

Appendix C

EPA Geospatial Monitoring of Air Pollutants (GMAP) Monitoring Report

SUBJECT: Crossett, AR *GMAP Air Monitoring*

PREPARED BY: Marta Fuoco *MF 03/14/17*
Physical Scientist
Air Monitoring and Analysis Section
Region 5

**FIELD MONITORING
CONDUCTED BY:** Scott Hamilton
Environmental Scientist
Air Monitoring and Analysis Section
Region 5

Bilal Qazzaz
Environmental Scientist
Air Monitoring and Analysis Section
Region 5

**FIELD MONITORING
REQUESTED BY:** Sarah Frey
Environmental Scientist
Air Toxics Section
Compliance Assurance & Enforcement Division
Region 6

**DATES OF FIELD
MONITORING:** October 26-27, 2016

REPORT AUTHORIZED BY: *Michael S. Compher 3/14/17*
Michael Compher
Supervisor
Air Monitoring and Analysis Section
Region 5

This page left intentionally blank

Table of Figures

Figure 1: Time series – transect - Drive to ASB Zone 2 (10/26/16).....	2
Figure 2: Concentration ribbon – transect - Drive to ASB Zone 2 (10/26/16)	2
Figure 3: Time series – transect - GP2 Primary Clarifier and Ash Basin (10/26/16)	2
Figure 4: Stationary GPS coordinates of GP2 monitoring location.....	2
Figure 5: Geospatial H2S polar plot - stationary - GP3 East Ash Basin Inlets (10/26/16)	2
Figure 6: Time series - stationary - GP3 East Ash Basin Inlets (10/26/16).....	2
Figure 7: Pollution rose - stationary - GP3 East Ash Basin Inlets (10/26/16).....	2
Figure 8: Geospatial H2S pollution rose - stationary - GP3 East Ash Basin Inlets (10/26/16)	2
Figure 9: Geospatial H2S polar plot - stationary - GP4 West Ash Basin Inlets (10/26/16)	2
Figure 10: Time series - stationary - GP4 West Ash Basin Inlets (10/26/16)	2
Figure 11: H2S pollution rose - stationary - GP4 West Ash Basin Inlets (10/26/16).....	2
Figure 12: Geospatial H2S pollution rose - stationary - GP4 West Ash Basin Inlets (10/26/16).....	2
Figure 13: Geospatial H2S polar plot - stationary - GP5 East Ash Basin Inlet (10/26/16).....	2
Figure 14: Time series - stationary - GP5 East Ash Basin Inlets (10/26/16).....	2
Figure 15: Geospatial H2S pollution rose - stationary - GP5 East Ash Basin Inlet (10/26/16).....	2
Figure 16: H2S pollution rose - stationary - GP5 East Ash Basin Inlet (10/26/16)	2
Figure 17: Concentration ribbon - transect - Waste Water Treatment System (10/26/16).....	2
Figure 18: Time series - transect - Waste Water Treatment System (10/26/16)	2
Figure 19: Concentration ribbon - transect - Thurman Road Neighborhood (10/27/16).....	2
Figure 20: Time series - transect - Thurman Road Neighborhood (10/27/16)	2
Figure 21: Concentration ribbon - transect - Primary Clarifier to Hancock Road (10/27/16)	2
Figure 22: Time series - transect - Primary Clarifier to Hancock Road (10/27/16).....	2
Figure 23: Geospatial polar plot - stationary - Northside by Dregs (10/27/16).....	2
Figure 24: Time series - stationary - Northside by Dregs (10/27/16)	2
Figure 25: Geospatial H2S pollution rose - stationary - Northside by Dregs (10/27/16).....	2
Figure 26: H2S pollution rose - stationary - Northside by Dregs (10/27/16).....	2
Figure 27: Concentration ribbon - transect - Inlet to ASB (10/27/16).....	2
Figure 28: Time series - transect - Inlet to ASB (10/27/16)	2
Figure 29: Concentration ribbon - transect - Drive to Spoils (10/27/16).....	2
Figure 30: Time series - transect - Drive to Spoils (10/27/16)	2
Figure 31: Concentration ribbon - transect - Drive to ASB Dredging (10/27/16)	2
Figure 32: Time series - transect - Drive to ASB Dredging (10/27/16).....	2
Figure 33: Time series - transect - Drive Back to ASB (10/27/16).....	2
Figure 34: Time series - transect - Drive back to ASB (10/27/16).....	2
Figure 35: Time series – transects around aeration pond.....	23

CROSSETT, AR GMAP MONITORING

Region 5’s Geospatial Monitoring of Air Pollution (GMAP) uses a Picarro G2204 cavity ringdown spectroscopy (CRDS) analyzer, SN 2267-BFADS2013. The data are integrated with global positioning system location information and meteorological parameters when available to quantify air pollutant concentrations. Additionally, the GMAP uses a DUVAS Model DV3000 SN UV3000-201502-1007 (or a backup unit DV3000 SN UV3000 SN 201502-1006) to collect BTEX, m-o-p xylene, styrene, formaldehyde, and SO₂ ambient air concentration data. Additional information can be found in the SOP and May13, 2016 Quality Assurance Project Plan (GMAP SOP R5-ARD-0002-r1; QAPP V3 0 2016-05-13). The monitored concentrations are compared to values identified in Table 1 below, or other values as applicable.

Compound	Molecular Formula	CAS#	ATSDR Inhalation Minimum Risk Levels (MRLs)			Other
			Acute	Intermediate	Chronic	
Benzene	C ₆ H ₆	71-43-2	0.009 ppm	0.006	0.003 ppm	
Toluene	C ₇ H ₈	108-83-3	2 ppm	-	1 ppm	
Ethylbenzene	C ₈ H ₁₀	100-41-4	5 ppm	2 ppm	0.06	
Xylene	C ₈ H ₁₀	1330-20-7	2 ppm	0.6 ppm	0.05 ppm	
Sulfur Dioxide	SO ₂	7446-09-5	-	-	-	75 ppb ¹ ; 0.5 ppm ²
Formaldehyde	CH ₂ O	50-00-0	0.04 ppm	0.03 ppm	0.008 ppm	
Styrene	C ₈ H ₈	100-42-5	5 ppm	-	0.2 ppm	
Hydrogen Sulfide	H ₂ S	7783-06-4	0.07 ppm	0.02	-	
Methane	CH ₄	74-82-8	-	-	-	12,500 ppm ₃

Table 1: Health Screening Data

¹: Primary 1 hour NAAQS

²: Secondary 3 hour NAAQS

³: ATSDR’s *de minimis* level for screening purposes of 1.25% of soil gas concentrations

USEPA R5 monitored to evaluate the ambient air concentrations of hydrogen sulfide (H₂S), methane (CH₄), benzene (C₆H₆), toluene (C₇H₈), ethylbenzene (C₈ H₁₀), xylene (C₈ H₁₀), sulfur dioxide (SO₂), formaldehyde (CH₂O), and styrene (C₈H₈), around a Pulp and Paper Mill in Crossett, AR on October 26-27, 2016.

Concentrations above the detection limit were measured at the site for H₂S (ppb), CH₄ (ppm), SO₂ (ppb), benzene (ppb), m-xylene (ppb), and p-xylene (ppb); toluene, ethylbenzene, o-xylene, formaldehyde, and styrene were also measured, but failed post-QA checks and were subsequently invalidated. Table 2 depicts the maximum 1 second measured concentrations; concentrations of H₂S, CH₄, and benzene

CROSSETT, AR GMAP MONITORING

exceeded health screening levels found in Table 1, indicating a potential for an acute human health hazard.

Maximum H₂S Concentrations	H2S(ppb)	CH4(ppm)	SO2(ppb)	BEN(ppb)	XYM(ppb)	XYP(ppb)
BackgroundStationaryCollection	37.71	<MDL	1.21	<MDL	20.32	5.56
CrosettARStationary	5.12	<MDL	1.41	5.94	19.03	5.70
DrivebacktoASB	359.73	4.61	1.83	<MDL	11.51	4.85
DrivetoASBDredging	934.80	8.55	<MDL	14.84	20.07	9.76
DrivetoASBZone2	1068.23	10.87	1.63	<MDL	20.29	7.95
DrivetoSludgeReclamationPond	25.46	<MDL	1.09	<MDL	14.87	4.85
DrivetoSpoils	710.83	9.14	1.34	<MDL	18.44	6.78
GP1	18.27	6.52	<MDL	11.69	16.59	15.77
GP2PRIMARYCLARIFIERANDASHBASIN	99.09	4.89	1.17	4.81	11.97	5.91
GP3EastAshBasinInletSTATIONARY	265.07	6.52	<MDL	<MDL	15.63	6.37
GP4WestAshBasinInletSTATIONARY	76.40	17.33	1.14	<MDL	13.87	5.96
GP5EastAshBasinInletSTATIONARY	284.66	6.11	<MDL	<MDL	16.39	5.83
GP6MainParkingLotSTATIONARY	6.67	<MDL	<MDL	4.64	20.96	5.69
InletTOASB	183.41	5.98	9.73	12.65	12.24	21.17
NorthsidebyDregesSTATIONARY	855.72	3.90	<MDL	<MDL	10.94	6.44
PrimaryClarifiertoHancockRoad	24.89	<MDL	1.42	<MDL	<MDL	5.10
ThurmanRoadNeighborhoodDriveAround	70.54	8.17	1.13	25.34	17.30	6.49
WasteWaterTreatmentSystem	986.23	12.11	<MDL	<MDL	<MDL	<MDL
Max:	1068.23	17.33	9.73	25.34	20.96	21.17

Table 2: Maximum Values

The figures below were created in R, an open-source programming language for statistical computing. The time series demonstrate measured concentrations over individual transects. Ribbons representing H₂S concentrations are geospatially overlaid on a Google Earth map, exhibiting the plume captured during the transect. Stationary measurement allows for several additional analyses. The bivariate polar plot is a function in the R openair statistical package that plots concentration in polar coordinates by wind speed and wind direction. In these plots, the weighted mean of H₂S concentration (measured by R5's GMAP during stationary collection) * the frequency of occurrence highlights the wind speed/direction conditions that dominate the overall mean and provides an indication of the source(s). The pollution rose plots pollutant concentrations with wind direction by intervals. These plots can be overlaid on a Google Earth image, with the coordinate origin centered on the gps coordinates recorded during the stationary data collection. The resulting graphics provides a visual indication of source attribution and identification.

CROSSETT, AR GMAP MONITORING

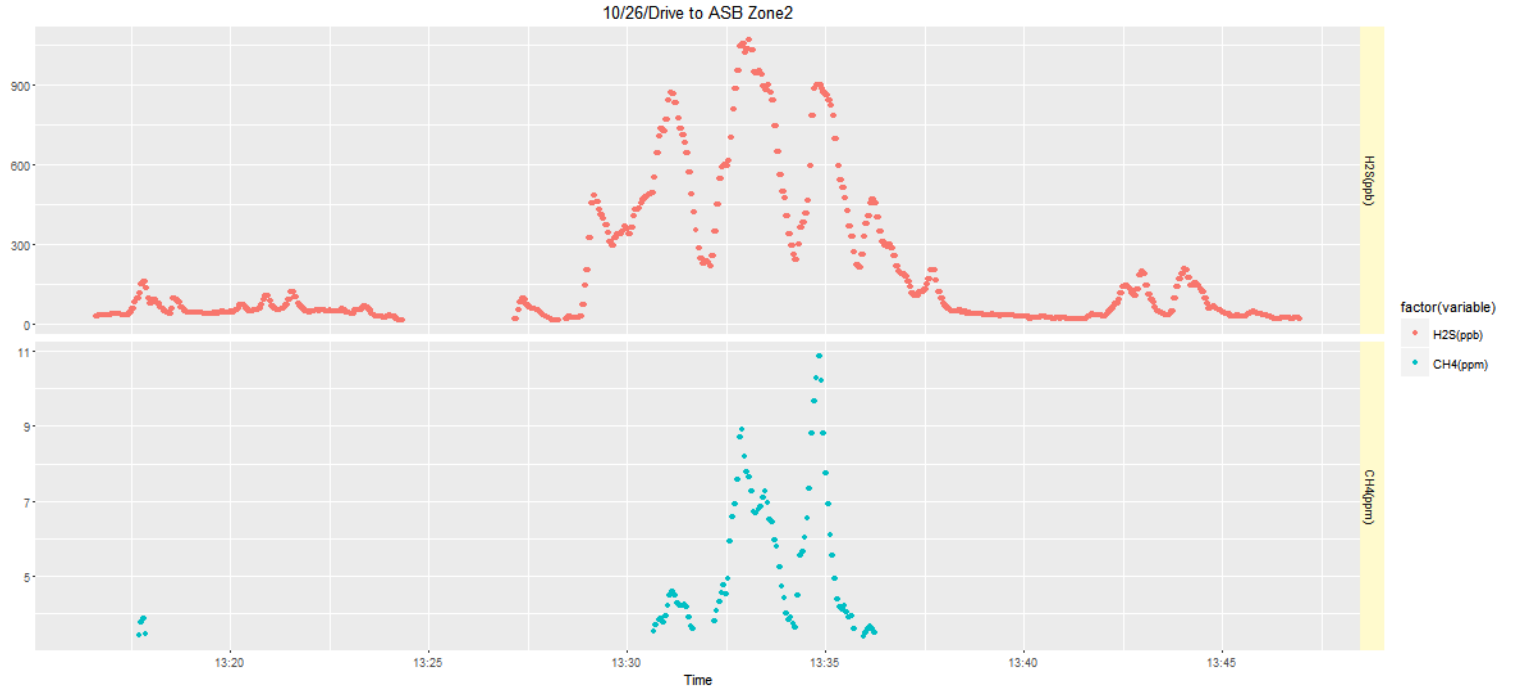


Figure 1: Time series – transect - Drive to ASB Zone 2 (10/26/16)

