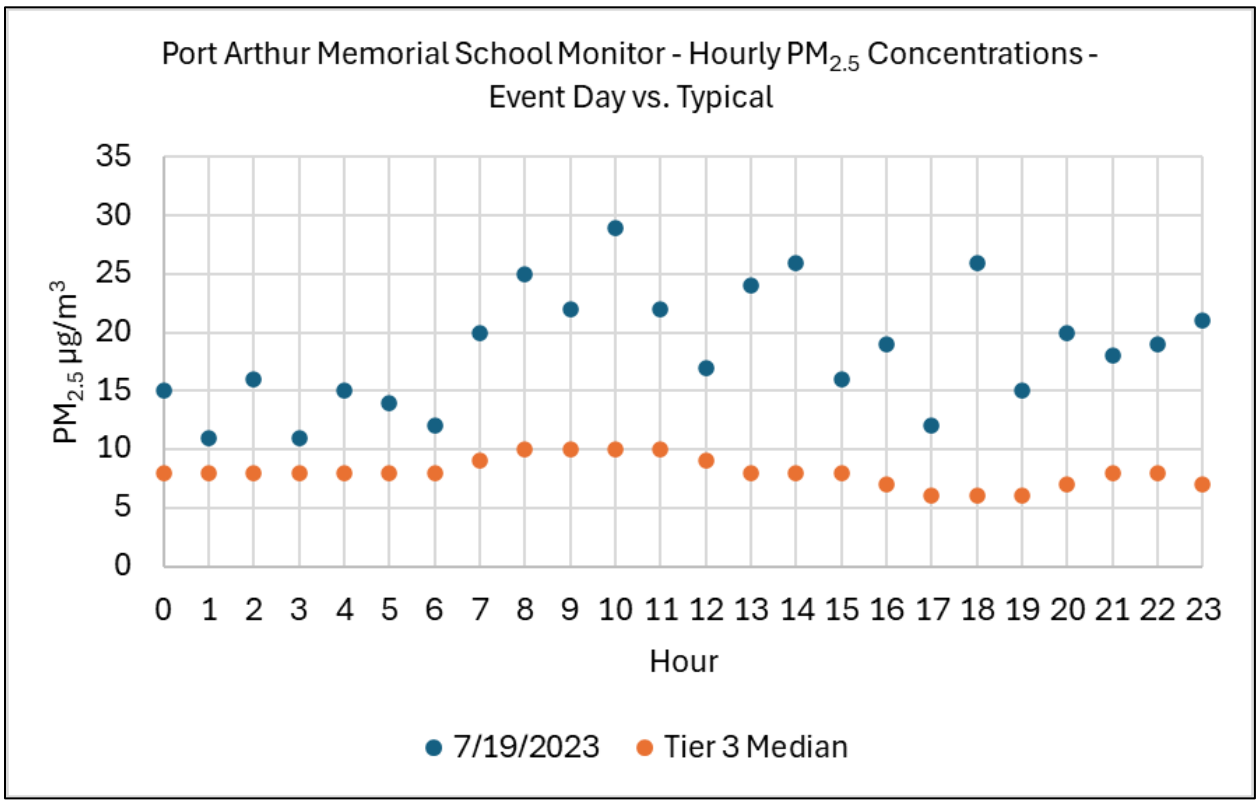

Figure 3-117: Hourly $PM_{2.5}$ Concentrations on July 19, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

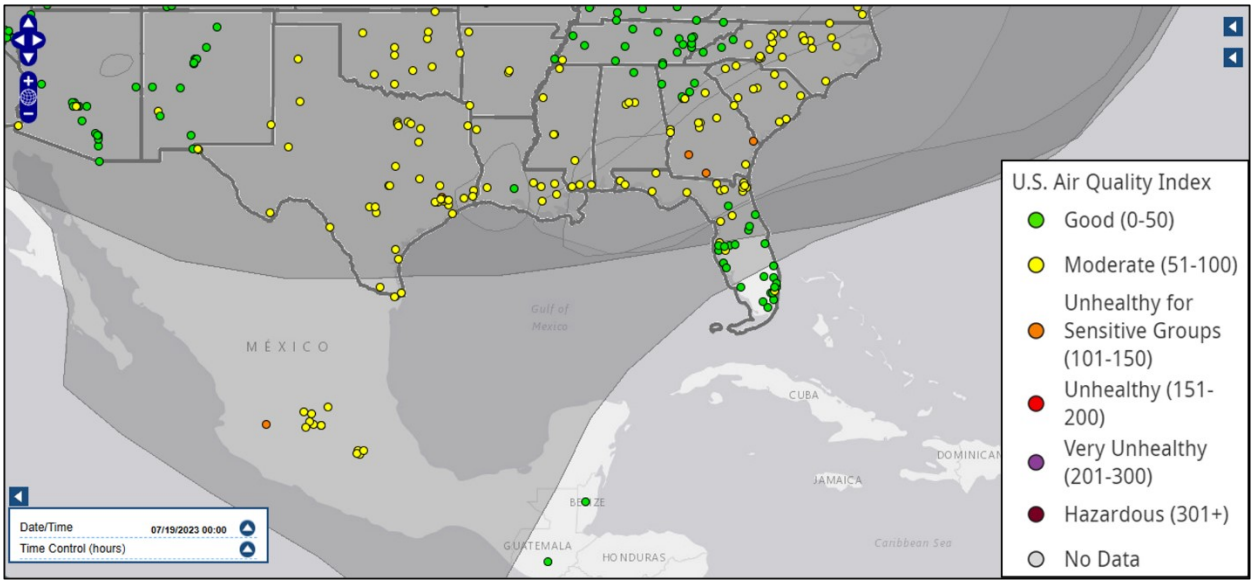

Figure 3-118: AirNow HMS Smoke Plume for July 19, 2023

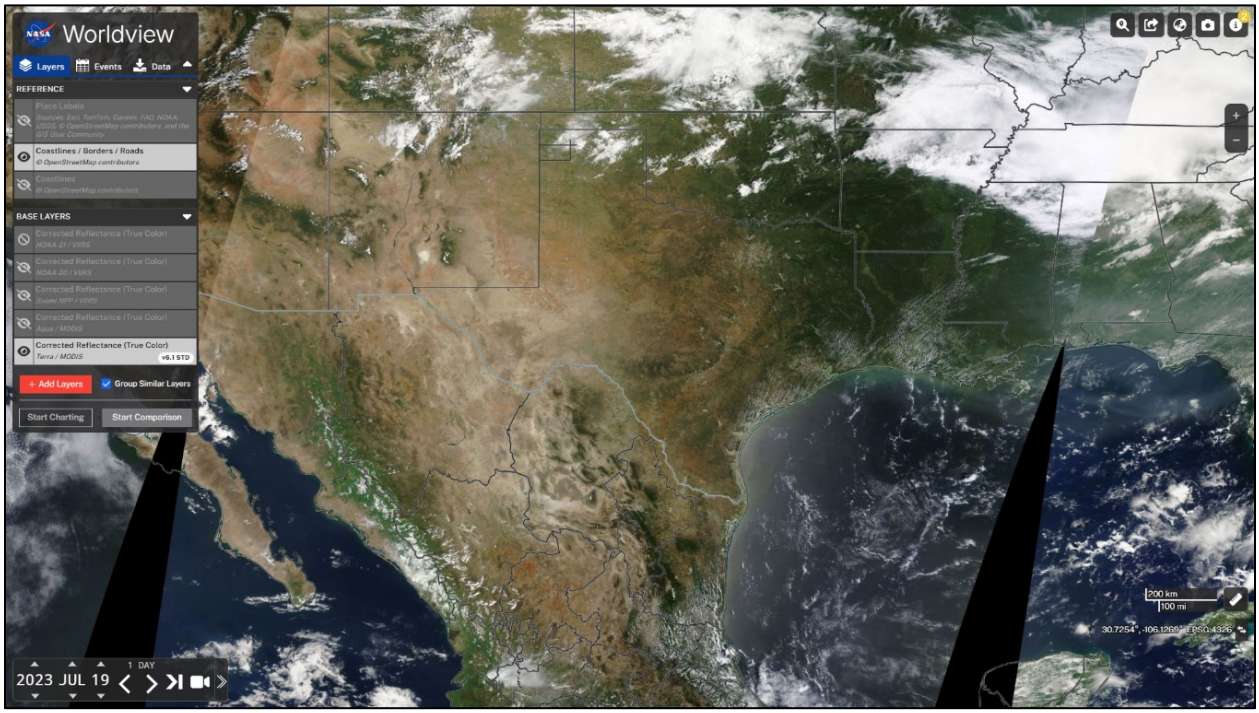

Figure 3-119: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 19, 2023, Showing Hazy Conditions in Gulf of America

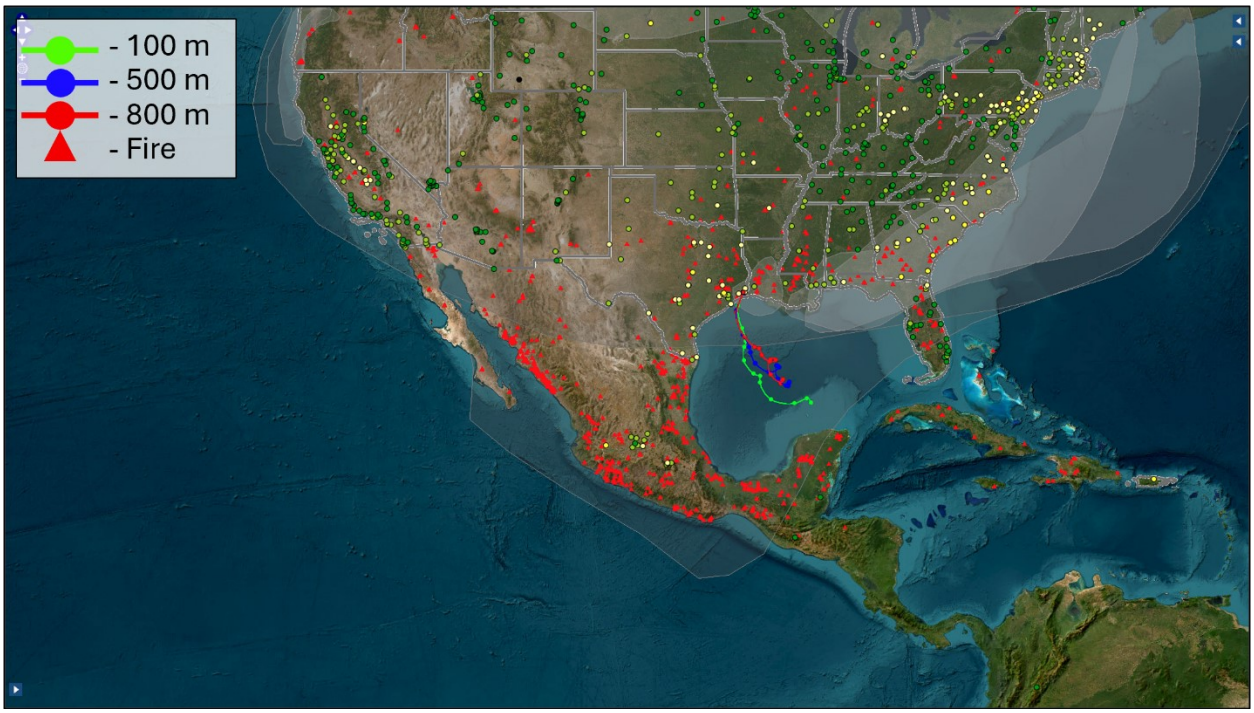

Figure 3-120: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 19, 2023

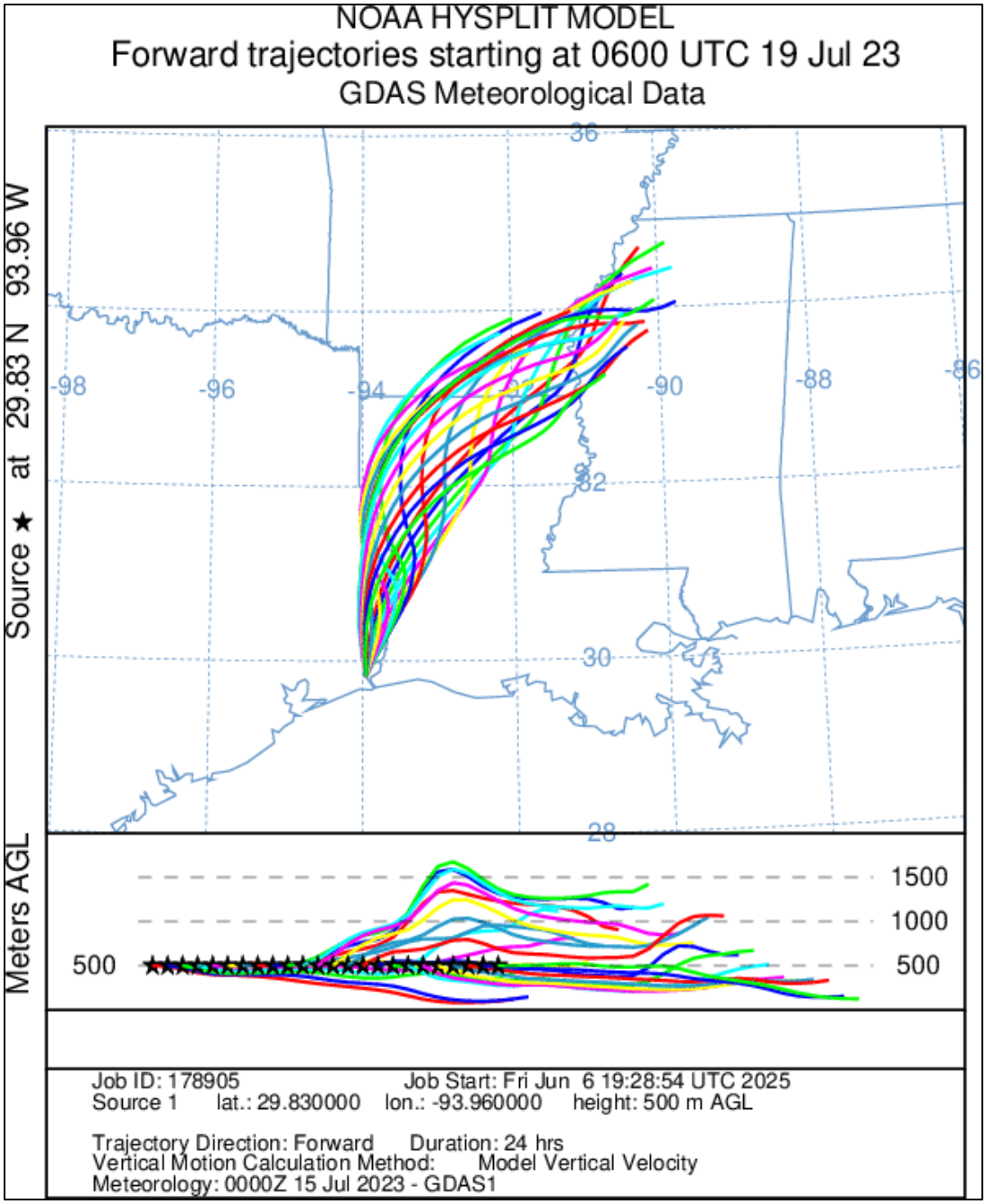

Figure 3-121: NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Louisiana and Mississippi River Valley with Fires, Starting on July 19, 2023

3.2.12 Group 12 – Evidence for July 26, 2023, and July 29, 2023, African Dust $PM_{2.5}$ Event

July 26, 2023, and July 29, 2023, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 18.4 µg/m^3 and 19.8 µg/m^3, respectively. These elevated concentrations were a result of African dust.

The TCEQ forecast for July 26, 2023 (Table C-12), references that incoming Saharan dust and light smoke from Canadian wildfires were expected to affect much of Texas. The forecast stated that most smoke was expected to stay aloft. Figure 3-122: *Hourly $PM_{2.5}$ Concentrations on July*

26, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-123: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 26, 2023* shows high readings of aerosols in the Gulf of America, with a Moderate AQI in East Texas. Figure 3-124: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 26, 2023, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Haze is most visible along the coast of Texas. Figure 3-125: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 26, 2023* shows movement of air from the Gulf of America the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-126: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on July 12, 2023* shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

Media reports (Figure C-14, Figure C-15, and Figure C-16) published respectively on either July 26, 2023, or July 27, 2023, by a Houston media outlet, San Antonio media outlet, and a Liberty County media outlet all reference the arrival of African dust in Texas.

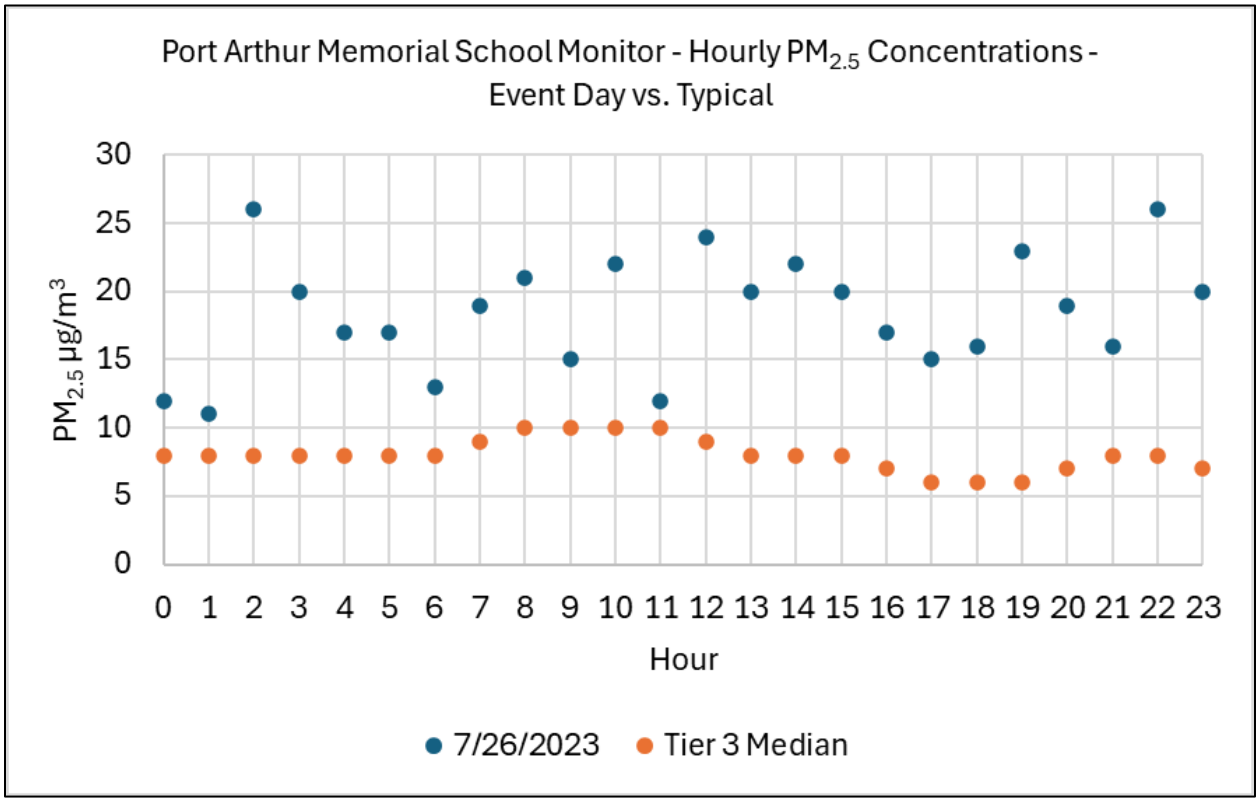

Figure 3-122: Hourly $PM_{2.5}$ Concentrations on July 26, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

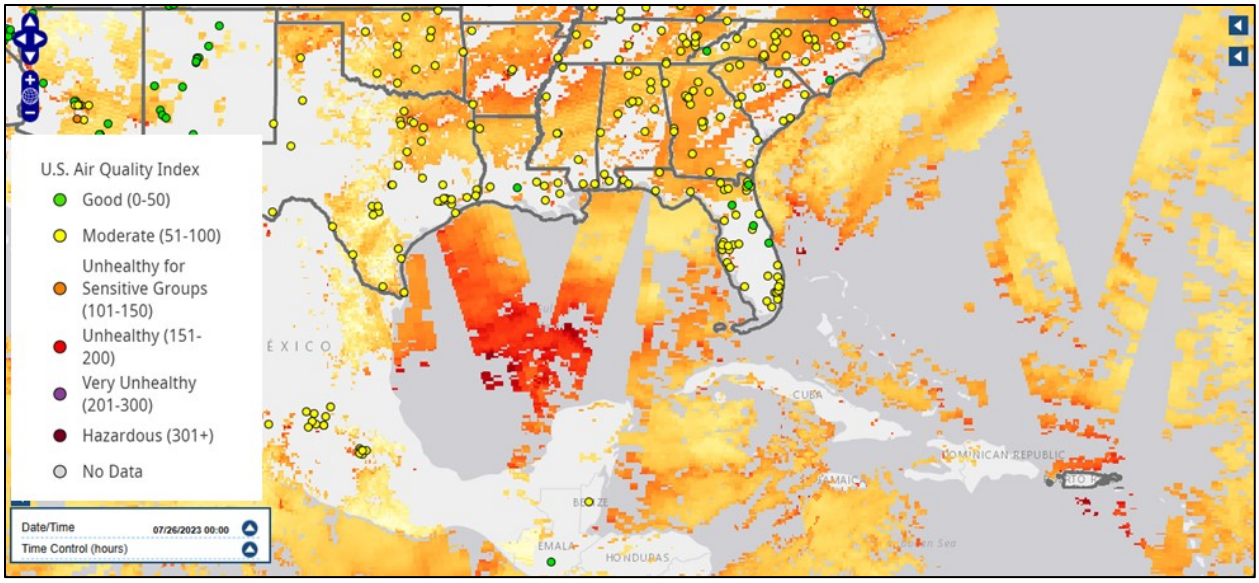

Figure 3-123: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 26, 2023

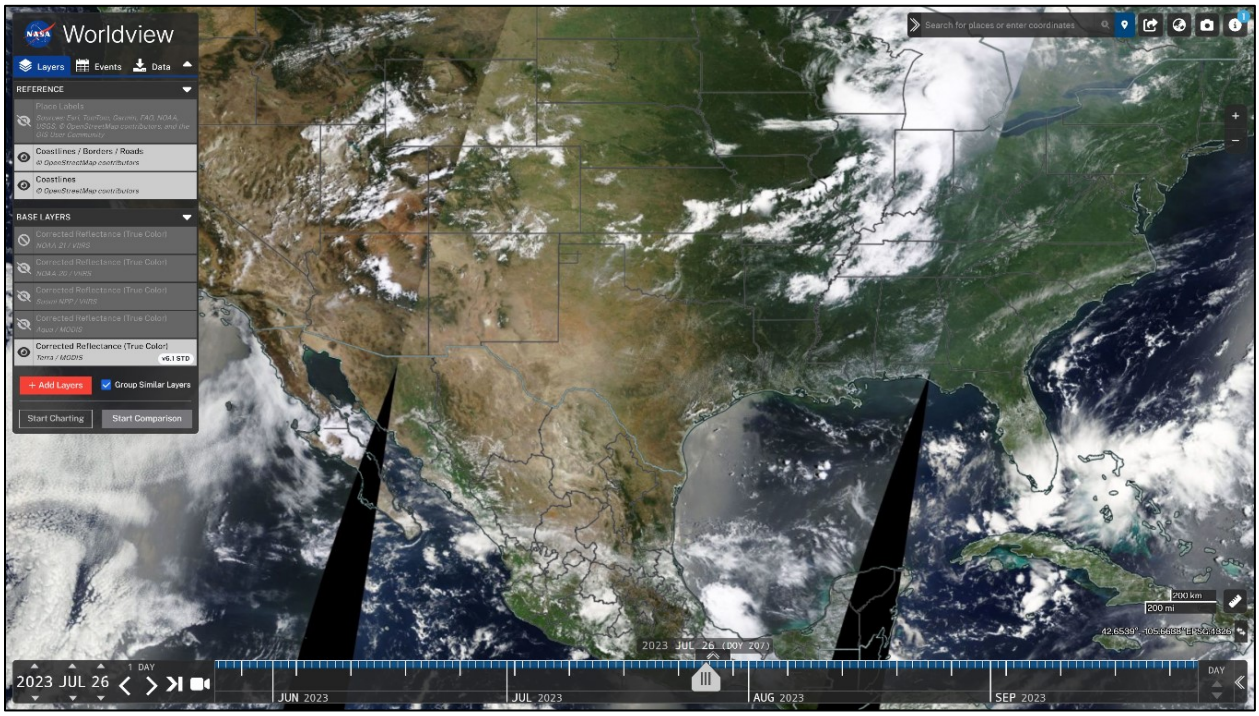

Figure 3-124: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 26, 2023, Showing Haze in the Gulf of America

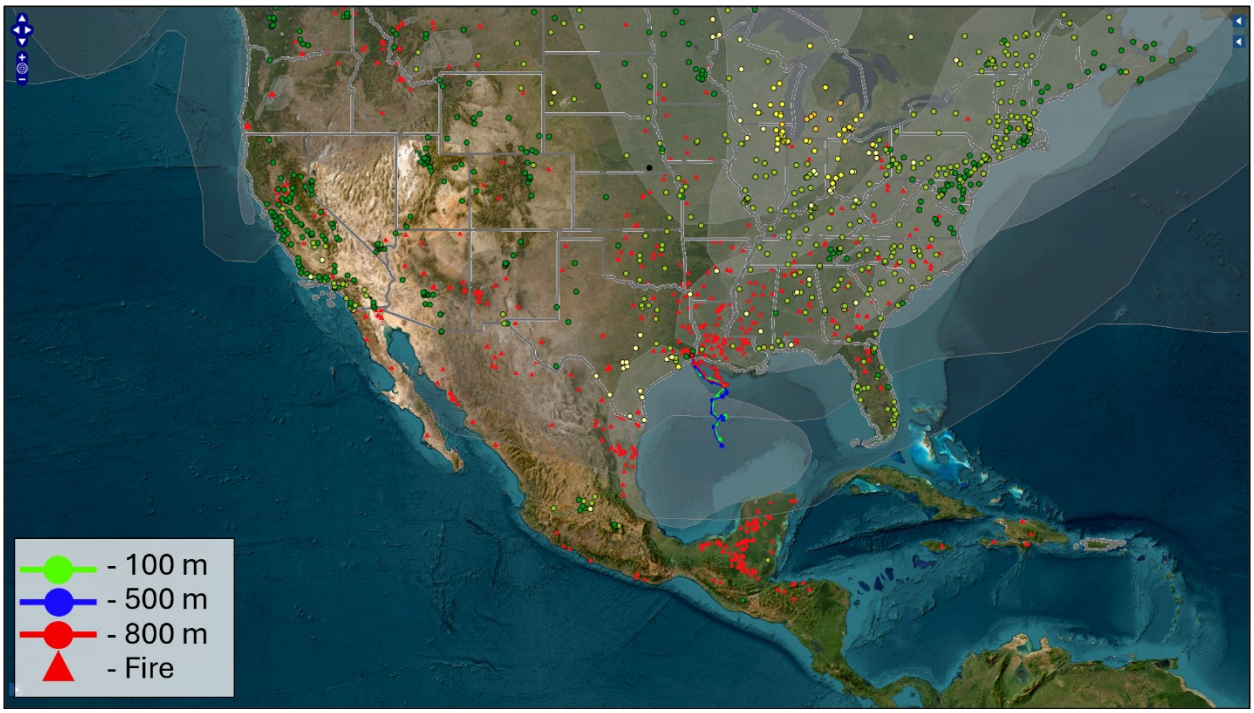

Figure 3-125: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 26, 2023

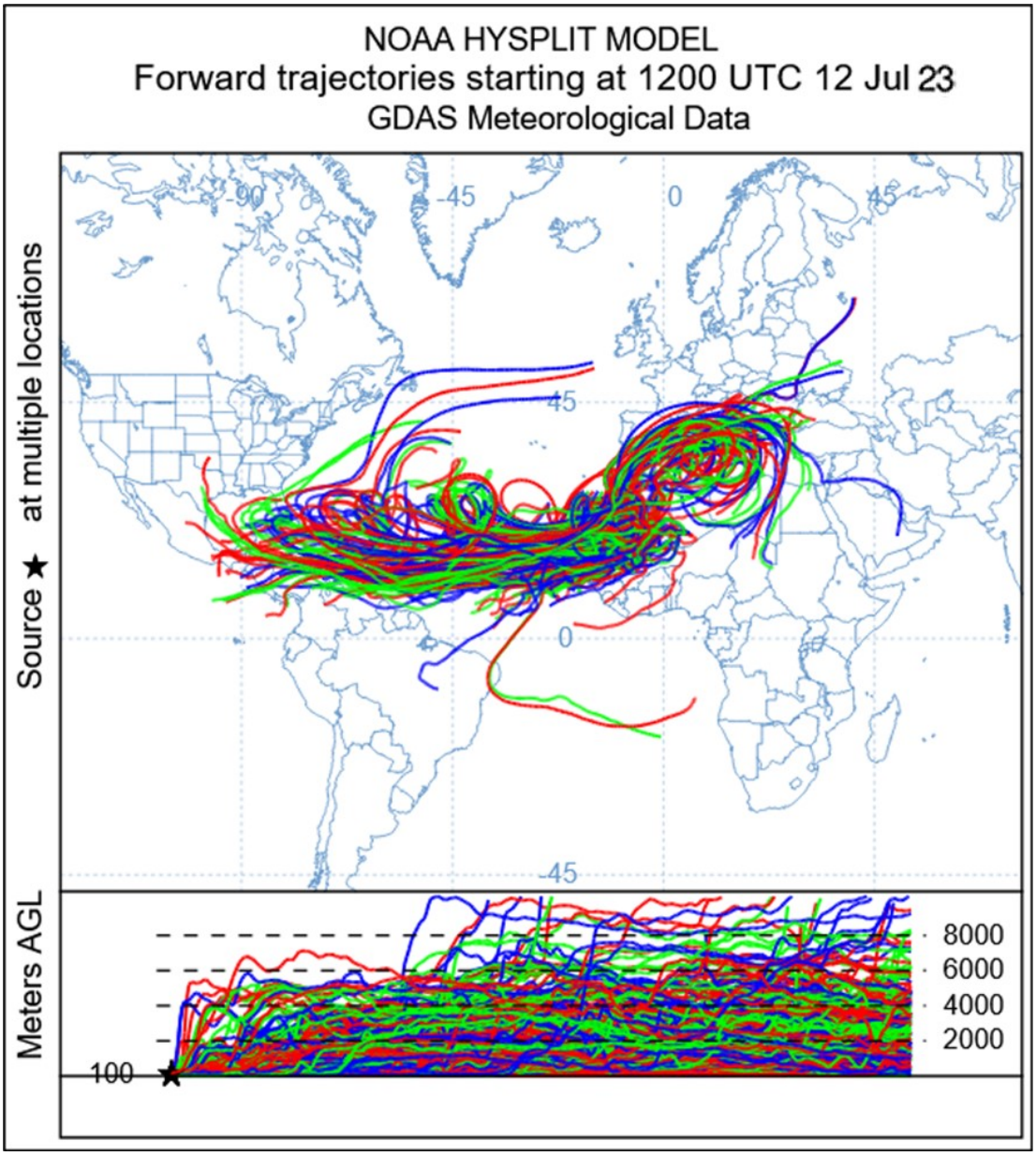

Figure 3-126: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 12, 2023

The TCEQ forecast for July 29, 2023 (Table C-12), references that $PM_{2.5}$ is expected to remain elevated across Texas due to lingering Canadian wildfire smoke, local burning in east and central Texas, increased humidity, and incoming Saharan dust. The heaviest dust impacts were forecast over central, north-central, southeast, and the Coastal Bend portions of Texas. Figure 3-127: *Hourly $PM_{2.5}$ Concentrations on July 29, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-128: *Aerosol optical depth map from Terra and Aqua / MODIS AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 29, 2023*, shows high readings of aerosols in the Gulf of America, with a Moderate AQI in East Texas. Figure 3-129: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 29, 2023, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-130: *AirNow Tech HYSPLIT*

72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 29, 2023, shows movement of air from the Gulf of America to the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-131: *NOAA HYSPLIT 15-Day Trajectories Originating from the Saharan Desert, Starting on July 14, 2023*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

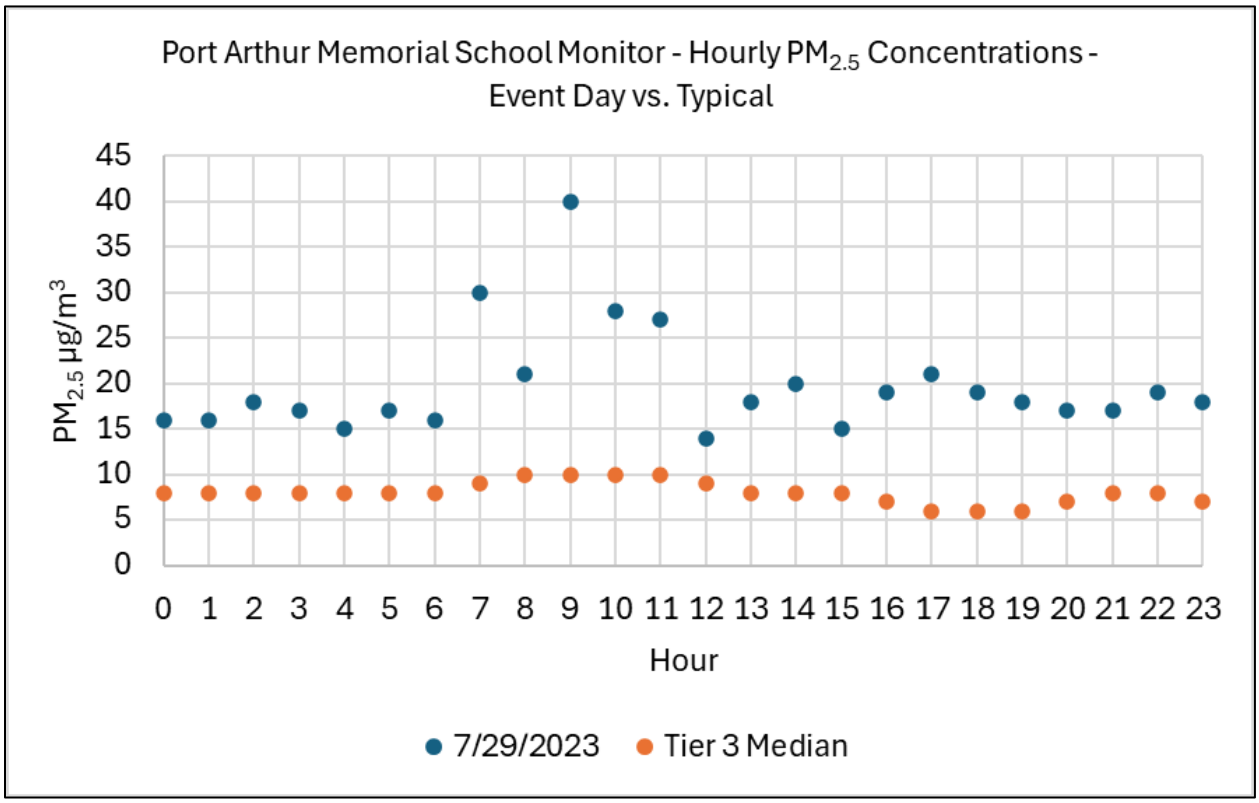

Figure 3-127: Hourly $PM_{2.5}$ Concentrations on July 29, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

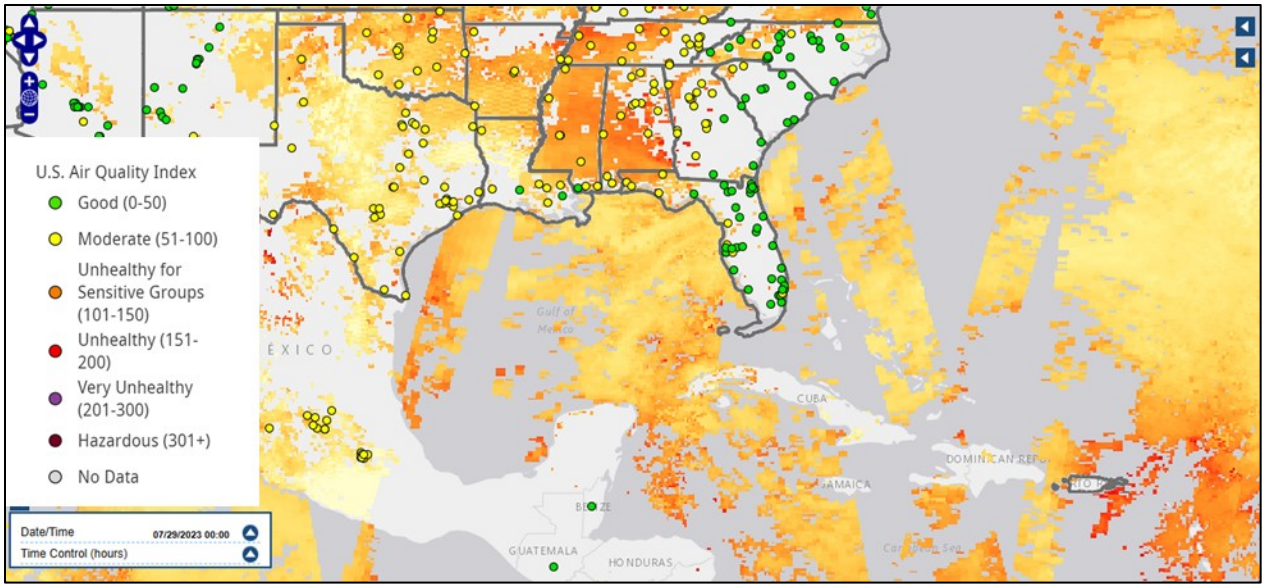

Figure 3-128: Aerosol optical depth map from Terra and Aqua / MODIS AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 29, 2023

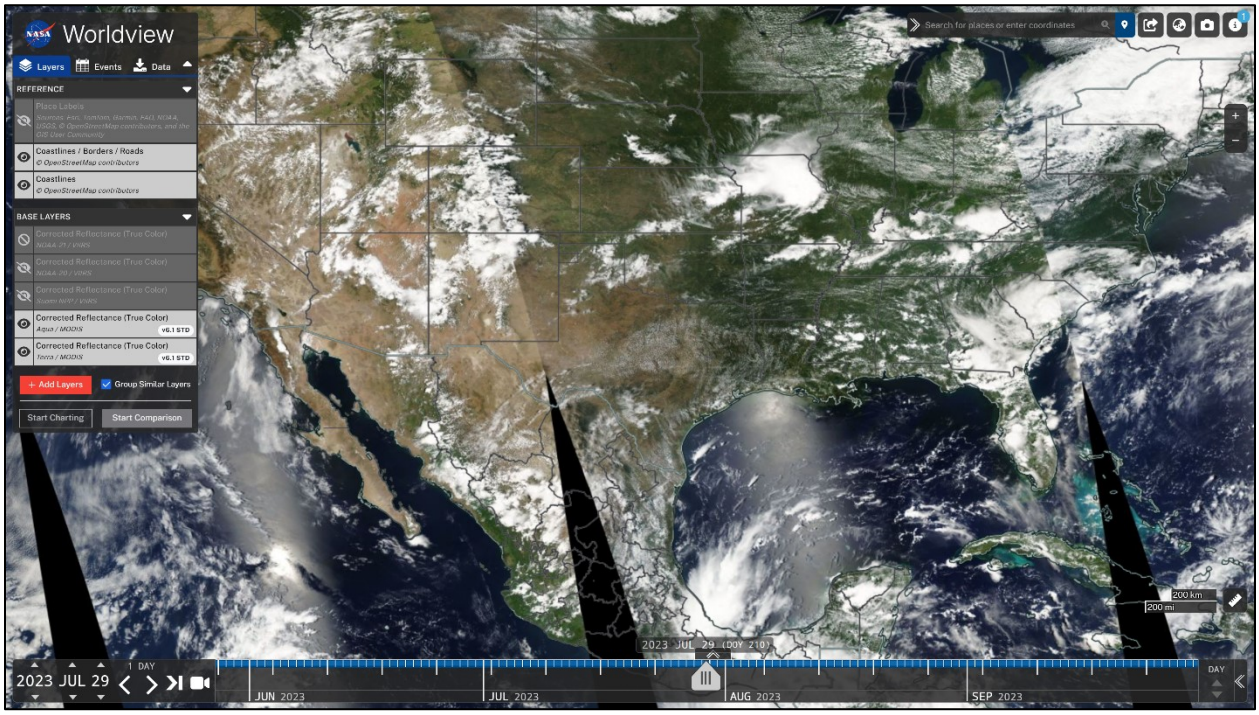

Figure 3-129: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 29, 2023, Showing Haze in the Gulf of America

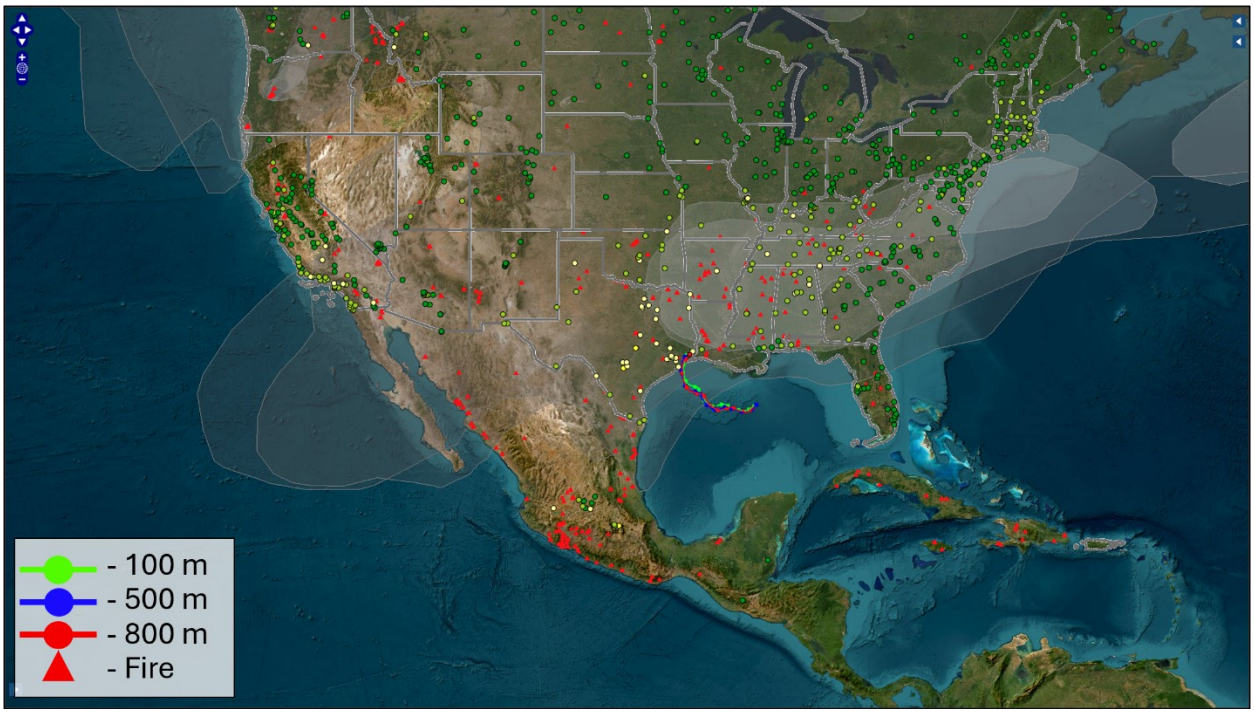

Figure 3-130: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 29, 2023

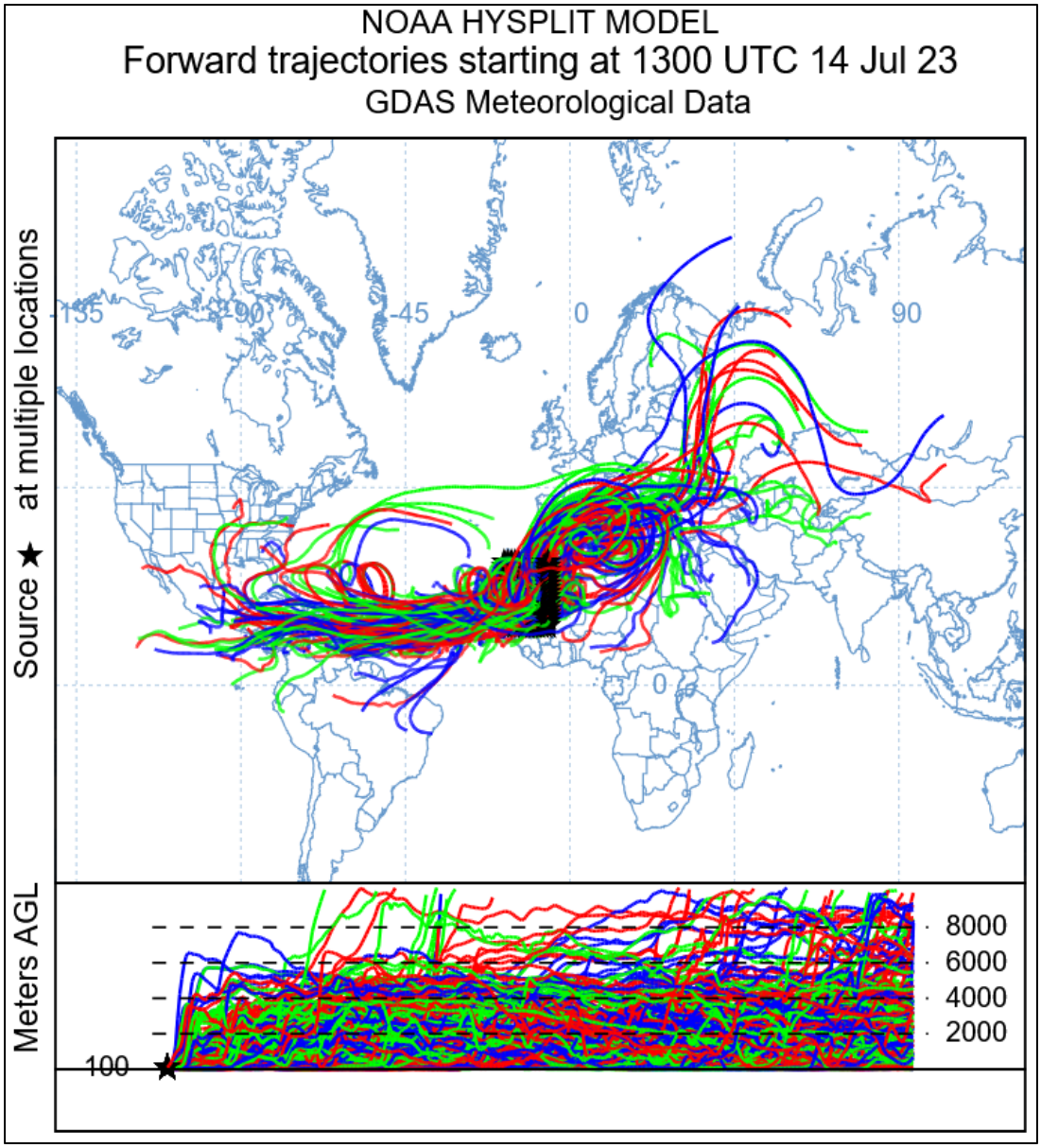

Figure 3-131: NOAA HYSPLIT 15-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 14, 2023

3.2.13 Group 13 – Evidence for August 2, 2023, Prescribed Fire $PM_{2.5}$ Event

August 2, 2023, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentrations of 22.8 µg/m^3. These elevated concentrations were a result of smoke from prescribed fires in Mississippi River Valley.

The TCEQ forecast for August 2, 2023 (Table C-13) references residual smoke from seasonal burnings in the Lower Mississippi River Valley that could have affected southeast Texas. The forecasts also references residual smoke from Canadian wildfires spreading over most of the state, though remaining aloft. Figure 3-132: *Hourly $PM_{2.5}$ Concentrations on August 2, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that most hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor, and a concentration of 193 µg/m^3 was recorded at the monitor at 15:00 local time. Figure 3-133:

AirNow HMS Smoke Plume for August 2, 2023, shows smoke in the vicinity of Jefferson County in southeast Texas, with a Good to Moderate AQI in East Texas. Figure 3-134: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 2, 2023, Showing Haze in East Texas* shows hazy conditions over East Texas and portions of the Gulf of America. Figure 3-135: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 2, 2023*, shows slow-moving air at the lowest altitude traveling over the Gulf of America prior to reaching Jefferson County. The trajectories at higher altitudes traveled in a southerly direction prior to shifting to the southwest around the Mississippi River Delta and crossing over the Gulf of America before shifting to the west and ultimately northwest prior to arrival in Jefferson County. Figure 3-136: *NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Lower Mississippi River Valley with Fires, Starting on August 2, 2023*, shows through 24-hour trajectories that winds traveled from a potential fire location to the north over Jefferson County.

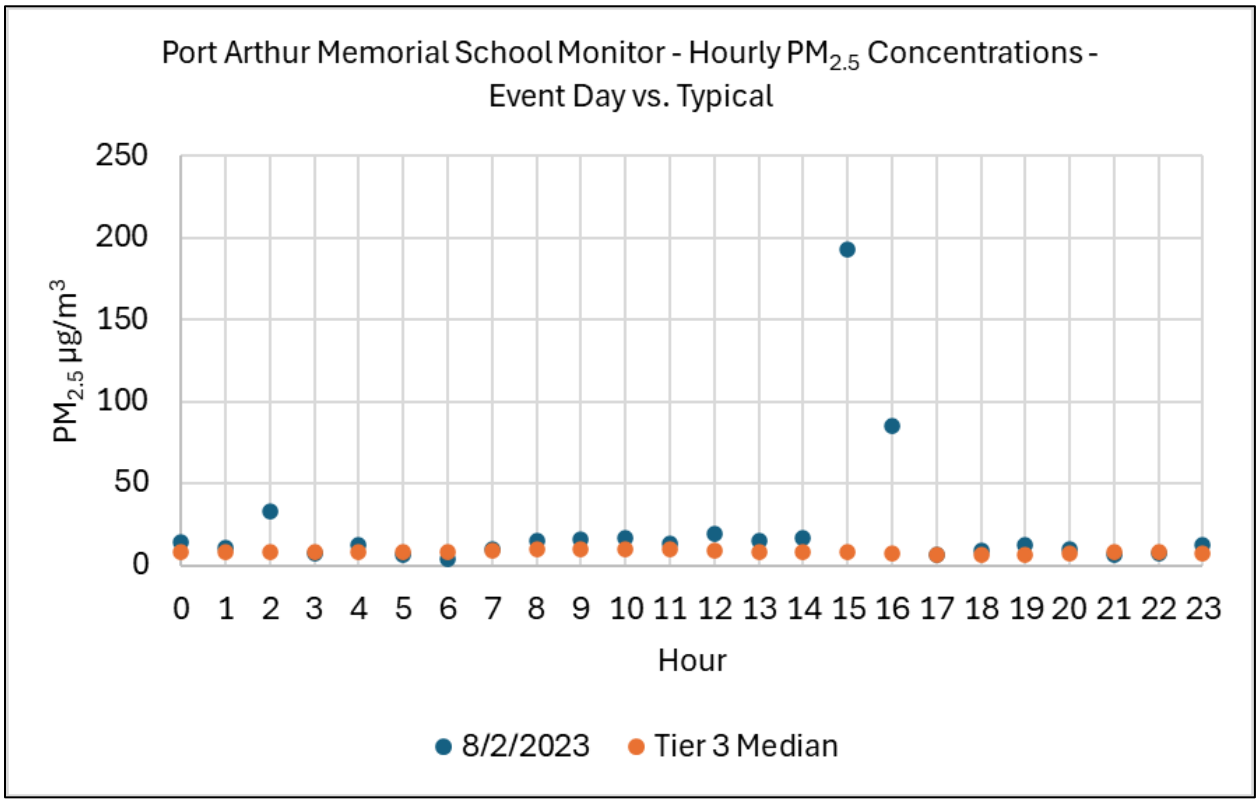

Figure 3-132: Hourly $PM_{2.5}$ Concentrations on August 2, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

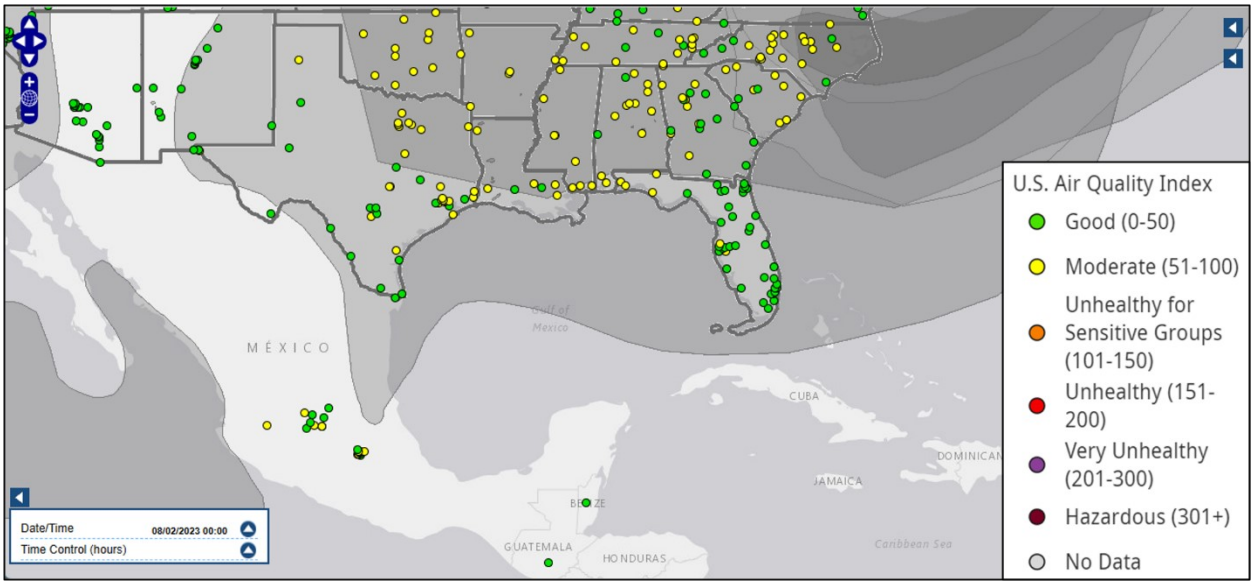

Figure 3-133: AirNow HMS Smoke Plume for August 2, 2023

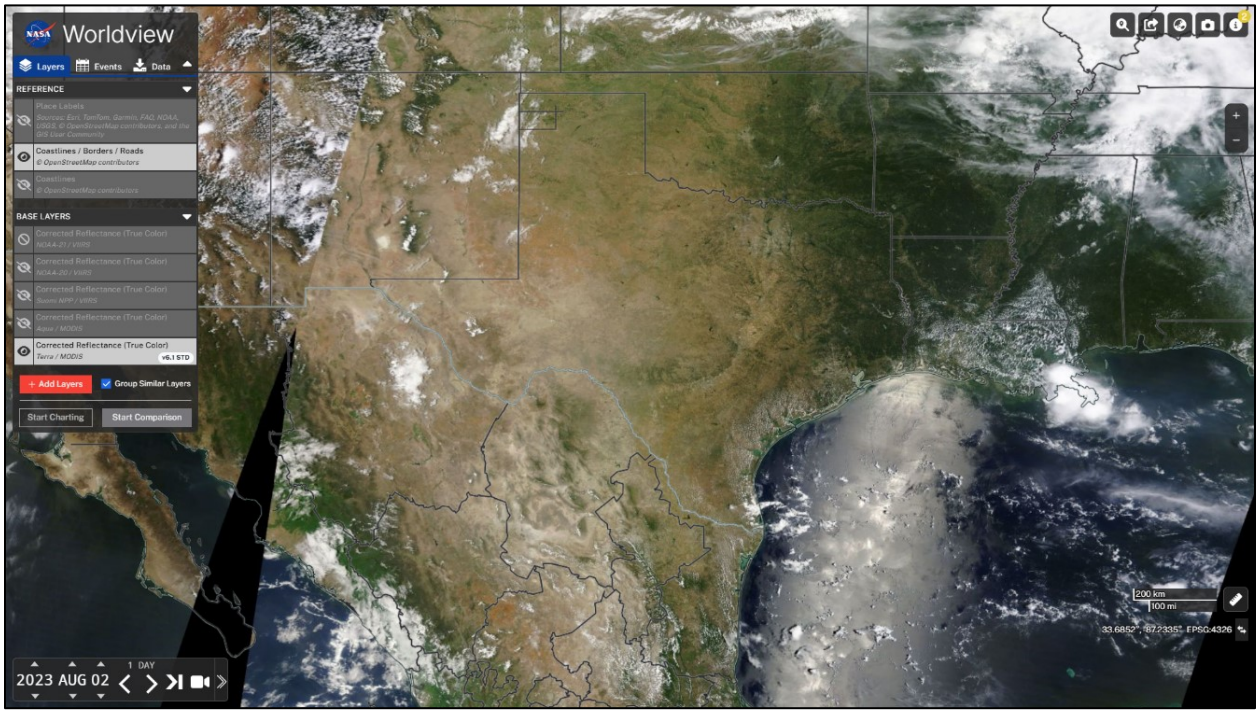

Figure 3-134: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 2, 2023, Showing Haze in East Texas

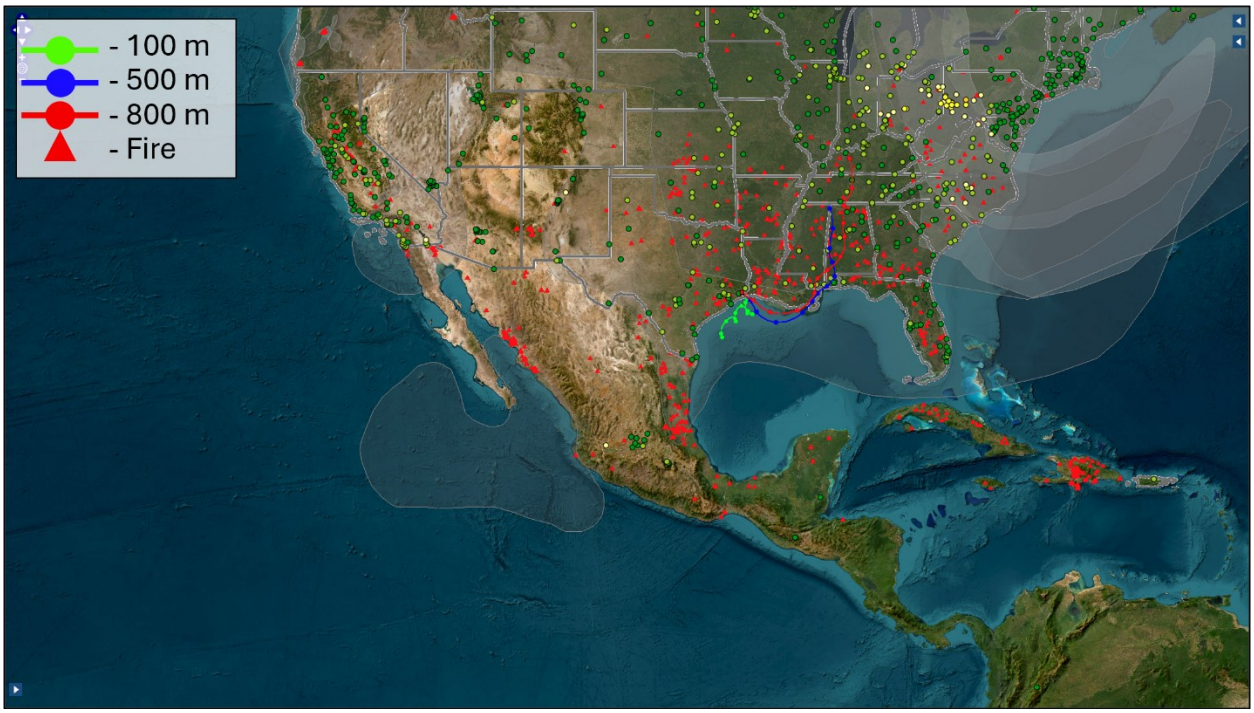

Figure 3-135: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 2, 2023

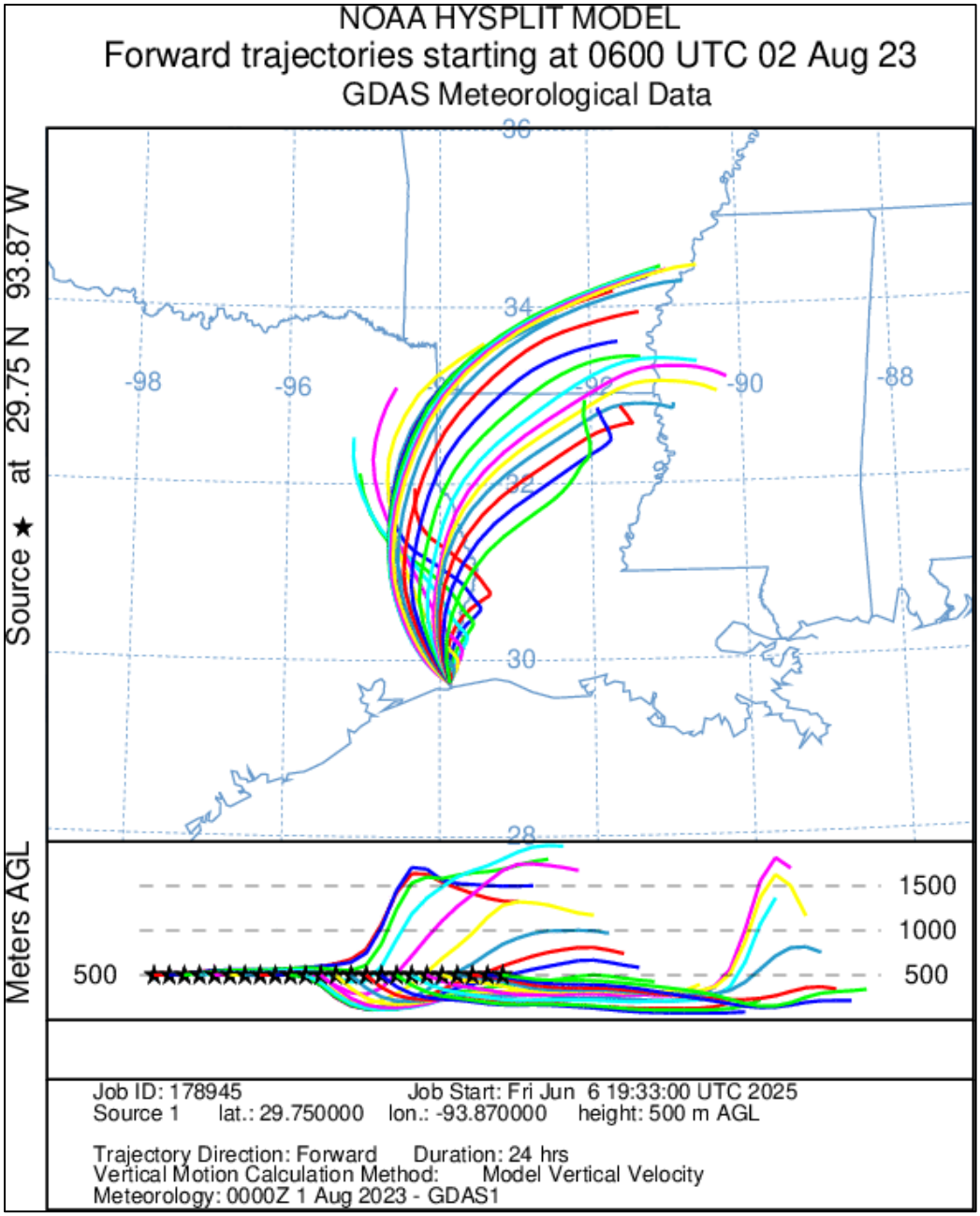

Figure 3-136: NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Lower Mississippi River Valley with Fires, Starting on August 2, 2023

3.2.14 Group 14 – Evidence for August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023, Wildfire-U.S. $PM_{2.5}$ Event

August 24, 2023, August 25, 2023, August 28, 2023, August 31, 2023, September 1, 2023, and September 2, 2023, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 18.9 µg/m^3, 18.5 µg/m^3, 18.9 µg/m^3, 23.8 µg/m^3, 18.7 µg/m^3, and 20.9 µg/m^3, respectively. These elevated concentrations were primarily a result of smoke from Texas, Louisiana, and Mississippi River Valley.

The TCEQ forecast for August 24, 2023 (Table C-14), references heavy-density smoke from the Tiger Island Fire in Louisiana that was forecasted to expand over southeast Texas. The forecast also referenced light density smoke expanding over most of Texas that was predicted to remain aloft from Canadian, northwest U.S., and northern California fires. A light density plume of Saharan dust was also referenced as moving over the Coastal Bend and south Texas. Figure 3-137: *Hourly $PM_{2.5}$ Concentrations on August 24, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-138: *AirNow HMS Smoke Plume for August 24, 2023*, shows smoke in the vicinity of Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-139: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 24, 2023, Showing Haze in East Texas* shows hazy conditions over East Texas and portions of the Gulf of America. Figure 3-140: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 24, 2023* shows slow-moving air at the lowest altitude traveling over the Gulf of America prior to reaching Jefferson County. The trajectories at higher altitudes traveled in a southerly direction prior to shifting to the southwest around the Mississippi River Delta and crossing over the Gulf of America before shifting to the west and ultimately northwest prior to arrival in Jefferson County. Figure 3-141: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 21, 2023*, shows through 72-hour trajectories that winds traveled from a potential fire location to the southwest over Jefferson County.

Multiple media outlets published stories about wildfires that occurred in close proximity to Jefferson County in late August of 2023 (Figure C-17 through Figure C-27). Particular attention is given to the Tiger Island fire in Louisiana. Additionally, attention is given to fires in Jasper County, Texas and Orange County, Texas. which are both in close proximity to Jefferson County and the Port Arthur Memorial School monitor.

