

Texas Commission on Environmental Quality  
Monitoring Division

Permian Basin Survey  
Region 2 Lubbock and  
Region 7 Midland  
February 9-13, 2020

Strategic Sampling Work Group

Document Number  
PB2002

## Overview

The Strategic Sampling Work Group (SSWG) traveled to the Permian Basin area February 9 – 13, 2020, to conduct a survey trip for hydrogen sulfide (H<sub>2</sub>S) and sulfur dioxide (SO<sub>2</sub>) at selected locations within Region 2 (R2) Lubbock and Region 7 (R7) Midland. Surveys were predominantly conducted around areas/facilities of concern identified by R2, R7, and the *Region 7 Permian Basin Survey Report* (PB1912).

## Project Summary

Monitoring was focused on areas where industry intersected with nearby publicly accessible areas, or where elevated concentrations of target compounds were detected. Monitoring was also conducted around areas highlighted by R2, R7, and areas identified in PB1912. Monitoring results were provided to regional staff at the end of each sampling day and/or upon the collection of any data that indicated the potential need for immediate investigation or follow-up.

### Total Reduced Sulfur, Hydrogen Sulfide, and Sulfur Dioxide Data

Data were collected by conducting handheld instrument surveys with a Jerome J605 (Jerome) for total reduced sulfur (TRS) and by continuous monitoring of H<sub>2</sub>S and SO<sub>2</sub> using a Picarro G2204 and Teledyne 101E analyzer, respectively. Mapped surveys collected data in 5-second averages. When surveyed concentrations of target compounds were detected above regulatory standard numerical values, noted below, or strong odors were detected, stationary monitoring was conducted to collect 5- and 30-minute (min) averages close to the downwind area where the elevated concentrations were detected (Attachment A).

Collected TRS, H<sub>2</sub>S, and SO<sub>2</sub> data were compared to the following limits, as applicable:

- The SO<sub>2</sub> regulatory limit is 400 parts per billion by volume (ppbv) averaged over a 30-min period (*30 Texas Administrative Code, Part 1, Chapter 112, Subchapter A, Rule §112.3*) and 75 ppbv averaged over a 1-hour period (*Title 40 Code of Federal Regulations §50.17*).
- The H<sub>2</sub>S regulatory limit is 80 ppbv averaged over a 30-min period (*30 Texas Administrative Code, Part 1, Chapter 112, Subchapter B, Rule §112.31*).

SO<sub>2</sub> results were compared to the SO<sub>2</sub> regulatory limits, while TRS and H<sub>2</sub>S data were compared to the H<sub>2</sub>S regulatory limit. SO<sub>2</sub> and H<sub>2</sub>S state regulatory limits are based on a net concentration (collected from upwind and downwind data) averaged over a 30-min period. The SO<sub>2</sub> federal limit (75 ppbv) is meant for comparison to a three-year average of the annual (99<sup>th</sup> percentile) daily maximum 1-hour average concentration. All concentrations within this report were only detected downwind of potential sources and are not net values. In addition, not all SO<sub>2</sub>, TRS, and H<sub>2</sub>S data were collected and averaged over a 30-min or 1-hour period. As such, the data in this report are not intended for compliance comparison to the regulatory limits. These limits were used as screening tools to aid in decision-making during the monitoring trip, such as when to create a survey map of an area, when to conduct stationary monitoring and to suggest potential locations for further investigation in the future.

Survey maps showing H<sub>2</sub>S concentrations higher than the H<sub>2</sub>S state regulatory standard numerical value are included as attachments.

No SO<sub>2</sub> data are included in this report due to the majority of the SO<sub>2</sub> data measured being at or near the detection limit of 3 ppbv. Four nonconsecutive, 1-minute average SO<sub>2</sub> concentrations collected during the monitoring trip were above the federal regulatory standard numerical value of 75 ppbv; however, these would not have contributed to a 1-hour average above 75 ppbv. No measurements above the state regulatory standard numerical value limit of 400 ppbv were observed.

### Global Positioning System Data

Global Positioning System (GPS) coordinates were collected in tandem with analytical data. During stationary monitoring at the end of Day 2, between 4:25 PM and 6:00 PM, the datalogger used to collect

GPS data stopped recording data. This malfunction was corrected on Day 4 at 6:00 PM. GPS data collected on Days 3 and 4 were not stored in the datalogger, though GPS coordinates were collected by hand for all stationary monitoring locations. No concentration gradient survey maps were able to be created for this timespan due to the lack of stored GPS data, however 5-second H<sub>2</sub>S data collected during these surveys are discussed in the Day 3 and 4 daily summaries.

### Meteorological Data

Meteorological (MET) data were collected using a Climatronics All-In-One (AIO) compact weather station. AIO data were used to generate wind roses that are included on the survey maps to indicate wind speed and direction during monitoring.

### Field Activities, Observations, and Results

Mobile monitoring within R2 and R7 occurred over a five-day period as outlined in the table below. The colors for each survey area refer to colors on the maps shown in Attachment B.

**Table 1: Daily Monitoring Activity and Facilities**

Facilities/Areas of Interest	Survey Area	Monitoring Dates
Complaint Source in Western Odessa Industrial Park in Southeastern Odessa Neighborhood in Southwestern Odessa Neighborhood in Western Odessa Neighborhood near LBJ Elementary	Odessa (orange)	February 9, 11, 13, 2020
Clyde Cowden Battery Goldsmith Gas Plant James Lake Gas Plant Neighborhoods in Goldsmith Neighborhoods in West Odessa Phillips 66 Tank Farm PWS Moss Blending Facility	Goldsmith and West Odessa (blue)	February 9, 10, and 12, 2020
Proposed Flyover Batteries, Farms, and Flares Neighborhoods outside Loop 250 Site of 11/2019 Midland Explosion and Fire South Gridiron Battery Tank Batteries outside and near Loop 250 Tank Farm Southeast of Midland	Midland (yellow)	February 10, 2020
Hess Corporation Seminole Gas Plant JB Fluid Services Riley Gas Plant Seminole Butane Tank Batteries near County Road (CR) 105 Whiting Oil and Gas Corporation Tank Battery	Seminole (green)	February 12-13, 2020
Cornell-Mahoney Gas Plant Denver Units CO <sub>2</sub> Recovery Plant Northern Natural Gas Company Plains Gas Plant Wasson Gas Plant Wasson CO <sub>2</sub> Plant Willard CO <sub>2</sub> Separation Plant Yoakum Tank Battery	Denver City (brown)	February 13, 2020

**Day 1, February 9, 2020**

Winds were predominantly south/southwest throughout the day, becoming west in the late afternoon. Throughout the morning, all orange and blue (Odessa, West Odessa, and Goldsmith) map markers (Attachment B) were surveyed for TRS downwind of pump jacks, tank batteries, gas plants and proposed flyover locations. Concurrently, H<sub>2</sub>S survey maps were created in an eastern Odessa area, near LBJ elementary school, bounded by Interstate Highway-(IH) 20 Business Loop, Northeast Loop 338, Texas Highway (TX) 191, and Billy Hext Road and the industrial park surrounding ACE Completions, bounded by IH-20, Southeast Loop 338, IH-20 Business Loop, and Solo Road (Attachment C, Figure 1b). H<sub>2</sub>S survey maps were also created in a western Odessa neighborhood intersecting the oil field inside Loop 338 bounded by Loop 338, W Yukon Road, US Highway (US) 385, and TX 191 (Attachment C, Figure 1a and Attachment D). None of the surveys conducted during the morning resulted in any 5-second H<sub>2</sub>S concentration above 80 ppbv.

In the early afternoon, while conducting surveys in Goldsmith, a maximum instantaneous TRS concentration of 160 ppbv was noted on Farm-to-Market (FM)-866, south of Goldsmith, between TX 158 and TX 302. A follow-up H<sub>2</sub>S survey was conducted in this area (Attachment C, Figure 1c and Attachment E) resulting in a 5-second H<sub>2</sub>S concentration of 143 ppbv downwind of the Phillips 66 tank battery. Continuous H<sub>2</sub>S measurement surveys were then conducted along TX 158 from the city of Goldsmith west for approximately one mile along the south side of the Goldsmith Gas Plant and along neighborhood streets in Goldsmith, including West Scharbauer Street, North Scharbauer Street, Odessa Street, Avenue D, Avenue E, Alma Street and Devonian Street (Attachment C, Figure 1c). Except for the one 5-second average H<sub>2</sub>S concentration of 143 ppbv south of Goldsmith on FM-866, none of the surveys detected any 5-second H<sub>2</sub>S concentrations over 80 ppbv.

In the late afternoon, stationary H<sub>2</sub>S monitoring was conducted from 5:30 PM to 6:15 PM in the western Odessa neighborhood on North Golder Avenue, approximately 500 feet north of West 48<sup>th</sup> Street, where morning surveys indicated H<sub>2</sub>S concentrations near 80 ppbv (Attachment C, Figure 1a and Attachment D) and rotten egg odors were strongest. This area was also of interest due to it being a proposed flyover area. During stationary monitoring, the maximum 5-min H<sub>2</sub>S average concentration was 120 ppbv and the maximum 30-min H<sub>2</sub>S average concentration was 48 ppbv (Attachment A and Attachment D).

Concurrent with the stationary H<sub>2</sub>S monitoring in western Odessa, a second sampling team returned to southeast Odessa (Attachment C, Figure 1b) to conduct additional TRS surveys around an industrial area associated with sulfur-type odor complaints received by R7. While no odors typically associated with sulfur compounds or TRS concentrations were detected, faint amine odors were noted downwind of ACE Completions. This was the only odor observed south of the neighborhood associated with R7 complaints.

**Day 2, February 10, 2020**

Due to morning precipitation, monitoring began around 11:00 AM. Winds were variable between northeast to east throughout the early afternoon. TRS surveys were conducted in eastern Midland along FM-307 from approximately one mile east to one mile west of IH-20, where faint rotten egg odors were detected near tank batteries lining the north side of the road. North of these tank batteries were multiple tank farms spanning a large section of eastern Midland. TRS was also surveyed in the areas downwind of tank batteries, tank farms, and pump jacks along Loop 250 North, from IH-20 to North Big Spring Street, in neighborhoods bordering these sites (yellow map markers in Attachment B). No TRS concentrations were detected above 80 ppbv and only faint odors were observed.

Three H<sub>2</sub>S surveys (Attachment F, Figure 2c) were conducted in eastern Midland on FM-307, between South Fairgrounds Road and South CR-1140 (Attachment F, Figure 2b), in northeast Midland off of Loop 250 North along North CR-1140 and west along East CR-60 (Attachment F, Figure 2a), and a neighborhood in north Midland off Loop 250 North from North CR-1160 to North Big Spring Street (Attachment F, Figure 2a). No H<sub>2</sub>S concentrations above the limit of quantitation (LOQ) of 20 ppbv were detected in Midland.