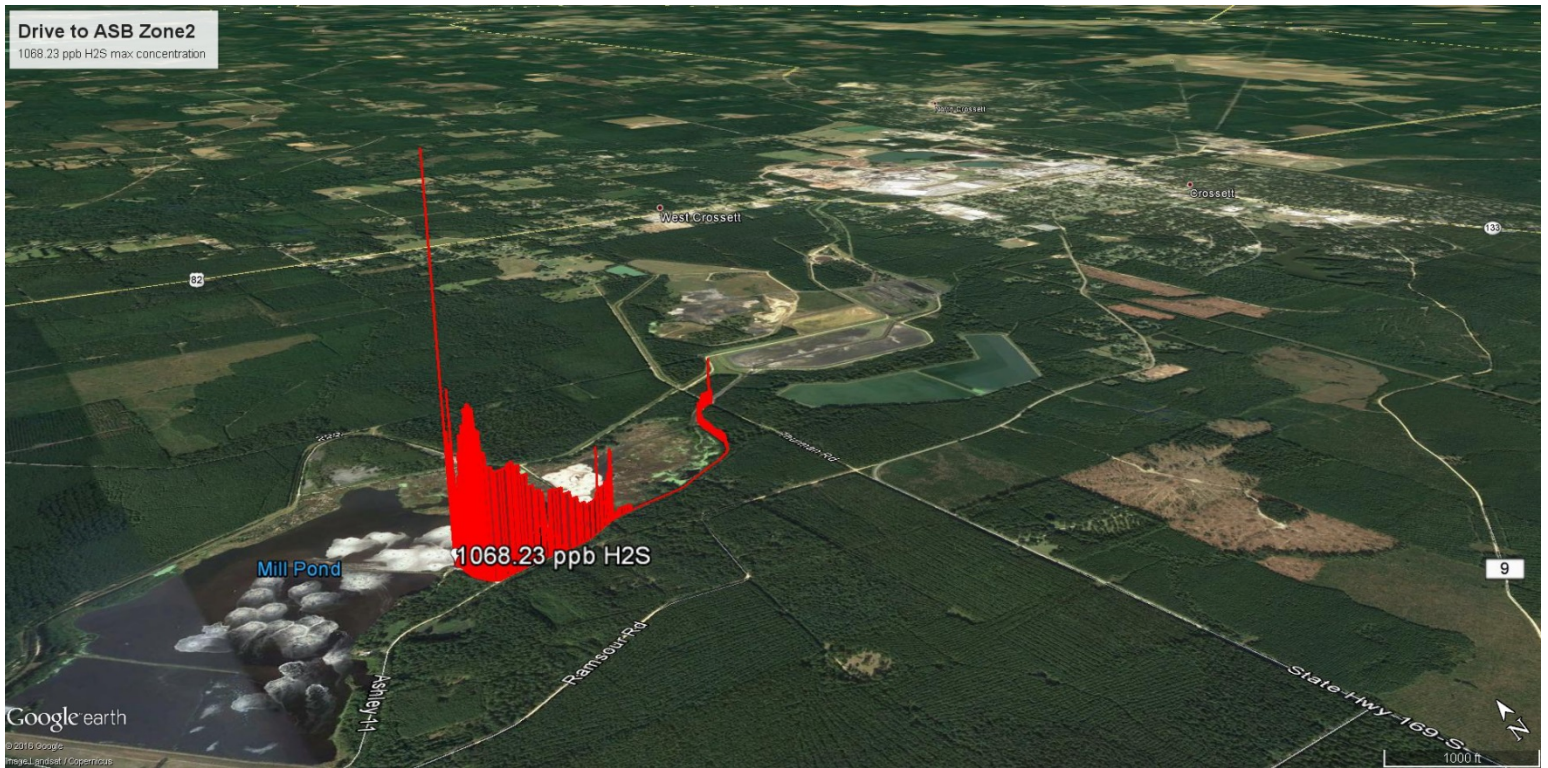


Figure 2: H2S Concentration Ribbon – transect - Drive to ASB Zone 2 (10/26/16)

CROSSETT, AR GMAP MONITORING

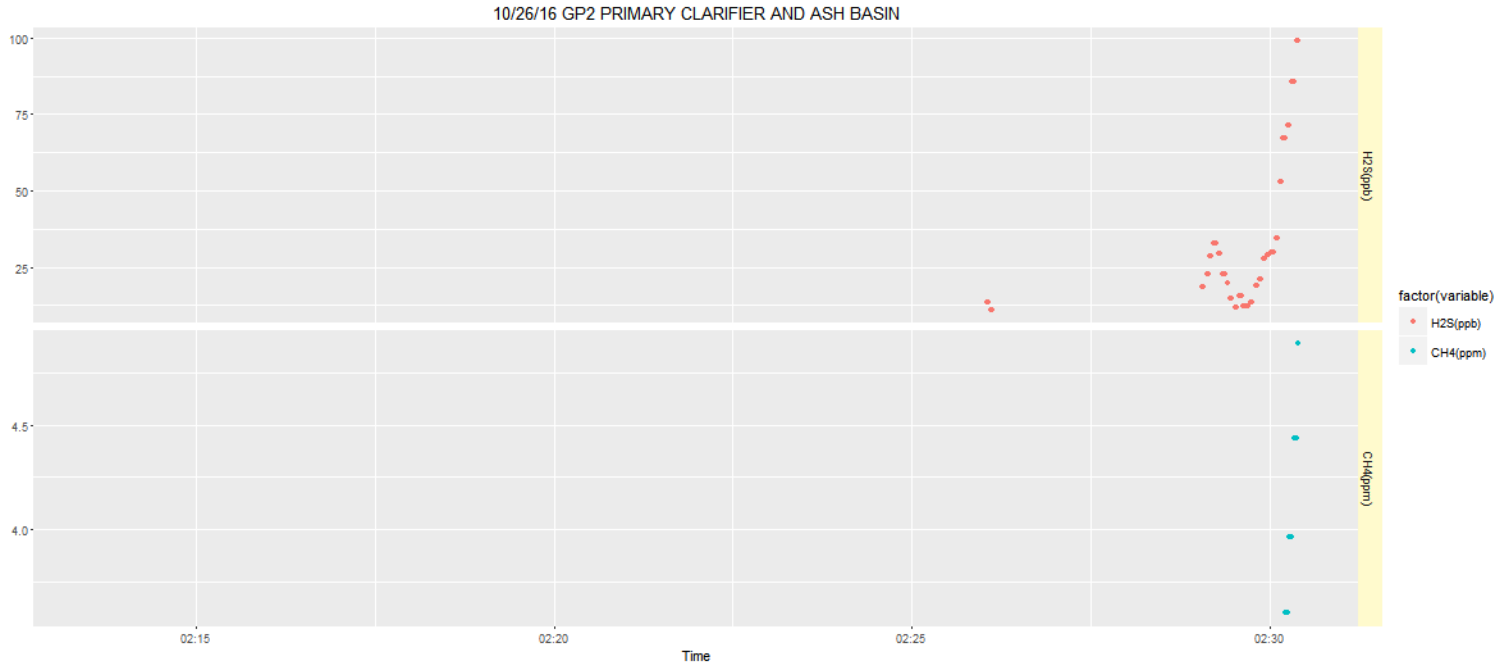


Figure 3: Time Series – transect - GP2 Primary Clarifier and Ash Basin (10/26/16)



Figure 4: Stationary GPS coordinates of GP2 monitoring location

CROSSETT, AR GMAP MONITORING

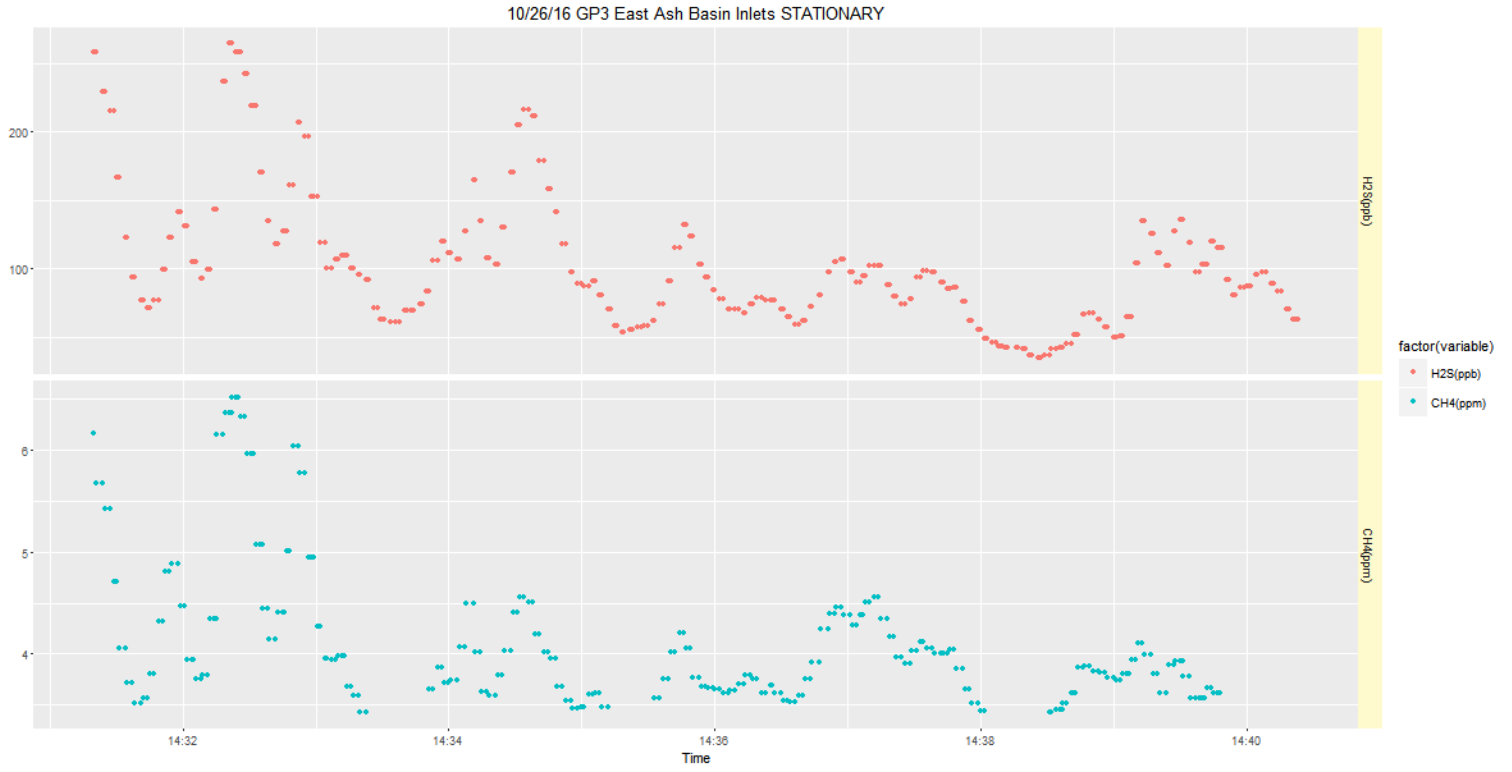


Figure 5: Time series - stationary - GP3 East Ash Basin Inlets (10/26/16)

