CAFO Monitoring 2006

Iowa DNR – Ambient Air Monitoring Group

CAFO Monitoring in 2006

Ten monitoring sites were operated during 2006 by houses located near some the largest confined animal feeding operations in the state. A background ammonia monitoring site without nearby animal feeding operations is also operated at Viking Lake State Park. Data from this site has been included in this report for comparison purposes. Details regarding the general location of these monitors, and the name of the closest animal feeding operation, are presented in the maps and table on pages 4-6. Raw data used to create this document was downloaded from the AIRS database on 1/18/2007.

Chapter 32 of 567 (455B) establishes the health effects value (HEV), and health effects standard (HES) for hydrogen sulfide. The HEV is the threshold for adverse health effects, and the HES is the threshold for regulatory action.

The HEV for hydrogen sulfide is 30 parts per billion (ppb) for a one-hour average. An hourly average of 31 ppb is the lowest value that exceeds the hydrogen sulfide HEV. An annual eighth-highest daily maximum hourly average of 31 ppb is the lowest value that exceeds the hydrogen sulfide HES.

In 2006, the HEV was exceeded at three monitoring sites: Newkirk, Sac City, and Stanhope. Newkirk recorded two HEV exceedances. Sac City and Stanhope each recorded one HEV exceedance. In 2006, there were no sites that violated the HES.

Summary charts of hourly data completeness and measured pollutant concentration statistics and several types of graphs have been plotted for each site:

- The concentration of each pollutant (in parts per billion by volume) is plotted against time. Data that failed quality assurance checks, along with instrument malfunctions, has been omitted.

- The second type of graph shows the relationship between pollutant concentration and wind speed. This type of graph can be useful along with locational data for analysis of the pollutant dilution and possible effects of other sources.

- Graphs have also been included to show if there is any relationship between the measured concentrations of hydrogen sulfide and ammonia where appropriate.

- The second last type of graph is pollutant concentration plotted against wind direction. The direction the wind is coming from is specified using an angle between 0 and 359 degrees. 0 represents a wind from due north, 90 from due east, etc.

- The last plot in each series shows how wind speed varies with wind direction.

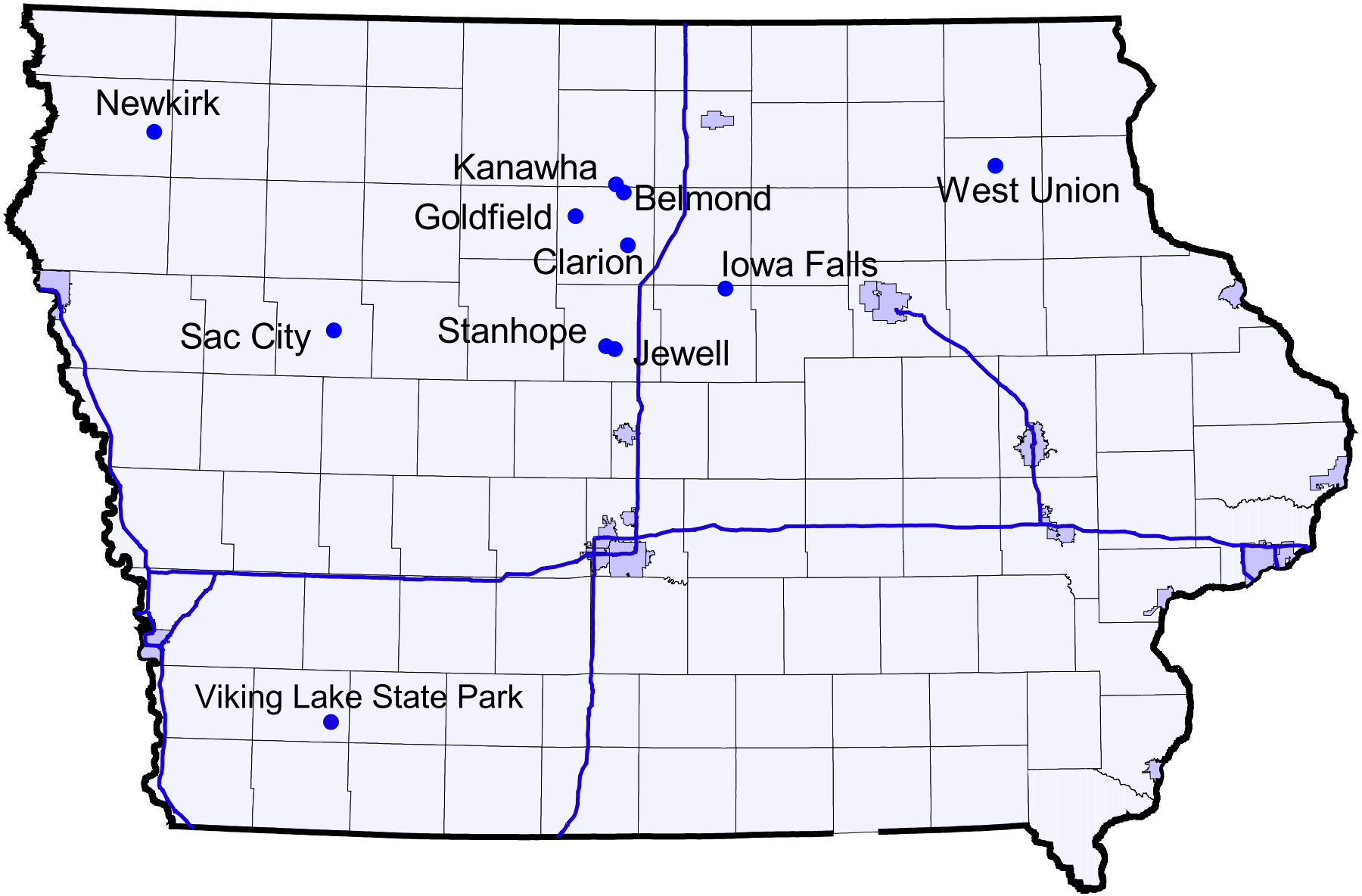
- Wind direction becomes ambiguous at very low wind speeds. Graphs that include wind direction have been modified to only show wind direction if the average wind speed was greater than zero.

CAFO Monitoring Sites - 2006 Network

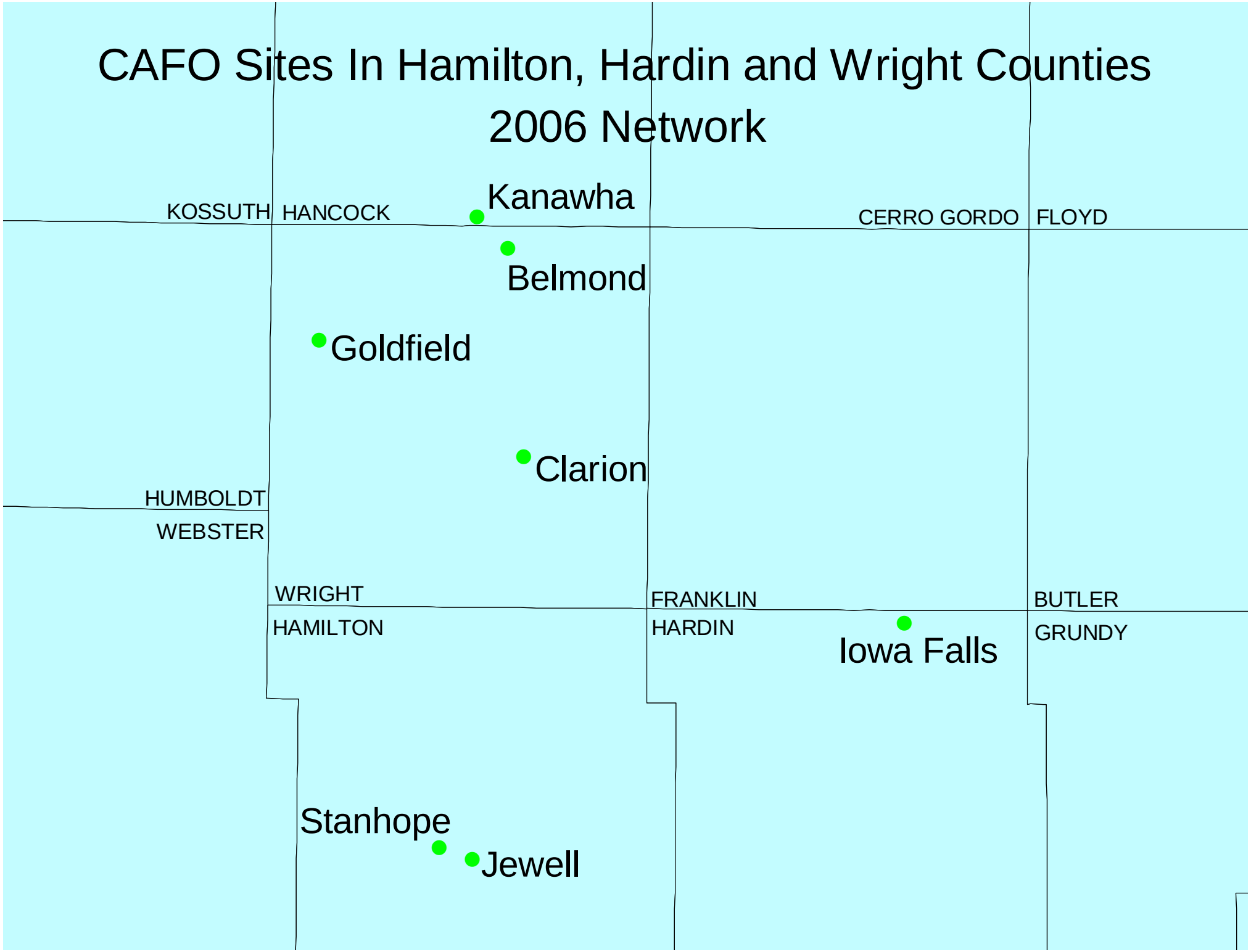
Nearby Town	County	Animal Type	Closest Facility	Site Type	Permitted Weight in lbs.
Belmond (New)	Wright	Swine	Buseman/Halfpop	1	2,310,000
Clarion	Wright	Swine	DeCoster #15	1	1,827,265
Goldfield	Wright	Swine	McCutcheon	1	2,475,000
Iowa Falls	Hardin	Swine	Stockdale	1	1,502,500
Jewell	Hamilton	Swine	Miller	1	1,462,500
Kanawha	Hancock	Swine	Fishjohn	1	2,310,000
Newkirk	Sioux	Dairy Cattle	Hickory Hills	1	2,390,000
Sac City	Sac	Swine	Withum	1	1,890,000
Stanhope	Hamilton	Swine	Winniger	1	2,475,000
Stanton (Viking Lake)	Montgomery	---	None-Background Monitor	---	---
West Union	Fayette	Poultry	IVA Inc	1	3,030,000

Site Type	Explanation
1	In ambient air, on property associated with a residence, close to house
2	In ambient air, on property associated with a residence, close to an animal feeding operation
3	In ambient air, not on property associated with a residence

2006 - CAFO Network



CAFO Sites In Hamilton, Hardin and Wright Counties
2006 Network



Hydrogen Sulfide

2006 Hourly Summary Statistics

Statistic/Site Name	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
Total Hours	8651	8685	8451	8427	8087	8677	8378	8392	8664	8699
Capture Percentage	99%	99%	96%	96%	92%	99%	96%	96%	99%	99%
Minimum (ppb)	0	0	0	0	0	0	0	0	0	0
Maximum (ppb)	6	25	7	13	28	7	40	51	33	3
Average (ppb)	0	0	0	0	0	0	0	0	0	0

Percentile	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
100%	6	25	7	13	28	7	40	51	33	3
90%	0	1	0	0	1	1	1	1	1	0
80%	0	0	0	0	0	0	1	0	0	0
70%	0	0	0	0	0	0	1	0	0	0
60%	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0
10%	0	0	0	0	0	0	0	0	0	0

Maximum	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	West Union
1	6	25	7	13	28	7	40	51	33	3
2	5	16	6	12	24	7	38	23	25	3
3	5	11	6	12	20	7	29	18	21	3
4	5	7	5	11	19	6	28	17	13	2
5	4	6	5	8	19	6	28	16	12	2
6	4	6	5	8	19	6	28	16	12	2
7	4	6	5	8	17	6	26	16	11	2
8	4	6	5	8	12	6	25	14	10	2
9	4	6	5	7	12	6	25	13	9	2
10	4	6	5	7	12	6	23	12	9	2

Ammonia

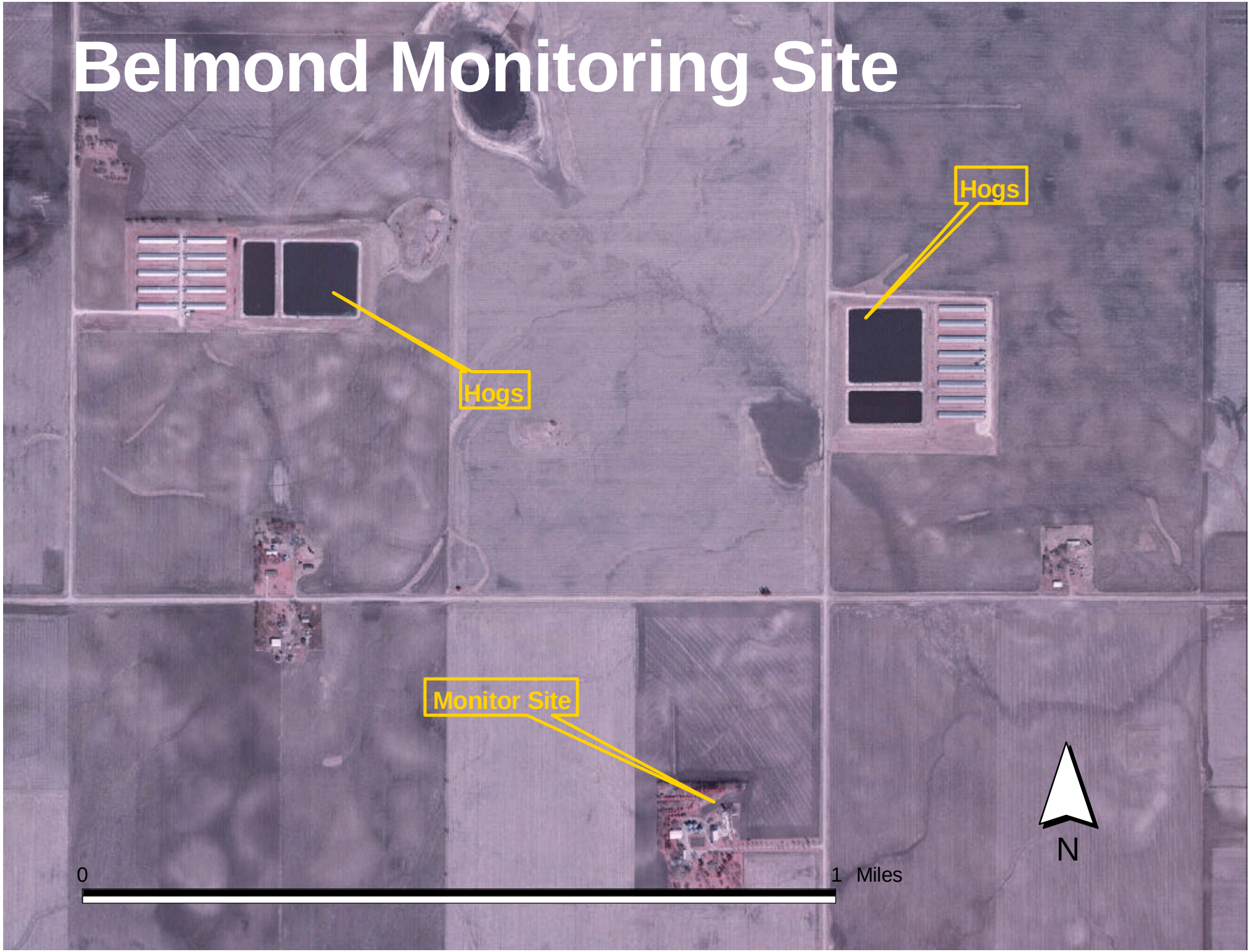
2006 Hourly Summary Statistics

Statistic/Site Name	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
Total Hours	8630	8641	8625	8600	8534	8620	8576	8612	8592	7691	8150
Capture Percentage	99%	99%	98%	98%	97%	98%	98%	98%	98%	88%	93%
Minimum (ppb)	0	0	0	0	0	0	0	0	0	0	0
Maximum (ppb)	181	551	539	286	996	315	279	396	1821	44	931
Average (ppb)	11	20	12	16	19	12	11	10	16	3	15

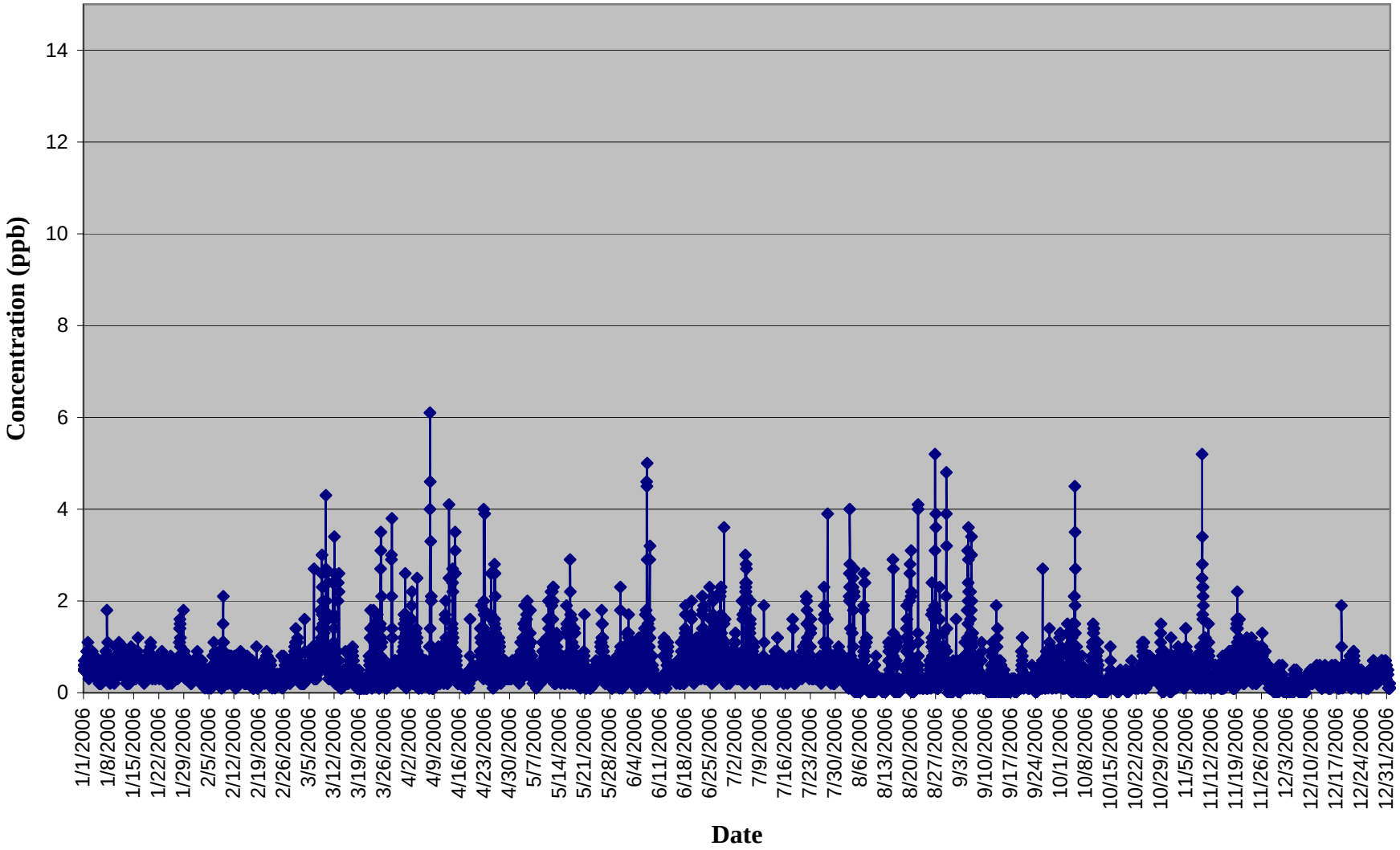
Percentile	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
100%	181	551	539	286	996	315	279	396	1821	44	931
90%	19	45	23	26	34	27	23	23	27	7	29
80%	15	27	16	21	24	19	16	16	20	5	15
70%	12	20	12	18	20	14	12	11	17	4	10
60%	11	15	10	16	17	11	10	8	14	3	8
50%	9	11	8	14	15	8	8	5	12	2	6
40%	8	8	7	12	13	6	7	3	10	1	5
30%	6	6	5	11	11	4	5	2	9	1	3
20%	5	4	4	9	9	2	4	0	6	0	2
10%	2	2	2	6	6	0	2	0	4	0	0

Maximum	Belmond	Clarion	Goldfield	Iowa Falls	Jewell	Kanawha	Newkirk	Sac City	Stanhope	Stanton	West Union
1	181	551	539	286	996	315	279	396	1821	44	931
2	145	445	389	284	762	258	263	285	1178	40	805
3	138	429	356	259	716	236	259	262	708	39	800
4	127	424	317	213	713	203	159	247	649	39	765
5	120	407	298	197	694	197	157	246	424	37	762
6	118	374	296	194	673	188	140	239	412	37	589
7	102	352	267	193	666	188	138	235	375	35	573
8	96	345	264	170	398	187	132	212	367	34	459
9	93	338	251	168	344	176	132	202	331	33	456
10	93	336	244	159	333	171	132	183	310	32	410