In the late afternoon, TRS surveys were conducted around the Goldsmith Gas Plant with calm, variable, and primarily southerly winds. Very strong rotten egg odors were observed and a maximum instantaneous TRS concentration of 9,700 ppbv was detected. Elevated concentrations of TRS continued for approximately 40 minutes while the H<sub>2</sub>S van traveled from Midland. The van then set up to conduct stationary monitoring directly north of Goldsmith Gas Plant on Scharbauer Street from 4:30 PM to 6:20 PM (Attachment G, Location 1). The maximum 5-second H<sub>2</sub>S concentration was approximately 20,000 ppbv, with a maximum 5-min H<sub>2</sub>S average concentration of 1,400 ppbv, and a maximum 30-min H<sub>2</sub>S average concentration of 360 ppbv (Attachment A).

### **Day 3, February 11, 2020**

Due to freezing rain conditions, monitoring did not begin until 1:00 PM and was limited due to icy road conditions. Wind speed and wind direction were collected in the parking lot of the Holiday Inn Odessa at the intersection of E 42<sup>nd</sup> Street and NE Loop 338. Winds were from the north-northeast to northeast all afternoon. Staff returned to the neighborhoods in western Odessa surveyed on Day 1 since elevated H<sub>2</sub>S concentrations had been observed (Attachment C, Figure 1a). Due to instrument malfunction, GPS data were not collected or stored resulting in the loss of the ability to create a map of the area where the Day 3 survey was conducted.

During this survey, a maximum 5-second H<sub>2</sub>S concentration of 212 ppbv was detected downwind of HC Foster Lease tank battery located on the northeast corner of Hereford Road and West 44<sup>th</sup> Street. Based on this measurement, additional data were collected at two stationary monitoring locations (Attachment H, Location 1 and Location 2) downwind of the tank battery along Hereford Road, 100 feet south of West 44<sup>th</sup> Street and on the southeast corner of Hereford Road and West 44<sup>th</sup> Street, respectively. Monitoring was conducted at Location 1 from 4:10 PM to 4:50 PM resulting in a maximum 5-min H<sub>2</sub>S concentration of 97 ppbv and maximum 30-min H<sub>2</sub>S concentration of 28 ppbv (Attachment A and Attachment H). Due to a small shift in wind direction around 4:45 PM, stationary monitoring was moved to Location 2 to intercept maximum downwind concentrations from the tank battery. Monitoring was conducted at Location 2 from 4:55 PM to 5:45 PM resulting in a maximum 5-min H<sub>2</sub>S concentration of 210 ppbv and maximum 30-min H<sub>2</sub>S concentration of 160 ppbv (Attachment A and Attachment H). As the tank battery near Locations 1 and 2 shares a fence line with a residential neighborhood.

### **Day 4, February 12, 2020**

Winds were from the west throughout the morning, shifting to northwest in the afternoon. Four H<sub>2</sub>S surveys were conducted in and around Seminole throughout the day. Due to continued instrument malfunction, GPS data were not collected or stored resulting in the inability to generate maps of the Day 4 surveys.

In the morning, a TRS survey was conducted downwind of the Whiting Oil and Gas Corporation tank battery on FM-1788, approximately 7 miles southeast of Seminole. A strong rotten egg odor was noted during flare operation and a maximum instantaneous TRS concentration of 449 ppbv was detected. Stationary monitoring could not be established before the flare was extinguished and odors and instantaneous TRS concentrations dissipated.

Concurrent with the TRS surveys, a second sampling team conducted H<sub>2</sub>S surveys downwind of the Hess Corporation Seminole Gas Plant: north along CR-205 from TX 214 to CR-208, east on CR-208 from CR-205 to US-385, and south on US-385 from CR-208 to CR-206. Due to strong rotten egg odors and 5-second H<sub>2</sub>S concentrations above 80 ppbv along CR-208, stationary monitoring was conducted from 11:55 AM to 12:40 PM directly downwind of a tank battery on the south side of CR-208, approximately 0.7 miles west of US-385 (Attachment I, Location 1). Winds were from the southwest to west-southwest during sampling. Steady 5-min H<sub>2</sub>S averages around 220 ppbv were recorded during this time. A maximum 5-min average was measured at 240 ppbv and a maximum 30-min H<sub>2</sub>S average was measured at 220 ppbv (Attachment A and Attachment I). As staff were leaving the area following the conclusion of their stationary monitoring, an H<sub>2</sub>S survey was conducted along CR-208 while traveling east towards US-385. This survey resulted in H<sub>2</sub>S concentrations above 80 ppbv until the survey van turned onto US-

385. R7 management were notified of the H<sub>2</sub>S concentrations and investigators were deployed to the area the next day.

An H<sub>2</sub>S survey of the Lindoss Unit tank battery, east of Seminole on CR-107 and approximately 0.2 miles south of CR-104, was conducted in the afternoon. A maximum 5-second H<sub>2</sub>S measurement of 80 ppbv was detected; however, no subsequent 5-second concentrations at or above 80 ppbv were detected and no further monitoring was conducted at this location.

While H<sub>2</sub>S surveys were being conducted east of Seminole, a second sampling team performed TRS surveys near the Riley Gas Plant, southwest of Seminole on CR-308 and approximately 0.25 miles east of CR-319. Due to the lack of accessible roadways, the team was unable to perform surveys directly downwind of the facility and no TRS concentrations were measured. Because of the distance from residential areas in Seminole and inability to sample downwind, no H<sub>2</sub>S monitoring was conducted.

In the late afternoon, staff returned to conduct H<sub>2</sub>S surveys around the Goldsmith Gas Plant. The surveys detected rotten egg odors, but no H<sub>2</sub>S concentrations were above 80 ppbv. Due to the high H<sub>2</sub>S concentrations measured on Day 2, overnight monitoring was conducted downwind of the Goldsmith Gas Plant on Highway 158, 1.2 miles west of Devonian Street (Attachment G, Location 2). Winds shifted consistently from due north to northeast throughout the night. The survey van was positioned south-southwest of the plant so that it was downwind for some period as wind shifts occurred. Stationary monitoring was conducted between the hours of 6:20 PM on Day 4 and 7:05 AM on Day 5. At 2:50 AM, the 5-min average reached a maximum H<sub>2</sub>S concentration of 65 ppbv with an associated maximum 30-min H<sub>2</sub>S concentration of 43 ppbv from 2:30 AM - 3:00 AM (Attachment A and Attachment G).

#### **Day 5, February 13, 2020**

Winds were predominantly from the east and southeast in Denver City throughout the day. TRS surveys of Denver City began around 9:00 AM and detected 124 ppbv of TRS west of a pumpjack at 17<sup>th</sup> Street and Franks Avenue north of Denver City. H<sub>2</sub>S surveys began at this location and continued through the early afternoon (Attachment J), though no H<sub>2</sub>S levels above the LOQ of 20 ppbv were detected.

While H<sub>2</sub>S surveys were being conducted, a second sampling team conducted TRS surveys near Yoakum Tank Battery, Willard CO<sub>2</sub> Separation Plant, Plains Gas Plant, Wasson CO<sub>2</sub> Plant, Wasson Gas Plant, and Cornell-Mahoney Gas Plant in and around Denver City (Attachment J). These plants either had no discernible smell, no instantaneous TRS concentrations above 80 ppbv, could not be accessed downwind, or were far from residential areas.

After mapping Denver City, both sampling teams returned to the tank battery on CR-208 in Seminole to meet with R7 investigators and monitor for H<sub>2</sub>S. Winds were primarily from the south and southeast allowing the survey van to position for stationary monitoring downwind of the tank battery on the south side of CR-208, approximately 0.9 miles west of US-385, (Attachment I, Location 1). Data collected at this location from 2:20 PM to 3:10 PM yielded a maximum 5-min H<sub>2</sub>S concentration of 570 ppbv and a maximum 30-min H<sub>2</sub>S concentration of 400 ppbv (Attachment A and Attachment D). H<sub>2</sub>S levels were sustained downwind of the tank battery during this time and confirmed by concurrent measurements of instantaneous TRS concentrations in the 400 ppbv range. Monitoring results were provided to R7 investigators on-site at the time of data collection.

At the end of Day 5, with southeast winds, R7 requested that the sampling teams return to the HC Foster Lease tank battery in western Odessa to evaluate the effectiveness of repairs to the tank battery. Upon arriving to the area, operators from the tank battery informed sampling staff that a thief hatch seal had been damaged earlier in the week and had been subsequently repaired. According to on-site operators, this was the suspected cause of the elevated H<sub>2</sub>S concentrations measured on Day 3. An H<sub>2</sub>S survey was conducted at the intersection of W 44<sup>th</sup> Street and Hereford Road and the streets immediately surrounding this intersection (Attachment K and Attachment L). Maintenance activities to a temporary flare across 44<sup>th</sup> Street (south) from the HC Foster Lease Tank Battery were noted and operators on-site explained that the flare was disconnected in order to be cleaned; the vent pipe normally connected to the flare was venting directly to the atmosphere. The survey, including the flare

and open vent pipe, resulted in a maximum 5-second H<sub>2</sub>S concentration of 950 ppbv (Attachment L). After the flare had been re-connected, stationary H<sub>2</sub>S monitoring was conducted in the neighborhood near the tank battery, on Hereford Road, approximately 0.1 mile south of West 46<sup>th</sup> Street (Attachment H, Location 2) from 5:00 PM to 5:30 PM. However, variable winds prevented consistent downwind monitoring of the temporary flare or tank battery and emissions from the temporary flare made it difficult to evaluate the integrity of the repair of the leaking tank battery, as requested by R7. The maximum 5- and 30-min H<sub>2</sub>S concentrations were 180 and 69 ppbv, respectively (Attachment A and Attachment H).

### **Quality Control (QC) Summary**

QC checks were performed every 24 hours for the Picarro and Teledyne instruments and included an equipment blank, a calibration verification, and a calibration verification duplicate to verify the calibrations. On the evening of the second day, February 10, 2020, the Teledyne calibration verification standard check did not pass accuracy acceptance criteria due to system instability. All QC checks passed on the morning of February 11, 2020, negating the need to recalibrate the system. All other QC checks met acceptance criteria.

A QC check was performed on the AIO compact weather station before and after the survey project per standard operating procedures. The QC checks met acceptance criteria for wind directions, wind speed, and temperature. The Jerome was regenerated before and after each day of monitoring per standard operating procedures.

The H<sub>2</sub>S data have been flagged with qualifiers for concentrations below the limit of detection (LOD) (J qualifier) and concentrations greater than or equal to the LOD but less than the limit of quantitation (L qualifier).

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**Hydrogen Sulfide (H<sub>2</sub>S\*) Ambient Air Data  
Permian Basin Survey Stationary Monitoring  
TCEQ Region 7  
February 9 - 13, 2020  
Van 5416**

These data were collected using a Picarro G2204 Cavity Ringdown Spectrometer H<sub>2</sub>S Analyzer.