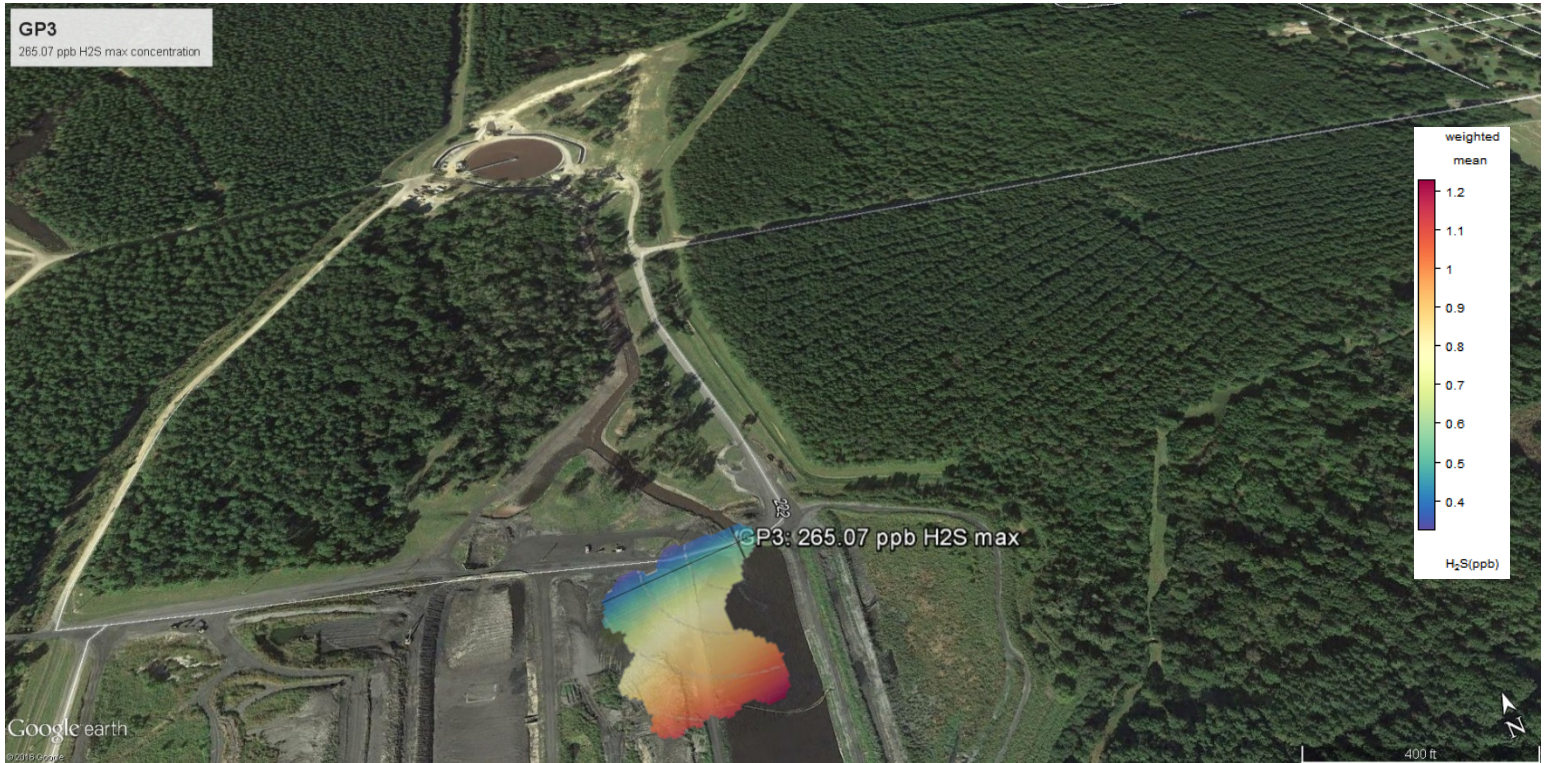


Figure 6: Geospatial H2S polar plot - stationary - GP3 East Ash Basin Inlets (10/26/16)

CROSSETT, AR GMAP MONITORING

H₂S Rose (ppb) – GP3 East Ash Basin Inlets STATIONARY 10/26/16

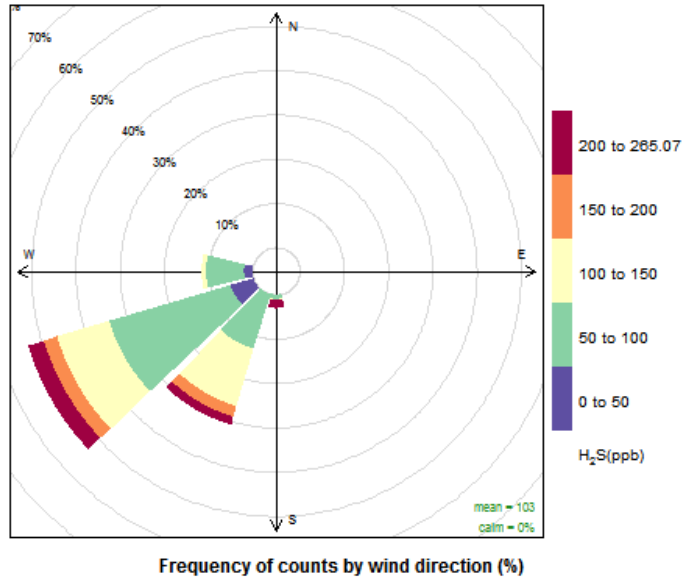


Figure 7: Pollution rose - stationary - GP3 East Ash Basin Inlets (10/26/16)



Figure 8: Geospatial H₂S pollution rose - stationary - GP3 East Ash Basin Inlets (10/26/16)

CROSSETT, AR GMAP MONITORING

10/26/16 GP4 West Ash Basin Inlets STATIONARY

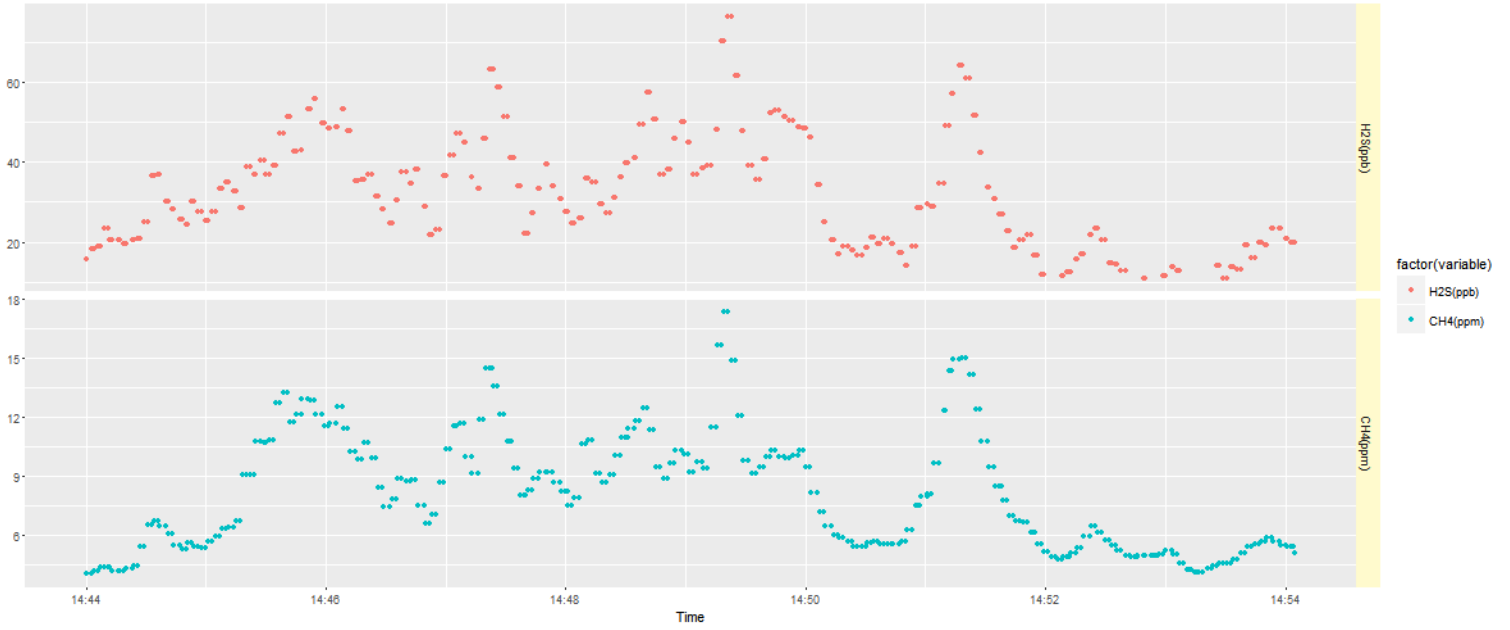


Figure 9: Time Series - stationary - GP4 West Ash Basin Inlets (10/26/16)



Figure 10: Geospatial H2S polar plot - stationary - GP4 West Ash Basin Inlets (10/26/16)

CROSSETT, AR GMAP MONITORING

H₂S Rose (ppb) – GP4 West Ash Basin Inlets STATIONARY 10/26/16

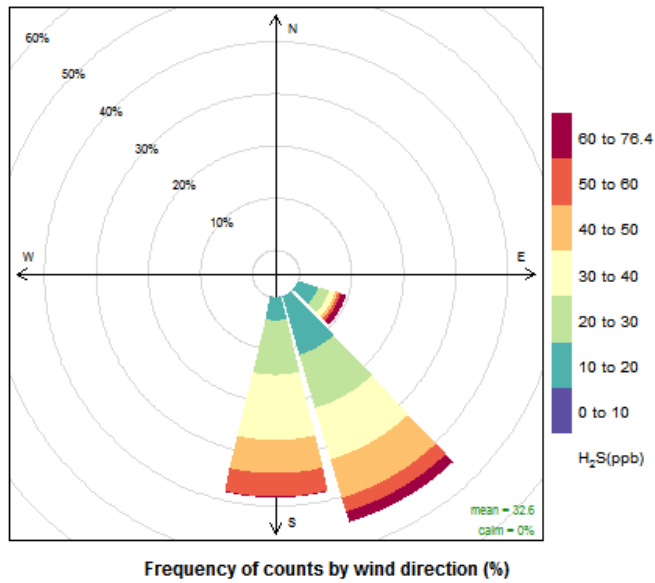


Figure 11: H₂S Pollution Rose - stationary - GP4 West Ash Basin Inlets (10/26/16)



Figure 12: Geospatial H₂S pollution rose - stationary - GP4 West Ash Basin Inlets (10/26/16)