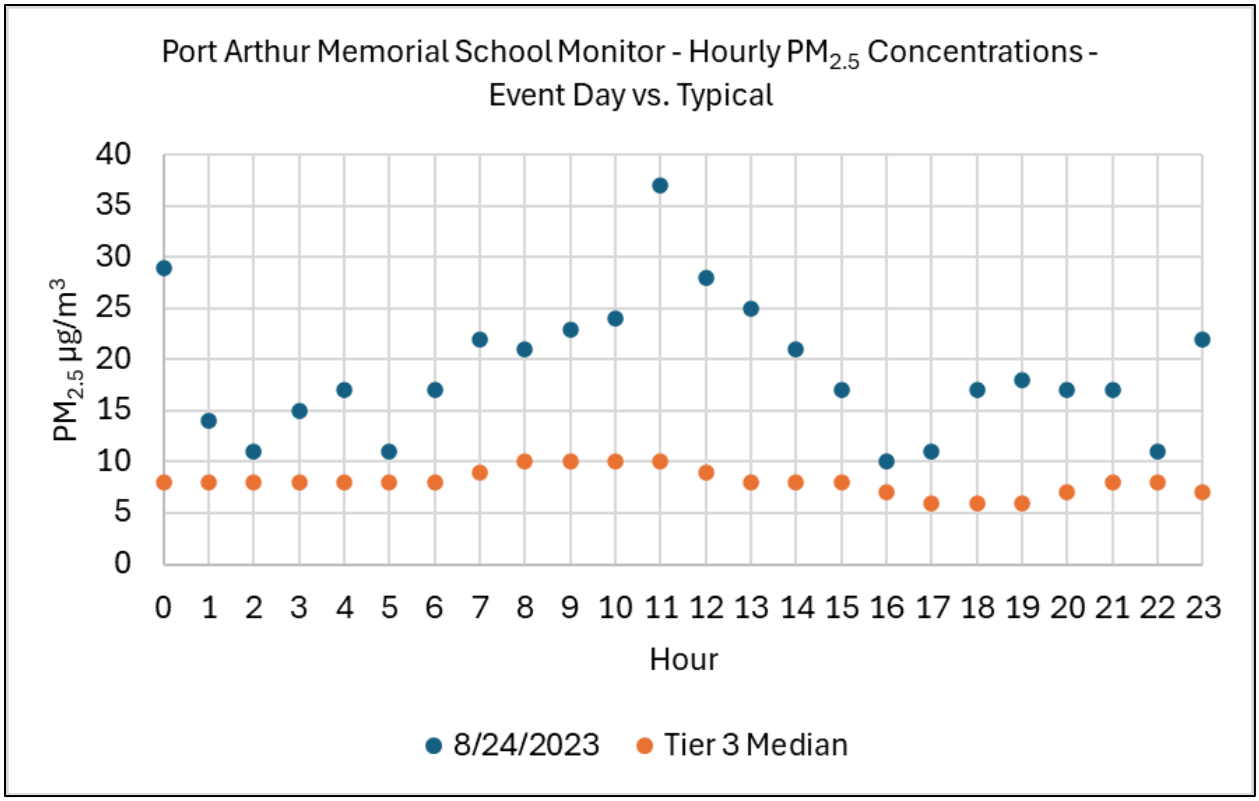

Figure 3-137: Hourly $PM_{2.5}$ Concentrations on August 24, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

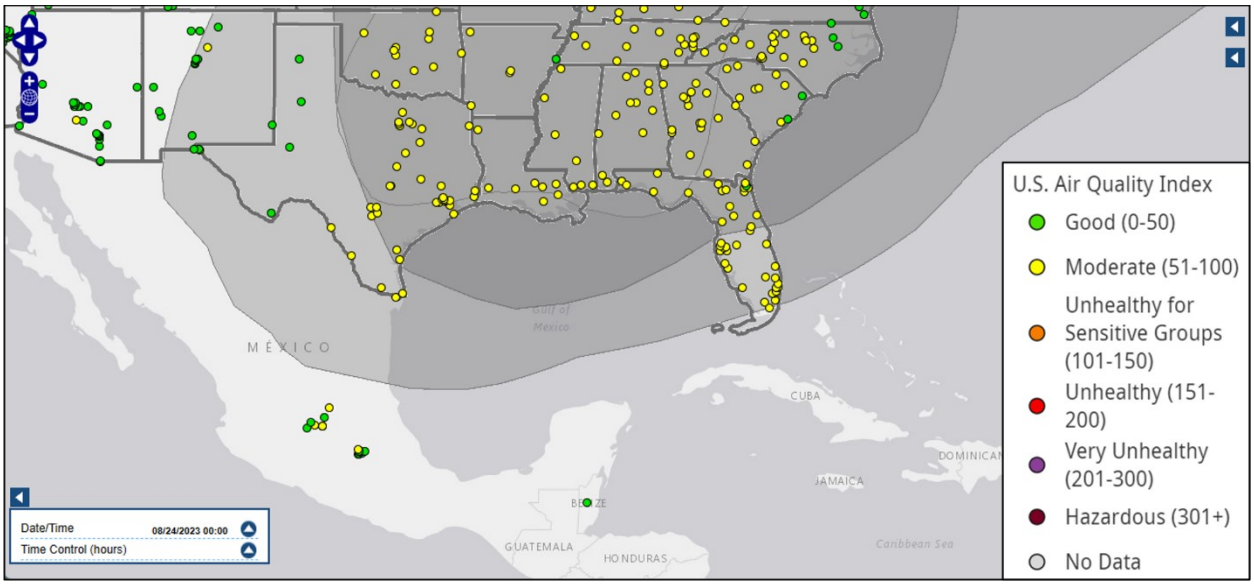

Figure 3-138: AirNow HMS Smoke Plume for August 24, 2023

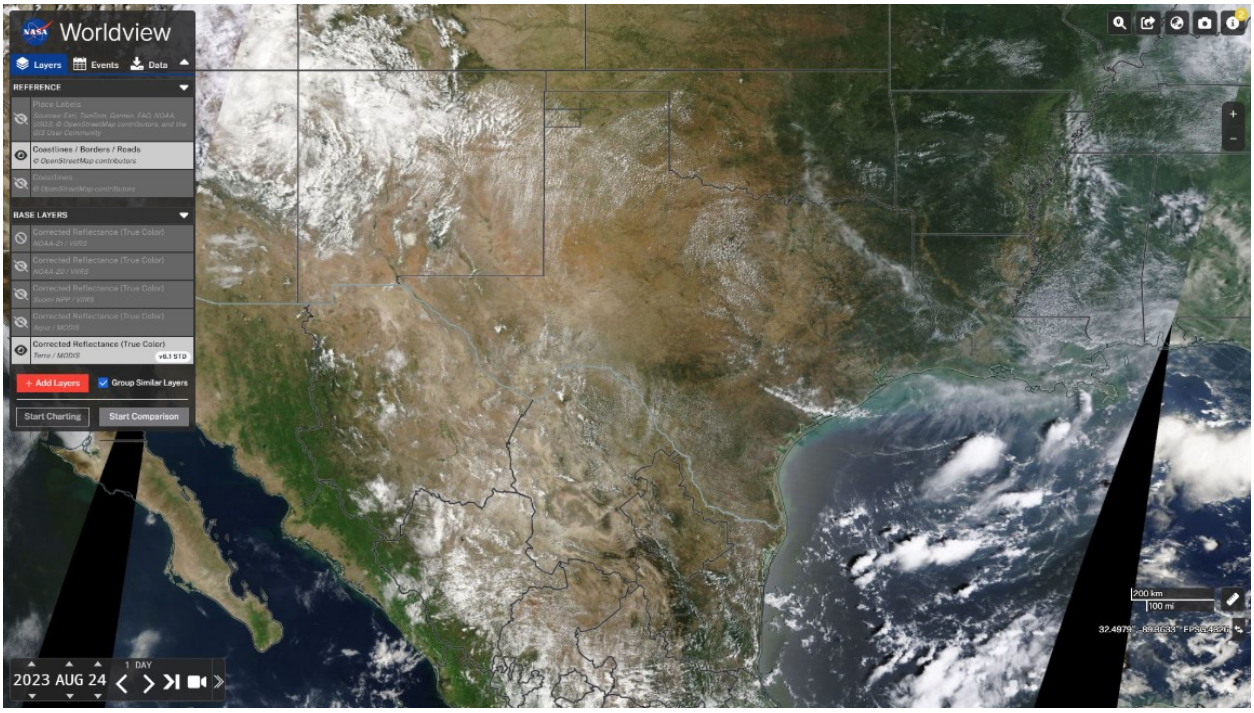

Figure 3-139: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 24, 2023, Showing Haze in East Texas

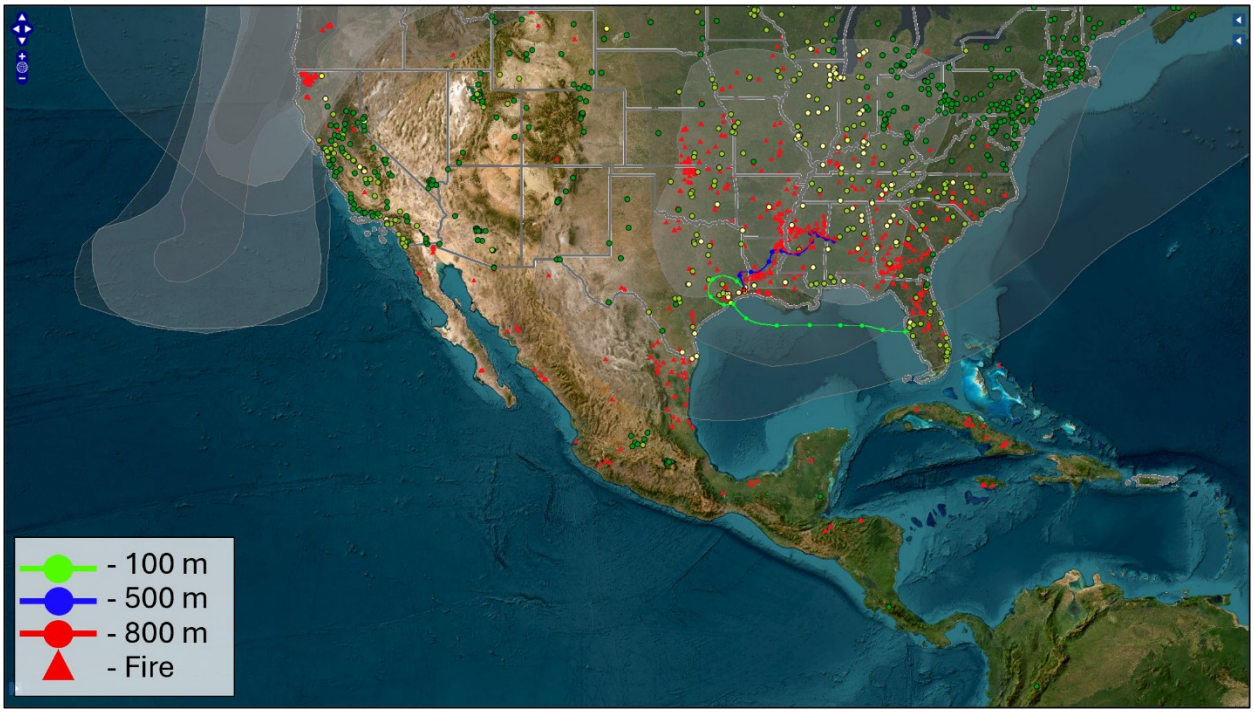

Figure 3-140: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 24, 2023

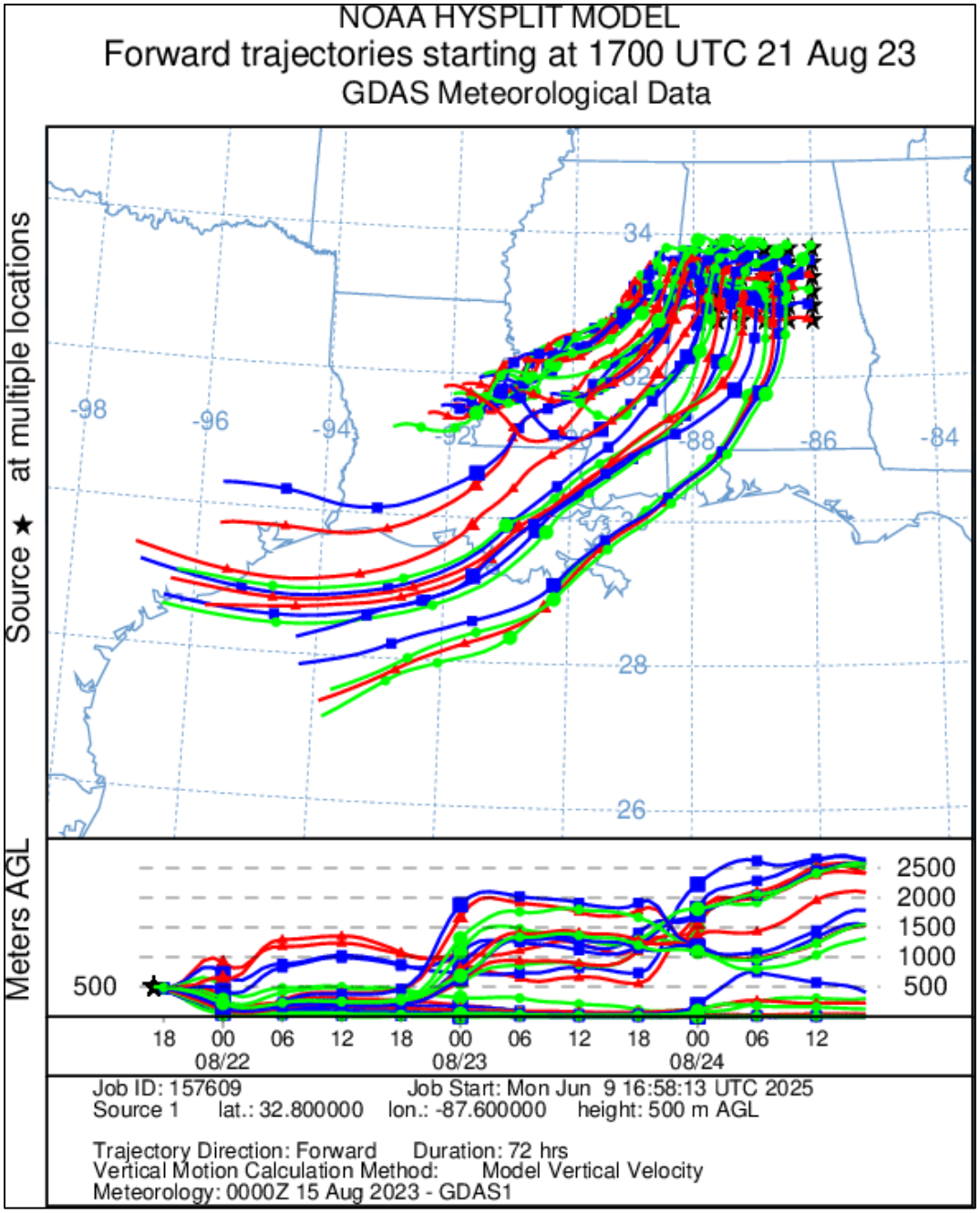

Figure 3-141: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 21, 2023

The TCEQ forecast for August 25, 2023 (Table C-14), has conditions similar to August 24, 2023, with smoke from Louisiana wildfires moving into southeast Texas, light smoke from U.S. and Canadian wildfires remaining aloft, and light Saharan dust coming into Texas from the coast. Figure 3-142: *Hourly $PM_{2.5}$ Concentrations on August 25, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-143: *AirNow HMS Smoke Plume for August 25, 2023*, shows smoke in the vicinity of Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-144: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 25, 2023, Showing Haze in East Texas*

shows hazy conditions over East Texas and portions of the Gulf of America. Figure 3-145: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 25, 2023*, shows slow-moving air at the lowest altitude traveling along the coast over the Gulf of America prior to reaching Jefferson County. The trajectories at higher altitudes traveled in a southwesterly direction prior to shifting to the west and ultimately northwest prior to arrival in Jefferson County. All trajectories pass through smoke plumes as indicated in Figure 3-145. Figure 3-146: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 22* shows through 72-hour trajectories that winds traveled from potential fire locations to the southwest with select trajectories terminating over Jefferson County.

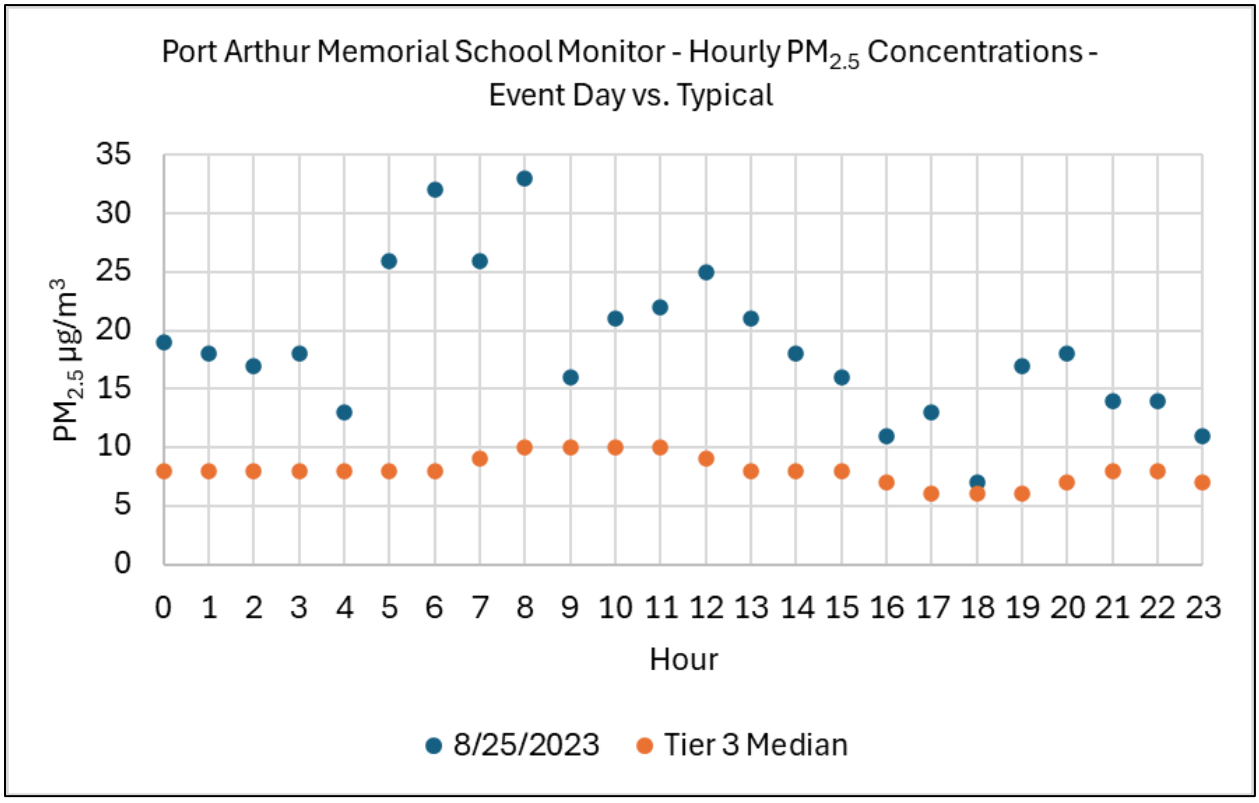

Figure 3-142: Hourly $PM_{2.5}$ Concentrations on August 25, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

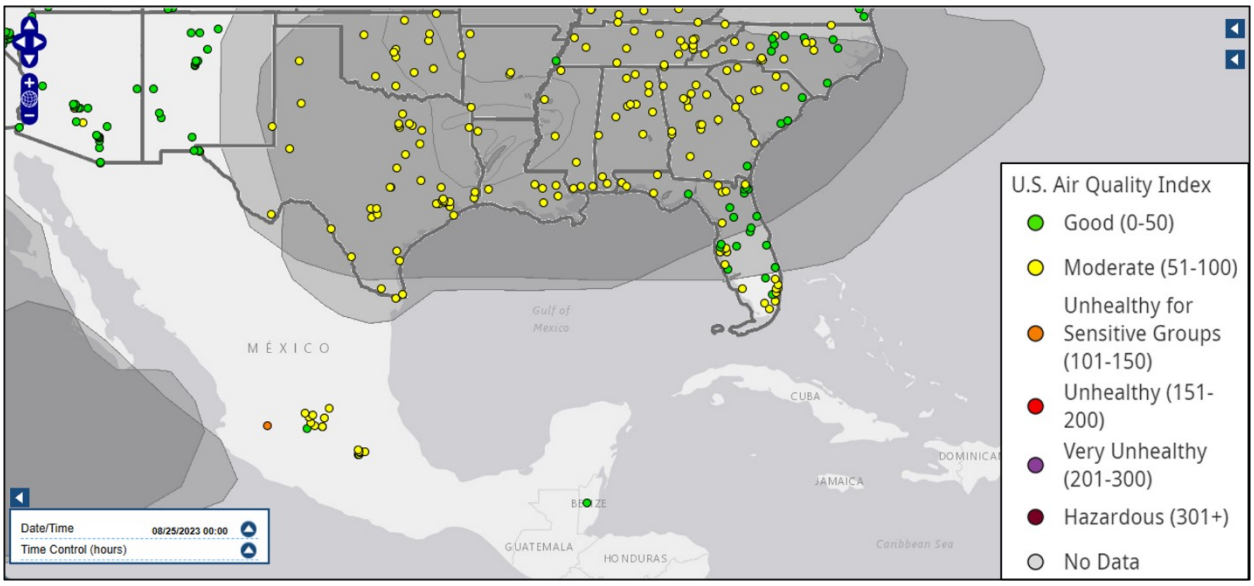

Figure 3-143: AirNow HMS Smoke Plume for August 25, 2023

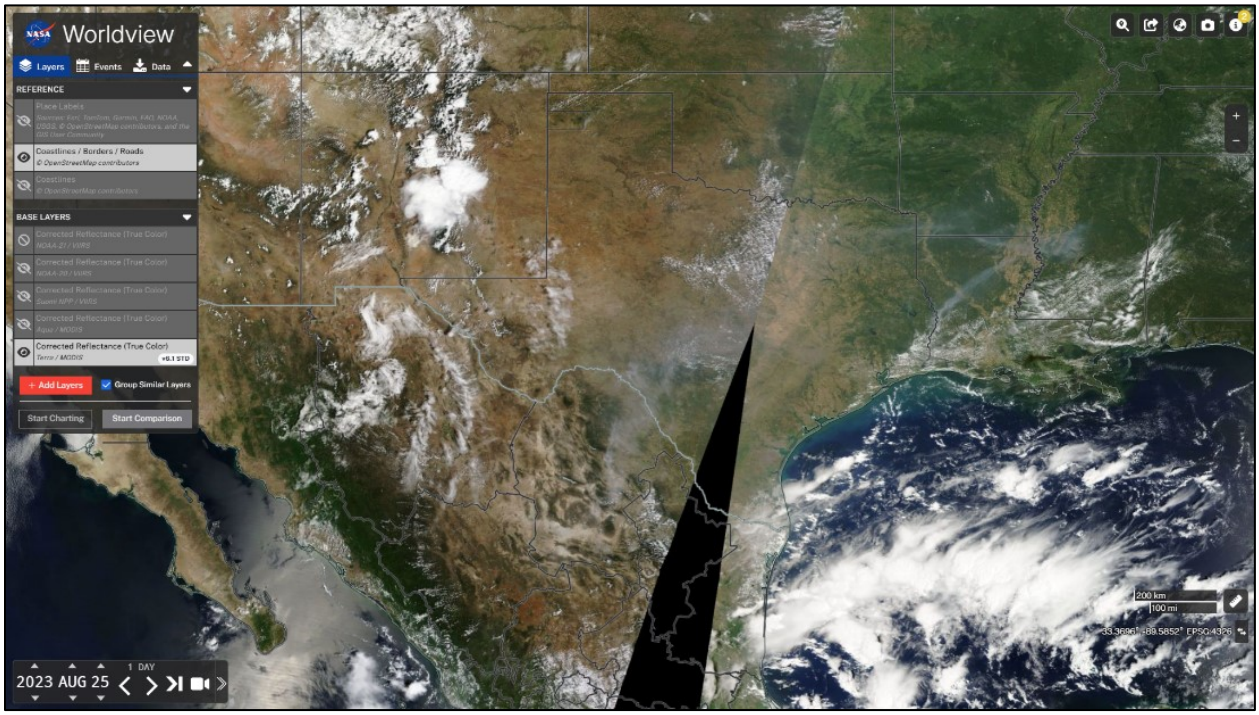

Figure 3-144: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 25, 2023, Showing Haze in East Texas

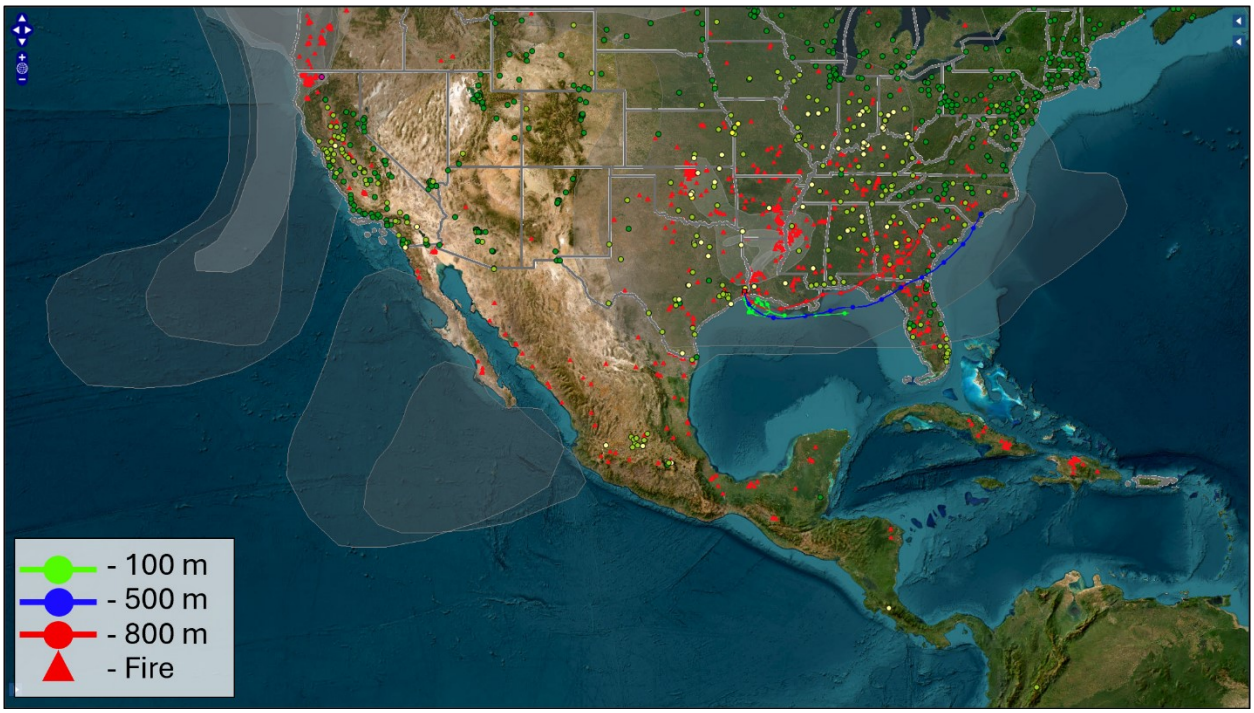

Figure 3-145: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 25, 2023

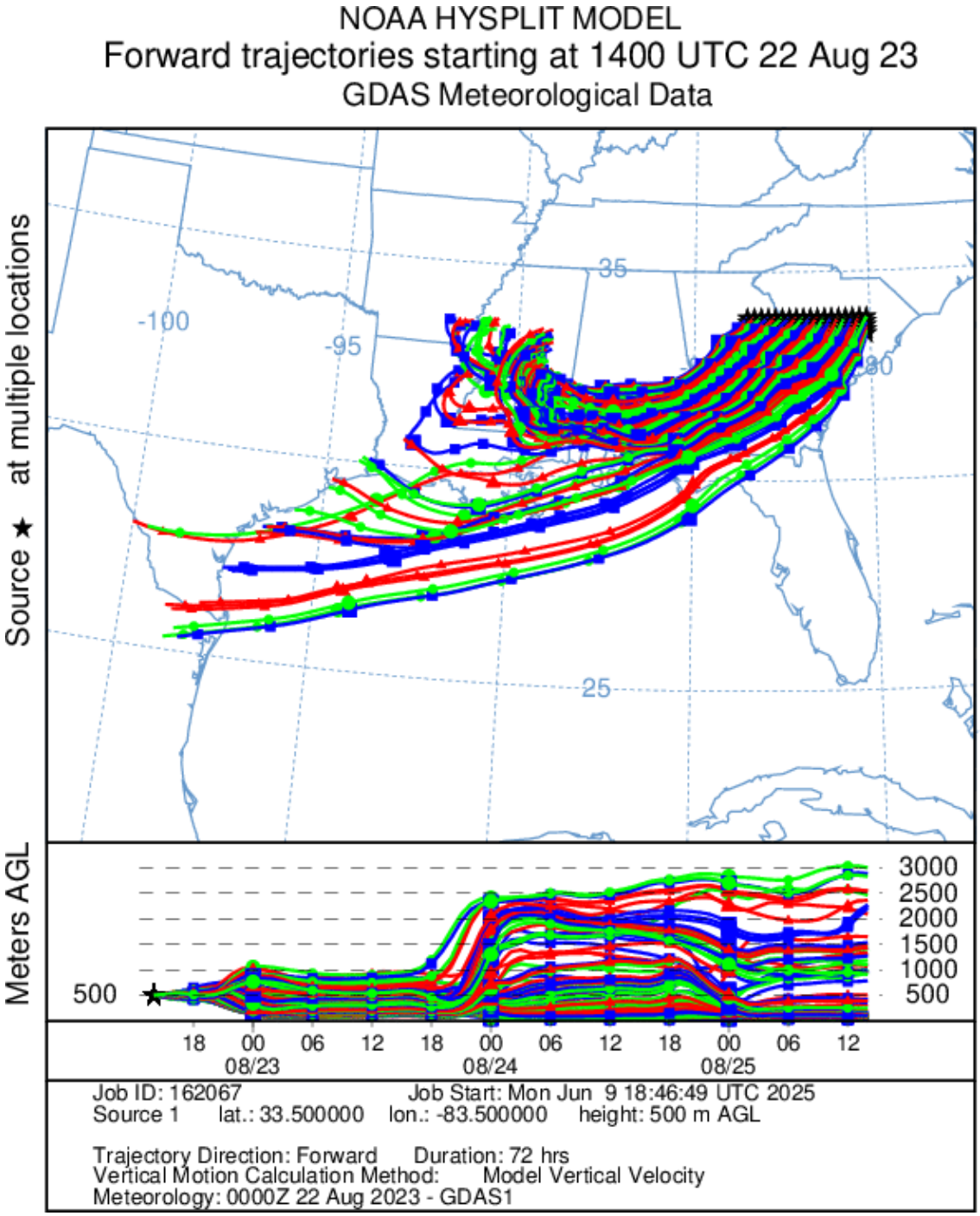

Figure 3-146: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 22

The TCEQ forecast for August 28, 2023 (Table C-14), referenced that light amounts of residual smoke from the wildfires in western Canada, the northwest U.S., and northern California combined with light residual smoke from East Texas and western Louisiana were forecast to continue to influence $PM_{2.5}$ concentrations. Figure 3-147: *Hourly $PM_{2.5}$ Concentrations on August 28, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-148: *AirNow HMS Smoke Plume for August 28, 2023*, shows smoke above

Jefferson County in southeast Texas, with a Moderate AQI in East Texas. Figure 3-149: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 28, 2023, Showing Cloud Cover Over East Texas* shows hazy conditions but much of East Texas is obscured by cloud cover. Figure 3-150: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 28, 2023* shows relatively slow-moving air at all trajectory altitudes with the trajectories from each altitude traversing a different direction. Despite the varying directions of the trajectories, smoke plumes existed along each path. Figure 3-151: *NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on August 27, 2023*, from fire source areas shows through 24-hour trajectories that winds traveled in a southerly direction along the Texas/Louisiana border with the potential to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County.

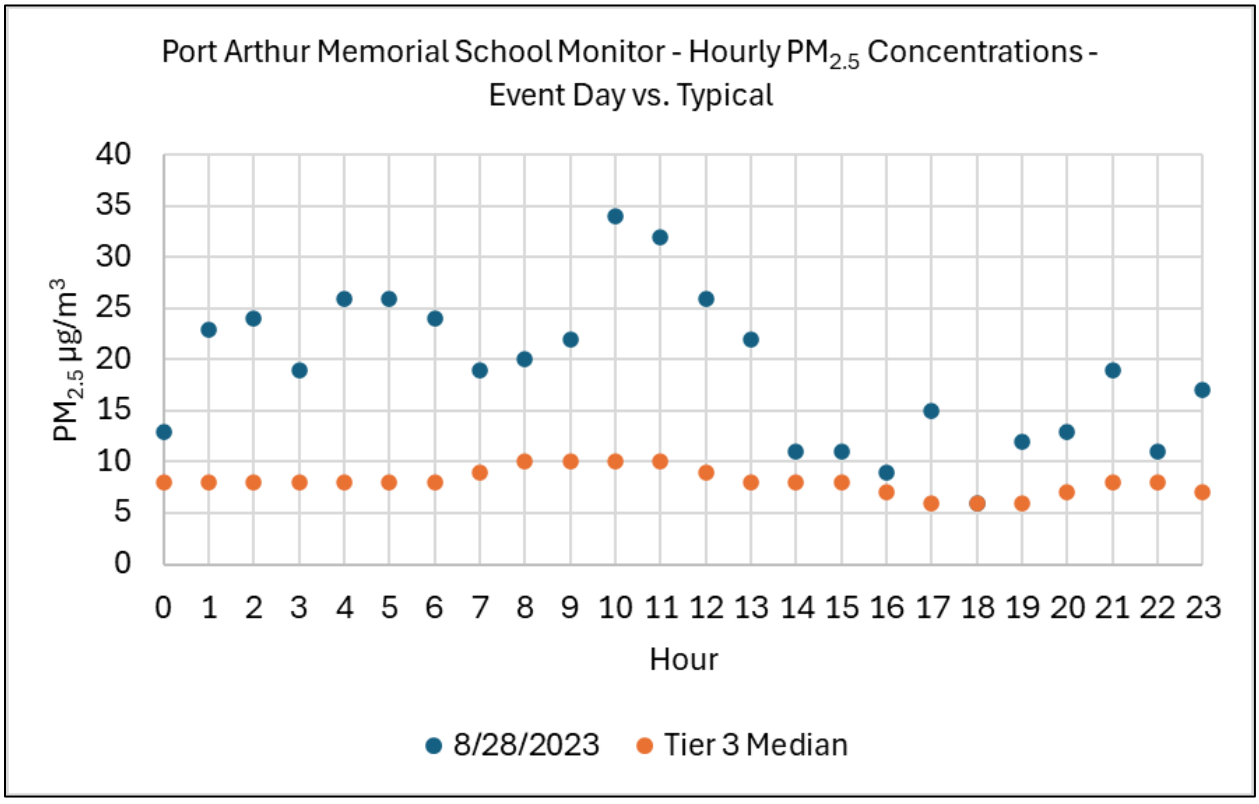

Figure 3-147: Hourly $PM_{2.5}$ Concentrations on August 28, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

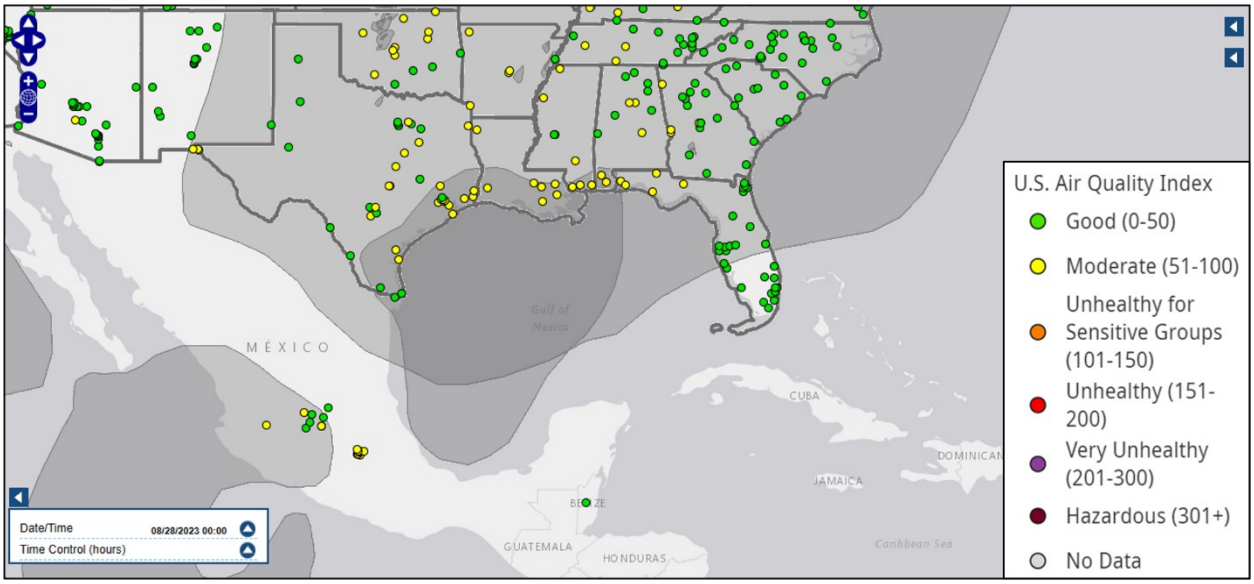

Figure 3-148: AirNow HMS Smoke Plume for August 28, 2023

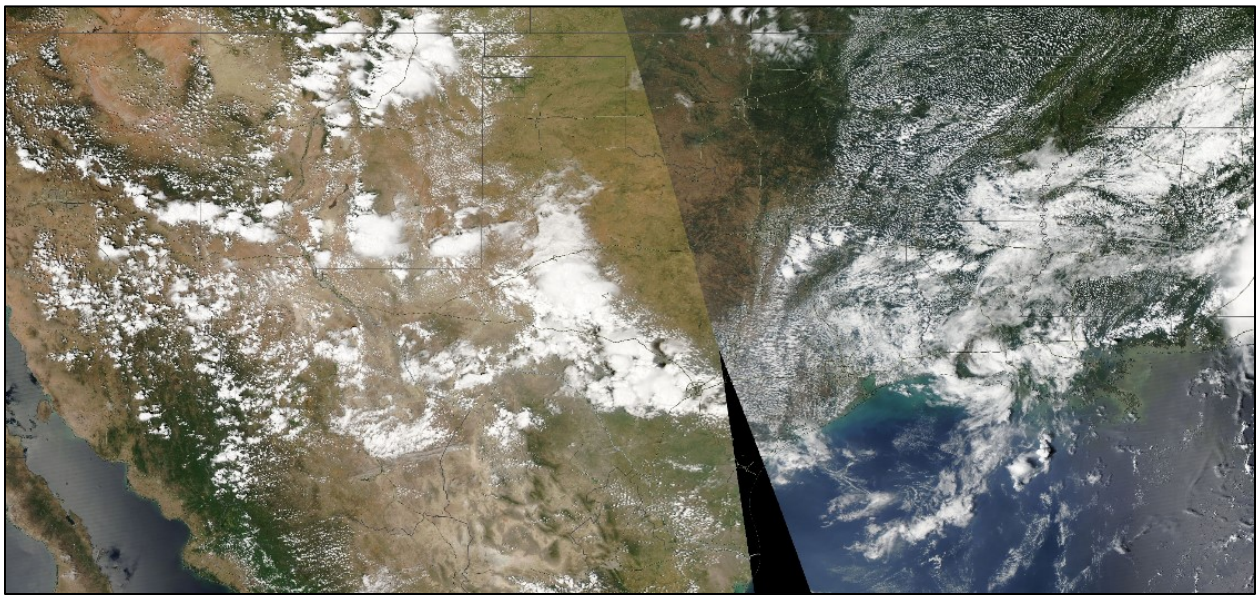

Figure 3-149: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 28, 2023, Showing Cloud Cover Over East Texas

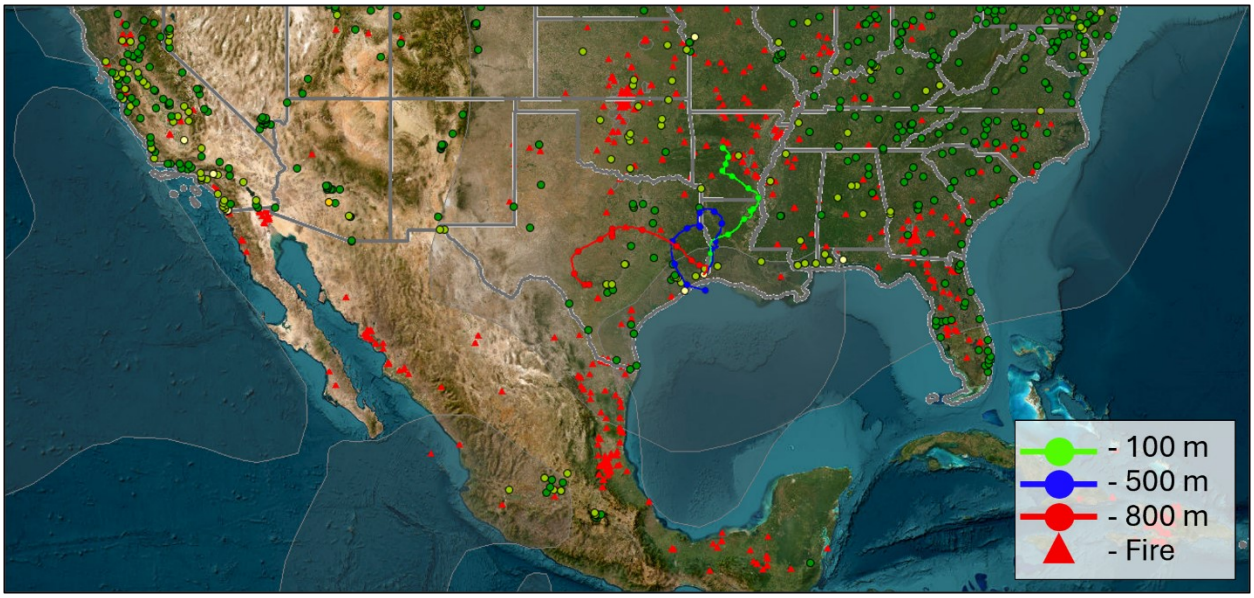

Figure 3-150: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 28, 2023

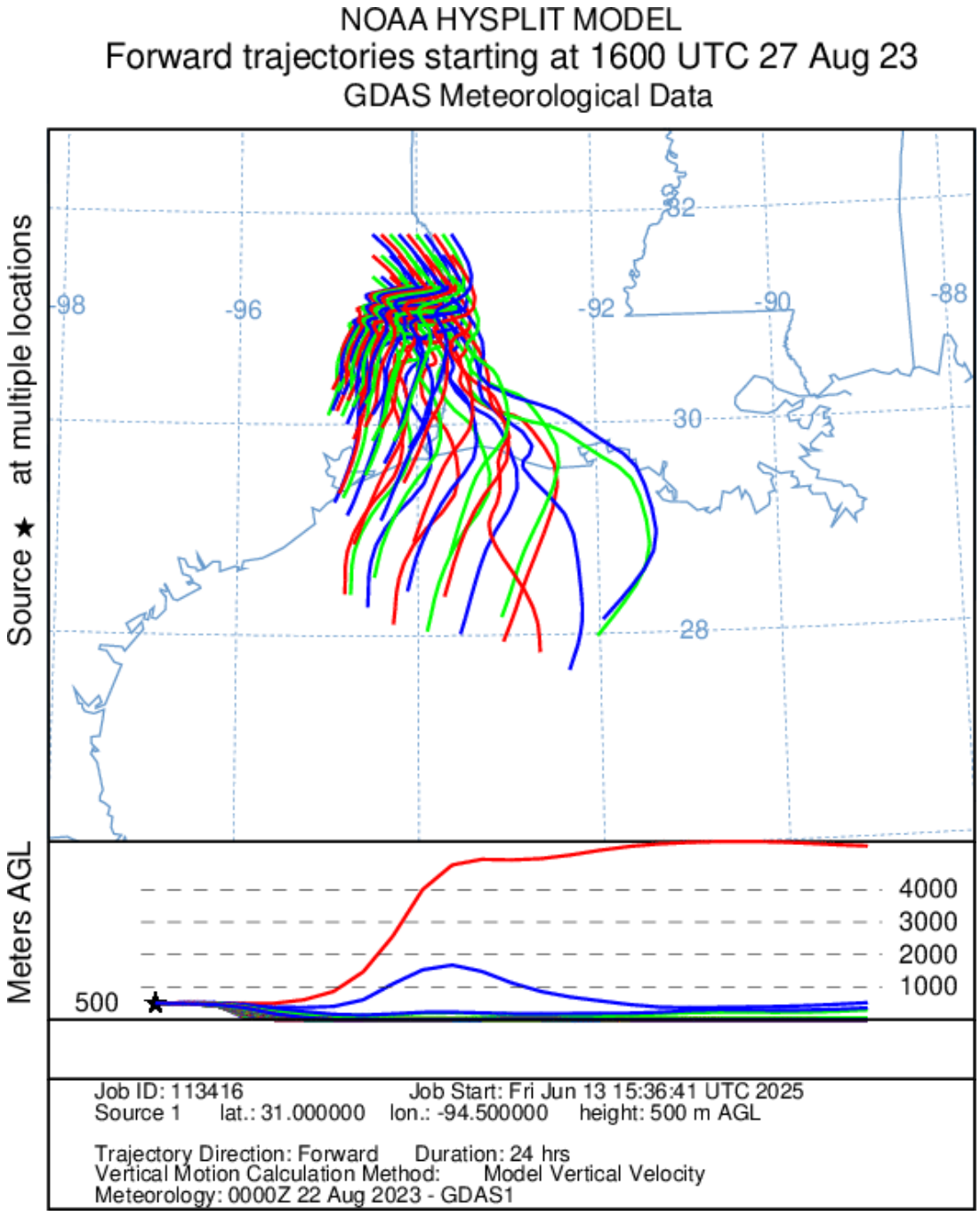

Figure 3-151: NOAA HYSPLIT 24-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on August 27, 2023

The TCEQ forecast for August 31, 2023 (Table C-14), referenced that smoke from Canadian wildfires led to elevated particulate levels across much of Texas, especially in the eastern and southeastern regions. Most of the state experienced moderate smoke, with the highest impacts observed in the eastern two-thirds and parts of southeast Texas. Smoke from these fires is believed to have comingled with smoke from U.S. fires present on August 31, 2023. Figure 3-152: *Hourly $PM_{2.5}$ Concentrations on August 31, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-153: *AirNow HMS Smoke Plume for*

August 31, 2023, shows smoke above Jefferson County with higher-density plumes visible in the vicinity of Jefferson County from nearby wildfires. Figure 3-154: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 31, 2023, Showing Haze in the Gulf of America* shows hazy conditions over East Texas and the Gulf of America. Figure 3-155: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 31, 2023*, shows trajectories coming from the north and northeast and passing through fires and plumes of smoke. The image shows that smoke from Canadian wildfires may have also been a factor in the elevated $PM_{2.5}$ concentrations at the monitor on August 31, 2023, in addition to smoke from local fires. Figure 3-156: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 28, 2023*, shows through 72-hour trajectories that winds traveled in a southwesterly direction to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County.

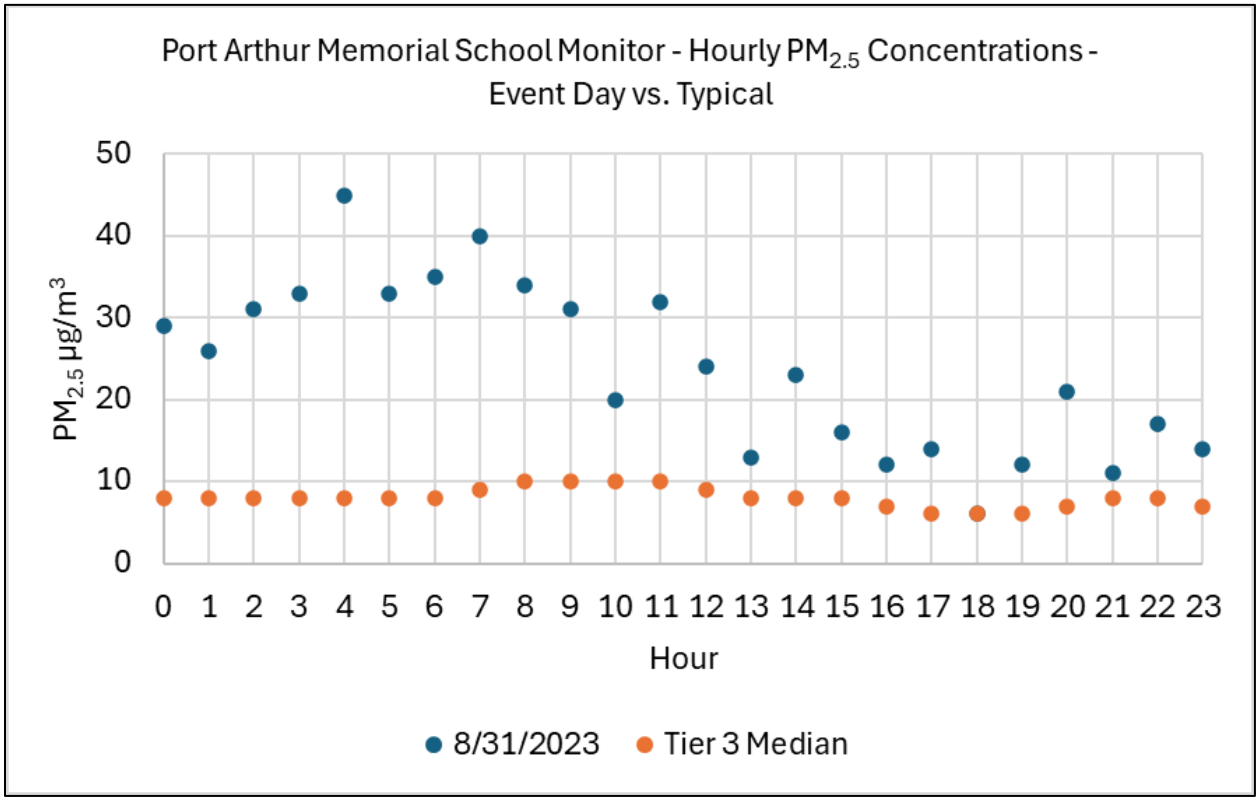

Figure 3-152: Hourly $PM_{2.5}$ Concentrations on August 31, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

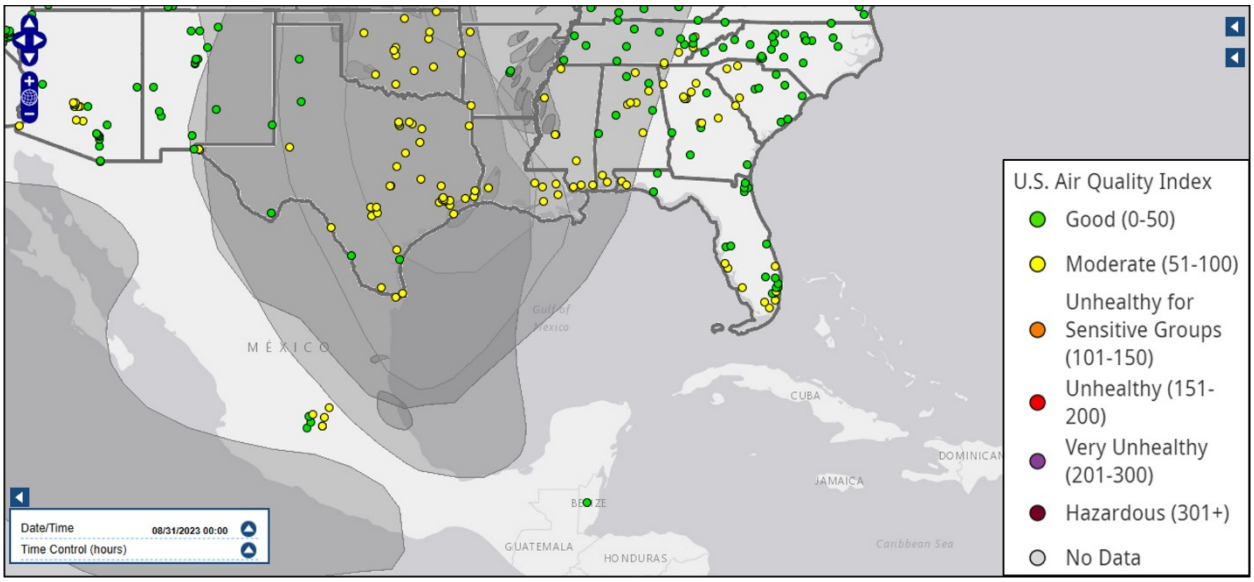

Figure 3-153: AirNow HMS Smoke Plume for August 31, 2023

Figure 3-154: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 31, 2023, Showing Haze in the Gulf of America

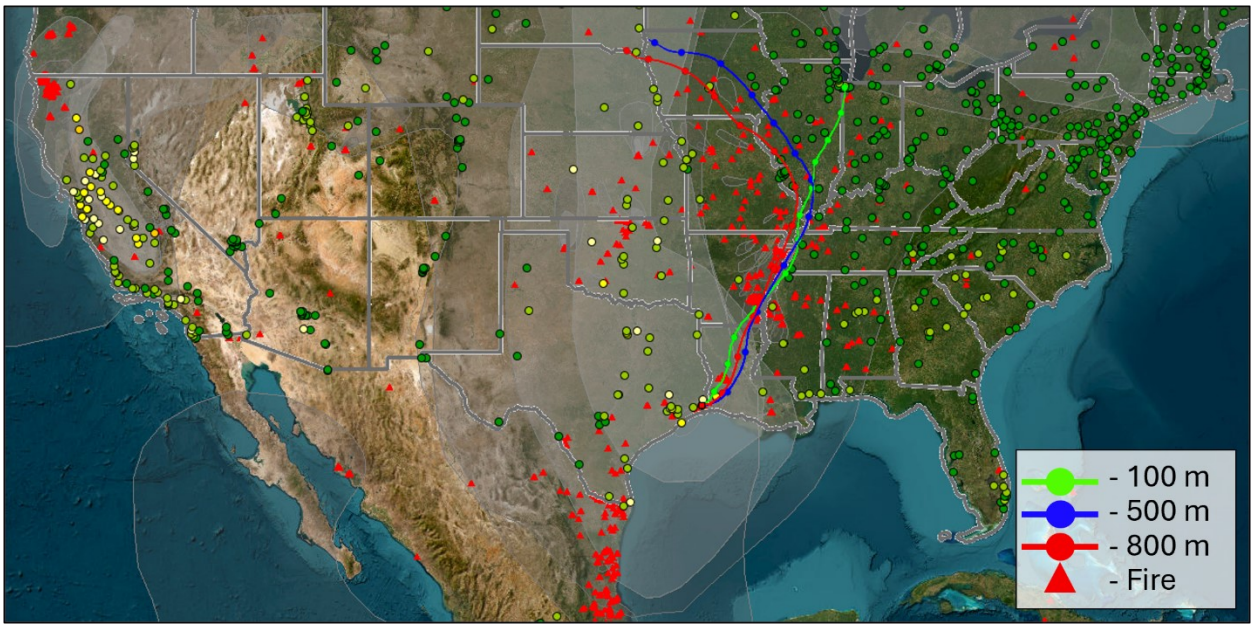

Figure 3-155: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on August 31, 2023

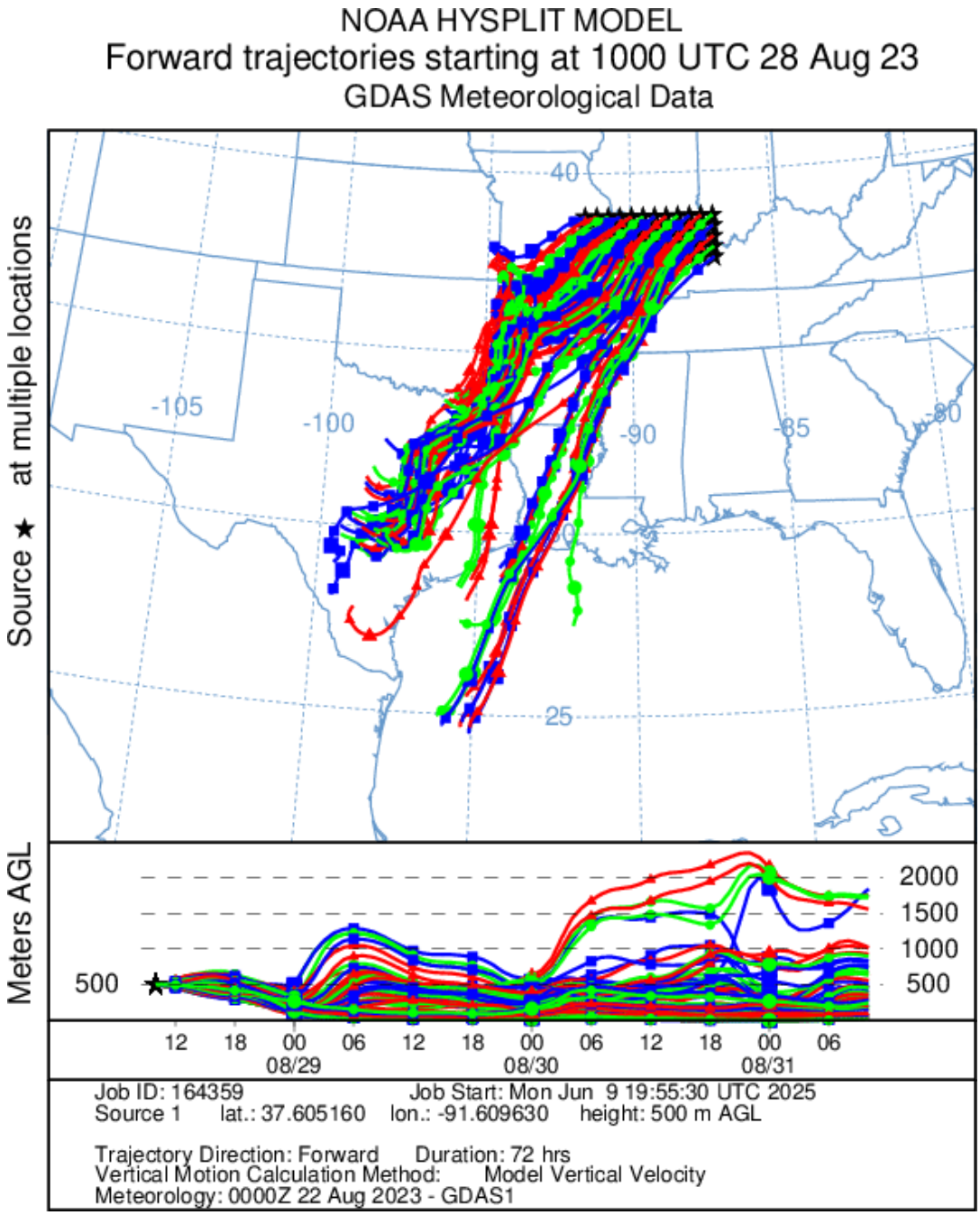

Figure 3-156: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 28, 2023

The TCEQ forecast for September 1, 2023 (Table C-14), referenced a combination of smoke from Canadian wildfires, local agricultural burning, and continental haze. Figure 3-157: *Hourly $PM_{2.5}$ Concentrations on September 1, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-158: *AirNow Navigator with HMS Smoke Plume for September 1, 2023*, shows smoke above Jefferson County with higher-density plumes visible in the vicinity of Jefferson County from nearby wildfires. Figure 3-159: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 1, 2023, Showing Haze in East Texas* shows hazy conditions over East Texas. Figure 3-160: *AirNow Tech HYSPLIT 72-Hour*

Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 1, 2023, shows trajectories coming from the north and northeast and passing through fires and plumes of smoke. Figure 3-161: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on August 29, 2023*, shows through 72-hour trajectories that winds traveled in a southwesterly direction to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County.

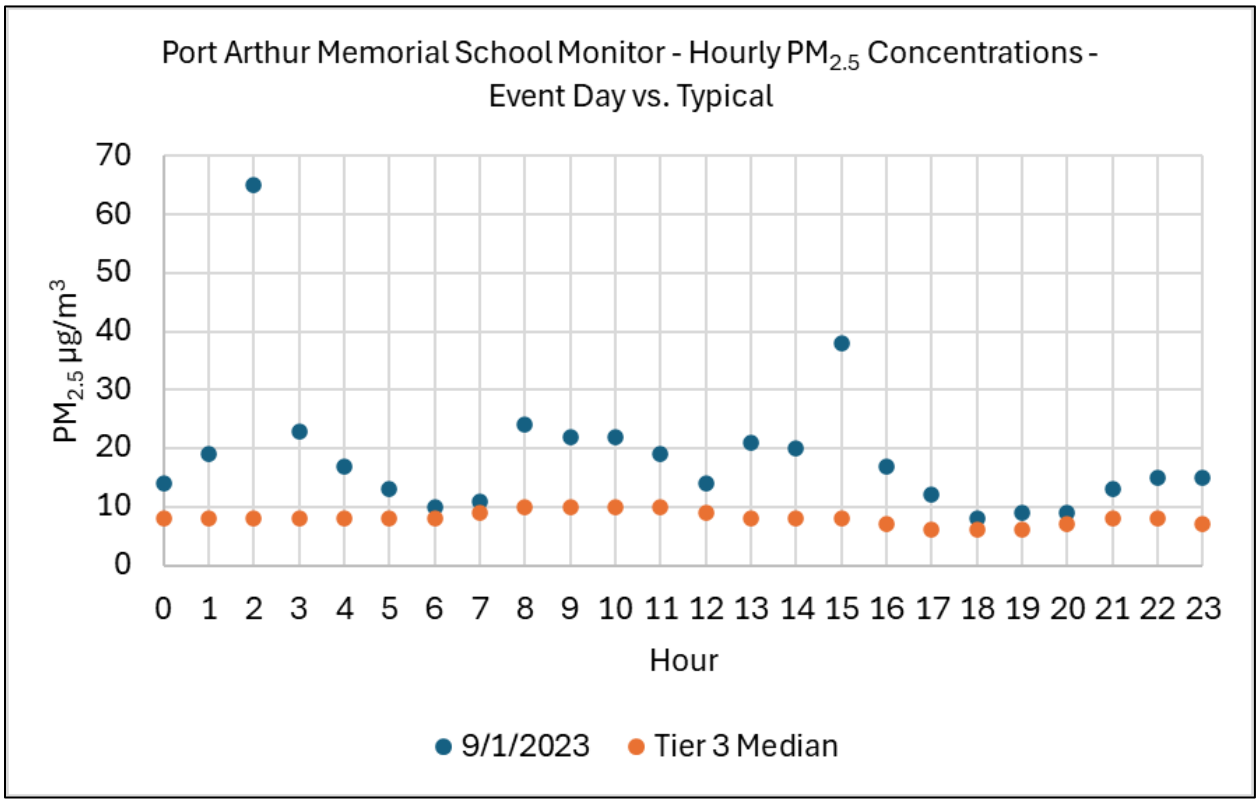

Figure 3-157: Hourly $PM_{2.5}$ Concentrations on September 1, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor

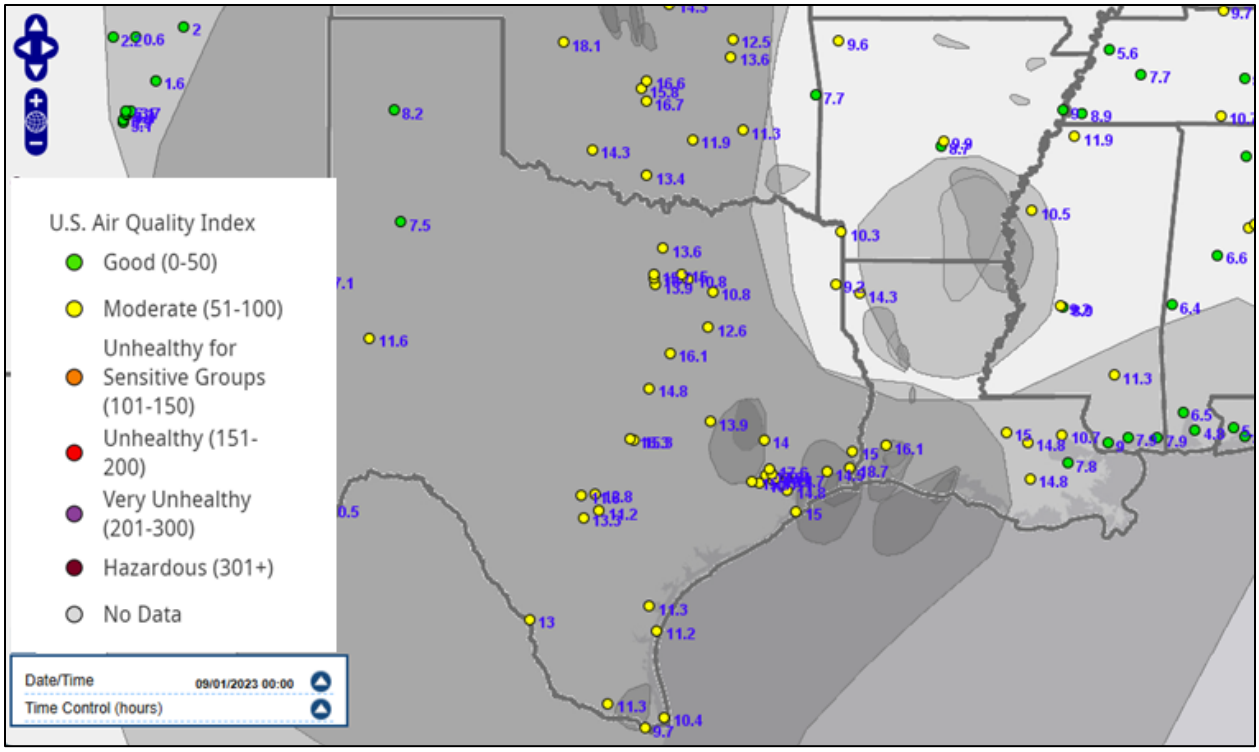

Figure 3-158: AirNow Navigator with HMS Smoke Plume for September 1, 2023

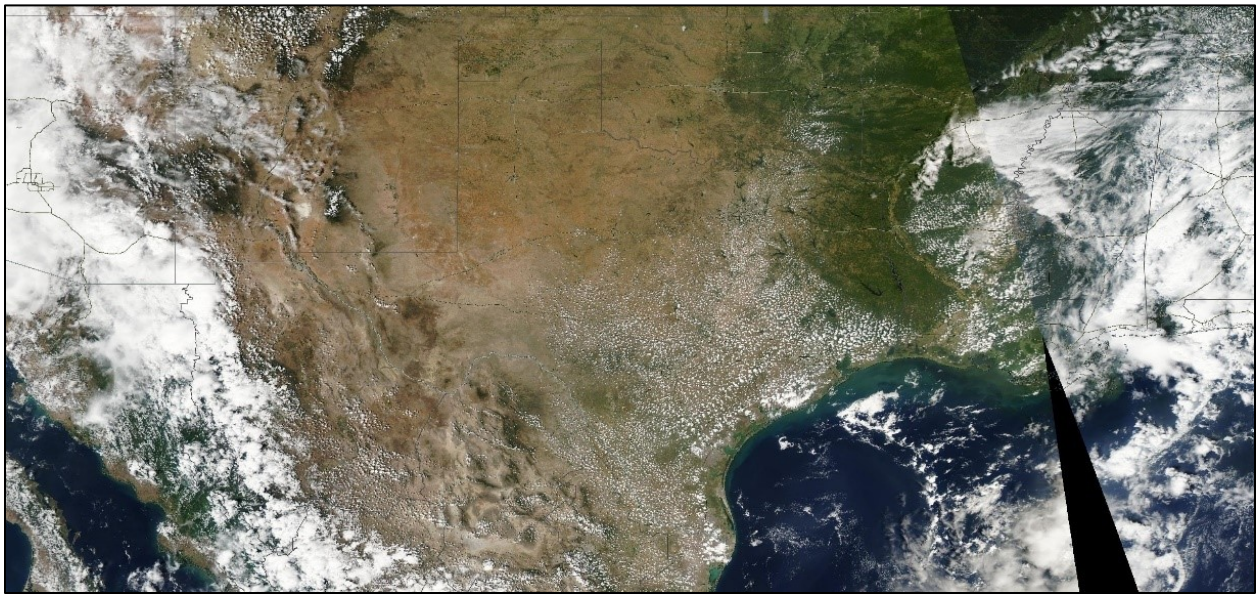

Figure 3-159: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 1, 2023, Showing Haze in East Texas

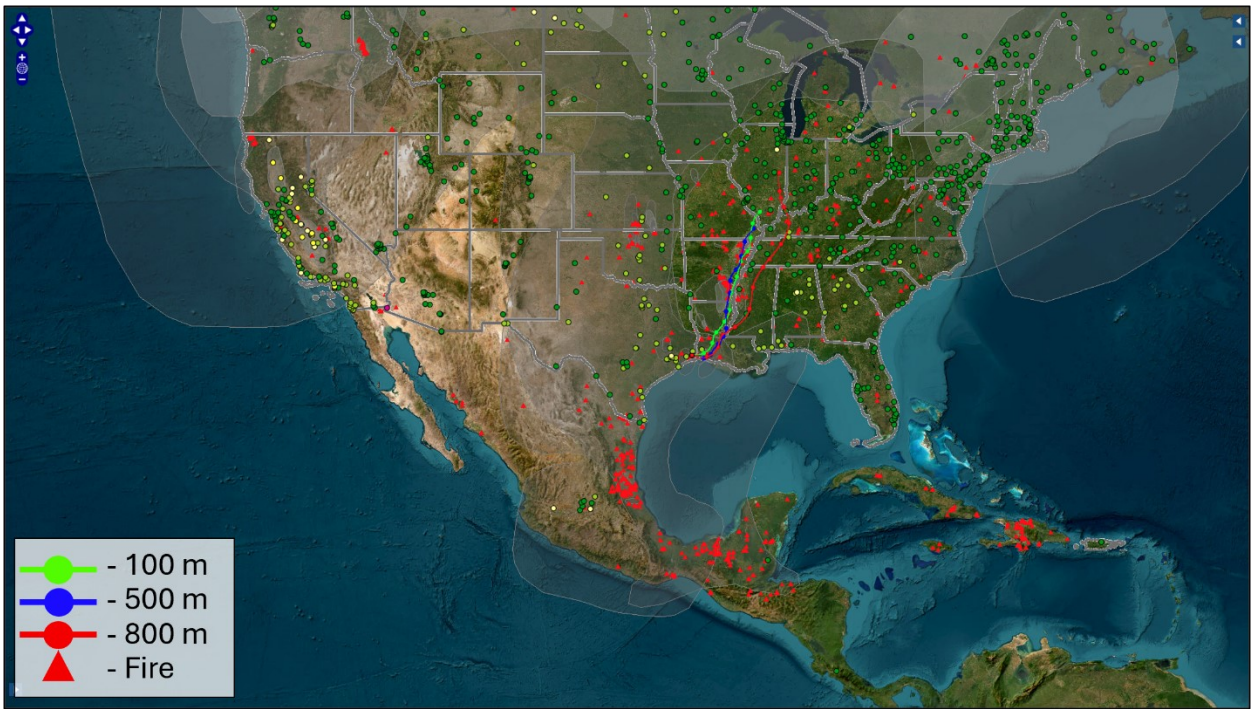

Figure 3-160: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 1, 2023

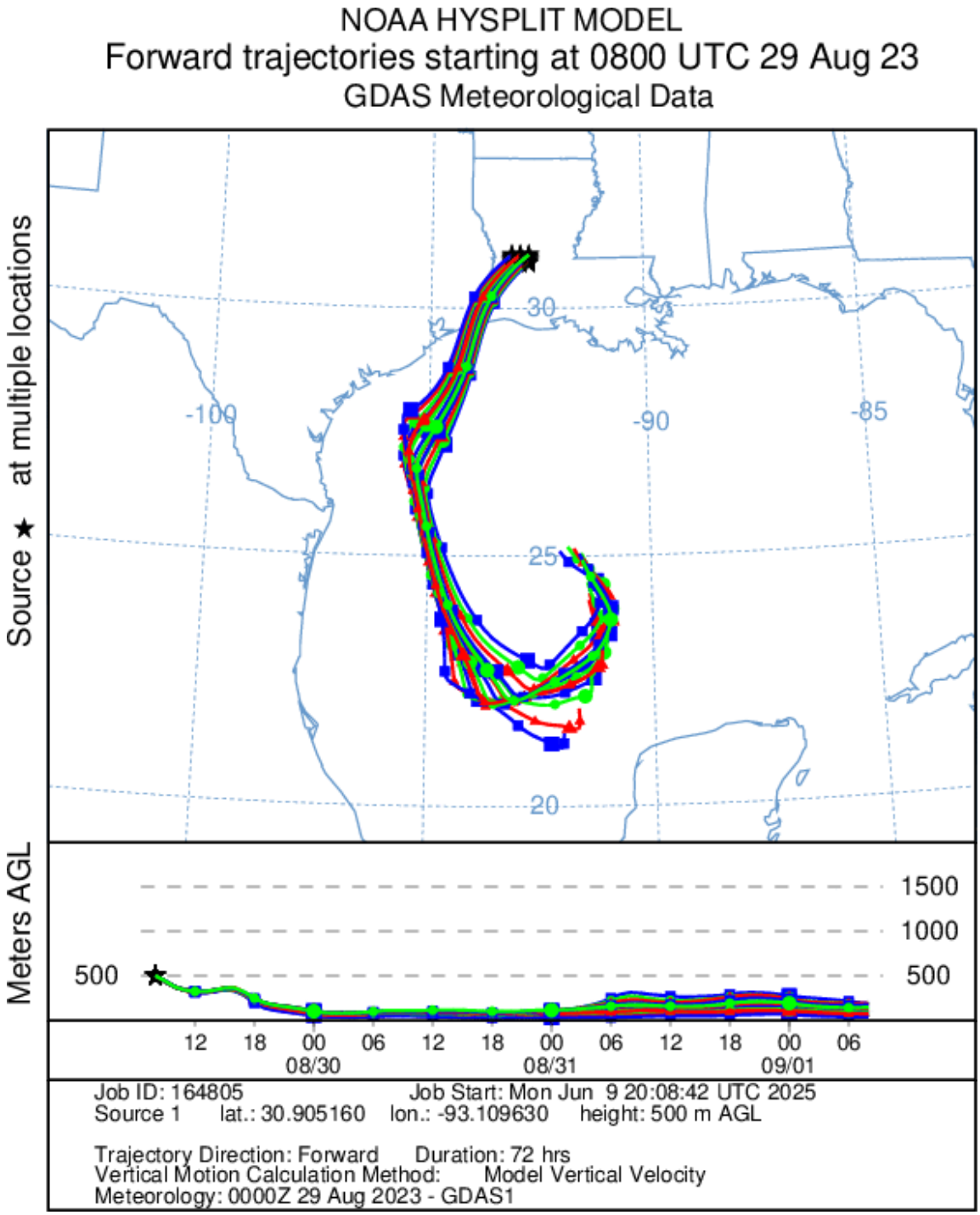

Figure 3-161: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on August 29, 2023

The TCEQ forecast for September 2, 2023 (Table C-14) referenced lingering smoke from Canadian wildfires and regional burning and increased humidity likely to contribute to fine particulate formation. Figure 3-162: *Hourly $PM_{2.5}$ Concentrations on September 2, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that most hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure Figure 3-163: *AirNow Navigator with HMS Smoke Plume for September 2, 2023* shows smoke

above Jefferson County with higher-density plumes visible in the vicinity of Jefferson County from nearby wildfires. Figure 3-164: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 2, 2023, Showing Haze in East Texas* shows hazy conditions over East Texas and in the Gulf of America. Figure 3-165: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 2, 2023*, shows trajectories coming from the north and southeast and passing plumes of smoke extending into the Gulf of America. Figure 3-166: *NOAA HYSPLIT 12-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on September 2, 2023*, shows through 12-hour trajectories that winds traveled in a westerly direction to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County prior to winds shifting to travel to the northwest.