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 1**

**North Golder Avenue, 500 feet north of 48<sup>th</sup> Street, Odessa**

2/9/2020	17:35	120			
2/9/2020	17:40	36			
2/9/2020	17:45	4.8	L		
2/9/2020	17:50	8.9	L		
2/9/2020	17:55	70			
2/9/2020	18:00	45		48	
2/9/2020	18:05	62		38	
2/9/2020	18:10	48		40	
2/9/2020	18:15	35		45	

**Sample Period 2**

**West Scharbauer Street, 0.6 miles west of Odessa Street, Goldsmith**

2/10/2020	16:30	16	L		
2/10/2020	16:35	14	L		
2/10/2020	16:40	10	L		
2/10/2020	16:45	620			
2/10/2020	16:50	1400	E		
2/10/2020	16:55	59		350	
2/10/2020	17:00	69		360	
2/10/2020	17:05	23		360	
2/10/2020	17:10	8.0	L	360	
2/10/2020	17:15	7.8	L	260	
2/10/2020	17:20	11	L	30	
2/10/2020	17:25	10	L	21	
2/10/2020	17:30	9.2	L	12	L
2/10/2020	17:35	9.1	L	9.2	L
2/10/2020	17:40	8.8	L	9.4	L
2/10/2020	17:45	10	L	10	L
2/10/2020	17:50	11	L	10	L
2/10/2020	17:55	12	L	10	L



## Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 2 (continued)****West Scharbauer Street, 0.6 miles west of Odessa Street, Goldsmith**

2/10/2020	18:00	12	L	10	L
2/10/2020	18:05	11	L	11	L
2/10/2020	18:10	11	L	11	L
2/10/2020	18:15	11	L	11	L
2/10/2020	18:20	8.9	L	11	L

**Sample Period 3: Location 1****Hereford Road, 100 feet south of 44<sup>th</sup> Street, Odessa**

2/11/2020	16:15	97			
2/11/2020	16:20	22			
2/11/2020	16:25	19	L		
2/11/2020	16:30	14	L		
2/11/2020	16:35	9.4	L		
2/11/2020	16:40	7.0	L	28	
2/11/2020	16:45	5.4	L	13	L
2/11/2020	16:50	11	L	11	L

**Sample Period 3: Location 2****Intersection of Hereford Road and 44<sup>th</sup> Street, Odessa**

2/11/2020	17:00	63			
2/11/2020	17:05	150			
2/11/2020	17:10	49			
2/11/2020	17:15	200			
2/11/2020	17:20	49			
2/11/2020	17:25	200		120	
2/11/2020	17:30	120		130	
2/11/2020	17:35	190		140	
2/11/2020	17:40	210		160	
2/11/2020	17:45	210		160	

**Sample Period 4: Location 1****County Road 208, 0.7 miles west of US Highway 385, Seminole**

2/12/2020	12:00	220			
2/12/2020	12:05	220			
2/12/2020	12:10	180			
2/12/2020	12:15	220			
2/12/2020	12:20	240			
2/12/2020	12:25	230		220	
2/12/2020	12:30	200		220	
2/12/2020	12:35	220		220	
2/12/2020	12:40	220		220	

## Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 4: Location 2****Highway 158, 1.2 miles west of Devonian Street, Goldsmith**

2/12/2020	18:25	0.39	J		
2/12/2020	18:30	1.1	J		
2/12/2020	18:35	1.1	J		
2/12/2020	18:40	0.90	J		
2/12/2020	18:45	1.2	J		
2/12/2020	18:50	1.0	J	1.0	J
2/12/2020	18:55	2.3	L	1.3	J
2/12/2020	19:00	3.5	L	1.7	J
2/12/2020	19:05	5.2	L	2.3	L
2/12/2020	19:10	3.7	L	2.8	L
2/12/2020	19:15	0.67	J	2.7	L
2/12/2020	19:20	0.90	J	2.7	L
2/12/2020	19:25	1.1	J	2.5	L
2/12/2020	19:30	0.27	J	2.0	L
2/12/2020	19:35	1.2	J	1.3	J
2/12/2020	19:40	4.2	L	1.4	J
2/12/2020	19:45	3.2	L	1.8	J
2/12/2020	19:50	1.5	J	1.9	J
2/12/2020	19:55	1.3	J	1.9	J
2/12/2020	20:00	0.92	J	2.1	L
2/12/2020	20:05	1.3	J	2.1	L
2/12/2020	20:10	1.3	J	1.6	J
2/12/2020	20:15	1.4	J	1.3	J
2/12/2020	20:20	1.7	J	1.3	J
2/12/2020	20:25	2.2	L	1.5	J
2/12/2020	20:30	4.0	L	2.0	L
2/12/2020	20:35	2.8	L	2.2	L
2/12/2020	20:40	2.6	L	2.5	L
2/12/2020	20:45	2.4	L	2.6	L
2/12/2020	20:50	1.6	J	2.6	L
2/12/2020	20:55	3.0	L	2.7	L
2/12/2020	21:00	2.4	L	2.5	L
2/12/2020	21:05	4.3	L	2.7	L
2/12/2020	21:10	10	L	3.9	L
2/12/2020	21:15	2.2	L	3.8	L
2/12/2020	21:20	2.1	L	3.9	L
2/12/2020	21:25	1.6	J	3.7	L
2/12/2020	21:30	4.1	L	4.0	L
2/12/2020	21:35	5.1	L	4.1	L
2/12/2020	21:40	6.6	L	3.6	L

## Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 4: Location 2 (continued)****Highway 158, 1.2 miles west of Devonian Street, Goldsmith**

2/12/2020	21:45	6.6	L	4.3	L
2/12/2020	21:50	6.0	L	5.0	L
2/12/2020	21:55	4.5	L	5.5	L
2/12/2020	22:00	5.0	L	5.6	L
2/12/2020	22:05	6.8	L	5.9	L
2/12/2020	22:10	8.1	L	6.2	L
2/12/2020	22:15	8.7	L	6.5	L
2/12/2020	22:20	8.2	L	6.9	L
2/12/2020	22:25	7.3	L	7.4	L
2/12/2020	22:30	6.3	L	7.6	L
2/12/2020	22:35	6.9	L	7.6	L
2/12/2020	22:40	7.7	L	7.5	L
2/12/2020	22:45	7.8	L	7.4	L
2/12/2020	22:50	8.2	L	7.4	L
2/12/2020	22:55	9.4	L	7.7	L
2/12/2020	23:00	11	L	8.6	L
2/12/2020	23:05	12	L	9.4	L
2/12/2020	23:10	11	L	10	L
2/12/2020	23:15	10	L	10	L
2/12/2020	23:20	12	L	11	L
2/12/2020	23:25	12	L	11	L
2/12/2020	23:30	12	L	12	L
2/12/2020	23:35	12	L	12	L
2/12/2020	23:40	12	L	12	L
2/12/2020	23:45	12	L	12	L
2/12/2020	23:50	13	L	12	L
2/12/2020	23:55	13	L	12	L
2/13/2020	0:00	14	L	13	L
2/13/2020	0:05	13	L	13	L
2/13/2020	0:10	13	L	13	L
2/13/2020	0:15	13	L	13	L
2/13/2020	0:20	13	L	13	L
2/13/2020	0:25	13	L	13	L
2/13/2020	0:30	13	L	13	L
2/13/2020	0:35	12	L	13	L
2/13/2020	0:40	11	L	13	L
2/13/2020	0:45	9.2	L	12	L
2/13/2020	0:50	9.2	L	11	L
2/13/2020	0:55	11	L	11	L
2/13/2020	1:00	13	L	11	L
2/13/2020	1:05	13	L	11	L

## Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
<b>Sample Period 4: Location 2 (continued)</b>					
<b>Highway 158, 1.2 miles west of Devonian Street, Goldsmith</b>					
2/13/2020	1:10	14	L	12	L
2/13/2020	1:15	13	L	12	L
2/13/2020	1:20	14	L	13	L
2/13/2020	1:25	13	L	14	L
2/13/2020	1:30	13	L	14	L
2/13/2020	1:35	12	L	13	L
2/13/2020	1:40	13	L	13	L
2/13/2020	1:45	14	L	13	L
2/13/2020	1:50	14	L	13	L
2/13/2020	1:55	16	L	14	L
2/13/2020	2:00	16	L	14	L
2/13/2020	2:05	16	L	15	L
2/13/2020	2:10	17	L	15	L
2/13/2020	2:15	17	L	16	L
2/13/2020	2:20	16	L	16	L
2/13/2020	2:25	21		17	L
2/13/2020	2:30	19	L	18	L
2/13/2020	2:35	28		20	
2/13/2020	2:40	29		22	
2/13/2020	2:45	35		25	
2/13/2020	2:50	65		33	
2/13/2020	2:55	54		38	
2/13/2020	3:00	44		43	
2/13/2020	3:05	18	L	41	
2/13/2020	3:10	16	L	39	
2/13/2020	3:15	17	L	36	
2/13/2020	3:20	17	L	28	
2/13/2020	3:25	21		22	
2/13/2020	3:30	22		18	L
2/13/2020	3:35	18	L	18	L
2/13/2020	3:40	17	L	19	L
2/13/2020	3:45	20	L	19	L
2/13/2020	3:50	30		21	
2/13/2020	3:55	29		22	
2/13/2020	4:00	19	L	22	
2/13/2020	4:05	16	L	22	
2/13/2020	4:10	14	L	21	
2/13/2020	4:15	15	L	20	L
2/13/2020	4:20	13	L	17	L
2/13/2020	4:25	11	L	15	L
2/13/2020	4:30	11	L	13	L
2/13/2020	4:35	9.0	L	12	L
2/13/2020	4:40	11	L	12	L

## Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 4: Location 2 (continued)****Highway 158, 1.2 miles west of Devonian Street, Goldsmith**

2/13/2020	4:45	13	L	11	L
2/13/2020	4:50	11	L	11	L
2/13/2020	4:55	14	L	11	L
2/13/2020	5:00	14	L	12	L
2/13/2020	5:05	15	L	13	L
2/13/2020	5:10	18	L	14	L
2/13/2020	5:15	17	L	15	L
2/13/2020	5:20	17	L	16	L
2/13/2020	5:25	16	L	16	L
2/13/2020	5:30	16	L	16	L
2/13/2020	5:35	15	L	16	L
2/13/2020	5:40	14	L	16	L
2/13/2020	5:45	11	L	15	L
2/13/2020	5:50	11	L	14	L
2/13/2020	5:55	12	L	13	L
2/13/2020	6:00	14	L	13	L
2/13/2020	6:05	26		15	L
2/13/2020	6:10	14	L	15	L
2/13/2020	6:15	17	L	16	L
2/13/2020	6:20	18	L	17	L
2/13/2020	6:25	26		19	L
2/13/2020	6:30	19	L	20	
2/13/2020	6:35	20		19	L
2/13/2020	6:40	41		24	
2/13/2020	6:45	51		29	
2/13/2020	6:50	37		32	
2/13/2020	6:55	16	L	31	
2/13/2020	7:00	15	L	30	
2/13/2020	7:05	12	L	29	

**Sample Period 5: Location 1****County Road 208, 0.9 miles west of US Highway 385, Seminole**

2/13/2020	14:25	170			
2/13/2020	14:30	340			
2/13/2020	14:35	570			
2/13/2020	14:40	390			
2/13/2020	14:45	350			
2/13/2020	14:50	370		370	
2/13/2020	14:55	370		400	
2/13/2020	15:00	370		400	
2/13/2020	15:05	290		360	
2/13/2020	15:10	350		350	

Attachment A

Date	Time	H <sub>2</sub> S 5-Minute Average (ppbv)	Data Flag	H <sub>2</sub> S 30-Minute Average (ppbv)	Data Flag
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**Sample Period 5: Location 2**

**Hereford Road, 0.1 mile south of 46<sup>th</sup> Street, Odessa**

2/13/2020	17:05	180			
2/13/2020	17:10	80			
2/13/2020	17:15	110			
2/13/2020	17:20	25			
2/13/2020	17:25	6.9	L		
2/13/2020	17:30	11	L	69	

\* H<sub>2</sub>S regulatory level is a 30-minute average of 80 ppbv, however data did not include upwind sampling of potential sources of H<sub>2</sub>S.