CROSSETT, AR GMAP MONITORING
 10/26/16 GP5 East Ash Basin Inlets STATIONARY

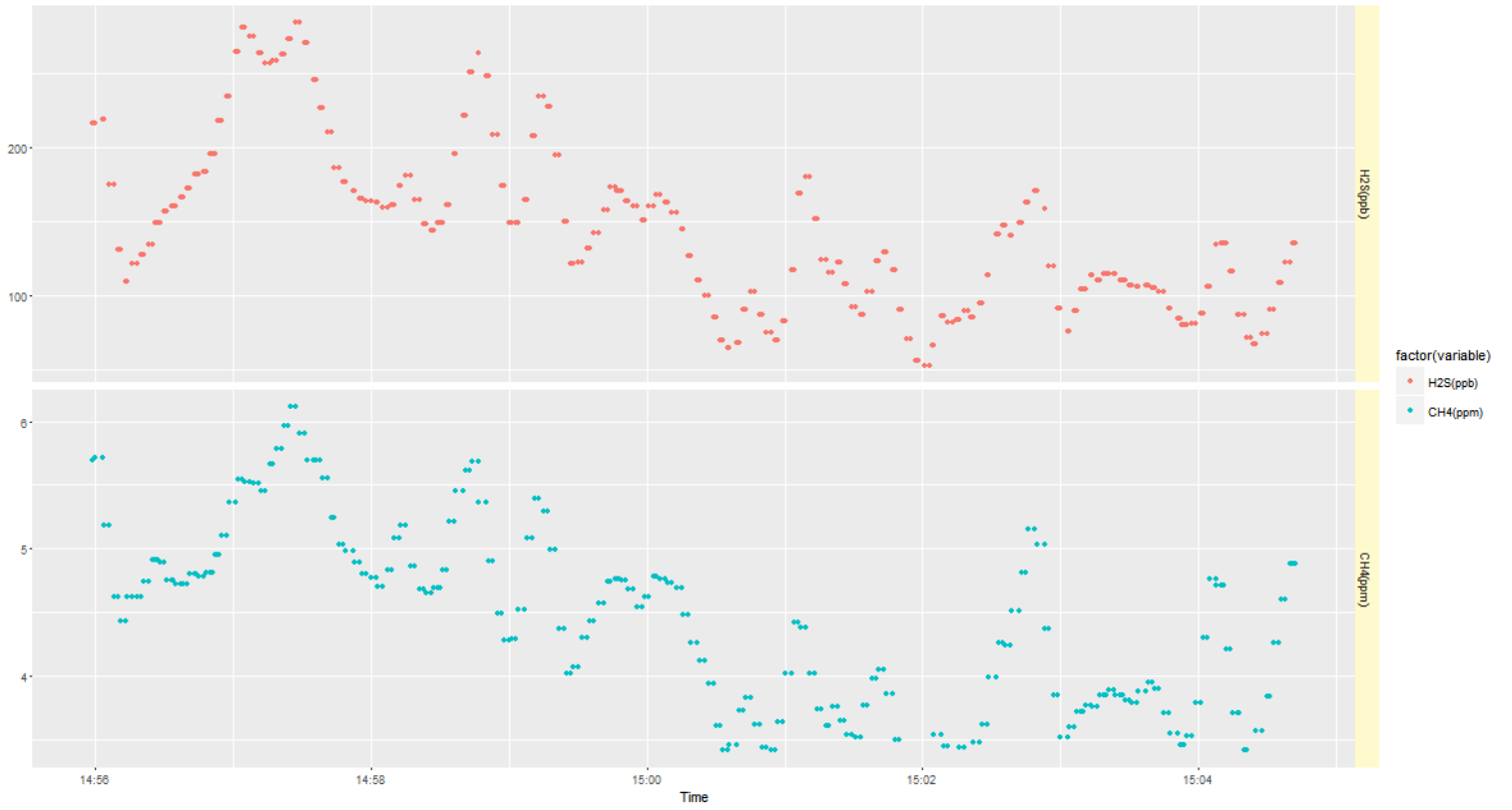


Figure 13: Time series - stationary - GP5 East Ash Basin Inlets (10/26/16)1

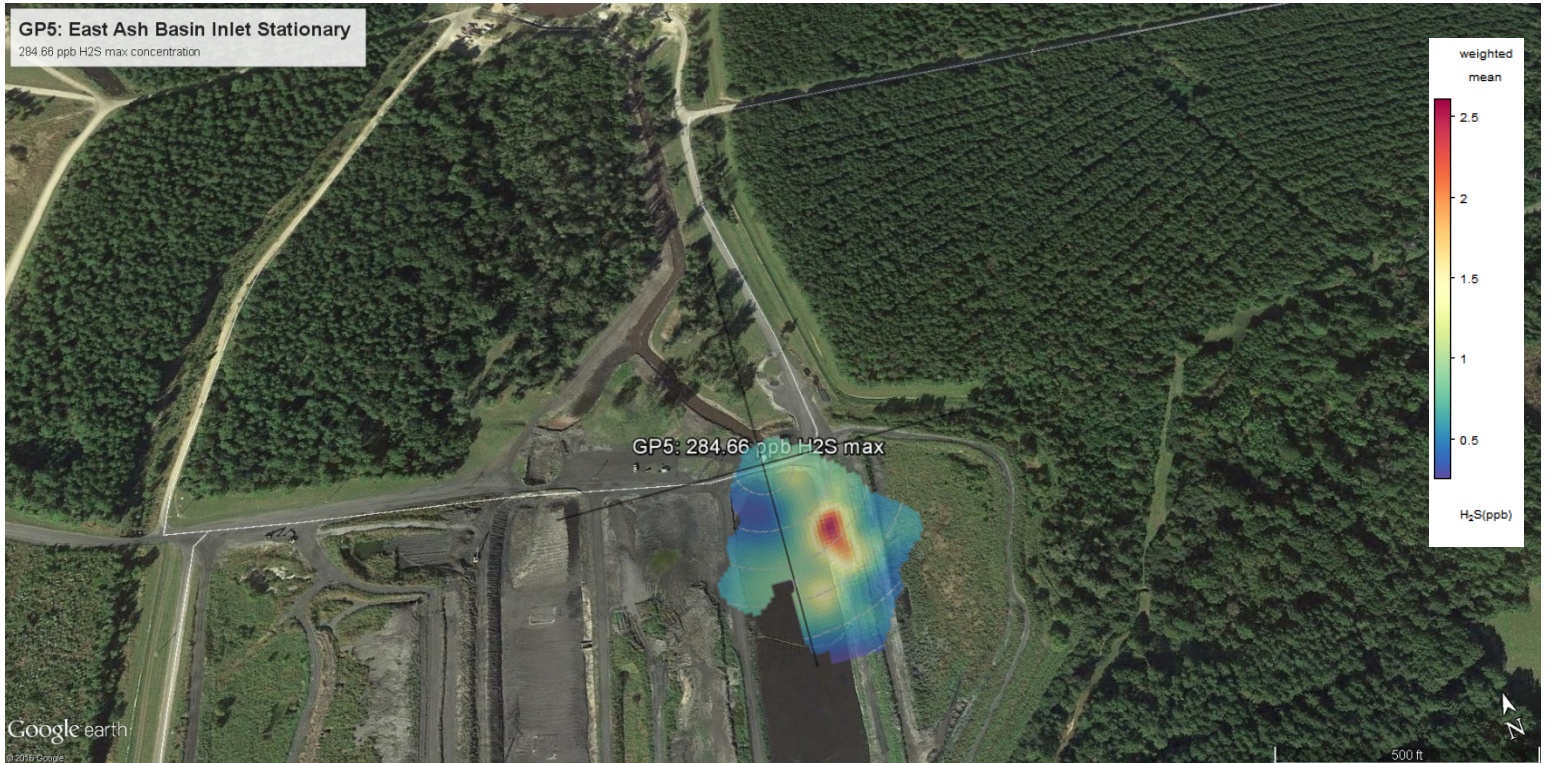


Figure 14: Geospatial H2S polar plot - stationary - GP5 East Ash Basin Inlet (10/26/16)1

CROSSETT, AR GMAP MONITORING

H₂S Rose (ppb) – GP5 East Ash Basin Inlets STATIONARY 10/26/16

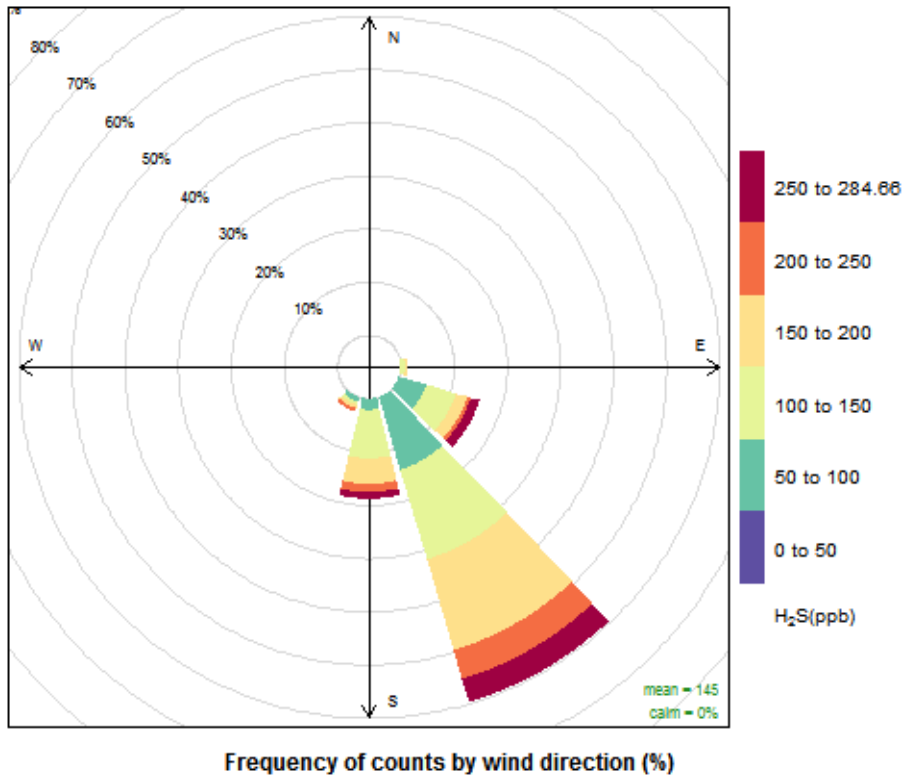


Figure 15: H₂S pollution rose - stationary - GP5 East Ash Basin Inlet (10/26/16)1



Figure 16: Geospatial H₂S pollution rose - stationary - GP5 East Ash Basin Inlet (10/26/16)

CROSSETT, AR GMAP MONITORING

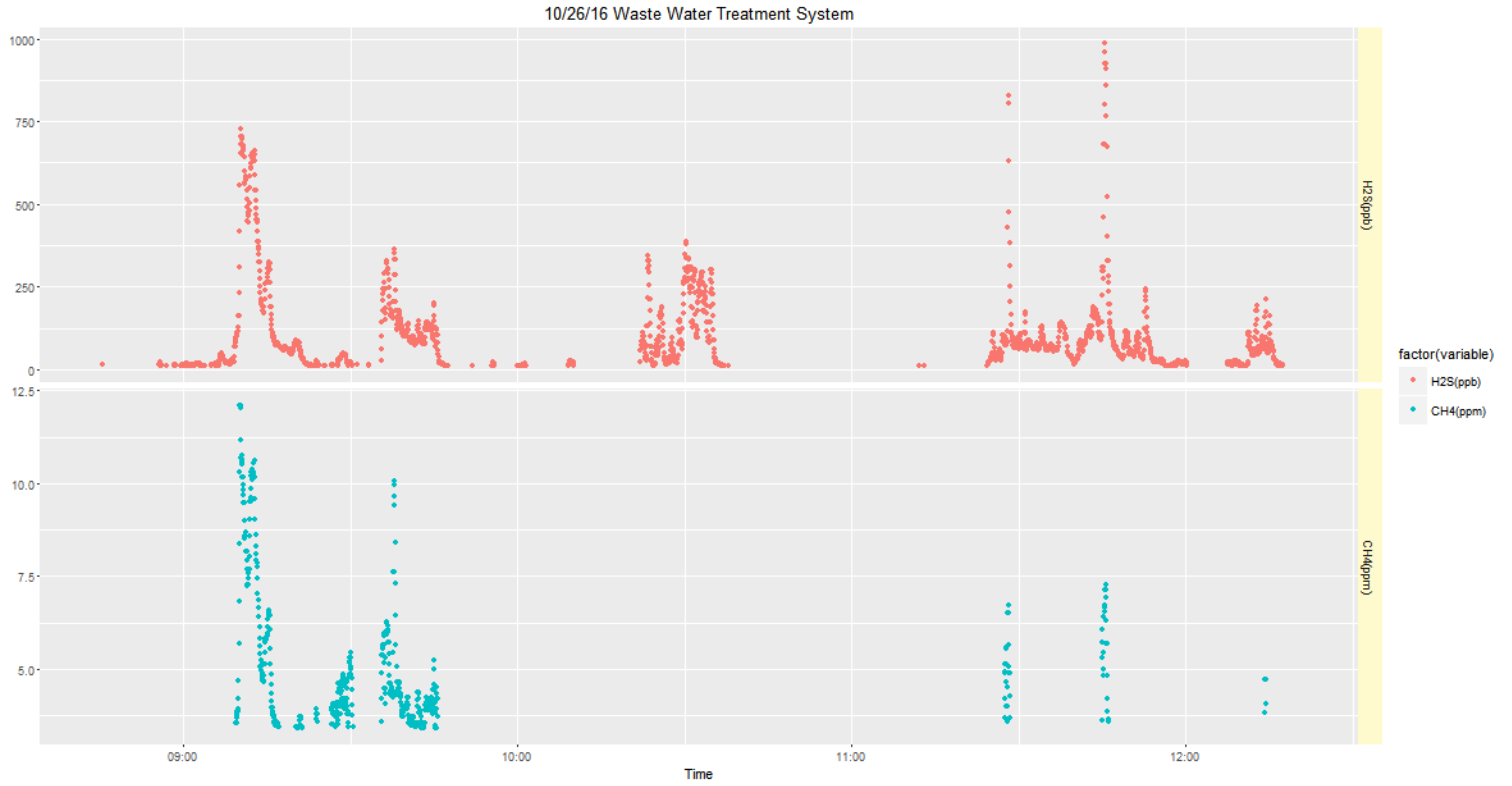


Figure 17: Time series - transect - Waste Water Treatment System (10/26/16)