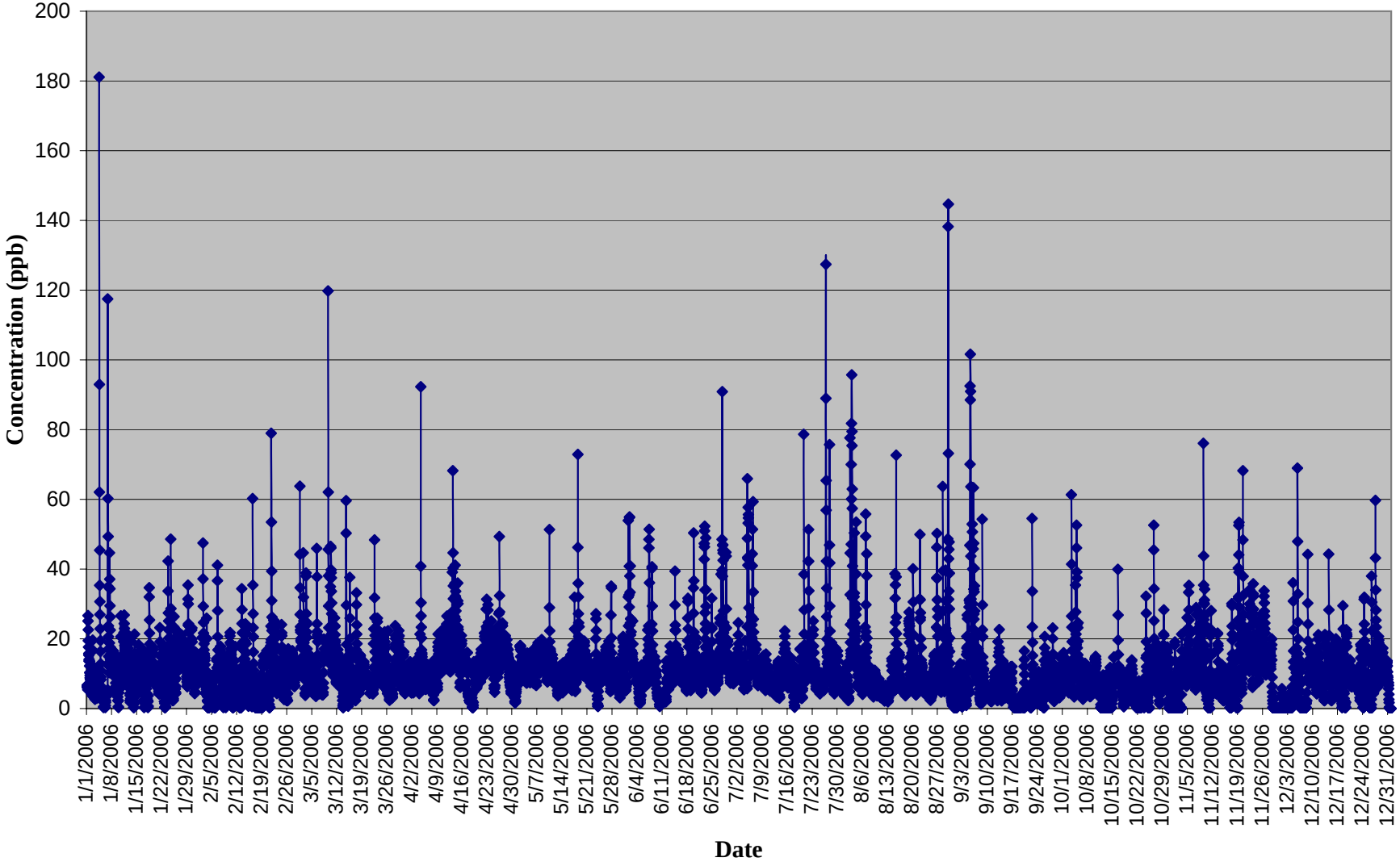
Belmond Monitoring Site



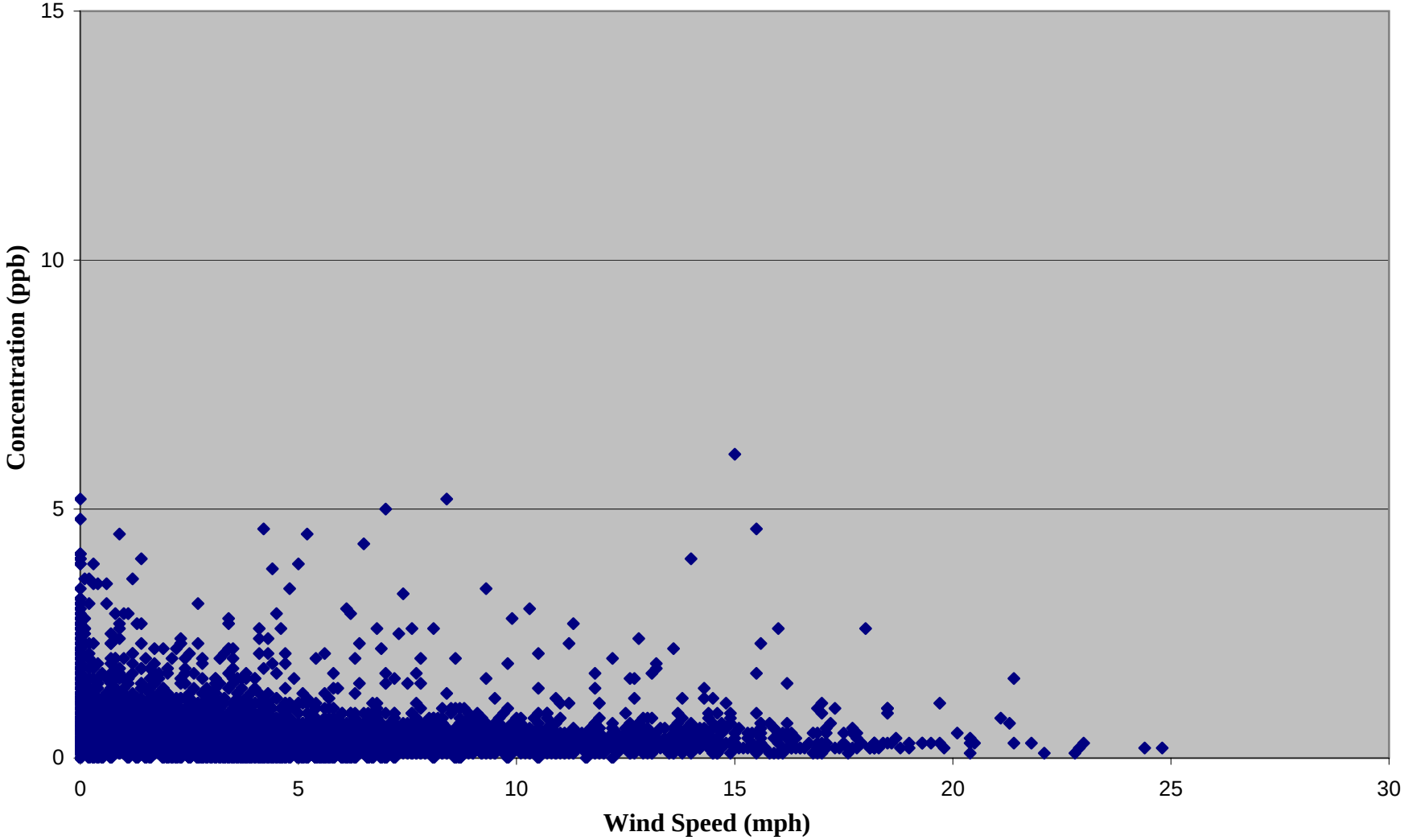
Belmond CAFO: Hydrogen Sulfide vs Time



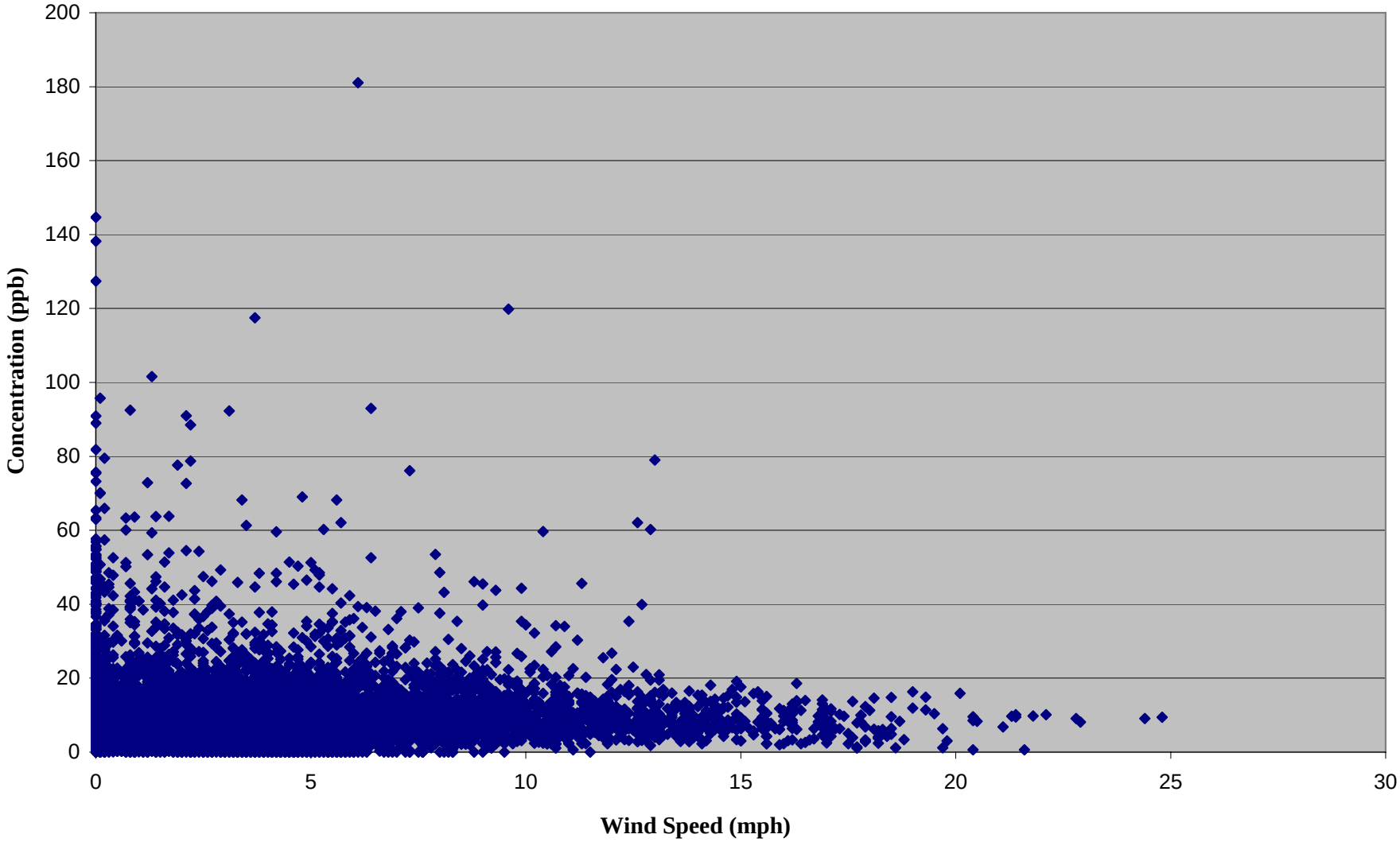
Belmond CAFO: Ammonia vs Time



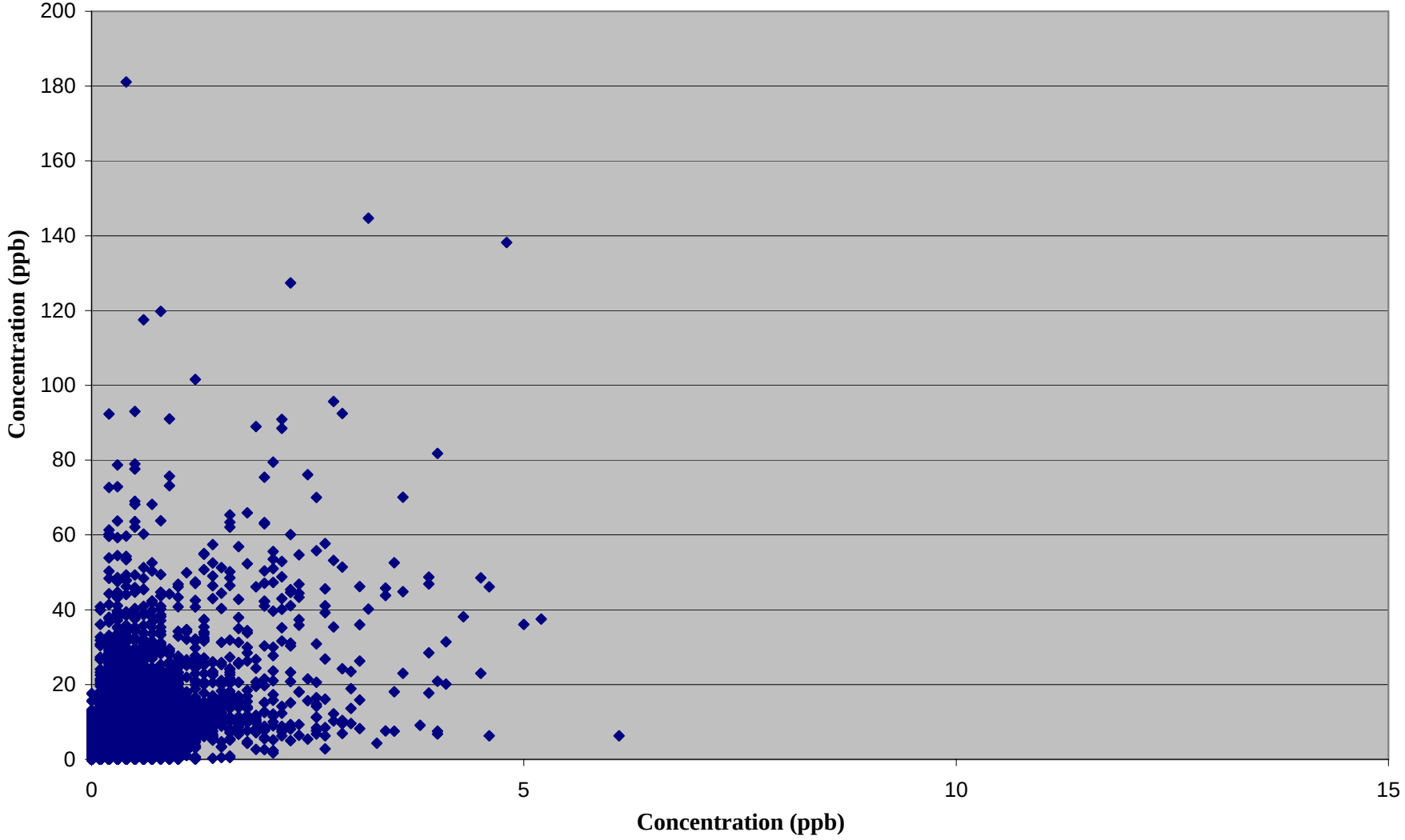
Belmond CAFO: Hydrogen Sulfide vs Wind Speed



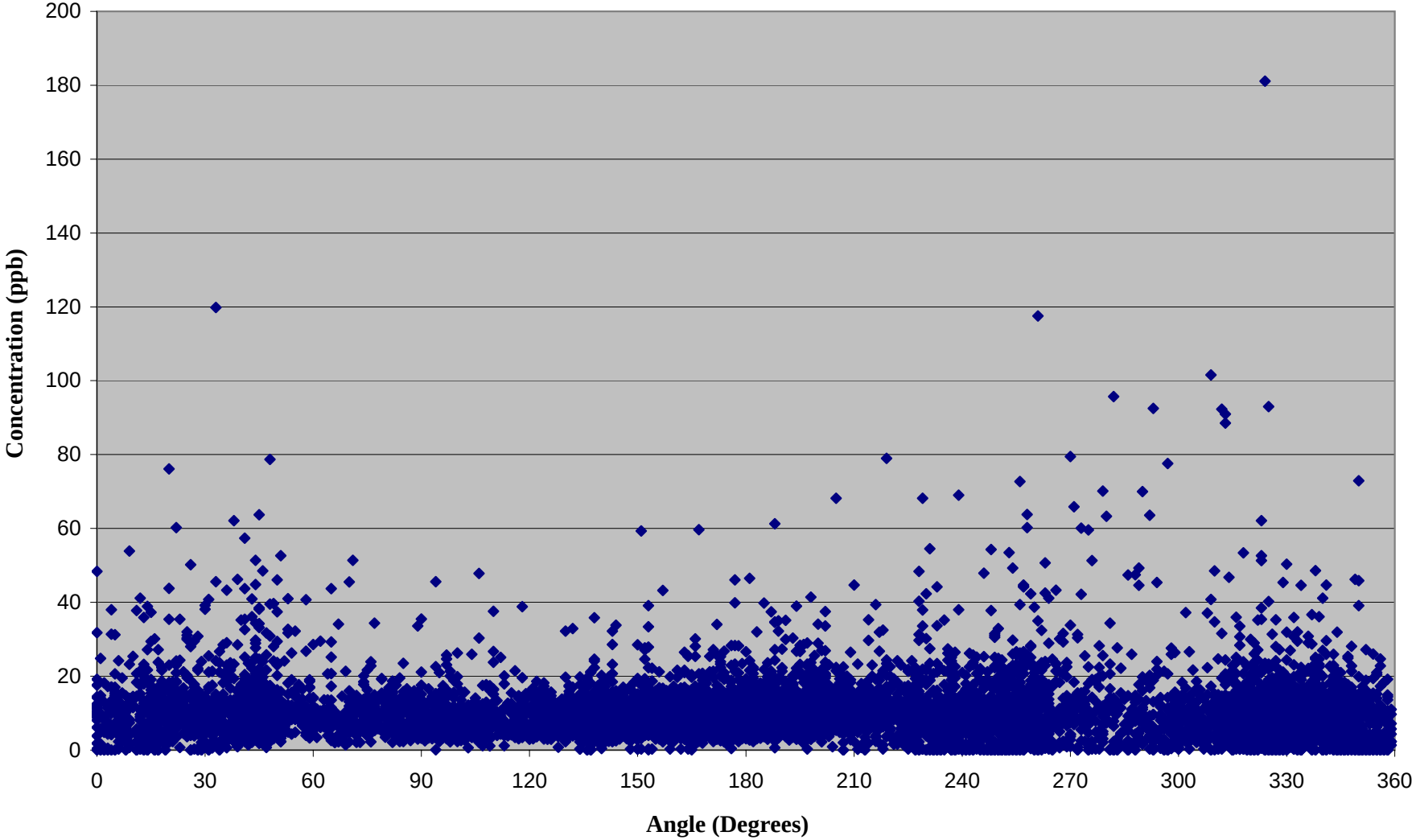
Belmond CAFO: Ammonia vs Wind Speed



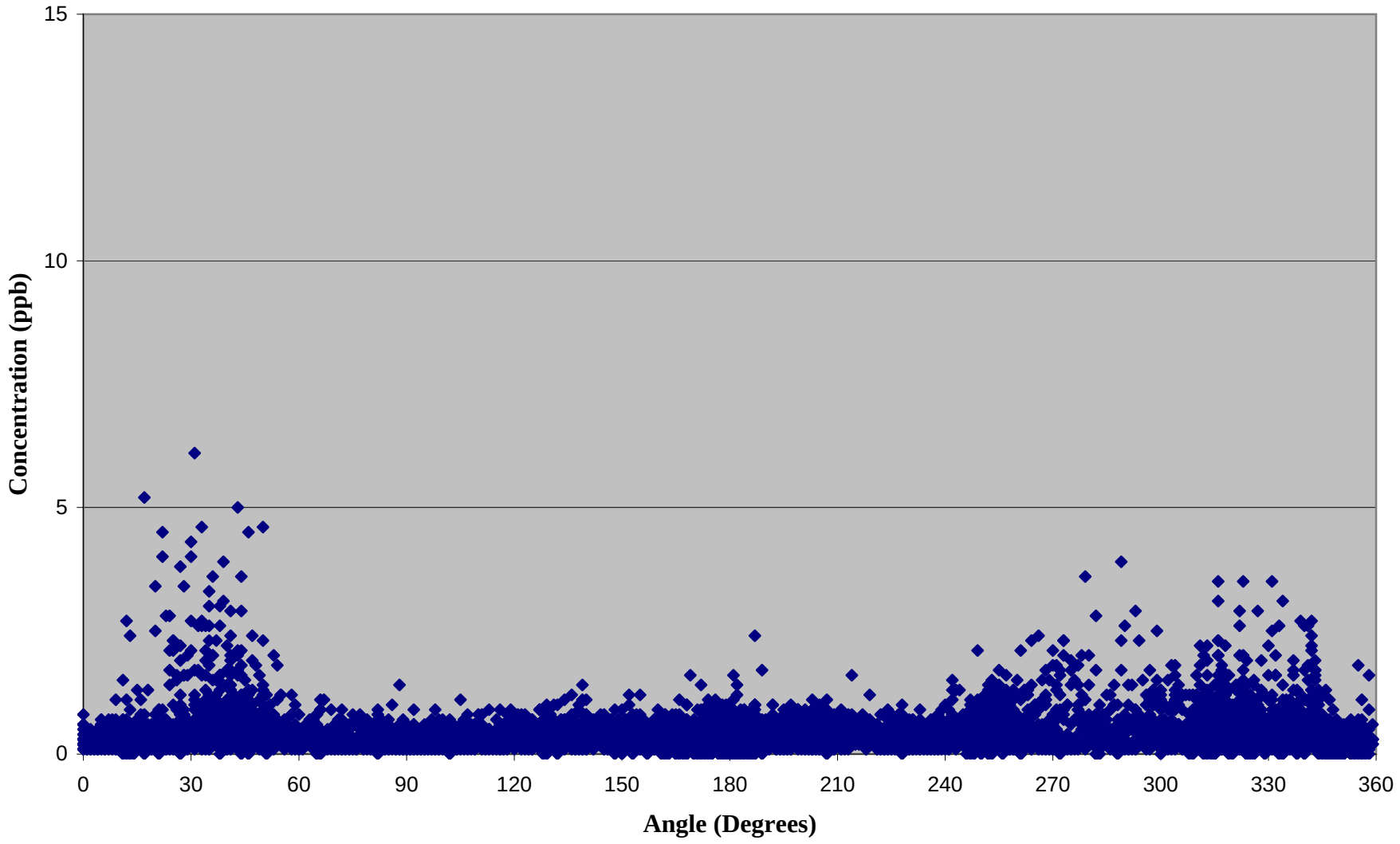
Belmond CAFO: Ammonia vs Hydrogen Sulfide



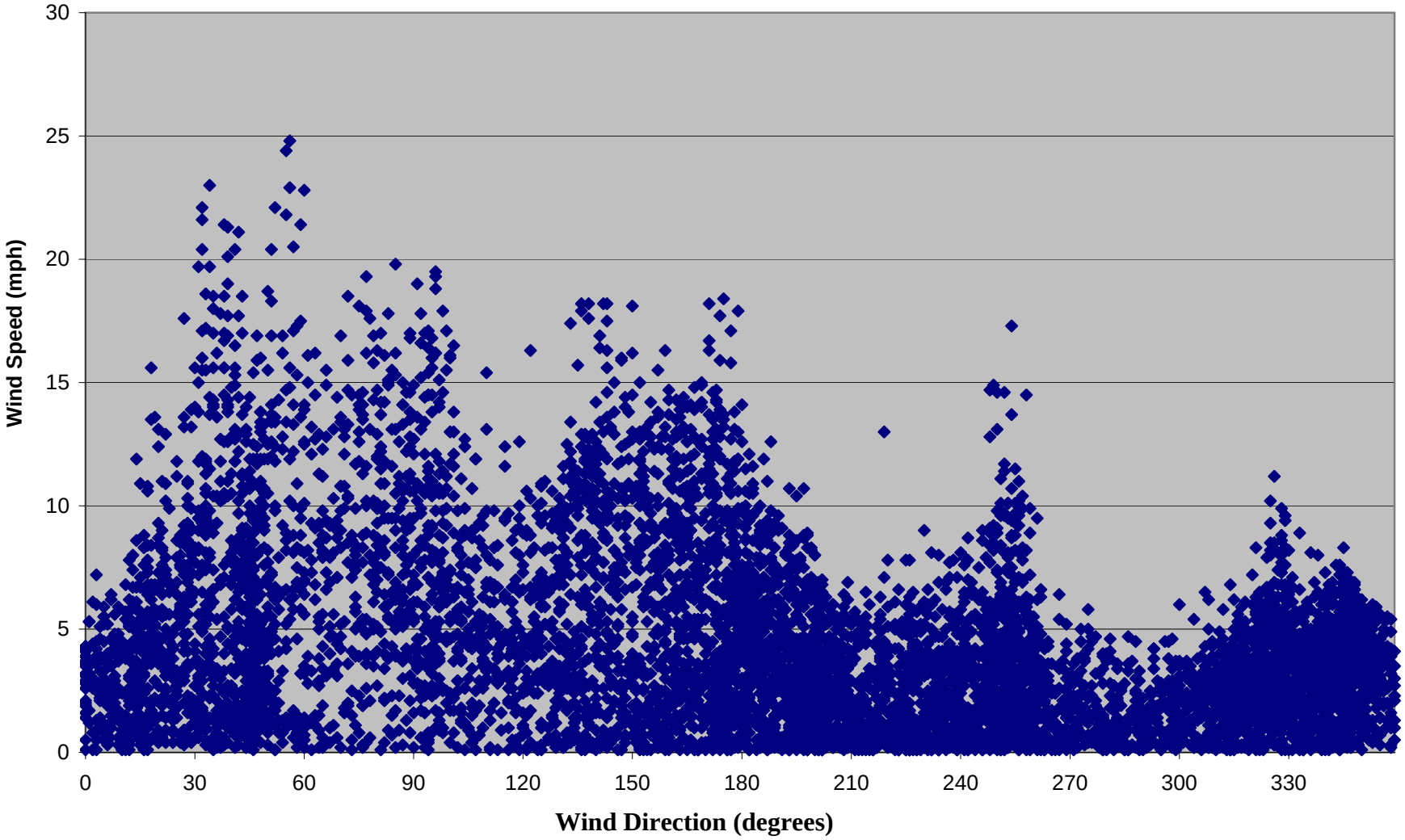
Belmond CAFO: Ammonia vs Wind Direction



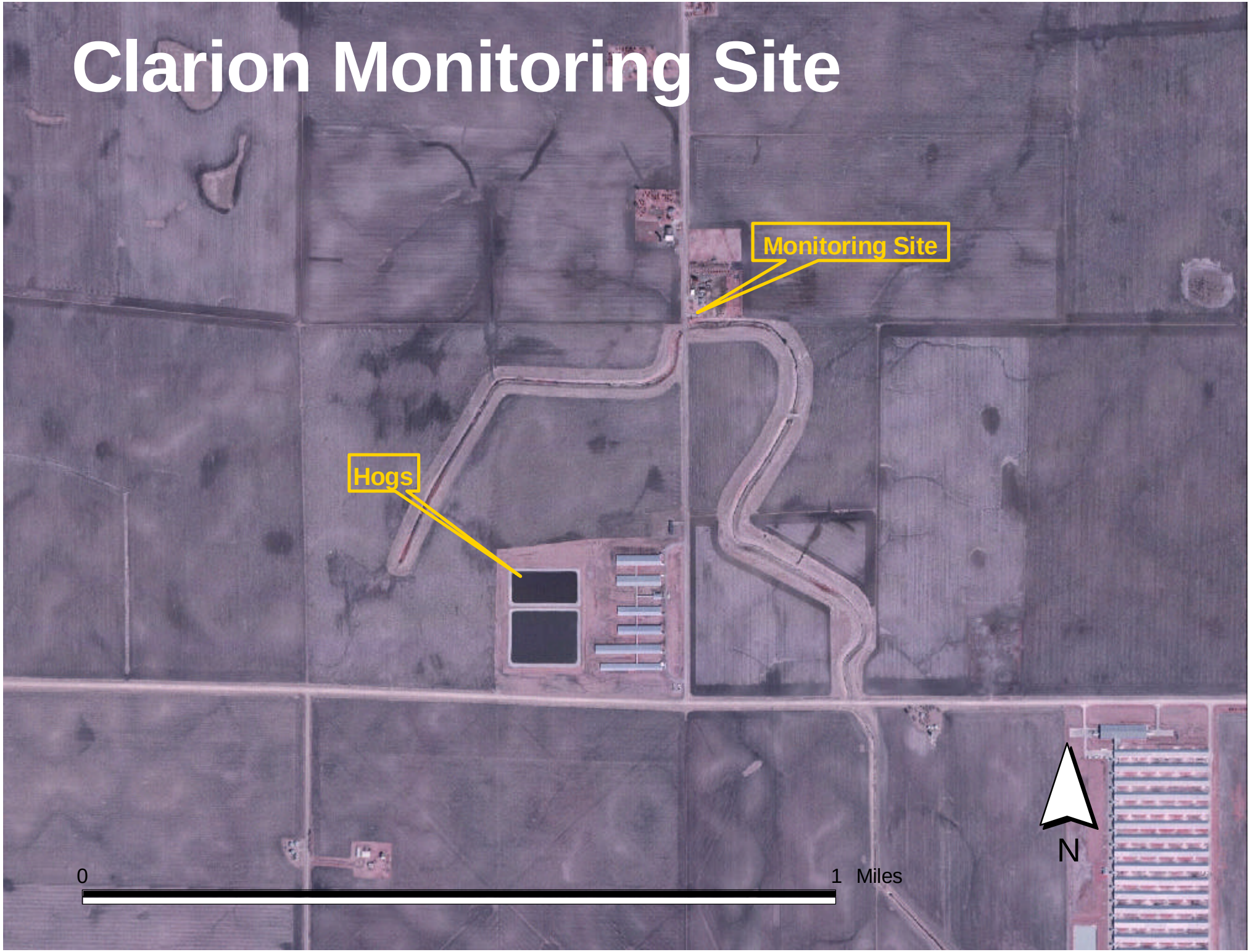
Belmond CAFO-Hydrogen Sulfide vs Wind Direction