All concentrations reported in parts per billion by volume (ppbv).

The H<sub>2</sub>S limit of detection is 2.00 ppbv.

The H<sub>2</sub>S limit of quantitation is 20.00 ppbv. Limit of quantitation is defined as the lowest point of the calibration curve.

E - reported concentration exceeds the instrument calibration upper limit.

J - reported concentration is below the limit of detection (LOD).

L - reported concentration is below the limit of quantitation (LOQ).

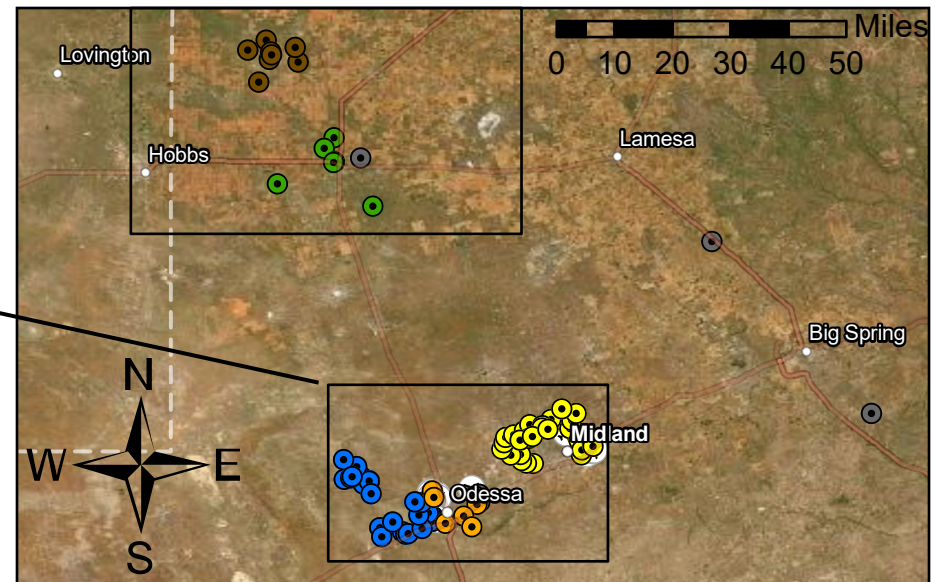
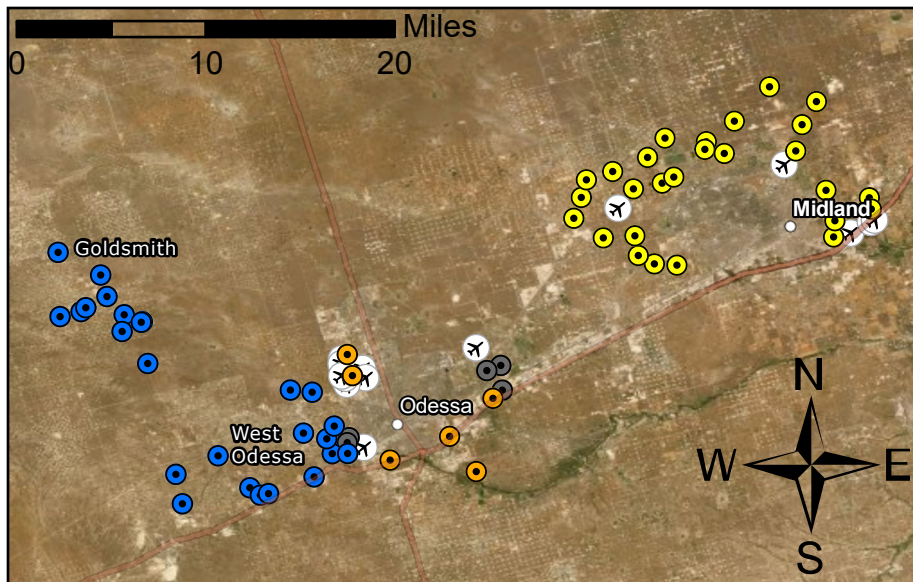
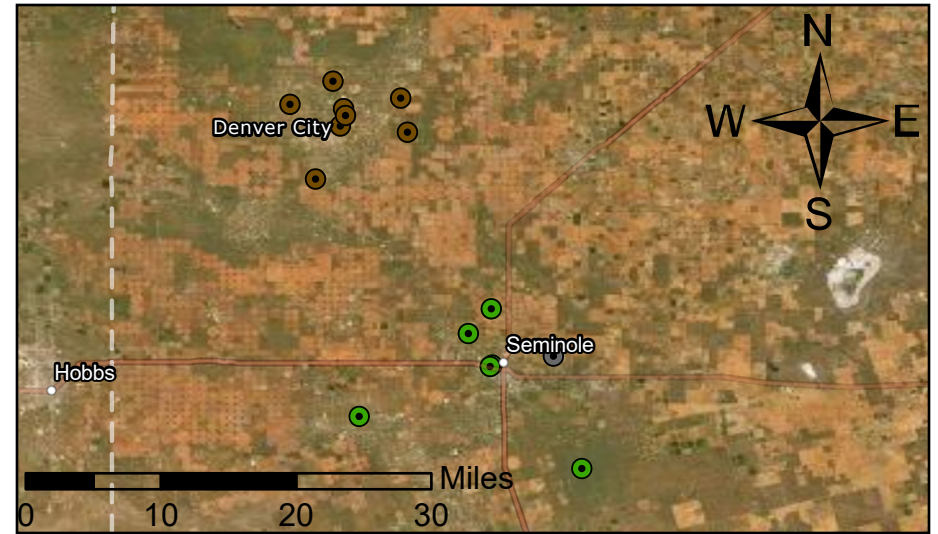
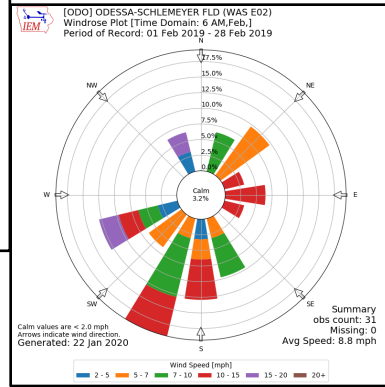
TX - Texas

US - United States

## R2 and R7 Sites Surveyed

### SURVEY AREAS

- Region 7 Areas of Interest
- ✈ Region 7 Flyover Areas
- Survey Area 1 (Odessa)
- Survey Area 2 (Goldsmith/W. Odessa)
- Survey Area 3 (Midland)
- Survey Area 4 (Seminole)
- Survey Area 5 (Denver City)



Wind rose generated using wind data from ODESSA-SCHLEMEYER FIELD Weather Station during daylight hours in February 2019.