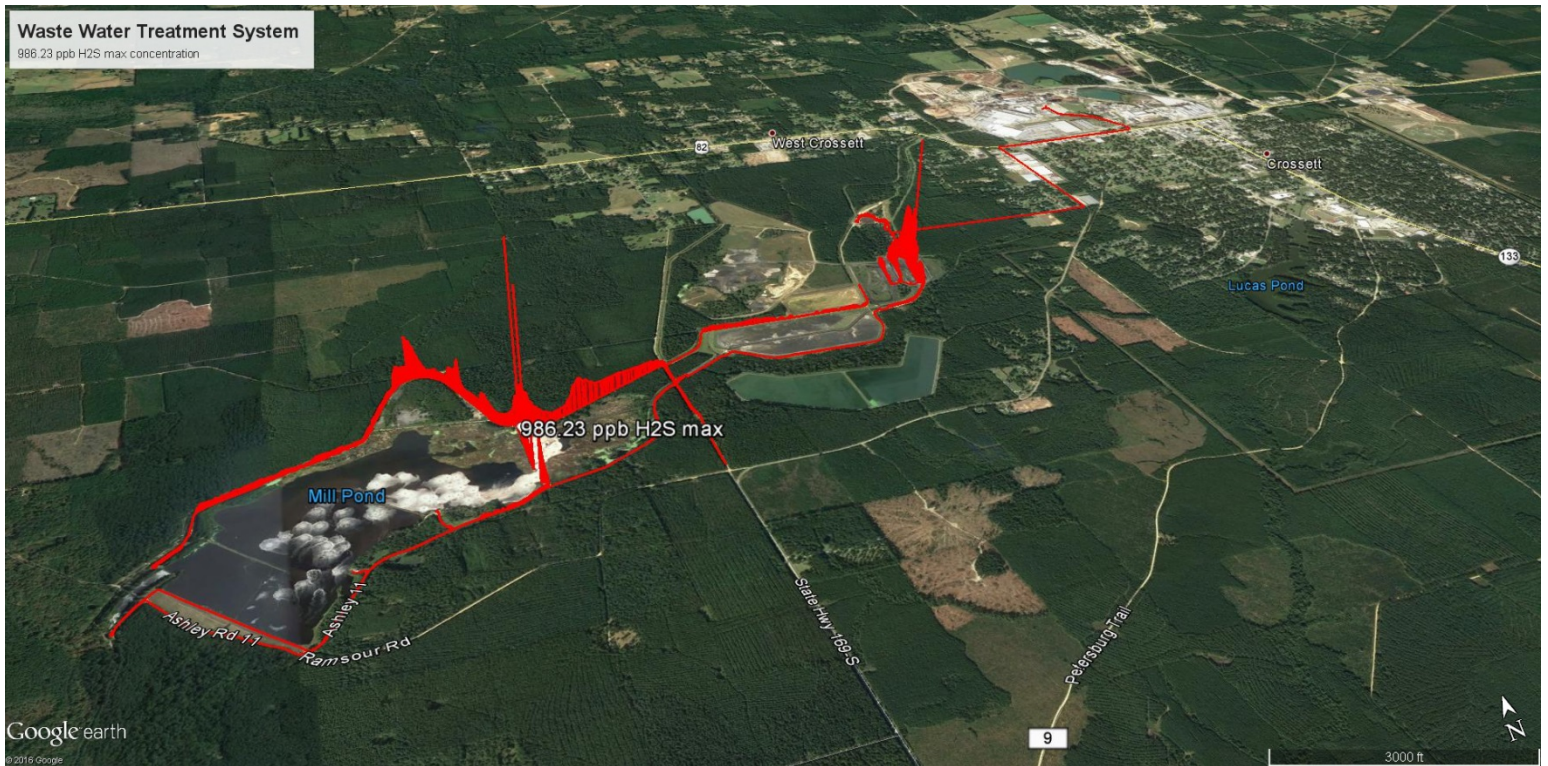


Figure 18: Concentration ribbon - transect - Waste Water Treatment System (10/26/16)

CROSSETT, AR GMAP MONITORING

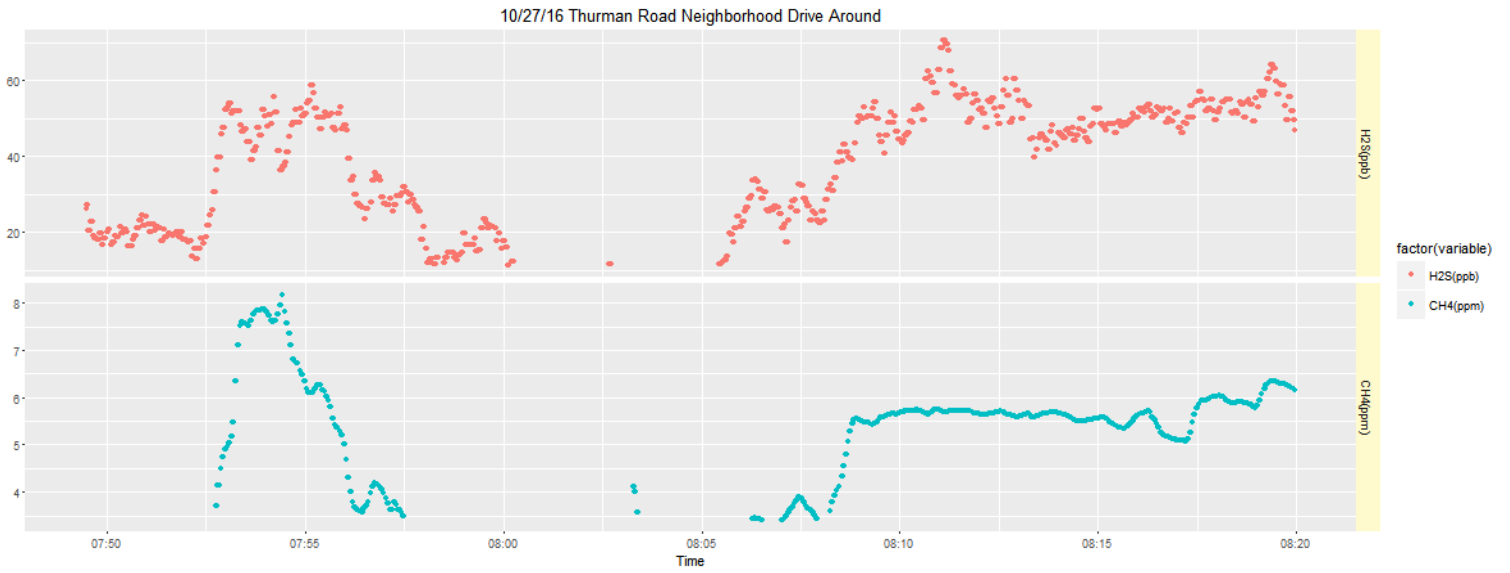


Figure 19: Time series - transect - Thurman Road Neighborhood (10/27/16)



Figure 20: Concentration ribbon - transect - Thurman Road Neighborhood (10/27/16)

CROSSETT, AR GMAP MONITORING

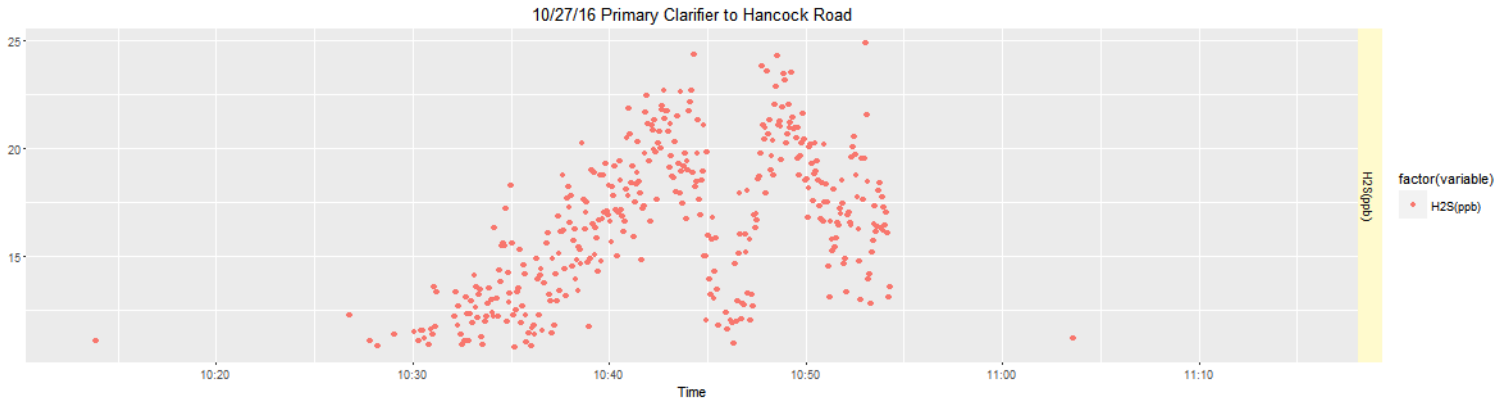


Figure 21: Time series - transect - Primary Clarifier to Hancock Road (10/27/162



Figure 22: Concentration ribbon - transect - Primary Clarifier to Hancock Road (10/27/16)2