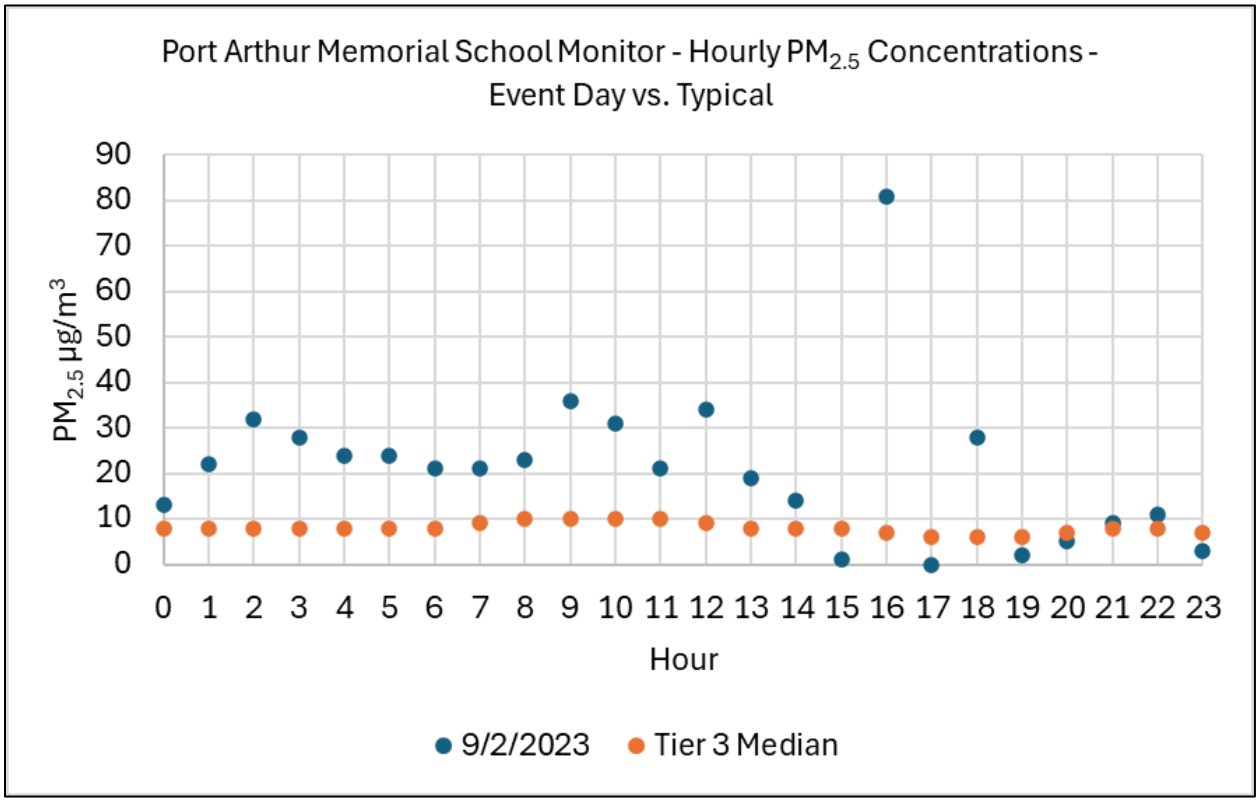

Figure 3-162: Hourly $PM_{2.5}$ Concentrations on September 2, 2023, compared to typical concentrations at the Port Arthur Memorial School Monitor

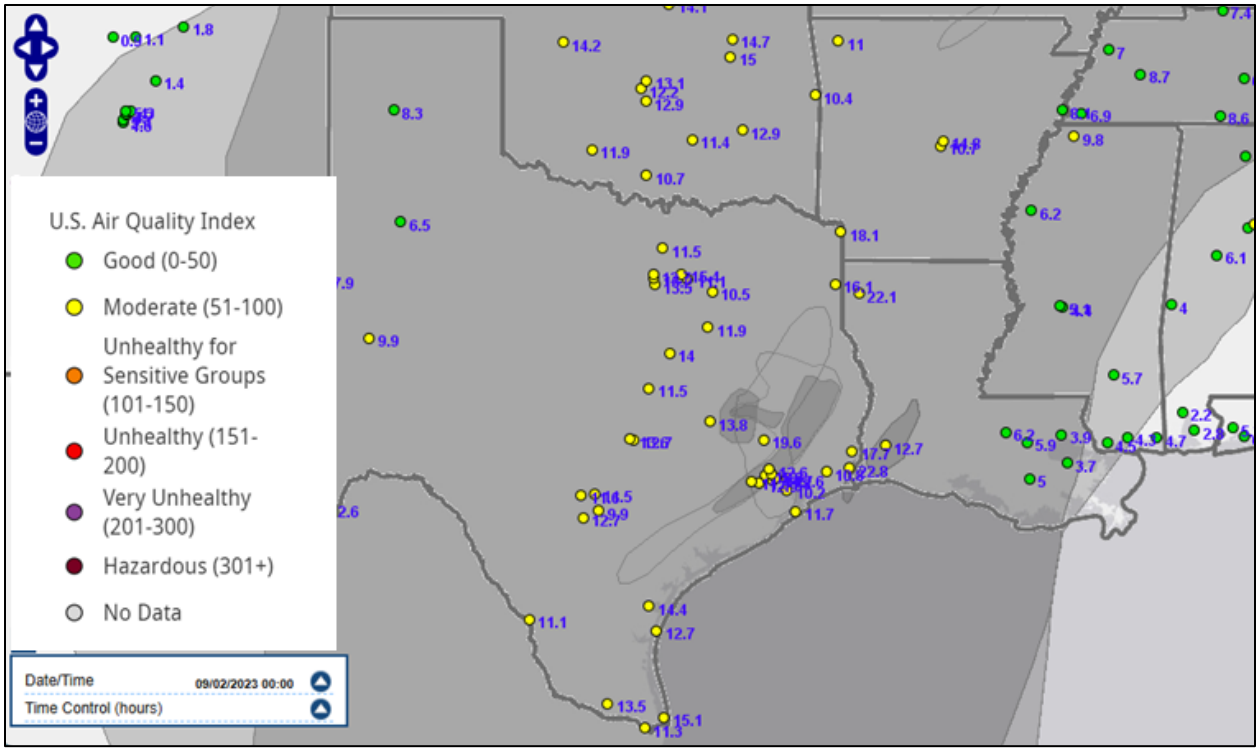

Figure 3-163: AirNow Navigator with HMS Smoke Plume for September 2, 2023

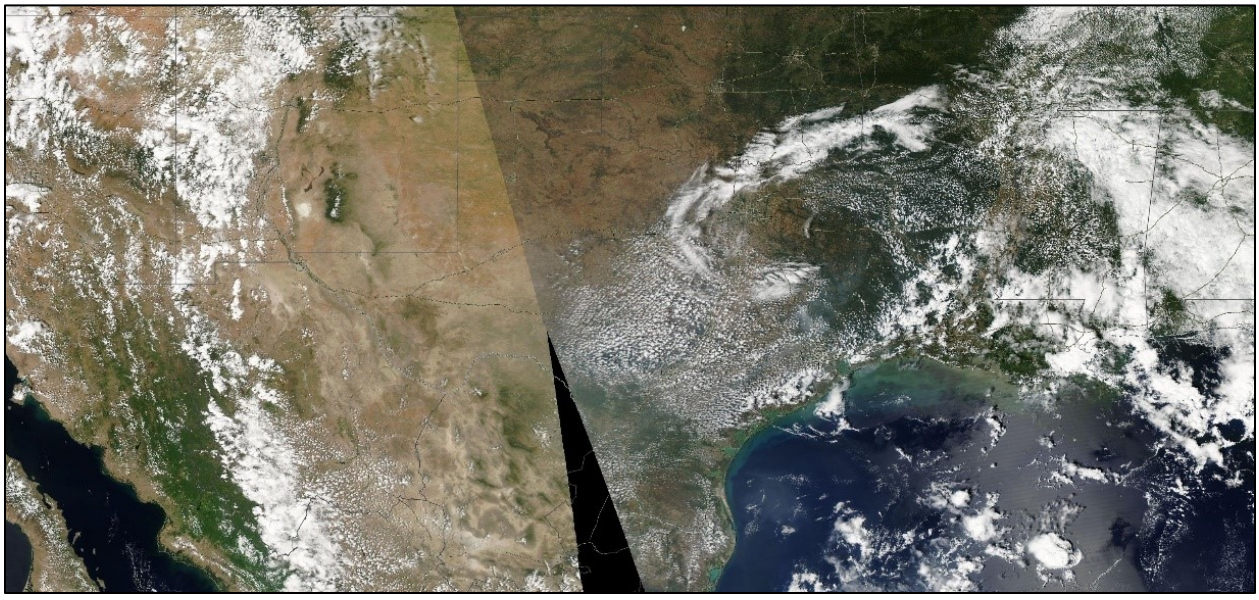

Figure 3-164: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from September 2, 2023, Showing Haze in East Texas

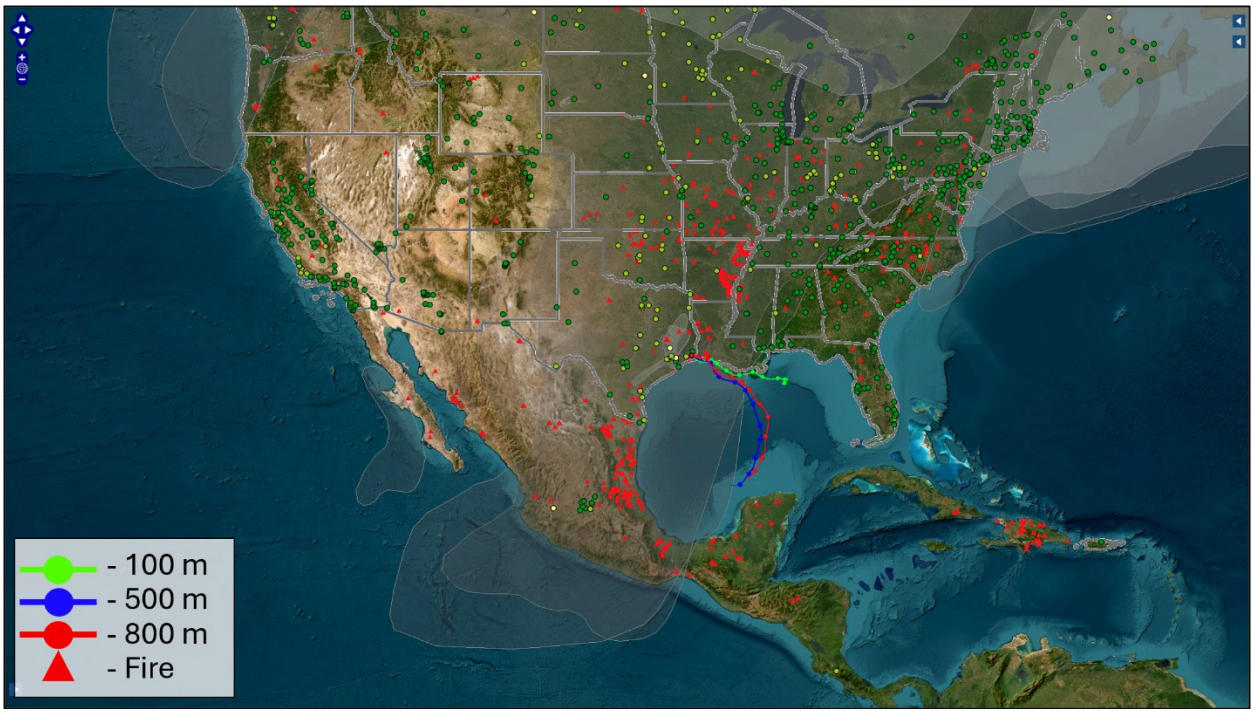

Figure 3-165: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on September 2, 2023

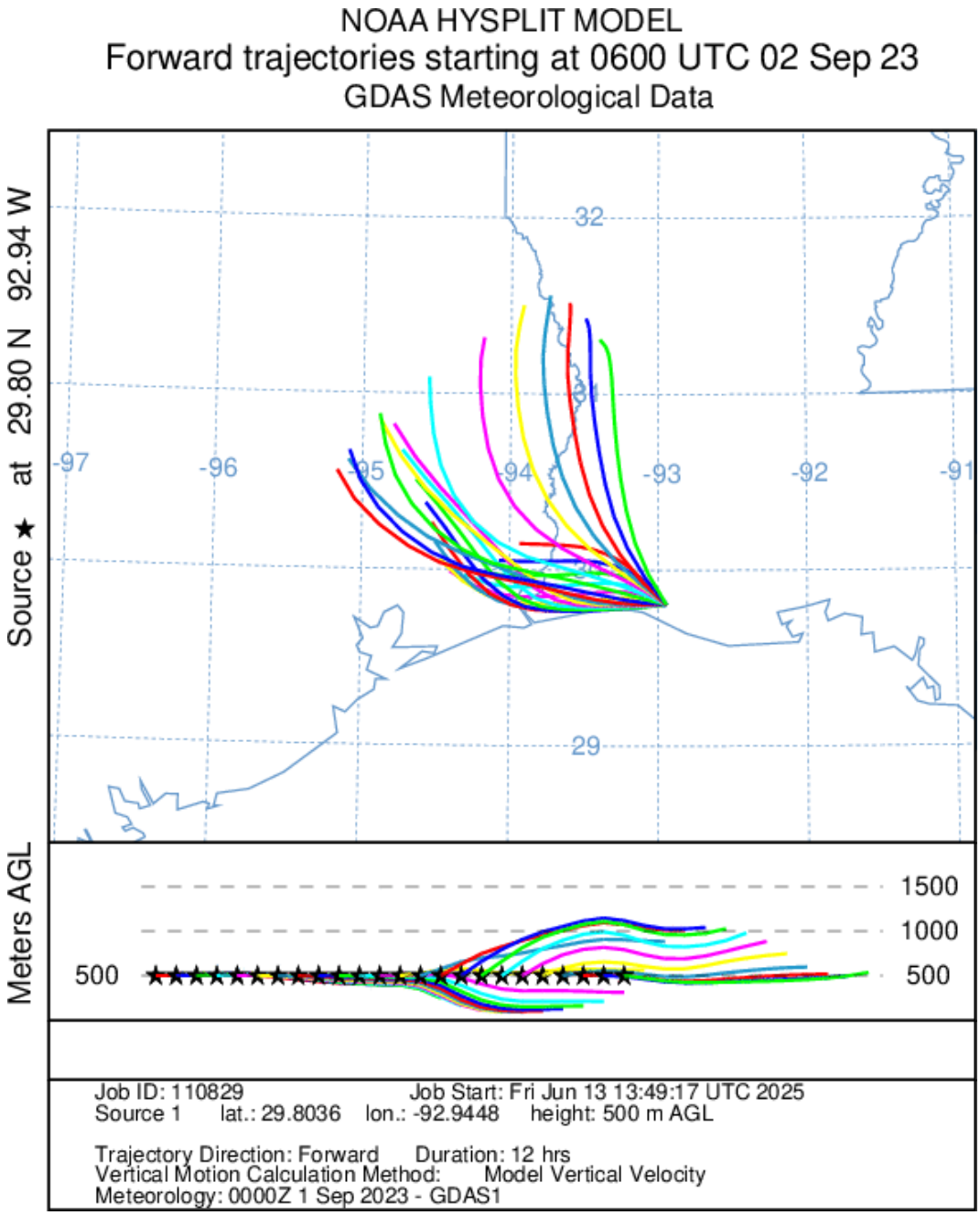

Figure 3-166: NOAA HYSPLIT 12-Hour Forward Trajectories Originating from Areas in Louisiana with Fires, Starting on September 2, 2023

3.2.15 Group 15 – Evidence for October 4, 2023, Wildfire-U.S. $PM_{2.5}$ Event

October 4, 2023, was identified as a Tier 2 day at the Port Arthur Memorial School monitor, with a 24-hour $PM_{2.5}$ concentrations of 22.2 µg/m^3. This elevated concentration was primarily a result of smoke from U.S. wildfires.

The TCEQ forecast for October 4, 2023 (Table C-15), referenced that residual smoke from burning in the southeastern U.S. and wildfires in Canada may slightly increase $PM_{2.5}$ levels across southeast Texas. It stated that elevated humidity and limited afternoon sunshine could

enhance fine particulate concentrations, but intermittent precipitation (0.11 inches of precipitation was reported at the Jack Brooks Regional Airport Station) and light winds were expected to help limit buildup. Figure 3-167: *Hourly $PM_{2.5}$ Concentrations on October 4, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-168: *AirNow HMS Smoke Plume for October 4, 2023*, shows smoke above Jefferson County with a Moderate AQI in East Texas. Figure 3-169: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 4, 2023, Showing East Texas Covered by Clouds* shows that cloud cover largely obstructed the ability to view haze over East Texas on this date. Figure 3-170: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 4, 2023*, shows trajectories coming from the east and southeast and passing through plumes of smoke extending into the Gulf of America and the Atlantic Ocean. Figure 3-171: *NOAA HYSPLIT 48-Hour Forward Trajectories Originating from Areas with Wildfires, Starting on October 2, 2023*, shows through 48-hour trajectories that winds traveled in a westerly direction to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County prior to winds shifting to travel to the north.

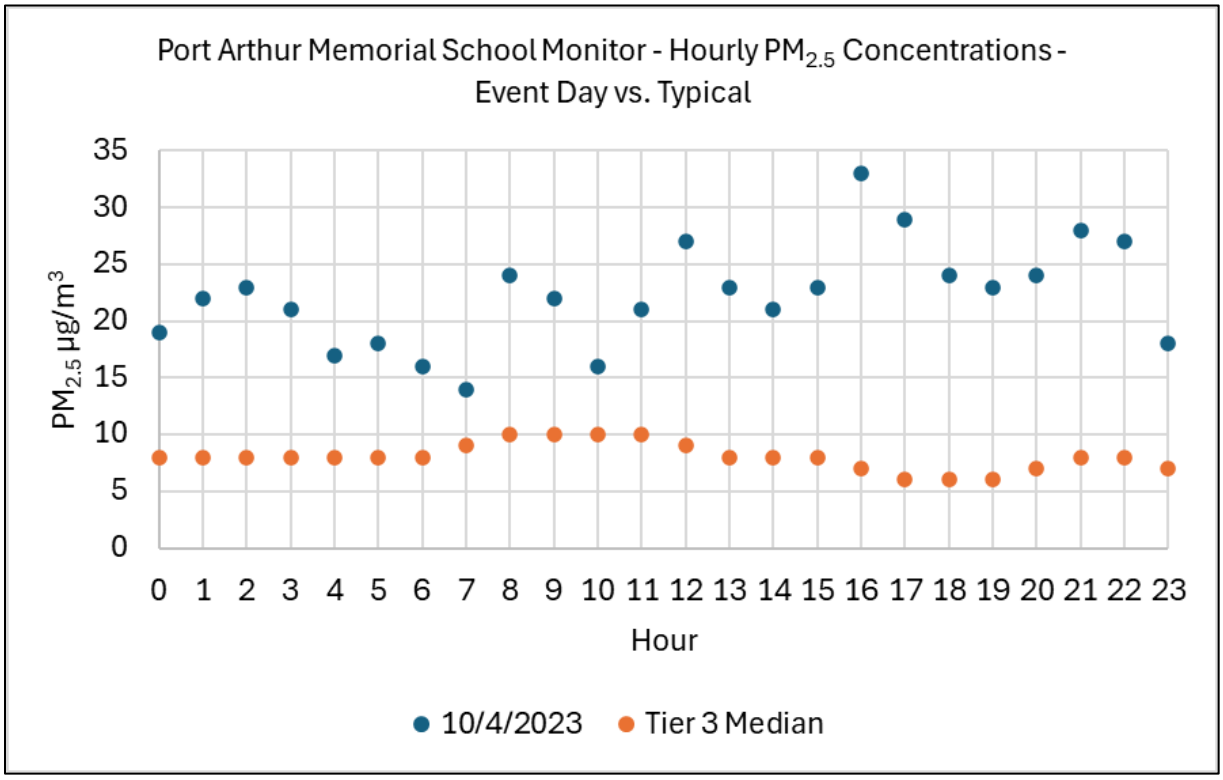

Figure 3-167: Hourly $PM_{2.5}$ Concentrations on October 4, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

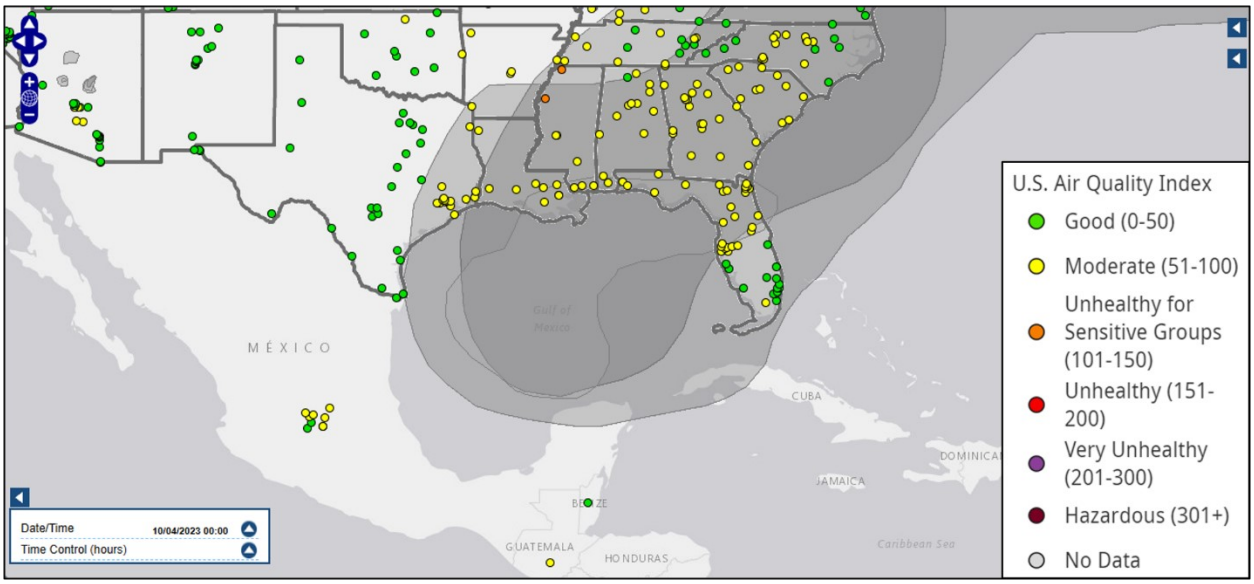

Figure 3-168: AirNow HMS Smoke Plume for October 4, 2023

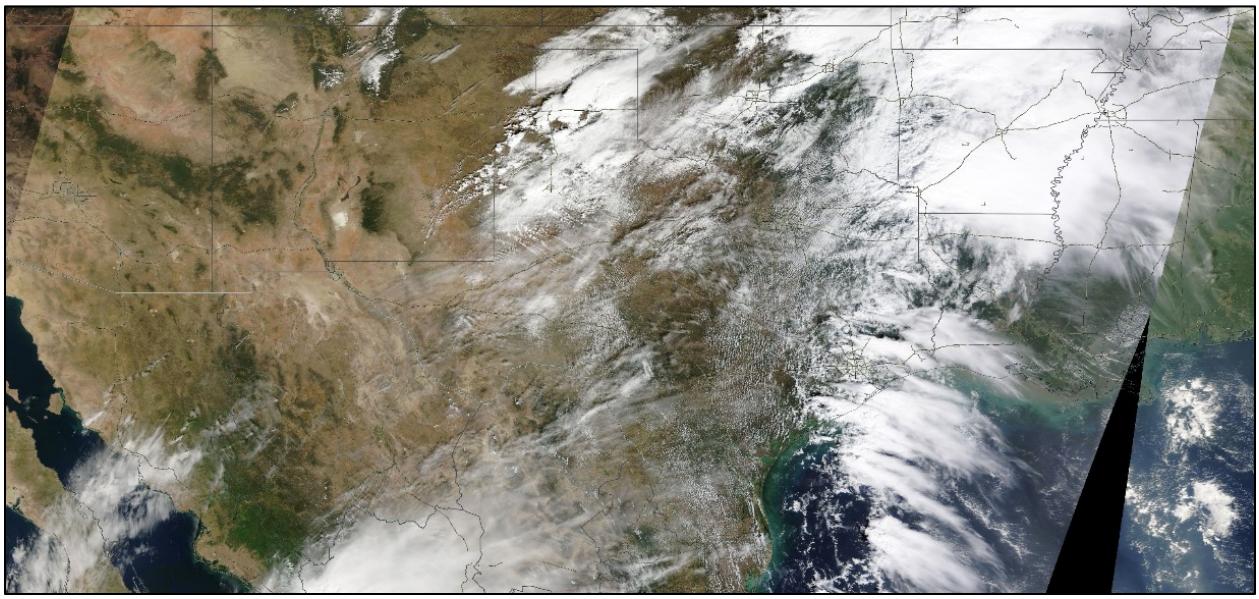

Figure 3-169: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 4, 2023, Showing East Texas Covered by Clouds

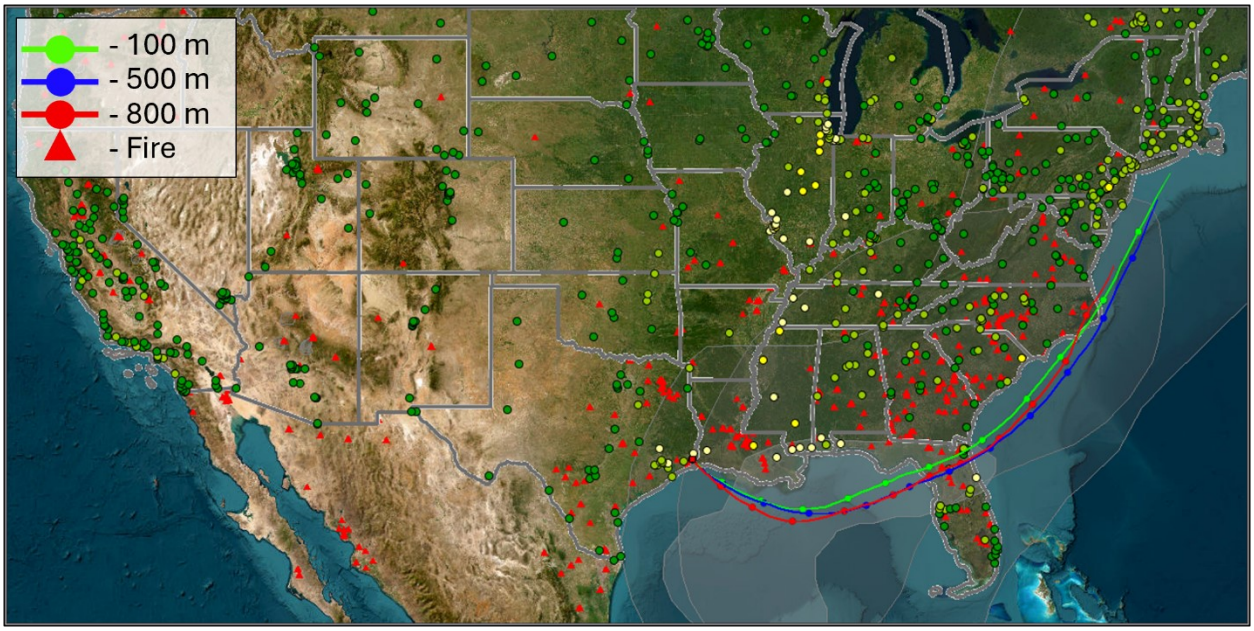

Figure 3-170: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 4, 2023

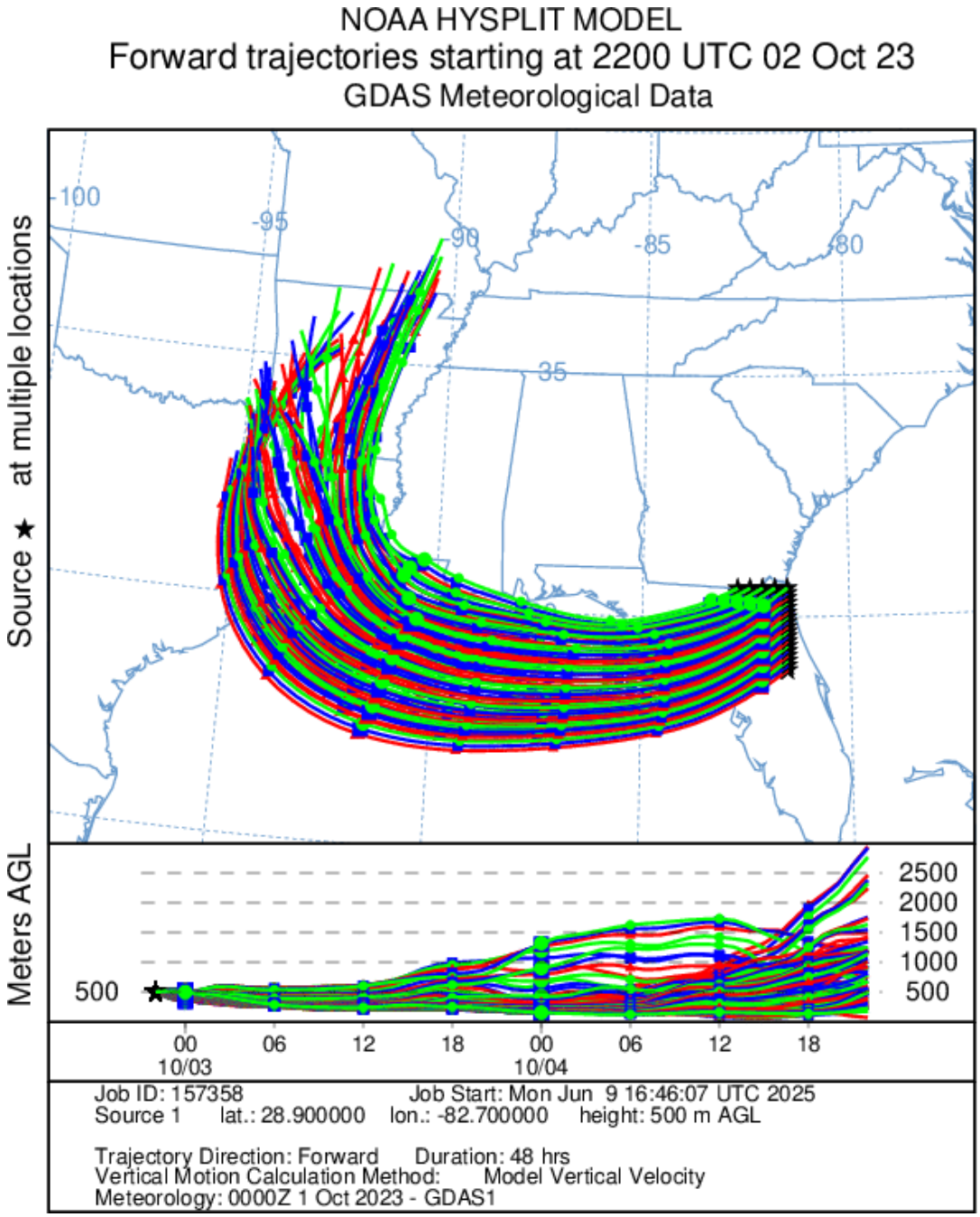

Figure 3-171: NOAA HYSPLIT 48-Hour Forward Trajectories Originating from Areas with Wildfires, Starting on October 2, 2023

3.2.16 Group 16 – Evidence for October 20, 2023, Prescribed Fire $PM_{2.5}$ Event

October 20, 2023, was identified as a Tier 2 day at the Port Arthur Memorial School monitor, with a 24-hour $PM_{2.5}$ concentrations of 18.0 µg/m^3. These elevated concentrations were primarily a result of smoke from prescribed fires in Texas. The TCEQ forecast for October 20, 2023 (Table C-16), referenced that seasonal burning activities across Texas as well as the Southeastern U.S. would place residual smoke over East Texas. Figure 3-172: *Hourly $PM_{2.5}$ Concentrations on October 20, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations in the early part of the day were up to 68 µg/m^3

higher than those classified as typical at this monitor. Hourly concentrations returned to typical levels around the middle portion of the day prior to rising again during the nighttime. Figure 3-173: *AirNow HMS Smoke Plume for October 20, 2023*, shows smoke above Jefferson County with a Moderate to Good AQI in East Texas. Figure 3-174: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 20, 2023, Showing Smoke Plumes in South Texas* does not provide a clean indication of haze over Jefferson County, although it does show smoke in South Texas. Figure 3-175: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 20, 2023*, shows trajectories traveling through smoke plumes prior to reaching the monitor. Figure 3-176: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in South Texas with Fires, Starting on October 18, 2023*, shows through 72-hour trajectories that winds traveled in a northerly and then easterly direction over the state of Texas to transfer smoke to the Port Arthur Memorial School monitor in Jefferson County.

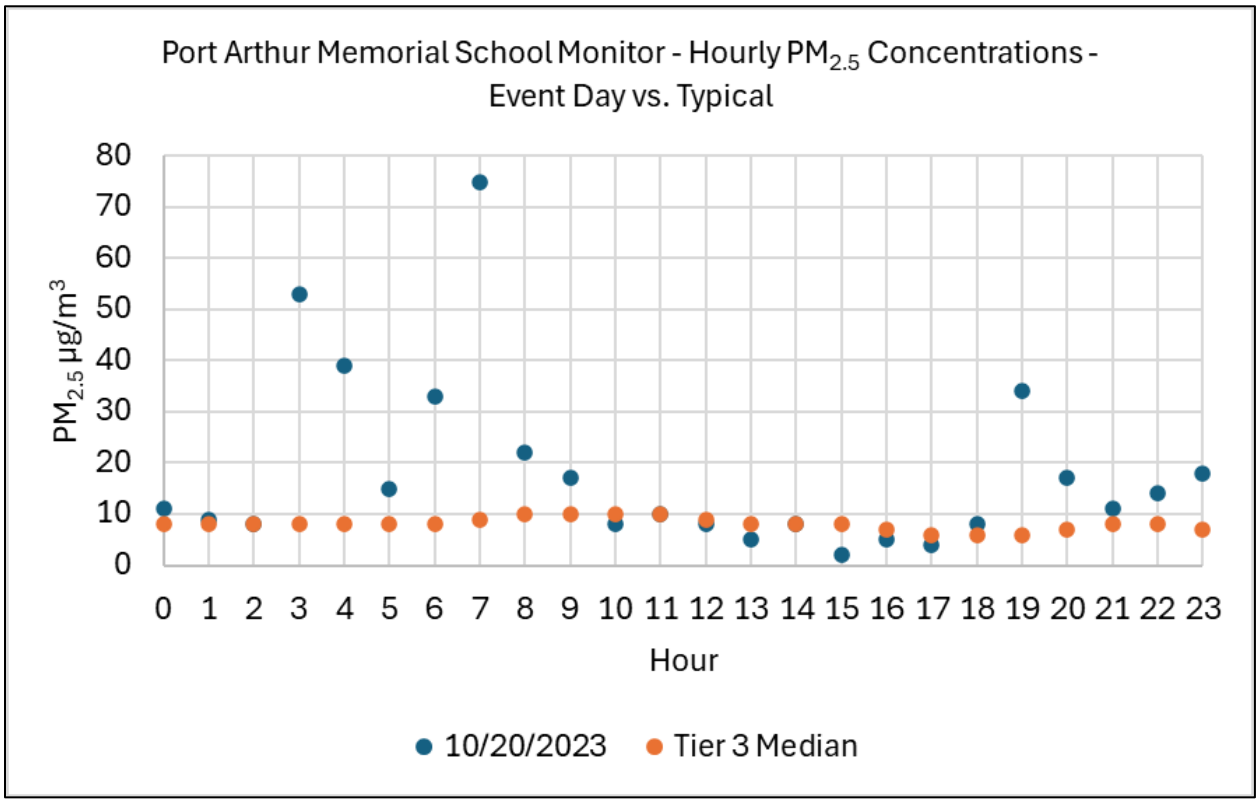

Figure 3-172: Hourly $PM_{2.5}$ Concentrations on October 20, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

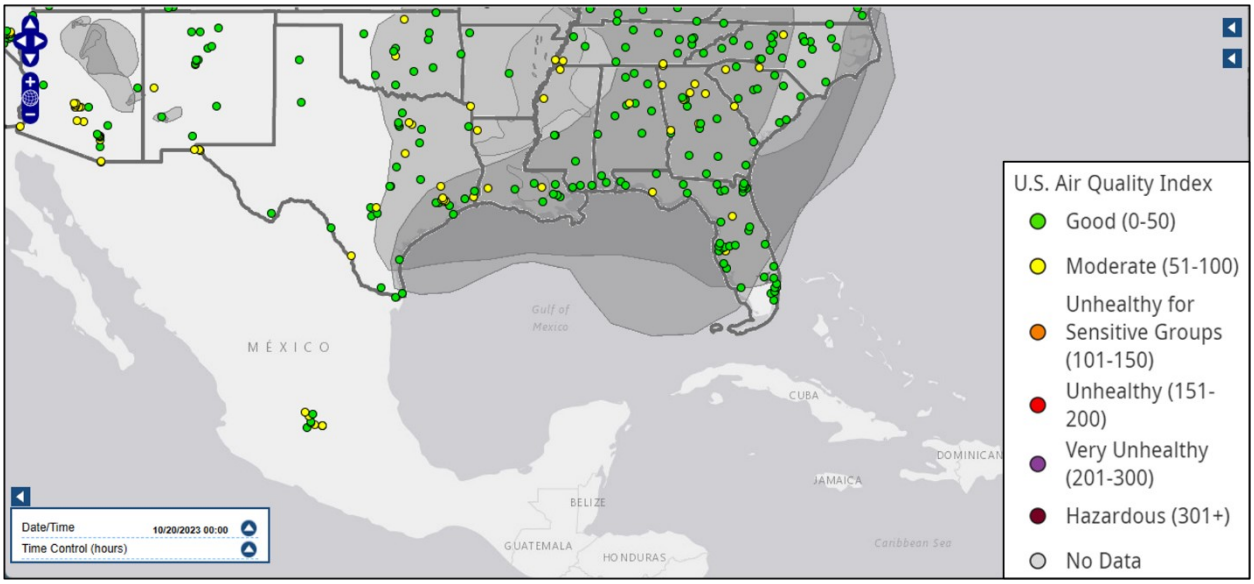

Figure 3-173: AirNow HMS Smoke Plume for October 20, 2023

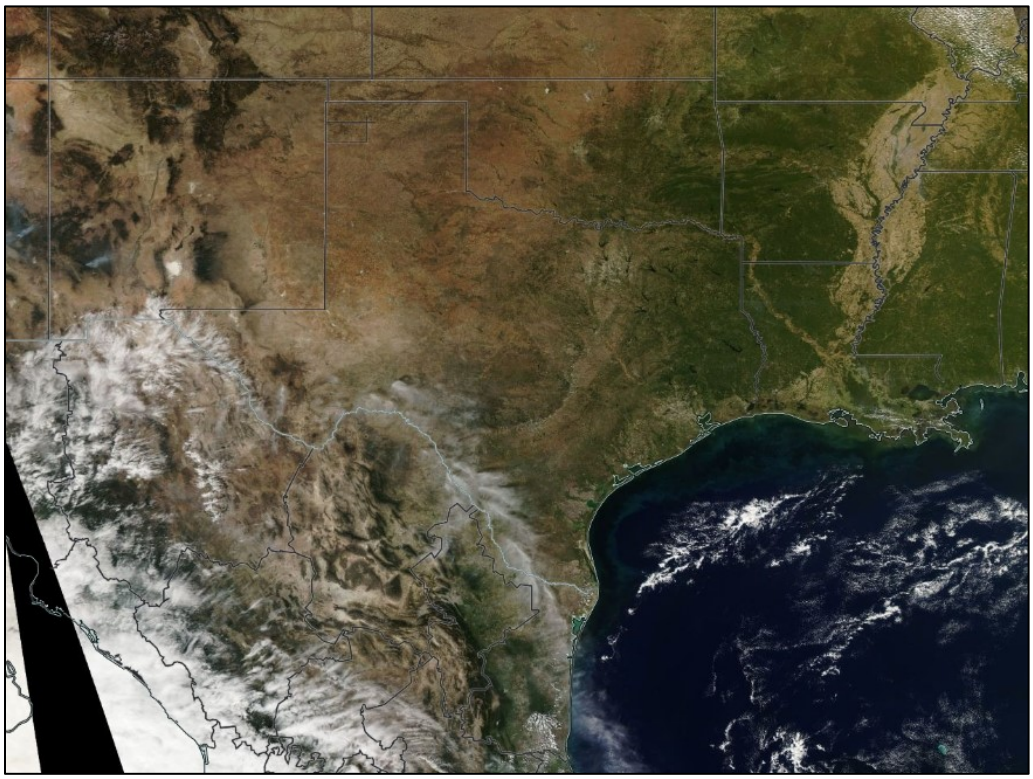

Figure 3-174: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 20, 2023, Showing Smoke Plumes in South Texas

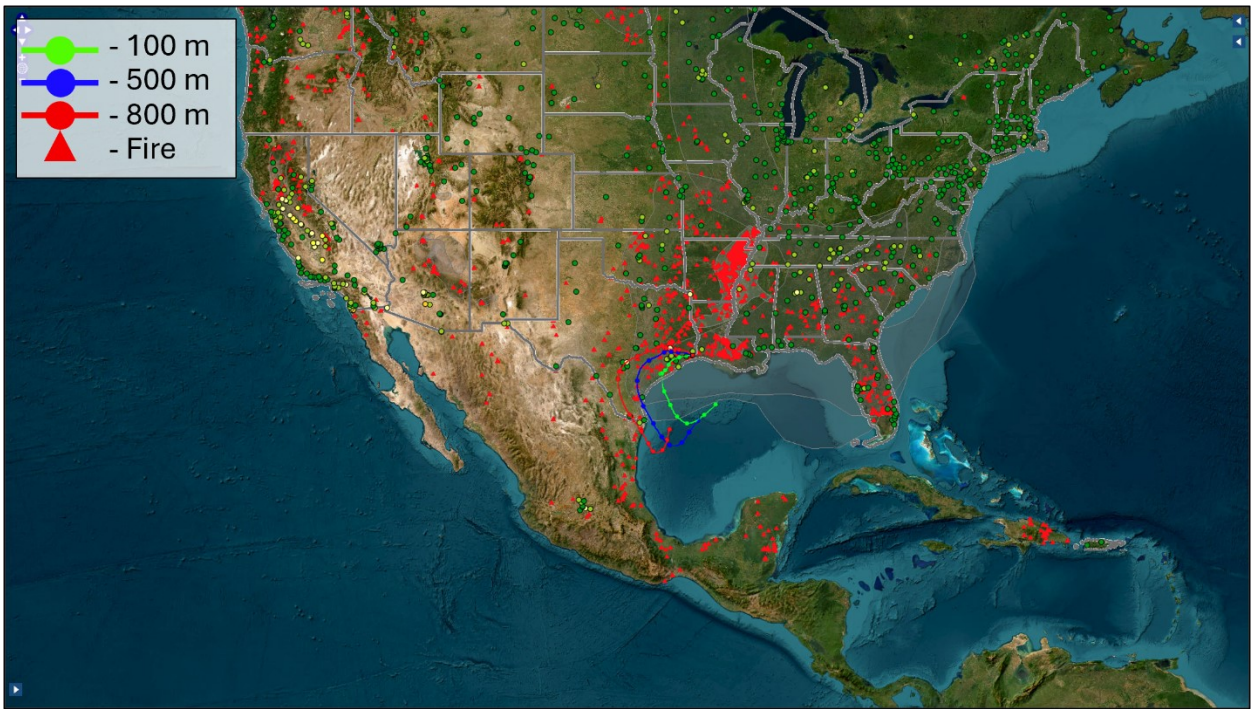

Figure 3-175: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 20, 2023

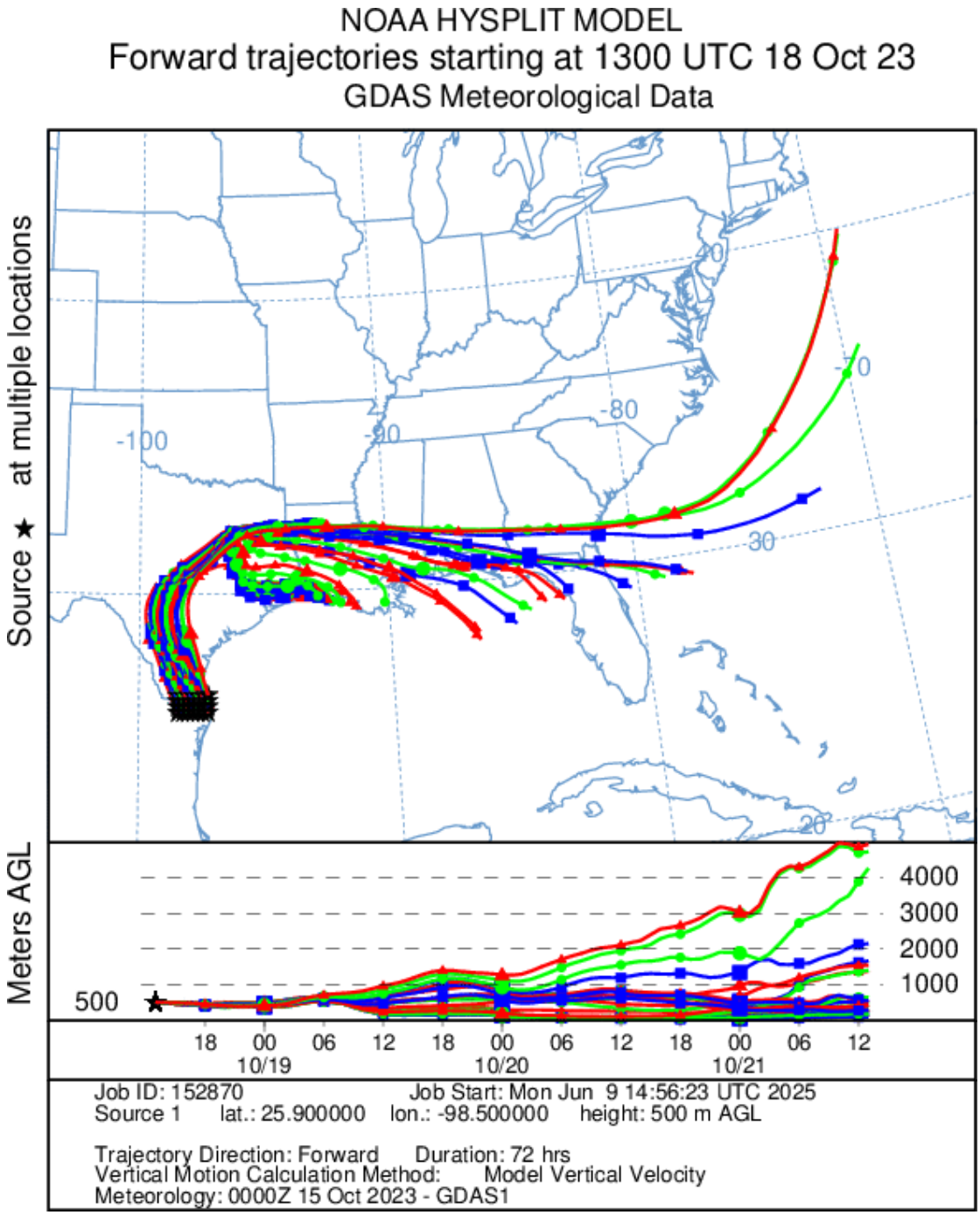

Figure 3-176: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in South Texas with Fires, Starting on October 18, 2023

3.2.17 Group 17 – Evidence for December 31, 2023, and January 1, 2024, Fireworks $PM_{2.5}$ Event

December 31, 2023, was identified as a Tier 1 day at the Port Arthur Memorial School monitor, with a 24-hour $PM_{2.5}$ concentration of 31.0 µg/m^3. January 1, 2024 was identified as a Tier 2 day with a 24-hour $PM_{2.5}$ concentration of 21.4 µg/m^3. These elevated concentrations were primarily a result of smoke from fireworks.

The TCEQ forecast for December 31, 2023 (Table C-17), referenced that light residual smoke from seasonal burning, and local heavy smoke from New Year's firework celebrations may contribute to elevated $PM_{2.5}$ levels, with air quality fluctuating throughout the day—especially near and downwind of celebratory events. Figure 3-177: *Hourly $PM_{2.5}$ Concentrations on December 31, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations began to elevate in the evening and peaked at 21:00 local time as would be the expected around sundown when fireworks are frequently deployed. Figure 3-178: *AirNow HMS Smoke Plume for December 31, 2023*, does not show widespread smoke over East Texas as would be expected on an event where fireworks were the cause of elevated $PM_{2.5}$ concentrations. The AQI classification was Moderate to Good in East Texas. Figure 3-179: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on December 31, 2023*, shows trajectories traveling north and northeast prior to arriving at the Port Arthur Memorial School monitor. Long-range trajectories are less effective at depicting the path of air flow through smoke en route to the monitor because the smoke from fireworks is more local in nature.

The use of fireworks during New Year's Day is considered significantly integral as a cultural event, therefore the data on this day should be excluded as allowed under 40 CFR §50.14(b)(2).

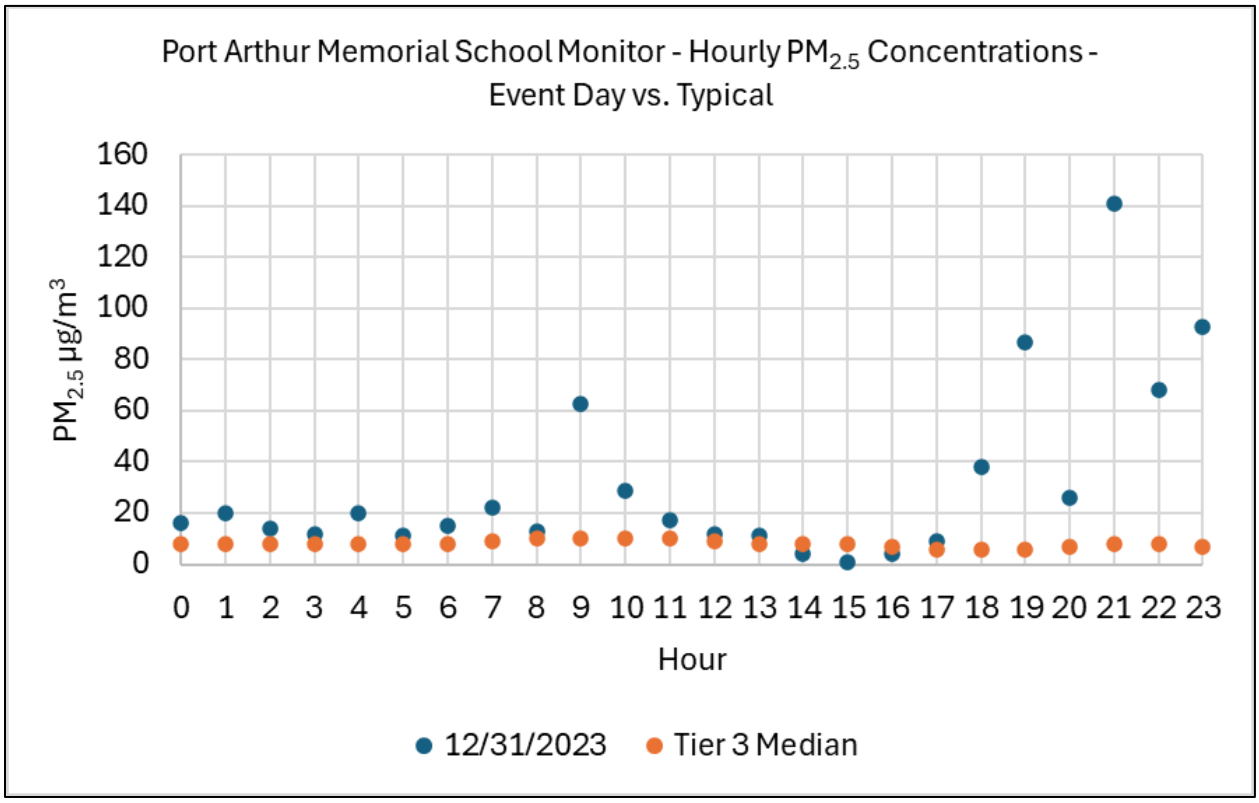

Figure 3-177: Hourly $PM_{2.5}$ Concentrations on December 31, 2023, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

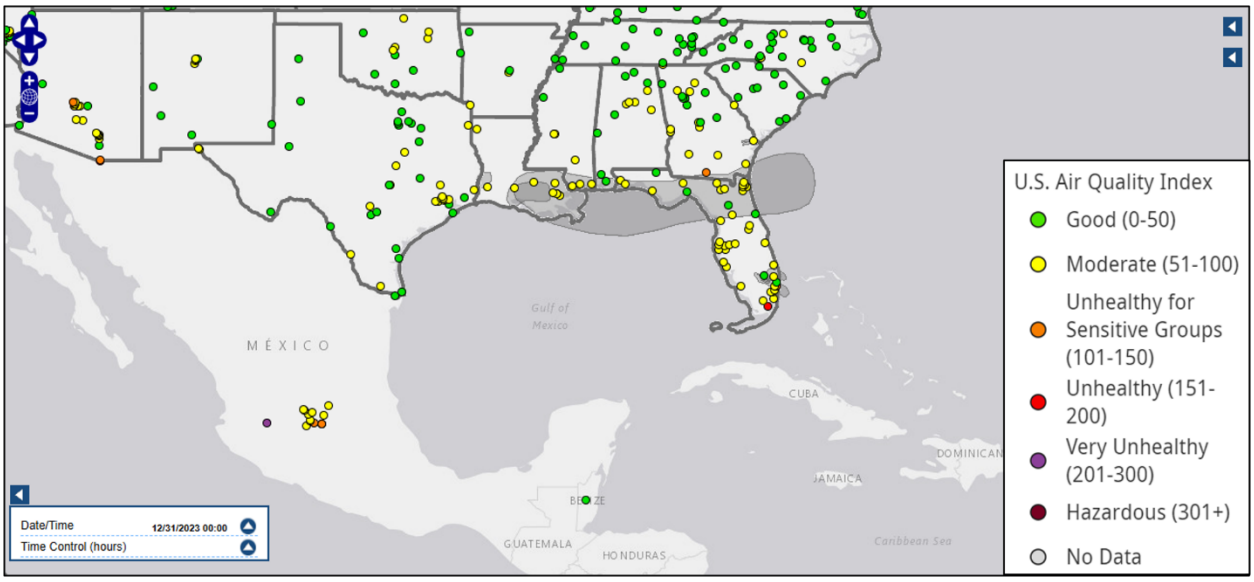

Figure 3-178: AirNow HMS Smoke Plume for December 31, 2023

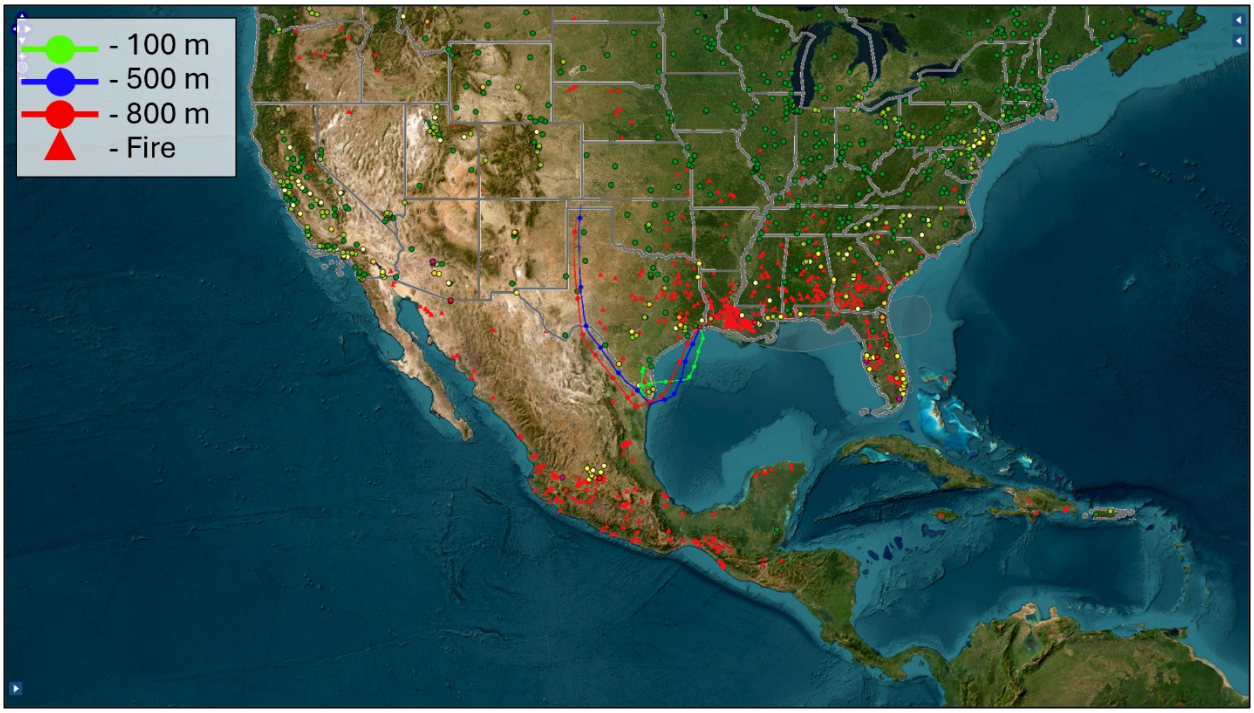

Figure 3-179: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on December 31, 2023

The TCEQ forecast for January 1, 2024 (Table C-17) referenced lingering fine particulate matter from New Year's festivities and residual smoke from regional burning possibly impacting southeast Texas, including the Beaumont-Port Arthur area. Figure 3-180: *Hourly $PM_{2.5}$ Concentrations on January 1, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that the highest hourly $PM_{2.5}$ concentration was recorded at 00:00 local time as would be expected with fireworks being deployed at the time that the new year begins. Figure 3-181: *AirNow HMS Smoke Plume for January 1, 2024*, does not show widespread smoke over East Texas as would be expected on an event where fireworks were the

cause of elevated $PM_{2.5}$ concentrations. The AQI classification was moderate in East Texas. Figure 3-182: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on January 1, 2024*, shows trajectories traveling north and northeast prior to arriving at the Port Arthur Memorial School monitor. Long-range trajectories are less effective at depicting the path of air flow through smoke en route to the monitor because the smoke from the fireworks was in the immediate vicinity of the monitor.

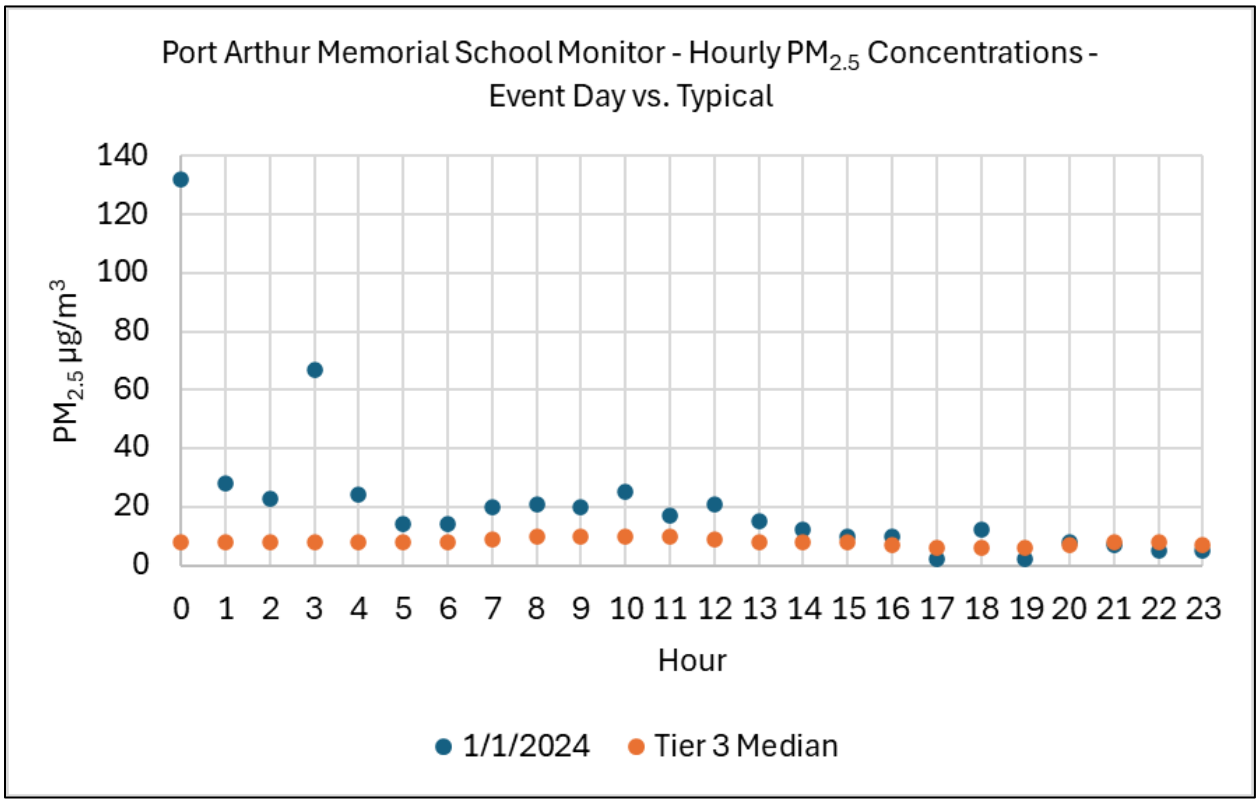

Figure 3-180: Hourly $PM_{2.5}$ Concentrations on January 1, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

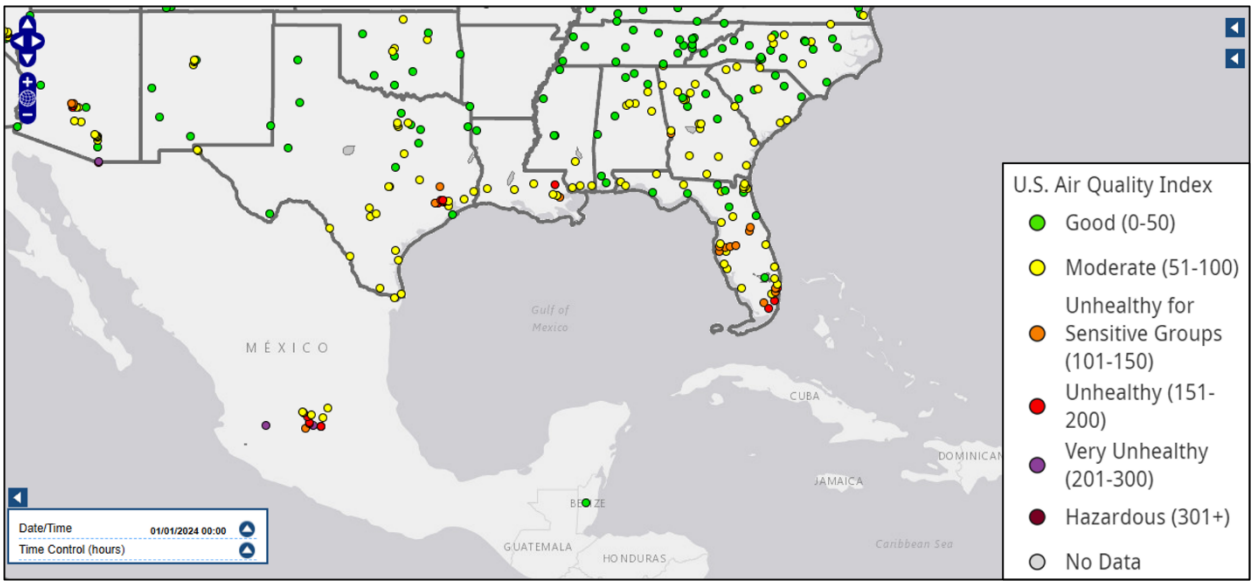

Figure 3-181: AirNow HMS Smoke Plume for January 1, 2024

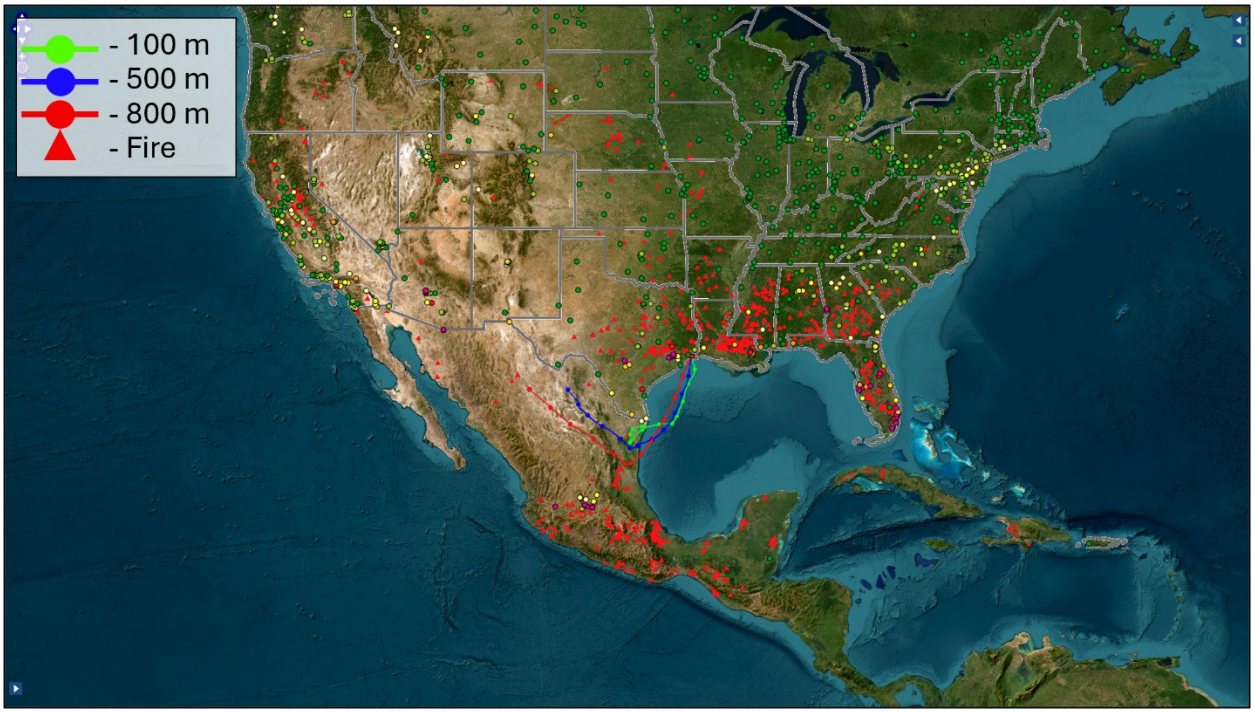

Figure 3-182: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on January 1, 2024

3.2.18 Group 18 – Evidence for May 8, 2024, May 9, 2024, and May 13, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

May 8, 2024, and May 13, 2024, were identified as a Tier 2 days at the Port Arthur Memorial School monitor with 24-hour $PM_{2.5}$ concentrations of 23.0 µg/m^3 and 19.9 µg/m^3, respectively. May 9, 2024, was identified as a Tier 1 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 38.0 µg/m^3. These elevated $PM_{2.5}$ concentrations were primarily caused by smoke from fires that originated in Mexico and Central America.

The TCEQ forecast for May 8, 2024 (Table C-18), referenced ongoing agricultural burnings in Mexico and Central America and the prospect that residual smoke could continue to linger and filter across southeast Texas. A media reports published on May 8, 2024 (Figure C-28), references haze and smoke from Mexico contributing to "milky" skies during the week. A media report published on May 10, 2024 (Figure C-29), references that fires in Mexico were contributing to hazy skies across Texas. Figure 3-183: *Hourly $PM_{2.5}$ Concentrations on May 8, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-184: *AirNow HMS Smoke Plume for May 8, 2024*, shows widespread smoke over the Gulf of America that extends into East Texas, with a Moderate AQI in East Texas. Figure 3-185: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 8, 2024, Showing Smoke in Gulf of America* shows smoke over the Gulf of America all the way to the Texas coast. Although East Texas is obstructed by cloud cover, the smoke extending all the way to the coast is a clear indicator that smoke continued over the land. Figure 3-186: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 8, 2024*, shows trajectories traveling through smoke plumes in the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-187: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 6, 2024*, shows through 72-hour trajectories that winds traveled from fires in the Yucatan Peninsula over the Gulf of America to Jefferson County.