# Day 1 Survey Routes February 9, 2020 Odessa and Goldsmith, Texas

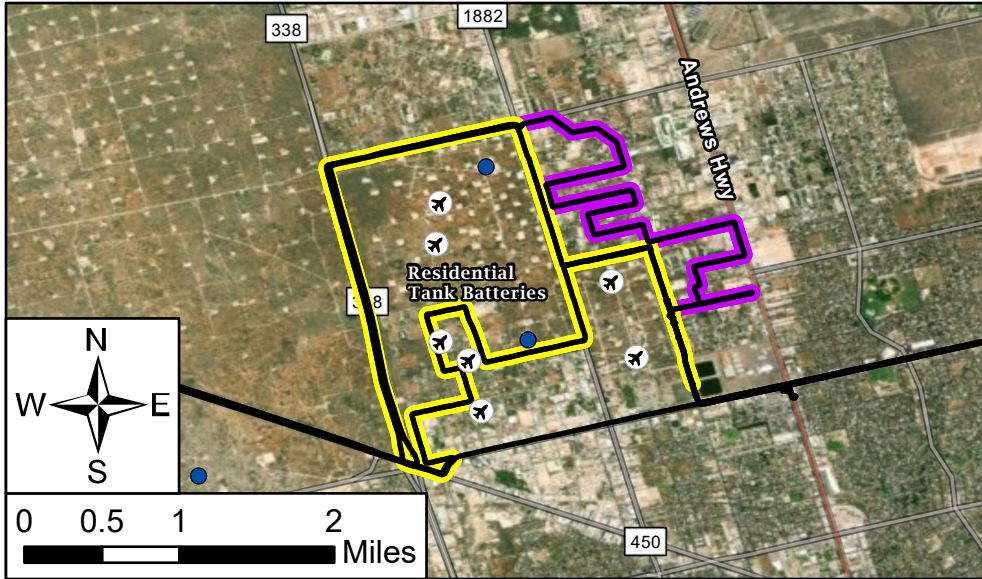


Figure 1a

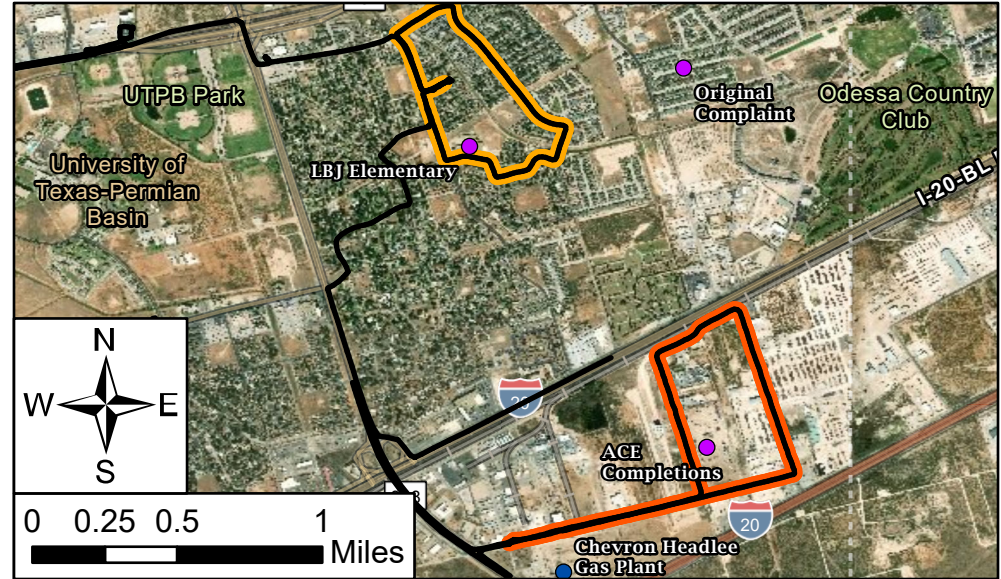


Figure 1b

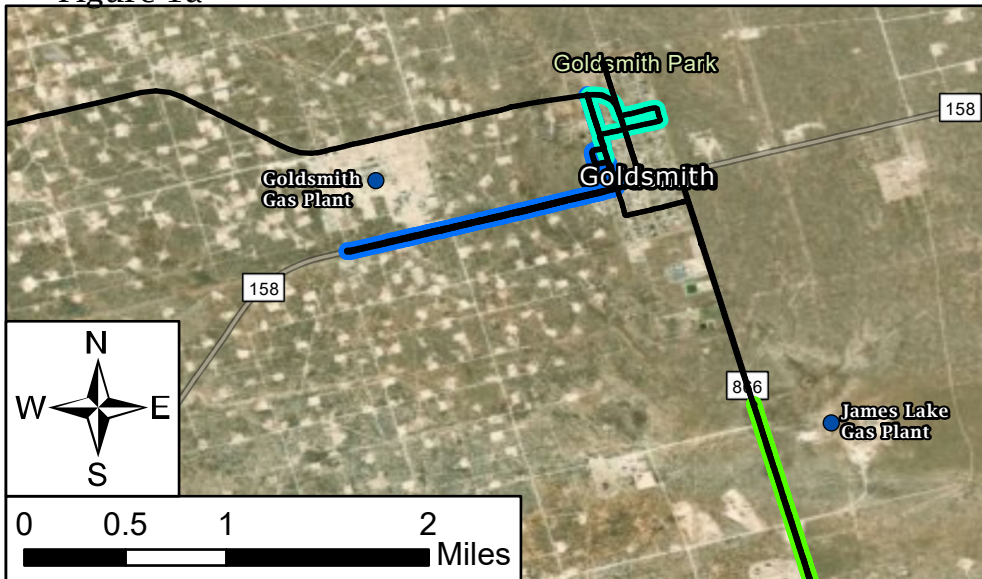


Figure 1c

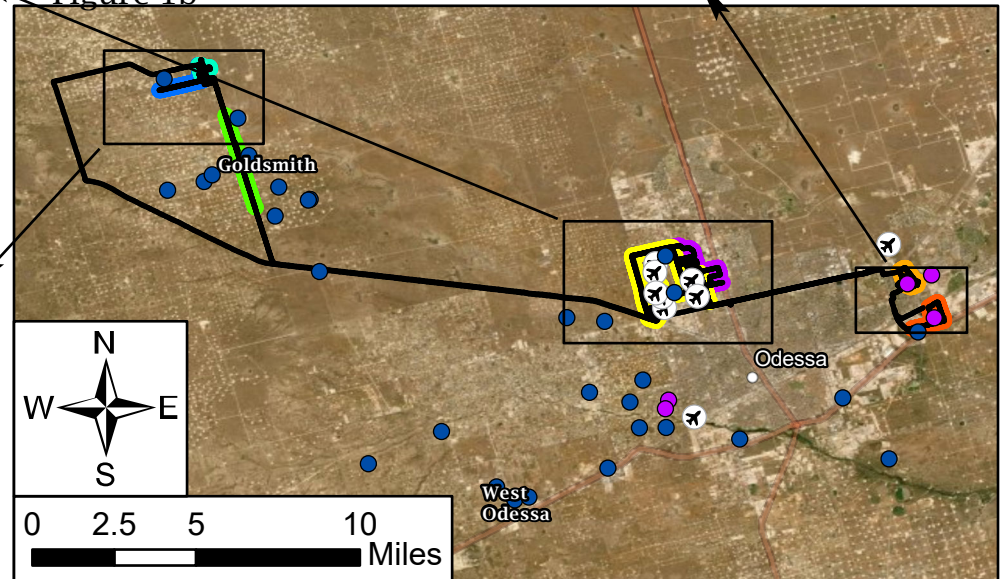
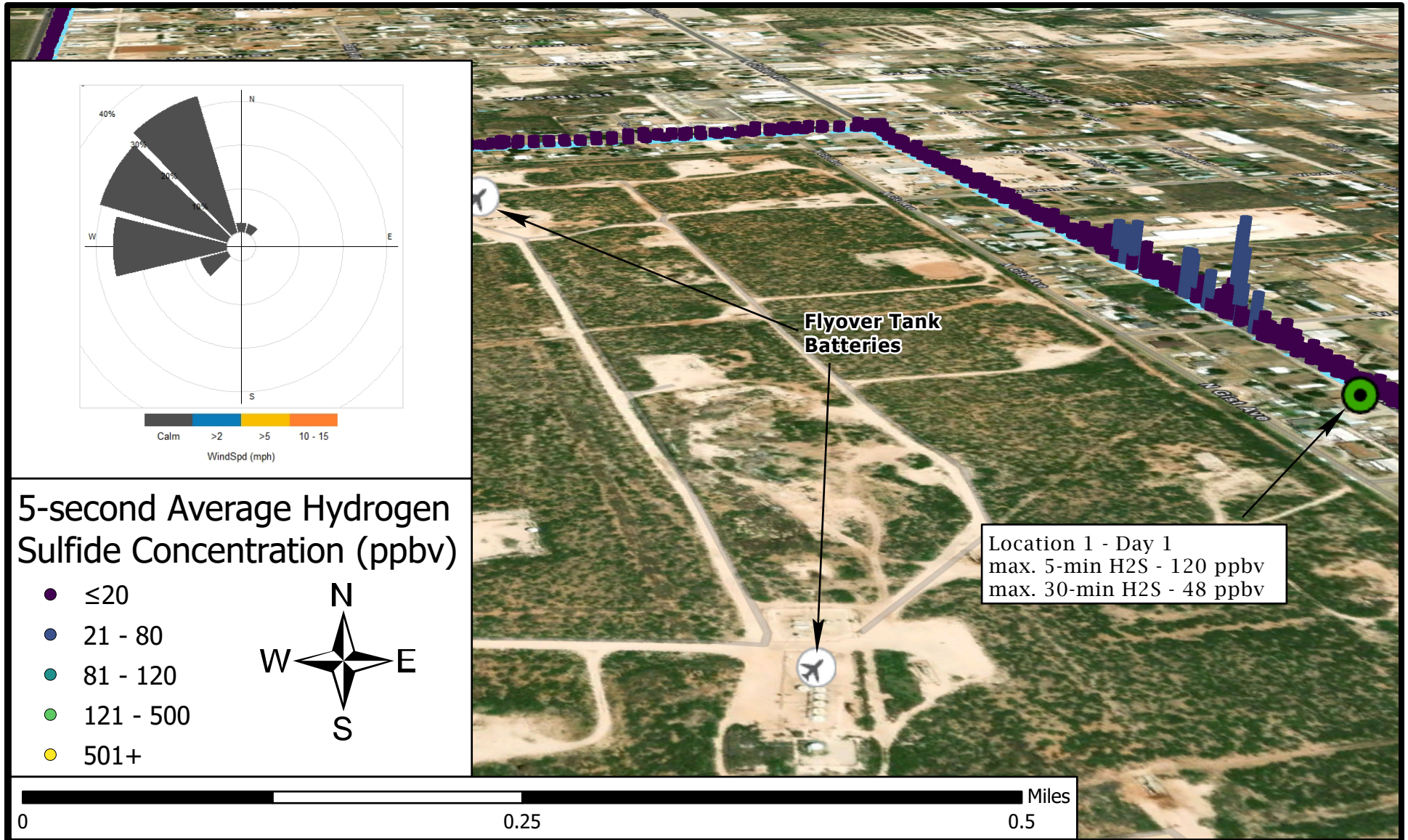


Figure 1d

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

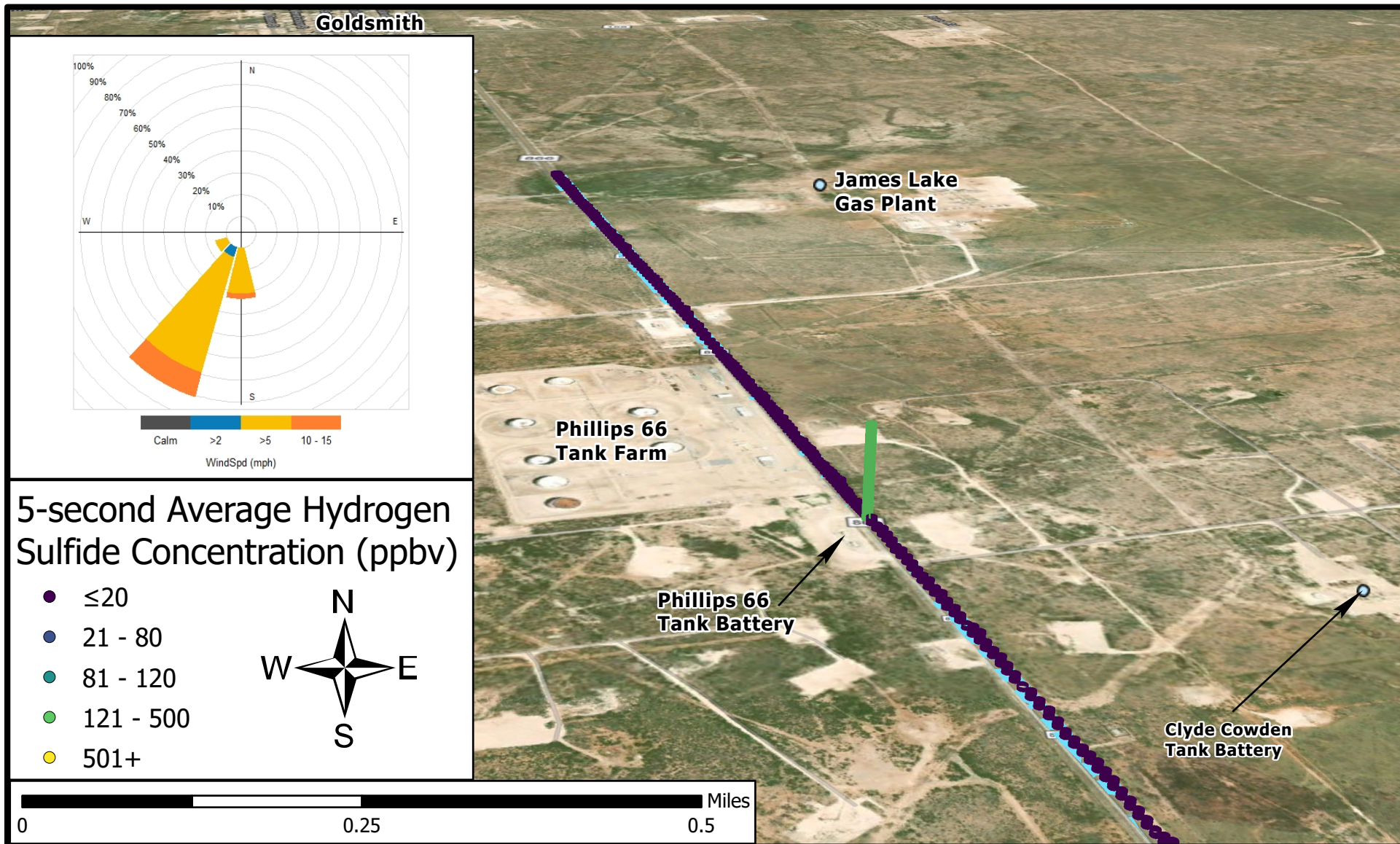


Day 1, February 9, 2020  
Western Odessa Oil Field



Wind rose generated using 1-minute wind data collected by SSWG during stationary monitoring.