CROSSETT, AR GMAP MONITORING

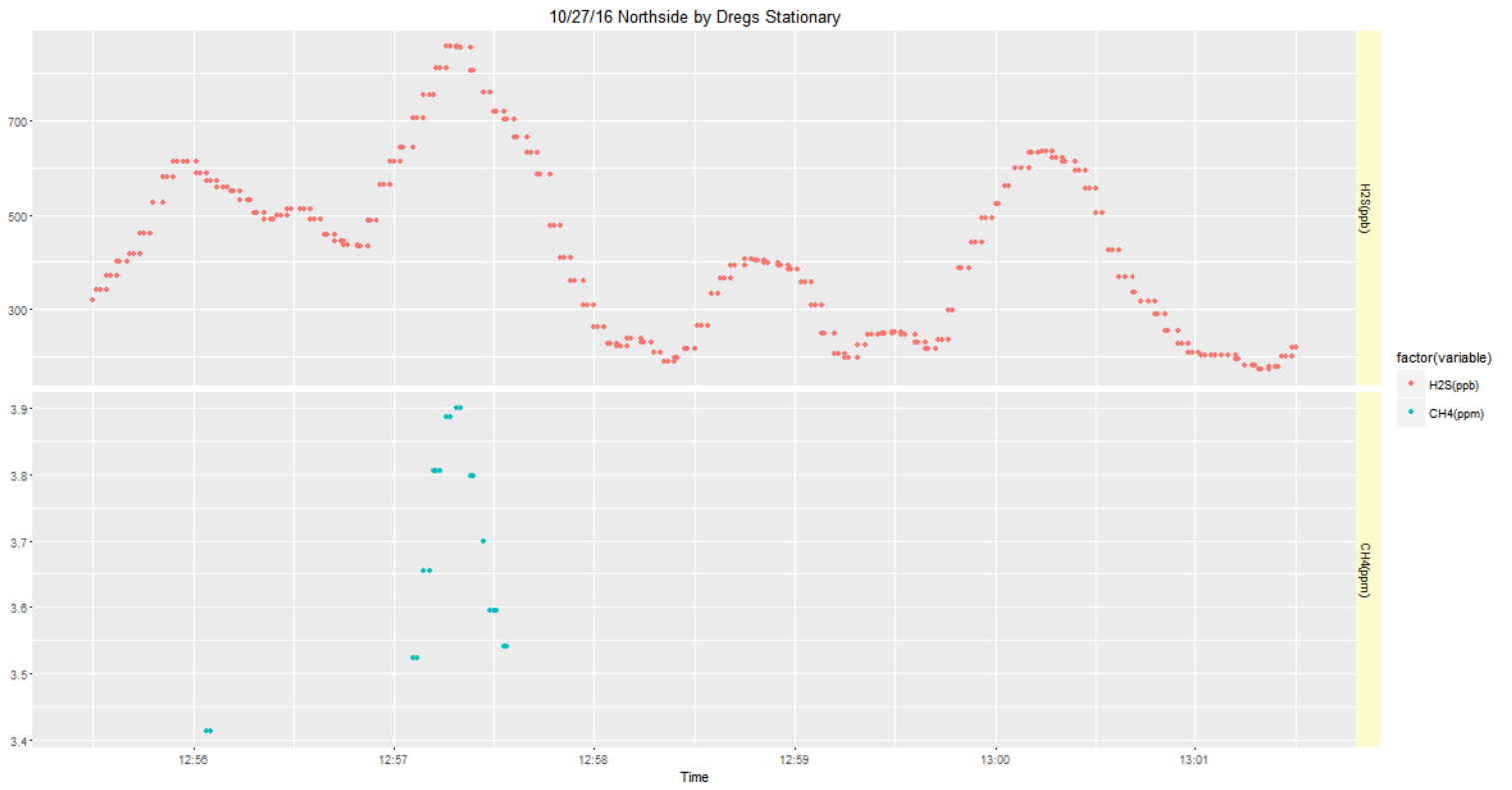


Figure 23: Time series - stationary - Northside by Dregs (10/27/16)2

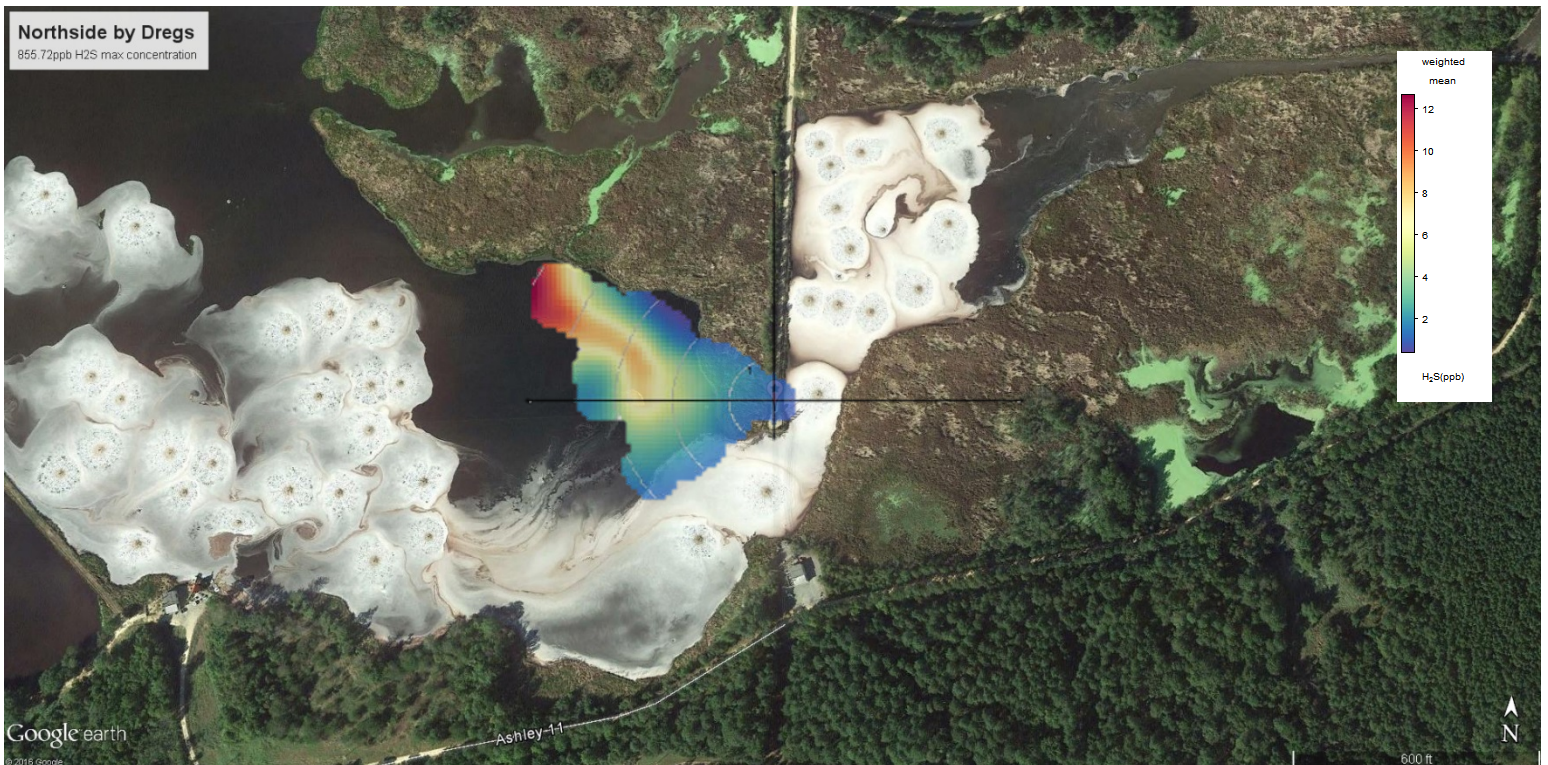


Figure 24: Geospatial polar plot - stationary - Northside by Dregs (10/27/16)

CROSSETT, AR GMAP MONITORING

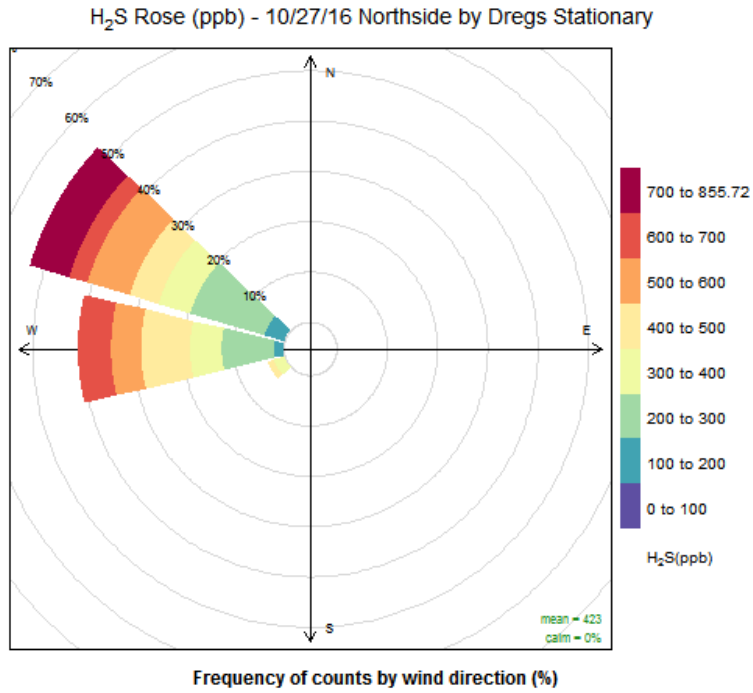


Figure 25: H₂S pollution rose - stationary - Northside by Dregs (10/27/16)

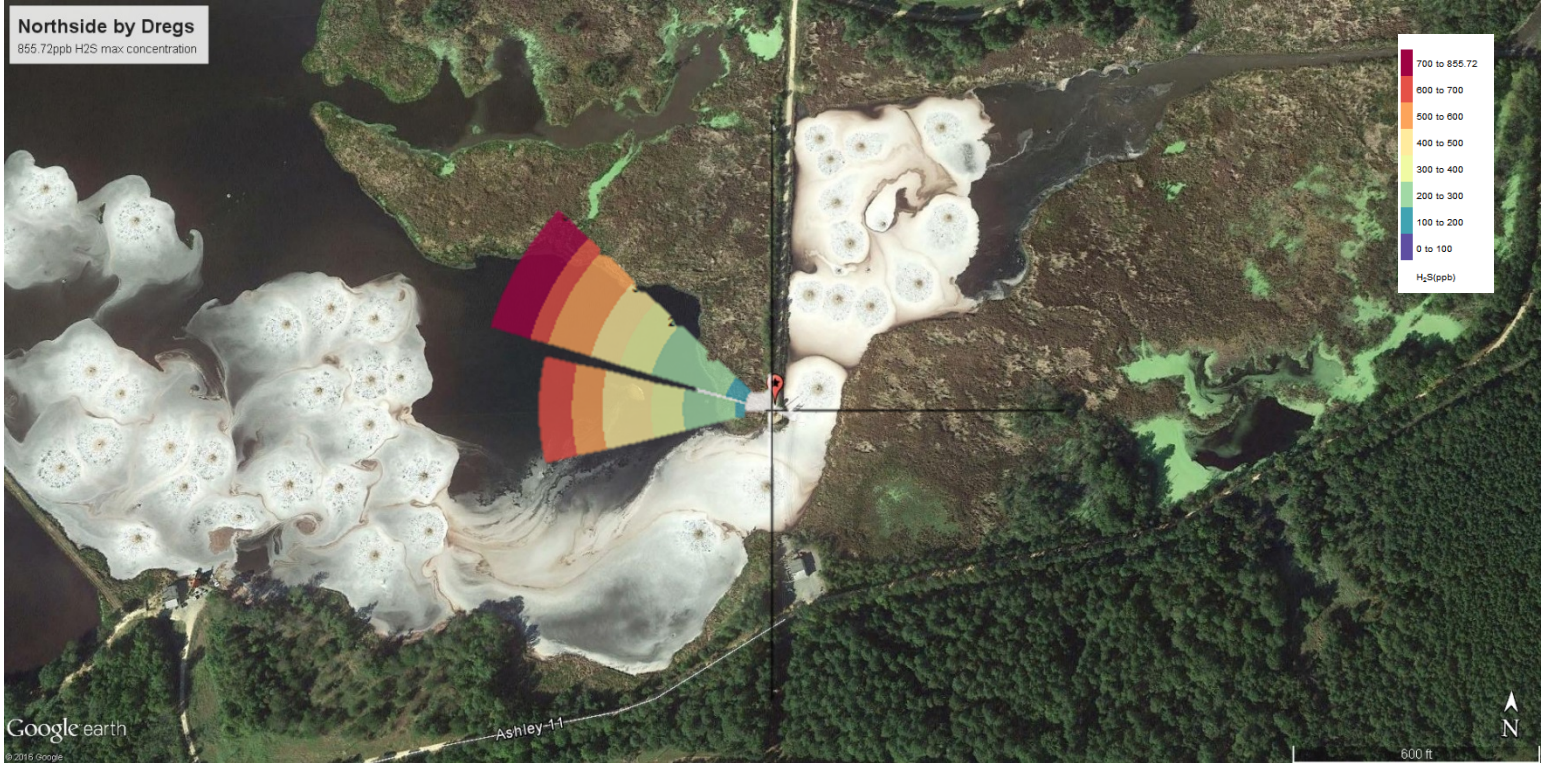


Figure 26: Geospatial H₂S pollution rose - stationary - Northside by Dregs (10/27/16)

CROSSETT, AR GMAP MONITORING

10/27/16 Inlet to ASB

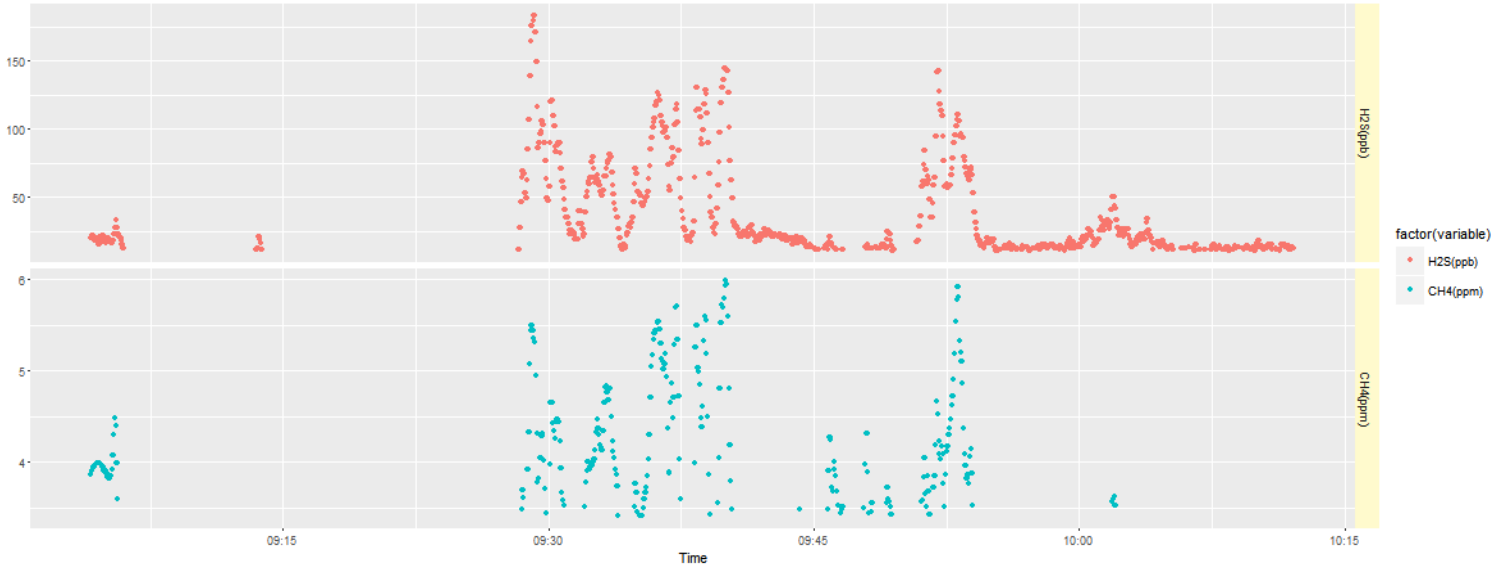


Figure 27: Time series - transect - Inlet to ASB (10/27/16)