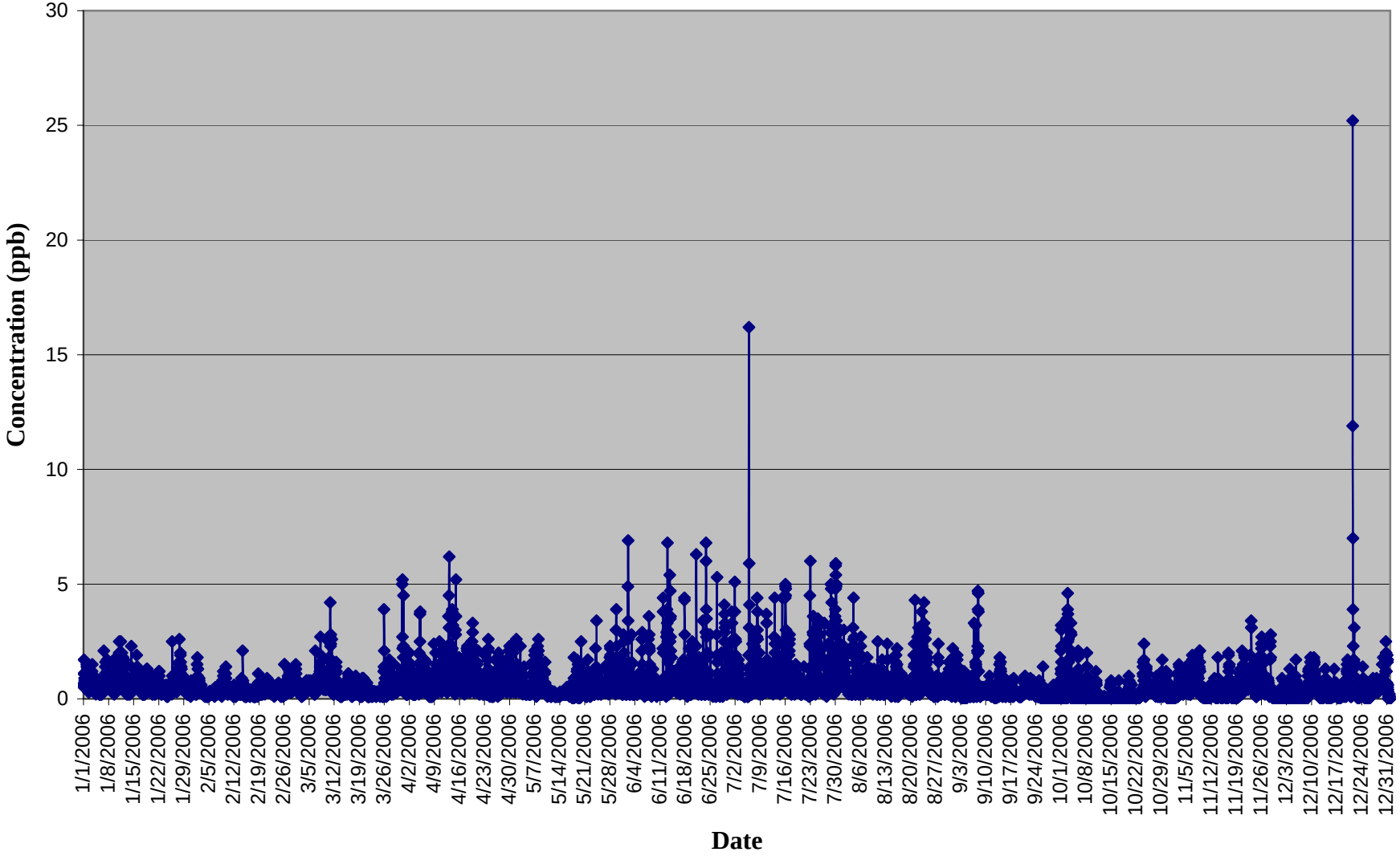
Belmond CAFO: Wind Speed vs Wind Direction



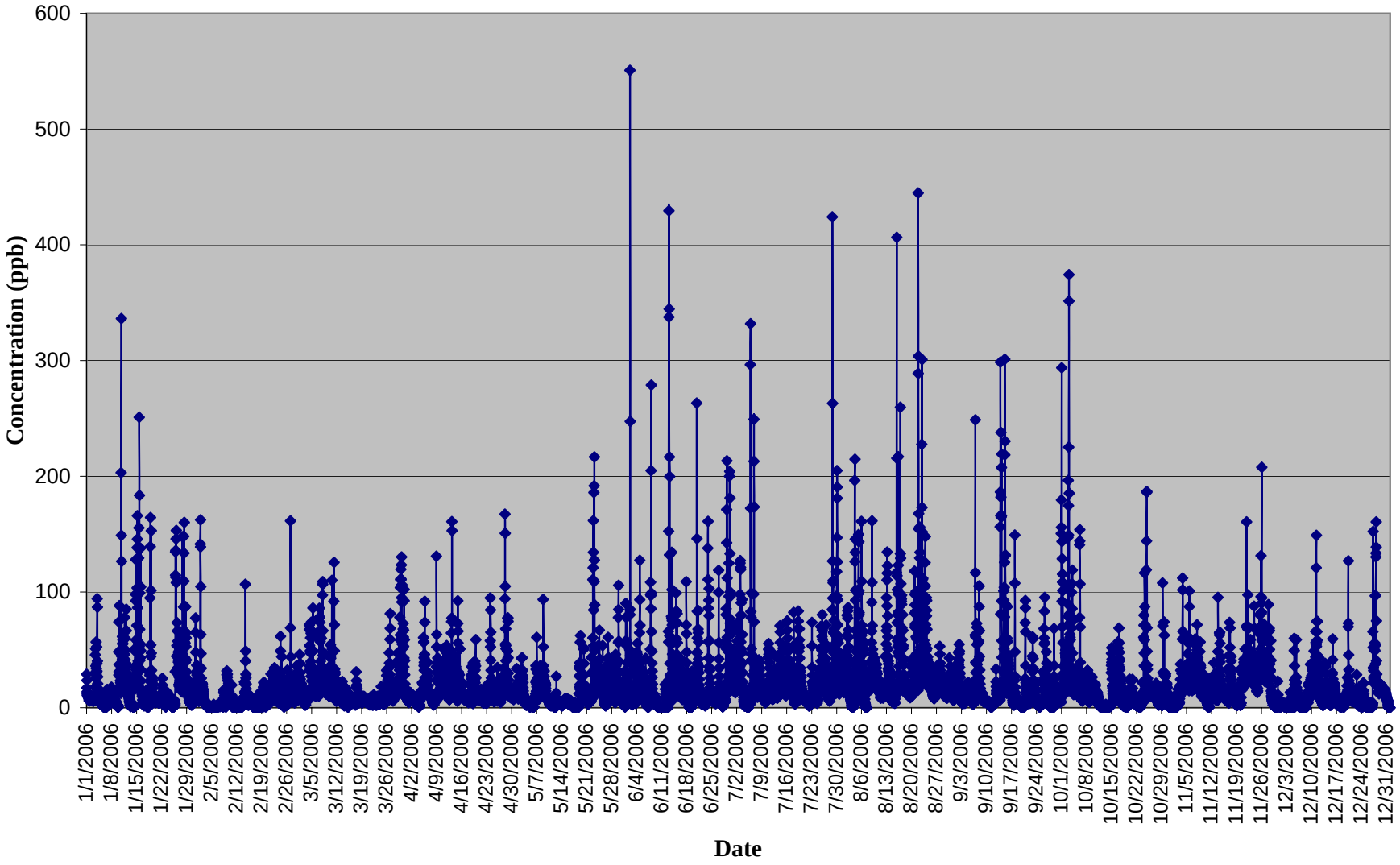
Clarion Monitoring Site



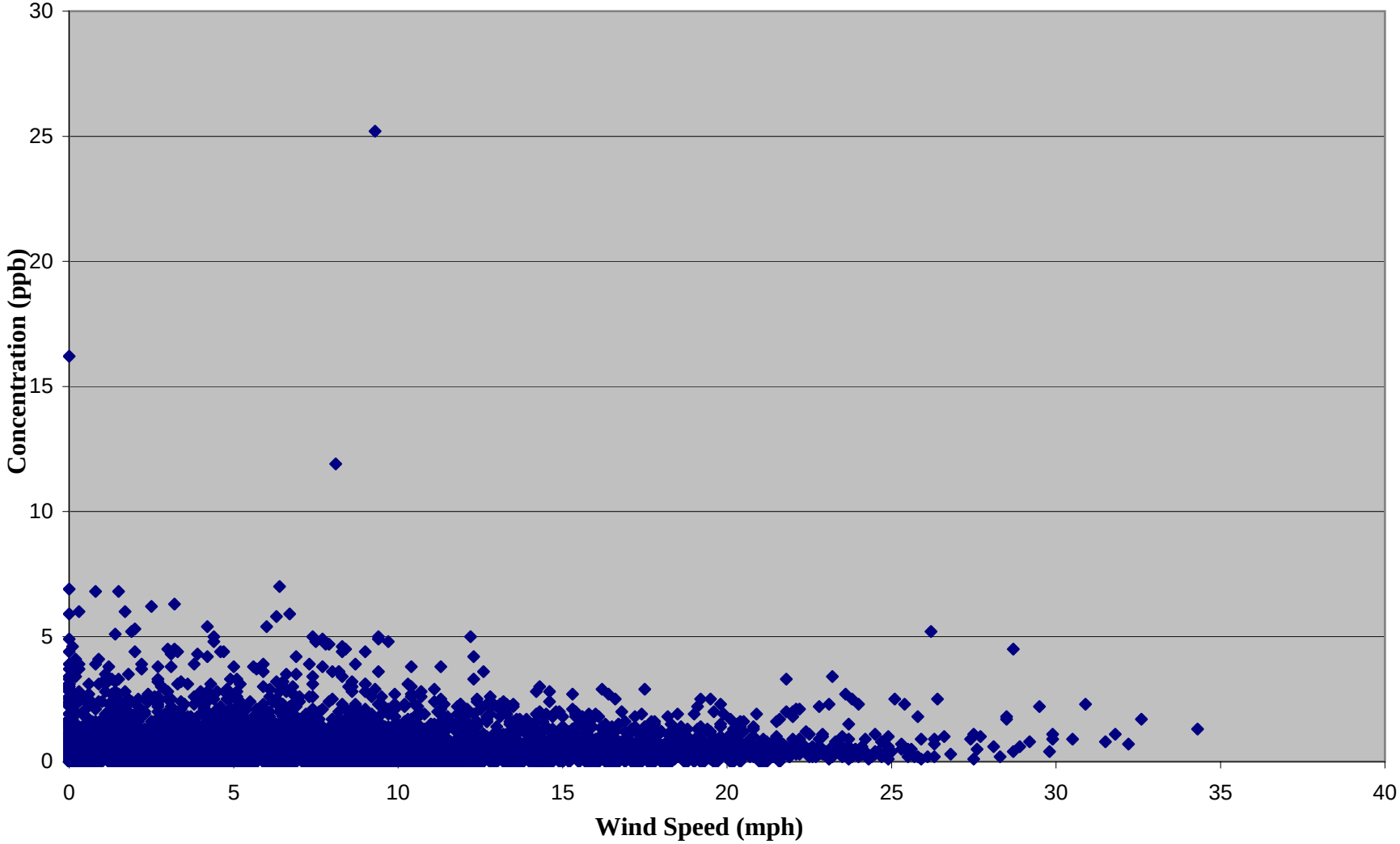
Clarion CAFO: Hydrogen Sulfide vs Time



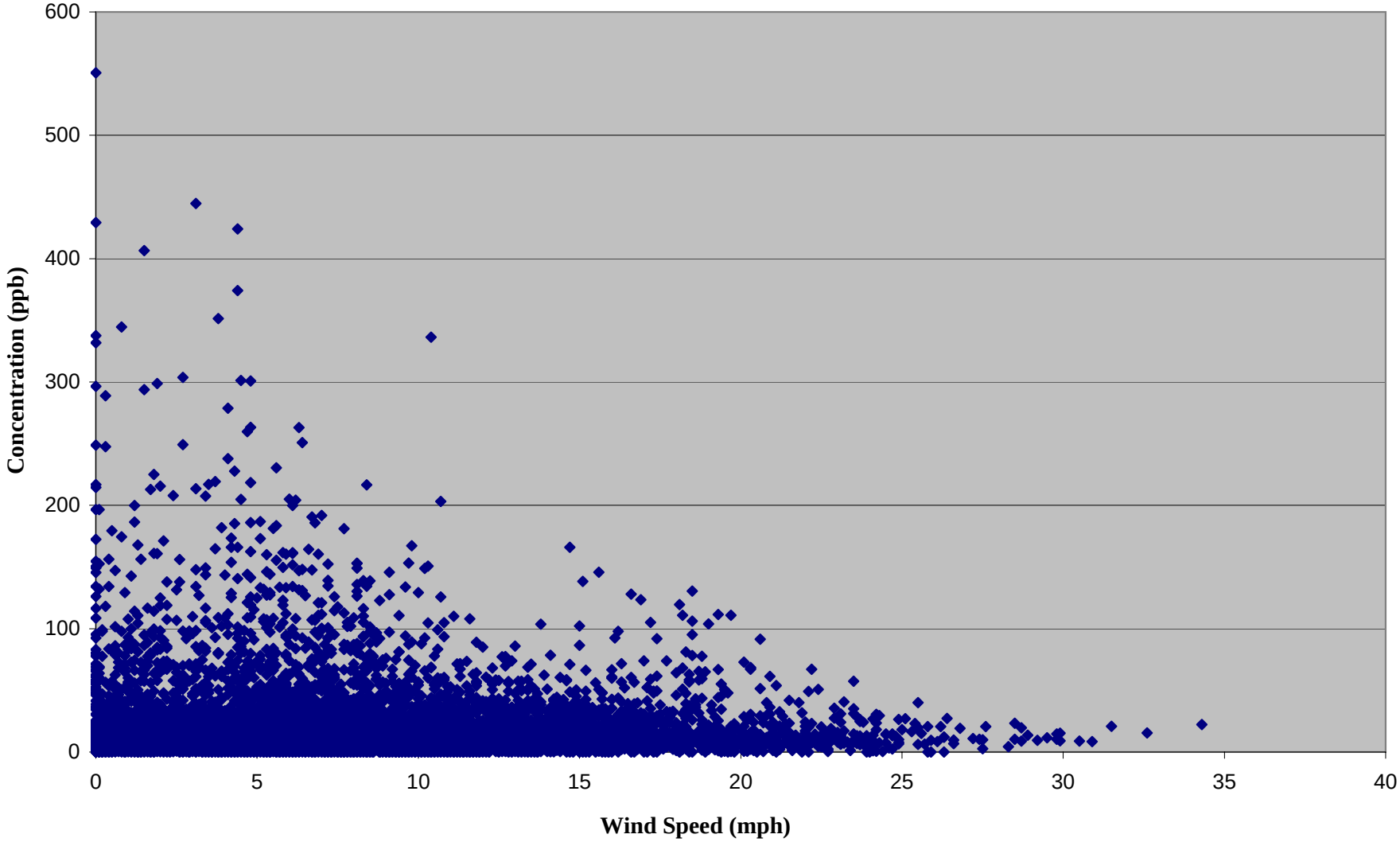
Clarion CAFO: Ammonia vs Time



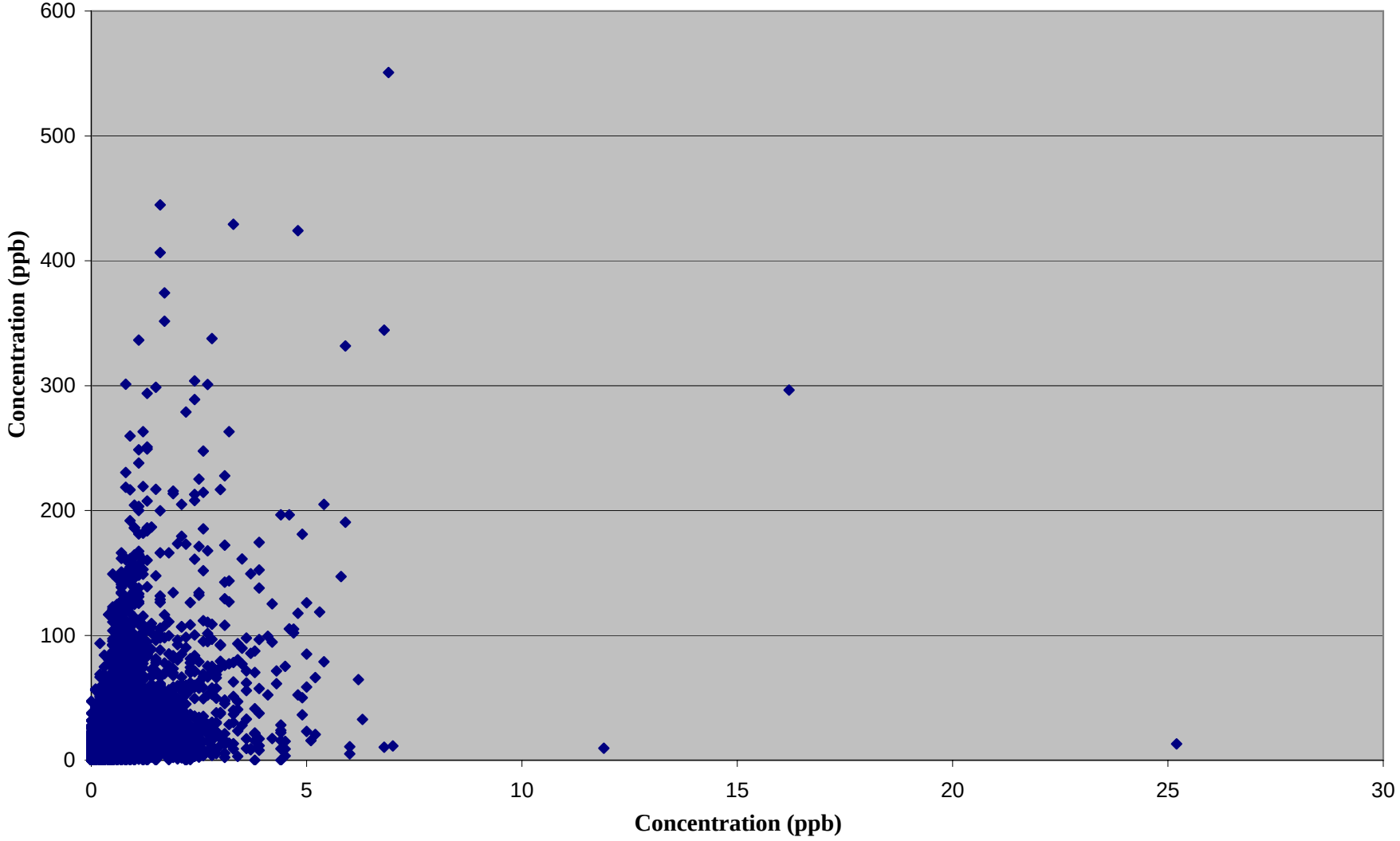
Clarion CAFO: Hydrogen Sulfide vs Wind Speed