# Day 1, February 9, 2020 Farm-to-Market Road 866 Oil Field



Wind rose generated using 1-minute wind data collected by SSWG during mobile survey.

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

# Day 2 Survey Routes February 10, 2020 Midland, Texas

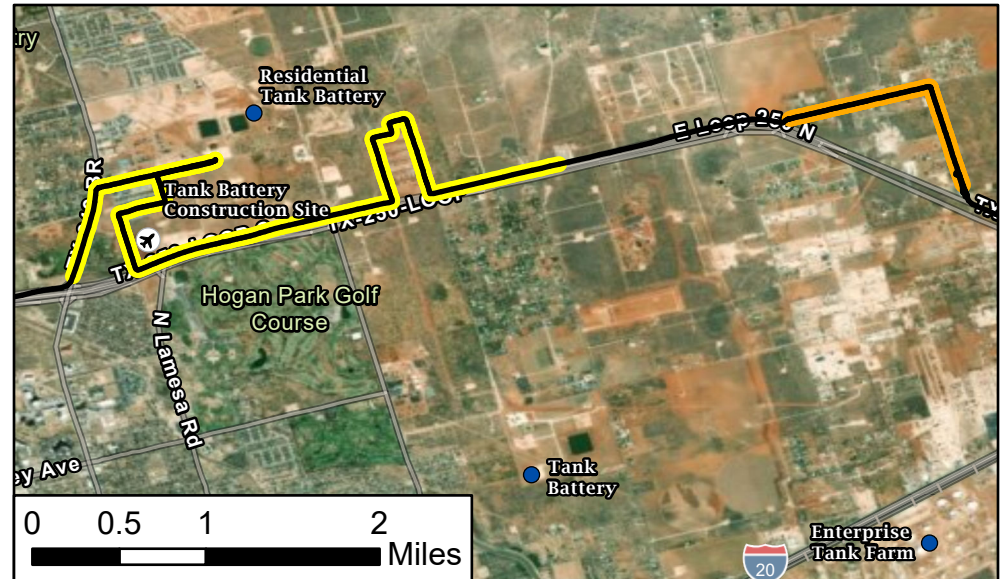
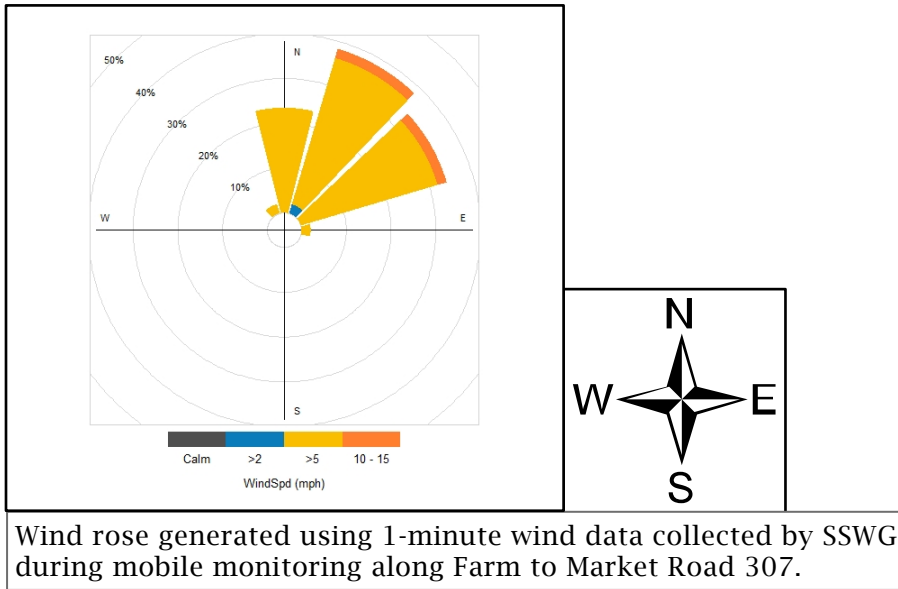


Figure 2a



Figure 2b

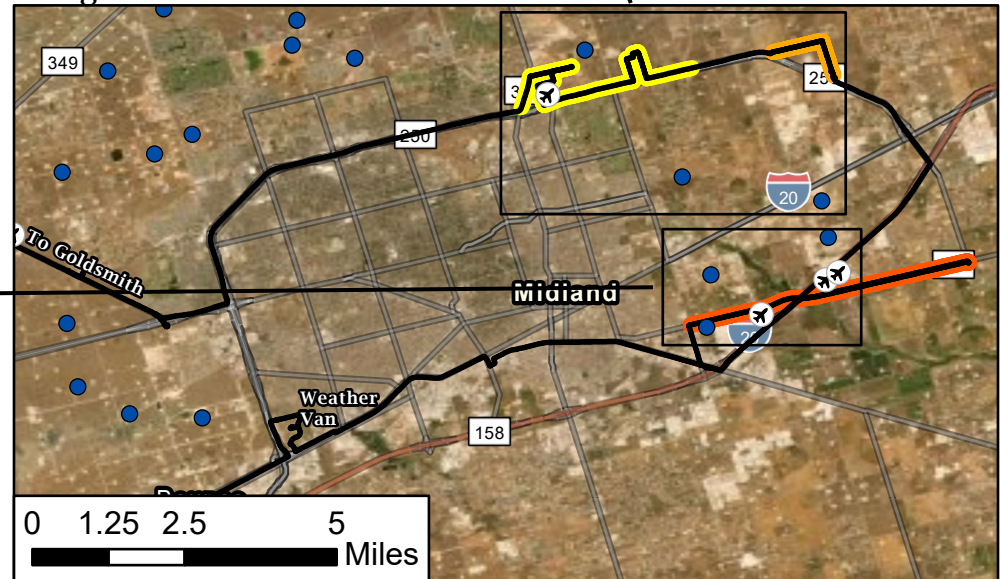
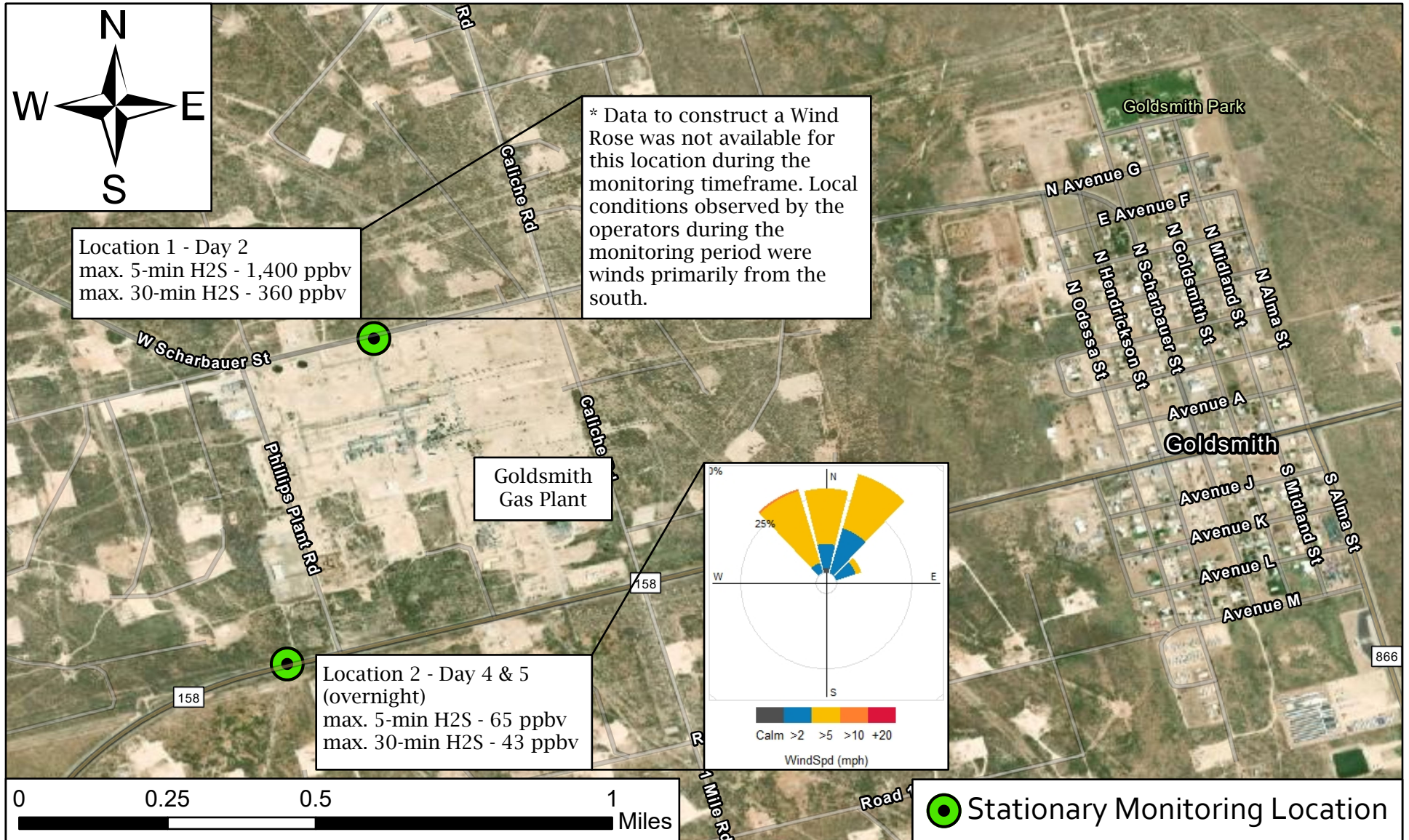