Figure28: Concentration ribbon - transect - Inlet to ASB (10/27/16)

CROSSETT, AR GMAP MONITORING

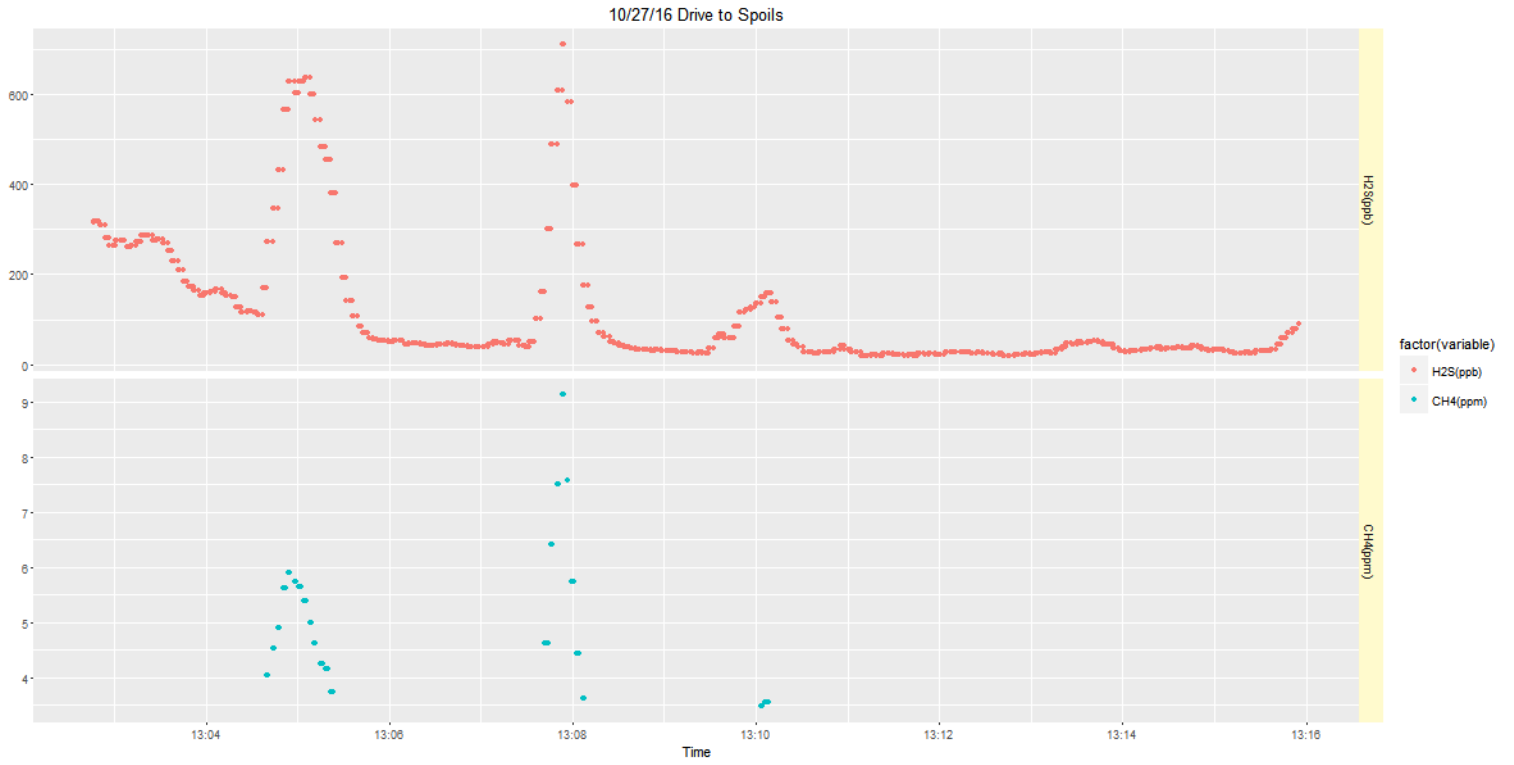


Figure 29: Time series - transect - Drive to Spoils (10/27/16)

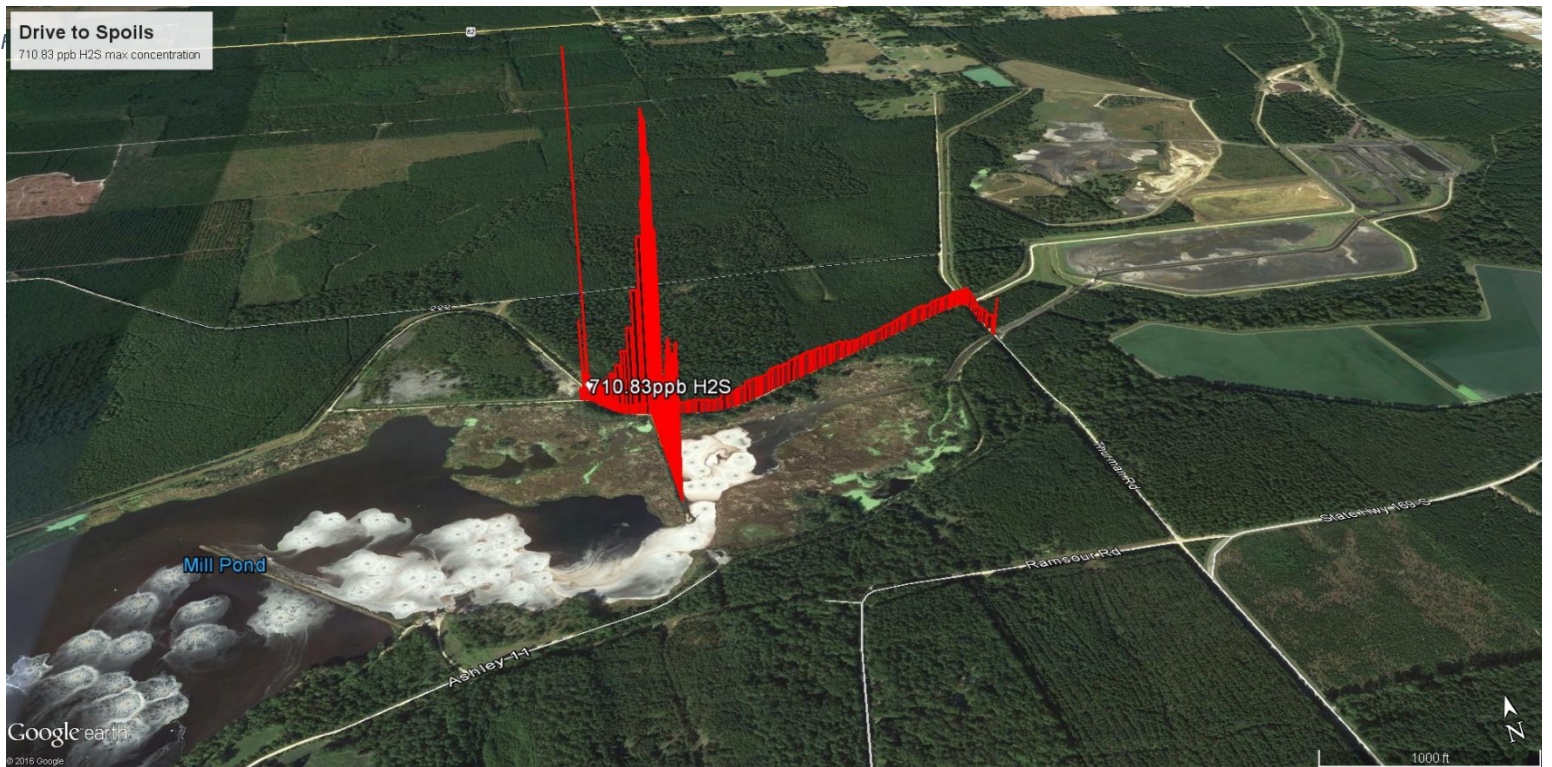


Figure 30: Concentration ribbon - transect - Drive to Spoils (10/27/16)

CROSSETT, AR GMAP MONITORING

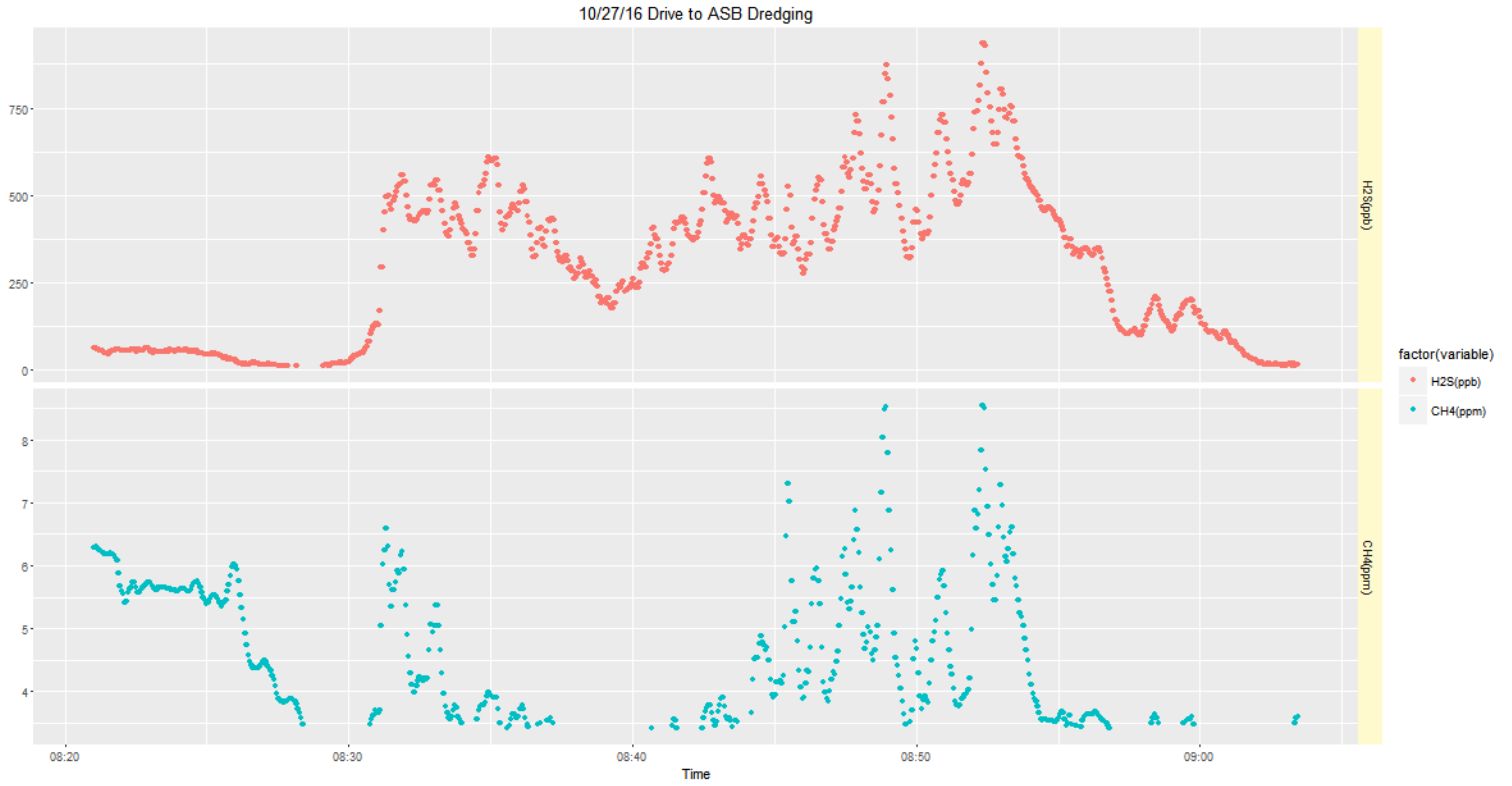


Figure 31: Time series - transect - Drive to ASB Dredging (10/27/16)