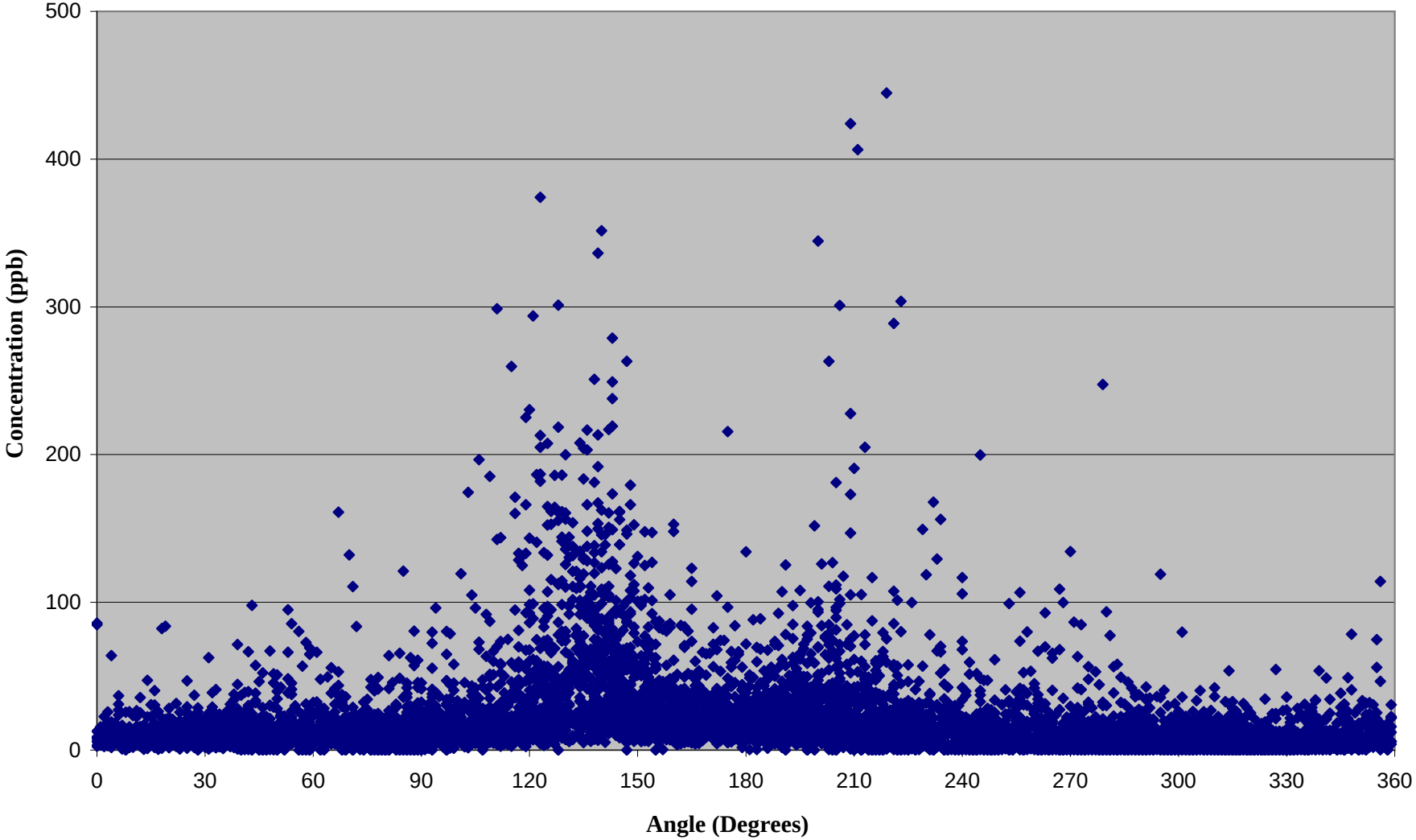
Clarion CAFO: Ammonia vs Wind Speed



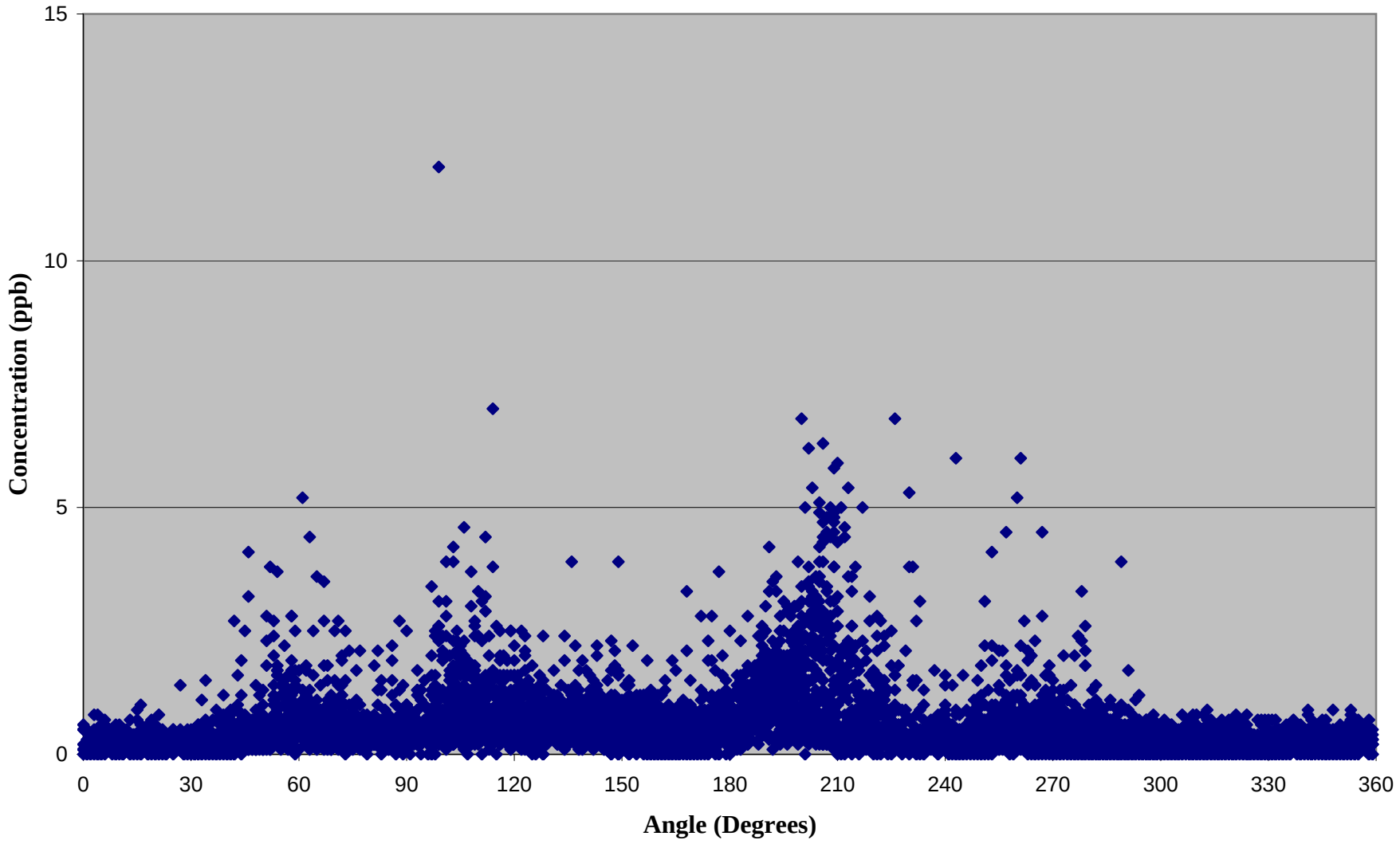
Clarion CAFO: Ammonia vs Hydrogen Sulfide



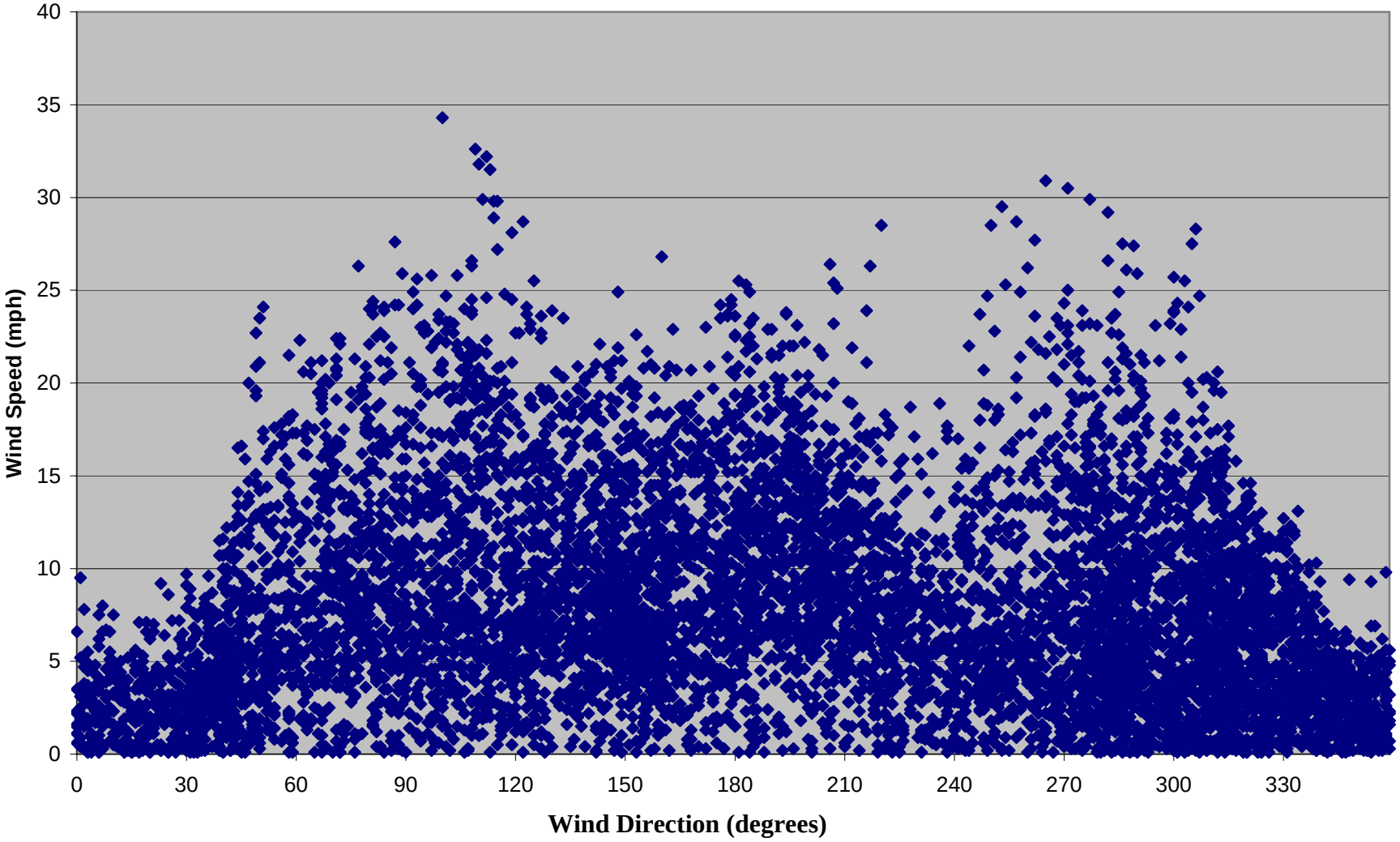
Clarion CAFO: Ammonia vs Wind Direction



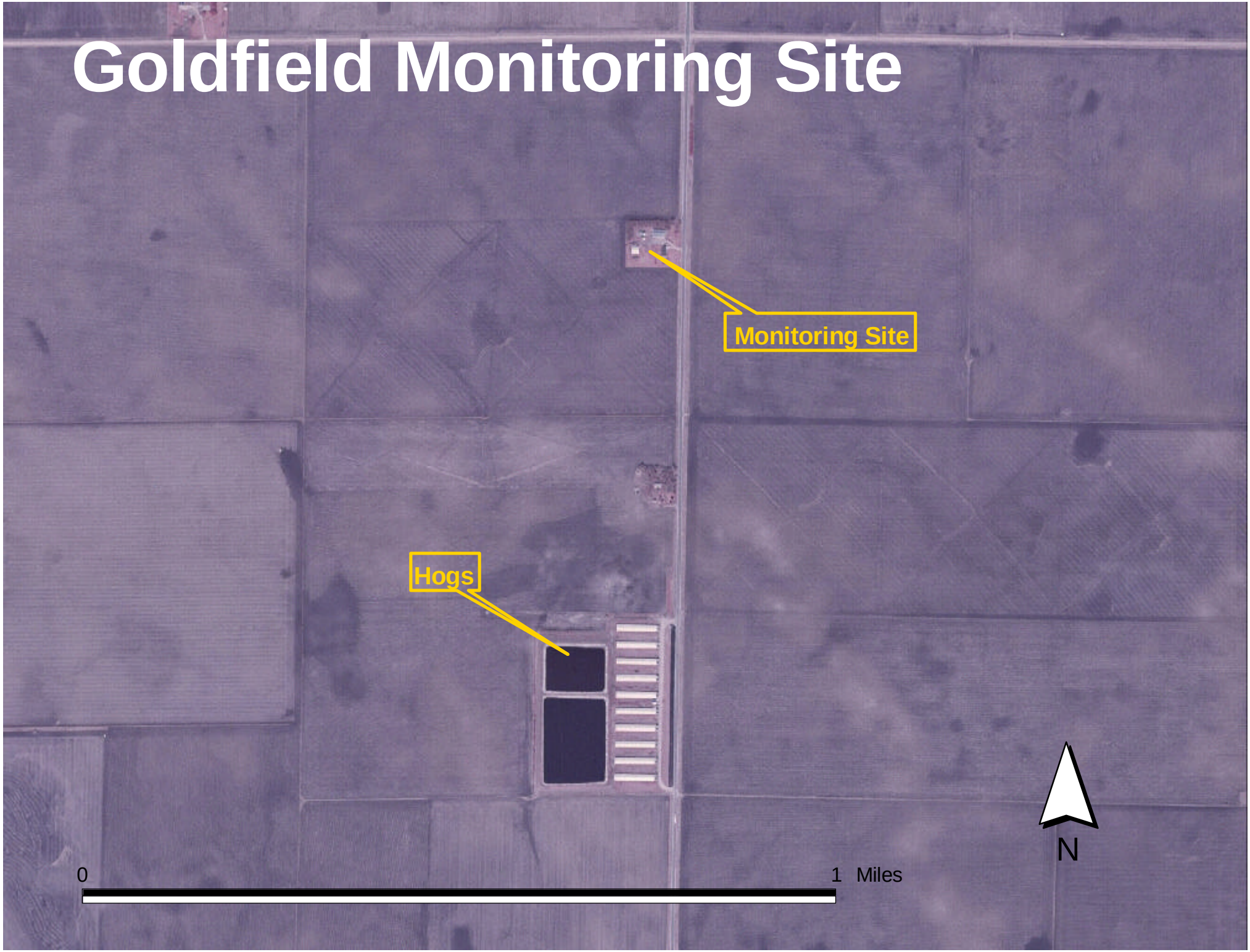
Clarion CAFO-Hydrogen Sulfide vs Wind Direction



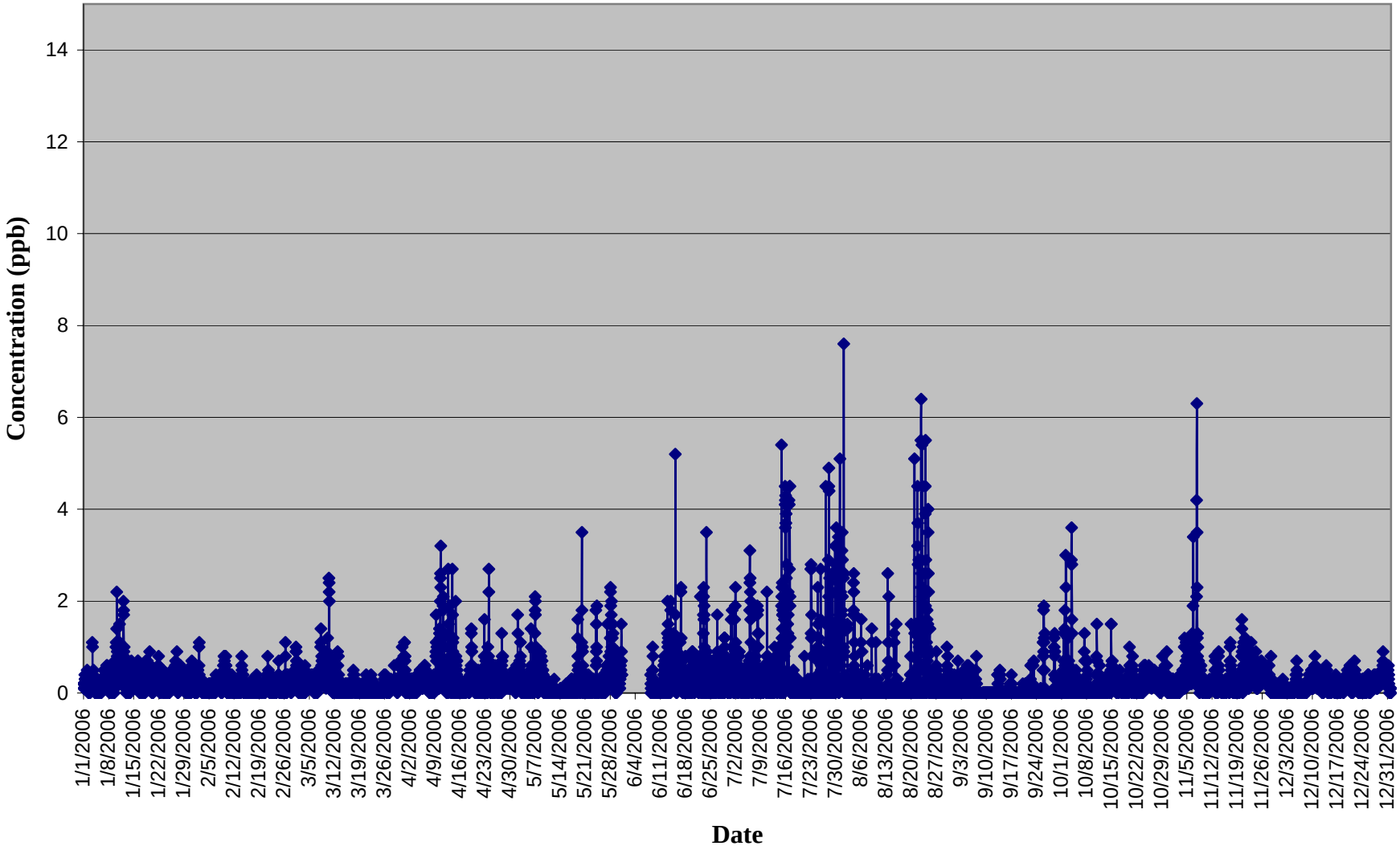
Clarion CAFO: Wind Speed vs Wind Direction



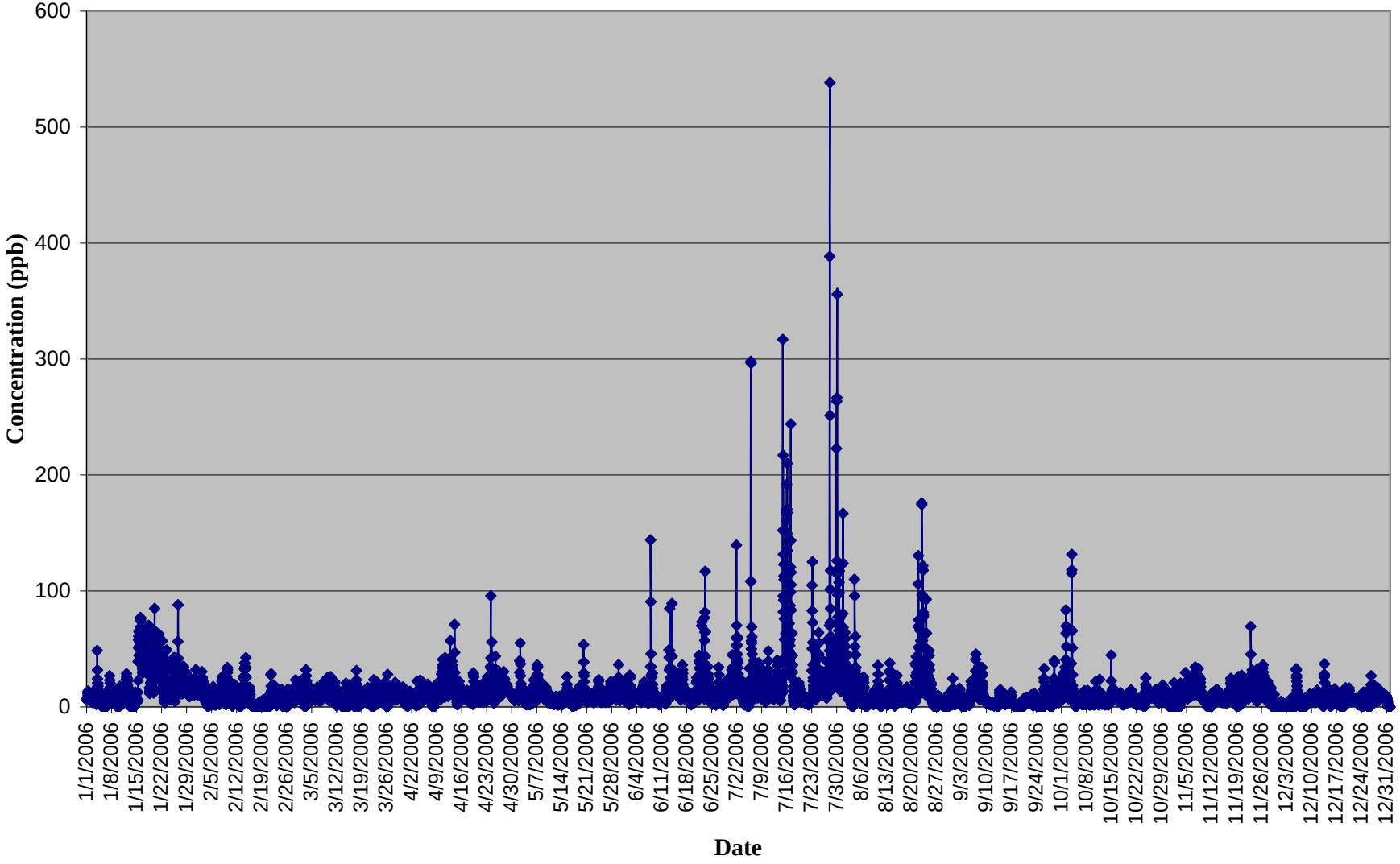
Goldfield Monitoring Site



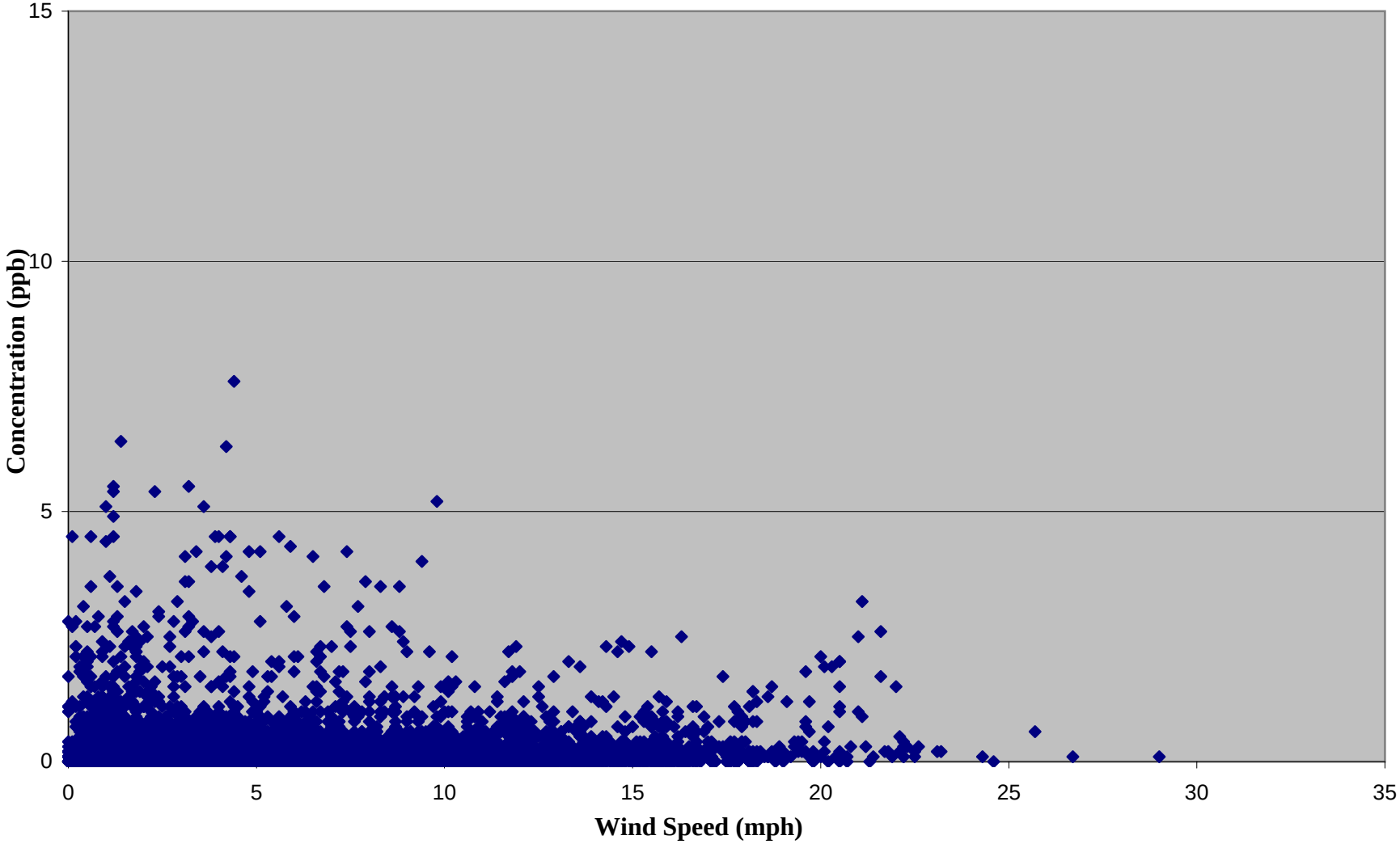
Goldfield CAFO: Hydrogen Sulfide vs Time