Figure 2c

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

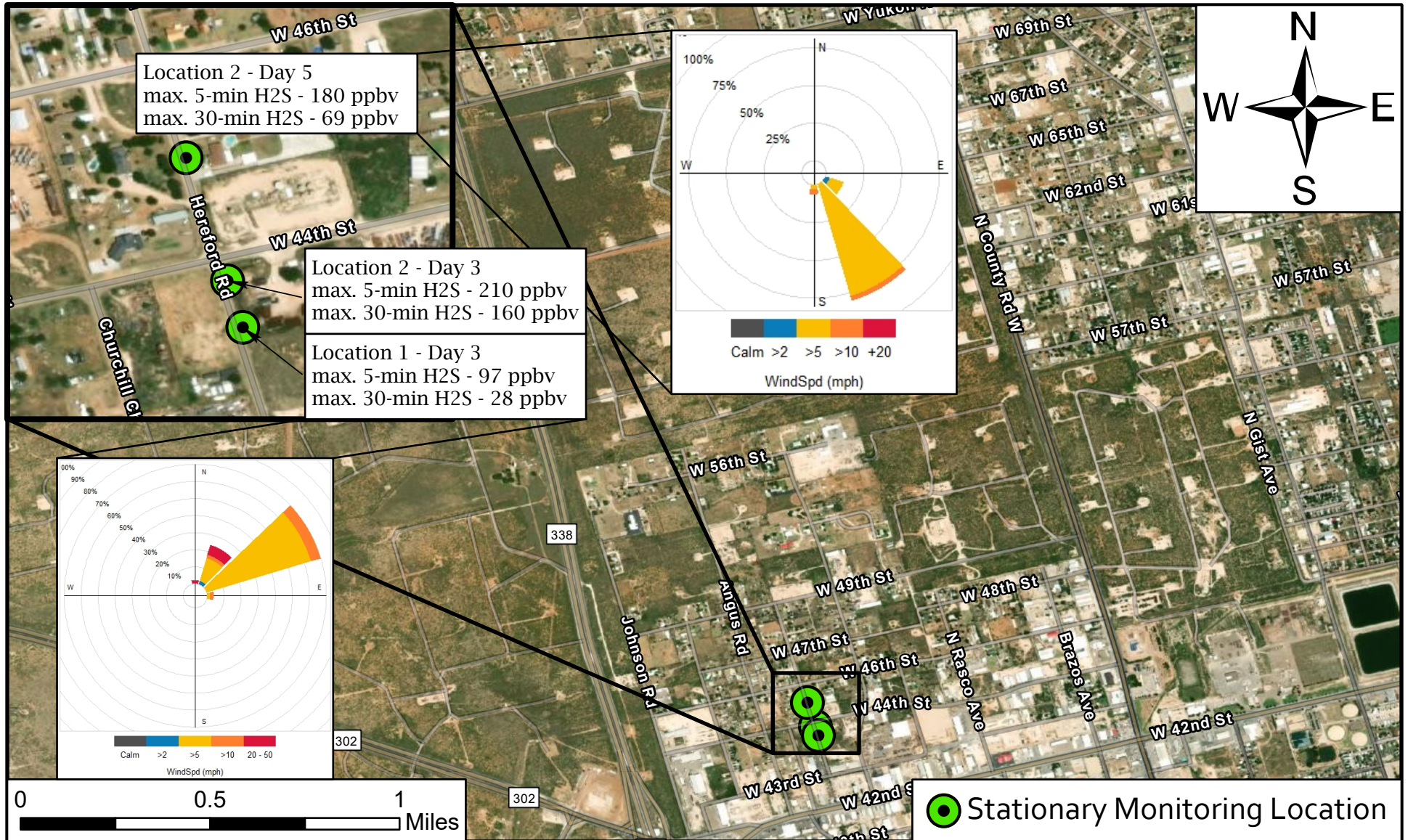
# Stationary Monitoring Goldsmith Gas Plant



Wind rose generated using 1-minute wind data collected by SSWG during stationary monitoring.

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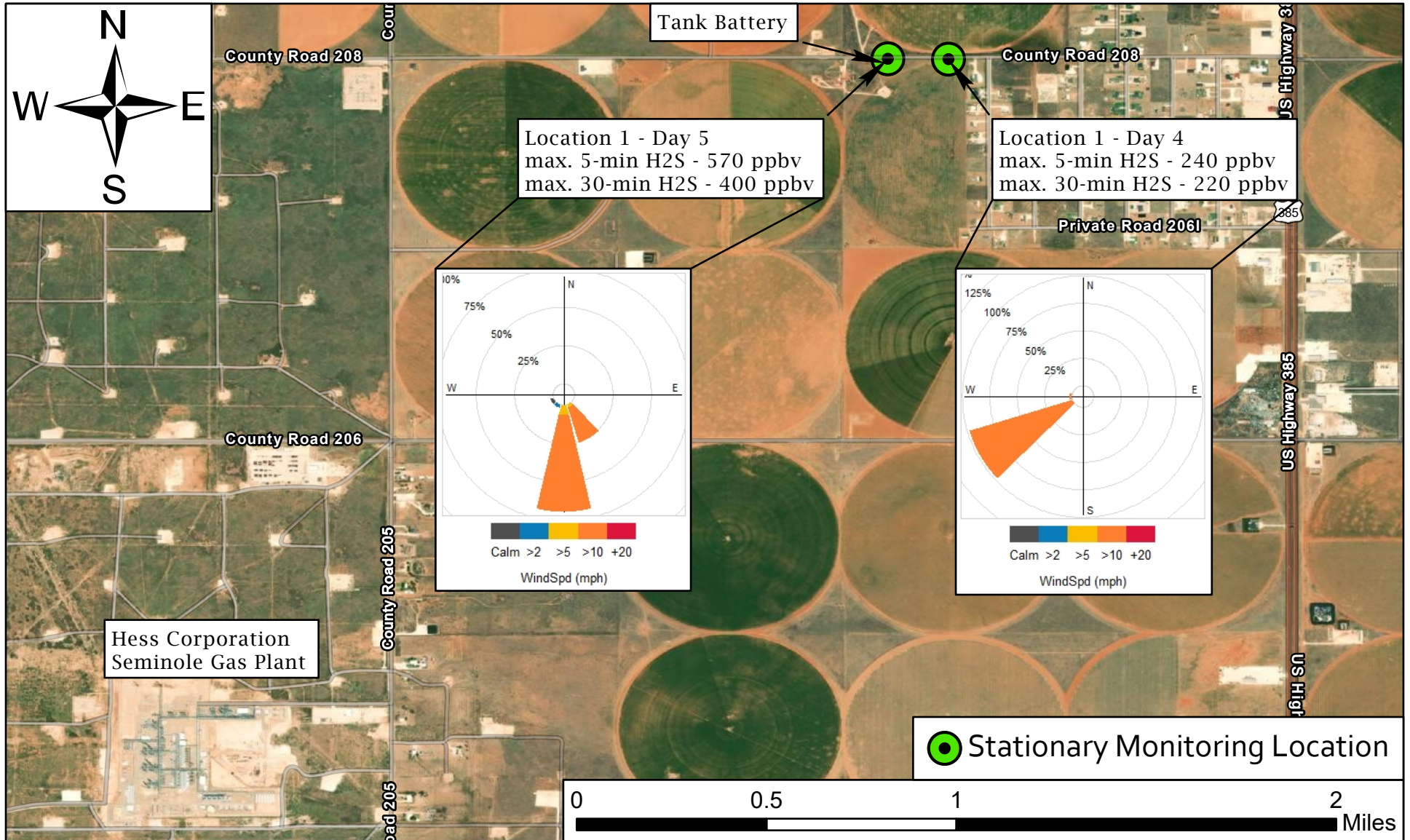
# Stationary Monitoring HC Foster Lease Tank Battery



Wind roses generated using 1-minute wind data collected by SSWG during stationary monitoring.

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

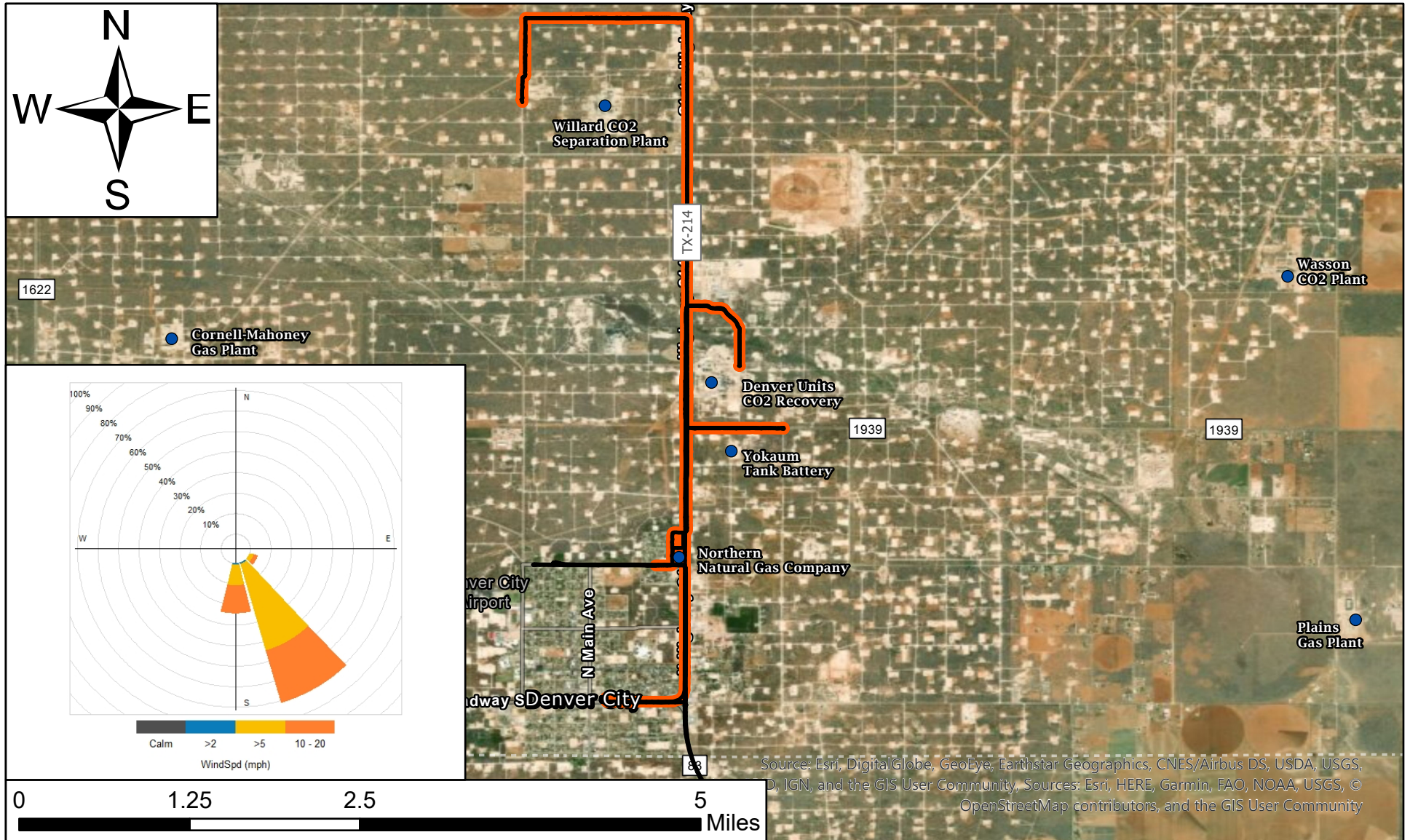
# Stationary Monitoring County Road 208 North Seminole



Wind roses generated using 1-minute wind data collected by SSWG during stationary monitoring.