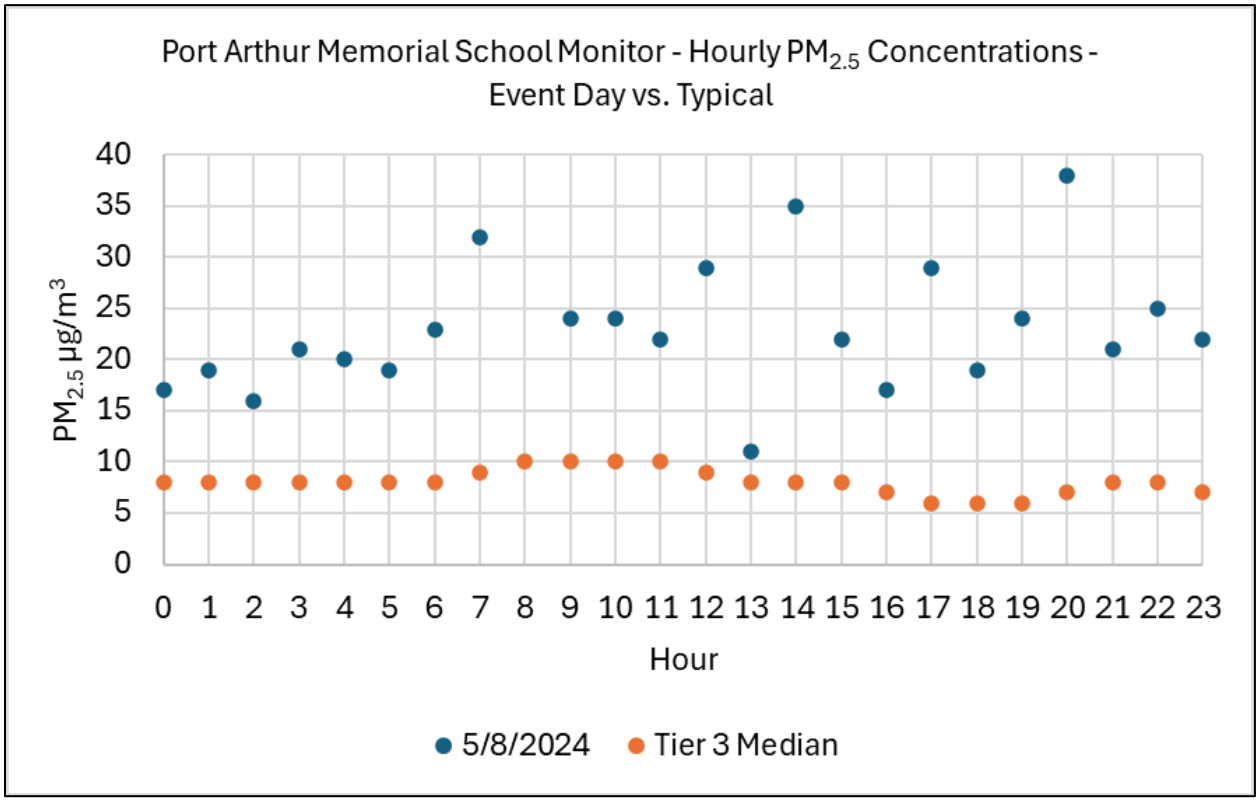

Figure 3-183: Hourly $PM_{2.5}$ Concentrations on May 8, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

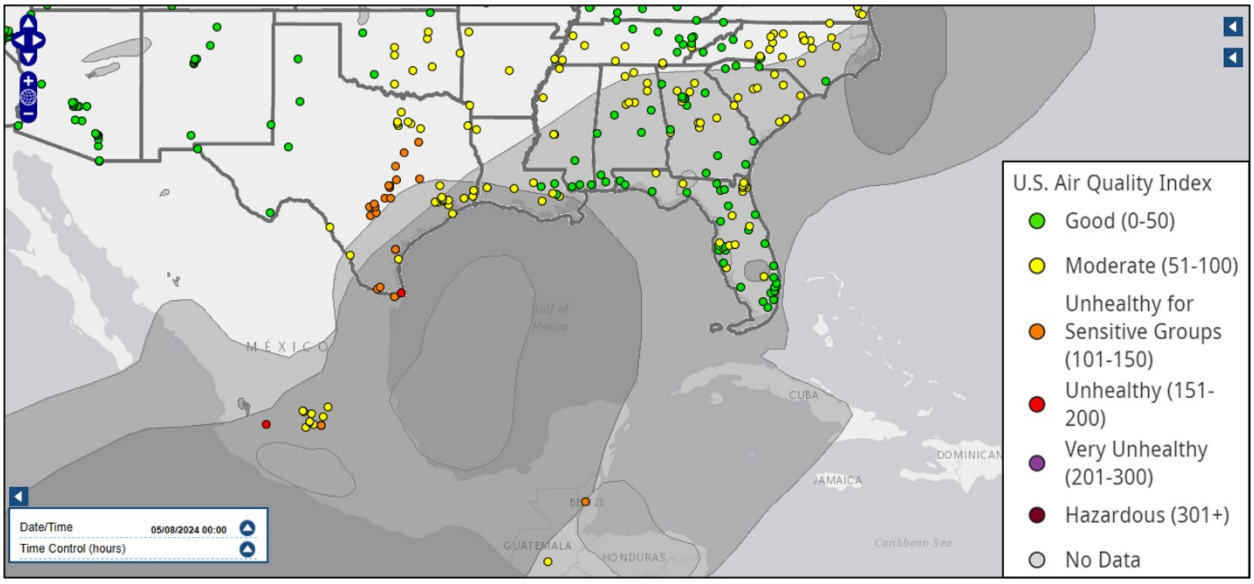

Figure 3-184: AirNow HMS Smoke Plume for May 8, 2024

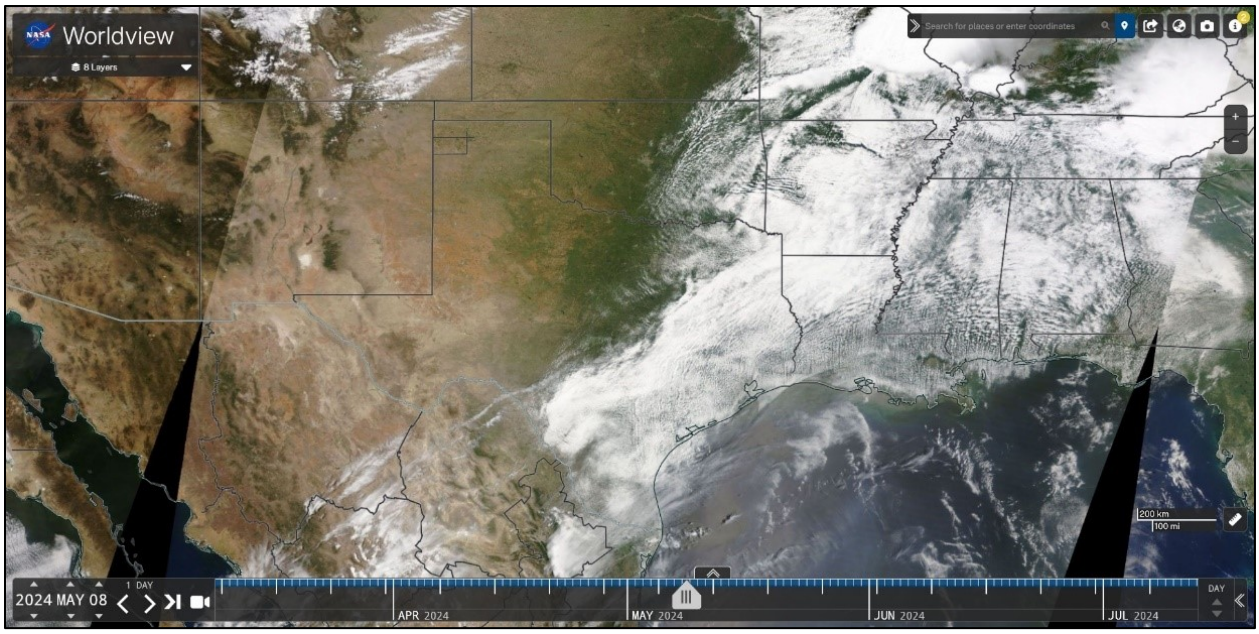

Figure 3-185: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 8, 2024, Showing Smoke in Gulf of America

Figure 3-186: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 8, 2024

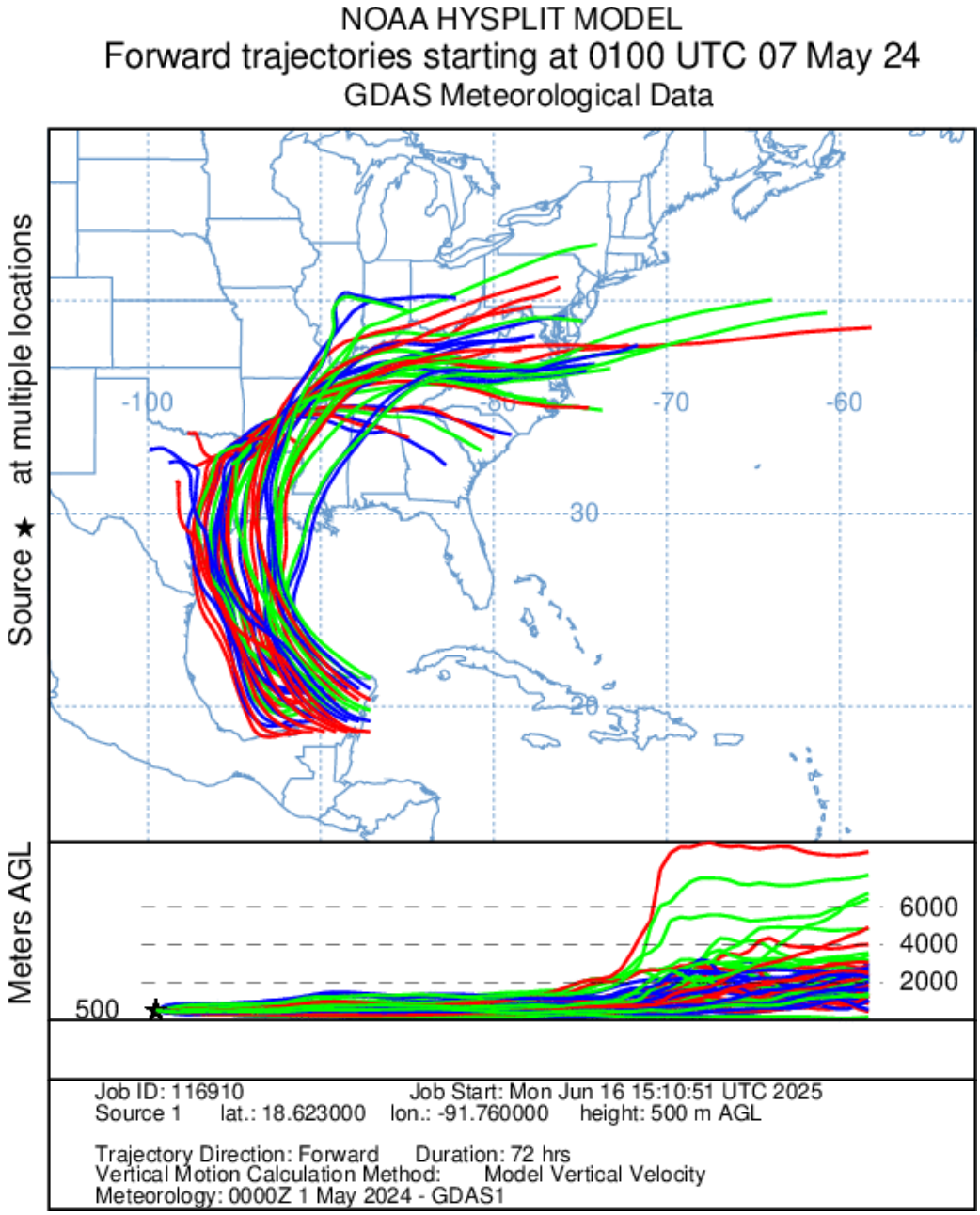

Figure 3-187: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 6, 2024

The TCEQ forecast for May 9, 2024 (Table C-18), referenced that southerly winds continued to transport light to moderate amounts of smoke from the agricultural burnings in Mexico and Central America into southeast Texas. Figure 3-188: *Hourly $PM_{2.5}$ Concentrations on May 9, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-189: *AirNow Navigator with HMS Smoke Plume for May 9, 2024*, shows widespread smoke over the Gulf of America that extends into East Texas, with a Moderate to Unhealthy for Sensitive Groups AQI in East Texas. Figure 3-190: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 9, 2024, Showing Smoke in the Gulf of America* shows smoke over the Gulf of America all the way to the Texas coast. Although East

Texas is obstructed by cloud cover, the smoke extending all the way to the coast is a clear indicator that smoke continued over the land. Figure 3-191: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 9, 2024* shows trajectories traveling through smoke plumes in the Gulf of America prior to arrival at the Port Arthur Memorial School monitor.

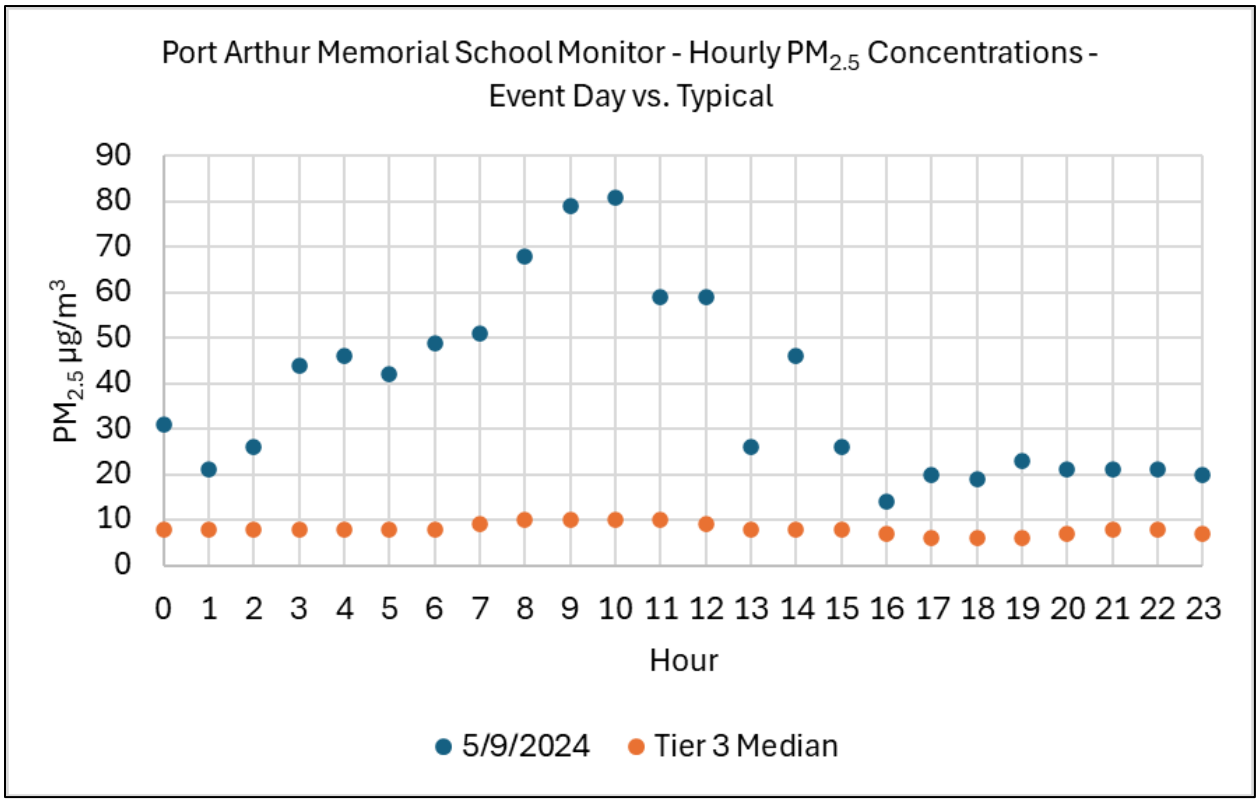

Figure 3-188: Hourly $PM_{2.5}$ Concentrations on May 9, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor

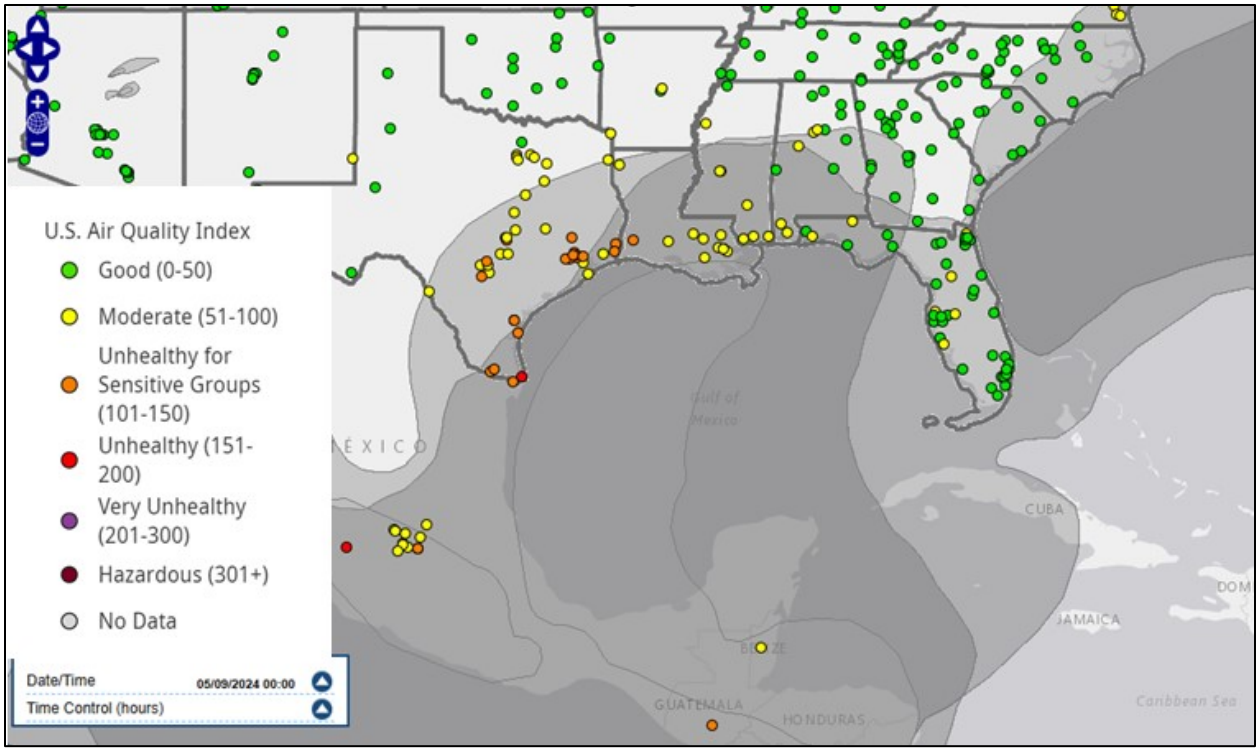

Figure 3-189: AirNow Navigator with HMS Smoke Plume for May 9, 2024

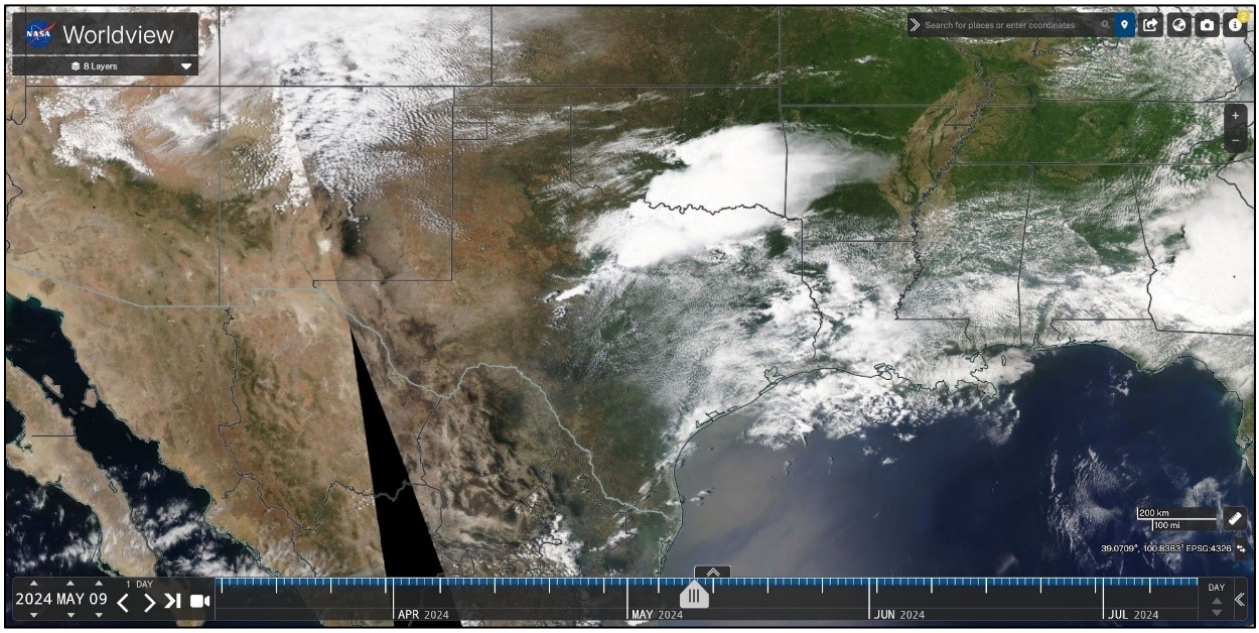

Figure 3-190: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 9, 2024, Showing Smoke in the Gulf of America

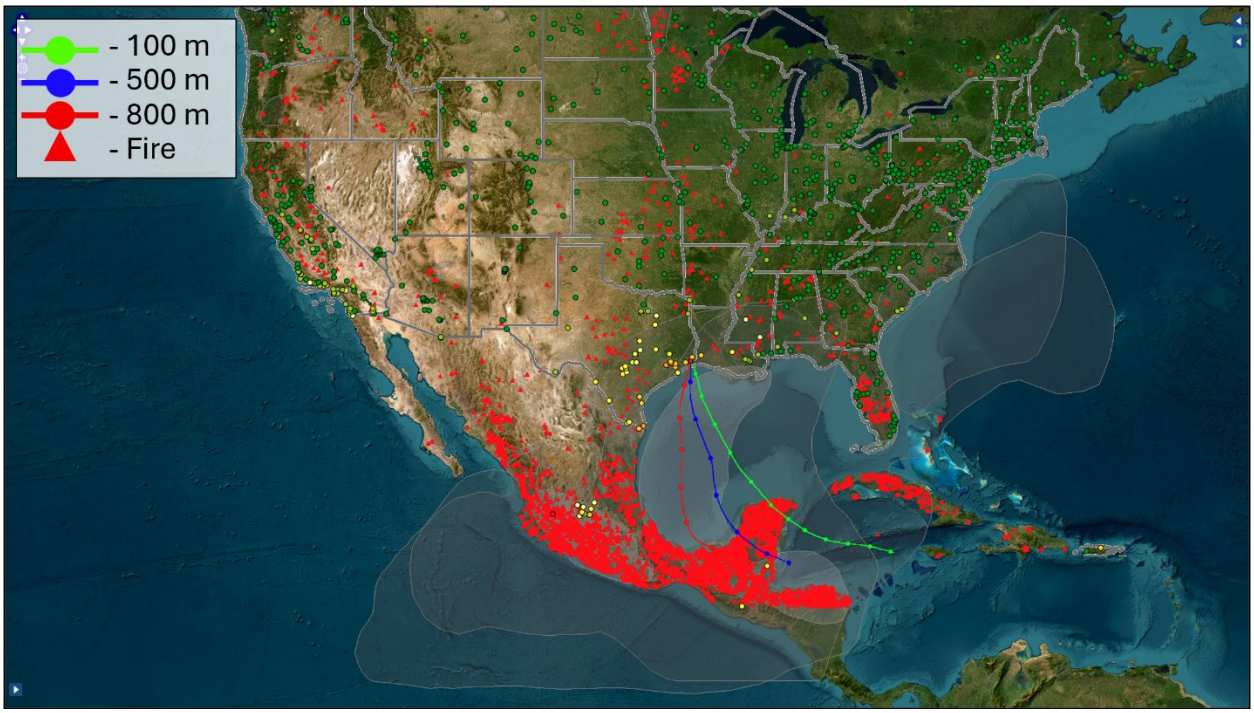

Figure 3-191: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 9, 2024

The TCEQ forecast for May 13, 2024 (Table C-18), referenced that residual smoke would be transported farther northward out of Mexico into the eastern two thirds of Texas as southerly winds persist ahead of a cold front that is forecast to make its way into the Texas Panhandle and Permian Basin by mid-morning. Figure 3-192: *Hourly $PM_{2.5}$ Concentrations on May 13, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that hourly $PM_{2.5}$ concentrations were at least 8 µg/m^3 greater than concentrations considered typical at this monitor through 14:00 local time. From 18:00 local time through the end of the day, hourly $PM_{2.5}$ concentrations were relatively close to concentrations considered typical at this monitor. Figure 3-193: *AirNow Navigator with HMS Smoke Plume for May 13, 2024*, shows widespread smoke over the Gulf of America that extends into East Texas, with a Moderate AQI in southeast Texas. Figure 3-194: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 13, 2024, Showing Smoke in the Gulf of America* shows that southeast Texas is obstructed by cloud cover, but smoke can still be seen over the Gulf of America that Figure 3-199 previously showed had extended to the Texas coast. Figure 3-195: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 13, 2024*, shows trajectories traveling through smoke plumes in the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-196: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 10, 2024* shows through 72-hour trajectories that winds traveled from fires in the Yucatan Peninsula over the Gulf of America to Jefferson County.

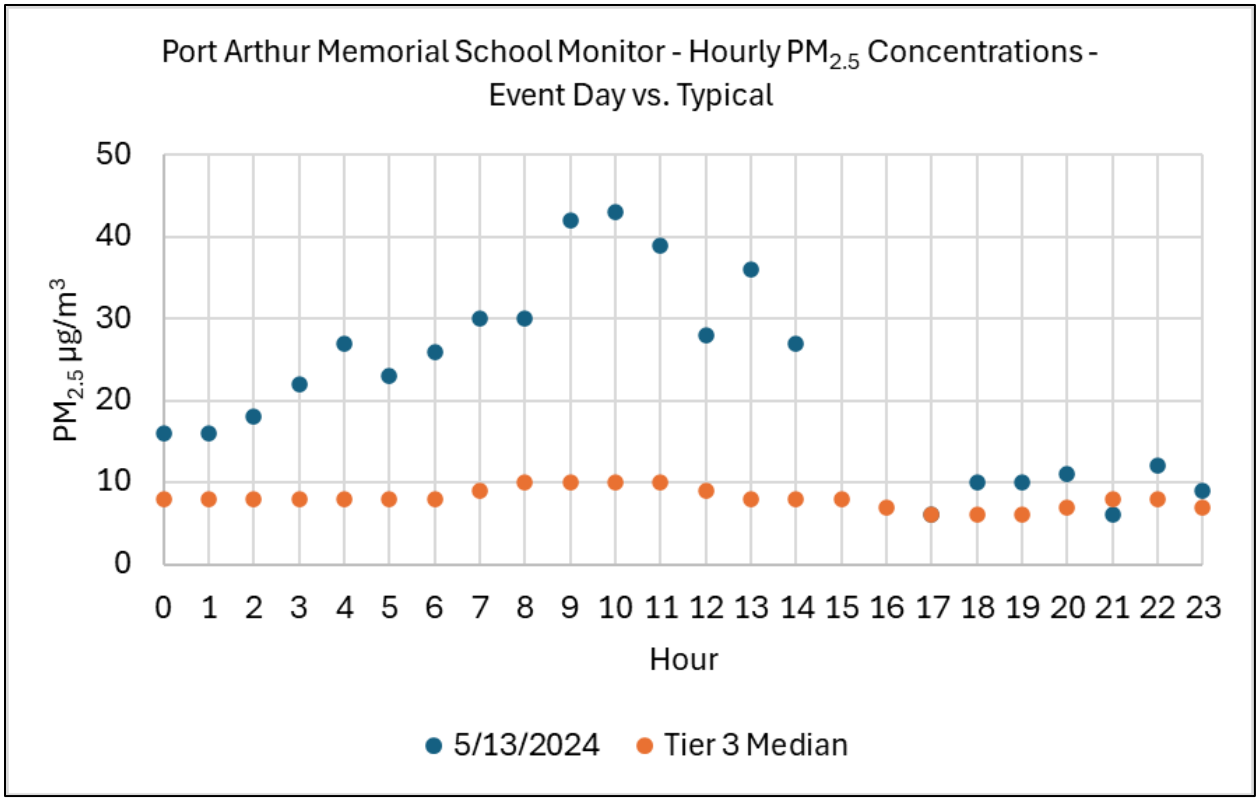

Figure 3-192: Hourly $PM_{2.5}$ Concentrations on May 13, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor

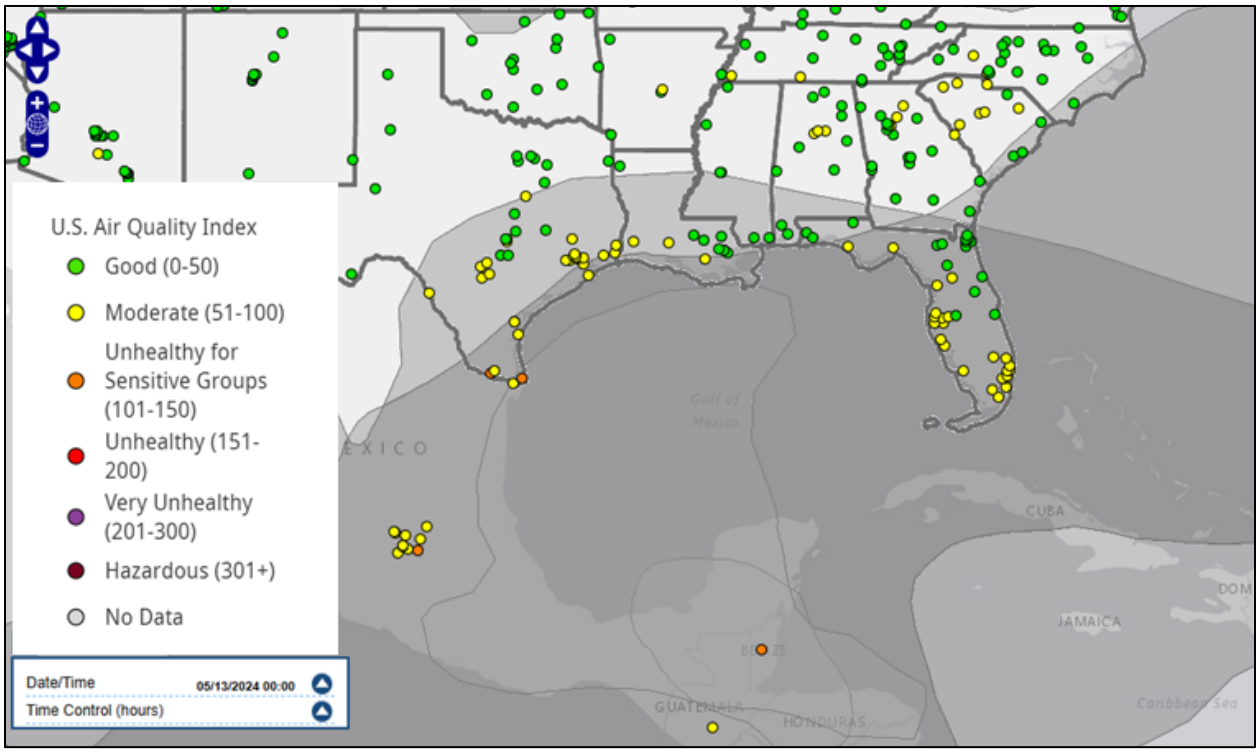

Figure 3-193: AirNow Navigator with HMS Smoke Plume for May 13, 2024

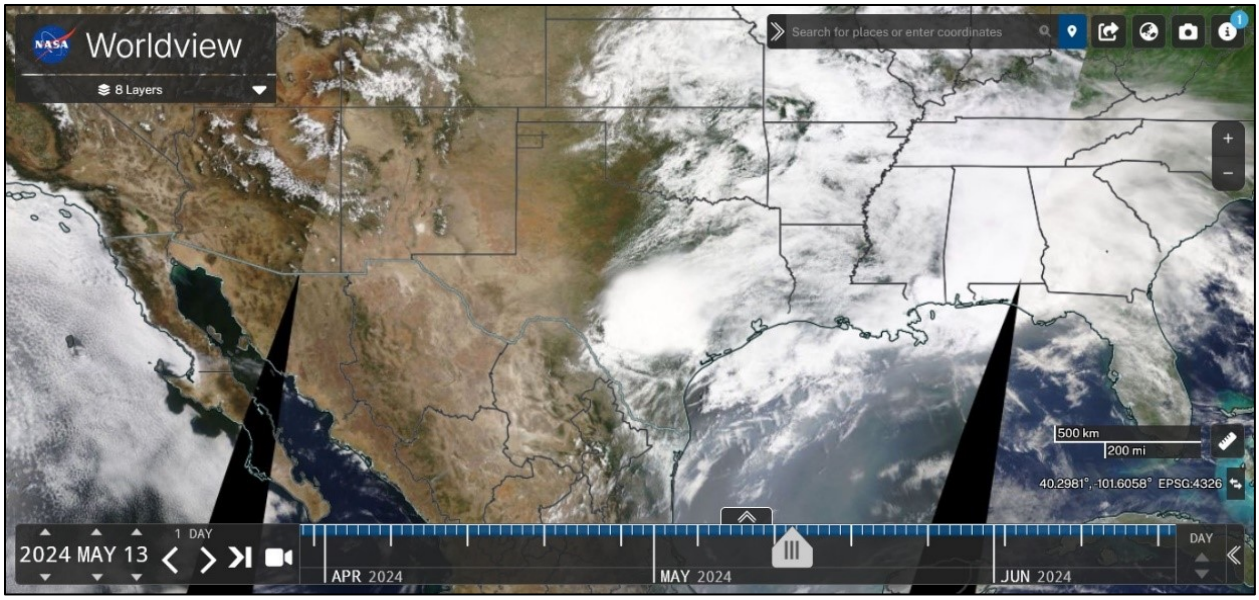

Figure 3-194: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 13, 2024, Showing Smoke in the Gulf of America

Figure 3-195: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 13, 2024

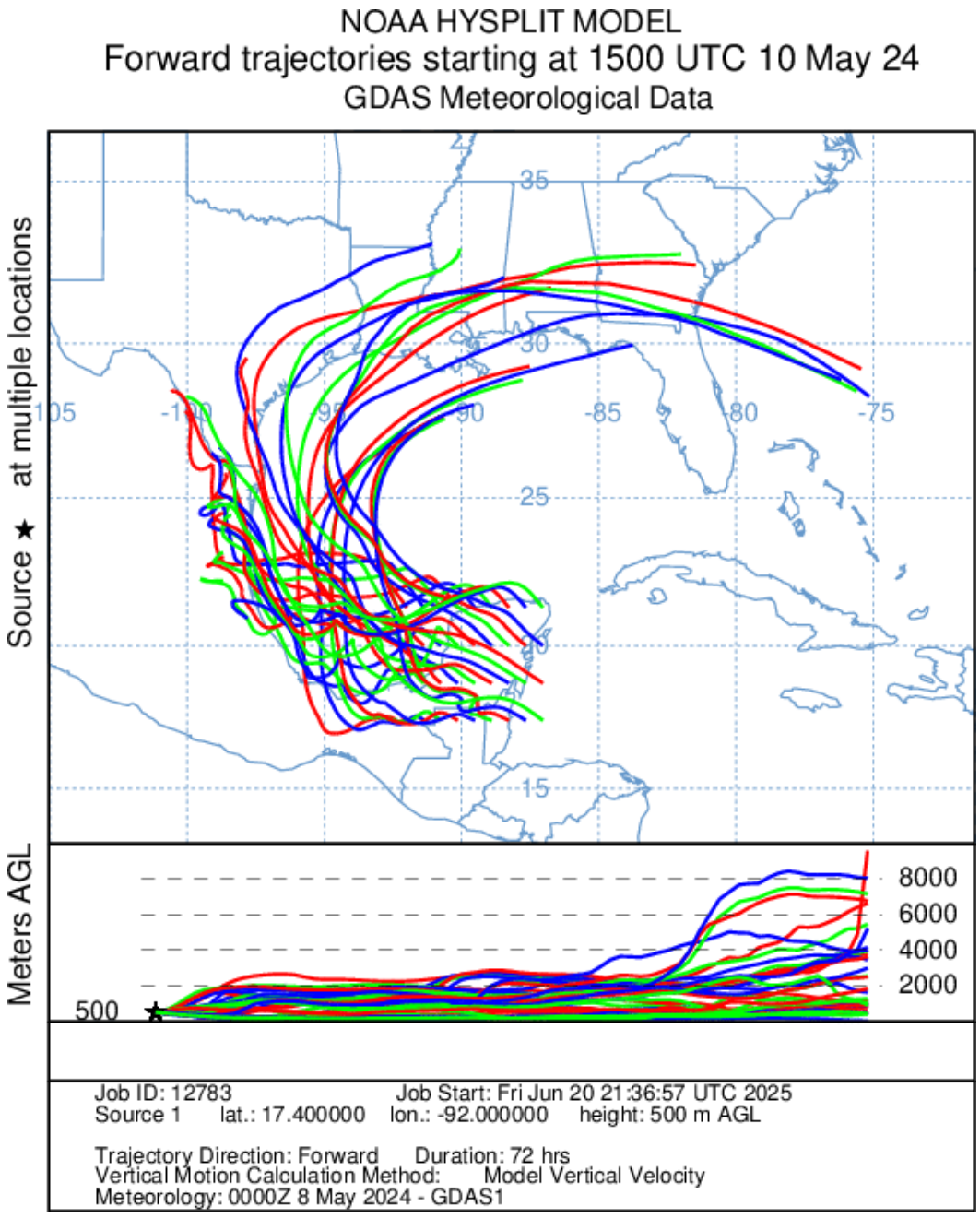

Figure 3-196: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 10, 2024

3.2.19 Group 19 – Evidence for May 15, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

May 15, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor, with a 24-hour $PM_{2.5}$ concentrations of 24.7 µg/m^3. This elevated concentration was primarily a result of smoke from Mexico and Central America.

The TCEQ forecast for May 15, 2024 (Table C-19), referenced that light to moderate density residual smoke from seasonal fire activities throughout central-southern Mexico, the Yucatan Peninsula, Central America, and northern South America would linger mainly over portions of southeast and south-central Texas. A media report published on May 17, 2024 (Figure C-30)

references fires in Mexico sending smoke over the southern U.S. reducing air quality readings from Texas to Florida. Figure 3-197: *Hourly $PM_{2.5}$ Concentrations on May 15, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that there was an hourly $PM_{2.5}$ concentration of 310 µg/m³ at 06:00 local time on May 15, 2024. All but two other hourly values on this date were equal to or greater than values classified as typical. Figure 3-198: *Figure 3-204: AirNow HMS Smoke Plume for May 15,* 2024, shows widespread smoke over the Gulf of America that extends into East Texas, with Good to Moderate AQI in Southeast Texas. Figure 3-199: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 15, 2024, Showing Cloud Cover Over East Texas* shows cloud cover over East Texas, and because of the obstruction from the clouds, it is difficult to discern smoke in the image. Figure 3-200: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 15, 2024*, shows trajectories at the two highest elevations traveling through smoke plumes north of Texas prior to arrival at the Port Arthur Memorial School monitor. The trajectory at the lowest elevation began just off the coast of Louisiana, traveled west into central Texas, and shifted back traveling east to the Port Arthur Memorial School monitor. Figure 3-201: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 10, 2024*, shows through 72-hour trajectories that winds traveled from fires in the Yucatan Peninsula over the Gulf of America to Jefferson County.

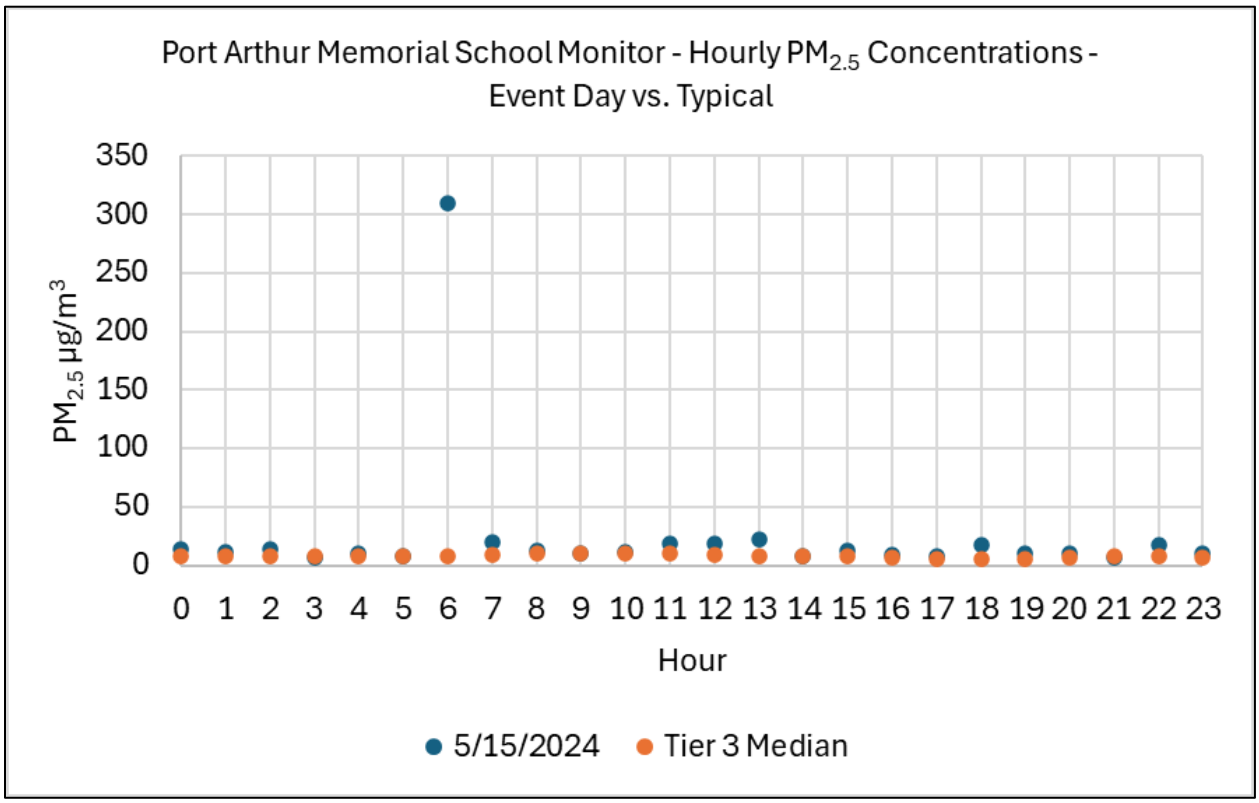

Figure 3-197: Hourly $PM_{2.5}$ Concentrations on May 15, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

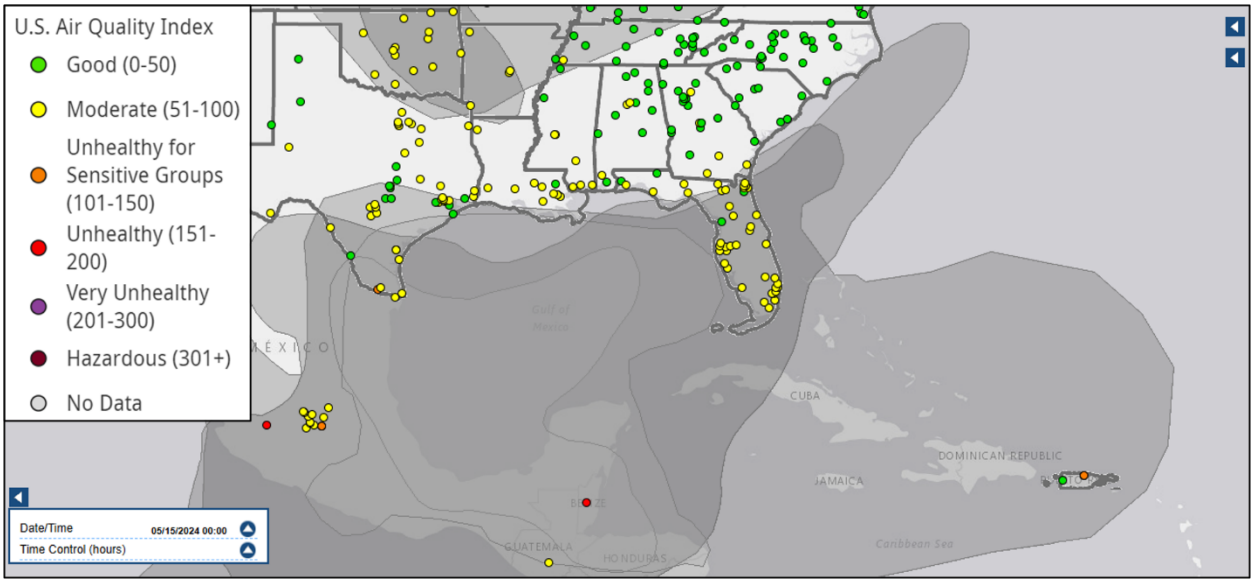

Figure 3-198: Figure 3-204: AirNow HMS Smoke Plume for May 15, 2024

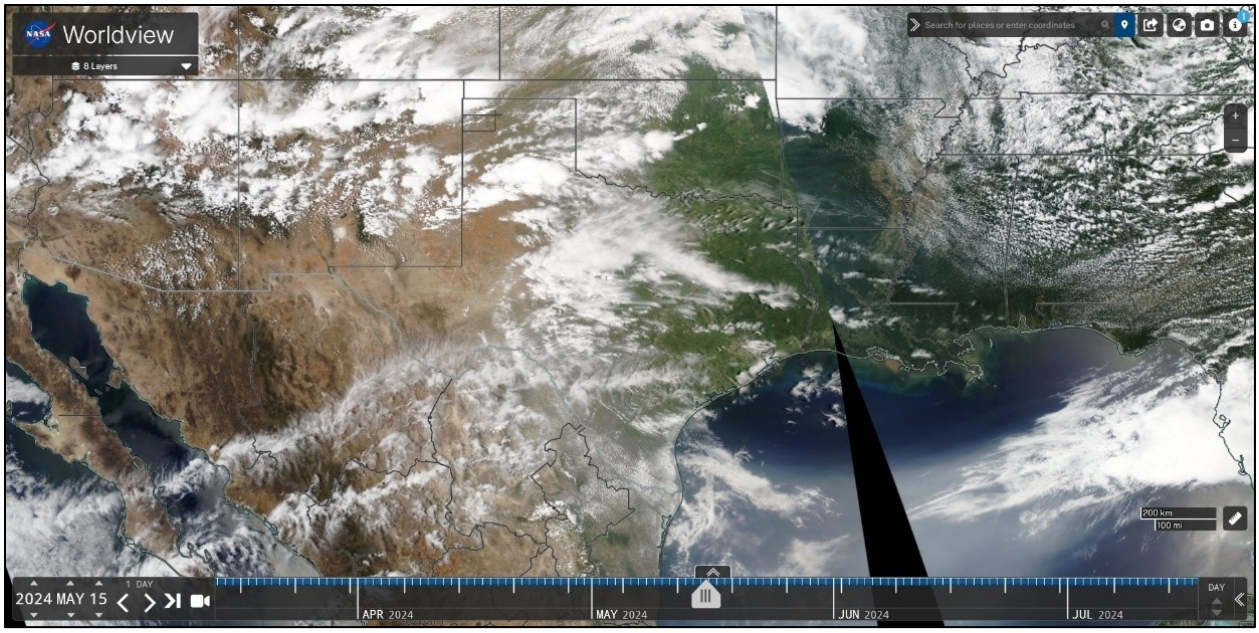

Figure 3-199: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 15, 2024, Showing Cloud Cover Over East Texas

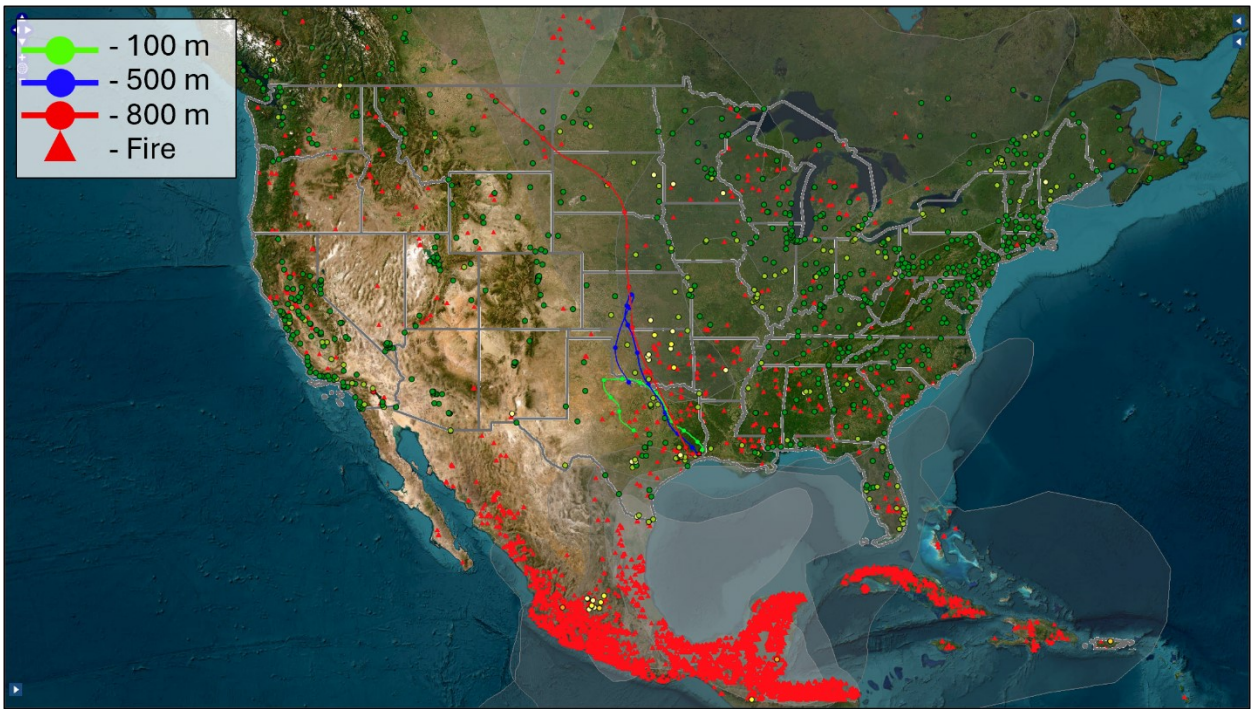

Figure 3-200: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 15, 2024

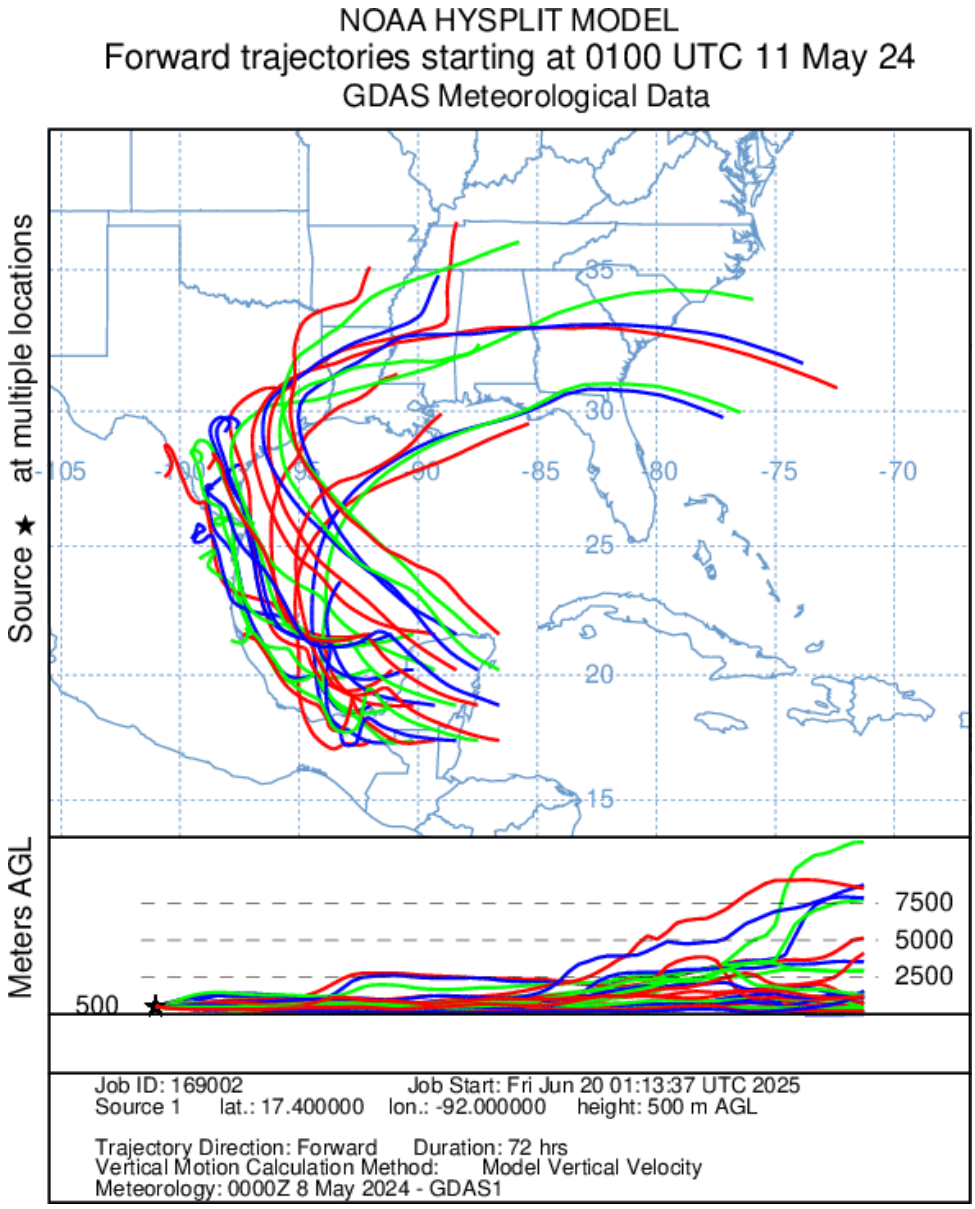

Figure 3-201: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 10, 2024

3.2.20 Group 20 – Evidence for May 24, 2024, and May 25, 2024, Fire (Mexico/Central America) $PM_{2.5}$ Event

May 24, 2024, and May 25 2024, were identified as a Tier 2 days at the Port Arthur Memorial School monitor with 24-hour $PM_{2.5}$ concentrations of 17.6 µg/m^3 and 20.4 µg/m^3, respectively. These elevated $PM_{2.5}$ concentrations were primarily caused by smoke from fires that originated in Mexico and Central America.

The TCEQ forecast for May 24, 2024 (Table C-20), referenced incoming smoke from agricultural fires in Mexico and Central America. Media report posted on May 27, 2024 (Figure C-31 and Figure C-32), reference the transport of smoke from agricultural fires in Mexico and Central America generating hazy skies in Texas. An additional media report posted on May 18, 2024 (Figure C-33), references occurrences of "severe weather" over the period of May 23, 2024,

through May 27, 2024, in multiple locations including southeast Texas. Figure 3-202: *Hourly $PM_{2.5}$ Concentrations on May 24, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-203: *AirNow HMS Smoke Plume for May 24, 2024*, shows widespread smoke over the Gulf of America that extends into East Texas, with a Moderate AQI in East Texas. Figure 3-204: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 24, 2024, Showing Smoke Along the Texas Caost* shows smoke over the Gulf of America all the way to the Texas coast. Figure 3-205: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 24, 2024*, shows trajectories traveling through smoke plumes in the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-206: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 21, 2024*, shows through 72-hour trajectories that winds traveled from fires in the Yucatan Peninsula over the Gulf of America and into Texas.

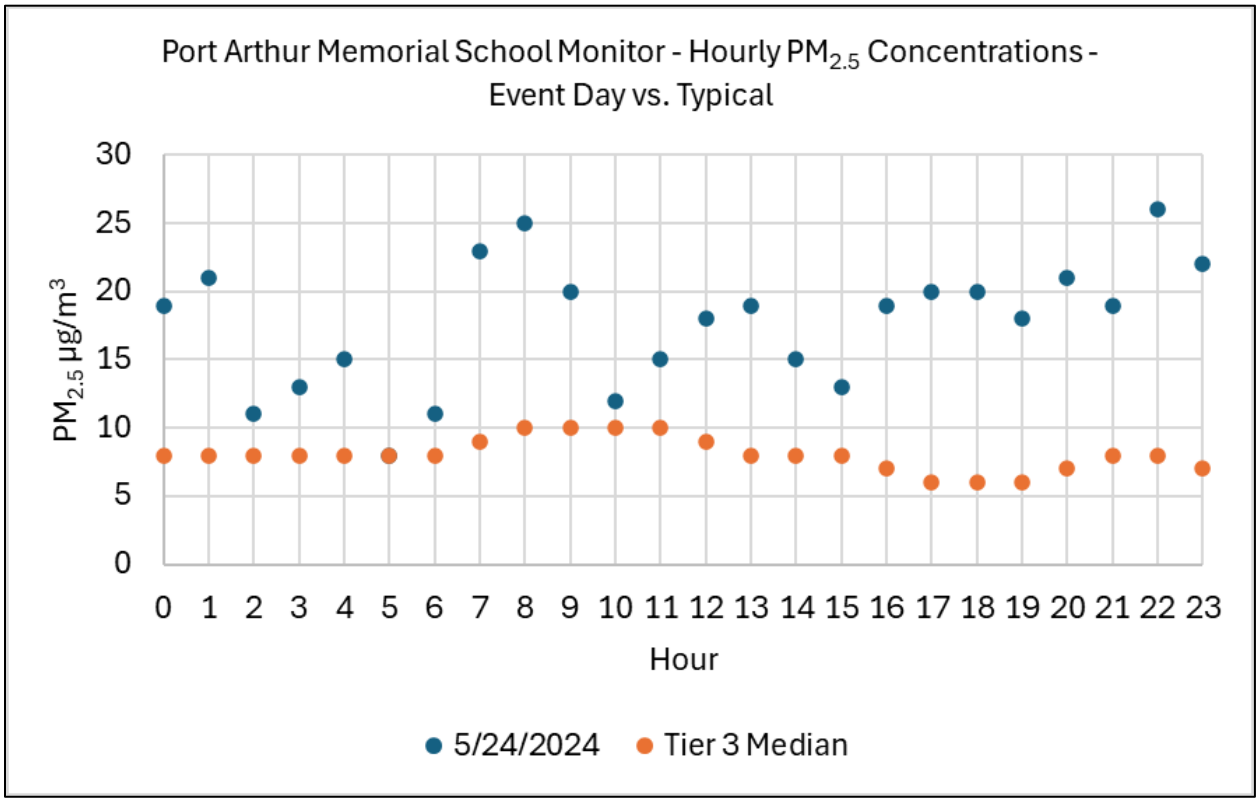

Figure 3-202: Hourly $PM_{2.5}$ Concentrations on May 24, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

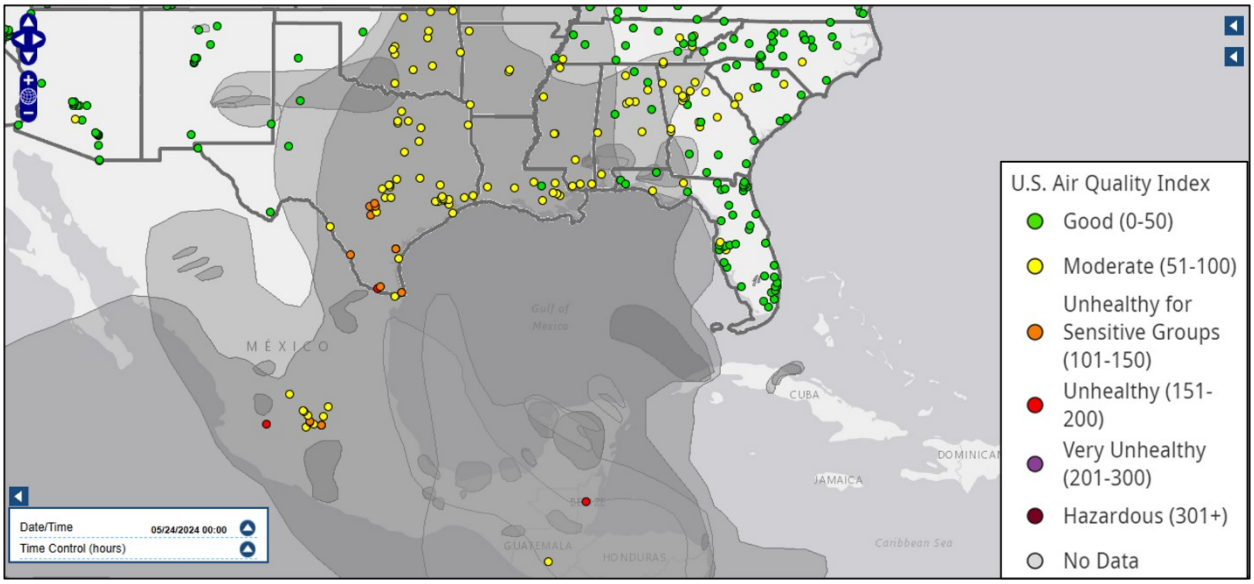

Figure 3-203: AirNow HMS Smoke Plume for May 24, 2024

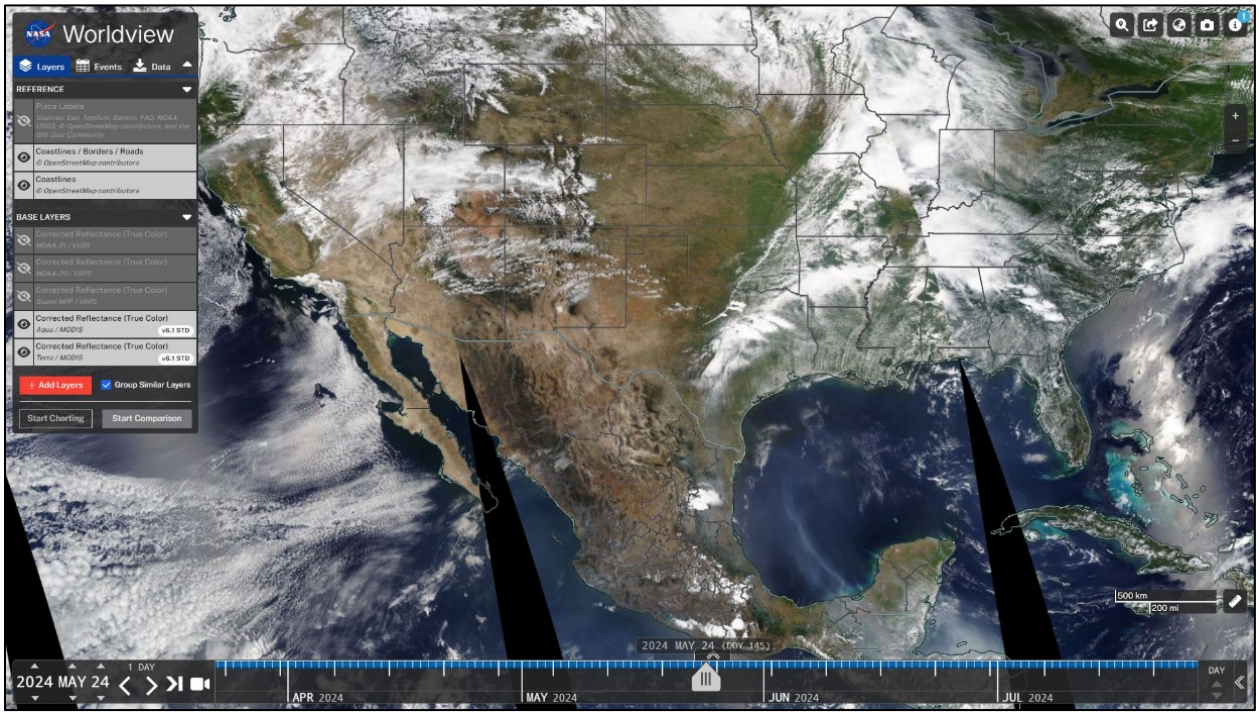

Figure 3-204: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 24, 2024, Showing Smoke Along the Texas Coast

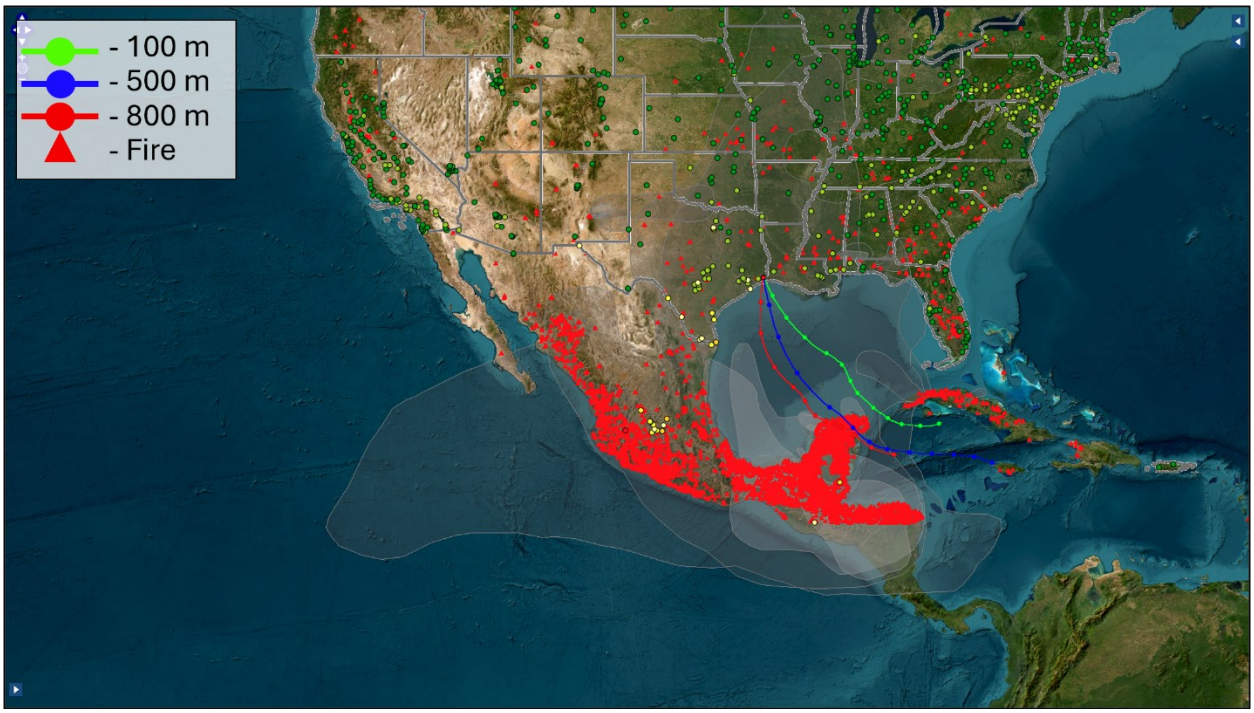

Figure 3-205: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 24, 2024

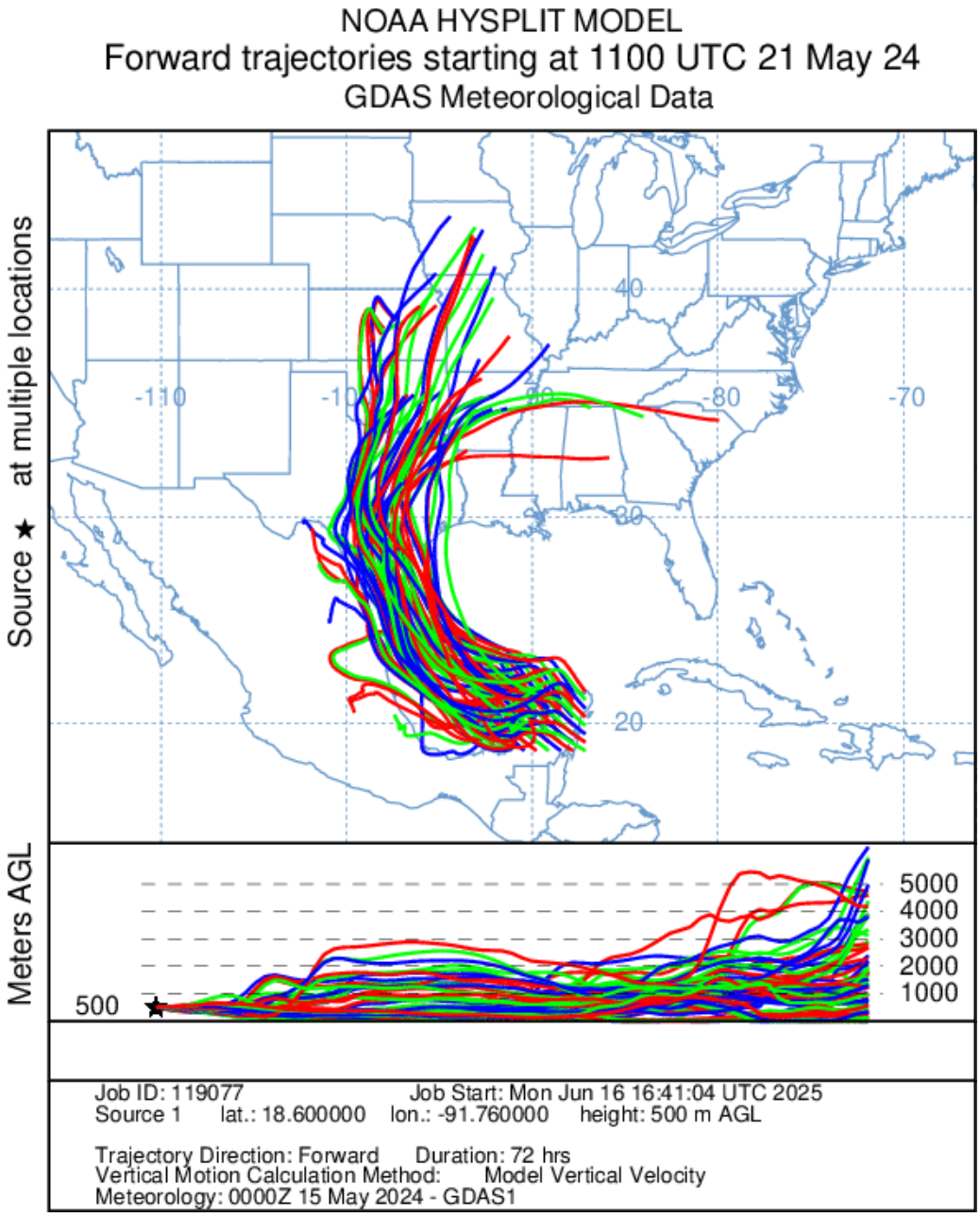

Figure 3-206: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 21, 2024

The TCEQ forecast for May 25, 2024 (Table C-20) referenced smoke from seasonal fires, wildfires, and industrial activity in Mexico and Central America affecting Texas

Figure 3-207: *Hourly $PM_{2.5}$ Concentrations on May 25, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-208: *AirNow HMS Smoke Plume for May 25, 2024* shows widespread smoke over the Gulf of America that extends into East Texas, with a Moderate AQI in East Texas. Figure 3-209: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 25, 2024, Showing Smoke from Mexico to East Texas* shows smoke over the Gulf of America all the way to the Texas coast. Figure 3-210: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur*

Memorial School Monitor on May 25, 2024 shows trajectories traveling through smoke plumes in the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-211: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 22, 2024*, shows through 72-hour trajectories that winds traveled from fires in the Yucatan Peninsula over the Gulf of America and into Texas.