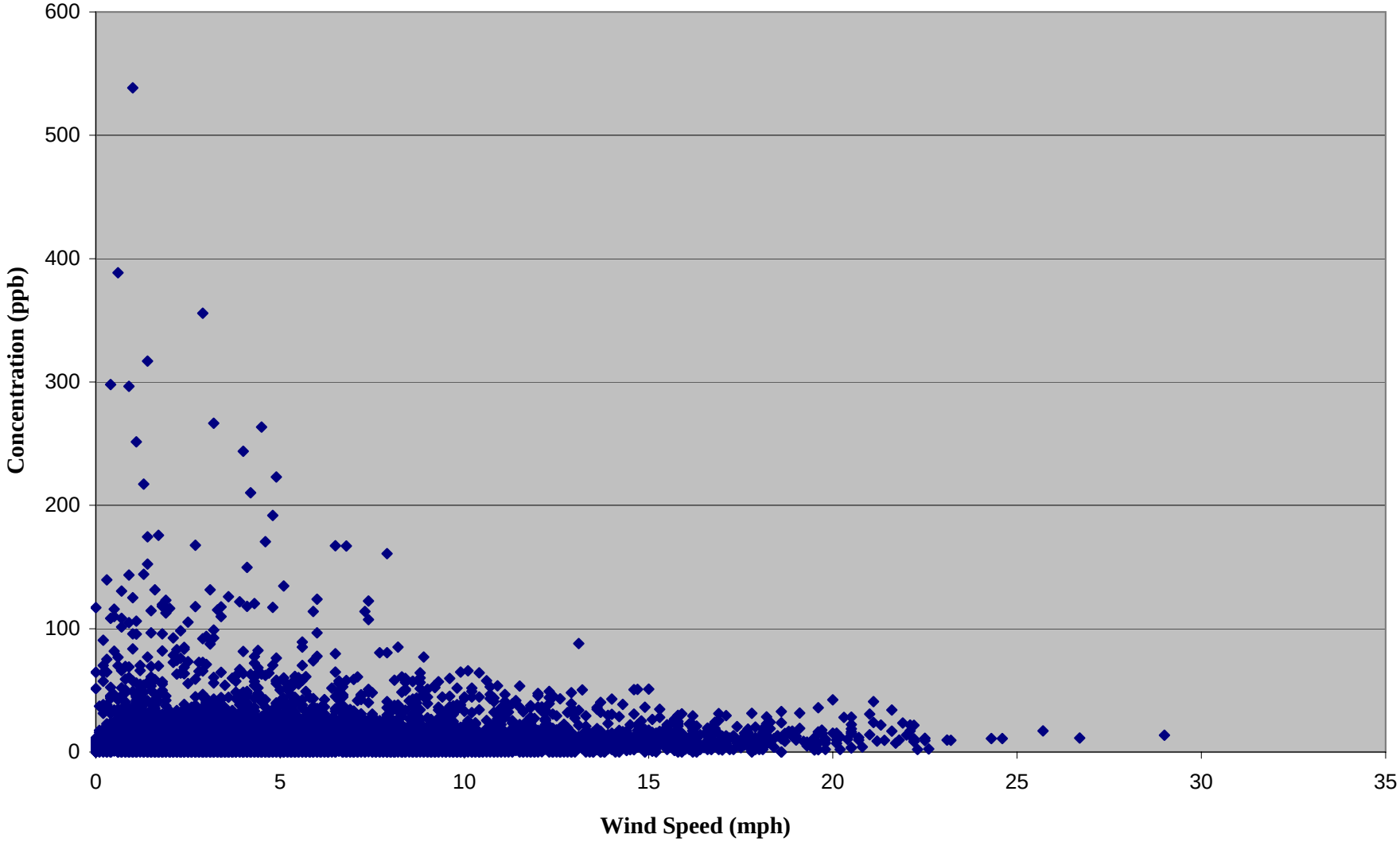
Goldfield CAFO: Ammonia vs Time



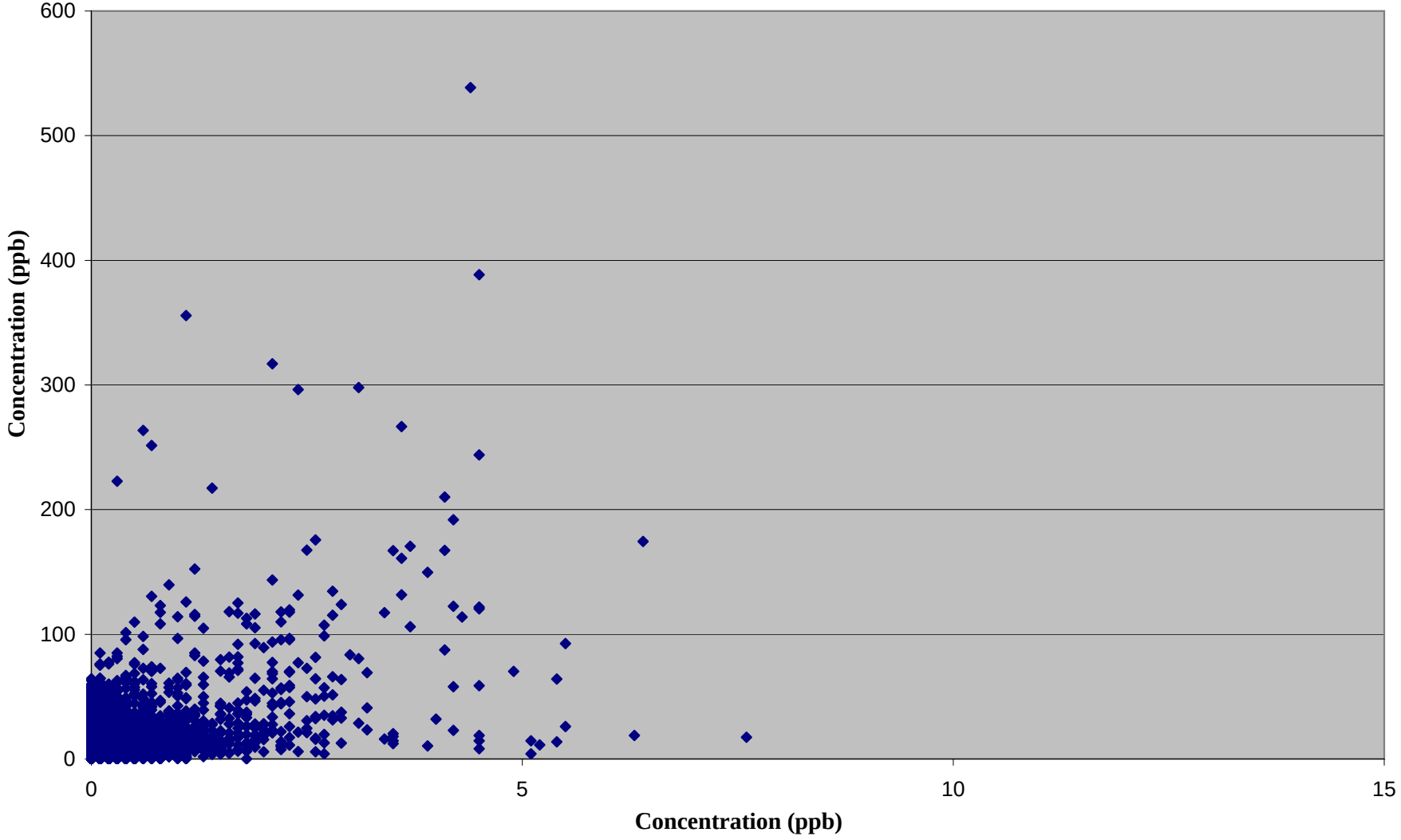
Goldfield CAFO: Hydrogen Sulfide vs Wind Speed



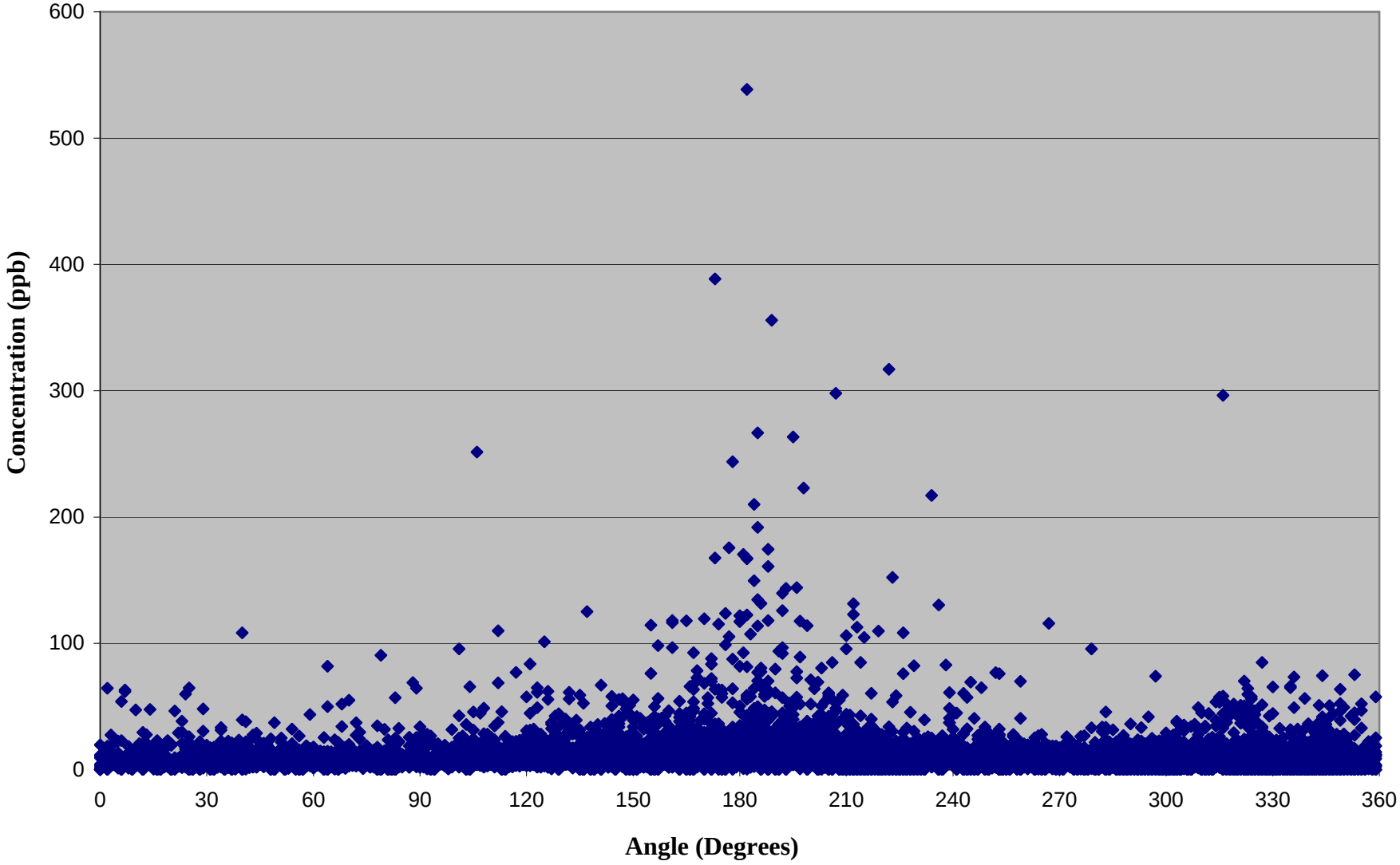
Goldfield CAFO: Ammonia vs Wind Speed



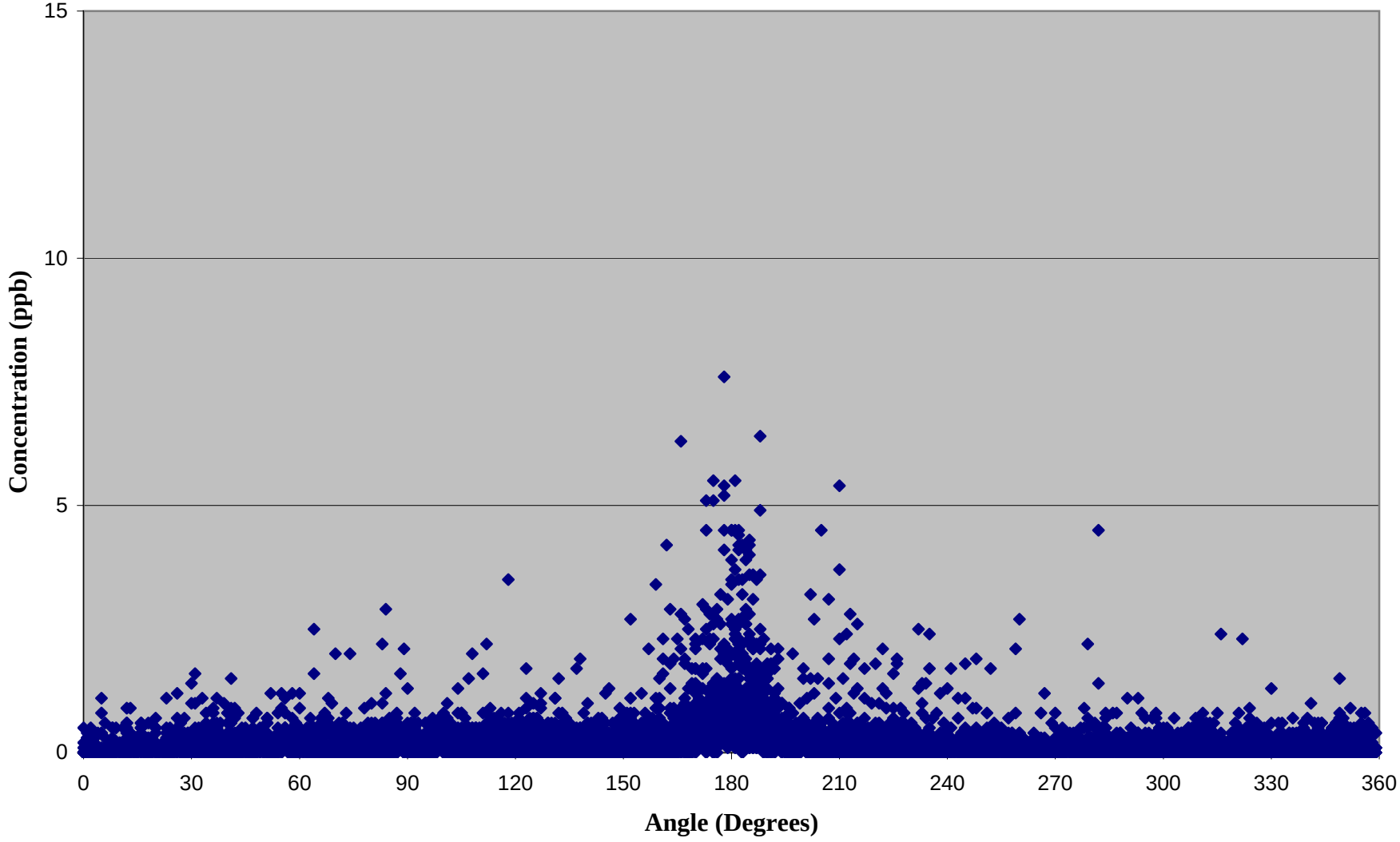
Goldfield CAFO: Ammonia vs Hydrogen Sulfide



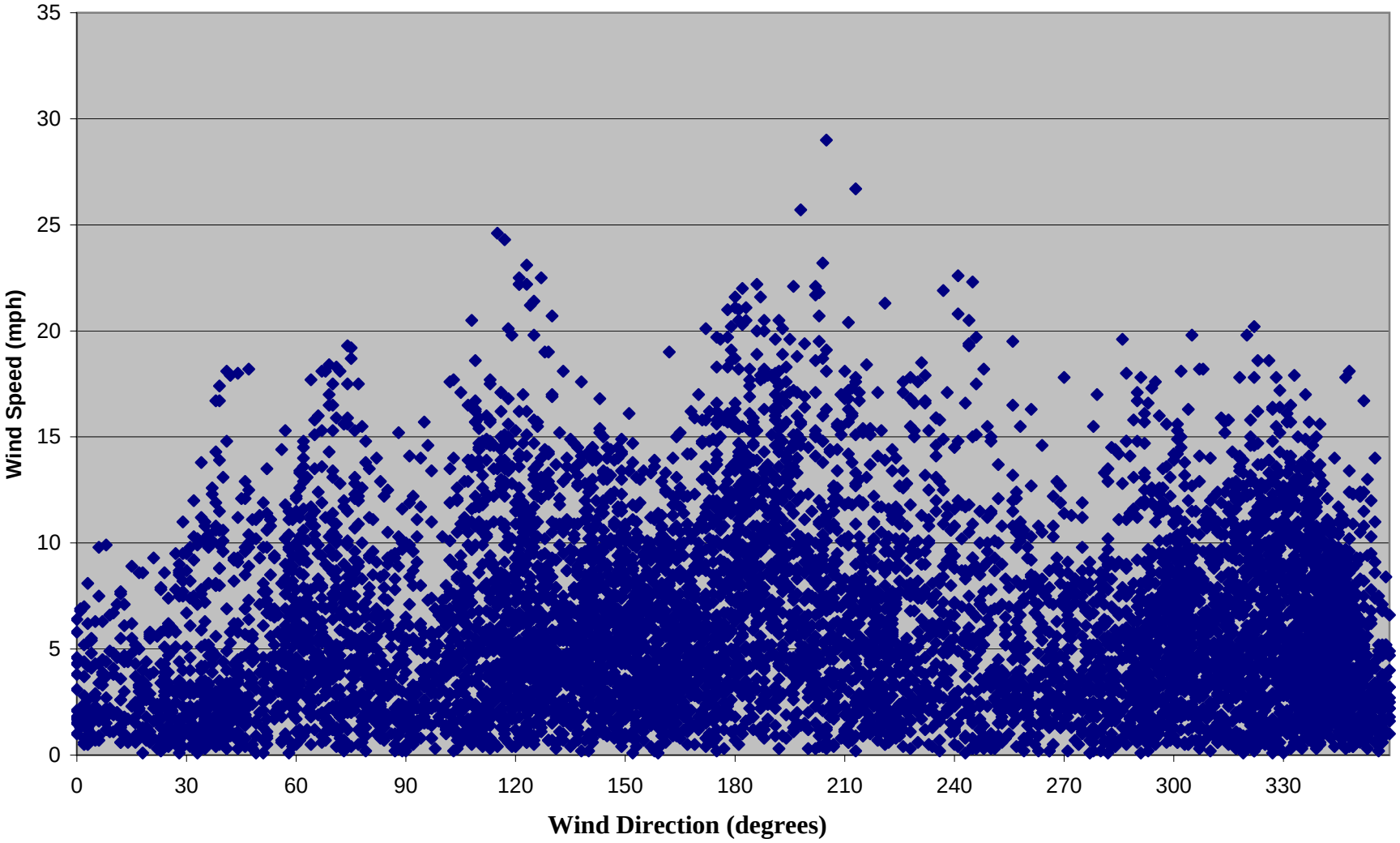
Goldfield CAFO: Ammonia vs Wind Direction



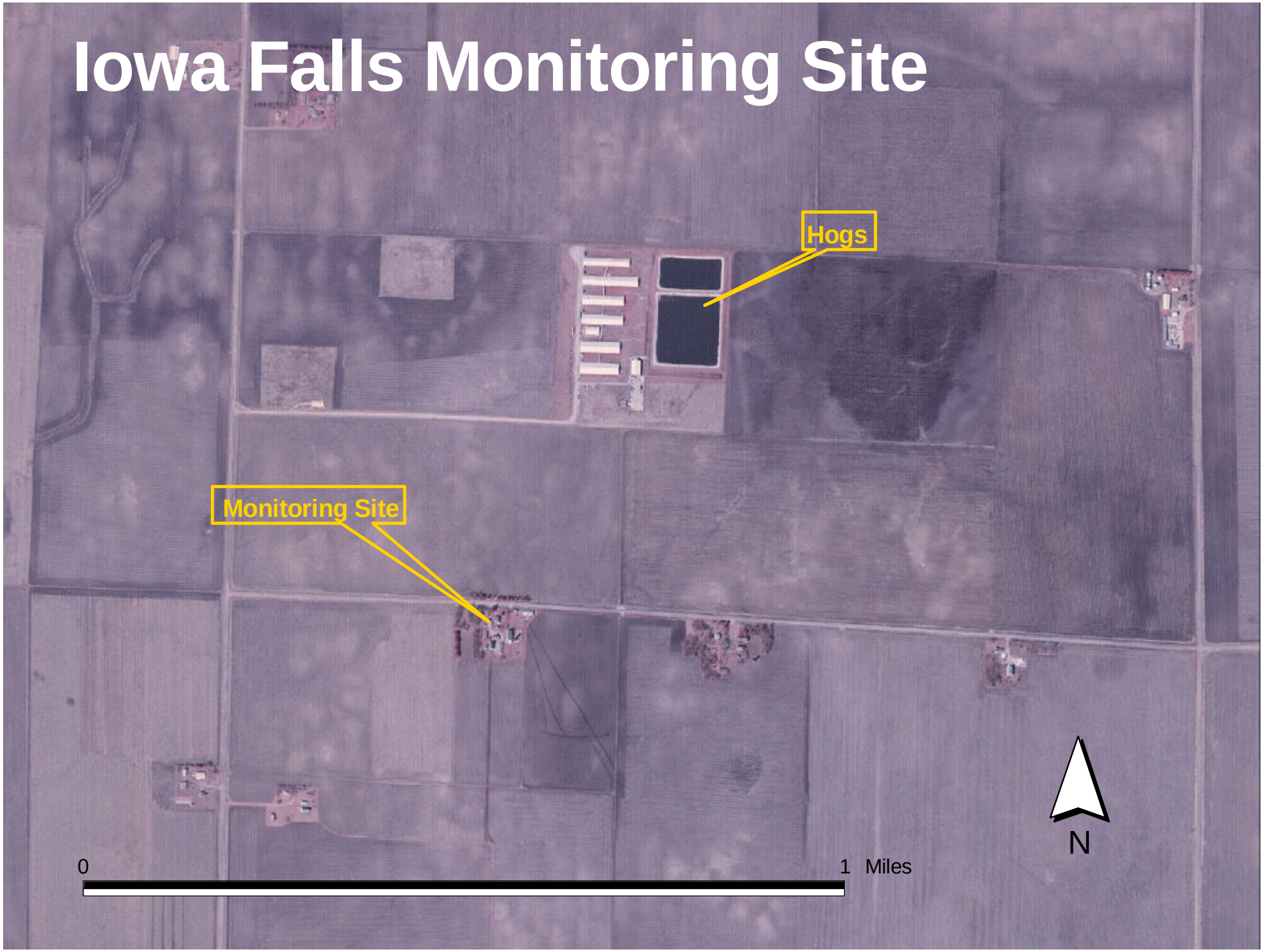
Goldfield CAFO-Hydrogen Sulfide vs Wind Direction



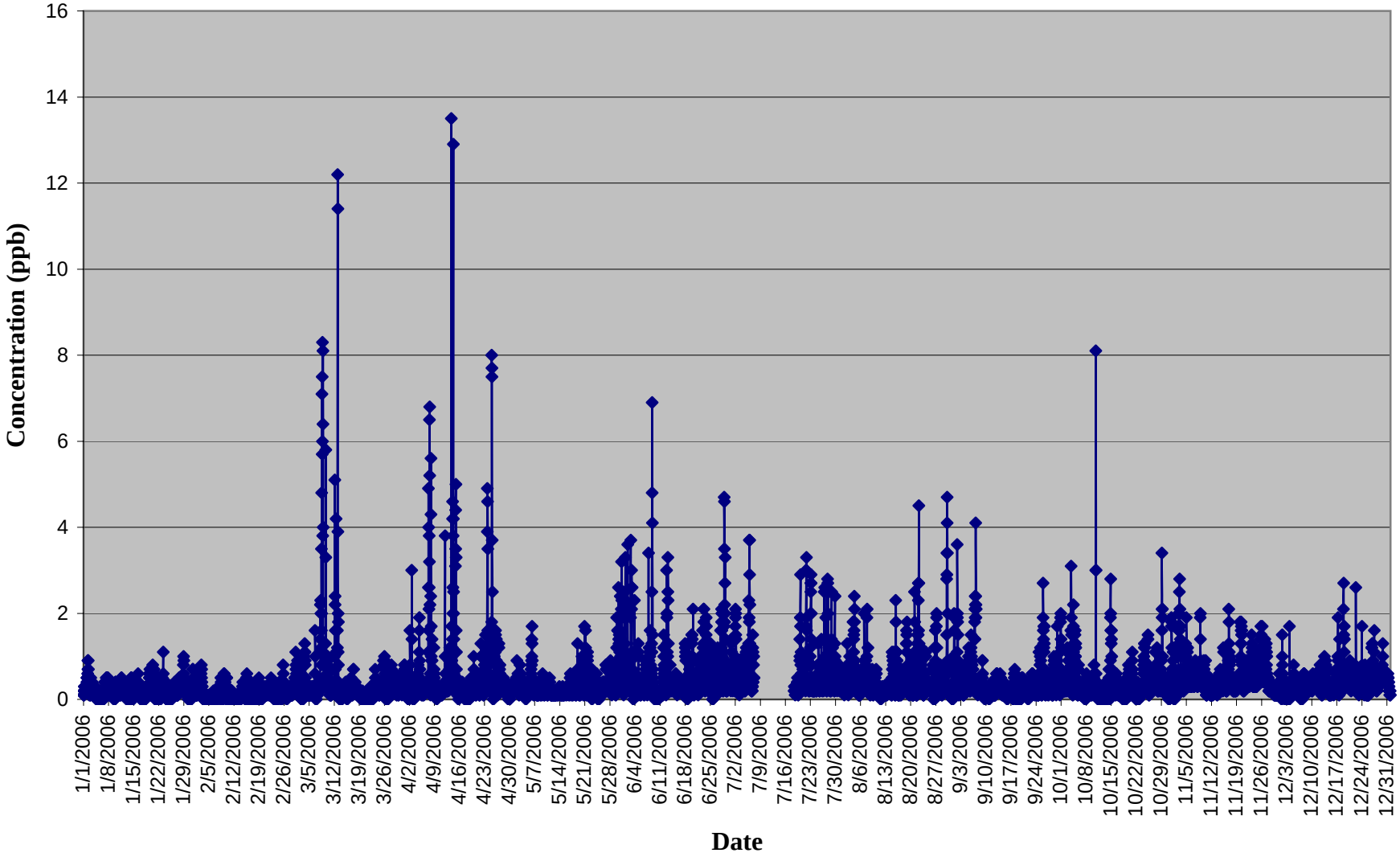
Goldfield CAFO: Wind Speed vs Wind Direction