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

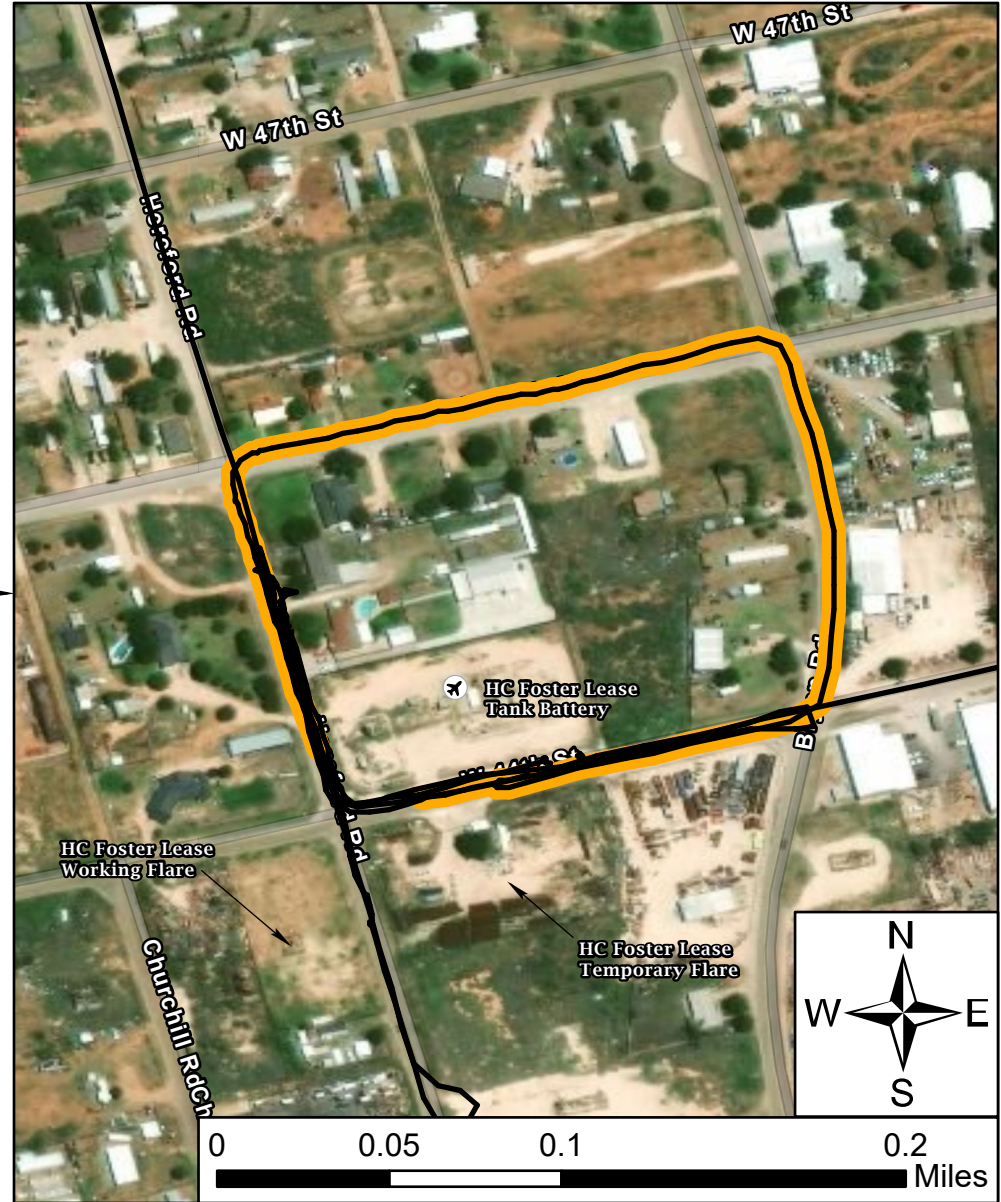
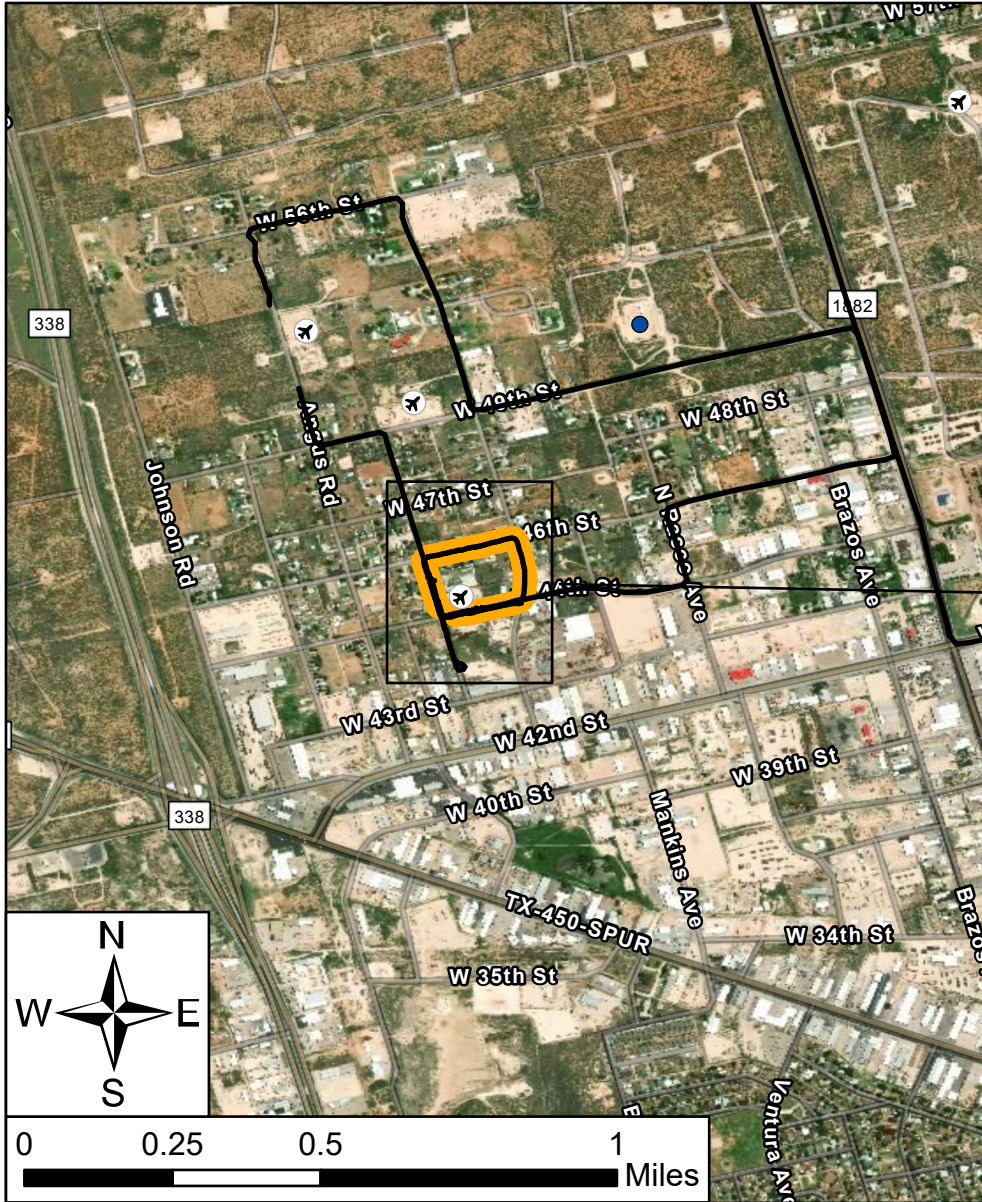
# Day 5 Survey Routes February 13, 2020 Denver City, Texas



Wind rose generated using 1-minute wind data collected by SSWG during mobile monitoring.

This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.

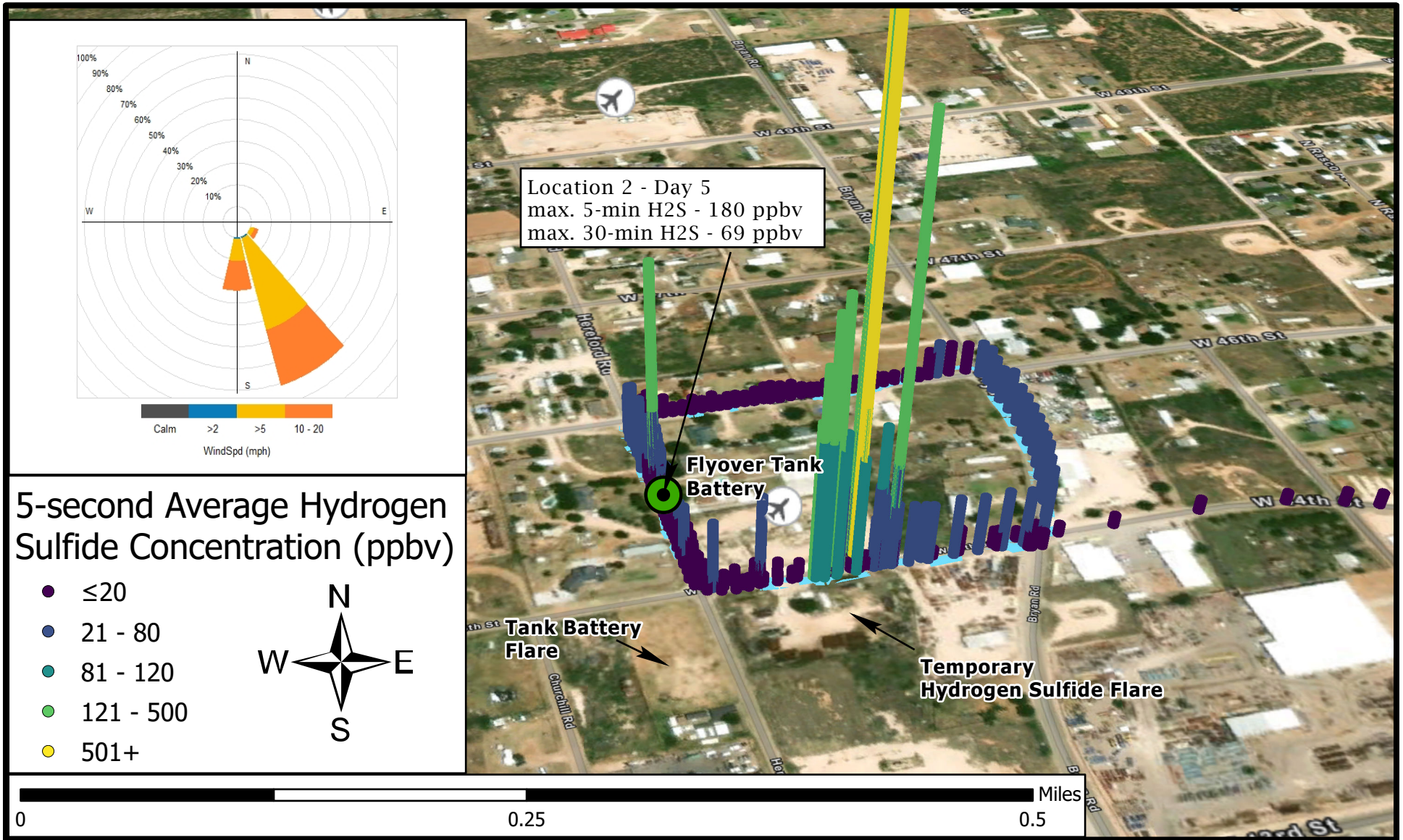
# Day 5 Survey Routes February 13, 2020 Odessa, Texas



This map was generated by the Monitoring Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Monitoring Division at 512-239-1796.



Day 5, February 13, 2020  
Western Odessa Oil Field



Wind rose generated using 1-minute wind data collected by SSWG during mobile survey.