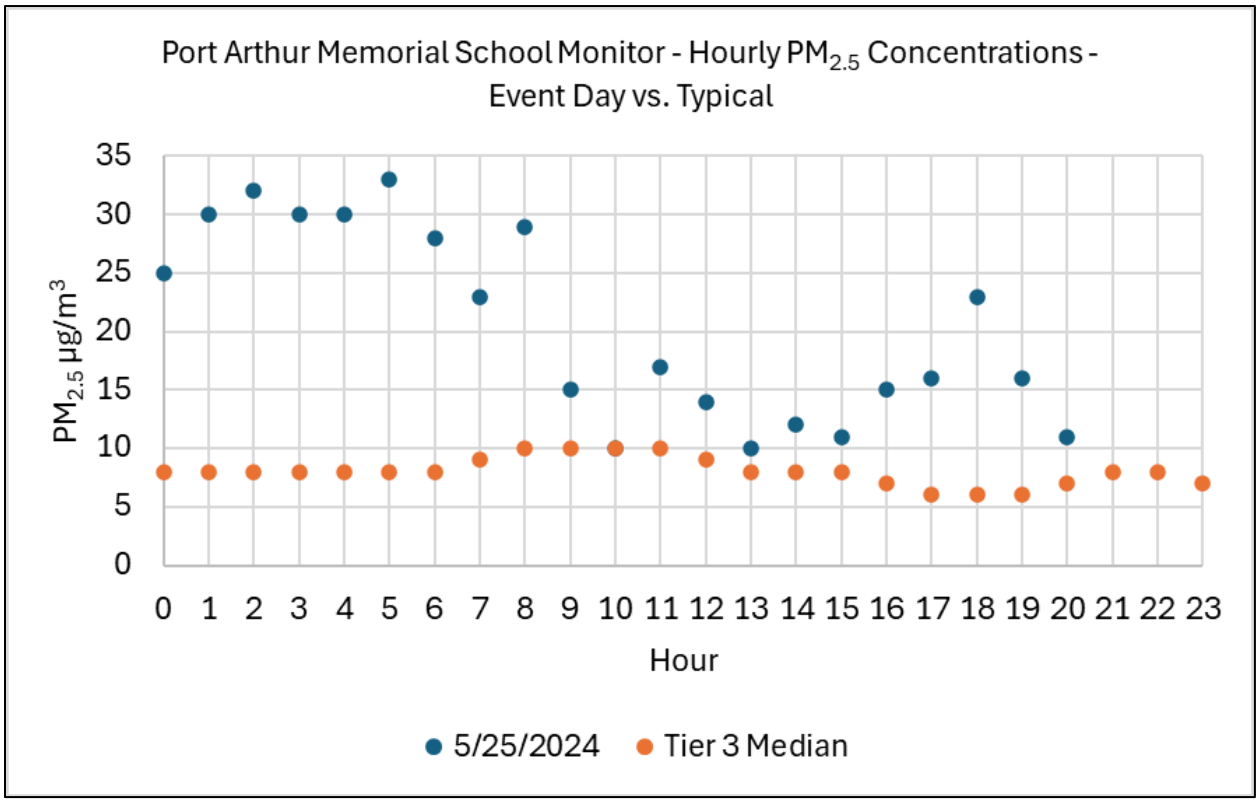

Figure 3-207: Hourly $PM_{2.5}$ Concentrations on May 25, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor

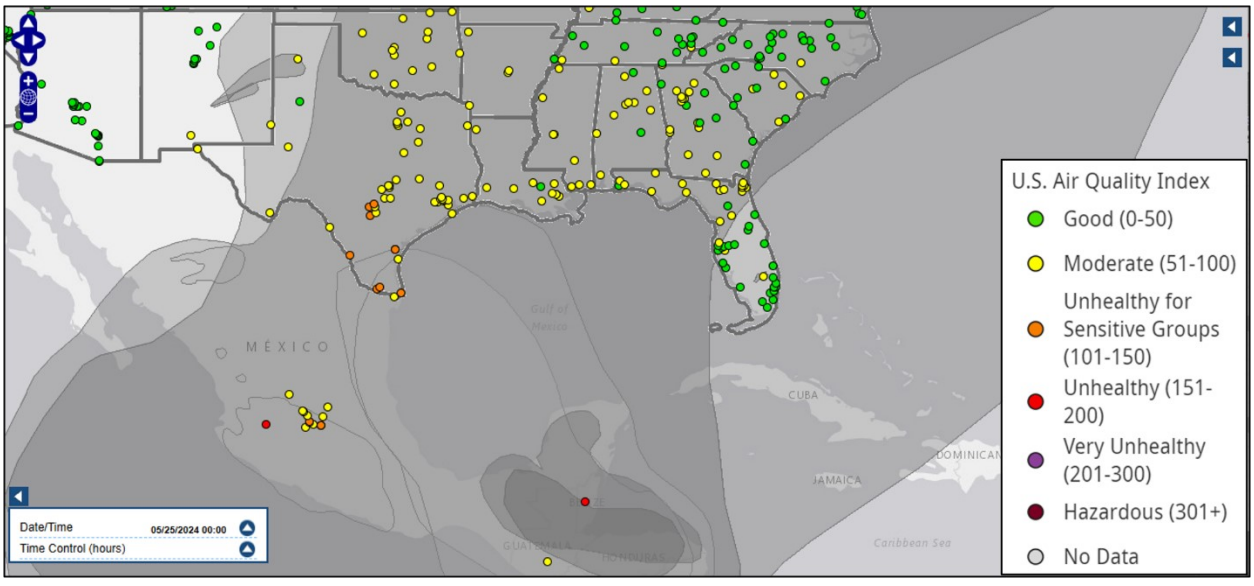

Figure 3-208: AirNow HMS Smoke Plume for May 25, 2024

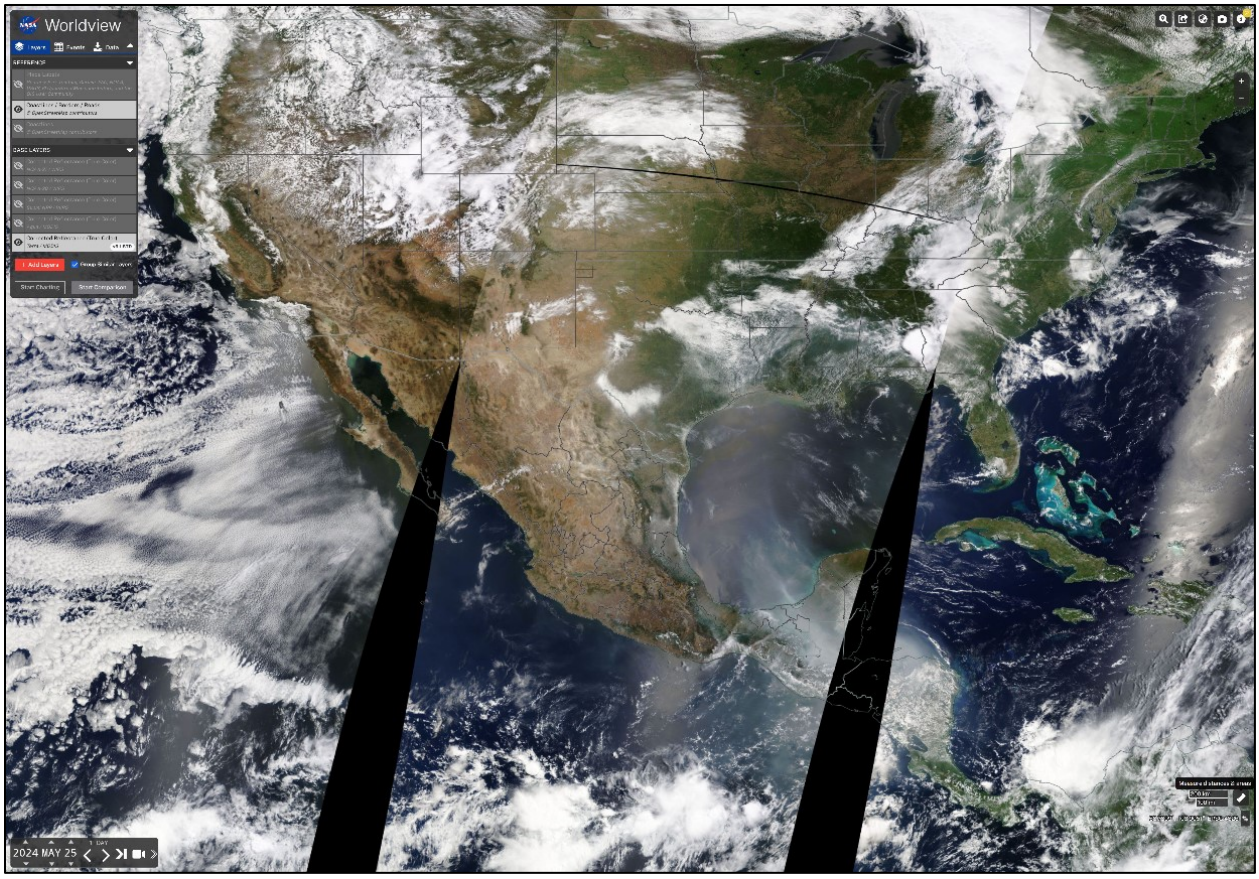

Figure 3-209: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from May 25, 2024, Showing Smoke from Mexico to East Texas

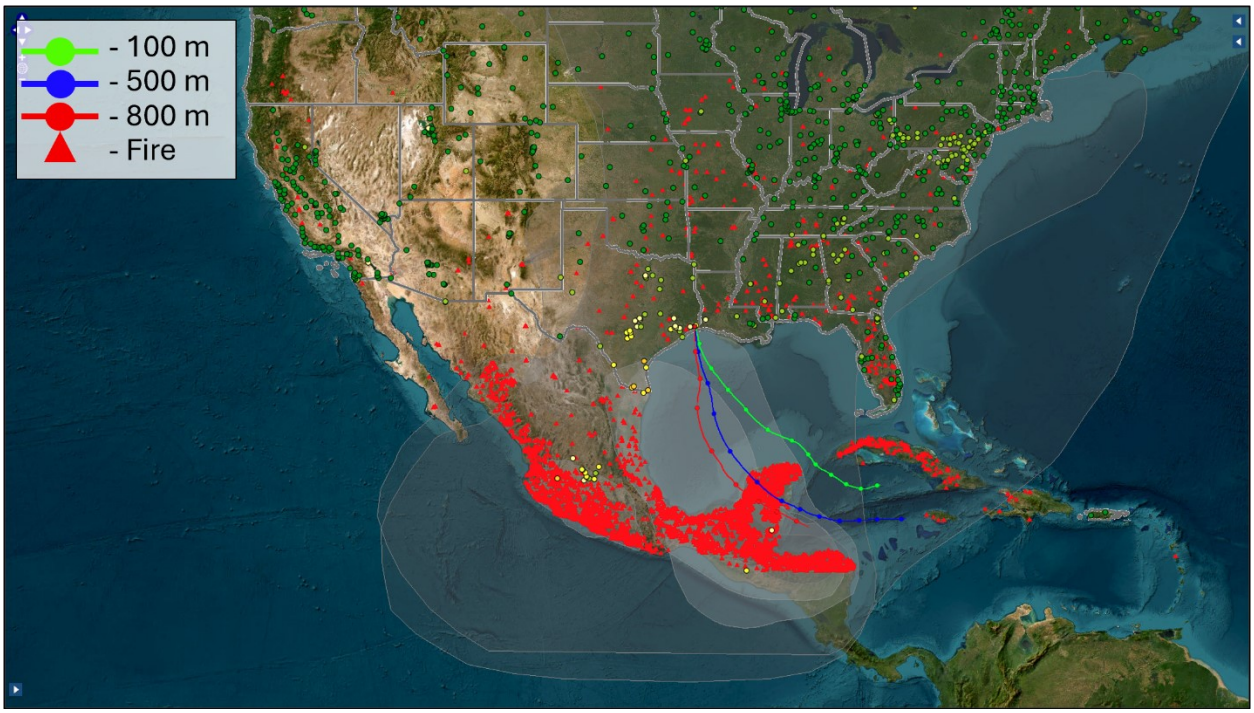

Figure 3-210: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on May 25, 2024

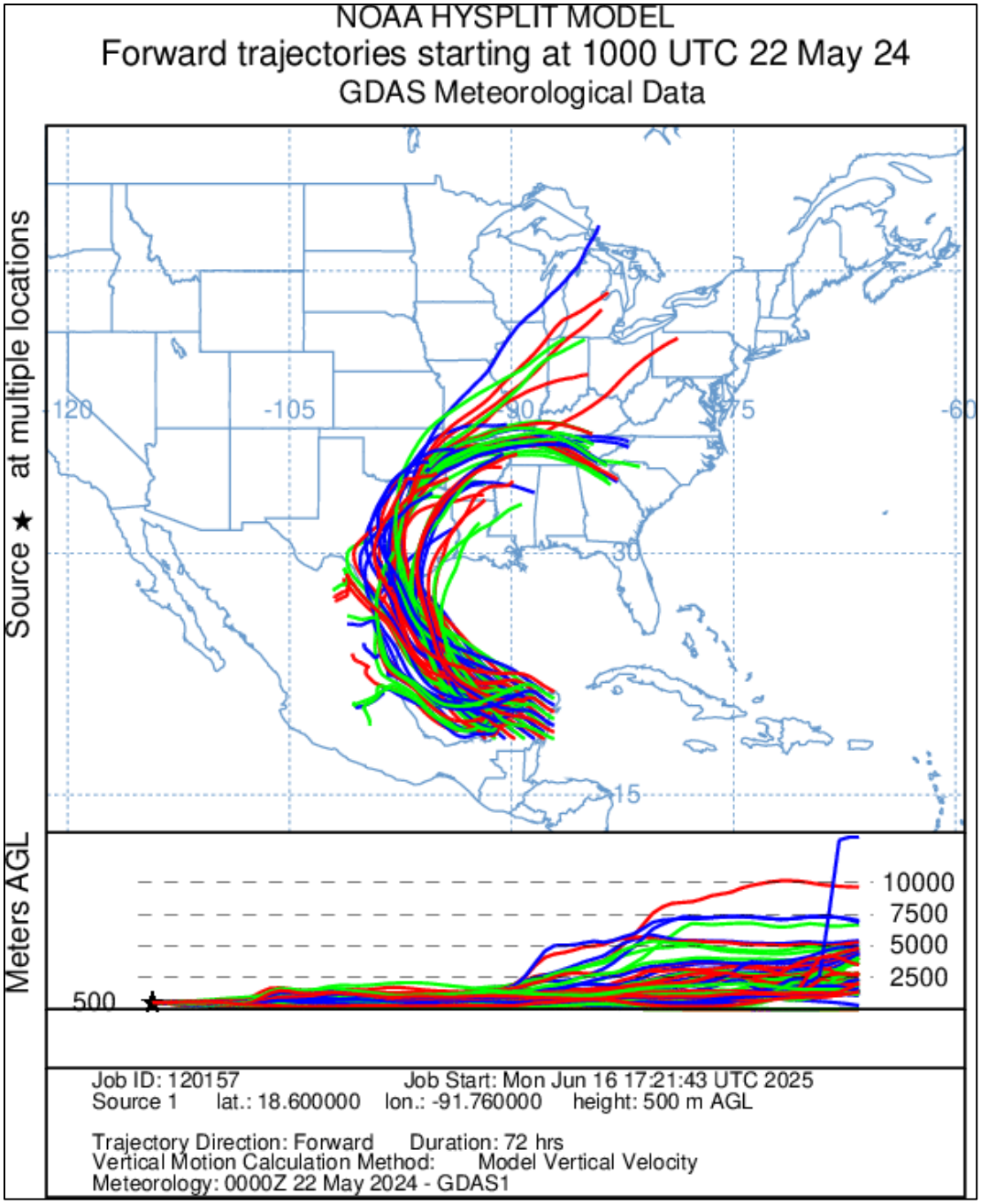

Figure 3-211: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mexico with Fires, Starting on May 22, 2024

3.2.21 Group 21 – Evidence for July 1, 2024, and July 3, 2024, African Dust $PM_{2.5}$ Event

July 1, 2024, and July 3, 2024, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 17.7 µg/m^3, 17.3 µg/m^3, and 21.8 µg/m^3, respectively. These elevated concentrations were a result of African dust.

The TCEQ forecast for July 1, 2024 (Table C-21), referenced that African dust was filtering through Texas. A media report published on July 1, 2024 (Figure C-34), referenced that Saharan

dust was moving across the coastline of Texas. Figure 3-212: *Hourly $PM_{2.5}$ Concentrations on July 1, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all but two hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-213: *Aerosol optical depth map from Terra and Aqua / MODIS on July 1, 2024*, shows high readings of aerosols in the Gulf of America, with a Moderate AQI in East Texas. Figure 3-214: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 1, 2024, Showing Haze in the Gulf of America* shows haze over the Gulf of America all the way to the Texas coast. Figure 3-215: *NOAA HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 1, 2024*, shows trajectories traveling from the Caribbean to the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-216: *NOAA HYSPLIT 72-Hour Trajectories Originating from the Saharan Desert, Starting* on *June 17, 2024*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

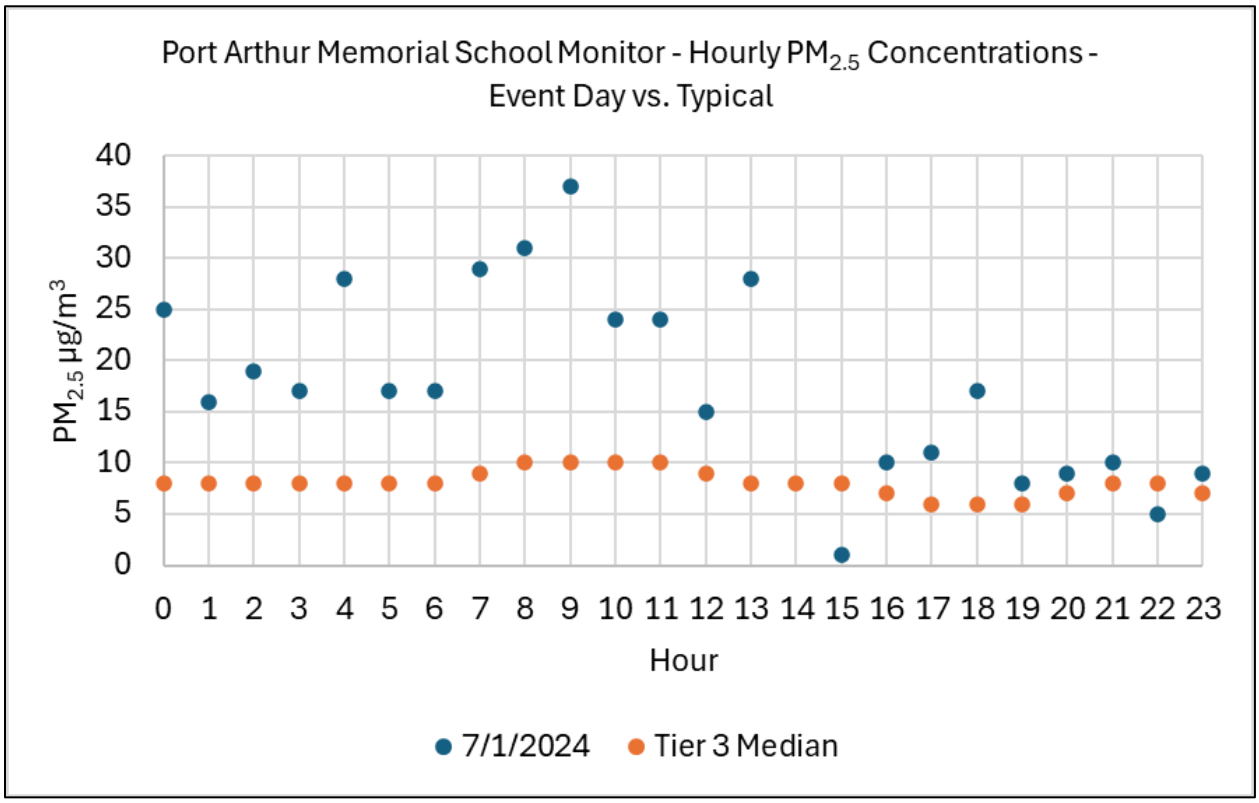

Figure 3-212: Hourly $PM_{2.5}$ Concentrations on July 1, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

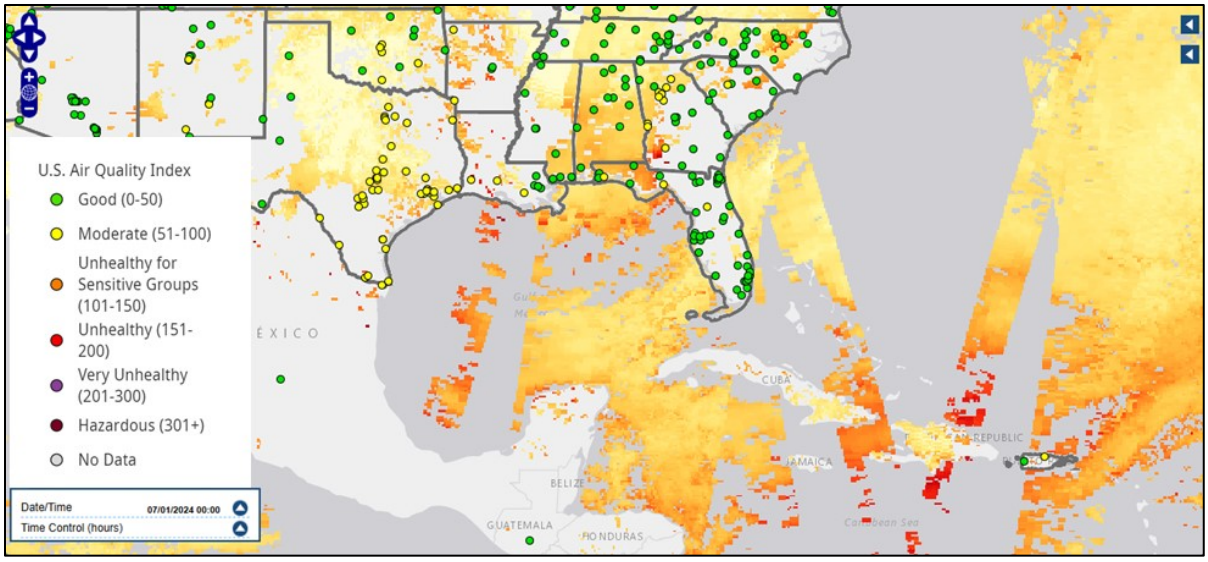

Figure 3-213: Aerosol optical depth map from Terra and Aqua / MODIS on July 1, 2024

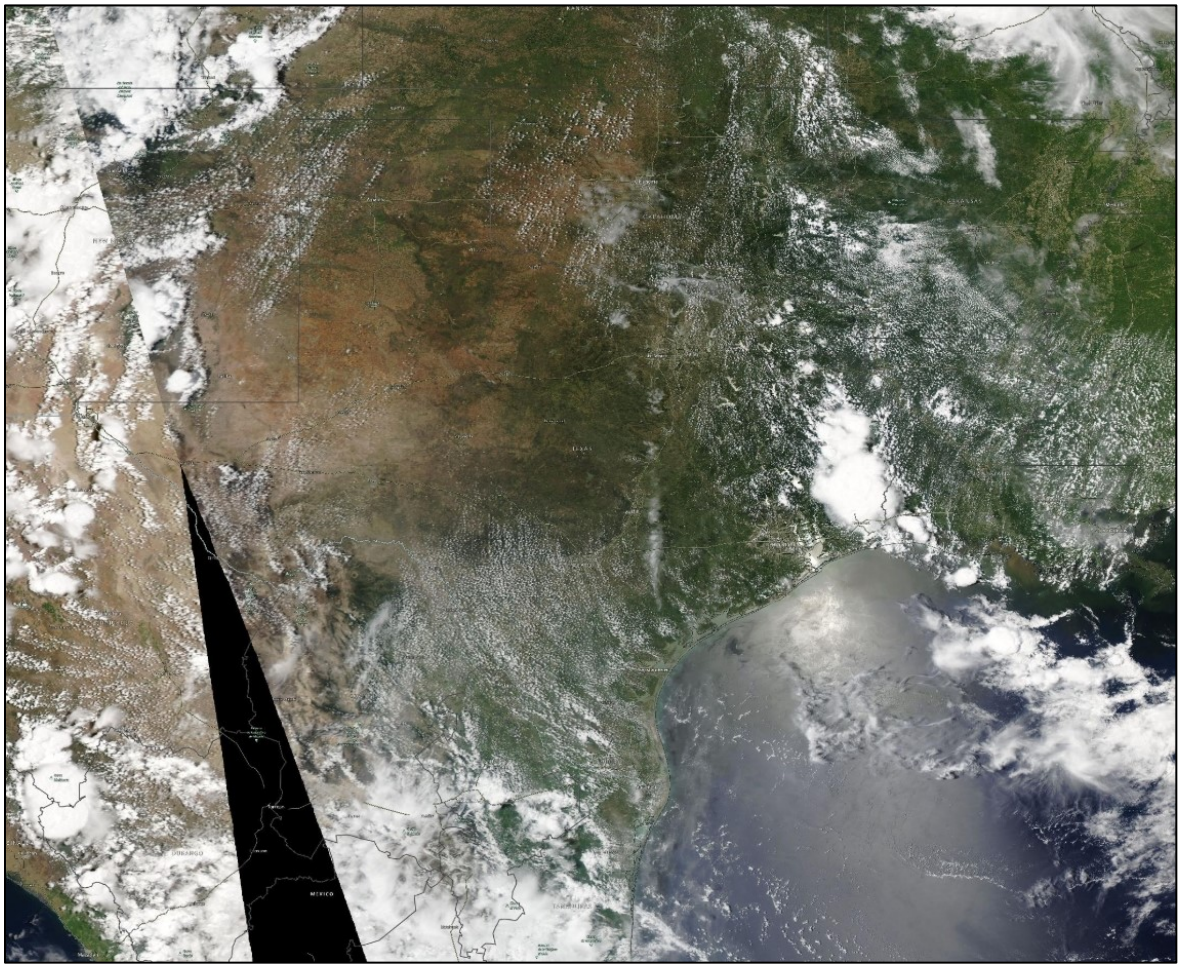

Figure 3-214: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 1, 2024, Showing Haze in the Gulf of America

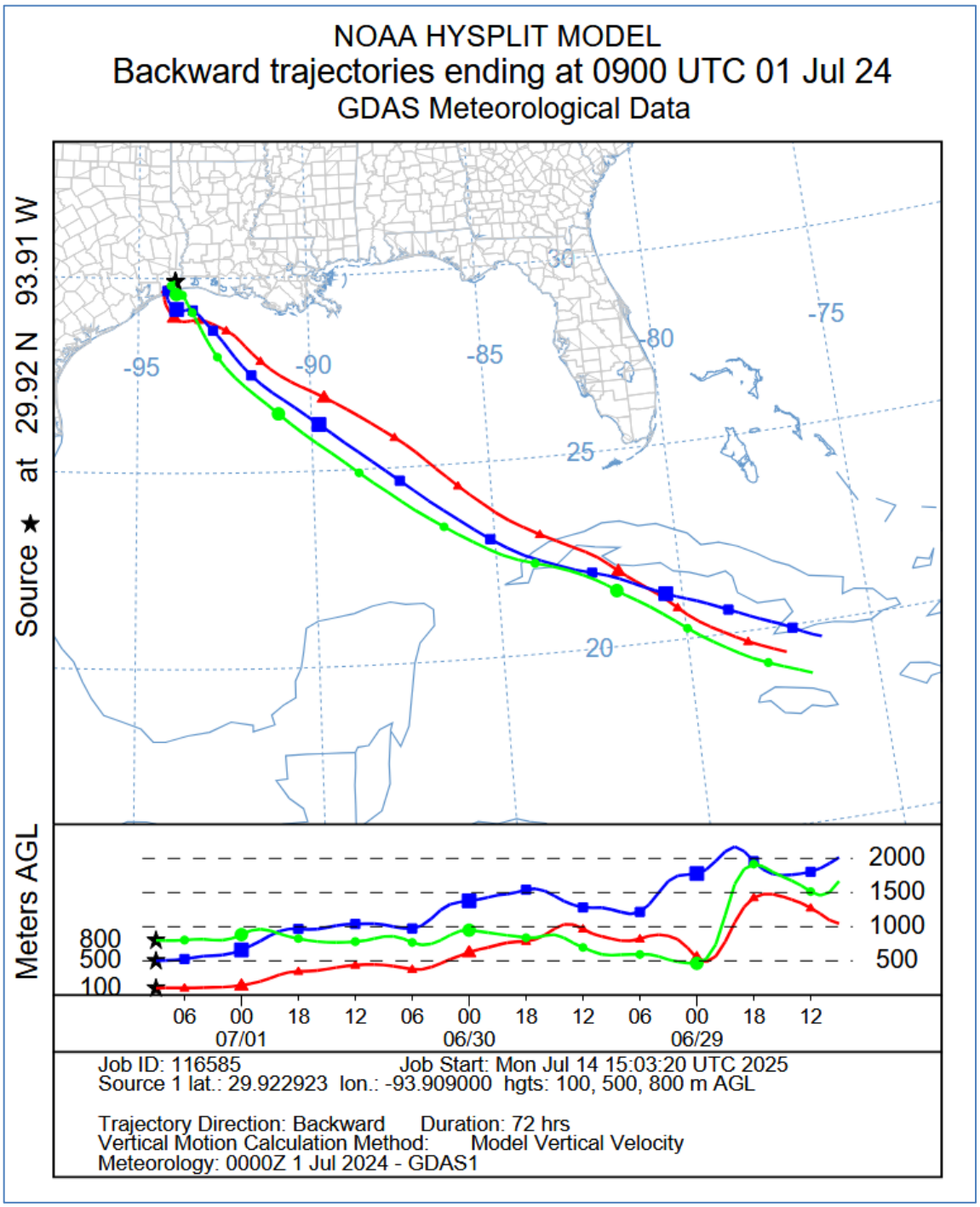

Figure 3-215: NOAA HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 1, 2024

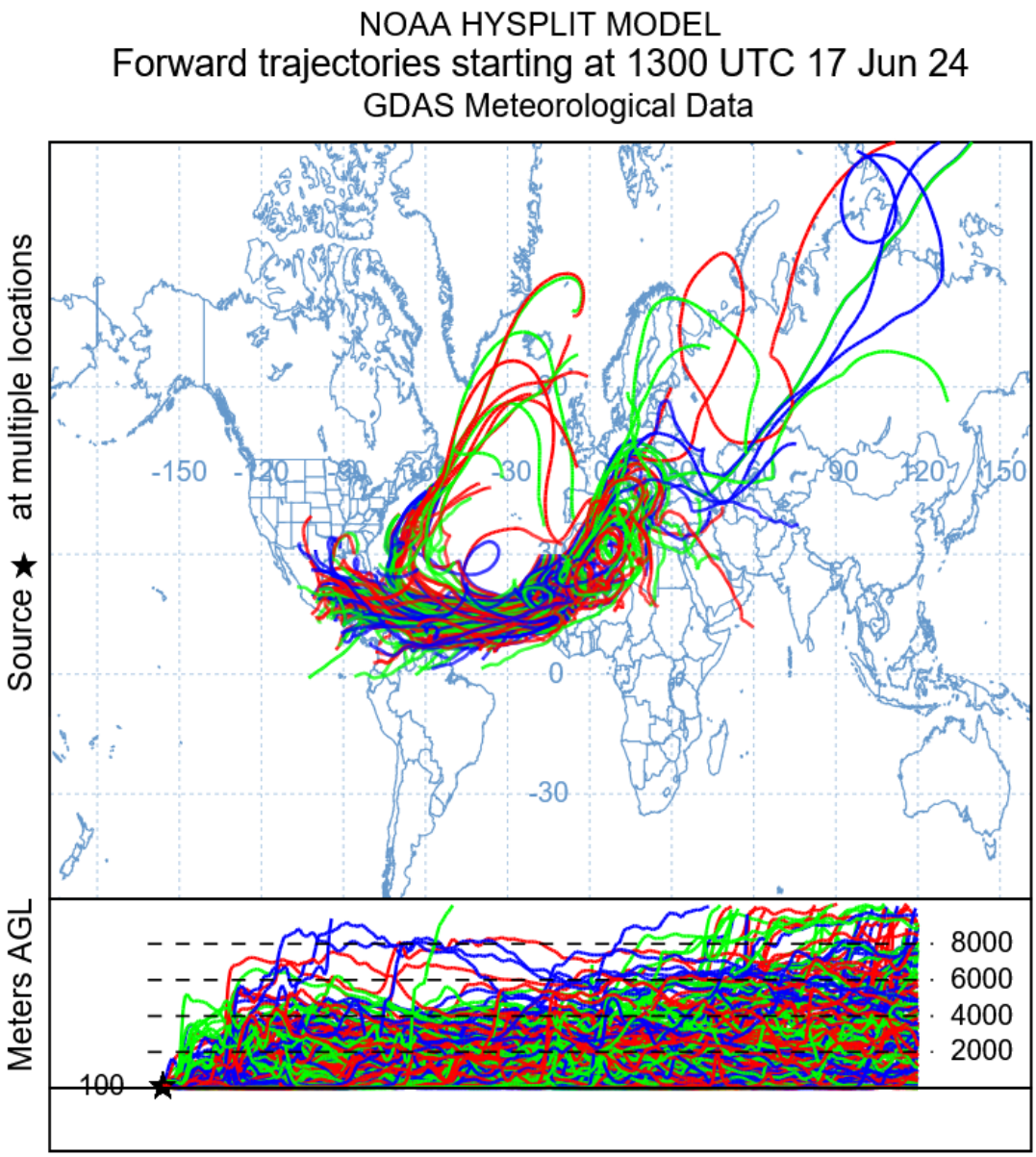

Figure 3-216: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on June 17, 2024

The TCEQ forecast for July 3, 2024 (Table C-21), referenced that an area of predominantly light density smoke was observed circulating around the southeast and portions of the Coastal Bend and southeast Gulf Coast of Texas. It further states that the edge of the Saharan dust plume that was initially expected earlier in the week could affect portions of the southern and southeast coast as a high-pressure center tracks farther eastward into the Gulf. Figure 3-217: *Hourly $PM_{2.5}$ Concentrations on July 3, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all but two hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-218: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua* Satellite Layers on July 3, 2024, is slightly incomplete but shows indications of aerosols in the Gulf of America and Texas, with a Moderate AQI in East Texas. Figure 3-219: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 3, 2024, Showing Haze in the Gulf of America* shows haze over the Gulf of America and the Texas coast. There is cloud cover obstructing the view of East Texas.

Figure 3-220: *NOAA HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 3, 2024*, shows trajectories traveling into the Gulf of America and then back north to the Port Arthur Memorial School monitor. Figure 3-221: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on June 19, 2024*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

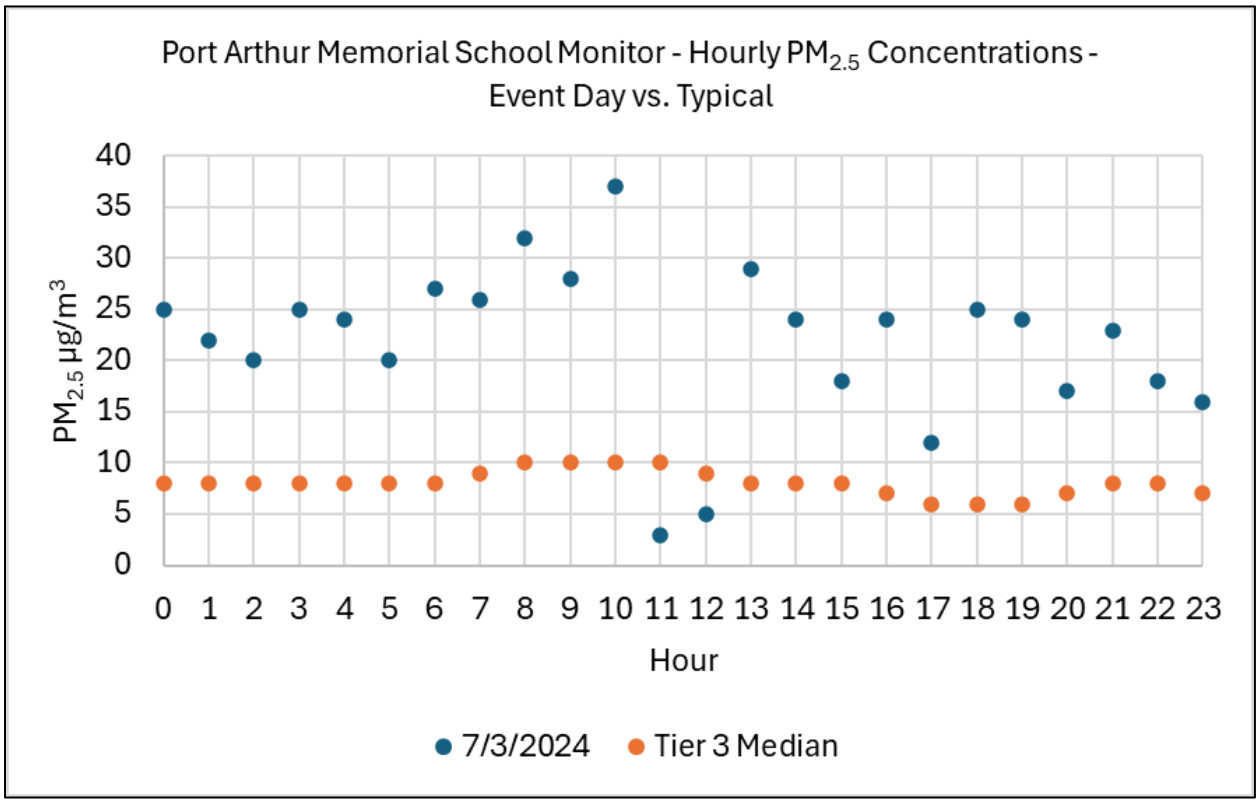

Figure 3-217: Hourly $PM_{2.5}$ Concentrations on July 3, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

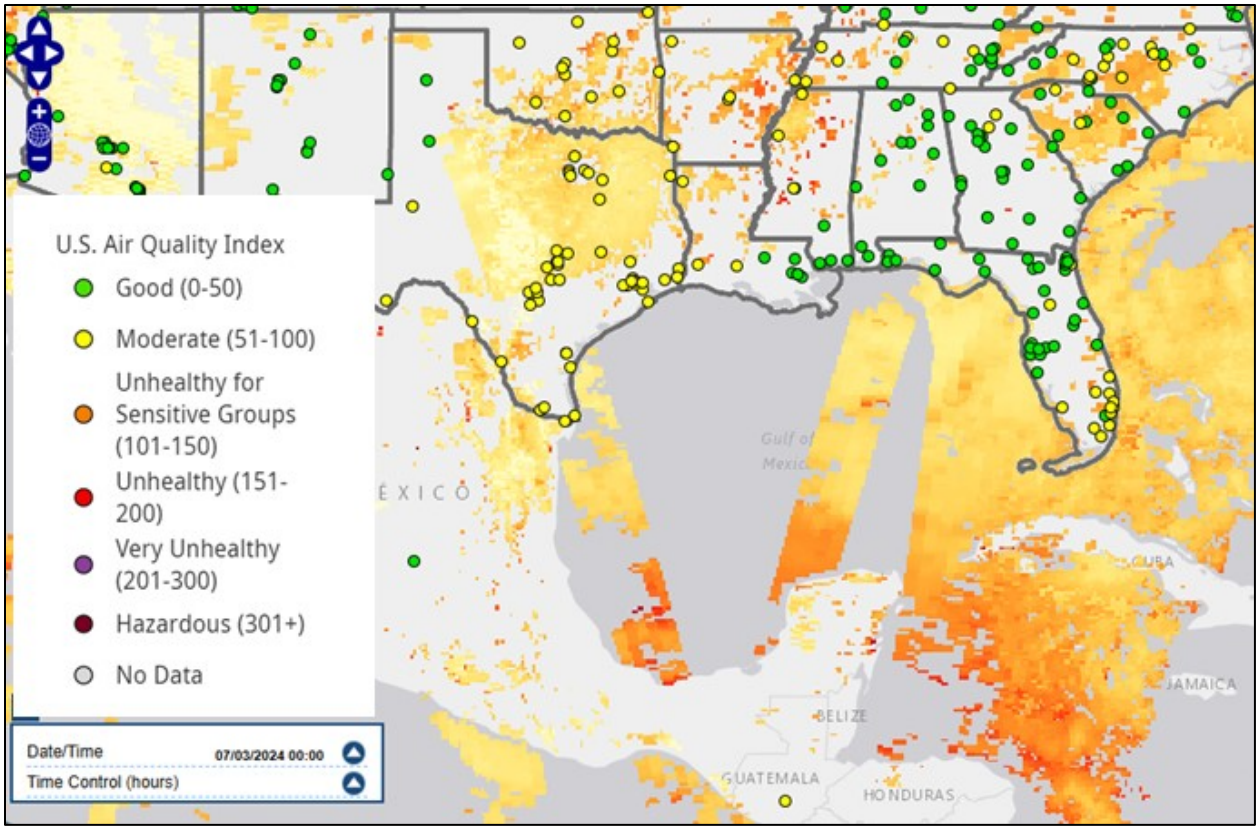

Figure 3-218: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 3, 2024

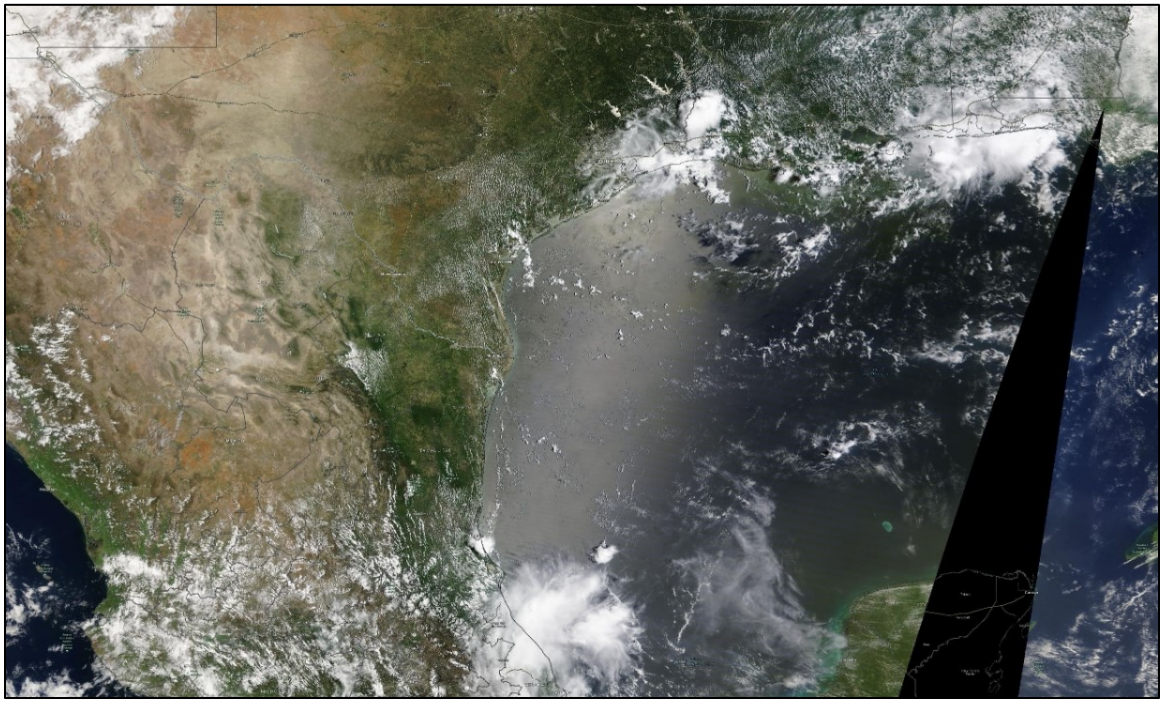

Figure 3-219: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 3, 2024, Showing Haze in the Gulf of America

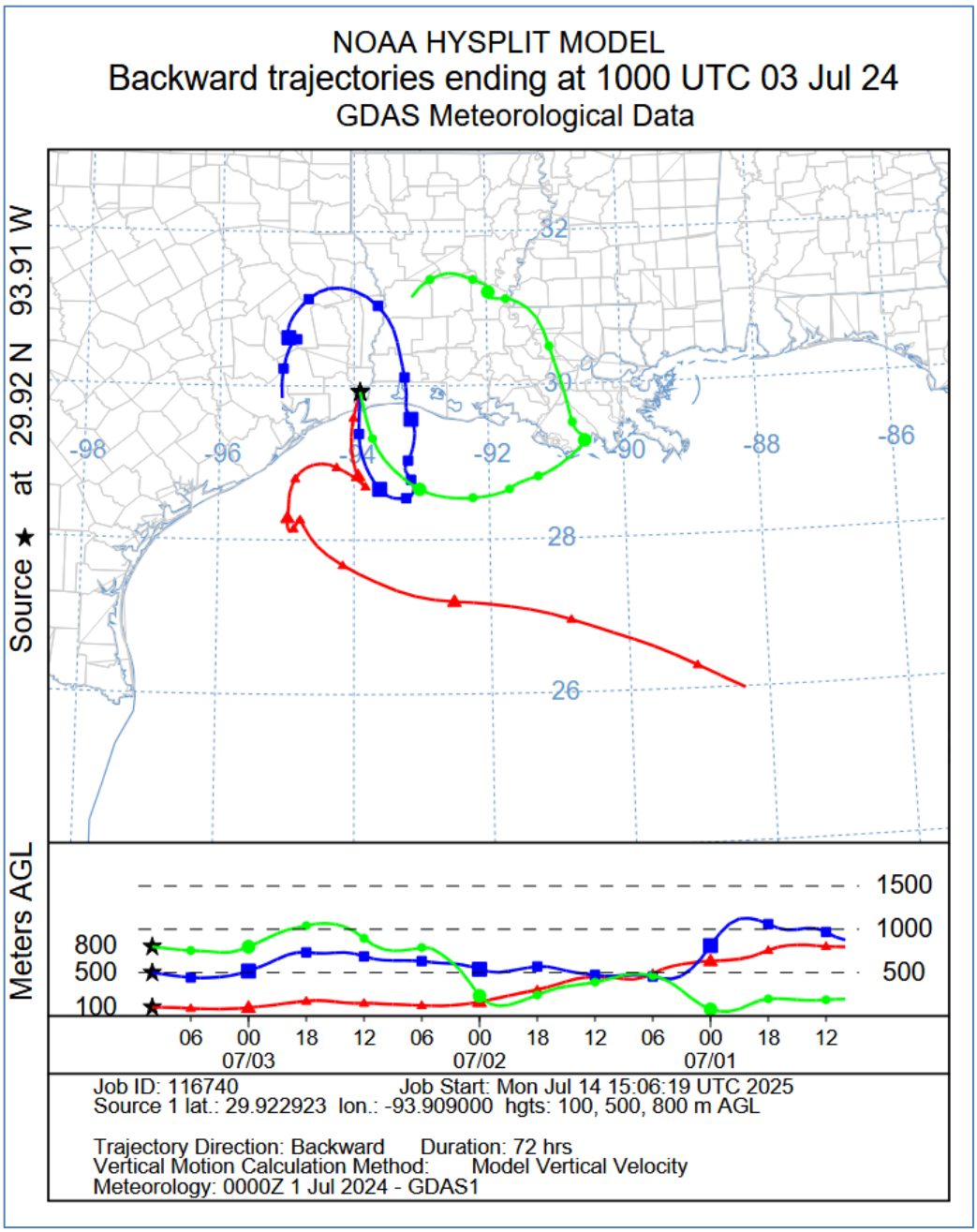

Figure 3-220: NOAA HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 3, 2024

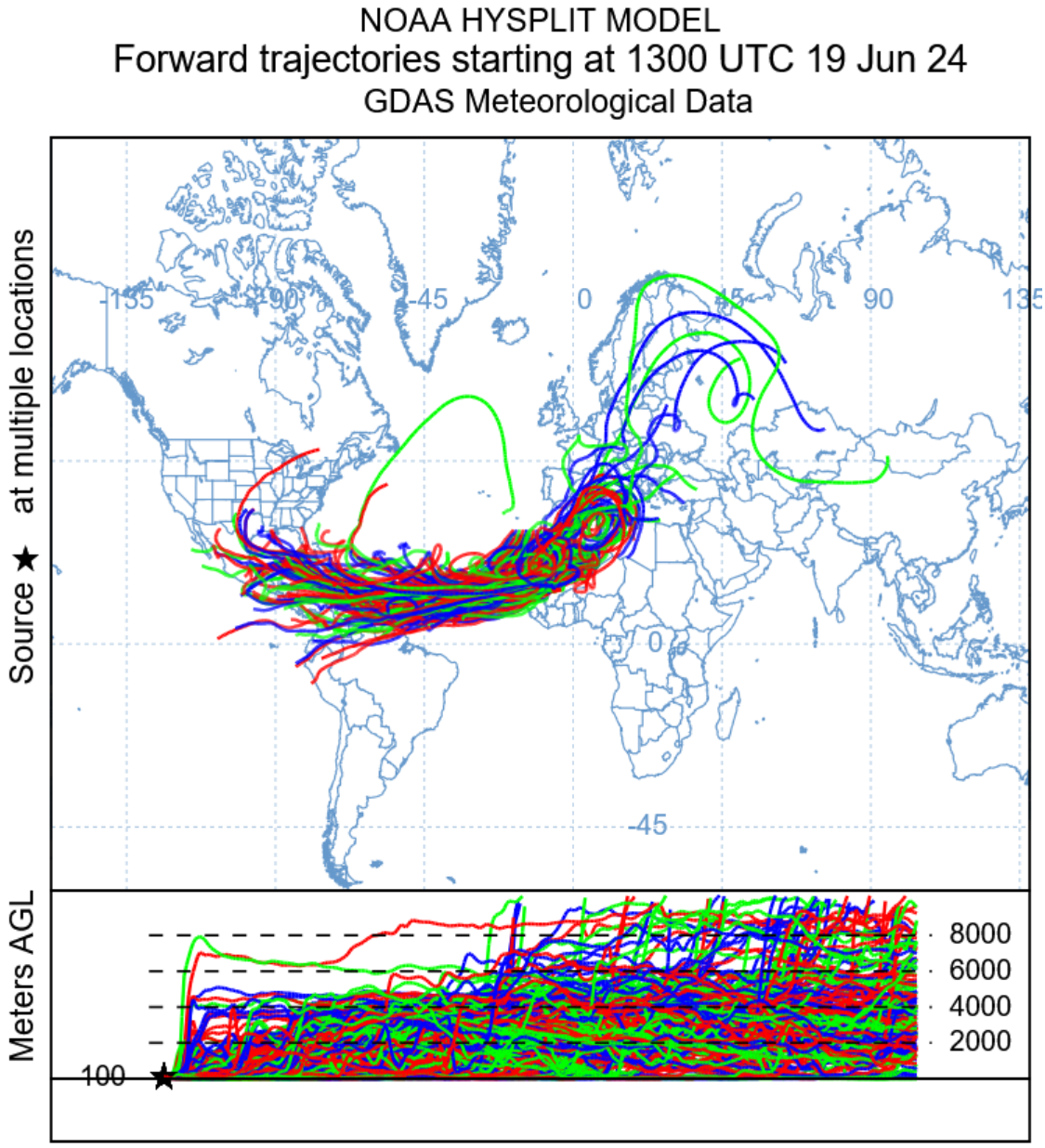

Figure 3-221: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on June 19, 2024

3.2.22 Group 22 – Evidence for July 6, 2024, Other –Weather $PM_{2.5}$ Event

July 6, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor, with a 24-hour $PM_{2.5}$ concentration of 19.4 The Port Arthur Memorial School monitor was affected by weather conditions resulting from the proximity of Tropical Storm Beryl on July 6, 2024.

The TCEQ forecast for July 6, 2024 (Table C-22), referenced that high relative humidity advecting from the Gulf maximized fine particulate formation near southeast coastal regions of the state. Media reports published on July 6, 2024 (Figure C-35 and Figure C-36), discuss the approach of Tropical Storm Beryl. Figure 3-222: *Hourly $PM_{2.5}$ Concentrations on July 6, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* that all but

three hourly $PM_{2.5}$ concentrations were greater than concentrations considered typical at this monitor. Figure 3-223: *AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 6, 2024*, is slightly incomplete but shows indications of aerosols in the Gulf of America and Texas, with a Moderate AQI in East Texas. Figure 3-224: *Aqua/Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 6, 2024, Showing Dust in the Atlantic, South Texas, and Gulf of America* shows dust along with cloudy conditions over the Atlantic, the Gulf of America and East Texas. Figure 3-225: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 6, 2024*, shows trajectories traveling from the Gulf of America prior to arrival at the Port Arthur Memorial School monitor.

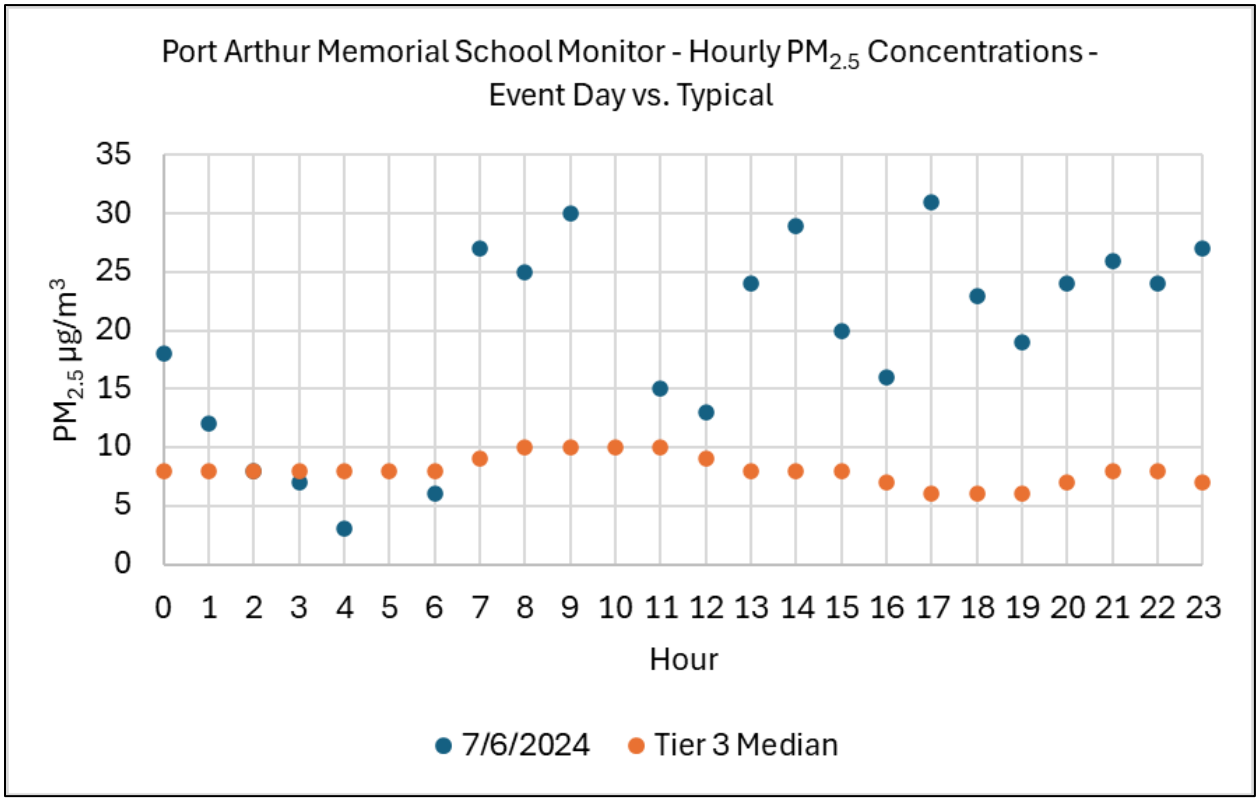

Figure 3-222: Hourly $PM_{2.5}$ Concentrations on July 6, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

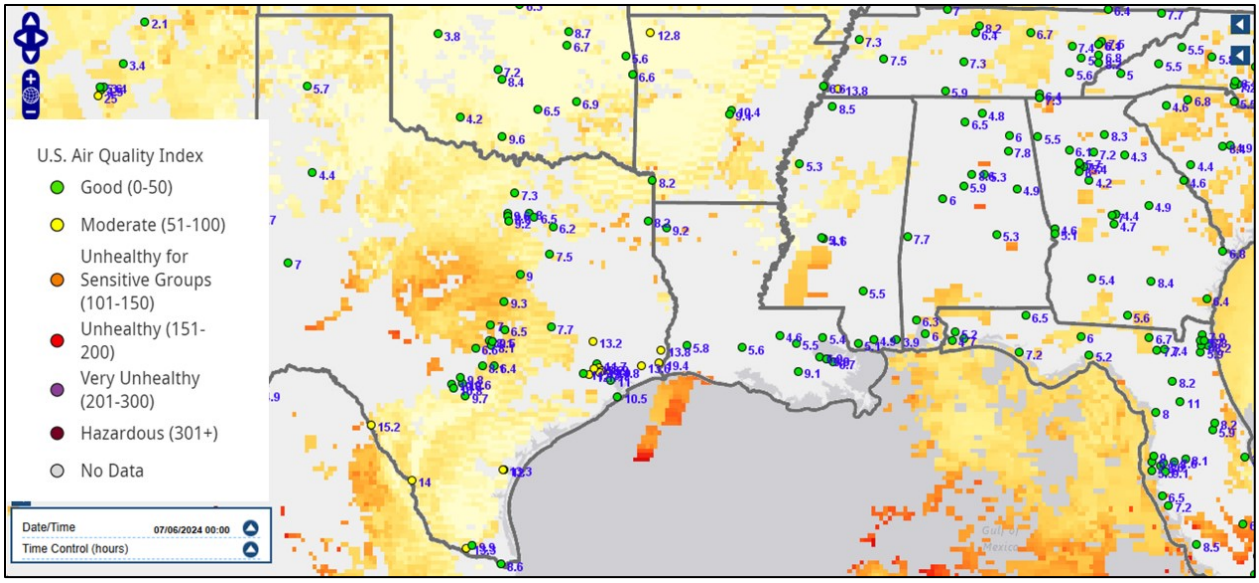

Figure 3-223: AirNow Tech Aerosol Optical Depth (AOD) Map, with MODIS Terra and Aqua Satellite Layers on July 6, 2024

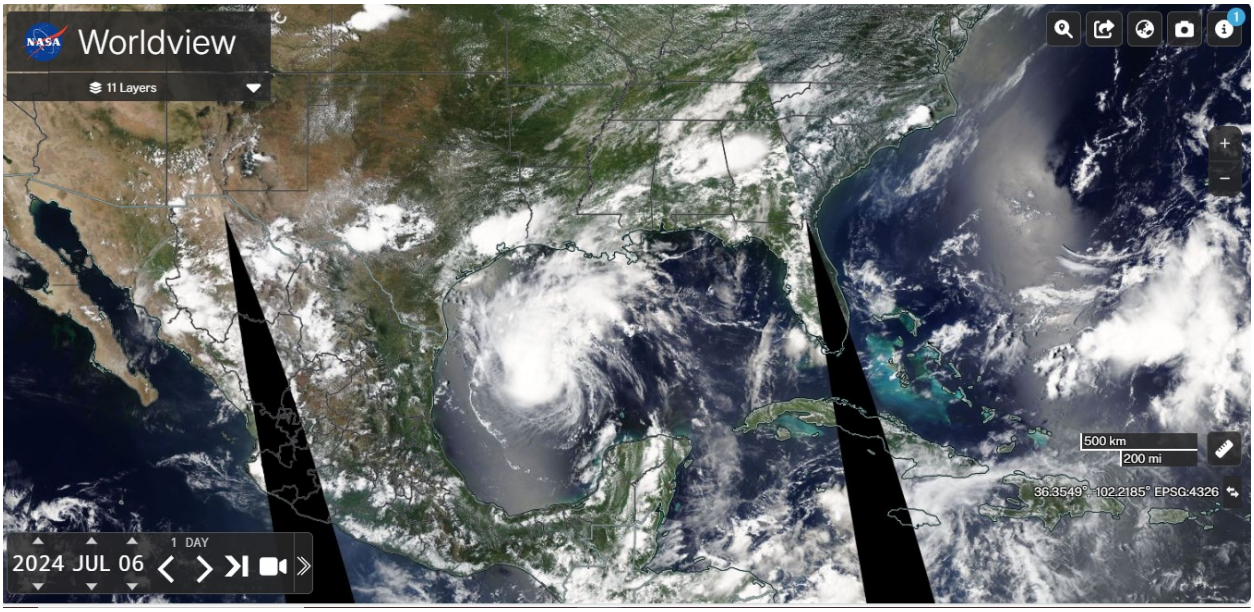

Figure 3-224: Aqua/Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 6, 2024, Showing Dust in the Atlantic, South Texas, and Gulf of America

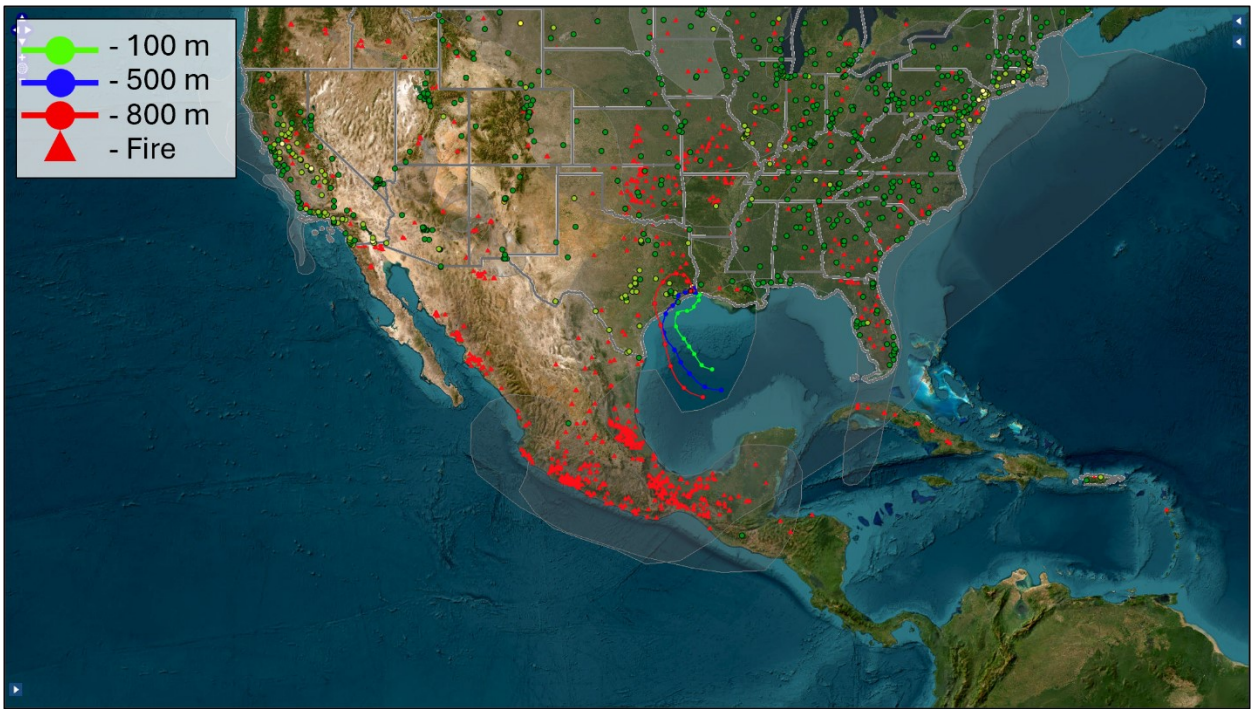

Figure 3-225: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 6, 2024

3.2.23 Group 23 - Evidence for July 30, 2024, and July 31, 2024, and August 1, 2024, African Dust $PM_{2.5}$ Event

July 30, 2024, and August 1, 2024, were identified as Tier 2 days at the Port Arthur Memorial School monitor, with 24-hour $PM_{2.5}$ concentrations of 24.2 µg/m^3 and 22.2 µg/m^3, respectively. July 31, 2024, was identified as a Tier 1 day with a 24-hour $PM_{2.5}$ concentrations of 32.4 µg/m^3. These elevated concentrations were a result of African dust.

The TCEQ forecast for July 30, 2024 (Table C-23), references that moderate Saharan dust was filtered throughout the state (excluding the panhandle and far West Texas), with the heaviest concentrations along the coast. Figure 3-226: *Hourly $PM_{2.5}$ Concentrations on July 30, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-227: *Aerosol optical depth map from Terra and Aqua / MODIS on July 30, 2024*, is incomplete but shows readings of aerosols in the Gulf of America with a Moderate AQI in East Texas. Figure 3-228: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 30, 2024, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and into East Texas. Figure 3-229: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 30, 2024*, shows movement of air from the Caribbean, into the Gulf of America, and ultimately to the Texas coastline. This path would travel through African dust over the Gulf of America prior to arrival at the Port Arthur Memorial School monitor. Figure 3-230: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on July 16, 2024*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and east Texas.

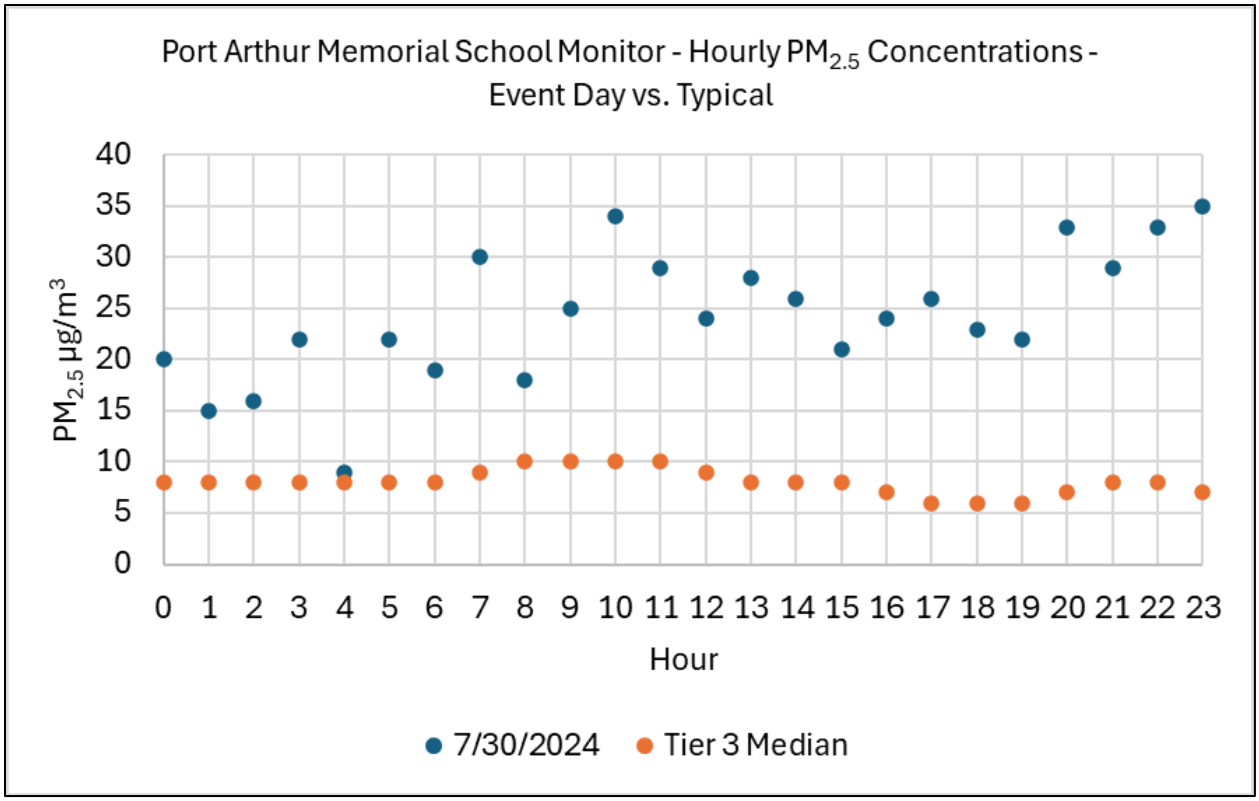

Figure 3-226: Hourly $PM_{2.5}$ Concentrations on July 30, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

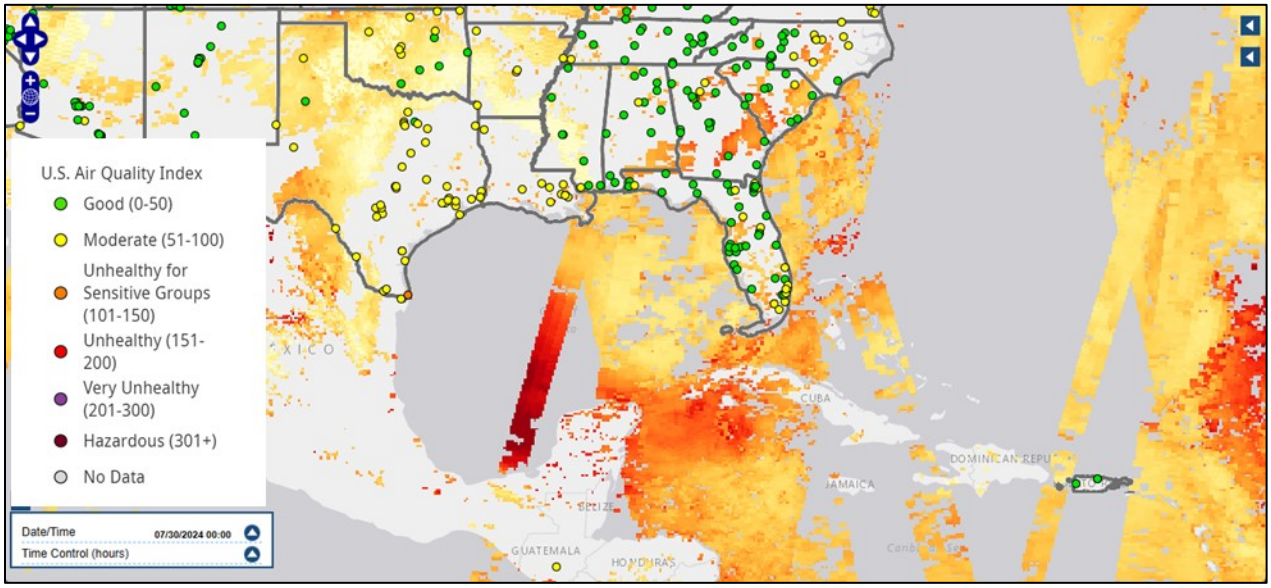

Figure 3-227: Aerosol optical depth map from Terra and Aqua / MODIS on July 30, 2024

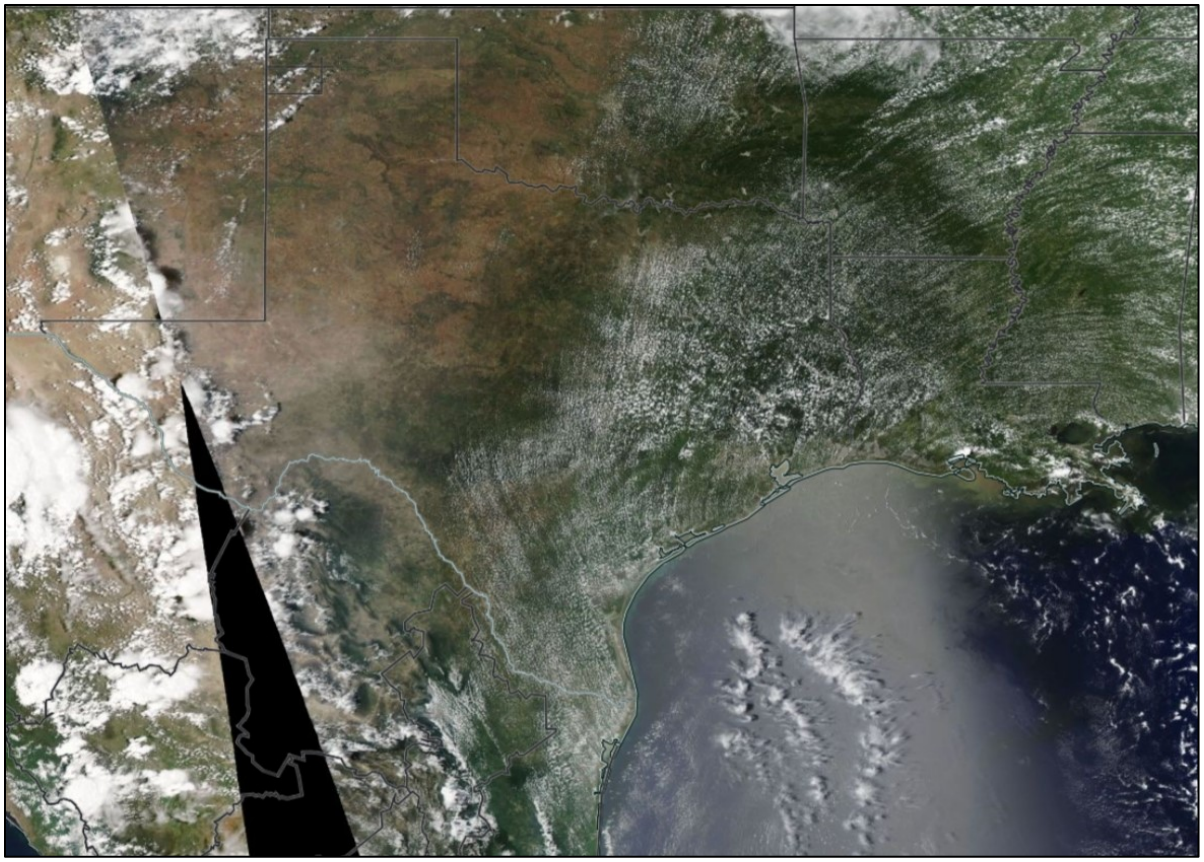

Figure 3-228: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 30, 2024, Showing Haze in the Gulf of America

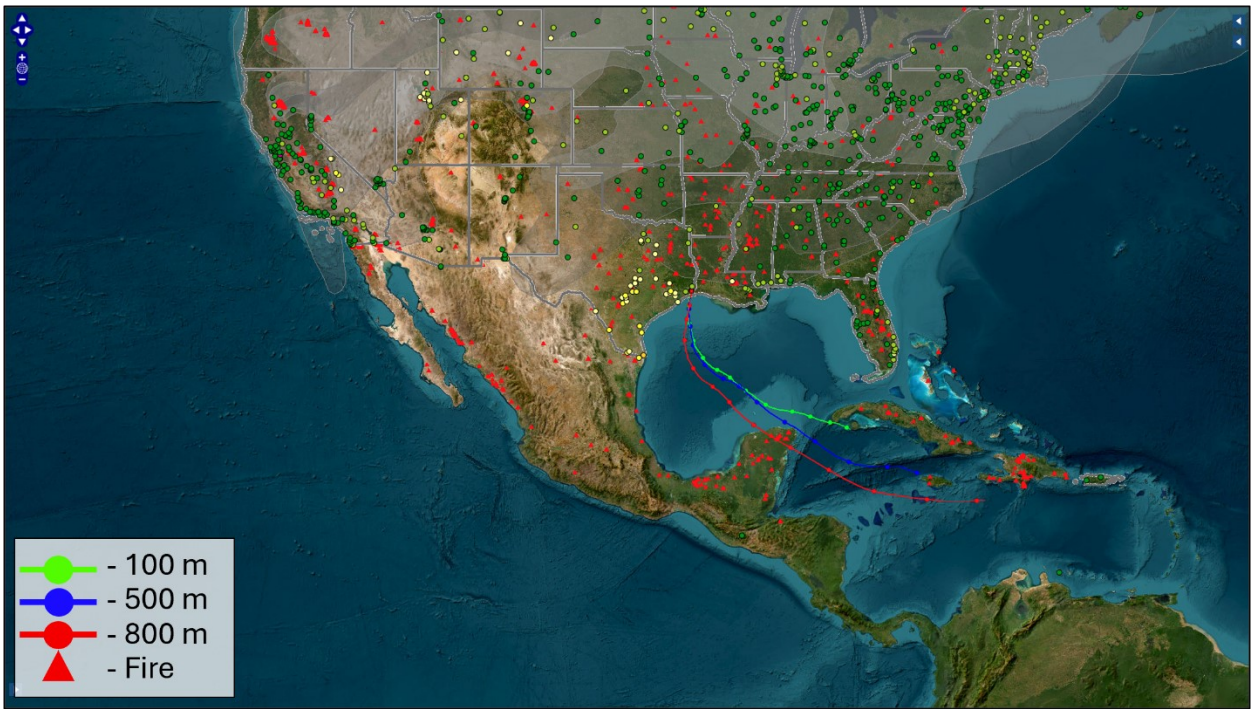

Figure 3-229: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 30, 2024

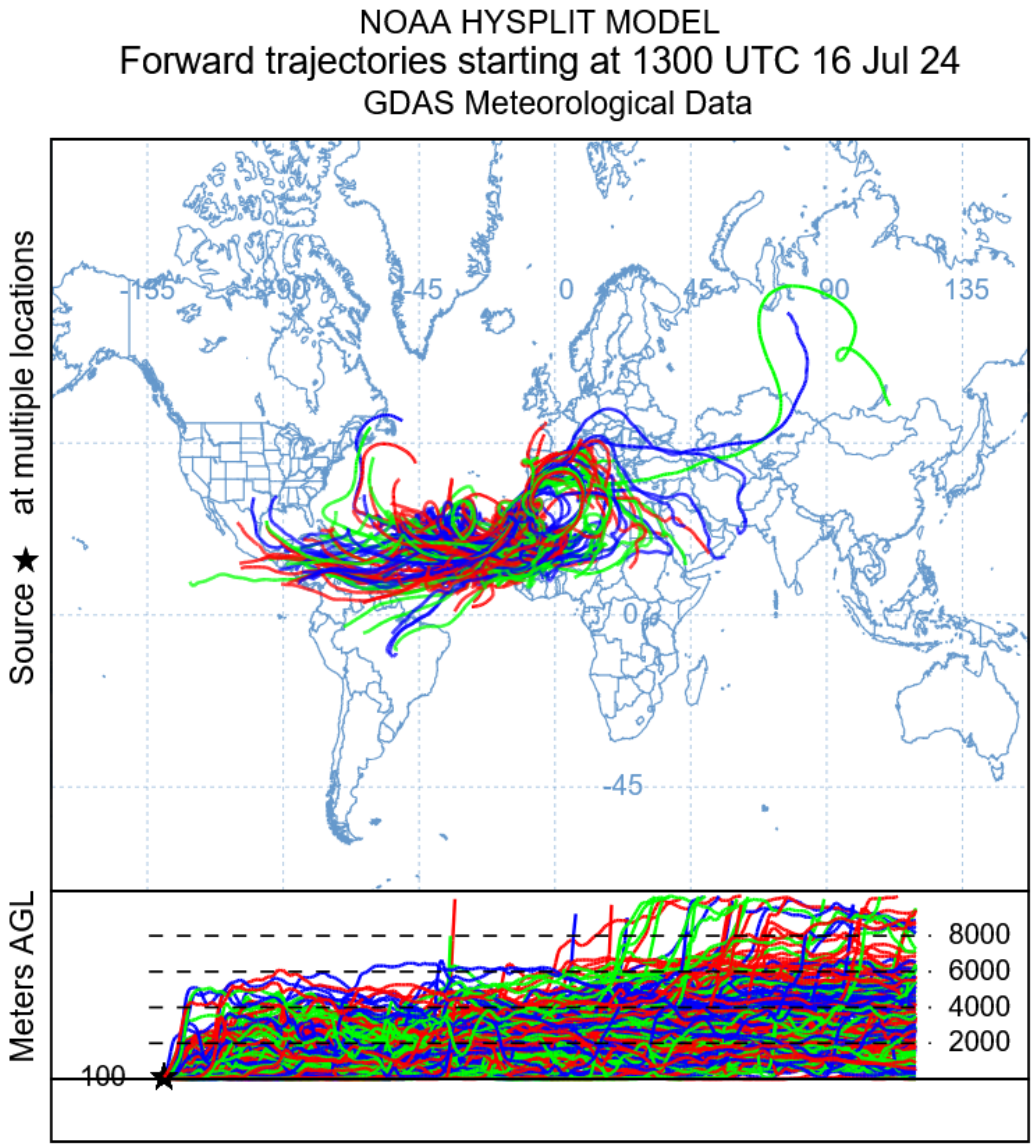

Figure 3-230: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 16, 2024

The TCEQ forecast for July 31, 2024 (Table C-23), references that the higher density portion of the Saharan dust plume had begun to move onshore along the southern and southeast coast of Texas and was forecast to gradually advect farther north and west into the state, with significantly increased impacts becoming more ubiquitous, particularly in the eastern half of Texas. Three media reports (Figure C-37, Figure C-38, and Figure C-39) published on July 30, 2024, reference the presence of African dust in Texas. Figure 3-231: *Hourly $PM_{2.5}$ Concentrations on July 31, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were at least 10 µg/m³ higher than those classified as typical at this monitor. Figure 3-232: *Aerosol optical depth map from Terra and Aqua / MODIS on July 31, 2024*, is incomplete but shows high readings of aerosols in the Gulf of America with a Moderate AQI in East Texas. Figure 3-233: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 31, 2024, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and east Texas. Figure 3-234: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 30, 2024*, shows movement of air from the Caribbean, into the Gulf of America, and

ultimately to the Texas coastline. This path would travel through African dust over the Gulf of America prior to arrival at the Port Arthur Memorial School monitor.