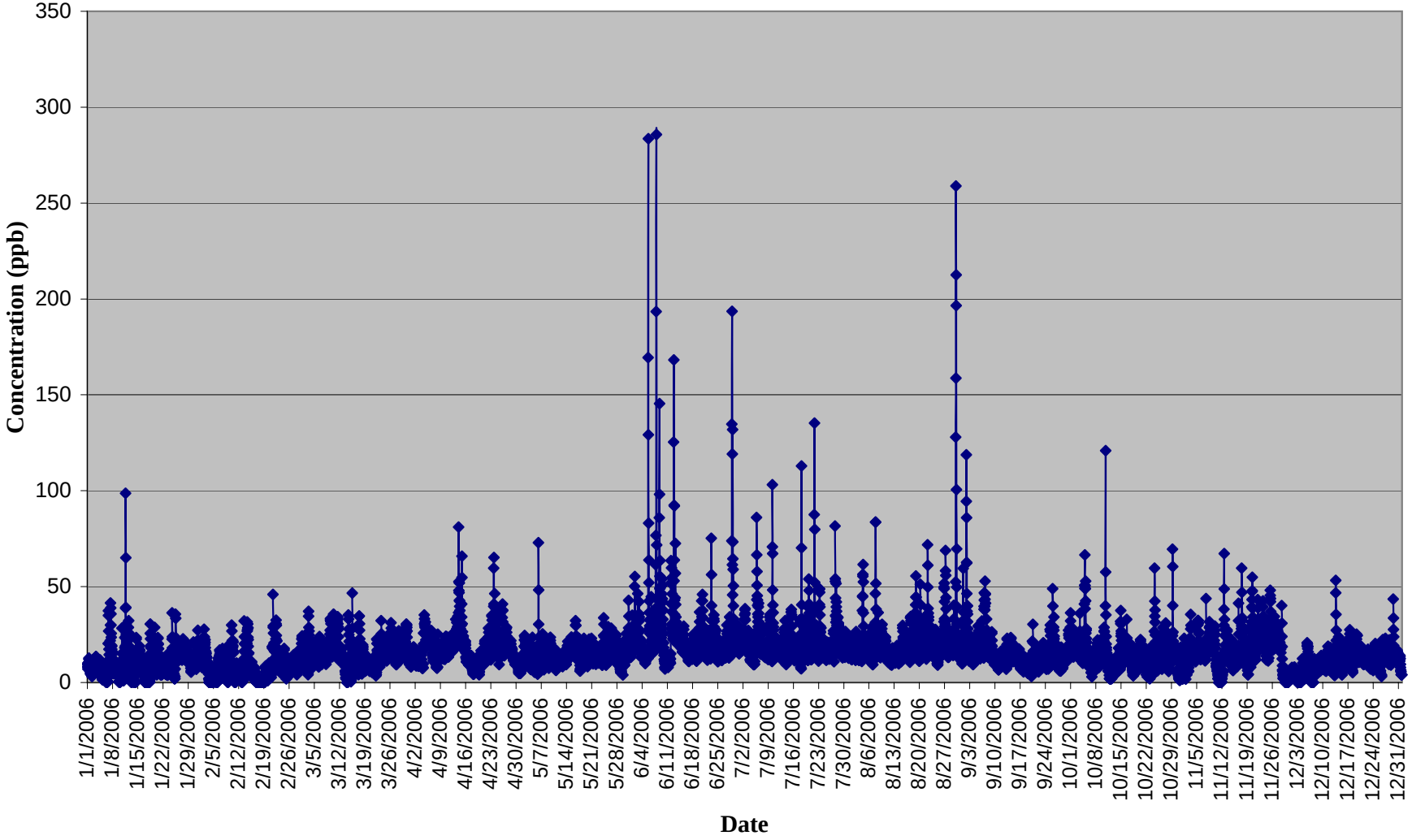
Iowa Falls Monitoring Site



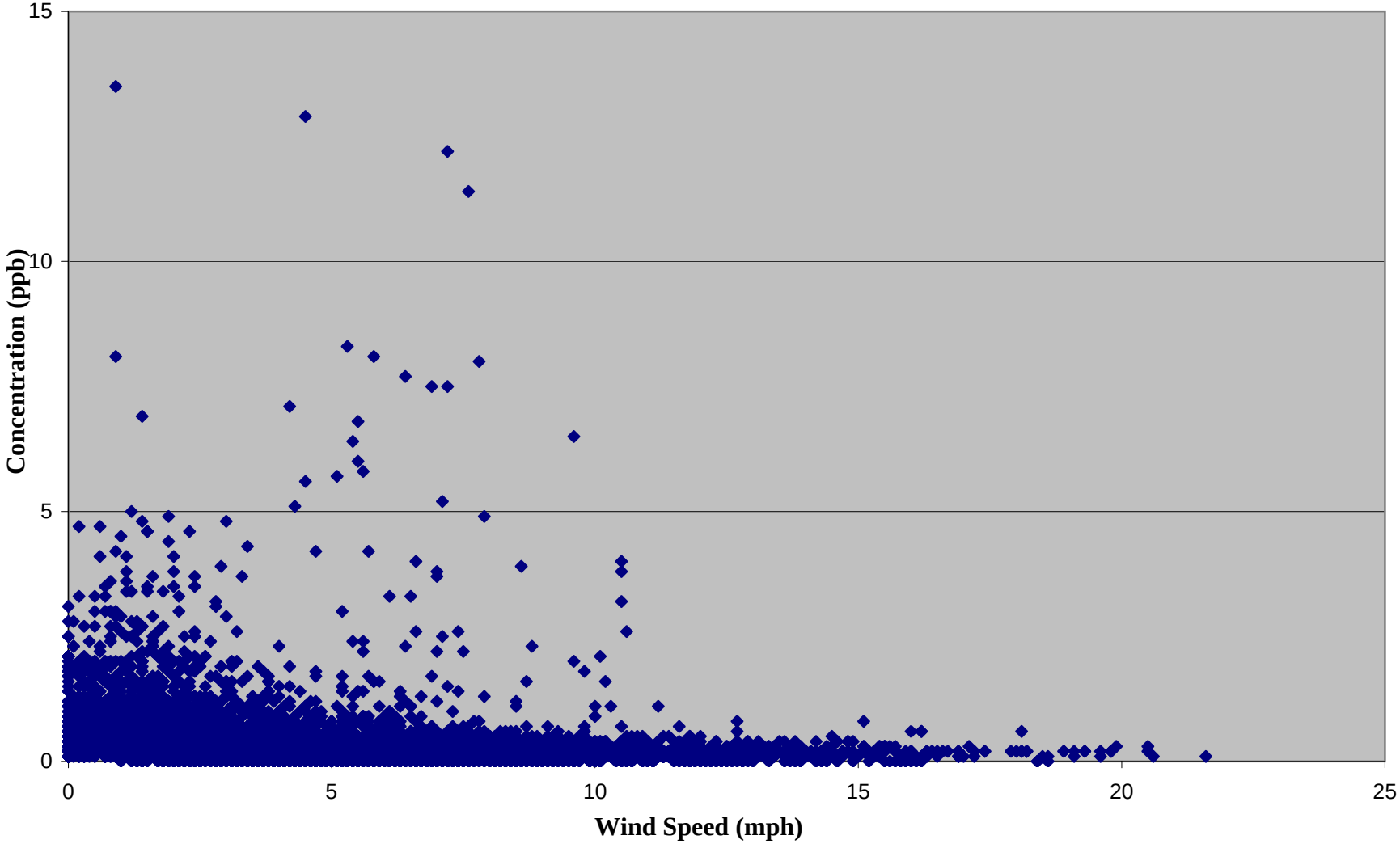
Iowa Falls CAFO: Hydrogen Sulfide vs Time



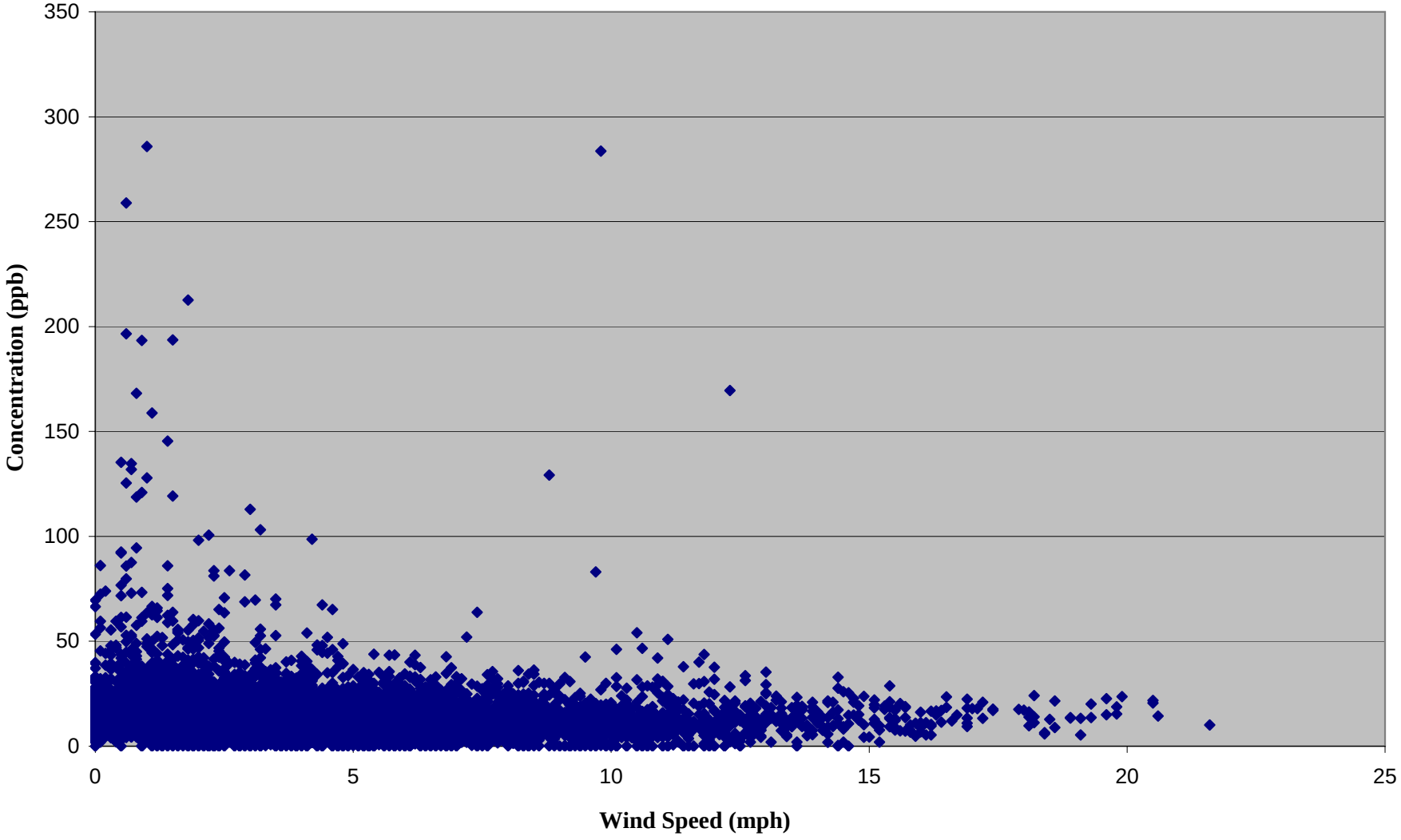
Iowa Falls CAFO: Ammonia vs Time



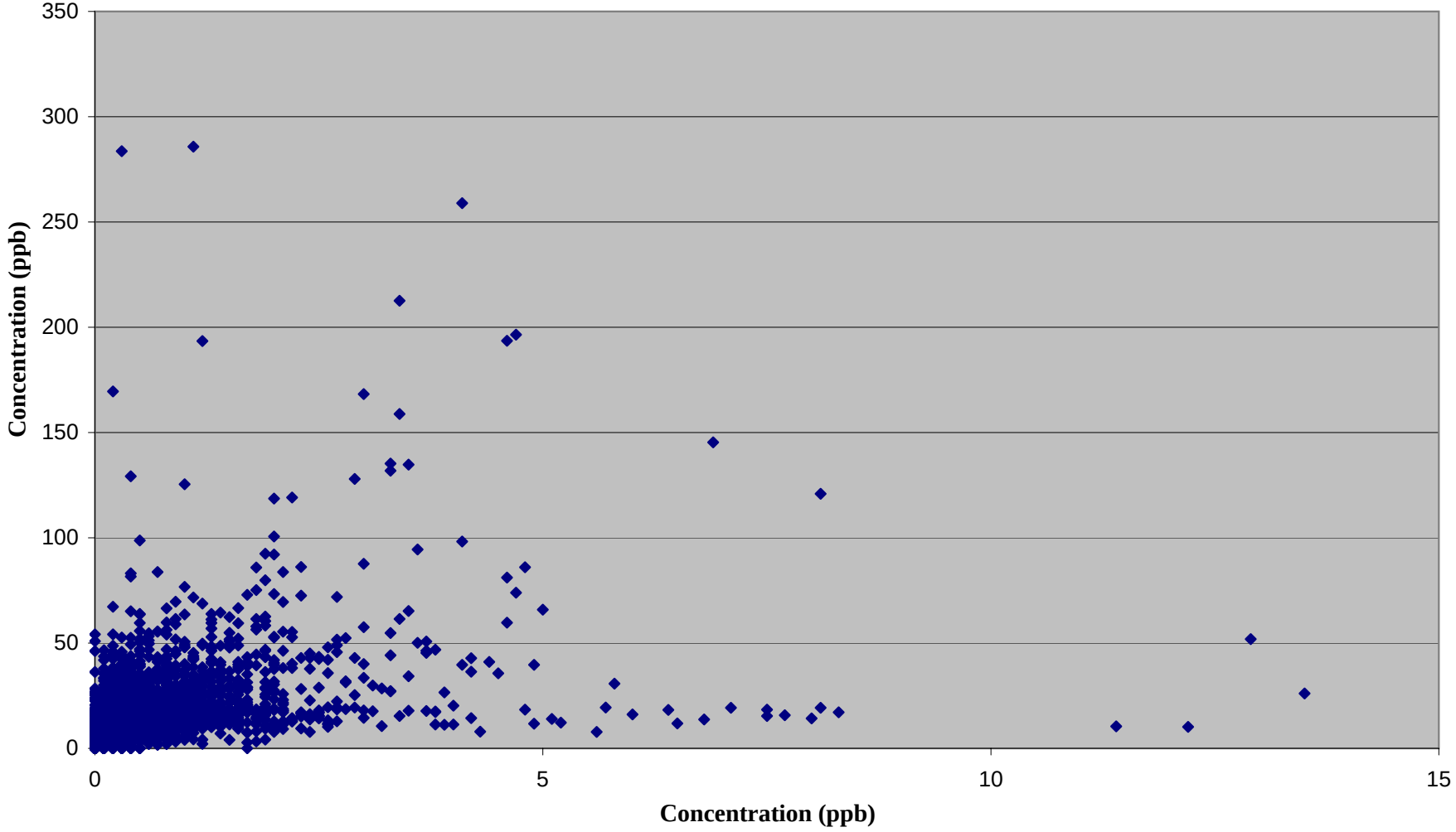
Iowa Falls CAFO: Hydrogen Sulfide vs Wind Speed



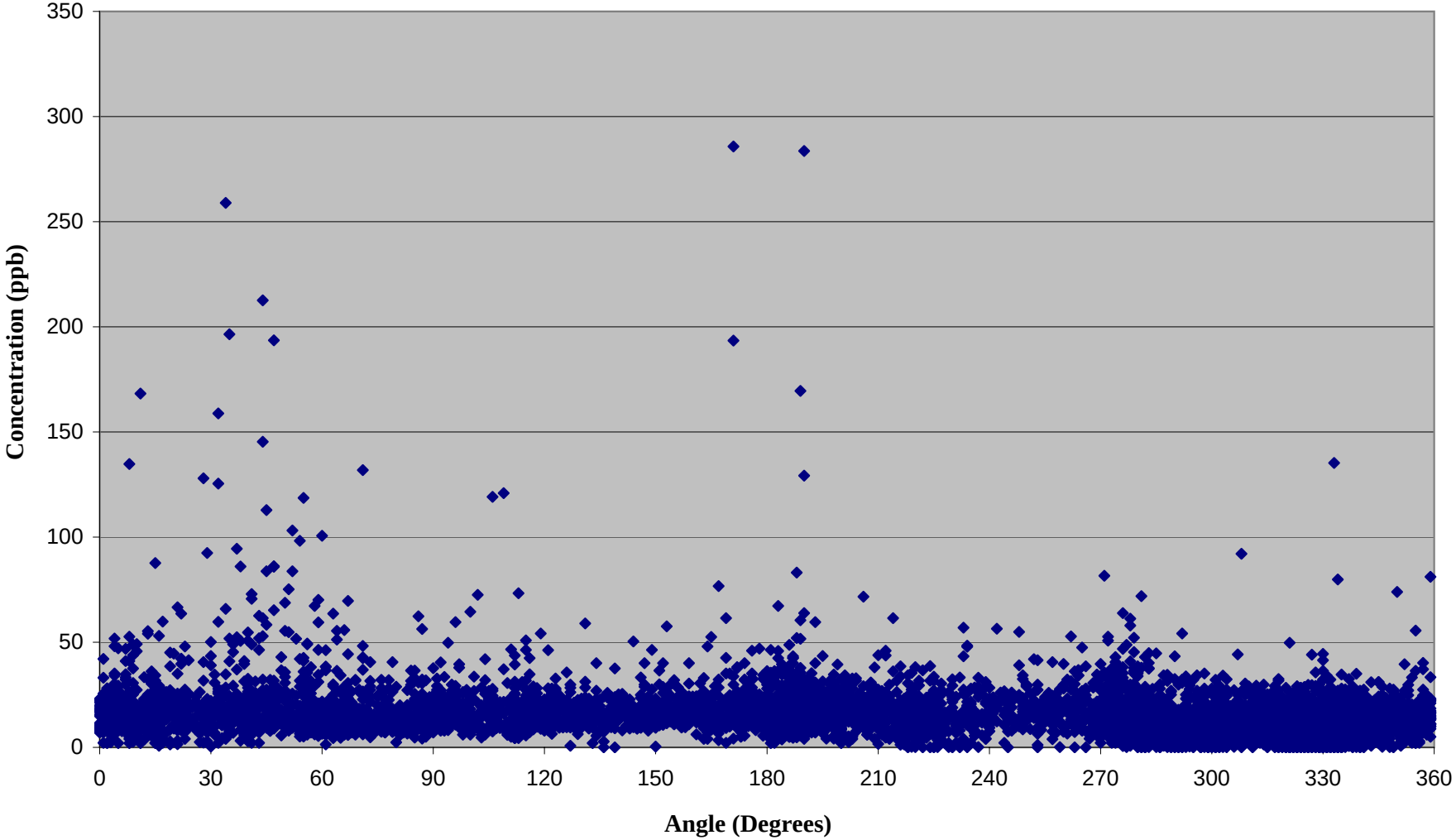
Iowa Falls CAFO: Ammonia vs Wind Speed



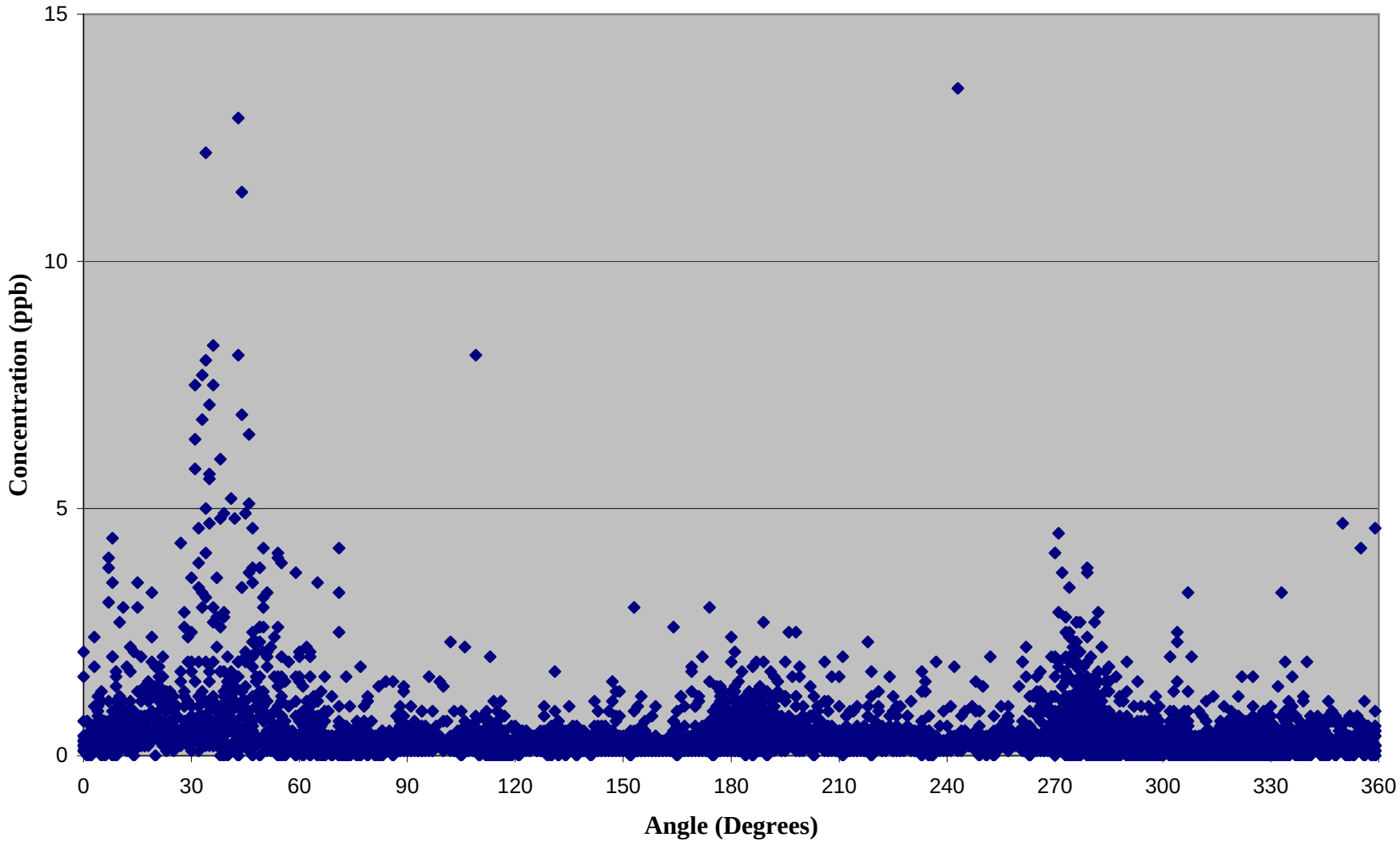
Iowa Falls CAFO: Ammonia vs Hydrogen Sulfide