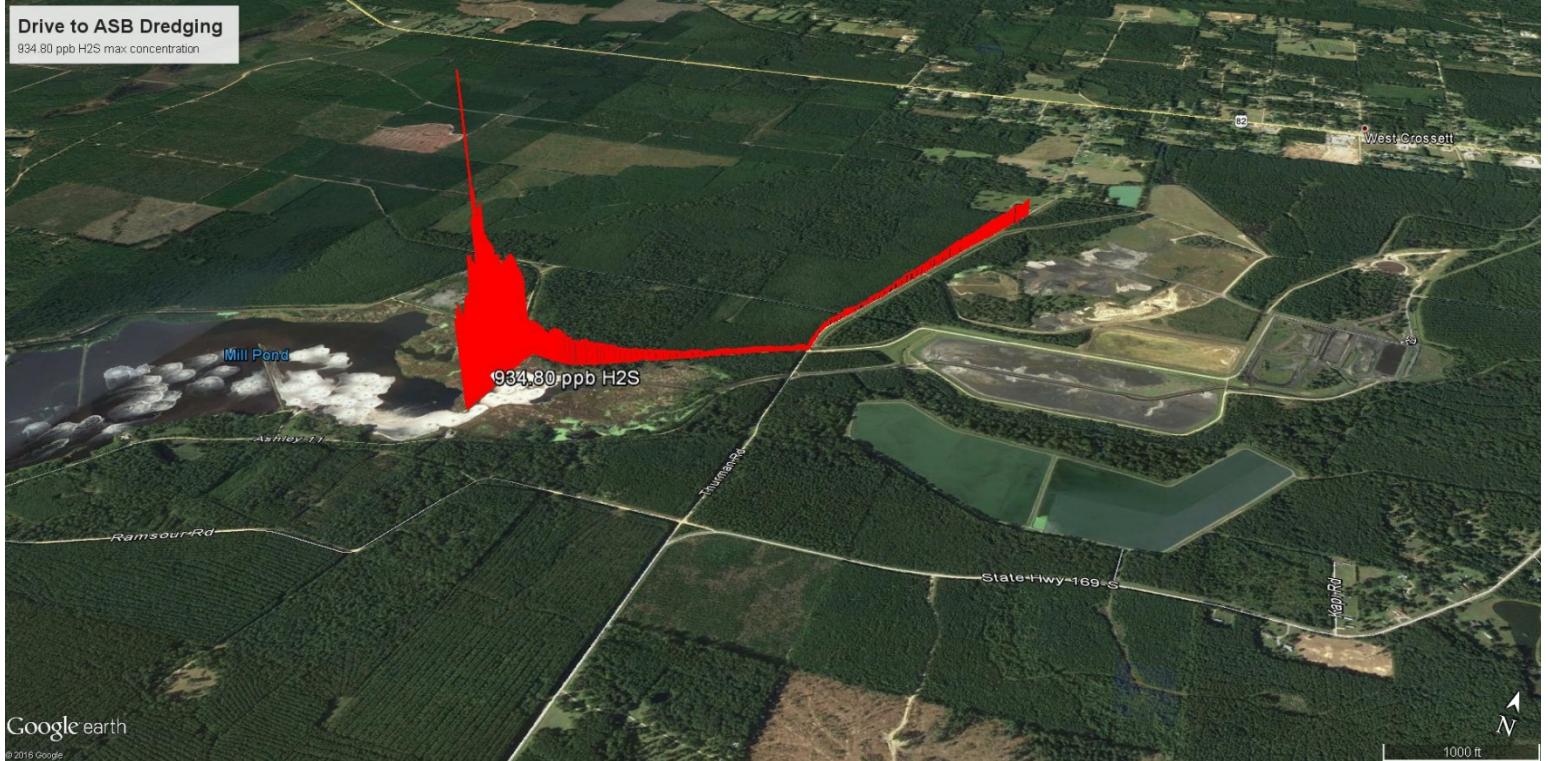


Figure 32: Concentration ribbon - transect - Drive to ASB Dredging (10/27/16)

CROSSETT, AR GMAP MONITORING

10/27/16 Drive Back to ASB

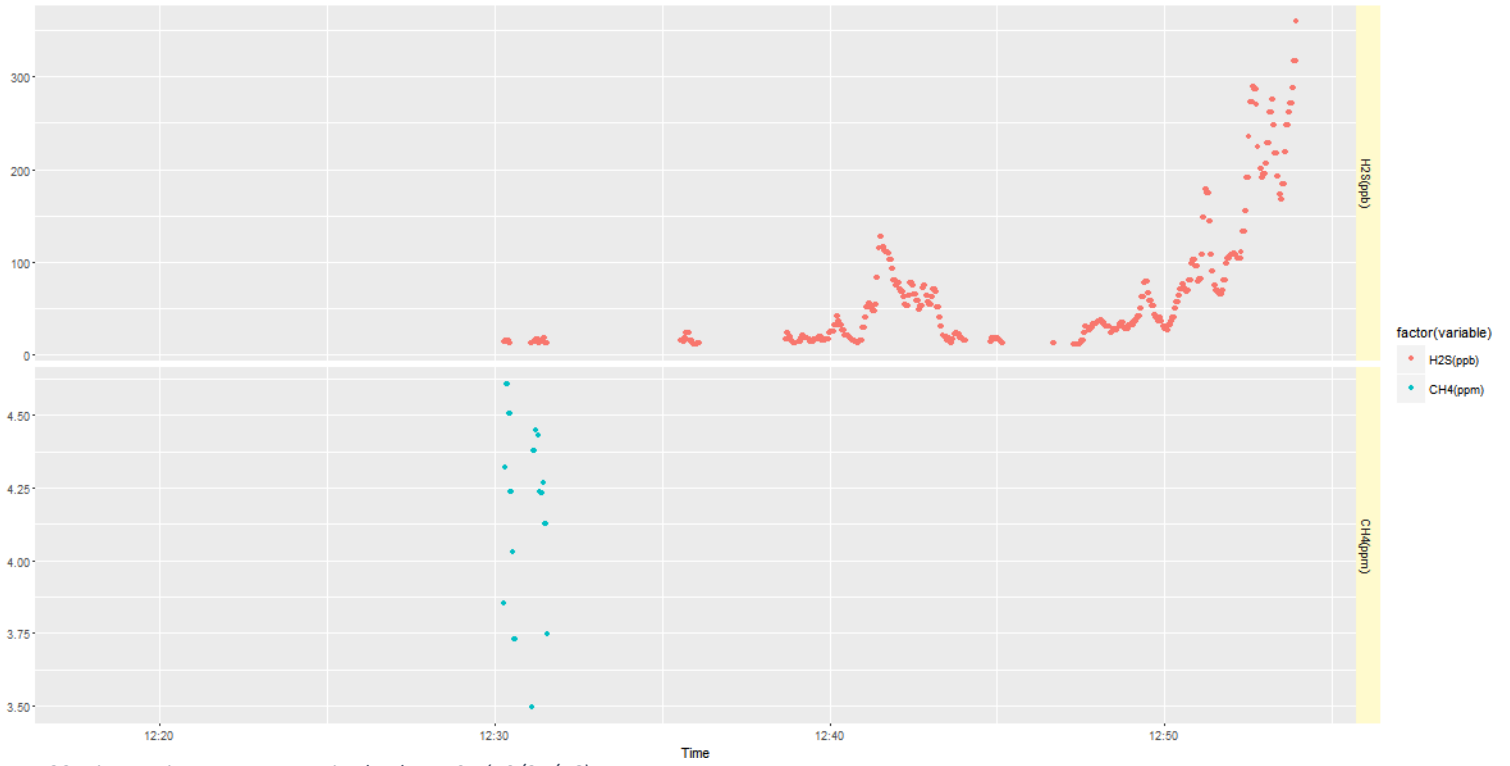


Figure 33: Time series - transect - Drive back to ASB (10/27/16)



Figure 34: Concentration ribbon - transect - Drive back to ASB (10/27/16)

CROSSETT, AR GMAP MONITORING

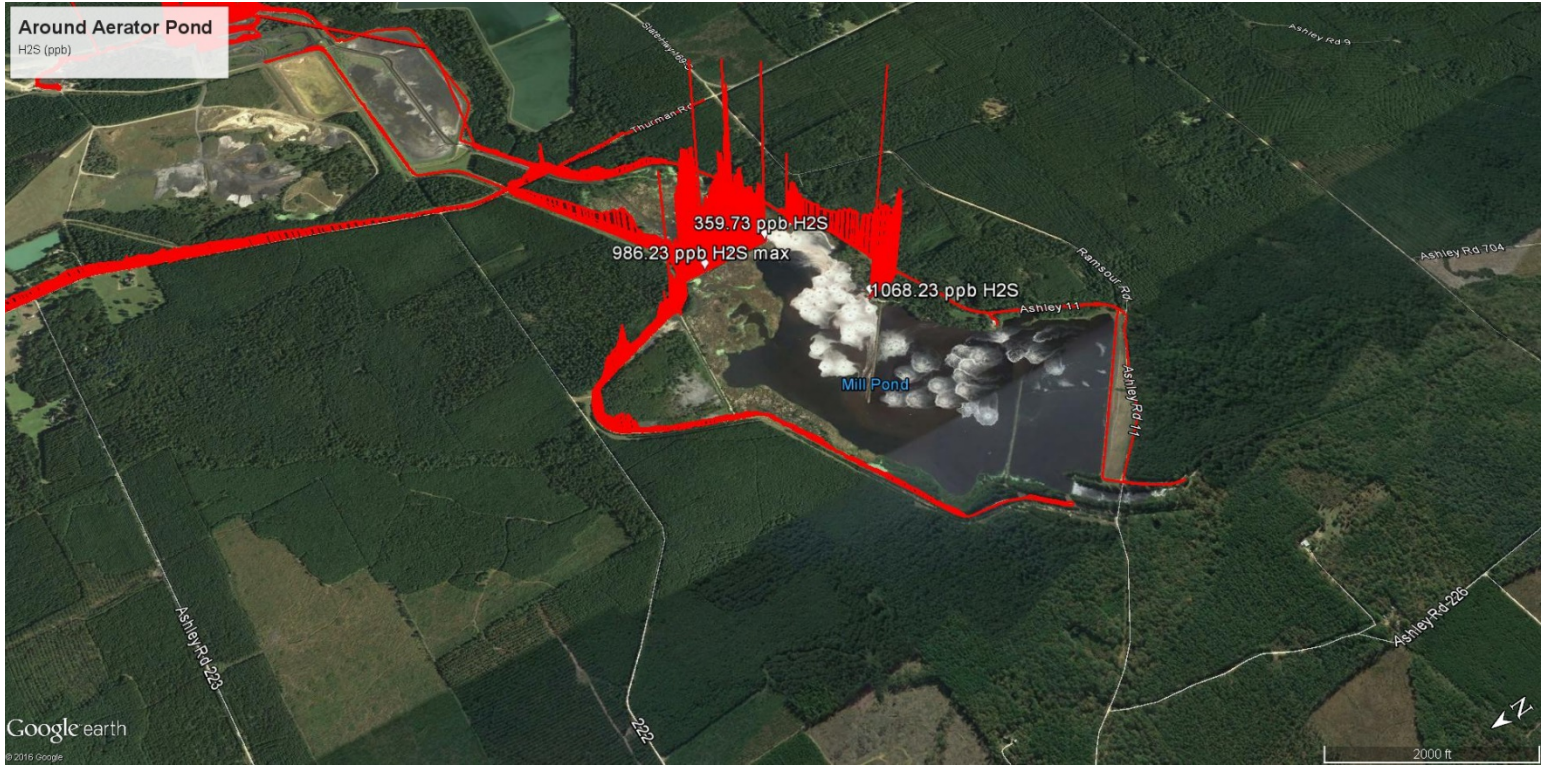


Figure 35: Concentration ribbon - transects around aerator pond

This page left intentionally blank