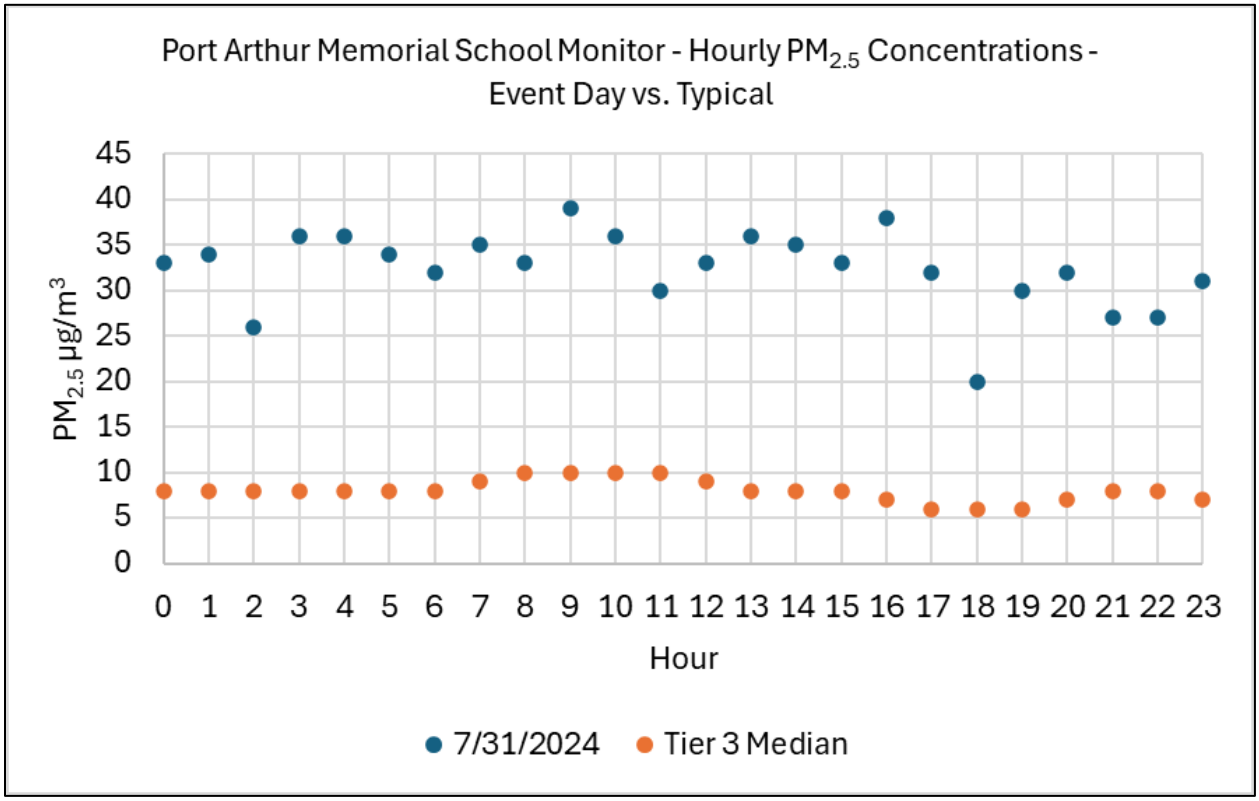

Figure 3-231: Hourly $PM_{2.5}$ Concentrations on July 31, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

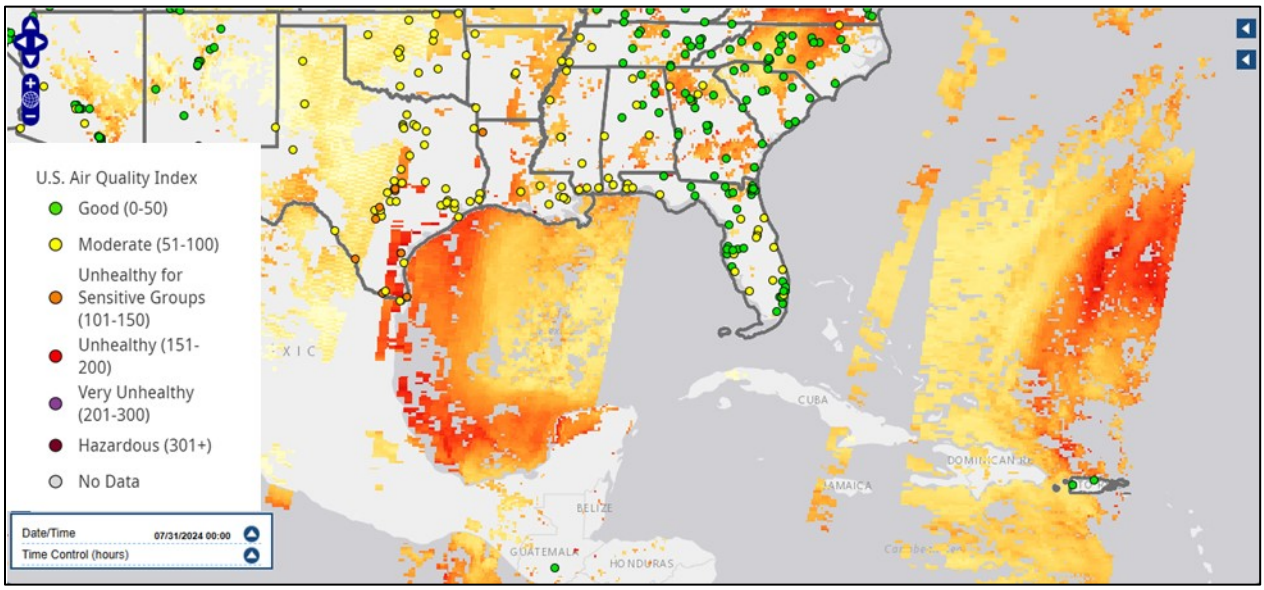

Figure 3-232: Aerosol optical depth map from Terra and Aqua / MODIS on July 31, 2024

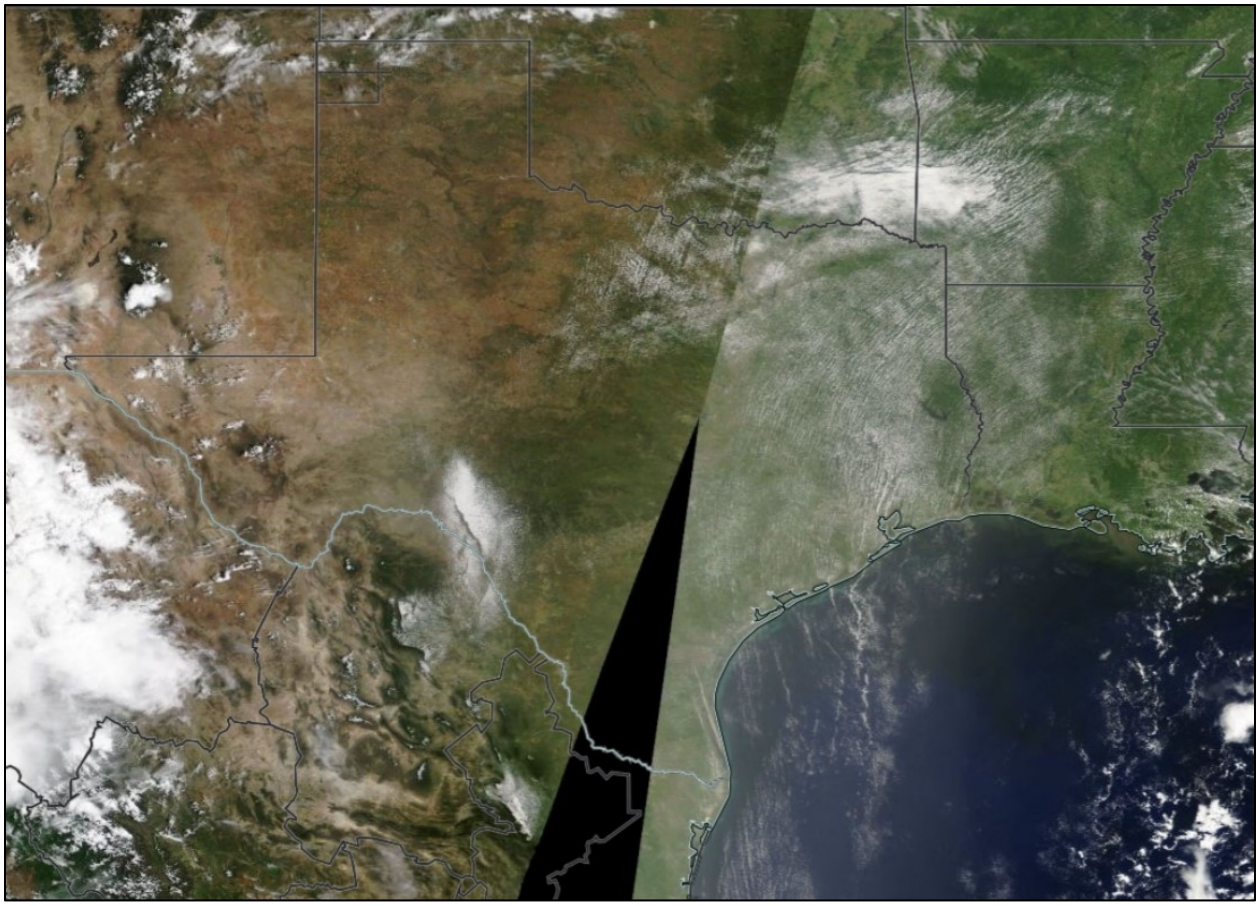

Figure 3-233: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from July 31, 2024, Showing Haze in the Gulf of America

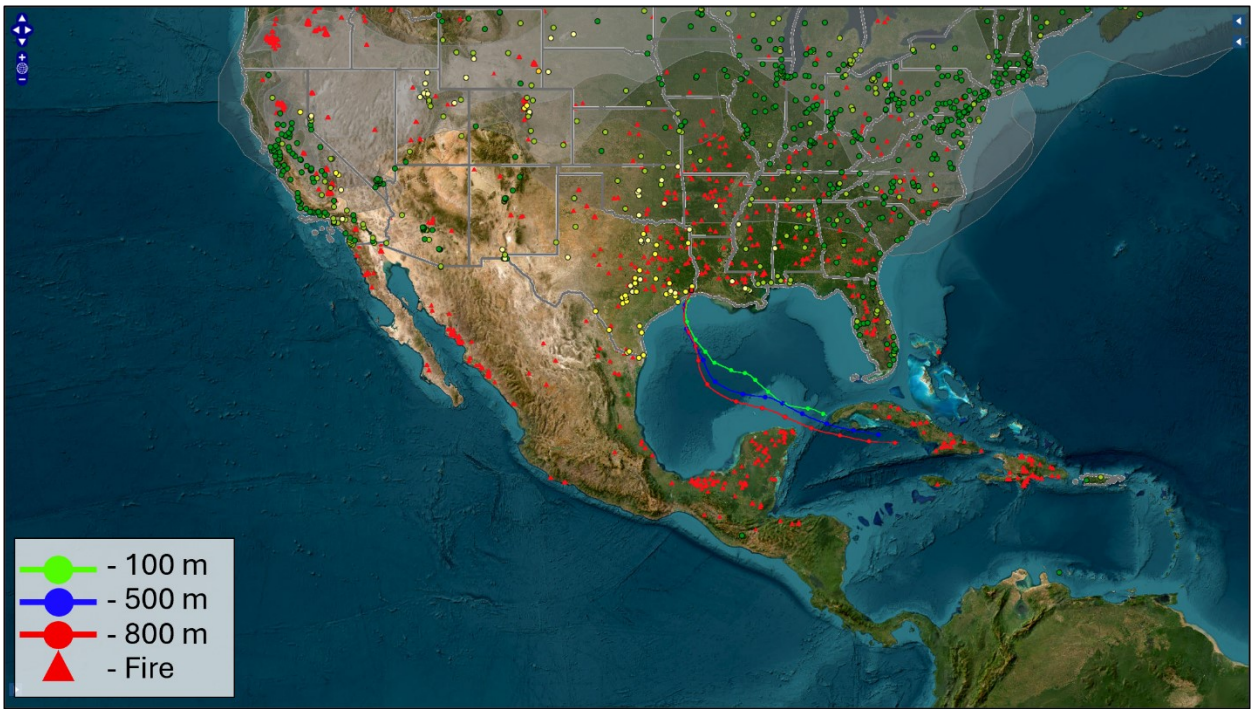

Figure 3-234: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on July 31, 2024

The TCEQ forecast for August 1, 2024 (Table C-23), references that the plume of Saharan dust would likely be affecting a majority of Texas by Thursday (August 1, 2024) with most regions experiencing noticeable impacts on fine particulate concentrations. While hazy skies were expected to persist, weather model guidance suggested that fine particulate levels would decrease and make for somewhat better air quality compared to Wednesday (July 31, 2024). Figure 3-235: *Hourly $PM_{2.5}$ Concentrations on August 1, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor* shows that all but one hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-236: *Aerosol optical depth map from Terra and Aqua / MODIS on August 1, 2024*, is incomplete but shows high readings of aerosols in East Texas and a strip of high readings in the Gulf of America, with a Moderate AQI in East Texas. Figure 3-237: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 1, 2024, Showing Haze in the Gulf of America* shows hazy conditions over the Gulf of America and East Texas. Figure 3-238: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 1, 2024*, shows movement of air from the Gulf of America, and ultimately to the Texas coastline. This path would travel through African dust over the Gulf of America. Figure 3-239: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on July 18, 2024*, shows that winds primarily traveled across the Atlantic Ocean with select trajectories traveling into the Gulf of America and East Texas.

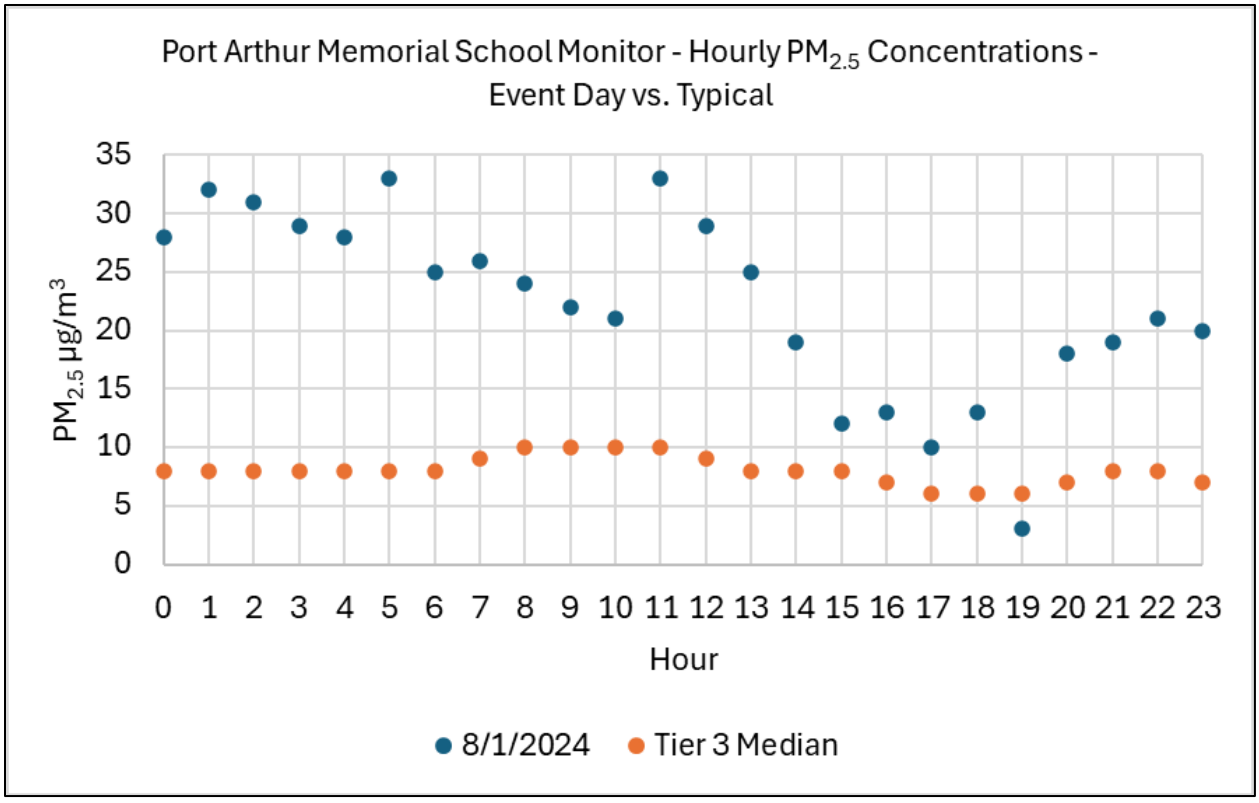

Figure 3-235: Hourly $PM_{2.5}$ Concentrations on August 1, 2024, compared to typical concentrations at the Port Arthur Memorial School Monitor

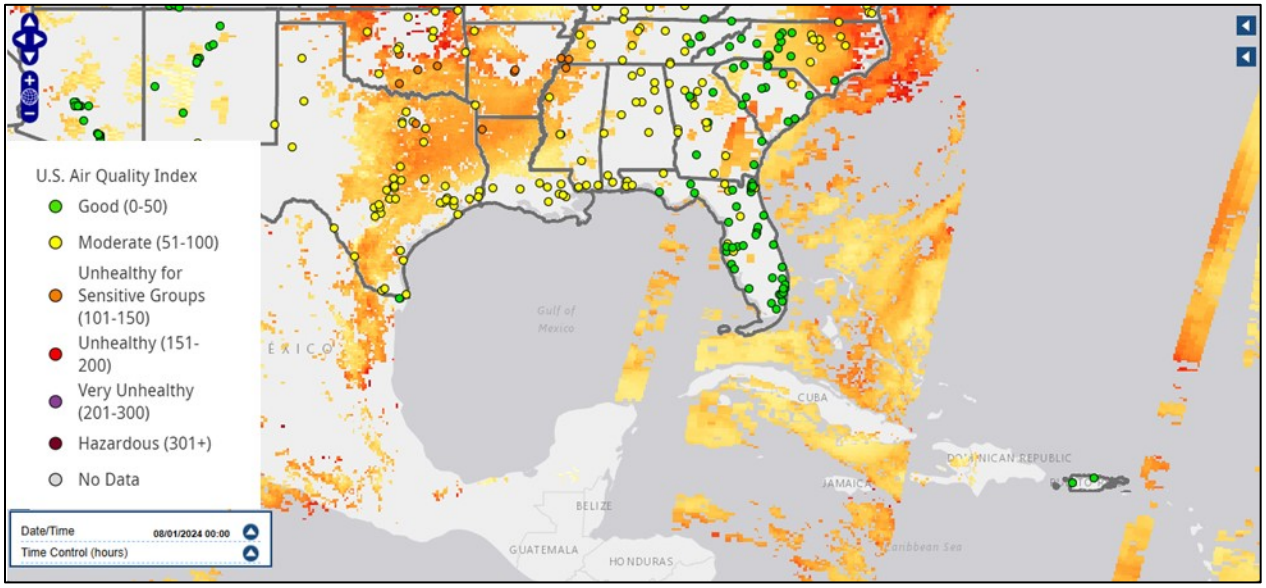

Figure 3-236: Aerosol optical depth map from Terra and Aqua / MODIS on August 1, 2024

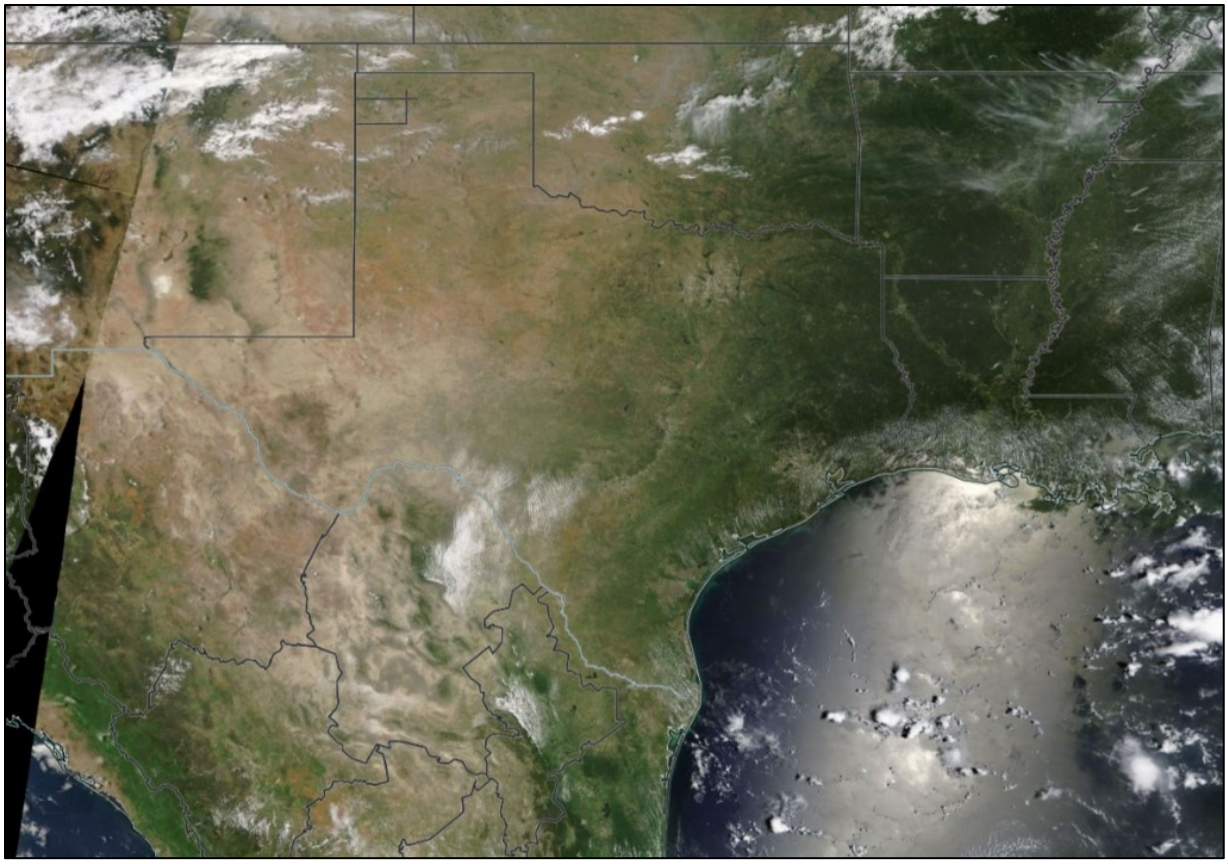

Figure 3-237: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 1, 2024, Showing Haze in the Gulf of America

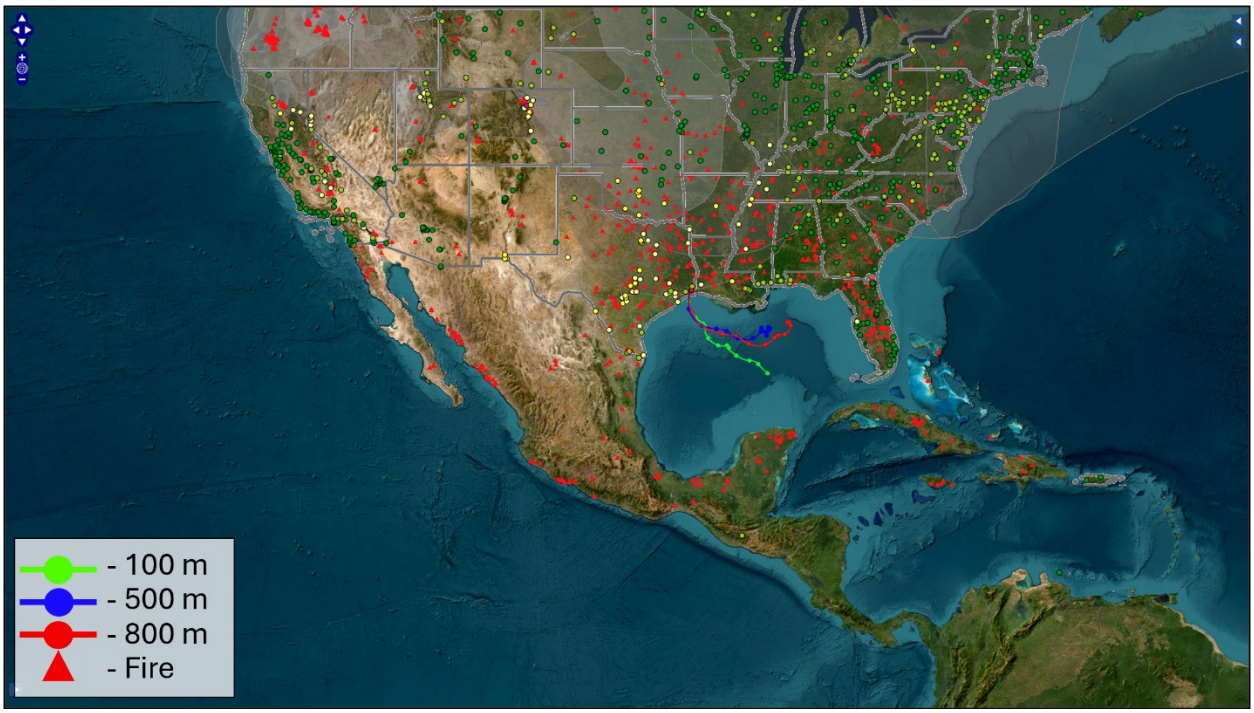

Figure 3-238: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 1, 2024

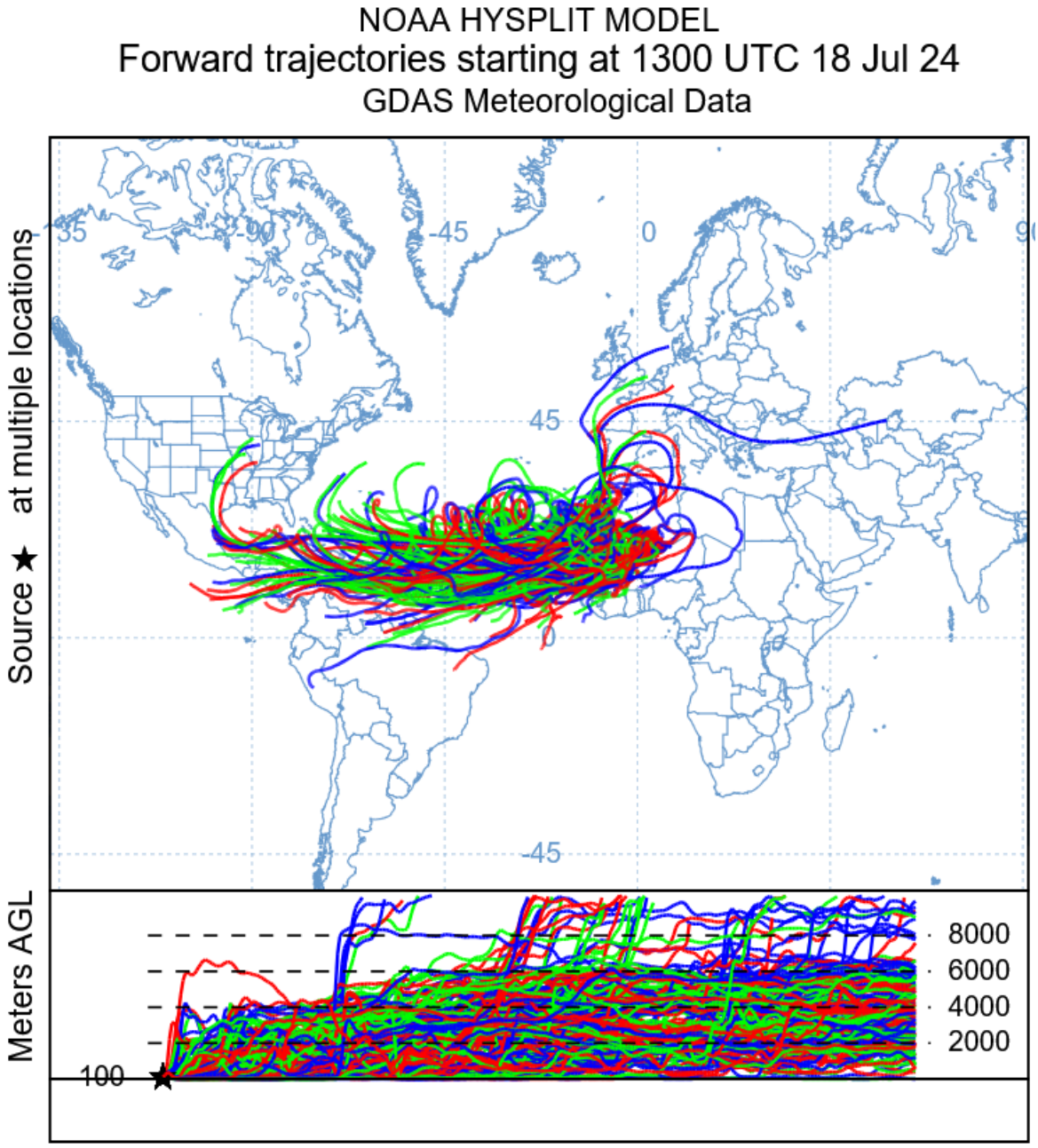

Figure 3-239: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on July 18, 2024

3.2.24 Group 24 – Evidence for August 6, 2024, and August 21, 2024, Wildfire-U.S. $PM_{2.5}$ Event

August 6, 2024, and August 21, 2024, were identified as a Tier 2 days at the Port Arthur Memorial School monitor with 24-hour $PM_{2.5}$ concentrations of 20.8 µg/m^3 and 20.0 µg/m^3, respectively. These elevated $PM_{2.5}$ concentrations were primarily caused by smoke from fires that originated in the U.S.

The TCEQ forecast for August 6, 2024 (Table C-24), references that light density smoke from wildfire activity in the U.S. and Canada would linger in the state, alongside residual Saharan

dust plumes focused over the coastal region. Figure 3-240: *Hourly $PM_{2.5}$ Concentrations on August 6, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-241: *AirNow HMS Smoke Plume for August 6, 2024*, shows a smoke plume over East Texas, with a Moderate AQI in East Texas. Figure 3-242: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 6, 2024, Showing Haze in the Gulf of America* shows an indication of hazy conditions over the Gulf of America and East Texas. Figure 3-243: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 6, 2024* shows movement of air from Mississippi and the Mississippi River Valley in a southwesterly direction through areas with fires prior to reaching the Port Arthur Memorial School monitor. Figure 3-244: *NOAA HYSPLIT 14-Day Trajectories Originating from the Saharan Desert, Starting on August 3, 2024*, shows how winds traveled from known fire or smoke areas to the Port Arthur Memorial School monitor.

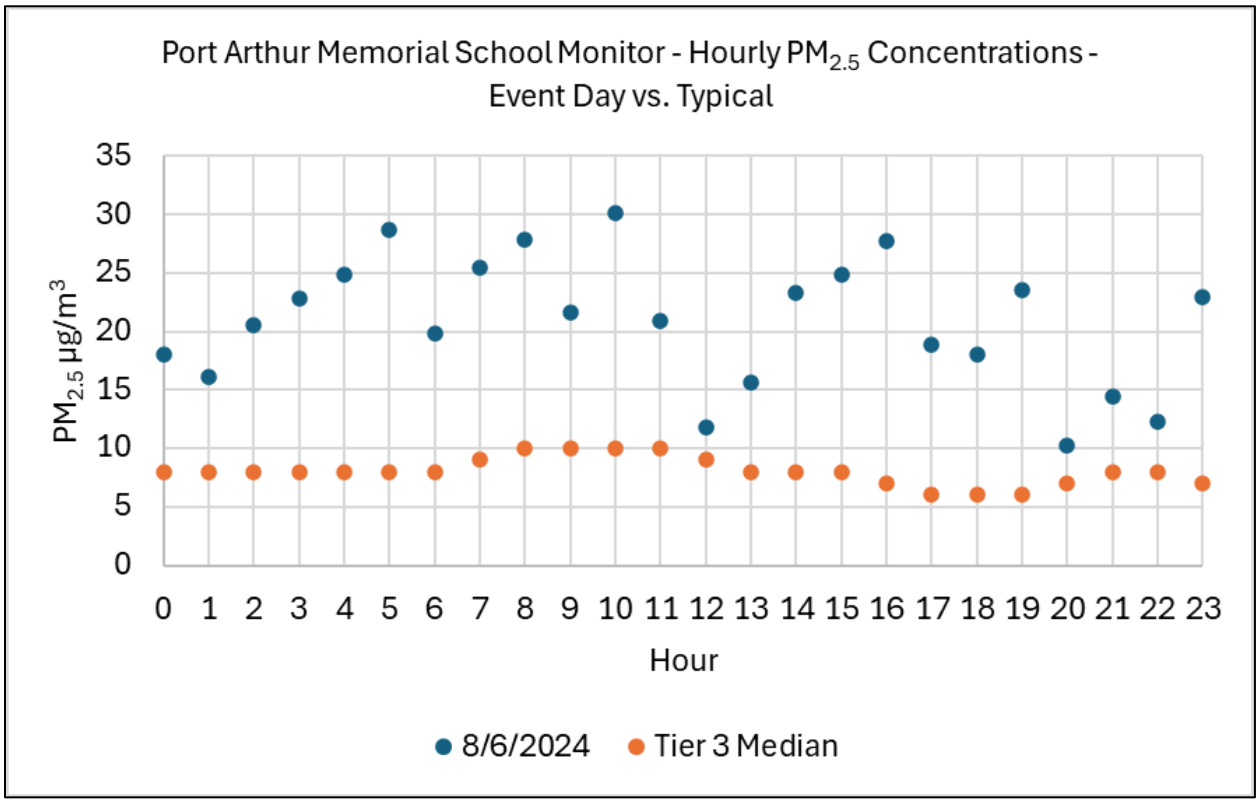

Figure 3-240: Hourly $PM_{2.5}$ Concentrations on August 6, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

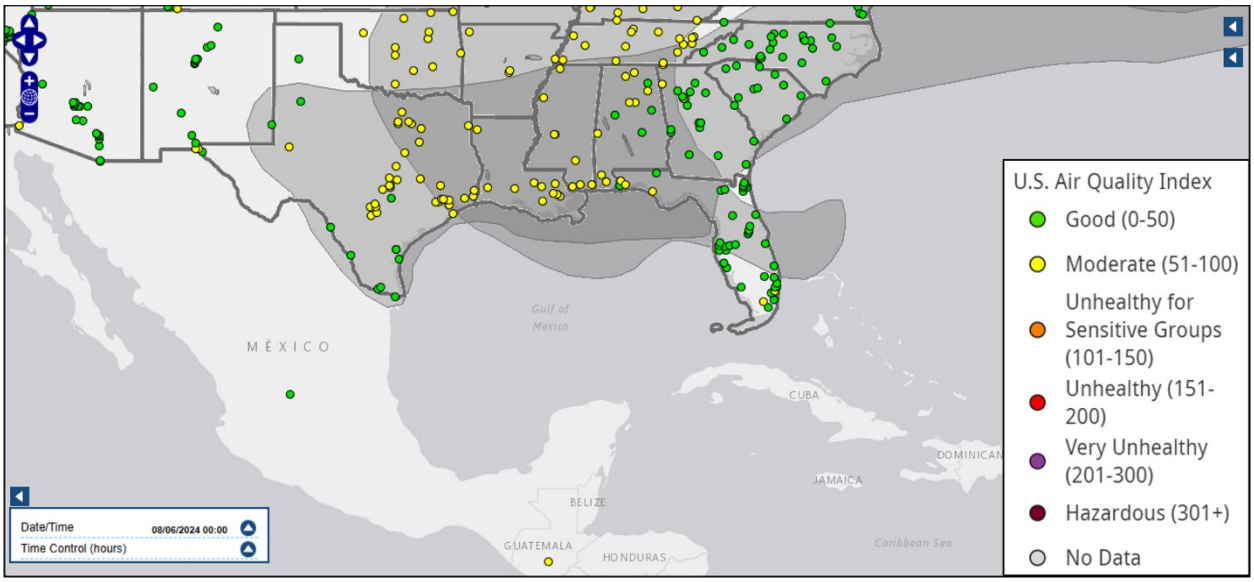

Figure 3-241: AirNow HMS Smoke Plume for August 6, 2024

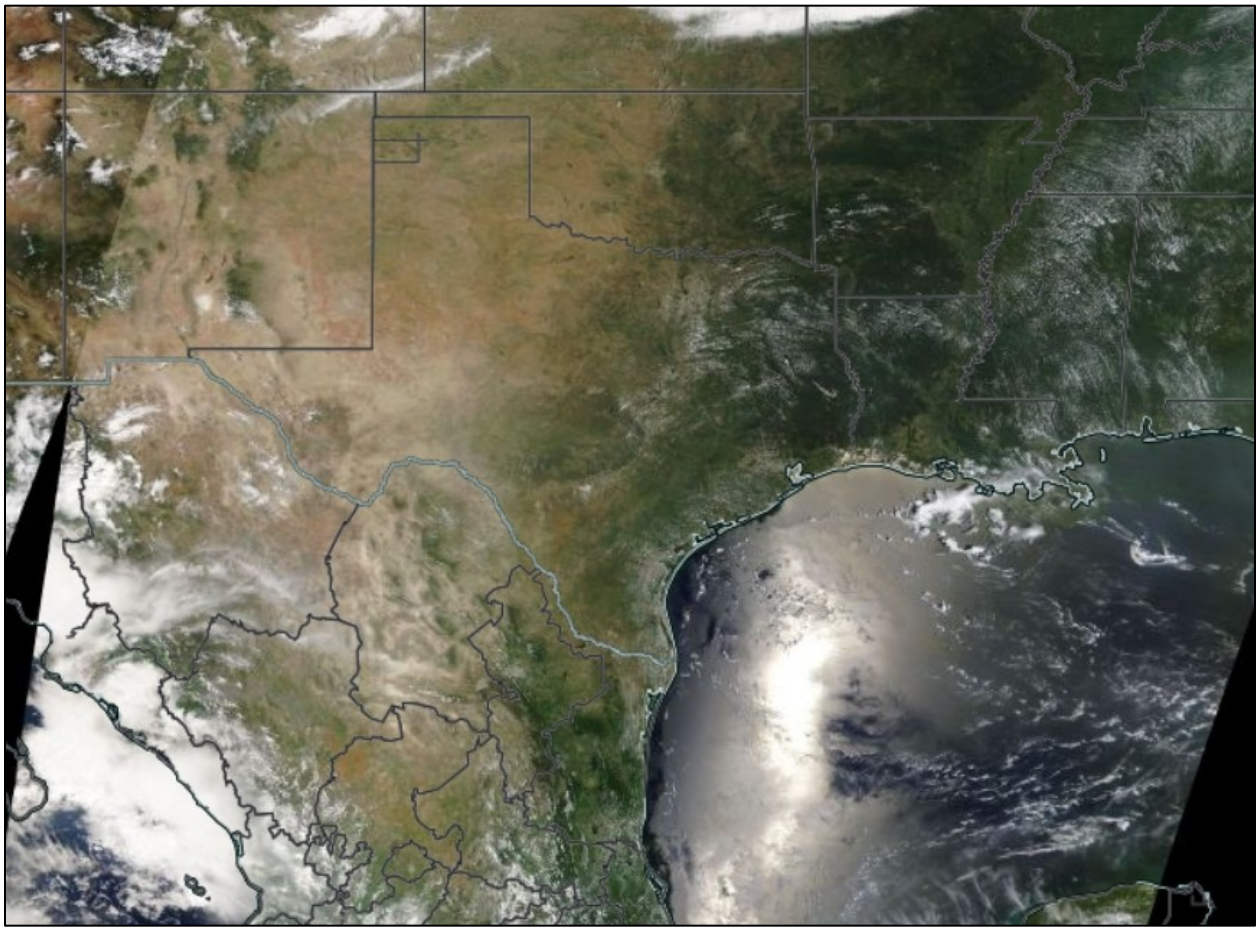

Figure 3-242: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 6, 2024, Showing Haze in the Gulf of America

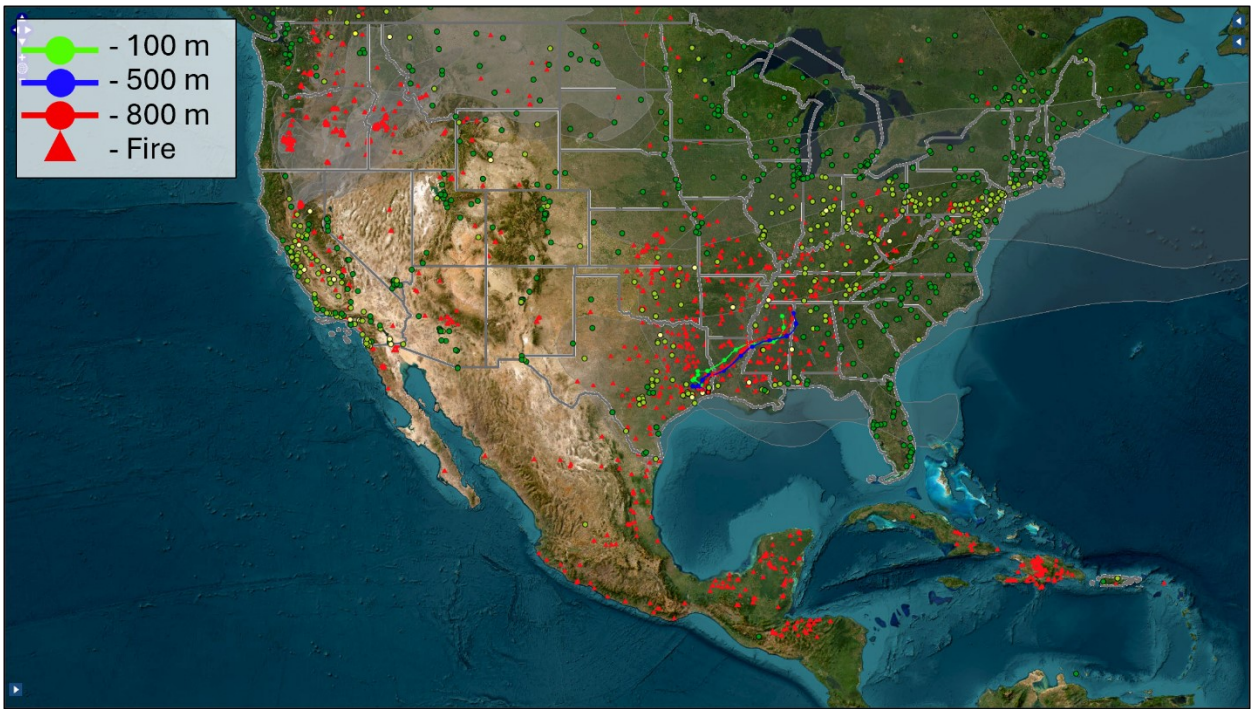

Figure 3-243: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 6, 2024

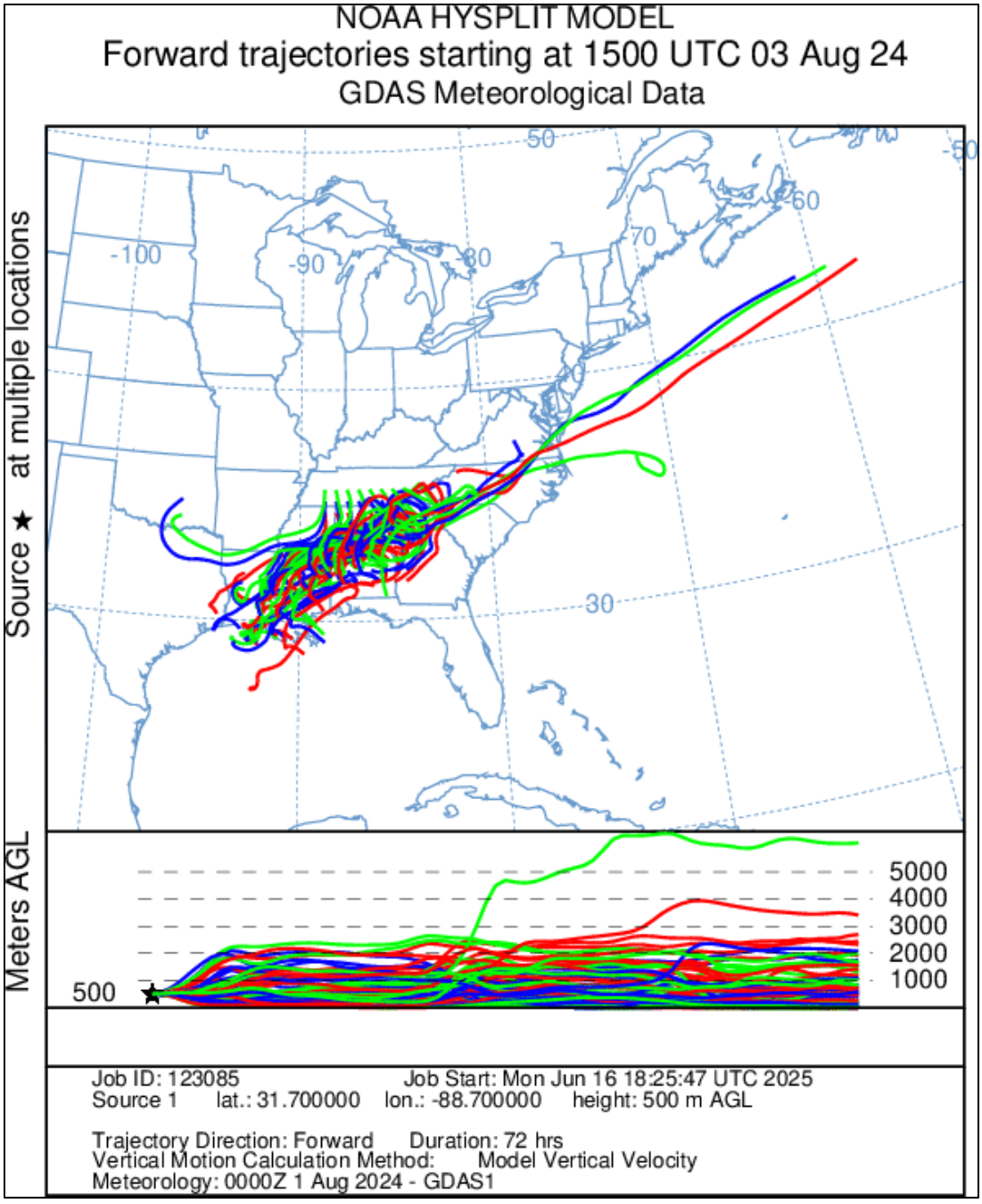

Figure 3-244: NOAA HYSPLIT 14-Day Forward Trajectories Originating from the Saharan Desert, Starting on August 3, 2024

The TCEQ forecast for August 21, 2024 (Table C-24), references that lingering and incoming moderate to light density smoke from wildfire activity in the southeastern U.S. filtered into the majority of the state. It also stated that light morning relative humidity was likely to increase $PM_{2.5}$ measurements across the eastern side of the state. Figure 3-245: *Hourly $PM_{2.5}$ Concentrations on August 21, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-246: *AirNow HMS Smoke Plume for August 21, 2024,* shows a smoke plume over East Texas, with a Moderate AQI in East Texas. Figure 3-247:

Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 21, 2024, Showing Haze in the Gulf of America shows hazy conditions over the Gulf of America and East Texas. Figure 3-248: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 21, 2024*, shows movement of air from the Mississippi River Valley in a southwesterly direction through areas with fires prior to reaching the Port Arthur Memorial School monitor. Figure 3-249: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas Wildfires, Starting on August 18, 2024*, shows the path air took from areas of fire and smoke.

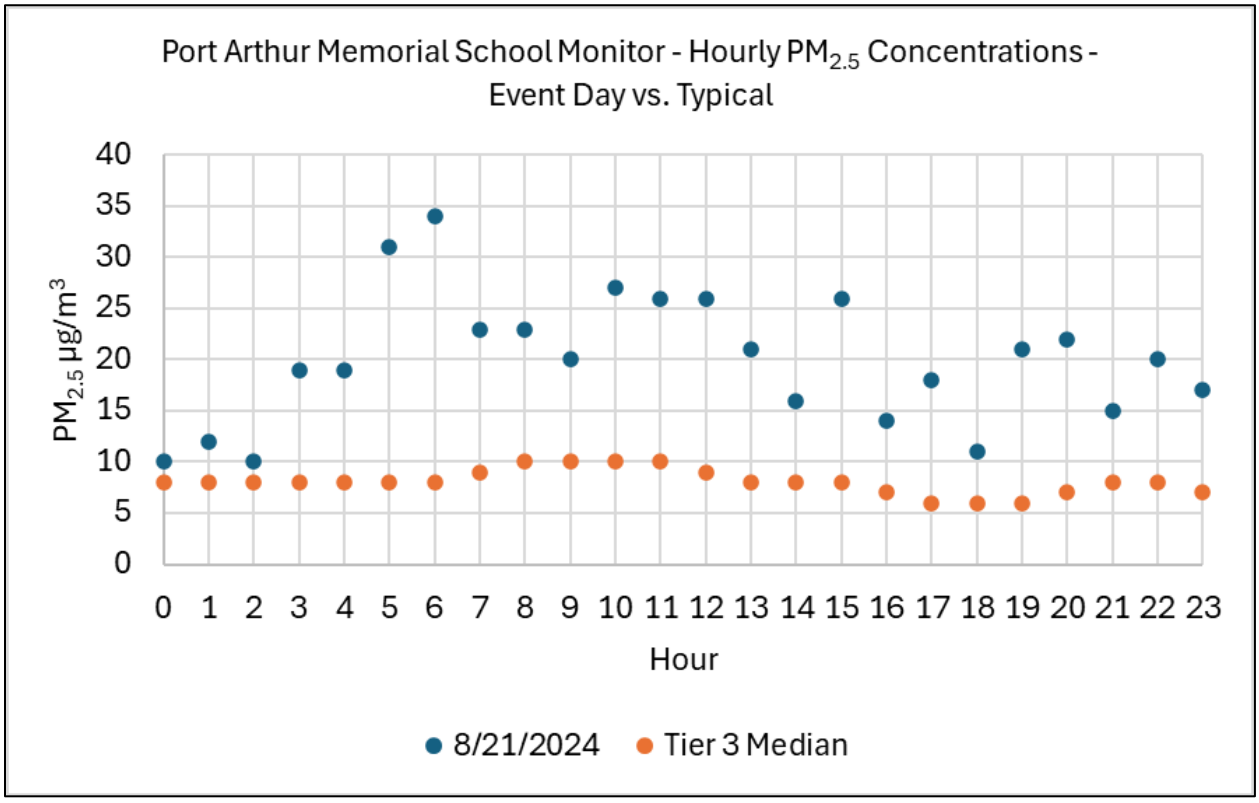

Figure 3-245: Hourly $PM_{2.5}$ Concentrations on August 21, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

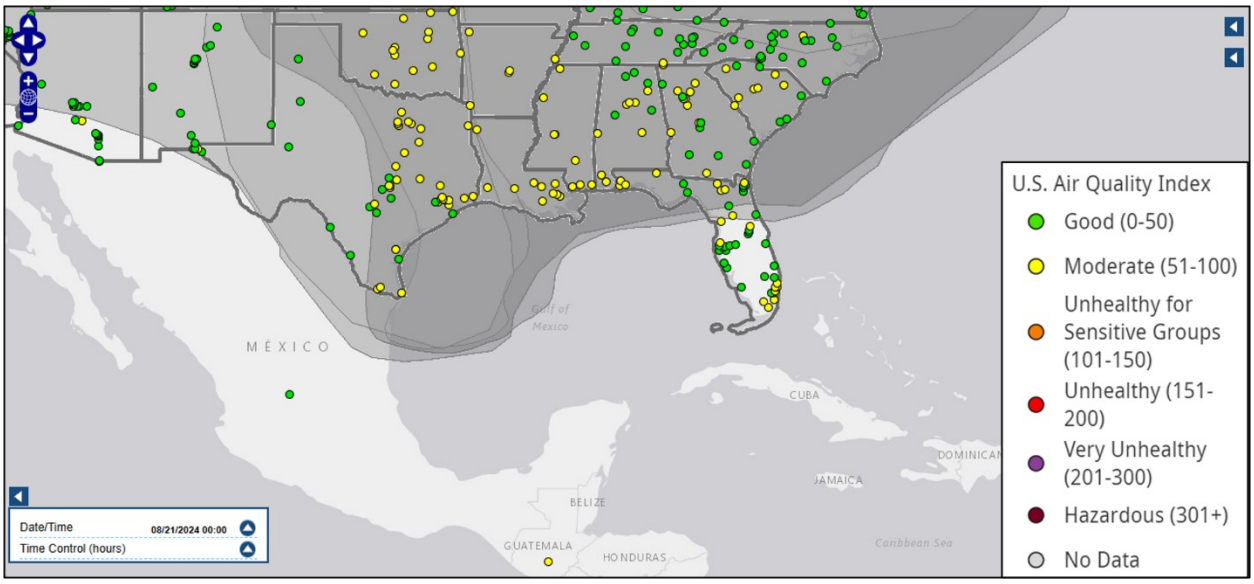

Figure 3-246: AirNow HMS Smoke Plume for August 21, 2024

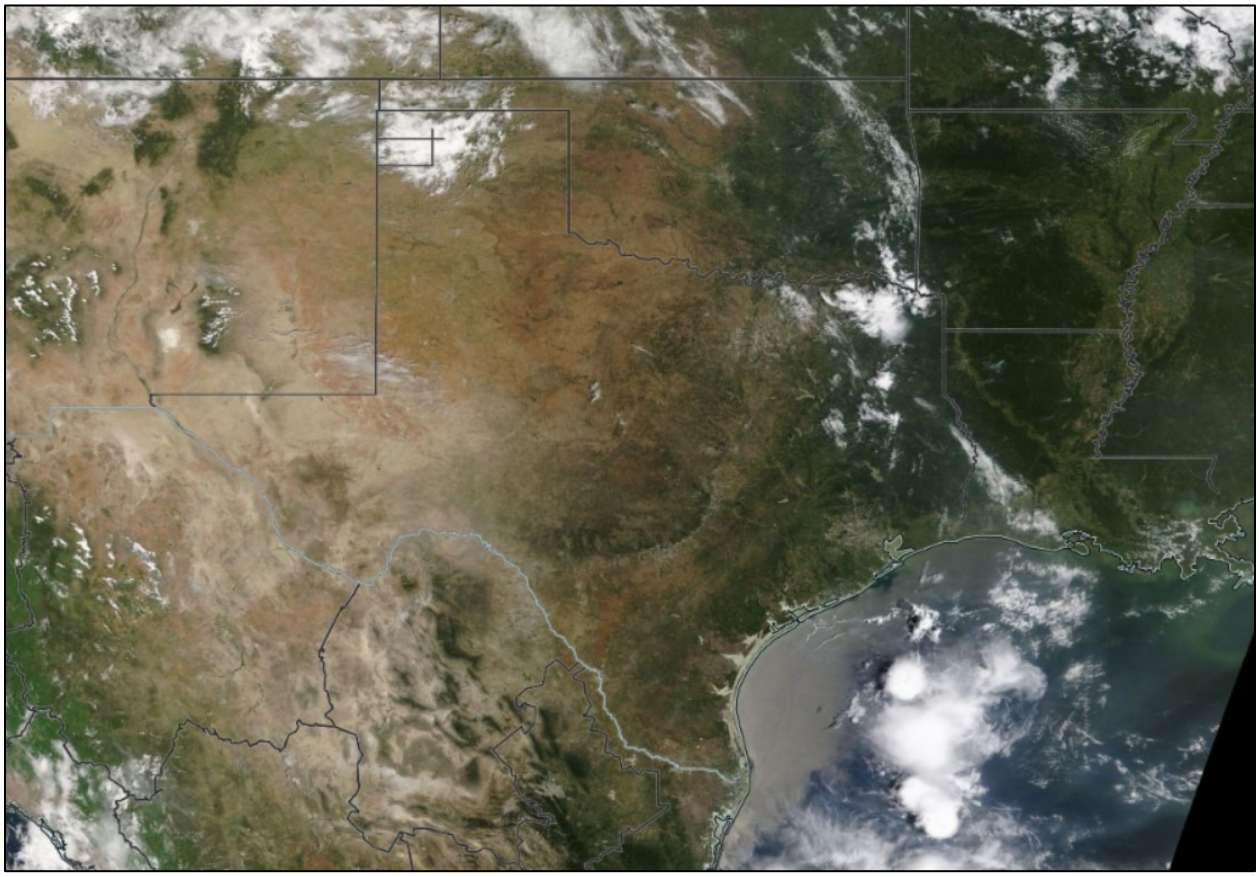

Figure 3-247: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 21, 2024, Showing Haze in the Gulf of America

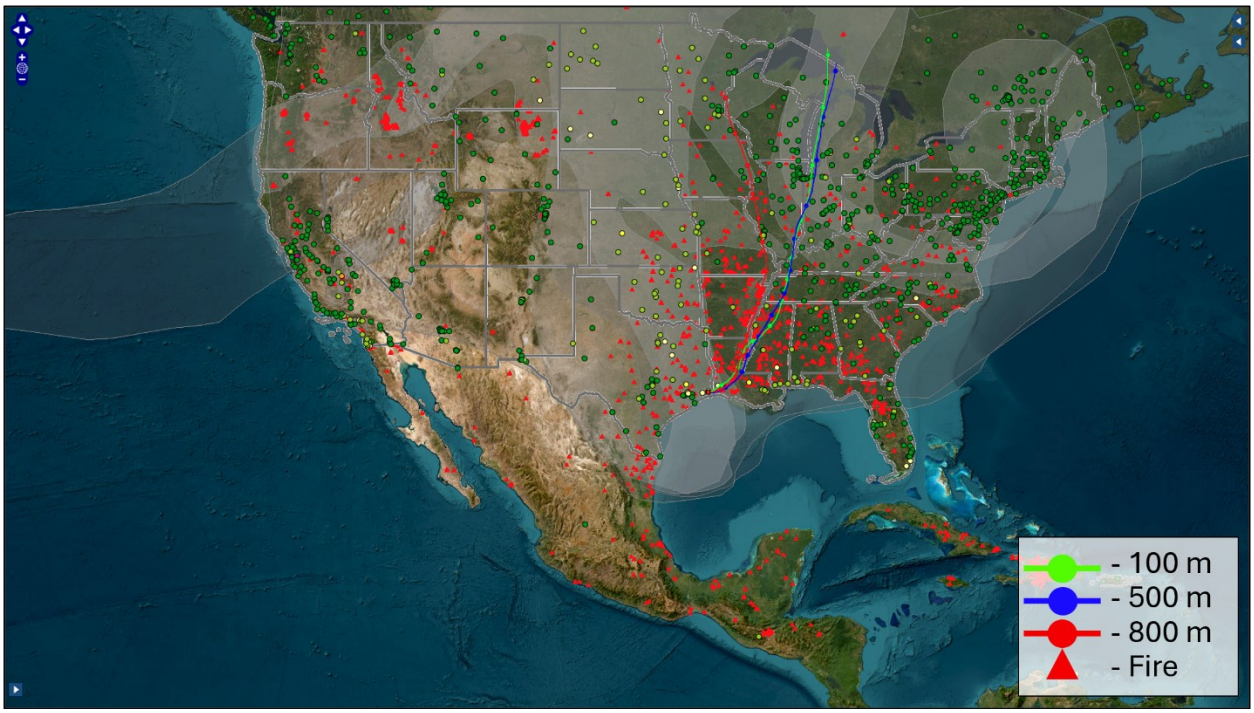

Figure 3-248: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 21, 2024

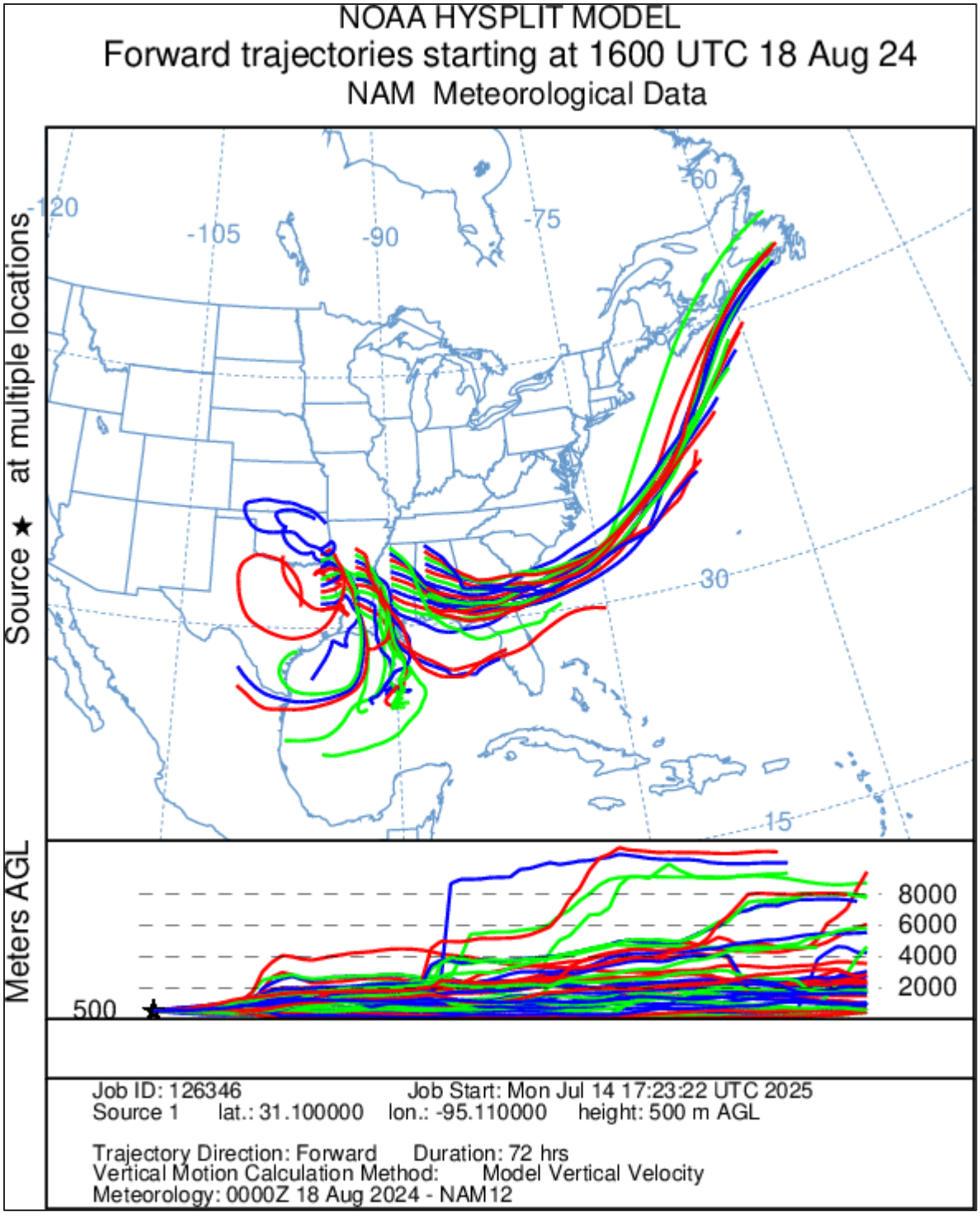

Figure 3-249: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas Wildfires, Starting on August 18, 2024

3.2.25 Group 25 – Evidence for August 22, 2024, Prescribed Fire $PM_{2.5}$ Event

August 22, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 17.7 µg/m^3. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from prescribed fires in the Mississippi River Valley.