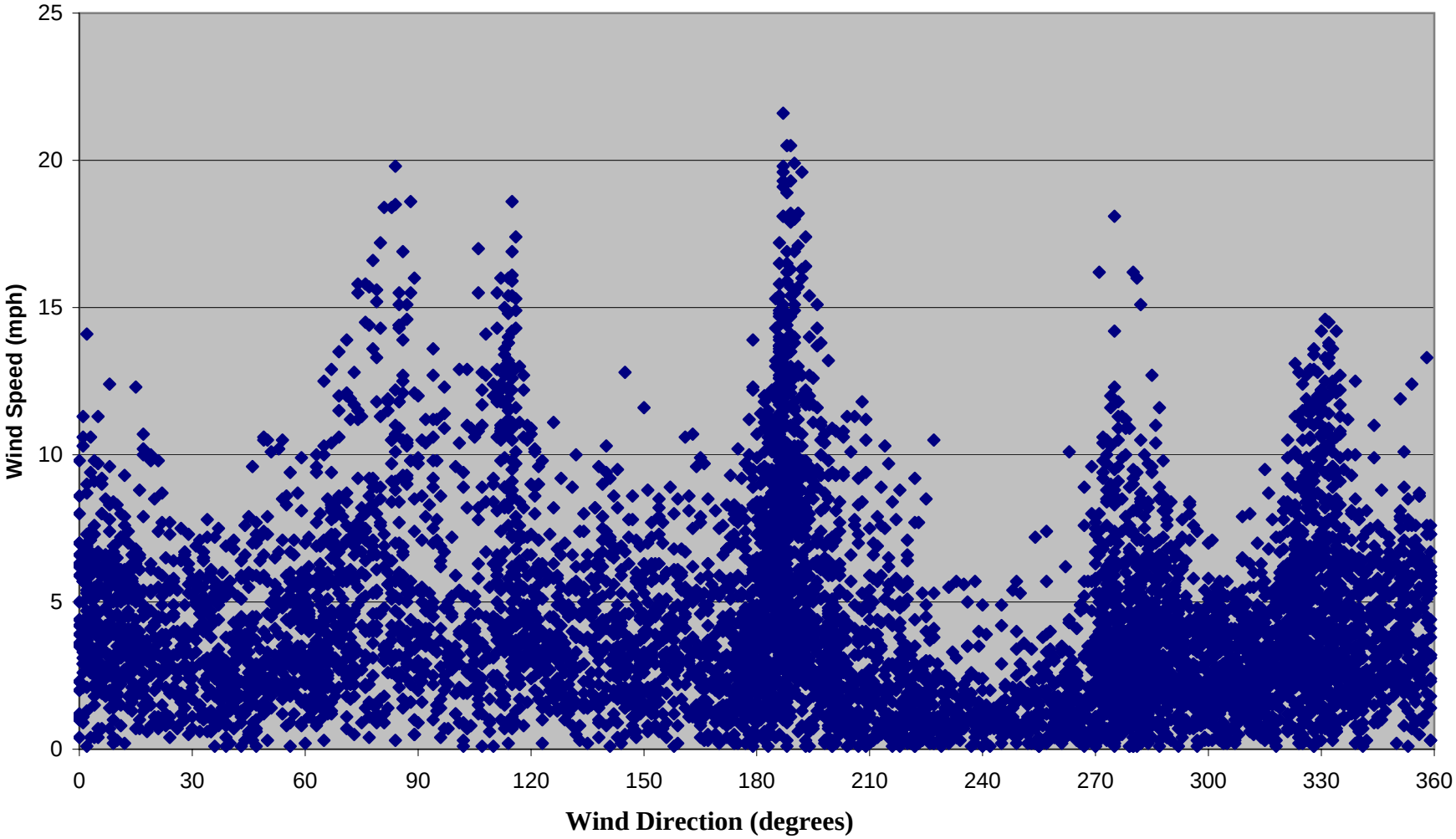
Iowa Falls CAFO: Ammonia vs Wind Direction