The TCEQ forecast for August 22, 2024 (Table C-25), references that lingering and incoming light-density residual smoke was present from seasonal fire activities across the southeastern U.S., the Mississippi River Valley, western Canada, and the U.S. Pacific Northwest. A media report posted by a news agency in Austin posted an article that referenced multiple wildfires burning in central Texas (Figure C-40). Figure 3-250: *Hourly $PM_{2.5}$ Concentrations on August 22, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-251: *AirNow HMS Smoke Plume for August 22, 2024*, shows a smoke plume over East Texas, with a Moderate AQI in East Texas. Figure 3-252: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 22, 2024, Showing Haze in the Gulf of America* shows an indication of hazy conditions over the Gulf of America and East Texas. Figure 3-253: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 22, 2024*, shows movement of air from the Mississippi River Valley through areas with fires prior to reaching the Gulf of America, reversing direction, and traveling to the Port Arthur Memorial School monitor. Figure 3-254: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 19, 2024* shows the path air took from areas of fire and smoke.

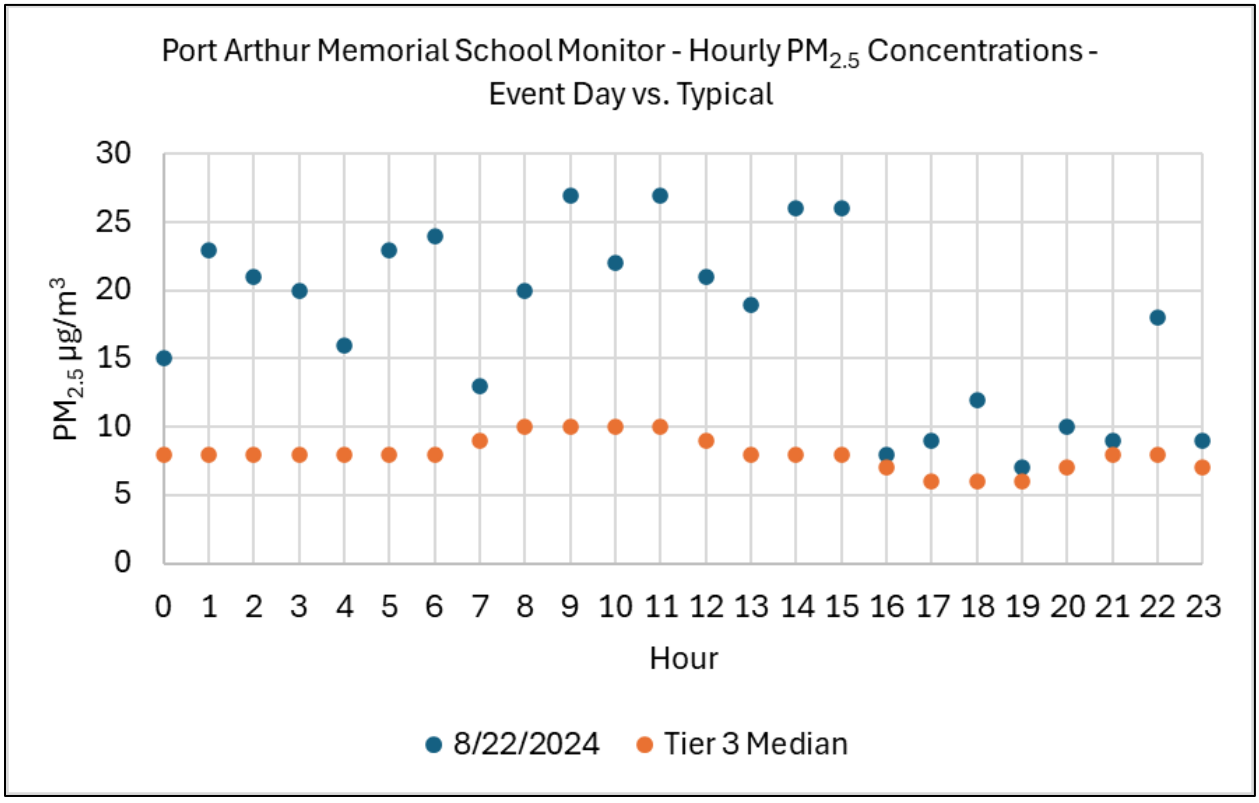

Figure 3-250: Hourly $PM_{2.5}$ Concentrations on August 22, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

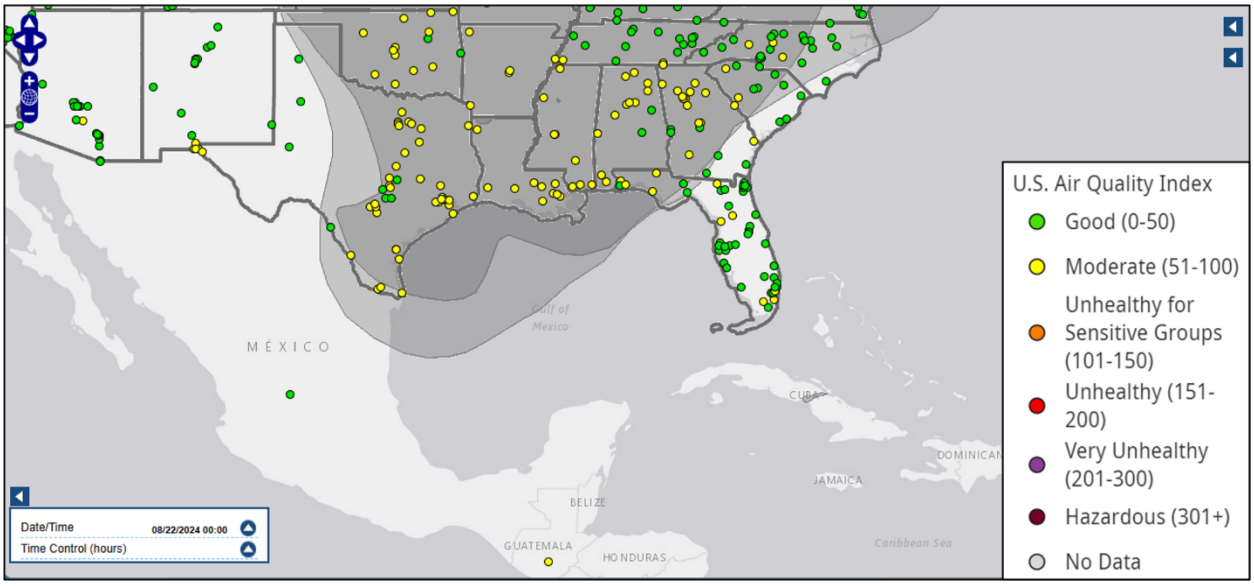

Figure 3-251: AirNow HMS Smoke Plume for August 22, 2024

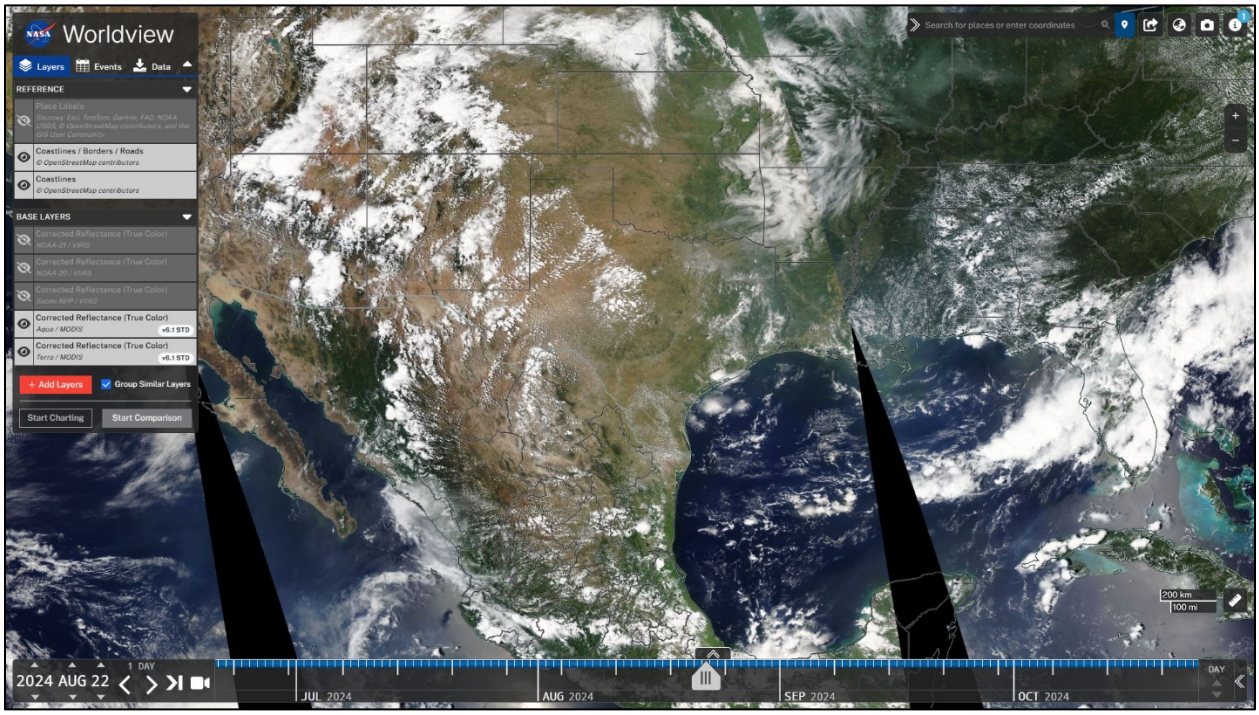

Figure 3-252: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from August 22, 2024, Showing Haze in the Gulf of America

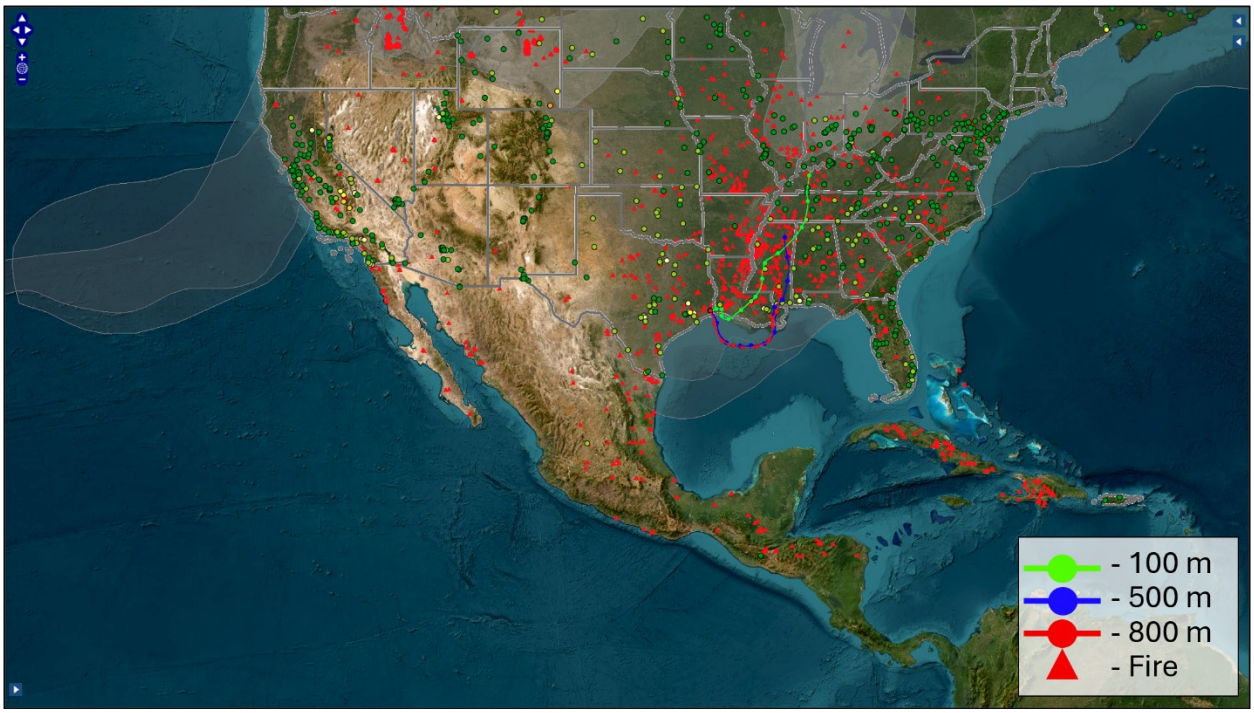

Figure 3-253: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on August 22, 2024

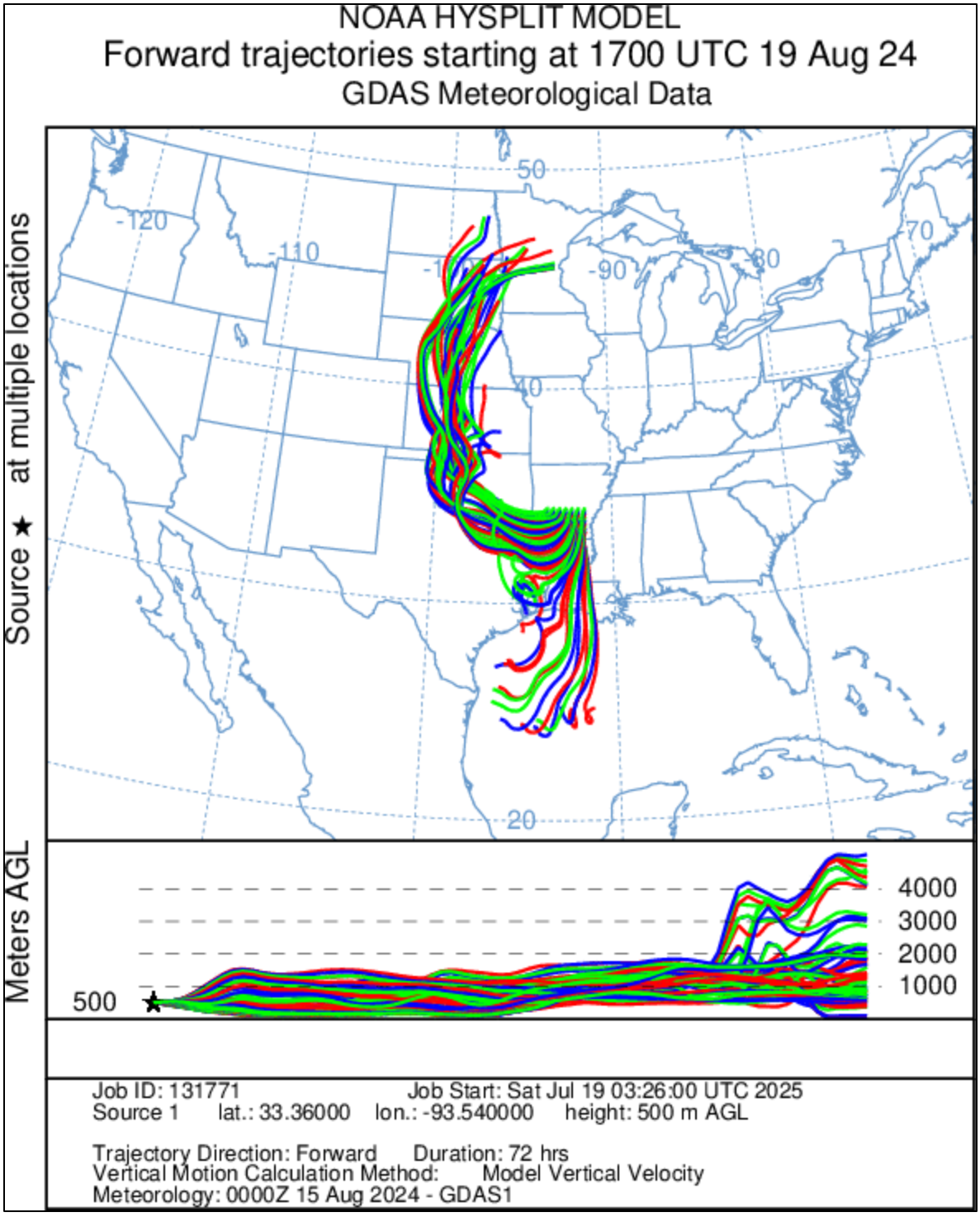

Figure 3-254: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Mississippi River Valley with Fires, Starting on August 19, 2024

3.2.26 Group 26 – Evidence for October 10, 2024, Wildfire – U.S. $PM_{2.5}$ Event

October 10, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 19.5 µg/m³. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from wildfires in Louisiana, Midwest, and Mississippi River Valley.

The TCEQ forecast for October 10, 2024 (Table C-26), references that a large area of moderate density smoke from wildfires in western states such as Oregon, coastal Washington, Idaho, and northern Utah extended southeast through the Central Plains and Mississippi River Basin, and this smoke combined with additional wildfire smoke from the southeastern U.S. to form a layer over much of Texas. Figure 3-255: *Hourly $PM_{2.5}$ Concentrations on October 10, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all hourly $PM_{2.5}$ concentrations were higher than those classified as typical at this monitor. Figure 3-256: *AirNow HMS Smoke Plume for August 22, 2024*, shows a smoke plume over East Texas with many smaller plumes of smoke in relatively close proximity to Jefferson County and the Port Arthur Memorial School monitor. The AQI was moderate in East Texas. Figure 3-257: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery* from October 10, 2024, Showing Haze Over Texas shows hazy conditions over Texas. Figure 3-258: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 10, 2024*, shows movement of air through the Mississippi River Valley and through areas with fires prior to reaching the Port Arthur Memorial School monitor. Figure 3-259: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in the Mississippi River Valley with Fires, Starting on October 7, 2024*, shows the path air took from areas of fire in Louisiana prior to passing over East Texas and Jefferson County.

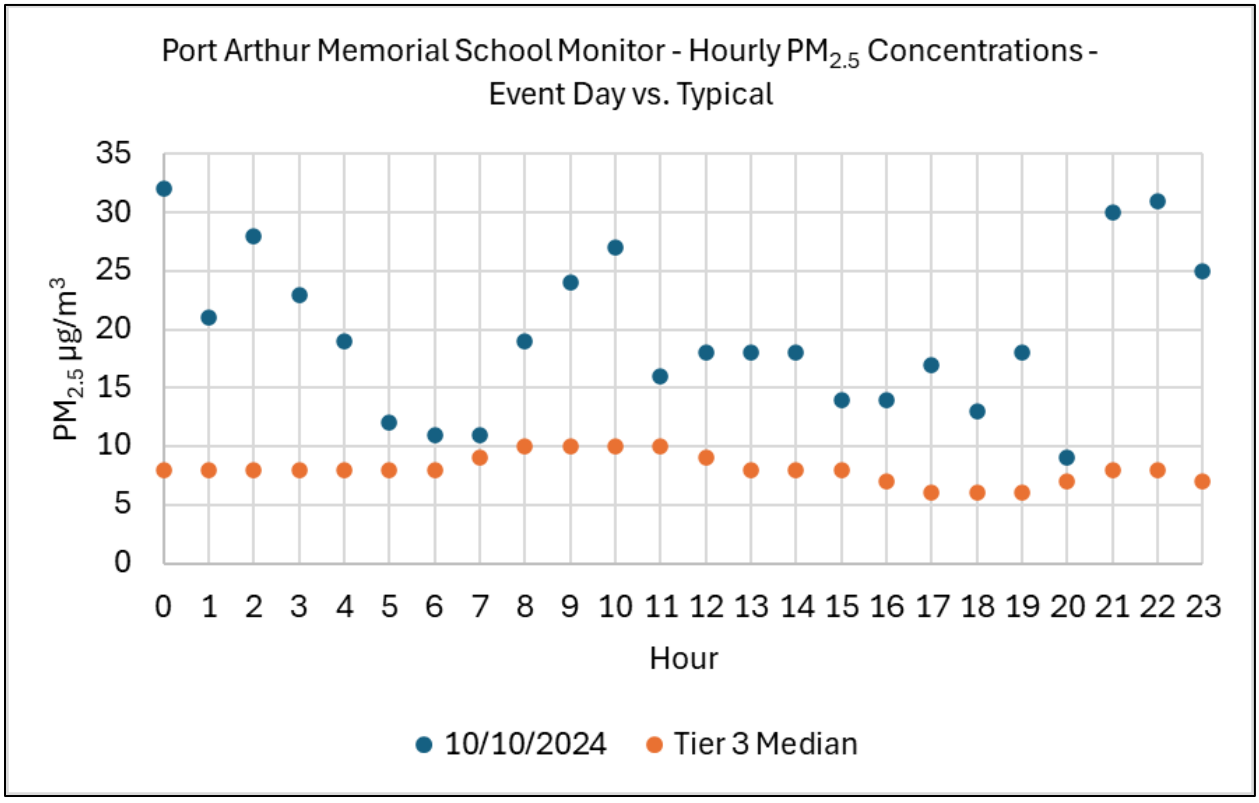

Figure 3-255: Hourly $PM_{2.5}$ Concentrations on October 10, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

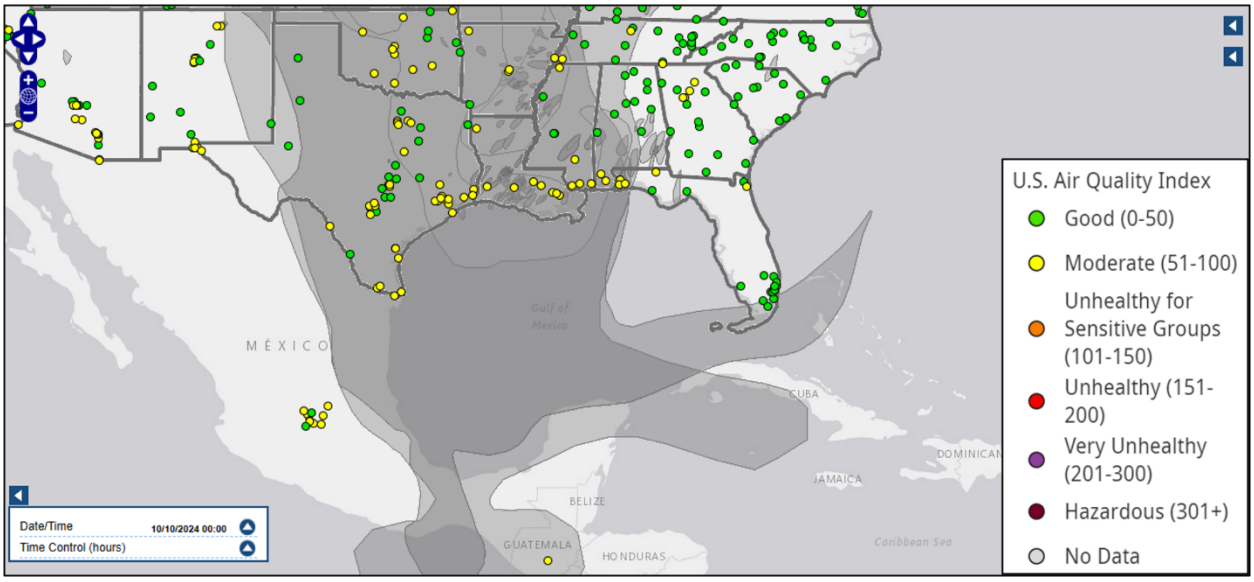

Figure 3-256: AirNow HMS Smoke Plume for October 10, 2024

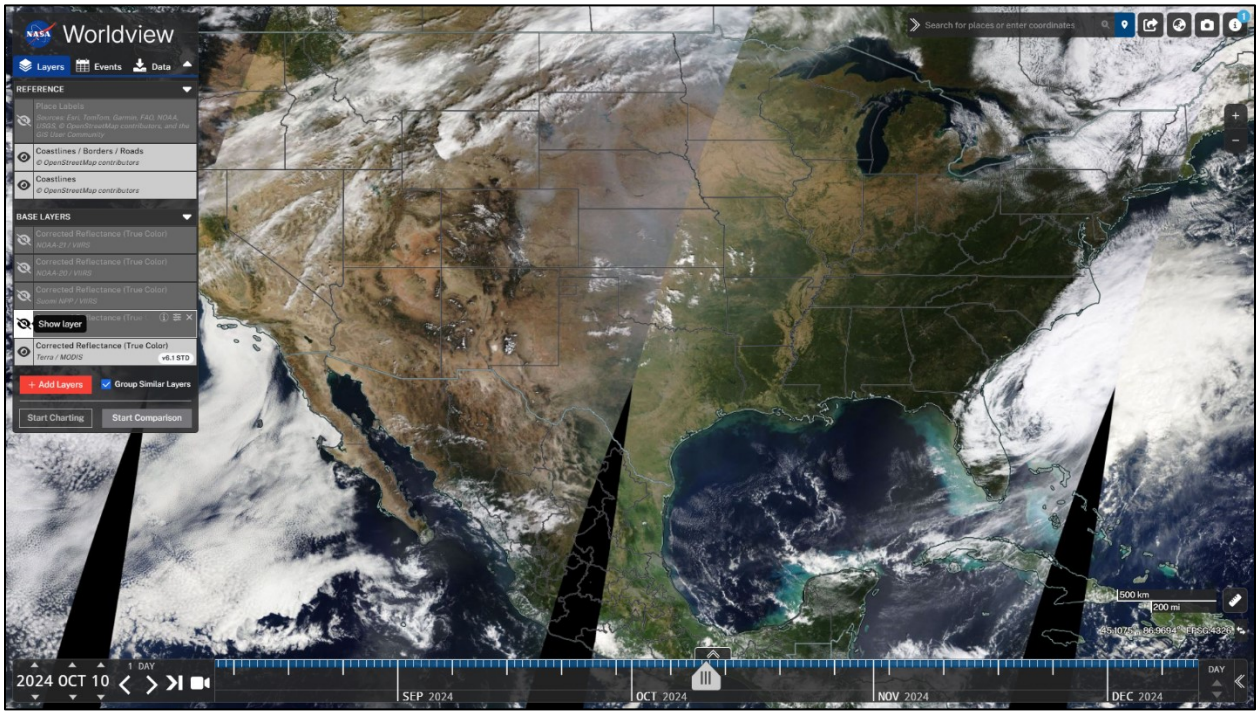

Figure 3-257: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 10, 2024, Showing Haze Over Texas

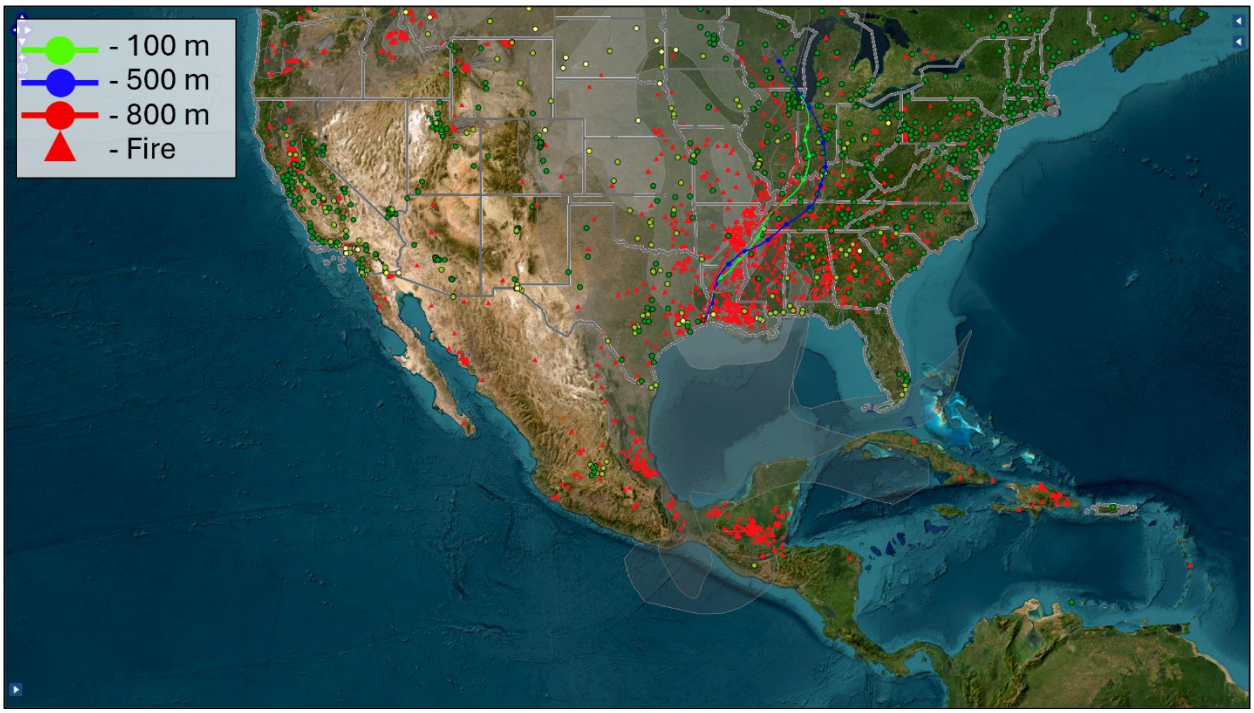

Figure 3-258: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 10, 2024

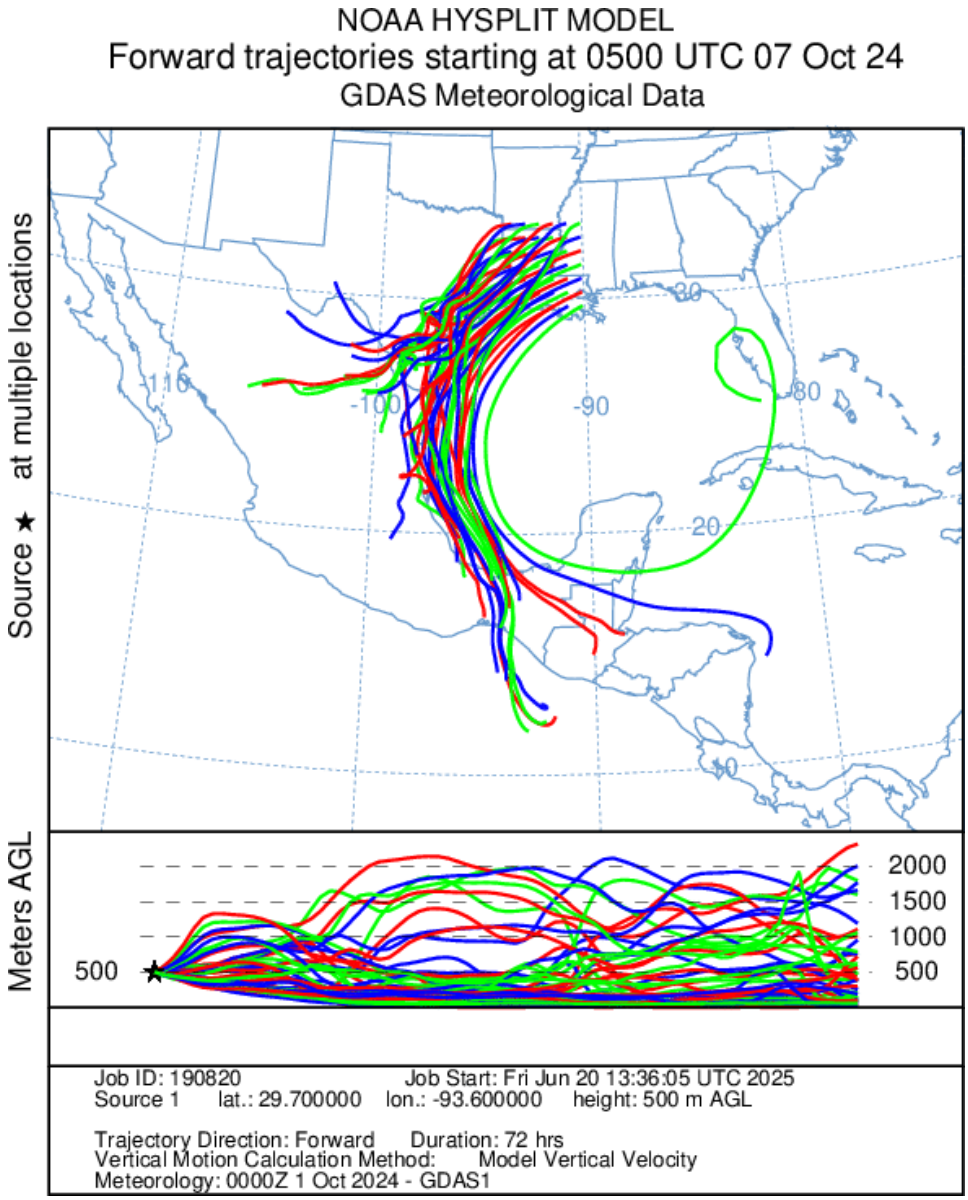

Figure 3-259: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in the Mississippi River Valley with Fires, Starting on October 7, 2024

3.2.27 Group 27 – Evidence for October 15, 2024, Fire – Canadian $PM_{2.5}$ Event

October 15, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 19.0 µg/m^3. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from wildfires in Canada.

The TCEQ forecast for October 15, 2024 (Table C-27), references that fine particulate levels were elevated across a large portion of Texas due to smoke transported from ongoing wildfires in the U.S. Pacific Northwest and western Canada. A report posted on Facebook by the Texas A&M Forest Service (Figure C-41) mentioned wildfires burning throughout northeast and southeast Texas. Figure 3-260: *Hourly $PM_{2.5}$ Concentrations on October 15, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that all but one hourly $PM_{2.5}$ concentration was higher than those classified as typical at this monitor. Figure

3-261: *AirNow HMS Smoke Plume for October 15, 2024*, shows a smoke plume over the entirety of Texas. The AQI was Moderate in East Texas. Figure 3-262: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 15, 2024, Showing Haze Over Jefferson County* shows hazy conditions over much of Texas, including the Jefferson County area. Figure 3-263: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 15, 2024*, shows movement of air from different directions at different altitudes, but based on the prevalence of smoke over the state, the specific direction of the trajectories had diminished importance. Figure 3-264: *NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Canada with Fires, Starting on October 12, 2024*, shows the path air took from fires in Canada en route to East Texas and the Jefferson County area.

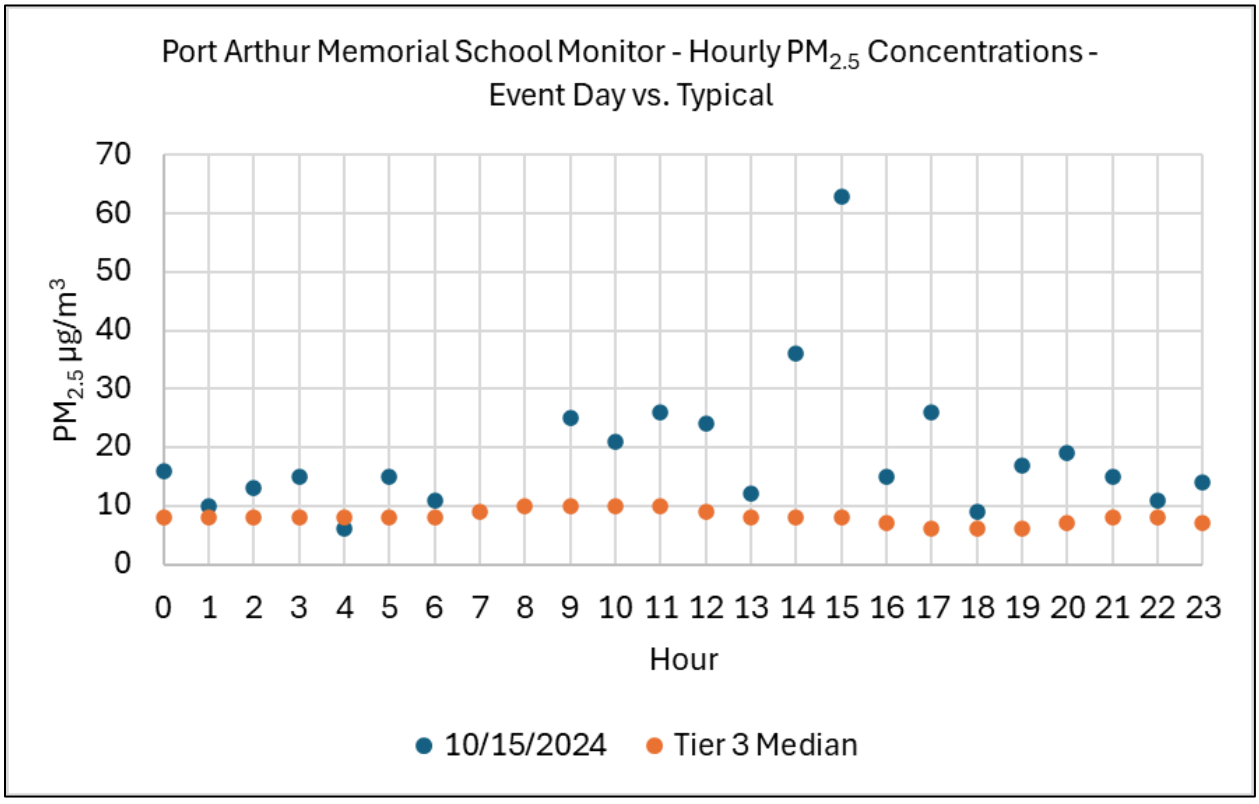

Figure 3-260: Hourly $PM_{2.5}$ Concentrations on October 15, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

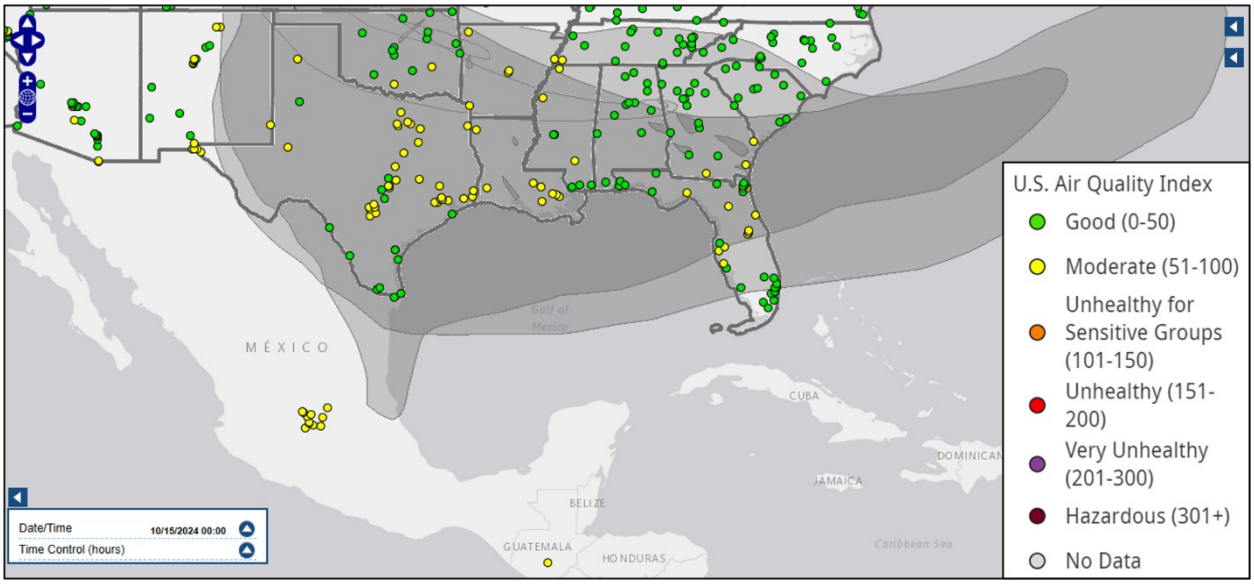

Figure 3-261: AirNow HMS Smoke Plume for October 15, 2024

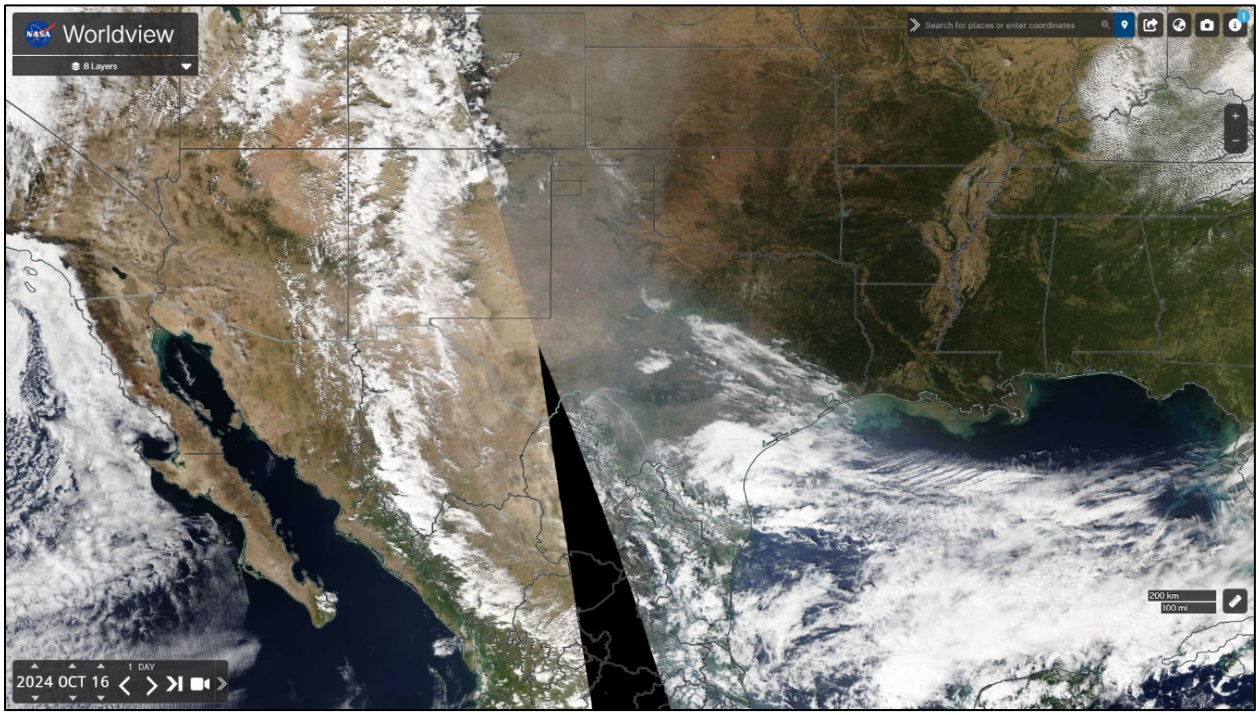

Figure 3-262: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 15, 2024, Showing Haze Over Jefferson County

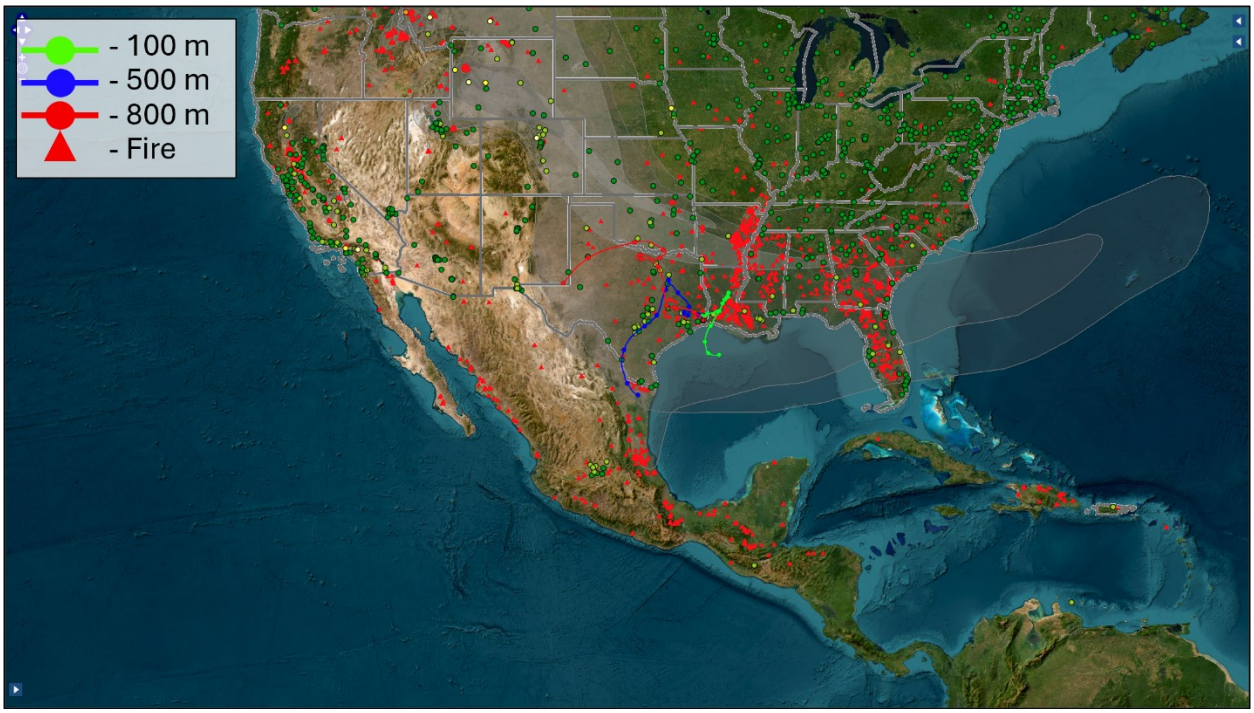

Figure 3-263: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on October 15, 2024

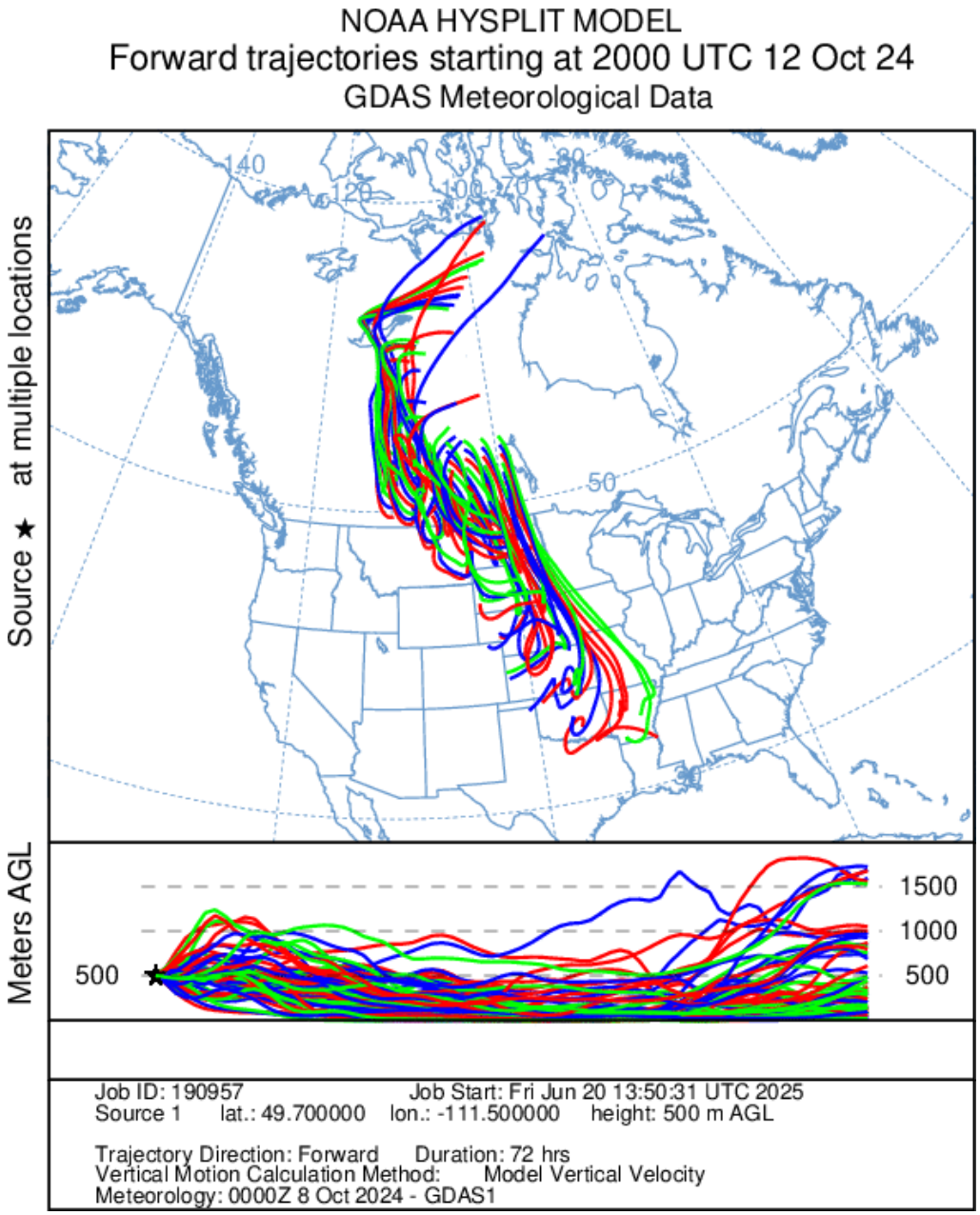

Figure 3-264: NOAA HYSPLIT 72-Hour Forward Trajectories Originating from Areas in Canada with Fires, Starting on October 12, 2024

3.2.28 Group 28 – Evidence for October 28, 2024, Prescribed Fire $PM_{2.5}$ Event

October 28, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 25.0 µg/m^3. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from prescribed fires in the lower Mississippi River Valley.

The TCEQ forecast for October 28, 2024 (Table C-28) references that light smoke from seasonal agricultural burning in the southeastern U.S., Mississippi River Valley, and eastern Texas was expanding over the eastern half of Texas. The report further referenced that this smoke combined with slightly elevated humidity levels and light winds, had potential to raise $PM_{2.5}$ levels. Figure 3-265: *Hourly $PM_{2.5}$ Concentrations on October 28, 2024, Compared to Typical*

Concentrations at the Port Arthur Memorial School Monitor shows that all but one hourly $PM_{2.5}$ concentration was higher than those classified as typical at this monitor. Figure 3-266: *AirNow HMS Smoke Plume for October 28, 2024*, shows a smoke plume over East Texas. The AQI was Good to Moderate in East Texas. Figure 3-267: *Aqua/ MODIS Corrected Reflectance (True Color) Satellite Imagery from on October 28, 2024, Showing Smoke in South and East Texas* shows hazy conditions over the Jefferson County area. Figure 3-268: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on October 28, 2024* shows movement of air from the southeast U.S., west over the Gulf of America, and ultimately northwest to the Port Arthur Memorial School monitor. This path passed through smoke plumes en route to the monitor.

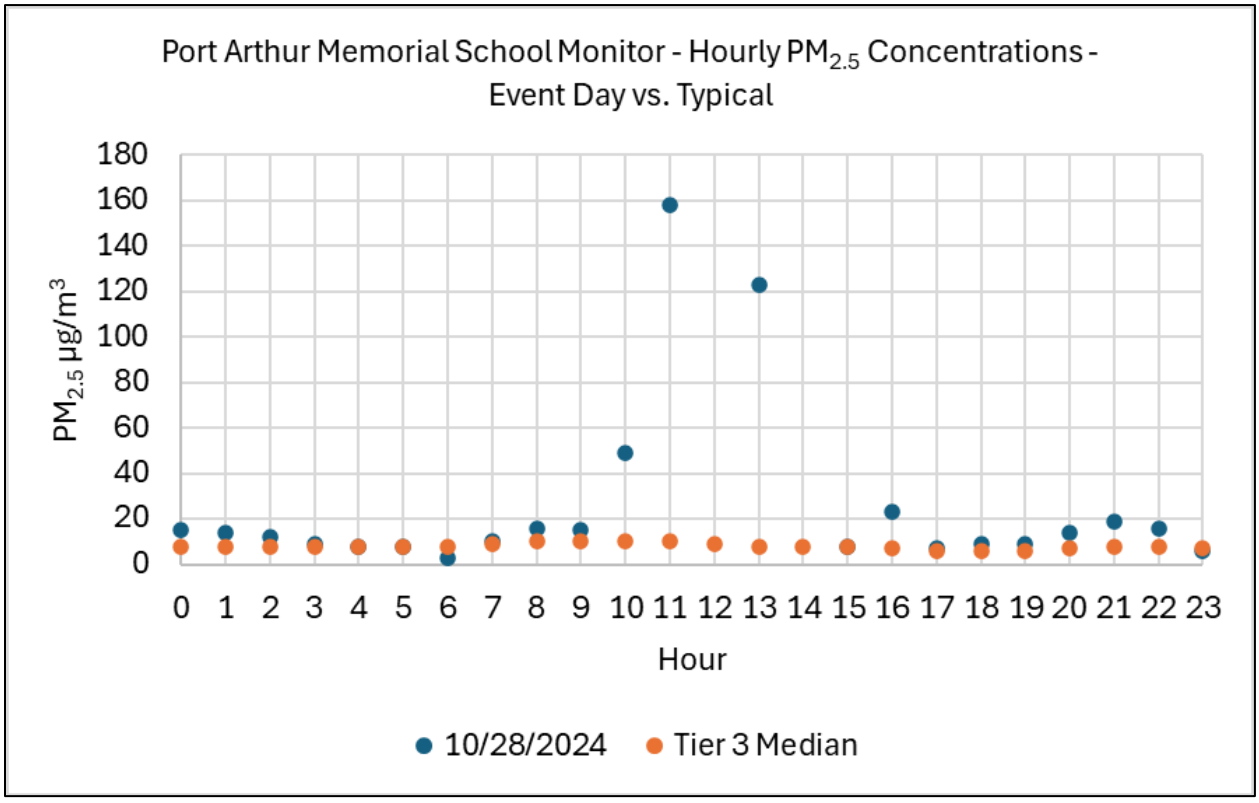

Figure 3-265: Hourly $PM_{2.5}$ Concentrations on October 28, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

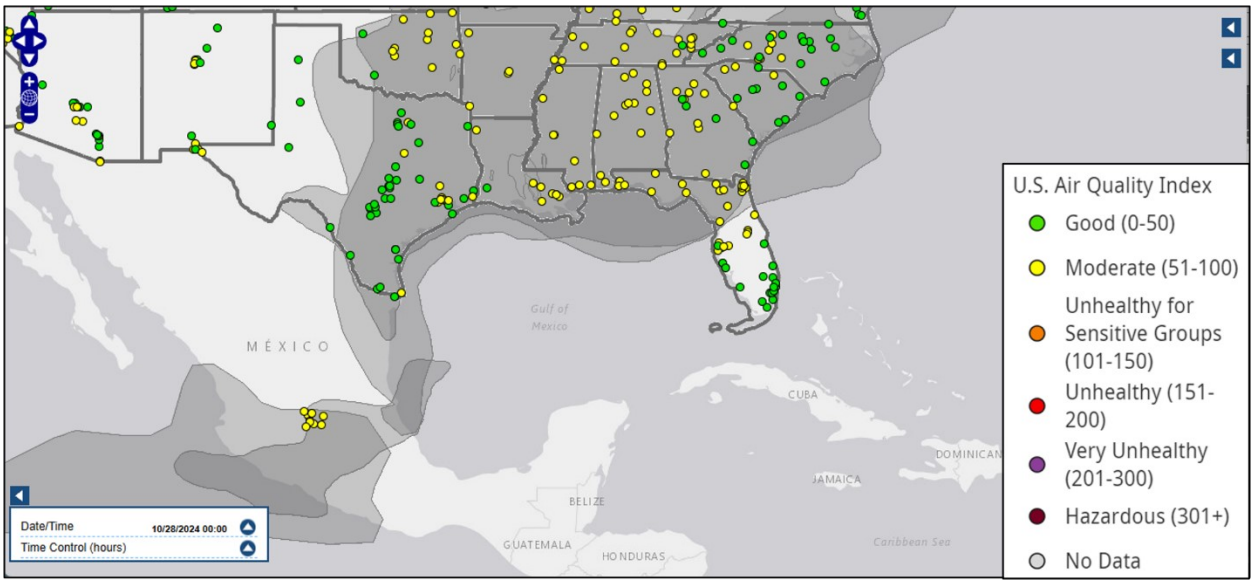

Figure 3-266: AirNow HMS Smoke Plume for October 28, 2024

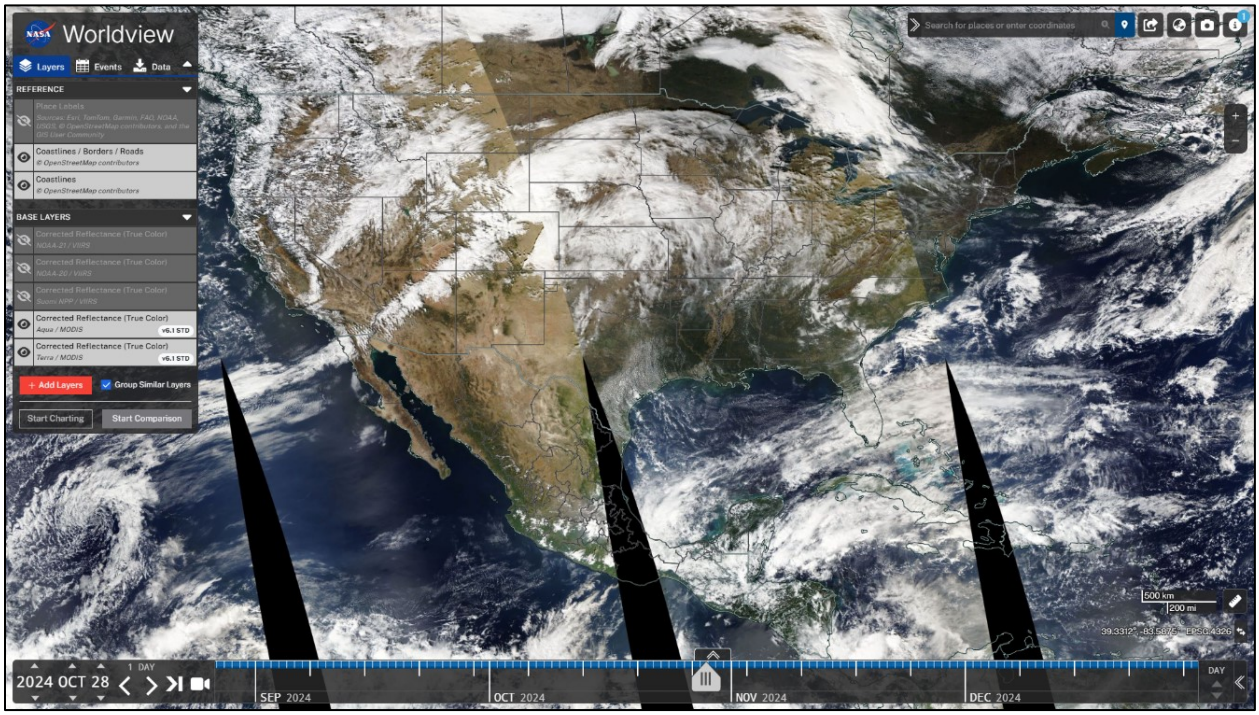

Figure 3-267: Aqua/ MODIS Corrected Reflectance (True Color) Satellite Imagery from on October 28, 2024, Showing Smoke in South and East Texas

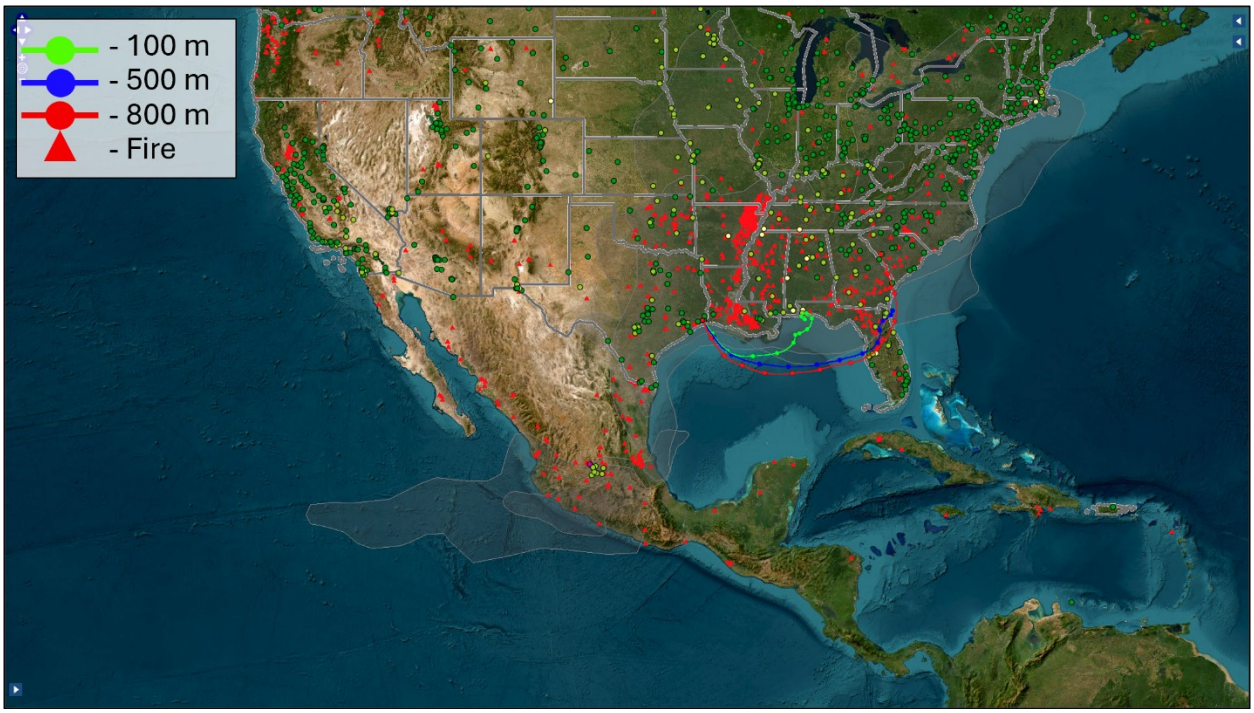

Figure 3-268: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on October 28, 2024

3.2.29 Group 29 – Evidence for October 29, 2024, Prescribed Fire $PM_{2.5}$ Event

October 29, 2024, was identified as a Tier 1 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 30.7 µg/m^3. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from prescribed fires in the lower Mississippi River Valey.

The TCEQ forecast for October 29, 2024 (Table C-29), references that light density residual smoke from wildfire activities across the southeastern U.S. was expected to raise monitored $PM_{2.5}$ levels. Figure 3-269: *Hourly $PM_{2.5}$ Concentrations on October 29, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations were at their highest from 07:00 through 13:00 local time. Figure 3-270: *AirNow HMS Smoke Plume for October 29, 2024*, shows a smoke plume over East Texas, with an AQI of Good in East Texas. Figure 3-271: *Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 29, 2024, Showing Cloud Cover over Jefferson County* shows cloud cover over the Jefferson County area. Figure 3-272: *AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on October 29, 2024*, shows movement of air from the southeast U.S., west over the Gulf of America, and ultimately northwest to the Port Arthur Memorial School monitor. This path had the potential to pass through smoke plumes en route to the monitor.

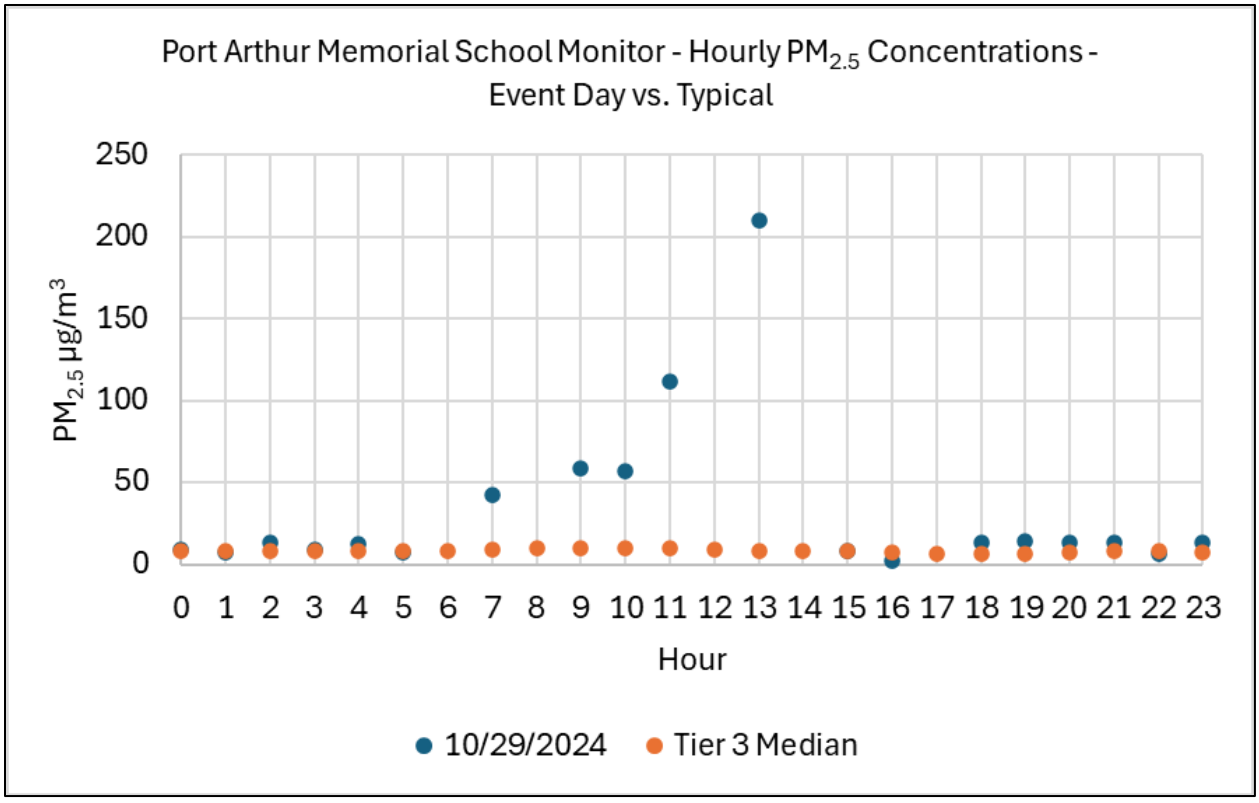

Figure 3-269: Hourly $PM_{2.5}$ Concentrations on October 29, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

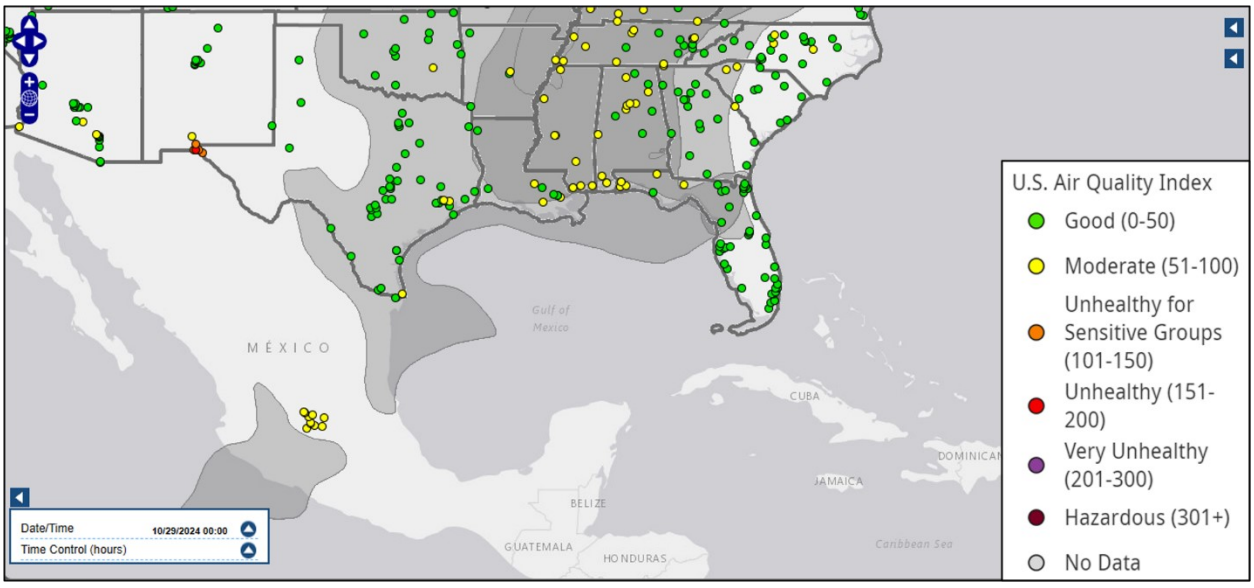

Figure 3-270: AirNow HMS Smoke Plume for October 29, 2024

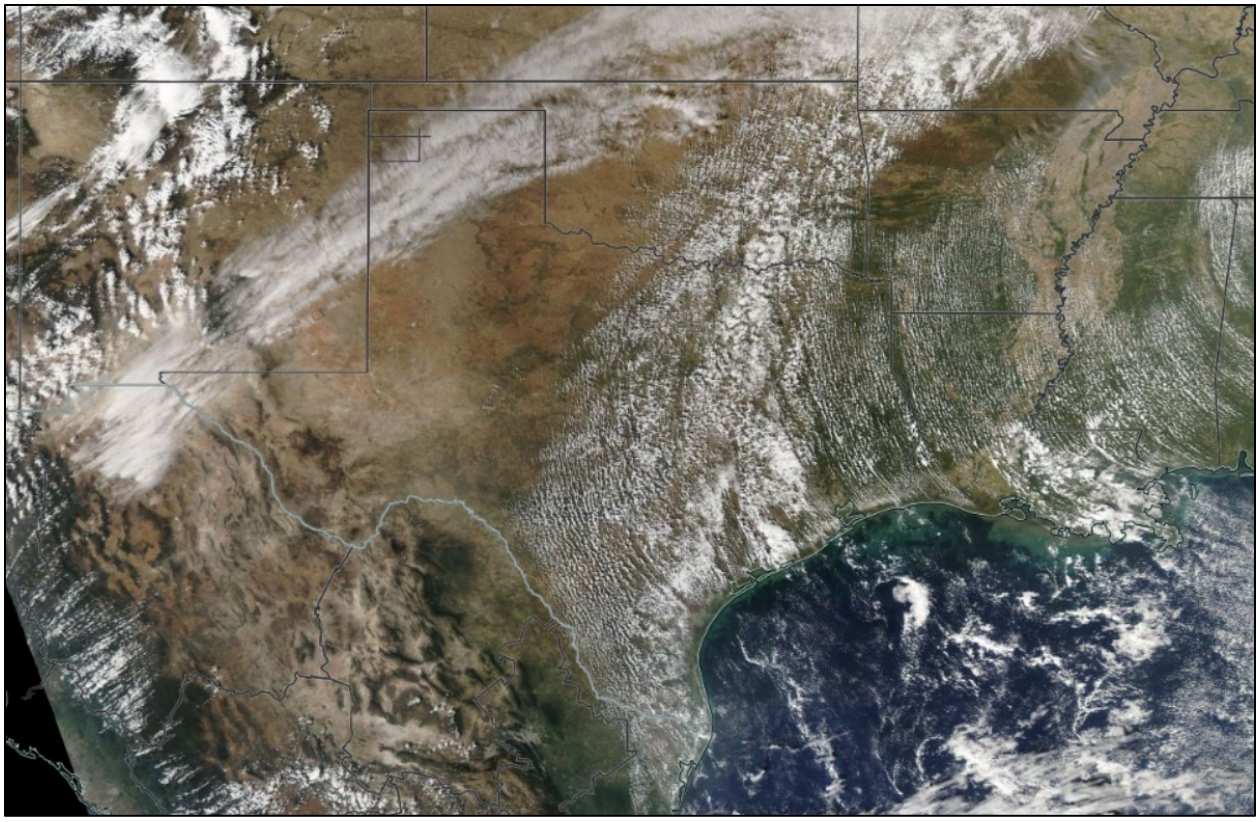

Figure 3-271: Aqua/MODIS Corrected Reflectance (True Color) Satellite Imagery from October 29, 2024, Showing Cloud Cover over Jefferson County

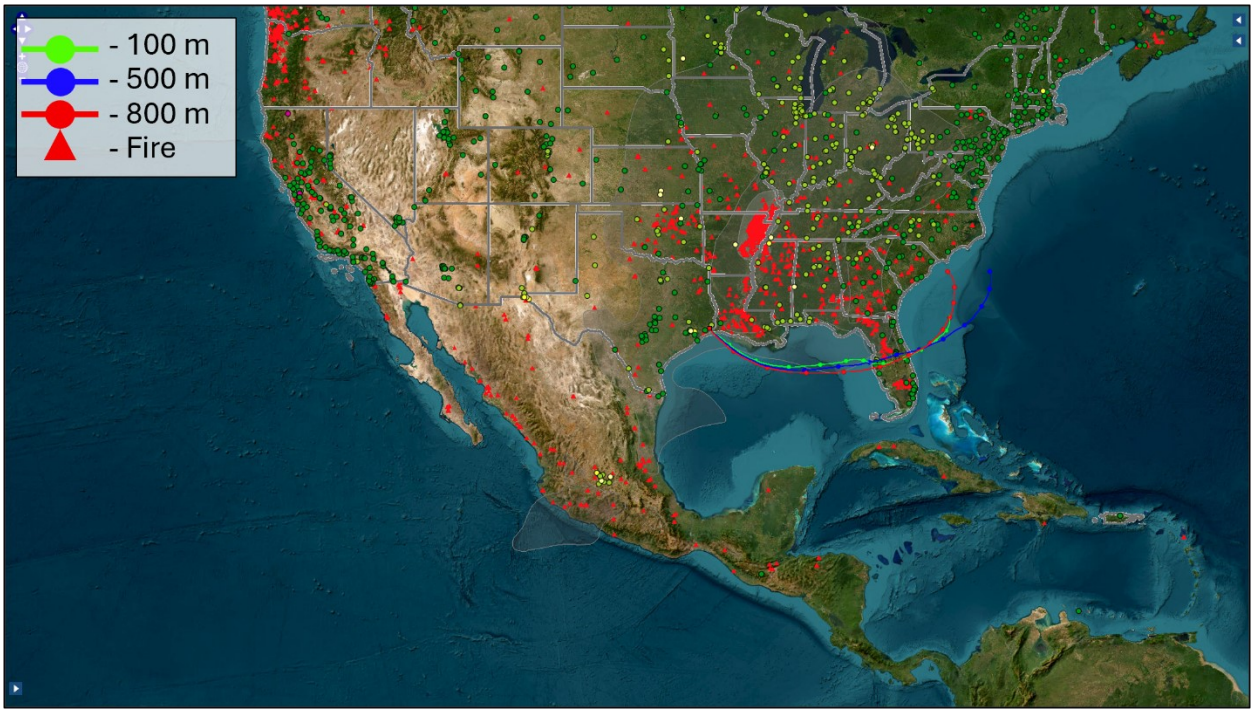

Figure 3-272: AirNow Tech HYSPLIT 72-Hour Back Trajectories from the Port Arthur Memorial School Monitor on October 29, 2024

3.2.30 Group 30– Evidence for November 26, 2024, Prescribed Fire $PM_{2.5}$ Event

November 26, 2024, was identified as a Tier 2 day at the Port Arthur Memorial School monitor with a 24-hour $PM_{2.5}$ concentration of 17.8 µg/m³. This elevated $PM_{2.5}$ concentration was primarily caused by smoke from prescribed fires in Louisiana.

The TCEQ forecast for November 26, 2024 (Table C-30), references that light surface winds and lower morning vertical mixing heights associated with the high-pressure building overhead may limit local dispersion of fine particulate matter. Figure 3-273: *Hourly $PM_{2.5}$ Concentrations on November 26, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor* shows that $PM_{2.5}$ concentrations spiked between 18:00 and 20:00 local time. These spikes were the primary cause of the high 24-hour $PM_{2.5}$ concentration on this date. Figure 3-274: *AirNow HMS Smoke Plume for November 26, 2024*, shows a smoke plume from a fire in the direct vicinity of the Port Arthur Memorial School monitor, with a Moderate AQI in East Texas. Figure 3-275: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from November 26, 2024, Showing Haze in the Gulf of America Figure 3-275: *Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from November 26, 2024, Showing Haze in the Gulf of America* shows haze in the Gulf of America just off the coast of the Jefferson County area. Figure 3-276: *AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on November 26, 2024*, shows movement of air from the north at trajectories at the lowest elevations. The remaining trajectories come from the west prior to shifting to a southerly direction around the Texas/Oklahoma border. Trajectories at all elevations pass through potential smoke plumes en route to the monitor.

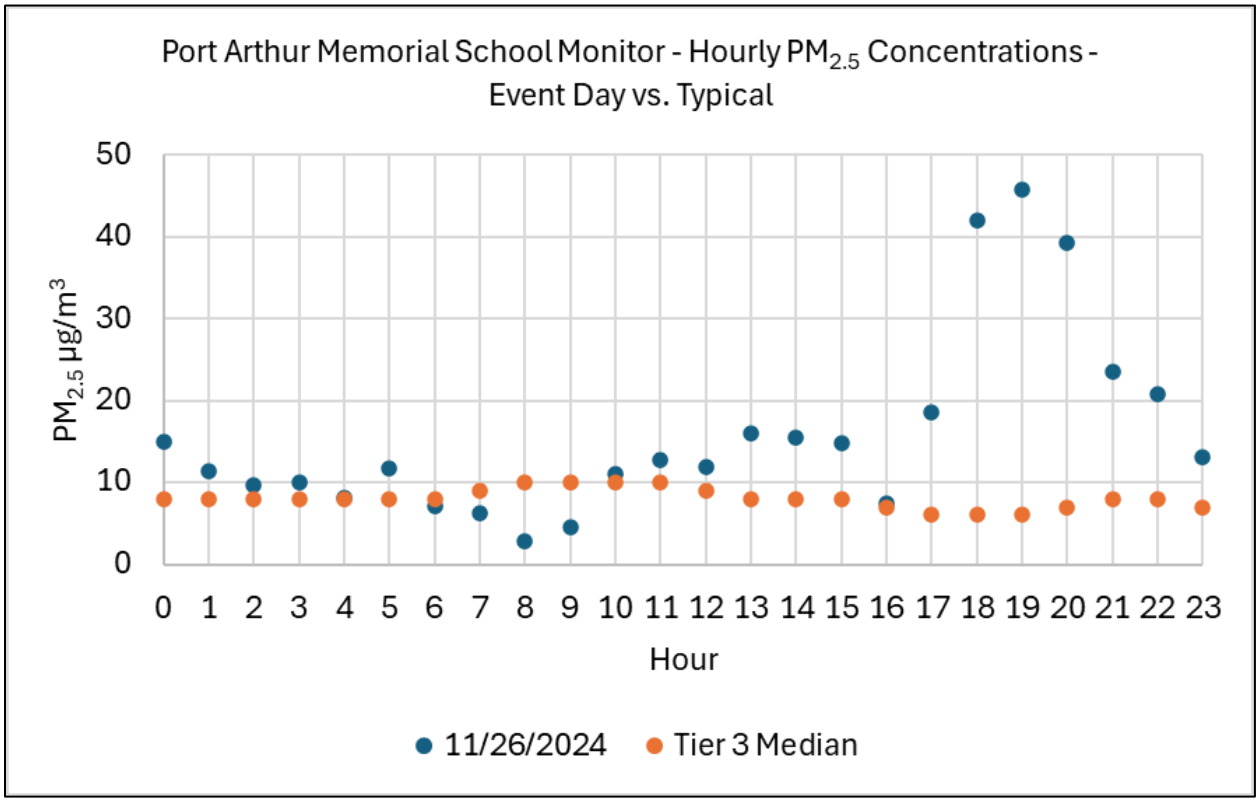

Figure 3-273: Hourly $PM_{2.5}$ Concentrations on November 26, 2024, Compared to Typical Concentrations at the Port Arthur Memorial School Monitor

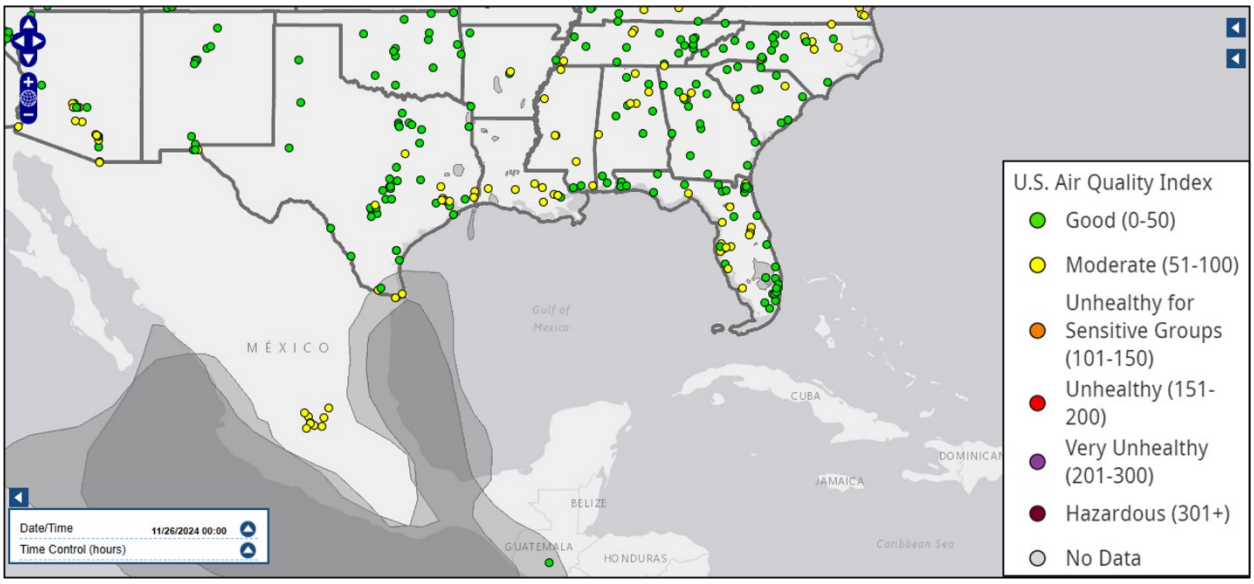

Figure 3-274: AirNow HMS Smoke Plume for November 26, 2024

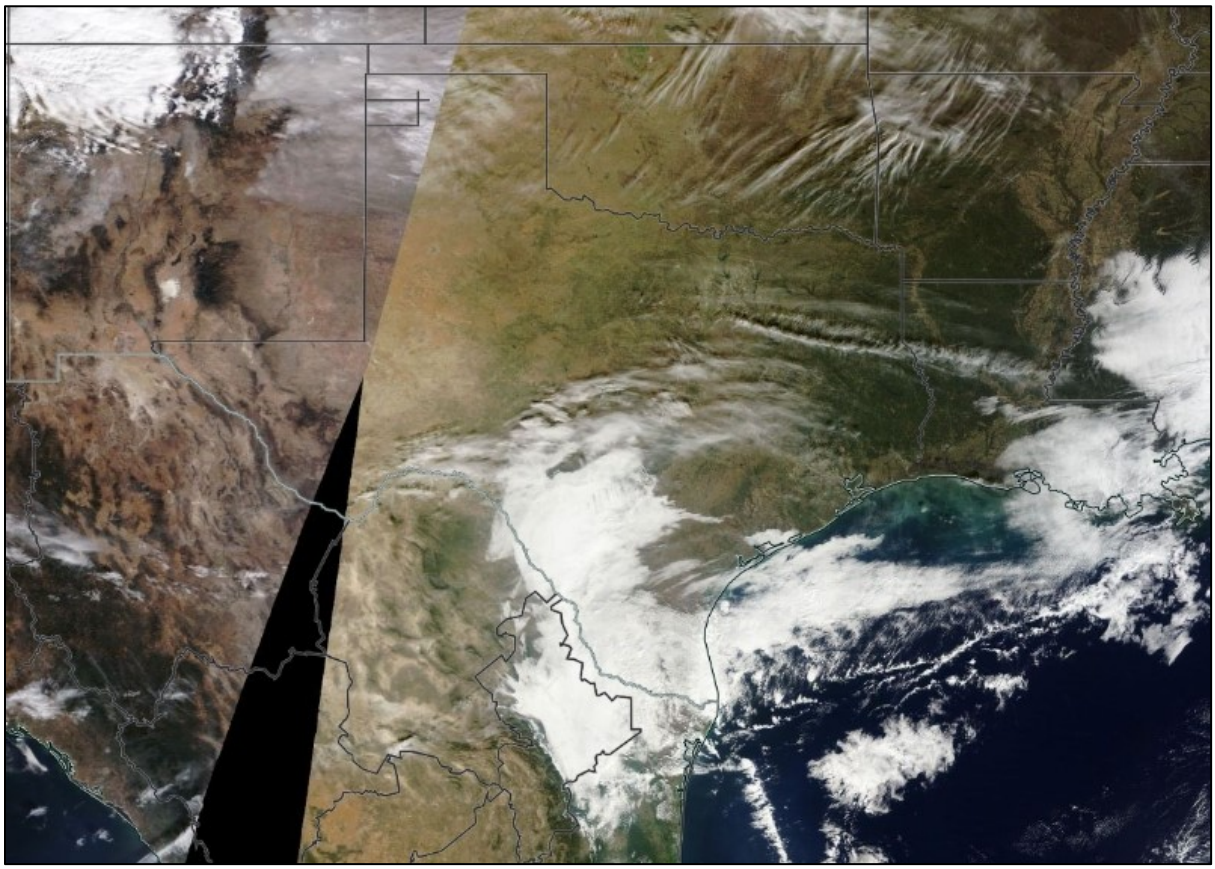

Figure 3-275: Terra/MODIS Corrected Reflectance (True Color) Satellite Imagery from November 26, 2024, Showing Haze in the Gulf of America

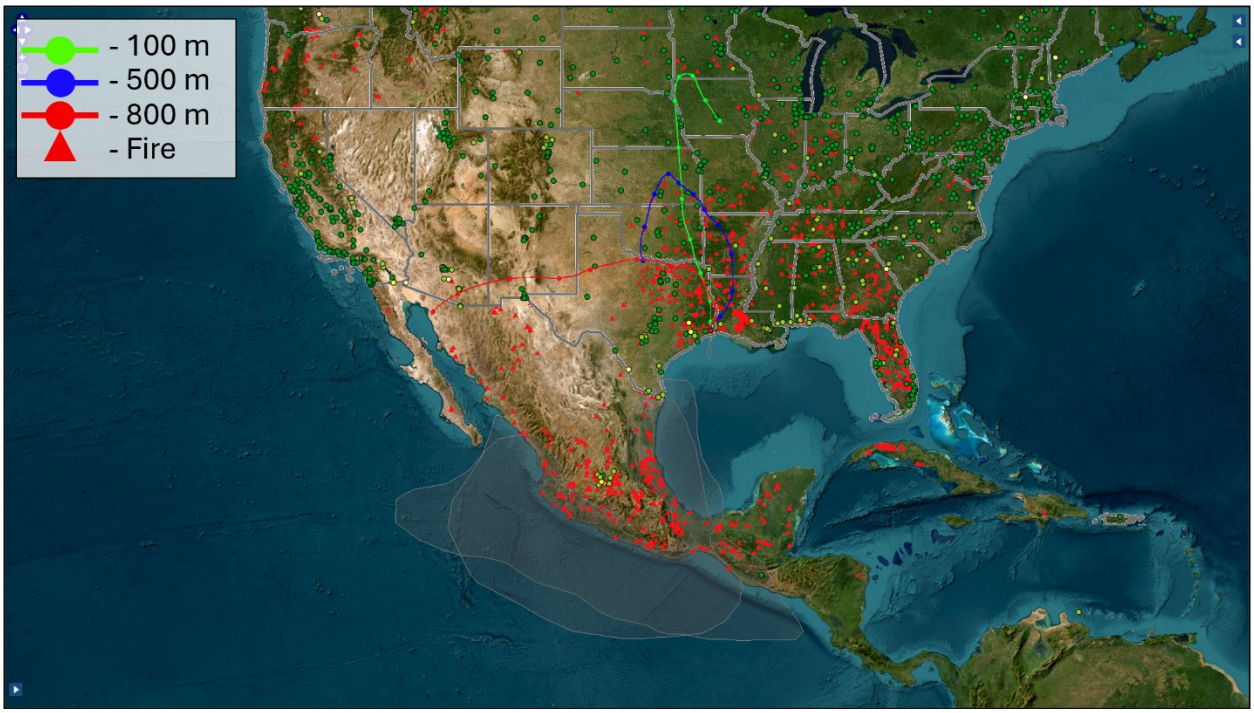

Figure 3-276: AirNow Tech HYSPLIT 72-Hour Backward Trajectories Originating from the Port Arthur Memorial School Monitor on November 26, 2024

SECTION 4: NOT REASONABLY CONTROLLABLE OR NOT REASONABLY PREVENTABLE

4.1 OVERVIEW

This section satisfies the Exceptional Events Rule Requirements at 40 CFR §§50.14(c)(3)(iv)(A), 50.1(j), 50.14(c)(3)(iv)(D), and 50.14(b)(4): "The event was caused by a natural event; an exceptional event is one that is not reasonably controllable or preventable."

4.2 NATURAL AND ANTHROPOGENIC SOURCE CONTRIBUTIONS

Stationary point source emissions data are collected annually from sites that meet the reporting requirements of 30 Texas Administrative Code (TAC) §101.10, and the emissions data are compiled in TCEQ's State of Texas Environmental Electronic Reporting System (STARS). STARS fine particulate matter ($PM_{2.5}$) emissions data are presented for each county. Emissions for other sectors from the 2020 National Emissions Inventory (NEI) are presented for each county.[13]

The wind rose at each monitor is from the EPA *$PM_{2.5}$ Designations Mapping Tool.*[14] The wind rose shows the general wind direction and speed for each monitor during the period from 2021 to 2023. The circular format of the wind rose shows the direction the winds blew from and the length of each "spoke" around the circle shows how often the wind blew from that direction.[15]

4.2.1 Jefferson County

The Port Arthur Memorial School monitor is located in Jefferson County, in the city of Port Arthur, Texas. The major point sources of $PM_{2.5}$ (as defined in 40 CFR §§51.165 and 51.166) are located in northeast Jefferson County and northeast in adjacent Orange County (*Figure 4-1: Point Sources in and around Jefferson County, from 2023*); however, a majority of the $PM_{2.5}$ emissions are non-point, as shown in Table 4-1: *Emissions Inventory in Jefferson County, from 2020*

[13] https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data
[14] https://experience.arcgis.com/experience/a2ca272ce9fc4019a88ce35b863e2cab
[15] https://www.epa.gov/sites/default/files/2019-01/documents/how_to_read_a_wind_rose.pdf

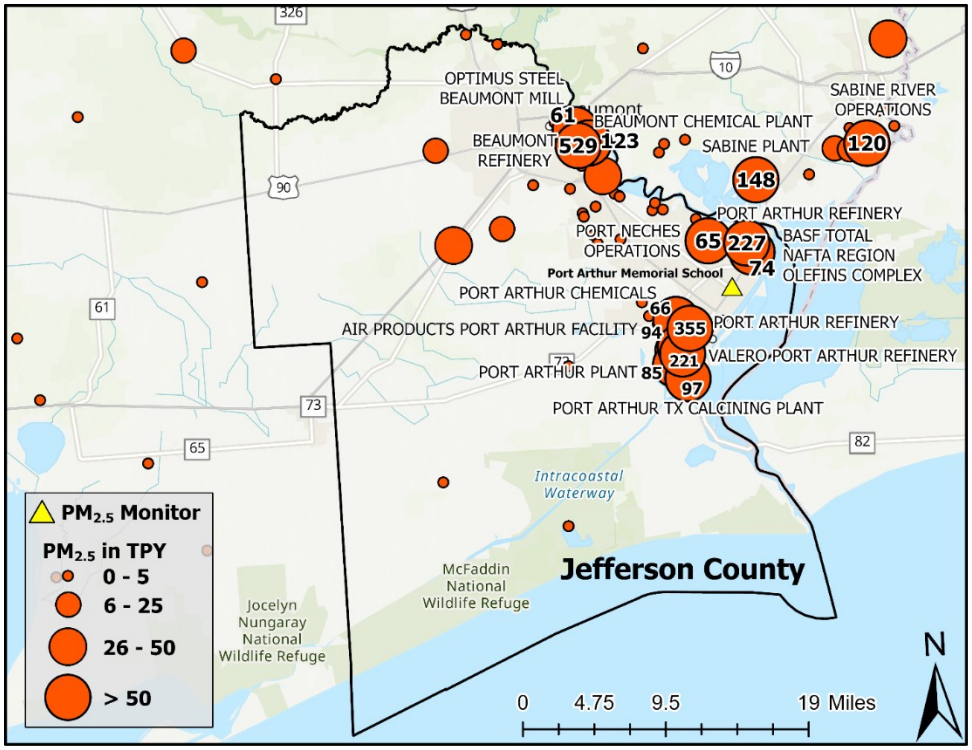

Figure 4-1: Point Sources in and around Jefferson County, from 2023

Table 4-1: Emissions Inventory in Jefferson County, from 2020

Emissions Categories	Emissions (tons per year)
On-road	65.28
Nonroad	54.76
Nonpoint	5,562.70
Point	2,103.88
Total	7,786.62

Figure 4-2: *Wind Rose in Jefferson County, from 2021-2023* shows that in Jefferson County, a higher percentage of winds are coming from the south and southeast direction, with a relatively strong spoke in the north, suggesting occasional strong winds from the northern direction. Figure 4-3: *Hourly Average Continuous $PM_{2.5}$ Concentrations at the Port Arthur Memorial School Monitor by Peak Area Hourly Wind Speed in Jefferson County for 2022, 2023, and 2024* displays peak area hourly wind speeds at Jefferson County monitors plotted against $PM_{2.5}$ concentrations at the Port Arthur Memorial School monitor. The pattern in Figure 4-3 shows that the highest $PM_{2.5}$ concentrations were recorded when hourly wind speeds were relatively low. This pattern is believed to be due to the fact that $PM_{2.5}$ can be transported great distances where local wind

conditions are less of a factor than wind conditions at the point from which the $PM_{2.5}$ was initially entrained in the air.

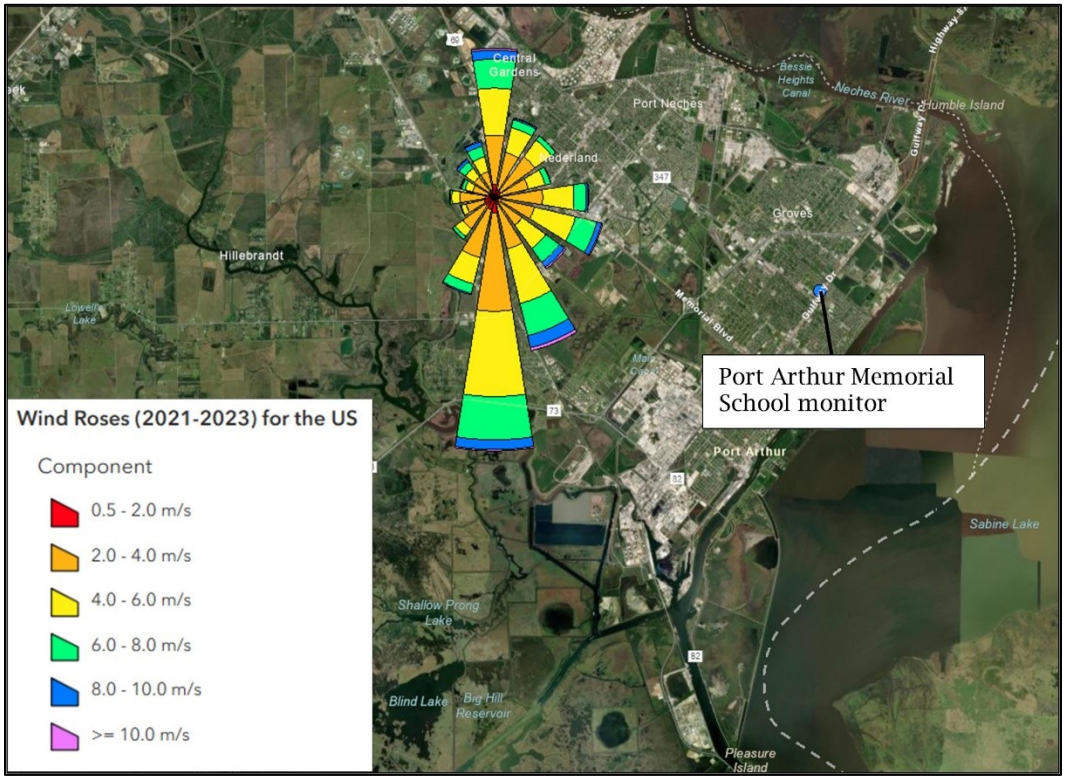

Figure 4-2: Wind Rose in Jefferson County, from 2021-2023

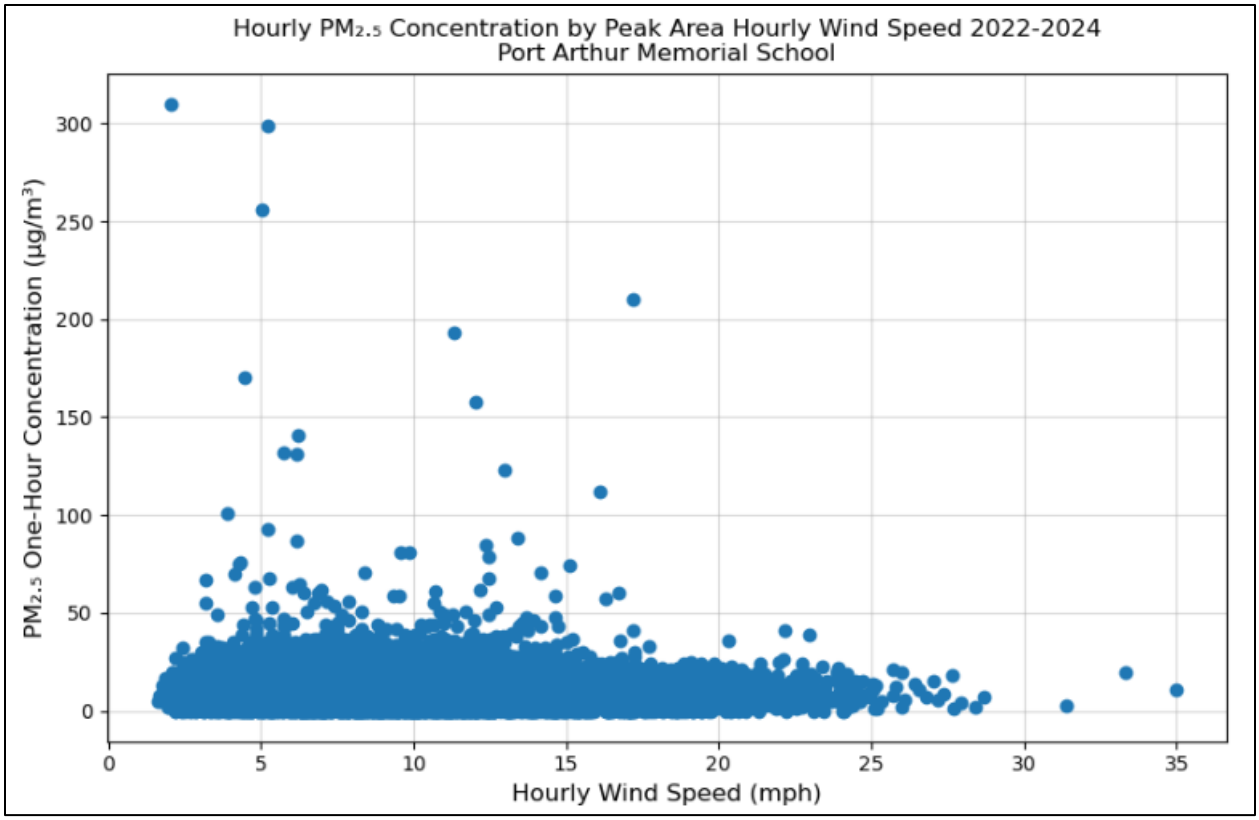

Figure 4-3: Hourly Average Continuous $PM_{2.5}$ Concentrations at the Port Arthur Memorial School Monitor by Peak Area Hourly Wind Speed in Jefferson County for 2022, 2023, and 2024

4.3 ATTAINMENT STATUS AND CONTROL MEASURES

Jefferson County is currently designated as attainment for the 2012 primary annual $PM_{2.5}$ standard of 12.0 µg/m³. In February 2024, EPA lowered the primary annual standard to 9.0 µg/m³, and 2024 design values show that $PM_{2.5}$ concentrations in Jefferson County are above the revised standard. In this document, TCEQ demonstrates that the $PM_{2.5}$ concentrations at monitors on dates listed in Table 1-1 were caused by exceptional events and requests that these dates be excluded from regulatory decisions for the 2024 annual $PM_{2.5}$ NAAQS.

As a part of the state implementation plan (SIP) strategy, Texas has established statewide rules to attain or maintain the National Ambient Air Quality Standards for particulate matter (PM). Title 30 TAC §111, Subchapter A includes statewide regulations for visible emissions and PM.[16] These regulations contain control requirements that apply to various sources of PM emissions and monitoring, testing, and recordkeeping requirements for affected sources. Title 30 TAC §111, Subchapter B is a statewide regulation that addresses outdoor burning and is applicable to particulate matter control.[17]

4.4 PRESCRIBED FIRES AND SMOKE MANAGEMENT PLANS

The Texas A&M Forest Service (TFS, formally called Texas Forest Service) coordinates fire and smoke management issues in Texas to address basic smoke management practices for

[16] https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=111&sch=A
[17] https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=111&sch=B&rl=Y

prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs pursuant to the requirements under the Regional Haze Rule 40 CFR §51.308(f)(2)(iv)(D).[18] The 34th Texas Legislature created the TFS in 1915. The legal mandate of the TFS includes the responsibility to "assume direction of all forest interests and all matters pertaining to forestry within the jurisdiction of the state." The TFS has developed a voluntary approach called the Texas Forest Service Smoke Management System, under which all land managers in Texas, including the National Park Service, inform the TFS before performing prescribed burns.

The Regional Haze Rule allows for states to have smoke management programs that are comparable to smoke management plans (SMP) without being certified as SMPs. The following list is documentation that Texas has a structure in place, with rules, communication systems, and data collection to help reduce particulate matter, which reduces visibility. The following are documents, rules, memorandums of understanding, etc., that help establish that Texas has a working smoke management program to help reduce smoke and fires throughout the state. This list is not exhaustive and is only a sample. The documents are updated periodically.

- Texas Forest Service (TFS), 2023. Texas Wildfire Protection Plan.[19]
- TFS, 2018. Texas A&M Forest Service Smoke Management Plan.[20]
- TCEQ, 2015. Outdoor Burning in Texas, publication number: RG-049.[21]
- Texas Administrative Code (TAC), Title 30, Environmental Quality, Part 1, Texas Commission on Environmental Quality, Chapter 111, Control of Air Pollution from Visible Emissions and Particulate Matter, Subchapter B, Outdoor Burning.[22]
- Texas Parks and Wildlife Department, 2015. General Plan for Prescribed Burning on Texas Parks and Wildlife Department Lands.[23]
- Master Cooperative Wildland Fire Management and Stafford Act Response Agreement with U.S. Forest Service, National Park Service, U.S. Fish & Wildlife Service, Bureau of Indian Affairs, Texas Forest Service, and Texas Parks and Wildlife Department, 2015.[24]

4.5 FIRES IN MEXICO/CENTRAL AMERICA, FIRE – CANADIAN, WILDFIRE – U.S., OTHER – WEATHER, AND SAHARAN DUST

Section 40 CFR §50.14 (a)(8)(vii) provides that a state would not be required to provide case-specific justification to support the not reasonably controllable or preventable portion of the rule when the emissions-generating event was outside the state. Specifically, Section 40 CFR §50.14 (a)(8)(vii) states:

> *The Administrator shall not require a State to provide case-specific justification to support the not reasonably controllable or preventable criterion for emissions-generating activity that occurs outside of the State's jurisdictional boundaries within which the concentration at issue was monitored.*

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[18] https://tfsweb.tamu.edu/
[19] https://tfsweb.tamu.edu/uploadedFiles/TFSMain/Wildfires_and_Disasters/Contact_Us(3)/Texas%20Wildfire%20Protection%20Plan_May%202023%20Revision.pdf
[20] https://tfsweb.tamu.edu/uploadedFiles/TFS_Main/Manage_Forests_and_Land/Prescribed_Fires/TFS%20SMP.pdf
[21] https://www.tceq.texas.gov/downloads/publications/rg/outdoor-burning-in-texas-rg-49.pdf
[22] https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=111&sch=B&rl=Y
[23] https://tpwd.texas.gov/publications/pwdpubs/media/pwd_lf_w7000_1818_general_plan_for_burning_on_tpwd_lands.pdf
[24] https://gacc.nifc.gov/swcc/management_admin/incident_business/docs/25.Texas%20Master%20Agreement.pdf

SECTION 5: HUMAN ACTIVITY UNLIKELY TO RECUR AT A PARTICULAR LOCATION OR NATURAL EVENT

5.1 OVERVIEW

This section satisfies the Exceptional Events Rule Requirement at 40 CFR §50.14(c)(3)(iv)(E): "A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event."

5.2 AFRICAN DUST – NATURAL EVENT

Based on the documentation provided in Section 3 of this demonstration, the event qualifies as a natural event due to dust originating from the Sahara Desert, which is relatively undisturbed by human activity and has commonly occurring dust storms.

EPA generally considers the emissions of $PM_{2.5}$ from dust events to meet the regulatory definition of a natural event under 40 CFR §50.1(k), defined as one 'in which human activity plays little or no direct causal role.'

Saharan dust impacts monitors in Texas every year, mainly in the summer. The three to six episodes per year are typically intense and characterized by high incoming background levels that last one to three days or more. Satellite imagery provides good visual evidence of African dust moving across the Atlantic Ocean, through the Caribbean, and into the Gulf of Mexico. Current NASA Worldview satellite imagery of dust surface mass concentration layers created from time-averaged 2-dimensional mean data collections from July 2021, 2022 and 2023, present an annual trend of dust being transported from west Africa through the Caribbean and into Texas (*Figure 5-1: July 2021 Monthly Average Dust Surface Mass Concentration (MERRA-2)*, Figure 5-2: *July 2022 Monthly Average Dust Surface Mass Concentration (MERRA-2)*, and Figure 5-3: *July 2023 Monthly Average Dust Surface Mass Concentration (MERRA-2)*).[25]

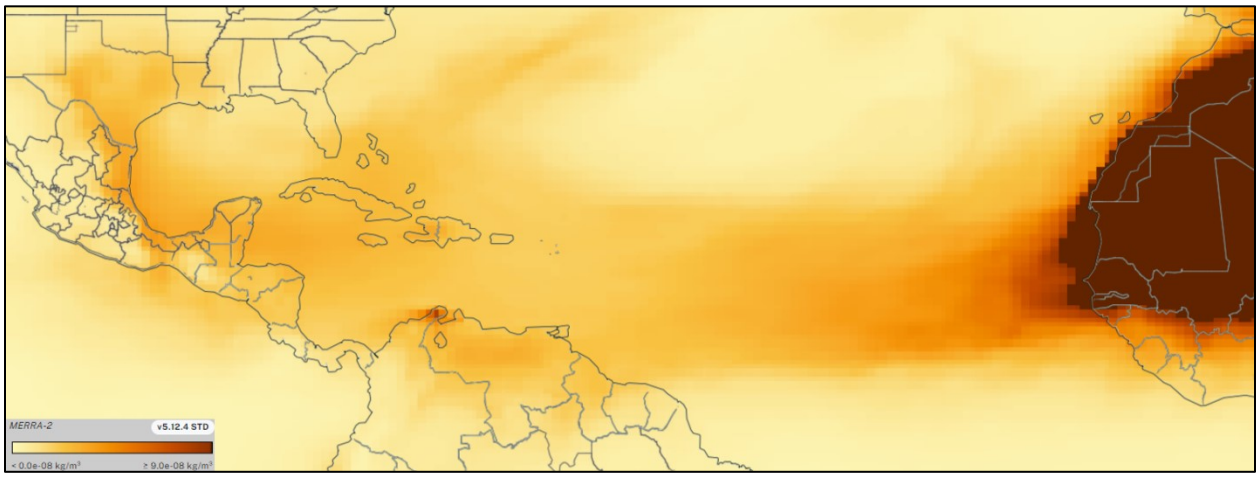

Figure 5-1: July 2021 Monthly Average Dust Surface Mass Concentration (MERRA-2)

[25] https://worldview.earthdata.nasa.gov/, accessed July 8, 2025

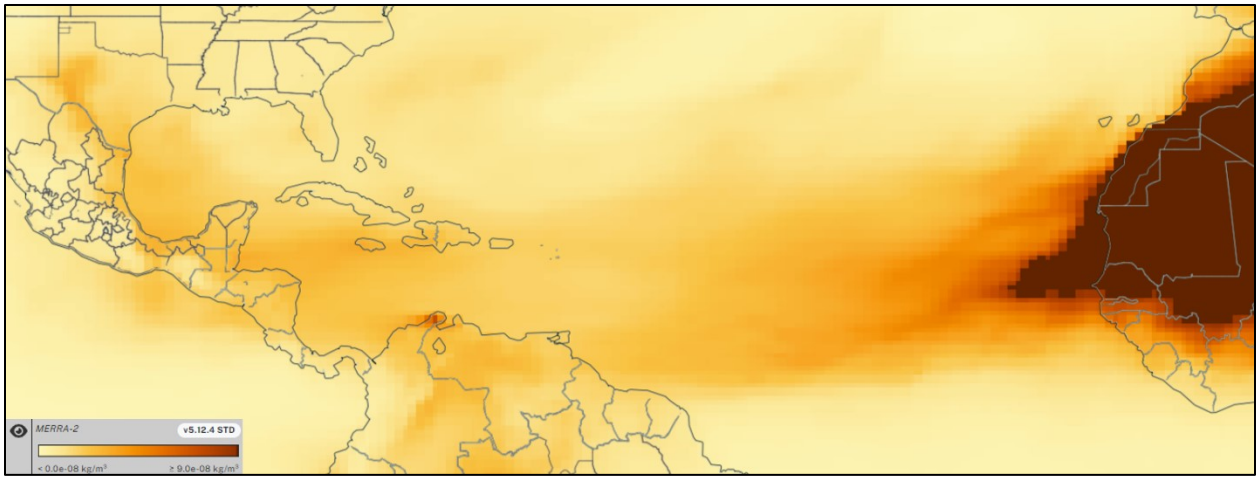

Figure 5-2: July 2022 Monthly Average Dust Surface Mass Concentration (MERRA-2)

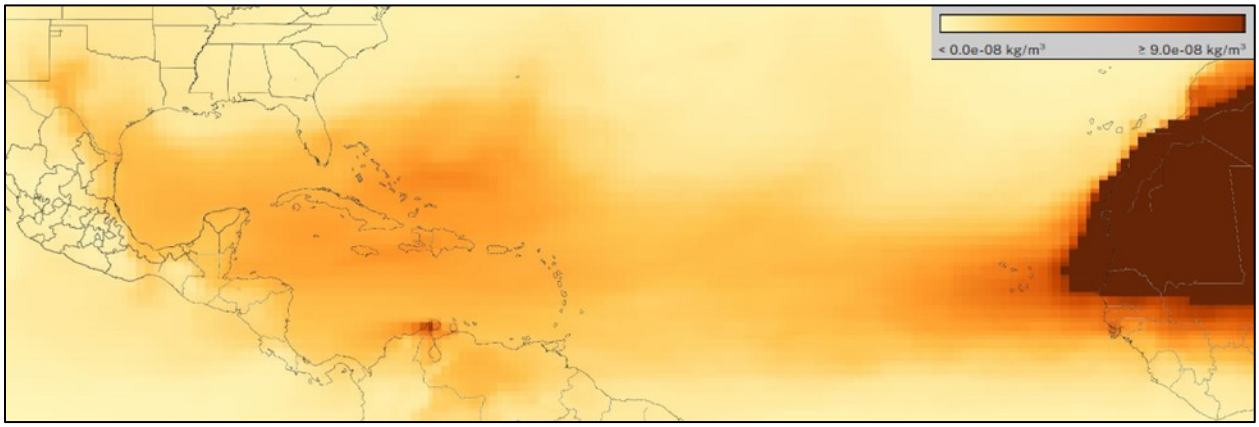

Figure 5-3: July 2023 Monthly Average Dust Surface Mass Concentration (MERRA-2)

5.3 PRESCRIBED FIRES – HUMAN ACTIVITY UNLIKELY TO RECUR AT A PARTICULAR LOCATION

Prescribed fires are recognized as being caused by human activity and therefore must satisfy the 'human activity unlikely to recur at a particular location' portion of the rule. Recurrence for prescribed fires is defined by either "the natural fire return interval or the prescribed fire frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem contained in a multi-year land or resource management plan with a stated objective to establish, restore and/or maintain a sustainable and resilient wildland ecosystem and/or to preserve endangered or threatened species through a program of prescribed fire." Thus, the recurrence frequency for prescribed fire is specific to the ecosystem and resource needs of the affected area.

The Texas A&M Forest Service coordinates prescribed fires and establishes smoke management plans for the state, as described in Section 4.4. Smoke from prescribed fires in other states may impact Texas monitors as well. The prescribed fires impacting monitors in Texas occurred in Texas and Louisiana. Any prescribed fires occurring outside the State of Texas were not reasonably controllable or preventable by the State of Texas and are essentially treated as wildfires in this demonstration. The State of Louisiana maintains robust programs aimed at

responding to wildfires and preventing future ones. The Louisiana Department of Agriculture and Forestry maintains information for prescribed burning on its Prescribed Burning webpage.[26]

Based on the documentation provided in Section 3 of this submittal, the prescribed fire events satisfied the 'human activity unlikely to recur at a particular location' criterion by describing the transitory nature of the fire smoke and the high $PM_{2.5}$ concentration on event days.

5.4 HIGH WINDS – NATURAL EVENT

High wind dust events are considered to be natural events in cases where windblown dust is entirely from natural undisturbed lands in the area or where all anthropogenic sources are reasonably controlled (40 CFR §50.14(b)(5)(ii)). An event involving windblown dust solely from natural undisturbed landscapes is considered a natural event.

Based on the documentation provided in Section 3 of this submittal, the high wind events qualify as a natural event. The exceedances of $PM_{2.5}$ associated with the high wind events listed in Table 1-1 meet the regulatory definition of a natural event at 40 CFR §50.14(b)(8). These events transported windblown dust from natural lands in West Texas and, accordingly, TCEQ has demonstrated that the event is a natural event and may be considered for treatment as an exceptional event.

5.5 FIRES IN MEXICO/CENTRAL AMERICA – HUMAN ACTIVITY UNLIKELY TO RECUR AT A PARTICULAR LOCATION

A recent report titled "*Fires in Mexico as Exceptional Events: Documentation and Implications*" provided evidence that the vast majority of the fires in Mexico are not caused by agricultural burning, and that they do not reoccur at the same location.[27] The evidence includes statistics on the source of fires from the Mexican government and other sources.

A majority of the observed fires are forest fires or burns performed to clear land for development, and these are also not expected to recur at a particular location. Once the forest is burned at a specific location, the biomass is consumed, and the land is not prime for additional fires in the following years. The Global Forest Watch website shows that areas with highest rates of tree loss due to forest fires occur along the east coast of Mexico. Mexican fires show seasonality that follows known climatology with a dry season, typically in the period of January to May, that affects Mexico and Central America. This dry season favors conditions for starting of wildfires.

The report suggests that most of the fires and smoke from fire in Mexico during the dry season should be considered non-recuring and thus should be considered exceptional events as it satisfies that is an event caused by human activity that is unlikely to recur at a particular location or a natural event.

TCEQ downloaded data on the number of reported fires in 2022, 2023, and 2024 and possible causes of these fires from the Gobierno de Mexico's "*Concentrado Nacional de Incendios Forestales*" (Government of Mexico's National Concentration of Forest Fires) webpage.[28] In 2022, a total of 6,719 instances of fires were reported with 15 unique possible causes: Camp fires, Unknown, Intentional, Smokers, Transportation, Agricultural activities, Celebrations and Rituals, Hunters, Cattle Activities, Burning Trash, Natural, Other productive activities, Forest

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[26] https://www.ldaf.la.gov/land/fire/prescribed-burning
[27] https://www.tceq.texas.gov/downloads/air-quality/sip/pm/ramboll_mexicanfires.pdf
[28] https://monitor_incendios.cnf.gob.mx/incendios_tarjeta_semanal, accessed on January 27, 2025.

Waste, Road Clearing, and Illegal Activities. Of the 6,719 fires in 2022, 2,198 (33%) fires occurred in protected natural areas and are unlikely to recur. In 2023 and 2024, a total of 7,611 and 8,002 instances of fires, respectively, were reported with 14 unique possible causes: Campfires, Unknown, Intentional, Smokers, Transportation, Agricultural Activities, Celebrations and Rituals, Hunters, Cattle Activities, Burning Trash, Natural, Other Productive Activities, Forest Waste, and Road Clearing. Of the 7,611 fires in 2023, 2,334 (31%) fires occurred in protected natural areas and are unlikely to recur. Of the 8,002 fires in 2024, 2,590 (32%) fires occurred in protected natural areas and are unlikely to recur.

Figure 5-4: *Map of Forest Fires in Mexico in 2022* is a map of all the instances of forest fires reported in 2022. Figure 5-5: *Fires in Mexico in 2022 classified as unlikely or likely to recur based on possible causes* shows that 45% of fires that occurred in 2022 are unlikely to recur based on the possible causes provided and covered a surface area of 286,854.66 hectares where fires are unlikely to recur.[29] Figure 5-6: *Map of Forest Fires in Mexico in 2023* is a map of all the instances of forest fires reported in 2023. Figure 5-7: *Fires in Mexico in 2023 classified as unlikely or likely to recur based on possible causes* shows that 49% of fires that occurred in 2023 are unlikely to recur based on the possible causes provided and covered a surface area of 405,785.69 hectares where fires are unlikely to recur.[30] Figure 5-8: *Map of Forest Fires in Mexico in 2024* is a map of all the instances of forest fires reported in 2024. Figure 5-9: *Fires in Mexico in 2024 classified as unlikely or likely to recur based on possible causes* shows that 35% of fires that occurred in 2024 are unlikely to recur based on the possible causes provided and covered a surface area of 346,504.05 hectares where fires are unlikely to recur.[29] It should be noted that the data available on the website is only for forest fires and is therefore only a subset of fires that happened in 2022, 2023, and 2024.

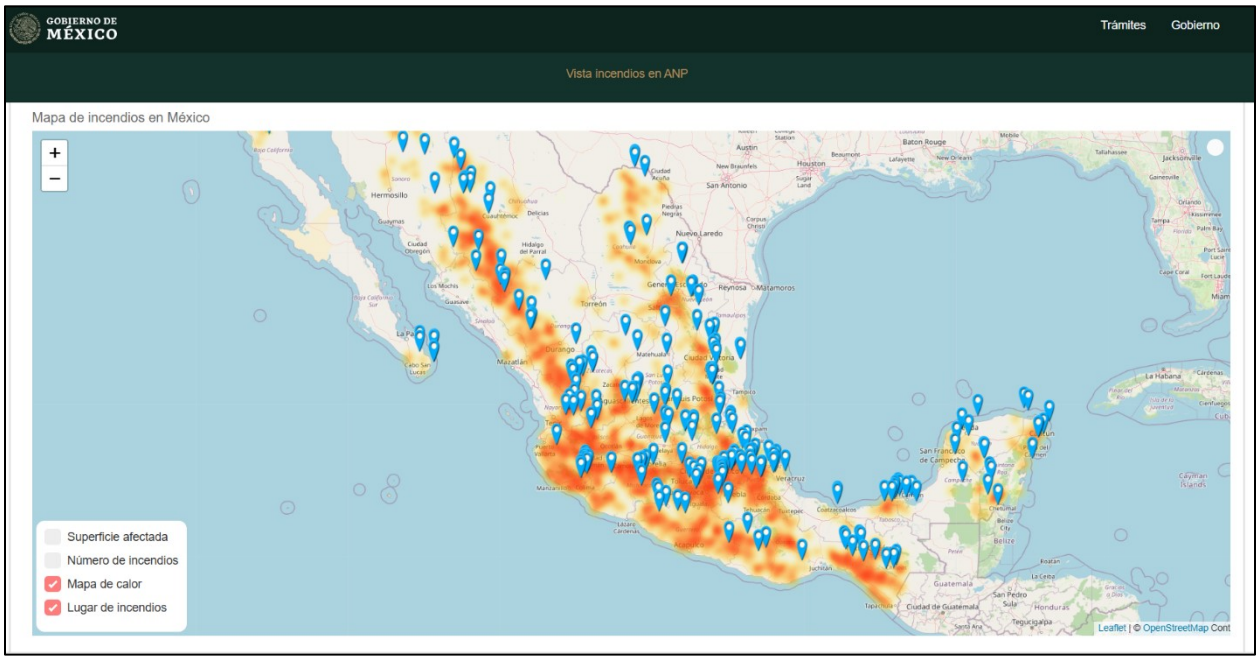

Figure 5-4: Map of Forest Fires in Mexico in 2022

[29] TCEQ classified forest fires that had possible causes of Campfires, Intentional, Smokers, Hunters, Natural, Forest Waste, and Illegal Activities as unlikely to recur.
[30] TCEQ classified forest fires that had possible causes of Campfires, Intentional, Smokers, Hunters, Natural, and Forest Waste as unlikely to recur.

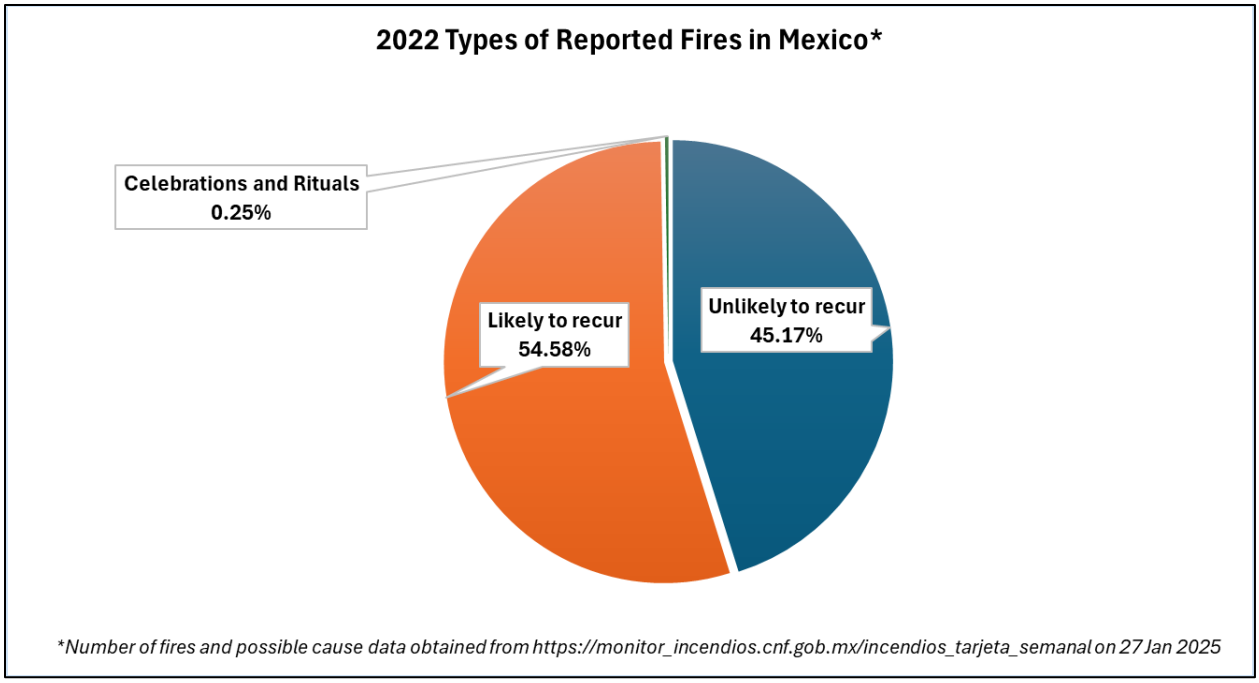

Figure 5-5: Fires in Mexico in 2022 classified as unlikely or likely to recur based on possible causes

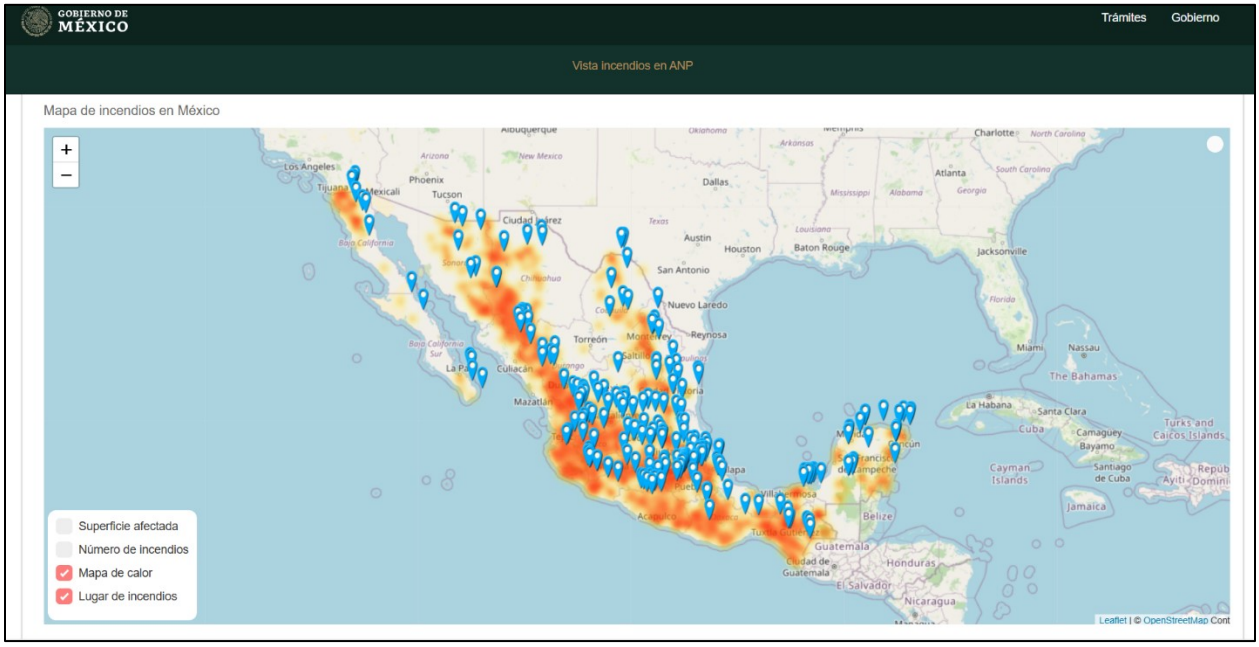

Figure 5-6: Map of Forest Fires in Mexico in 2023

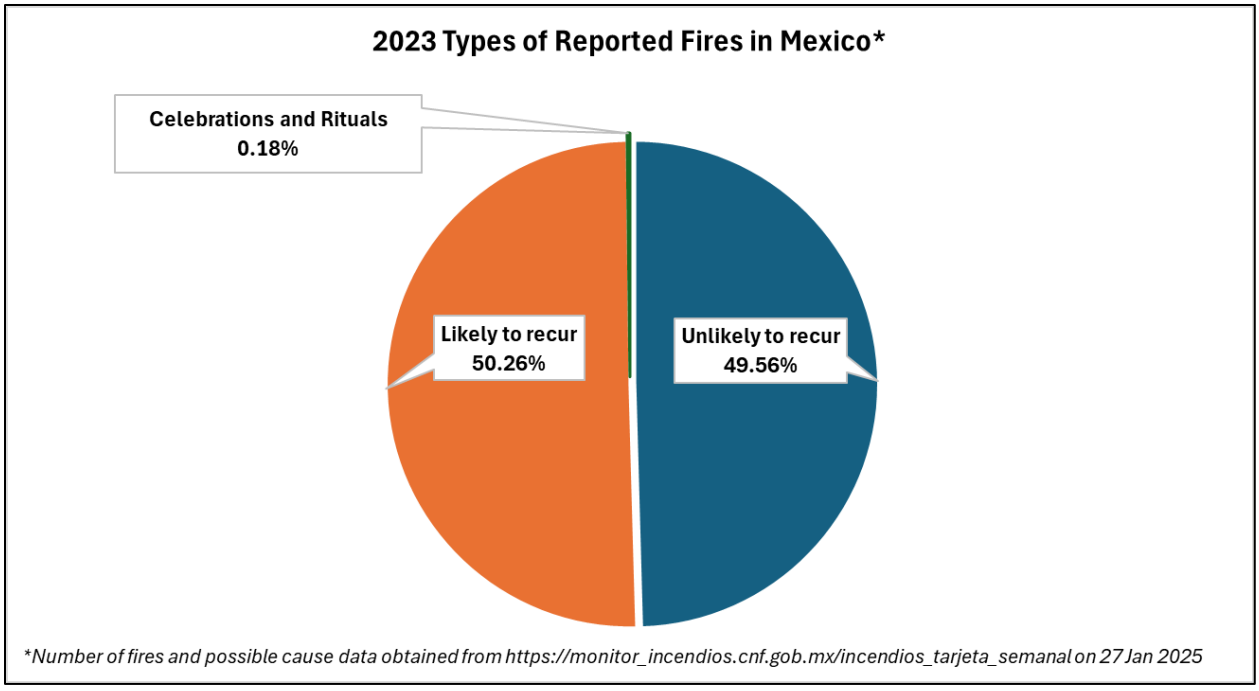

Figure 5-7: Fires in Mexico in 2023 classified as unlikely or likely to recur based on possible causes

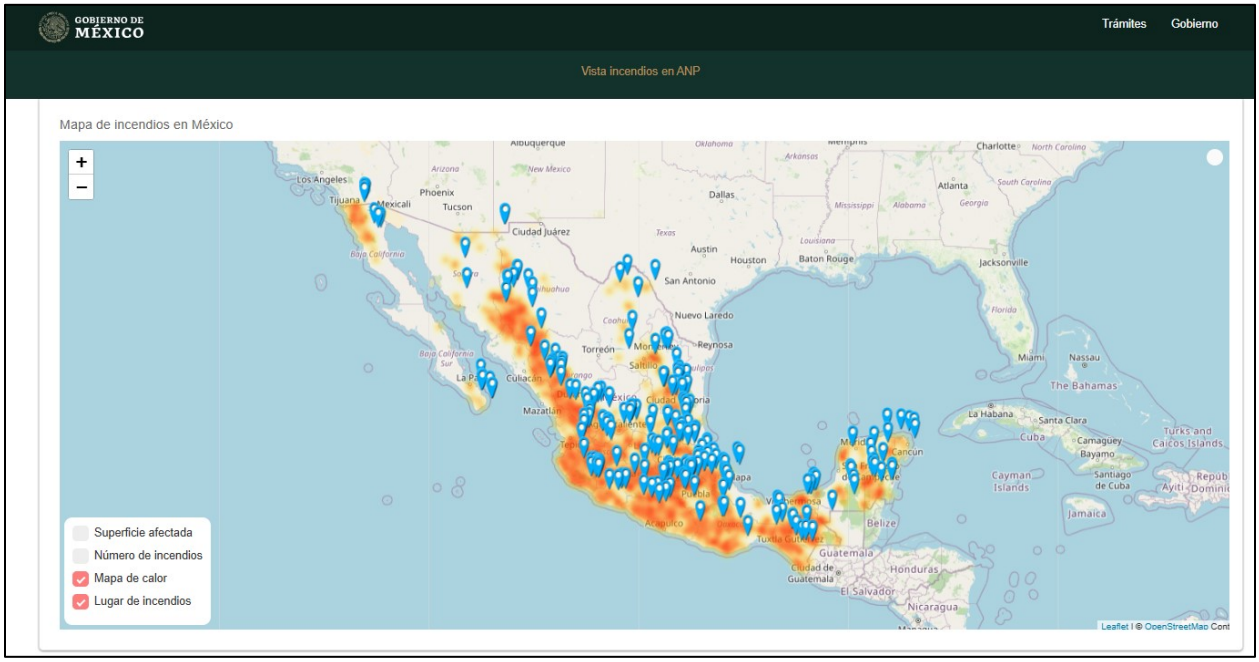

Figure 5-8: Map of Forest Fires in Mexico in 2024

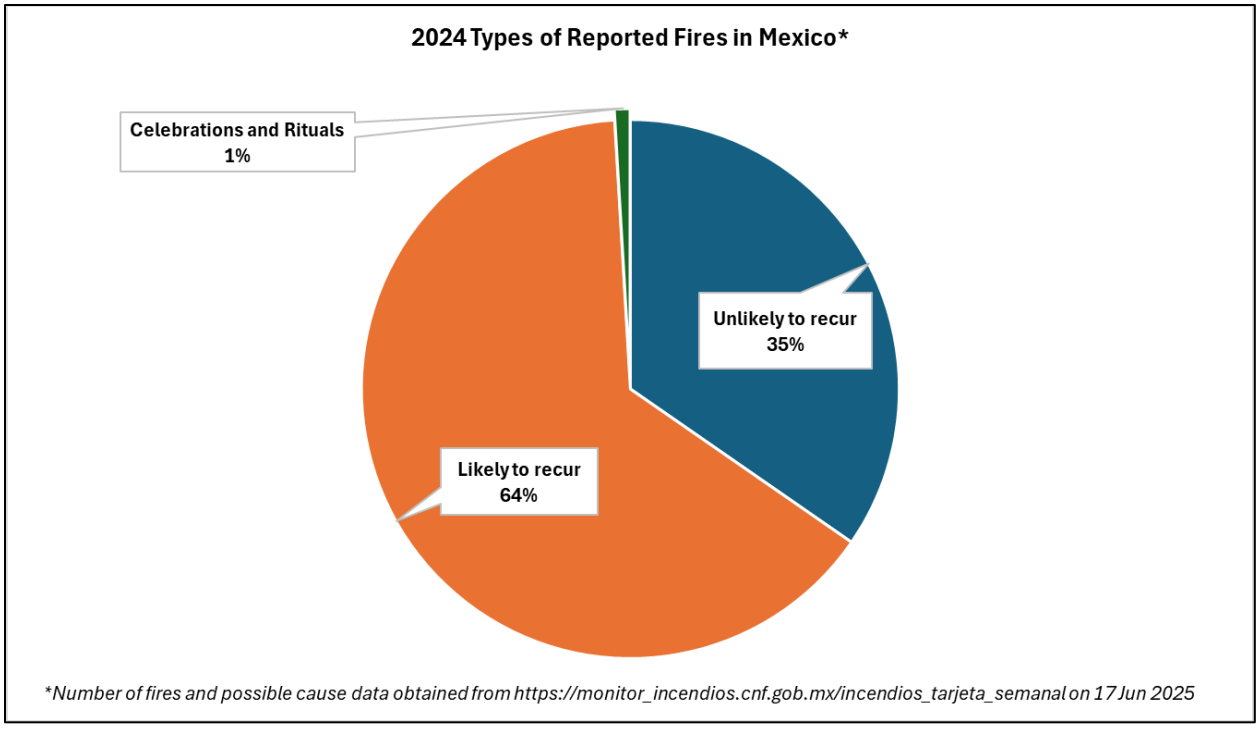

Figure 5-9: Fires in Mexico in 2024 classified as unlikely or likely to recur based on possible causes

SECTION 6: PUBLIC NOTIFICATION AND MITIGATION ACTIONS

6.1 OVERVIEW

This section satisfies the requirements in 40 CFR §51.930(a): "A state requesting to exclude air quality data due to exceptional events must take appropriate and reasonable actions to protect public health from exceedances or violations of the NAAQS." These are commonly referred to as mitigation actions.

Each of the specific requirements are addressed individually below.

6.2 PROMPT PUBLIC NOTIFICATION

The first mitigation requirement is to "provide for prompt public notification whenever air quality concentrations exceed or are expected to exceed an applicable ambient air quality standard." TCEQ provided (and continues to provide) ozone, fine particulate matter ($PM_{2.5}$), and particulate matter less than or equal to 10 microns in diameter (PM_{10}) Air Quality Index (AQI) forecasts for the current day and the next three days for 14 areas in Texas. These forecasts are available to the public on the Today's Texas Air Quality Forecast webpage of the TCEQ website and on EPA's AirNow website.[31, 32]

TCEQ provides near real-time hourly $PM_{2.5}$ measurements from monitors across the state which the public may access on the Latest Hourly $PM_{2.5}$ Levels webpage of the TCEQ website.[33] TCEQ also publishes an AQI Report for many Texas metropolitan areas on the AQI and Data Reports webpage of the TCEQ website, which displays current and historical daily AQI measurements.[34]

Finally, TCEQ publishes daily updates to its air quality forecast to interested parties through e-mail and social media platforms. Any person wishing to receive these updates may register on the Air Quality Forecast and Ozone Action Day Alerts webpage on the TCEQ website.[35] These measures provide daily and near real-time notification to the public, including the media, of current, expected, and changing air quality conditions.

6.3 PUBLIC EDUCATION

The second mitigation requirement is to "provide for public education concerning actions that individuals may take to reduce exposures to unhealthy levels of air quality during and following an exceptional event." Through its website, TCEQ provides the public with technical, health, personal activity, planning, and legal information and resources concerning particulate matter (PM) pollution. Besides its website, TCEQ publishes daily updates to its air quality forecast to interested parties through e-mail and social media platforms to provide daily and near real-time notification to the public of current, expected, and changing air quality conditions.

TCEQ maintains a particulate matter webpage, which provides important information regarding the health effects of particulate matter, steps that individuals can take to limit particulate matter emissions, and actions they may wish to take to reduce their exposure to higher levels

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[31] http://www.tceq.texas.gov/airquality/monops/forecast_today.html
[32] http://airnow.gov
[33] https://www.tceq.texas.gov/cgi-bin/compliance/monops/select_curlev.pl?user_param=88101
[34] https://www.tceq.texas.gov/airquality/monops/data-reports
[35] http://www.tceq.texas.gov/airquality/monops/ozone_email.html

of particulate matter.[36] The webpage also addresses the latest air quality planning for the particulate matter NAAQS.

TCEQ's main Air webpage provides air quality information on topics such as advisory groups, emissions inventories, air quality modeling and data analysis, scientific field studies, state implementation plan (SIP) revisions, air permits, rules, air monitoring data, and how to file complaints.[37]

TCEQ's website provides a hyperlink to the Texas AirNow website operated by EPA. This website links the public to additional information regarding health effects of PM, strategies for reducing one's exposure to PM, and actions that individuals can take to reduce pollution levels.[38]

The Texas Department of Transportation (TxDOT) sponsors the public education and awareness through the Drive Clean Across Texas campaign.[39] The campaign raises awareness about the impact of vehicle emissions on air quality and motivates drivers to take steps to reduce air pollution.

TCEQ sponsors the Take Care of Texas program, which addresses air quality and provides the public with proactive steps to reduce air pollution particularly on days when air quality forecasts are issued predicting greater potential for high PM concentrations.[40]

6.4 IMPLEMENTATION OF MEASURES TO PROTECT PUBLIC HEALTH

The third requirement is to "provide for the implementation of appropriate measures to protect public health from exceedances or violations of ambient air quality standards caused by exceptional events."

Particulate matter regulations are in place in Title 30 Texas Administrative Code Chapter 111 that are applicable to particulate matter control statewide. These regulations are previously described in Section 4: *Not Reasonably Controllable or Preventable*.

6.5 MITIGATION PLAN REQUIREMENTS

Section 319(b) of the federal Clean Air Act (FCAA) governs the identification of air quality monitoring data as exceptional events and how that data may be excluded from consideration for air quality regulatory purposes. EPA has adopted rules in 40 Code of Federal Regulation (CFR) §§50.14 and 51.930 to implement FCAA, §319, requiring states to adopt and implement mitigation plans in areas with historically documented or known seasonal events.

For $PM_{2.5}$, TCEQ has developed mitigation plans for exceptional events in Harris County and El Paso County that can be found on the TCEQ website.[41]

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[36] https://www.tceq.texas.gov/airquality/sip/criteria-pollutants/sip-pm
[37] http://www.tceq.texas.gov/agency/air_main.html
[38] https://www.airnow.gov
[39] http://www.drivecleanacrosstexas.org
[40] http://takecareoftexas.org/air-quality
[41] https://www.tceq.texas.gov/downloads/air-quality/modeling/exceptional/texas-ee-mitigation-plan-final.pdf

SECTION 7: PUBLIC COMMENT PERIOD

7.1 OVERVIEW

This section satisfies the Exceptional Events Rule Requirement at 40 CFR §50.14(c)(3)(iv)(A), (B), (C): "document that the air agency followed the public comment process and that the comment period was open for a minimum of 30 days, which could be concurrent with the beginning of EPA's initial review period of the associated demonstration provided the air agency can meet all requirements in this paragraph; submit the public comments received along with its demonstration to the Administrator; and address in the submission to the Administrator those comments disputing or contradicting factual evidence provided in the demonstration."

7.2 PUBLIC COMMENT PROCESS

The public comment period for this demonstration is from August 5, 2025, through September 5, 2025. During this comment period, the demonstration was available on TCEQ's website at https://www.tceq.texas.gov/airquality/monops/pm_flags.html. Written comments will be accepted via mail or e-mail. TCEQ will include all comments received or postmarked by 5:00 p.m. CDT on September 5, 2025, with the final demonstration submitted to EPA. TCEQ will also address those comments disputing or contradicting factual evidence provided in the final demonstration.

SECTION 8: CONCLUSION

This exceptional events demonstration shows that the Port Arthur Memorial School monitor was impacted by smoke and dust from prescribed fires, fires in Mexico and Central America, fireworks, and African dust. These exceptional events caused the elevated $PM_{2.5}$ concentrations on the dates listed in Table 1-1, as explained in Section 3: *Clear Causal Relationship*.

This demonstration shows that the exceptional events that influenced $PM_{2.5}$ concentrations are consistent with EPA's definition of an exceptional event under the 2016 Exceptional Events Rule. TCEQ requests that EPA concur with the exclusion from regulatory decisions the $PM_{2.5}$ concentration(s) in Table 1-1. The days and sites for which TCEQ is requesting concurrence were impacted by events consistent with EPA's definition of "unusual or naturally occurring events" that can affect air quality but are not reasonably controllable using techniques that tribal, state, or local air agencies may implement in order to attain and maintain the 2024 primary annual $PM_{2.5}$ NAAQS.