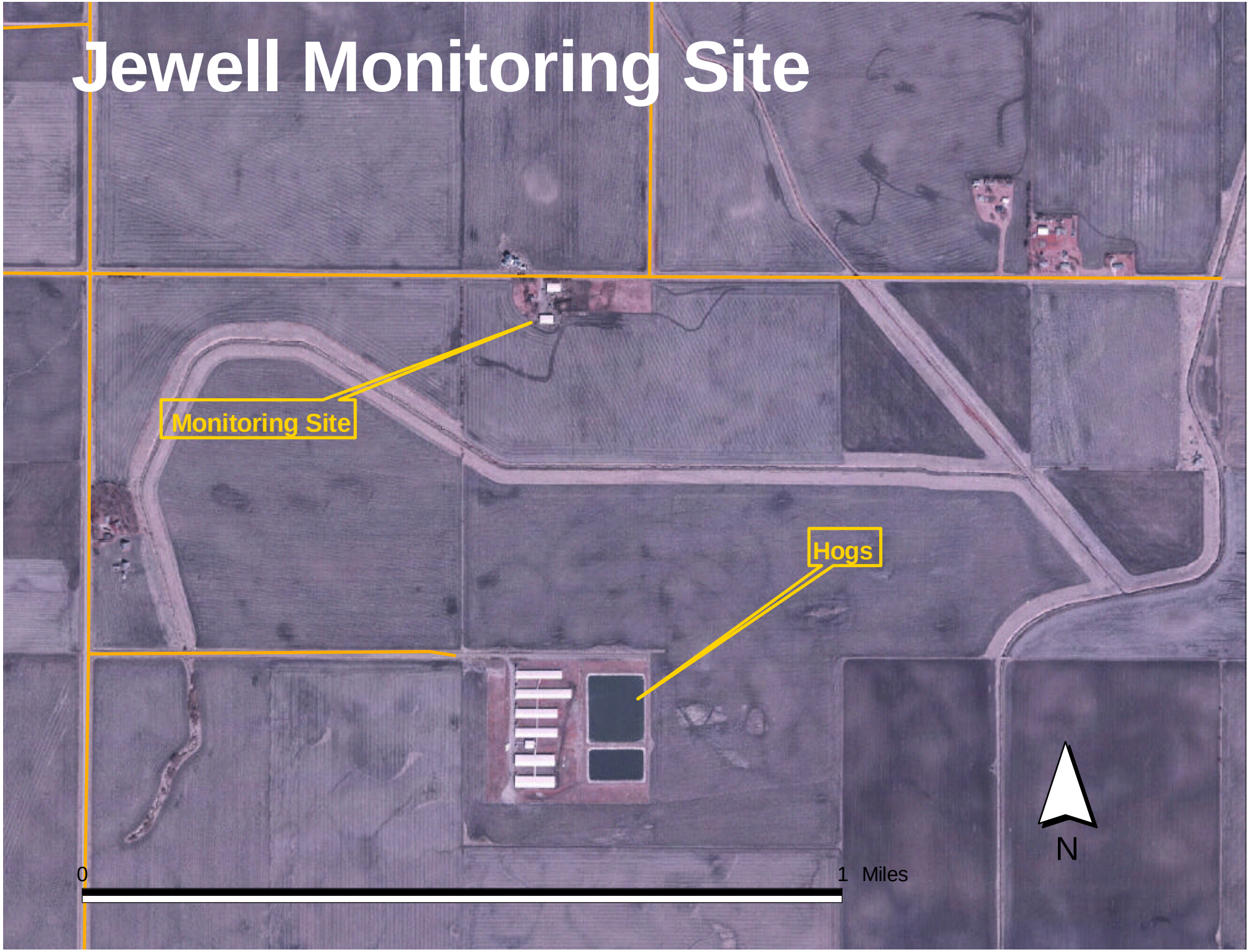


Iowa Falls CAFO-Hydrogen Sulfide vs Wind Direction

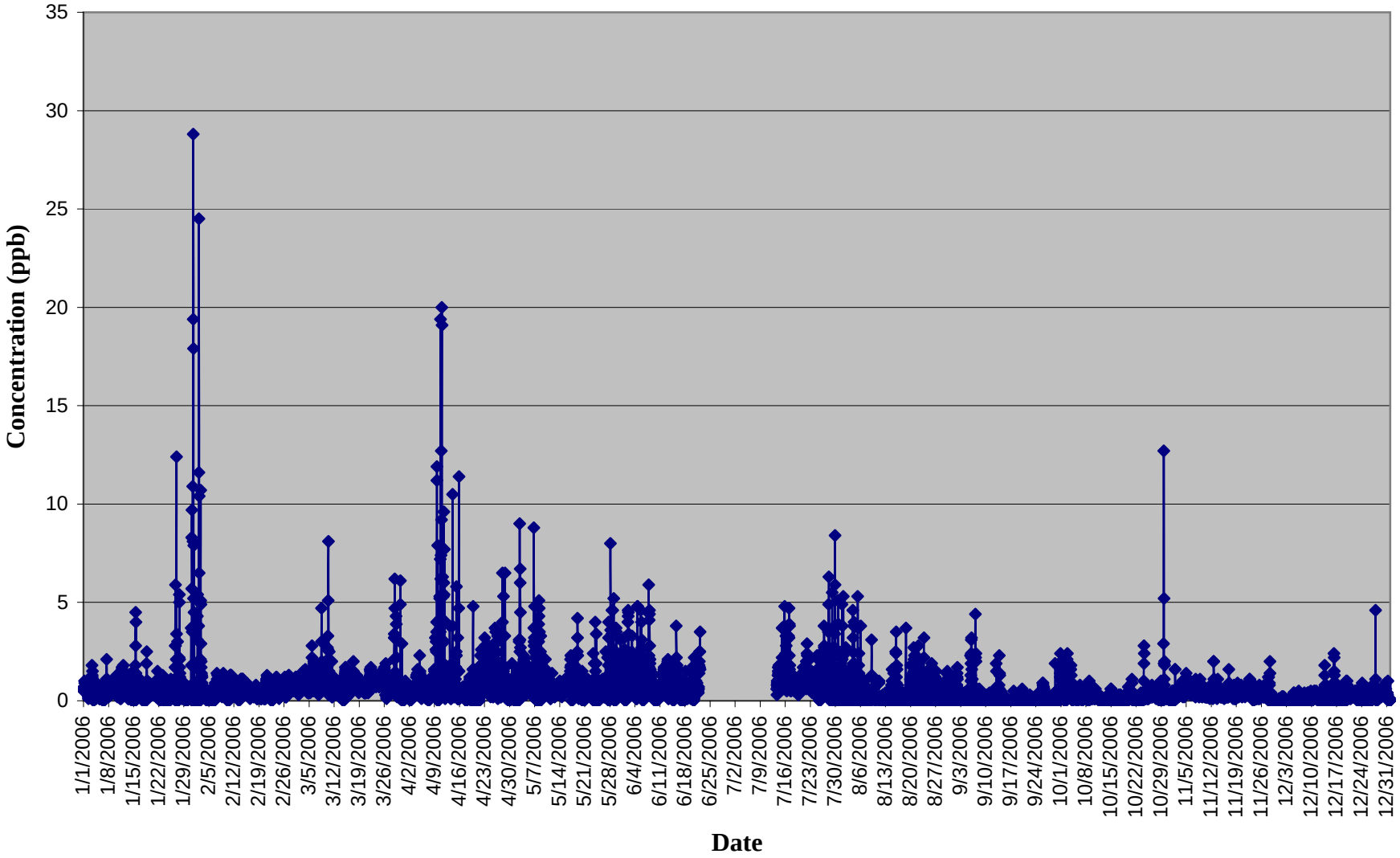


Iowa Falls CAFO: Wind Speed vs Wind Direction

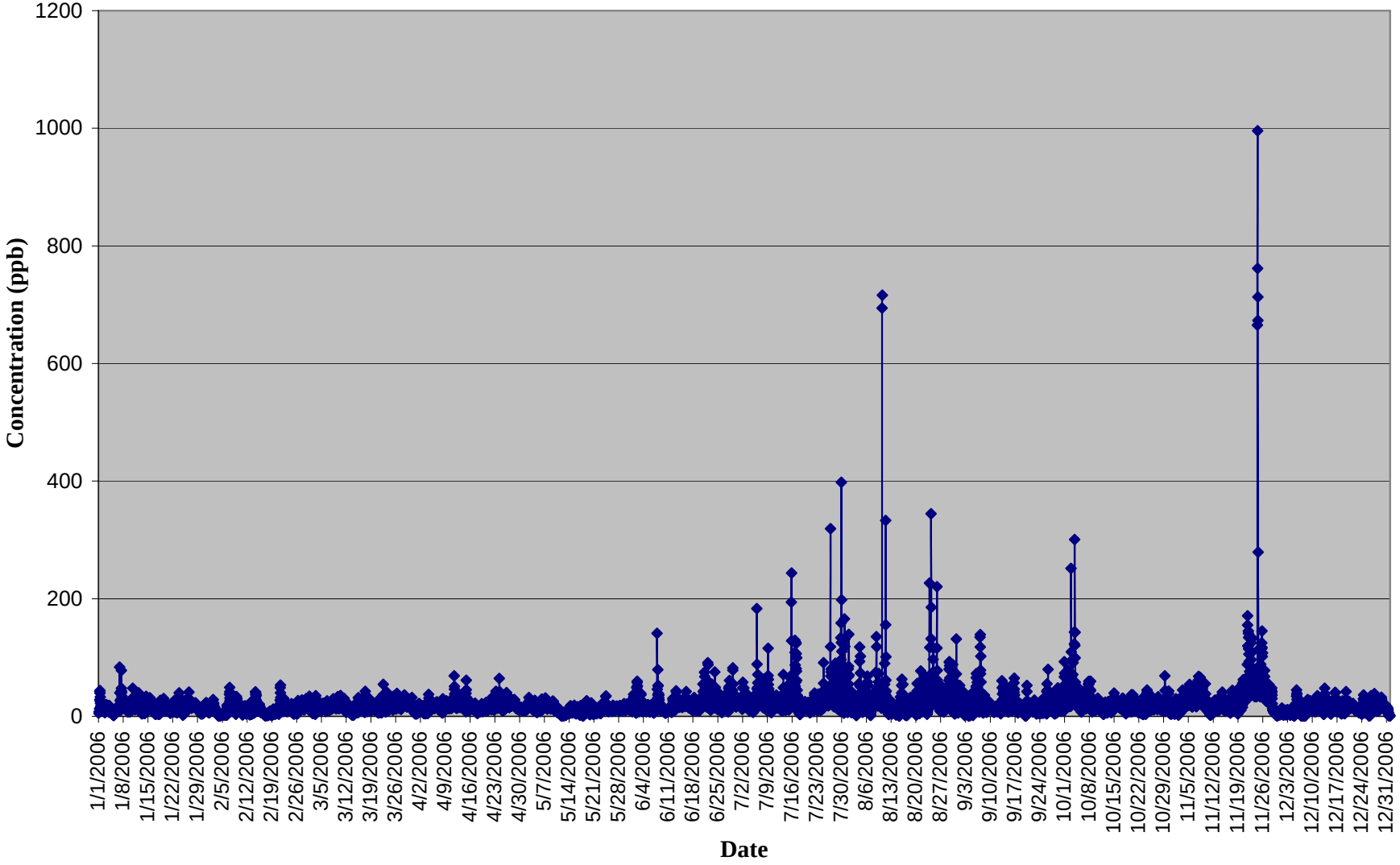



Jewell Monitoring Site
Monitoring Site
Hogs
N
0
1 Miles

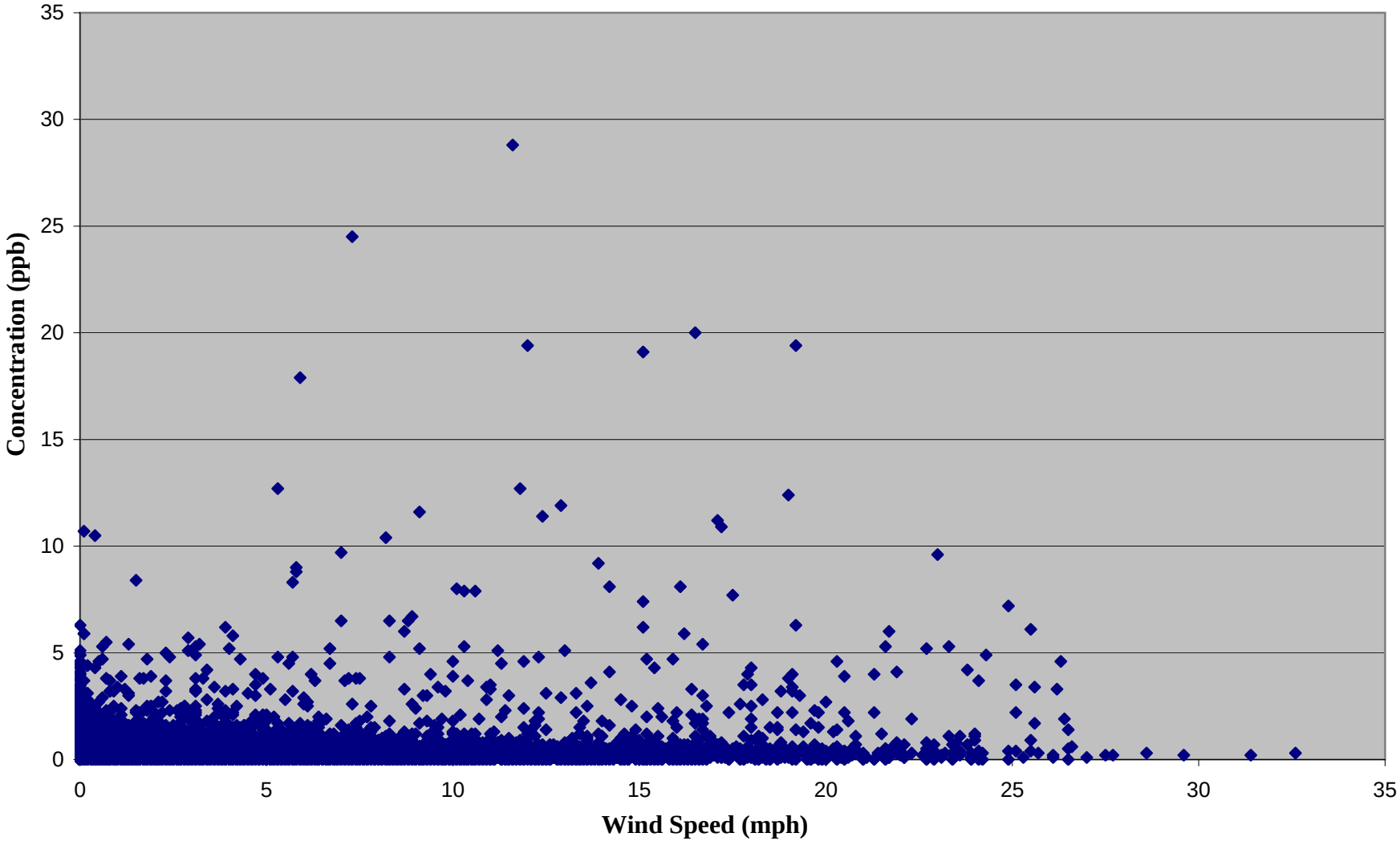
Jewell CAFO: Hydrogen Sulfide vs Time

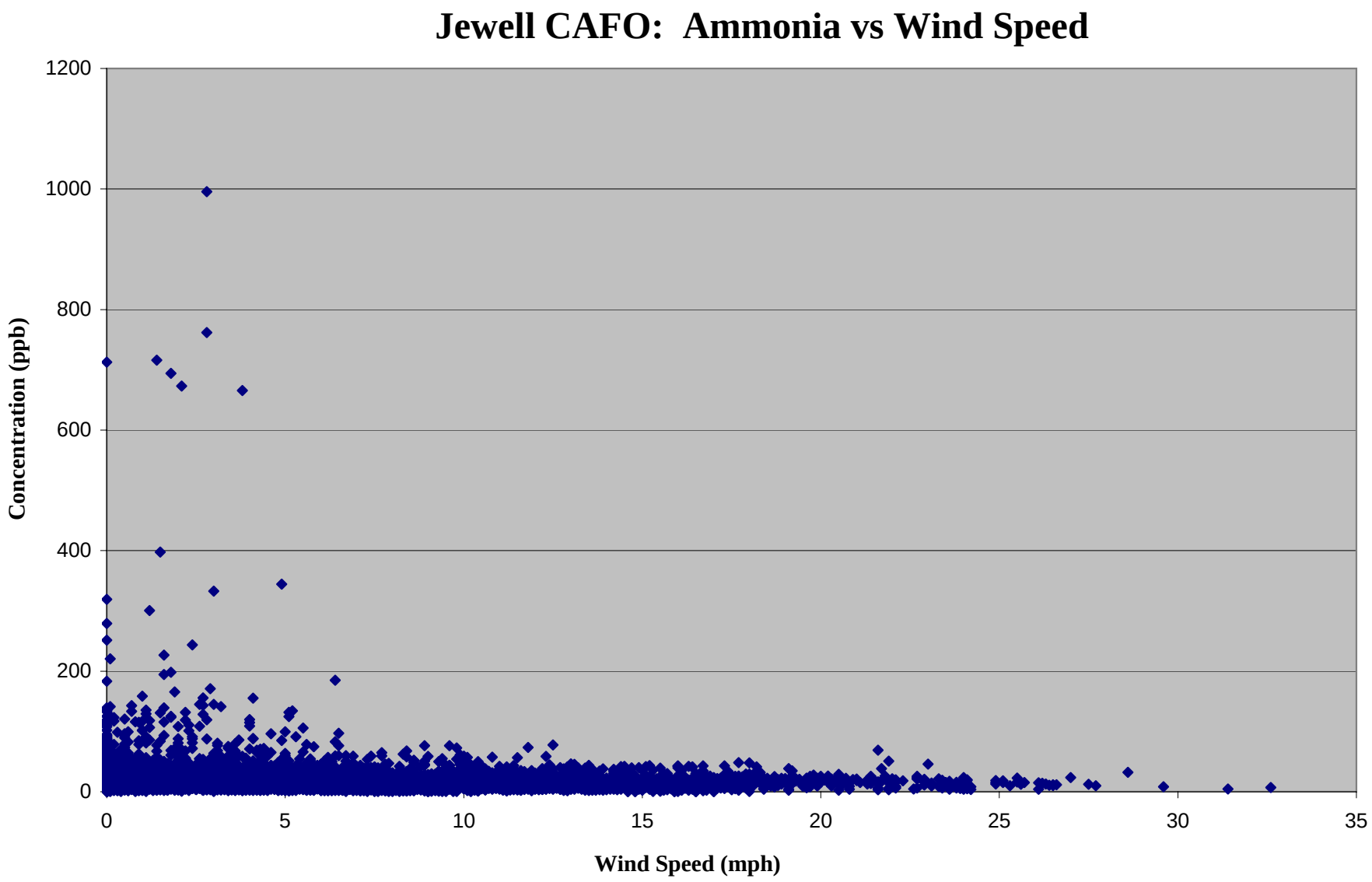


Jewell CAFO: Ammonia vs Time

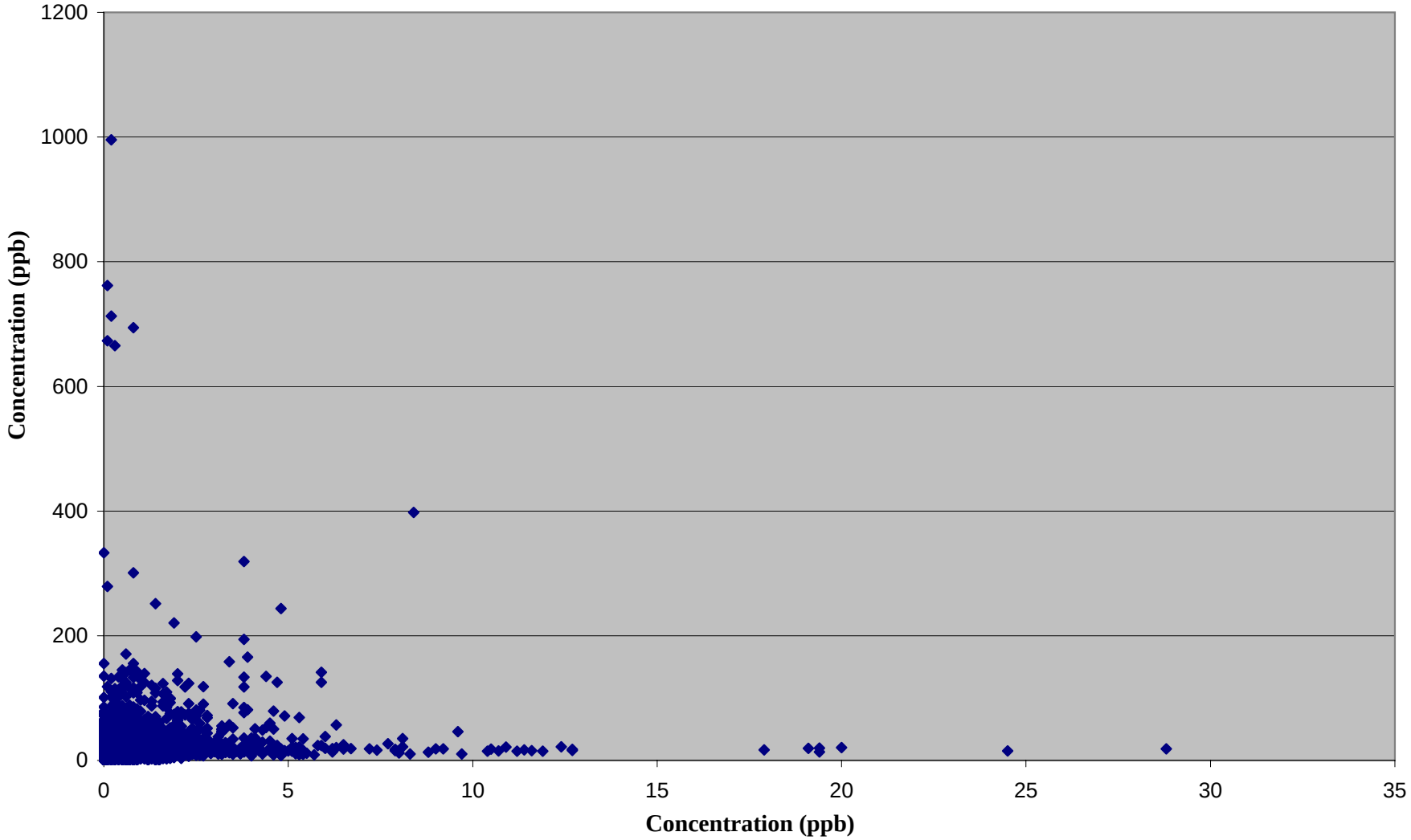


Jewell CAFO: Hydrogen Sulfide vs Wind Speed

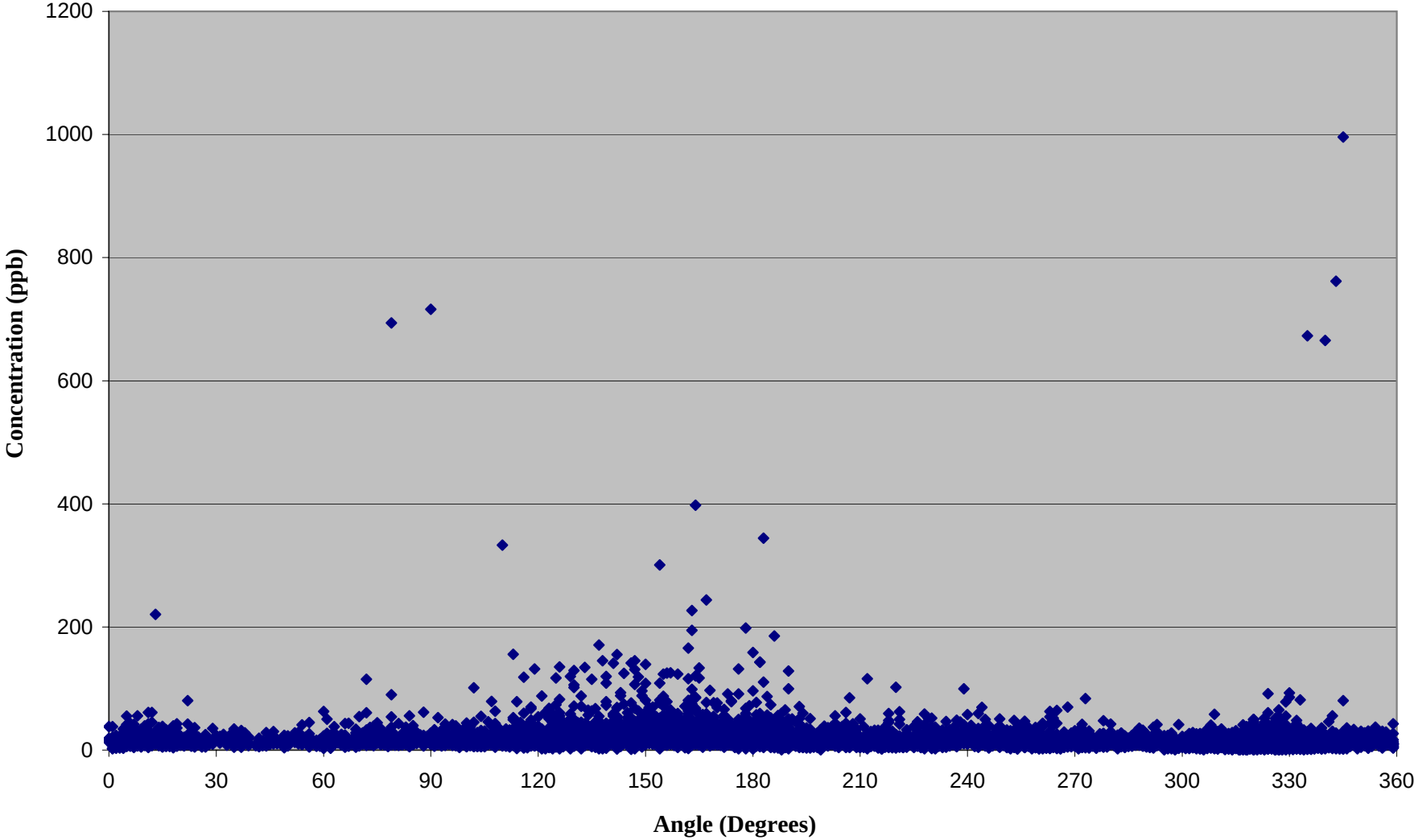



Jewell CAFO: Ammonia vs Wind Speed
Concentration (ppb)
1200
1000
800
600
400
200
0
0
5
10
15
20
25
30
35
Wind Speed (mph)

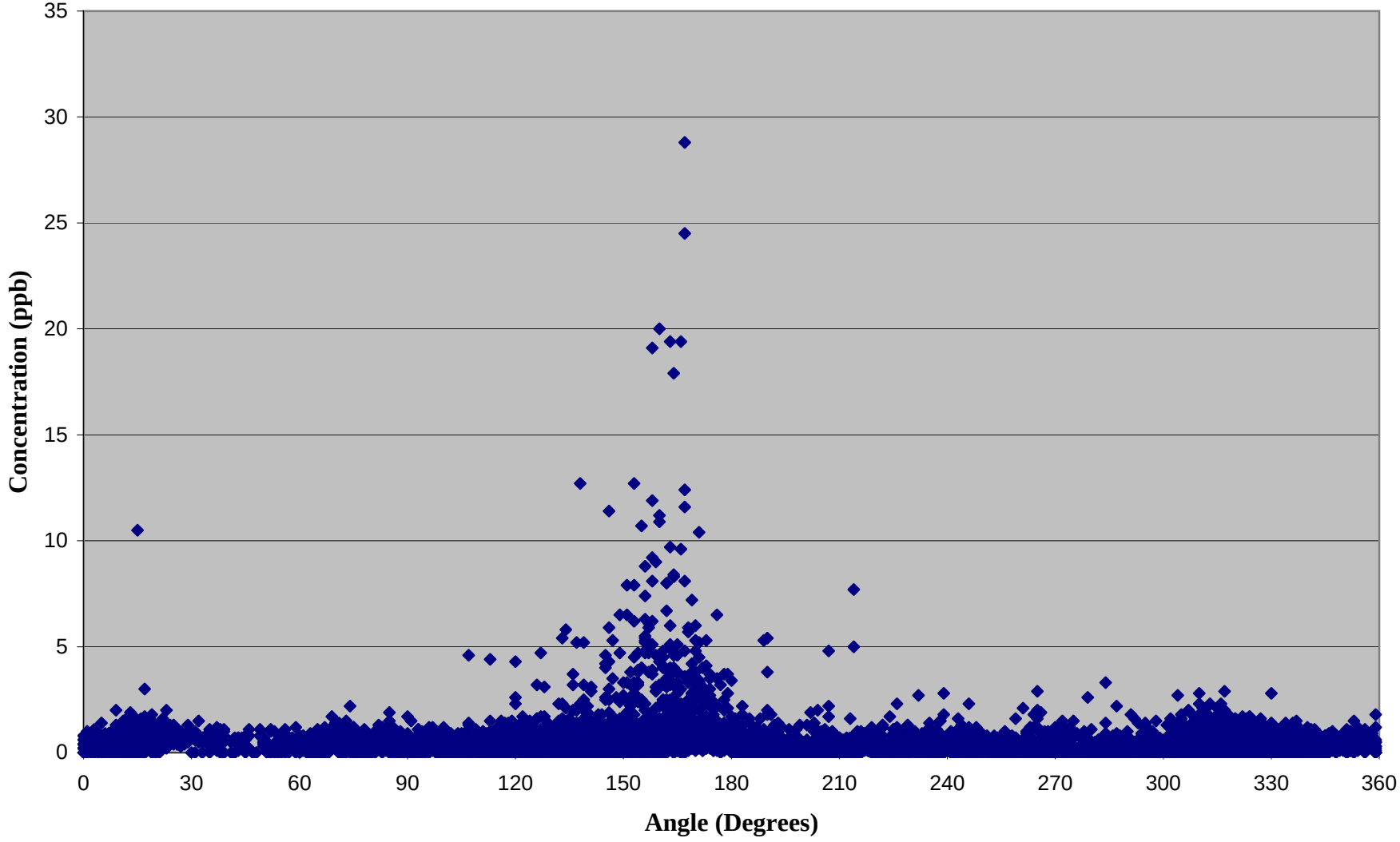
Jewell CAFO: Ammonia vs Hydrogen Sulfide



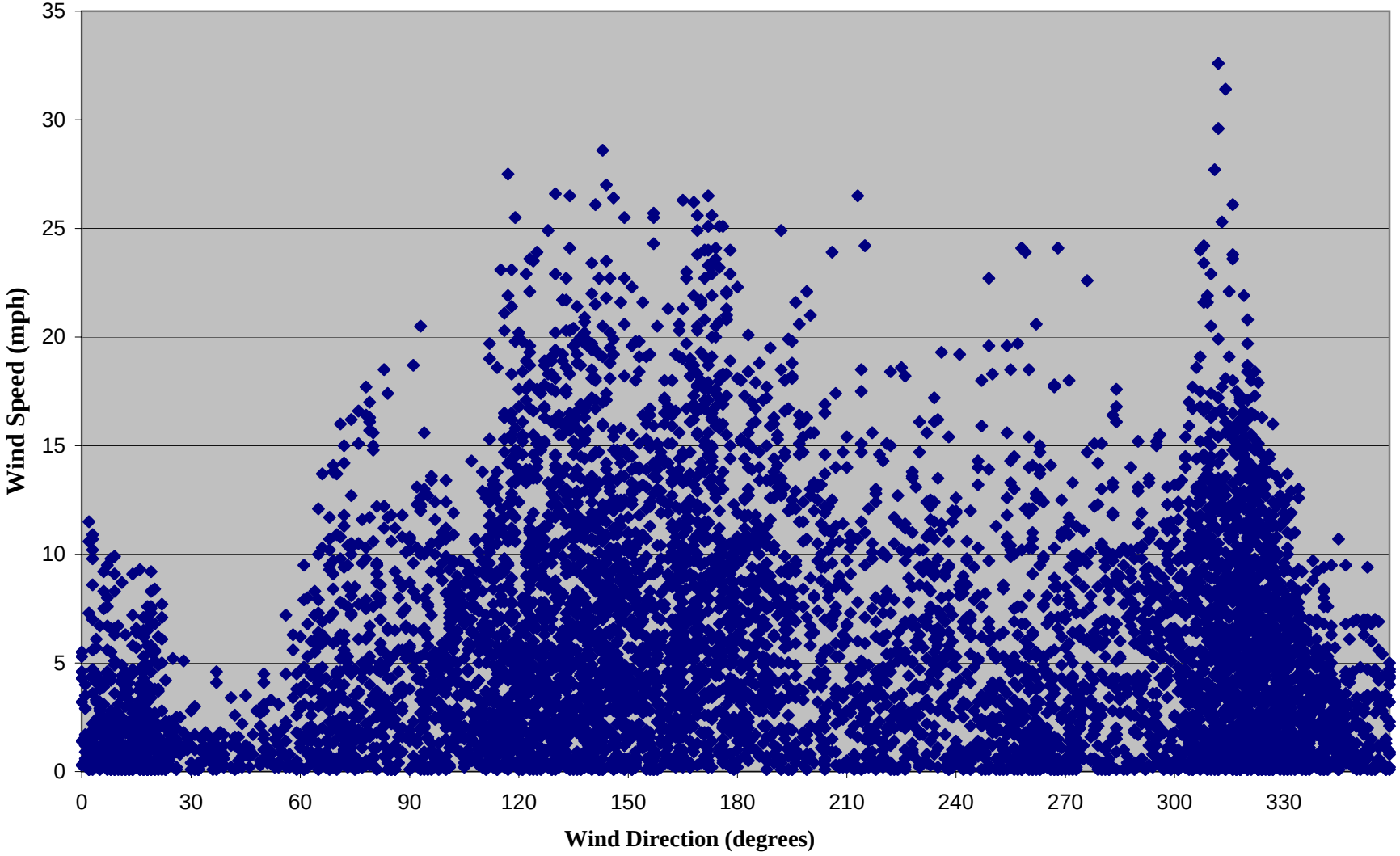
Jewell CAFO: Ammonia vs Wind Direction



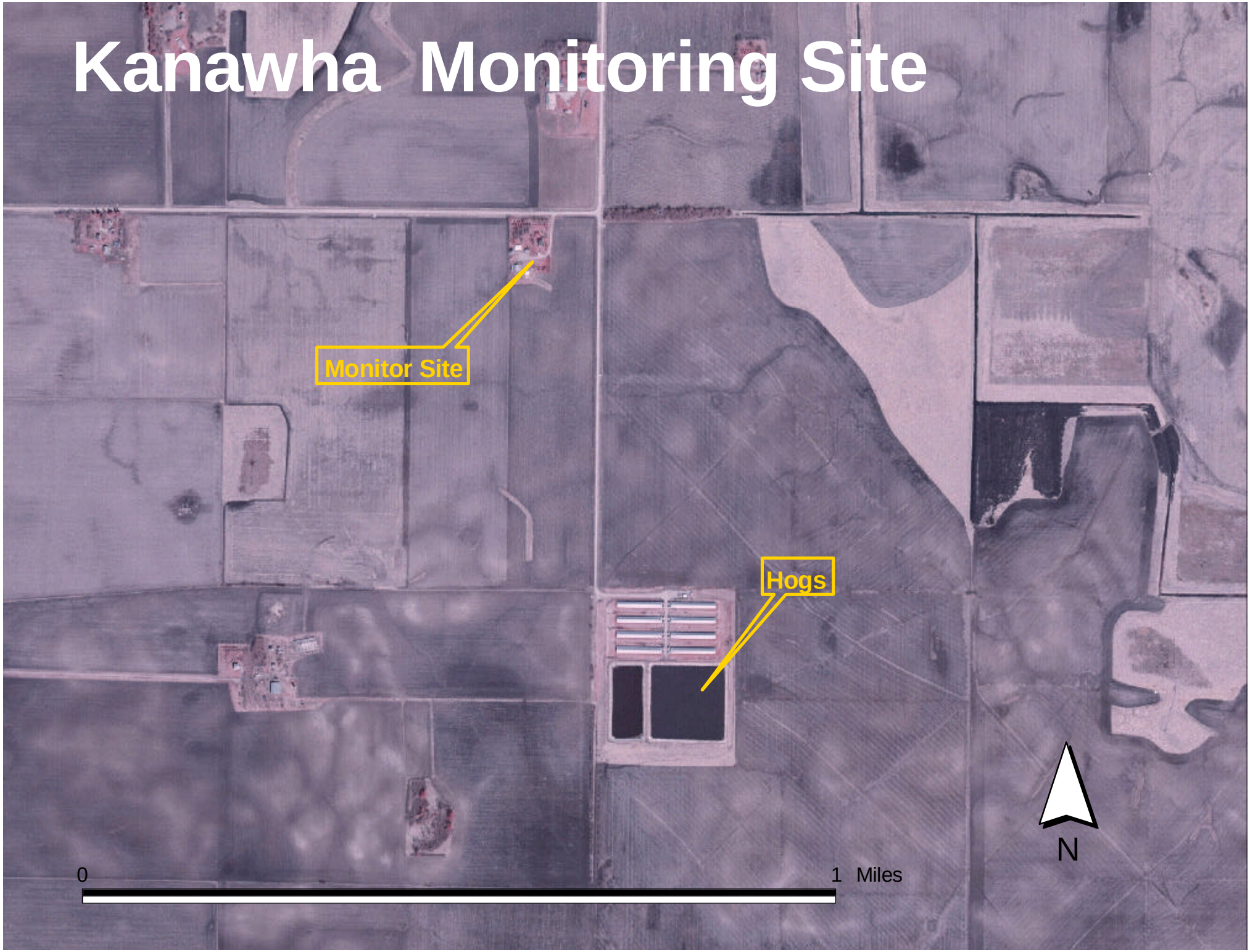
Jewell CAFO-Hydrogen Sulfide vs Wind Direction



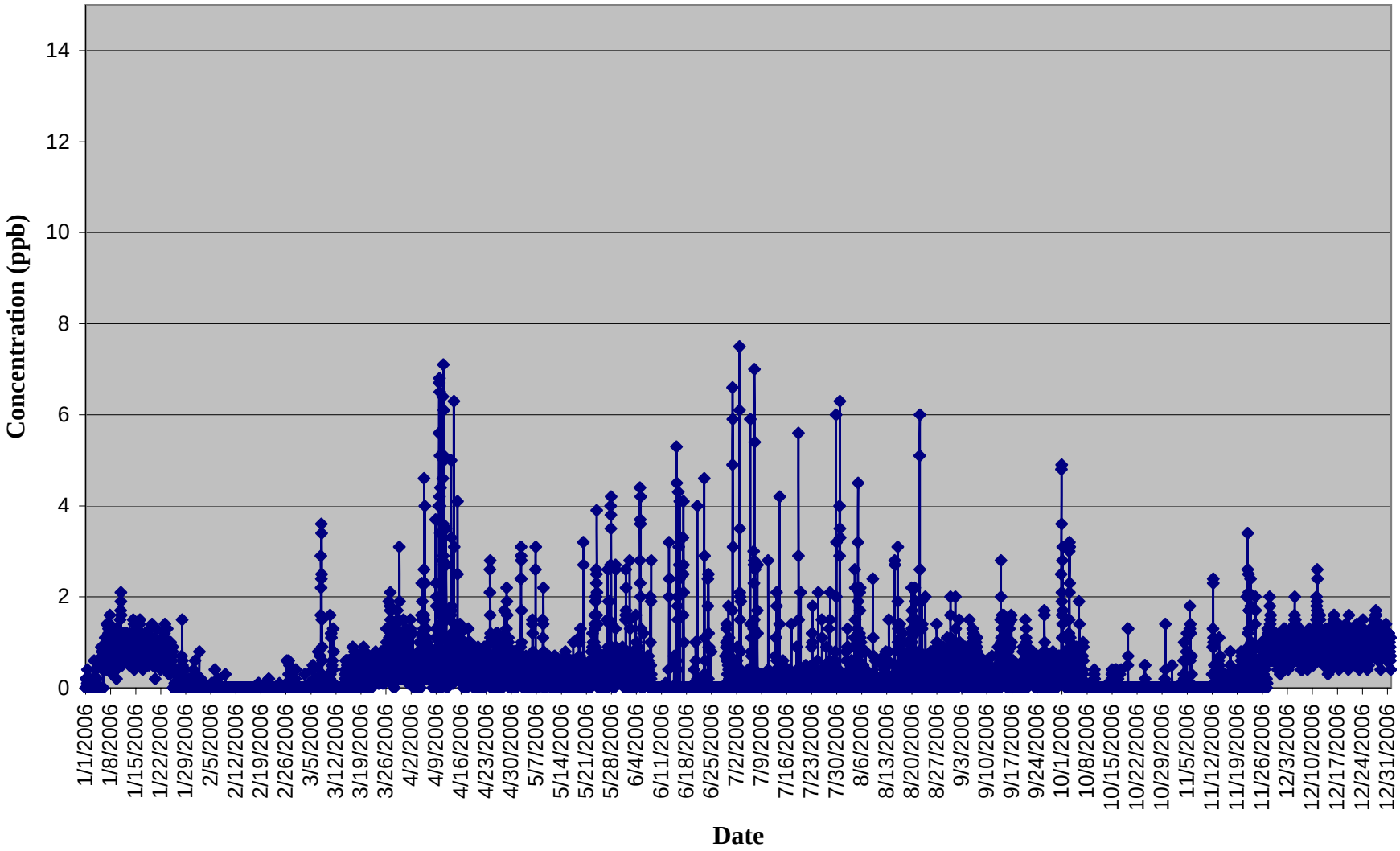
Jewell CAFO: Wind Speed vs Wind Direction



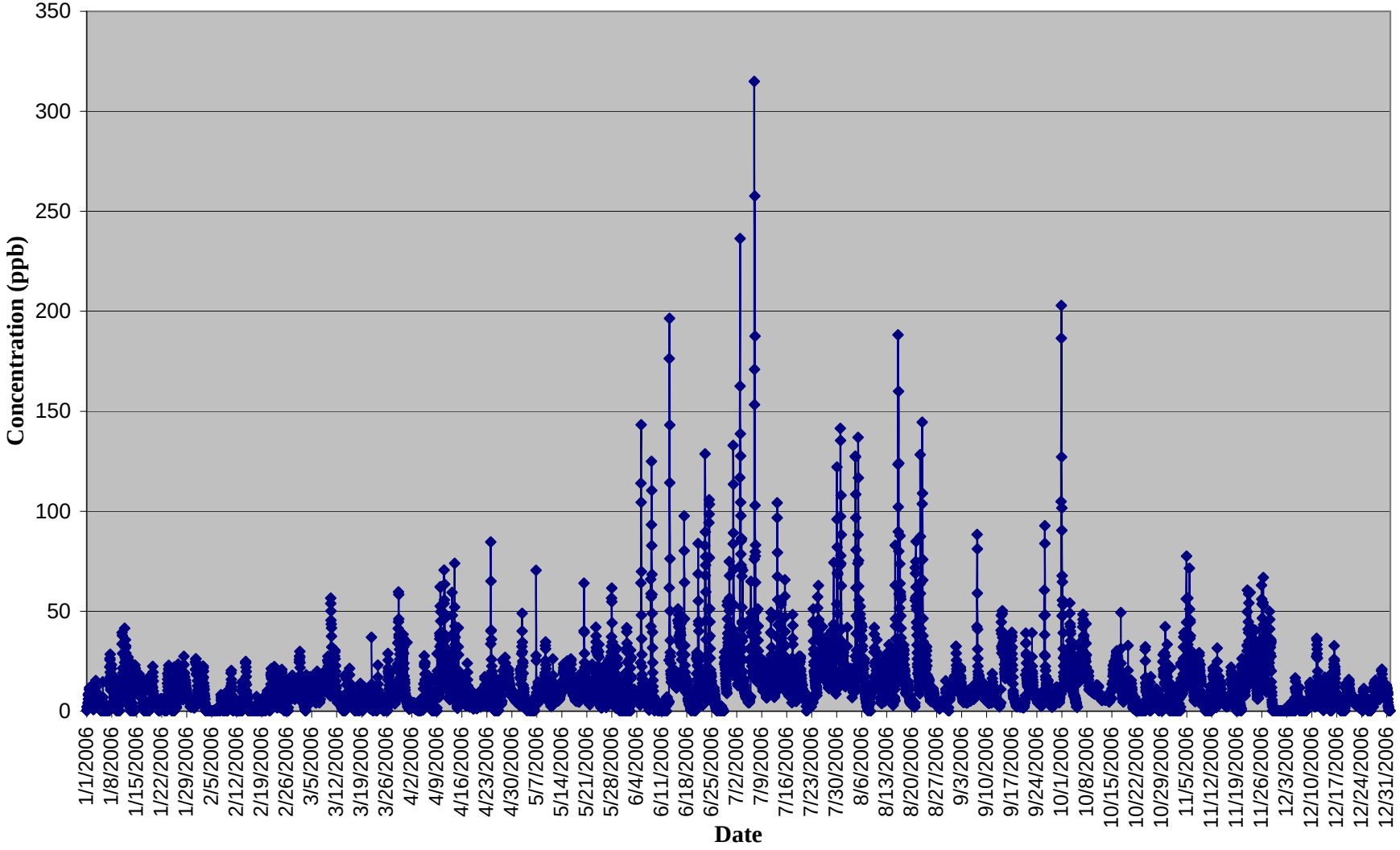
Kanawha Monitoring Site



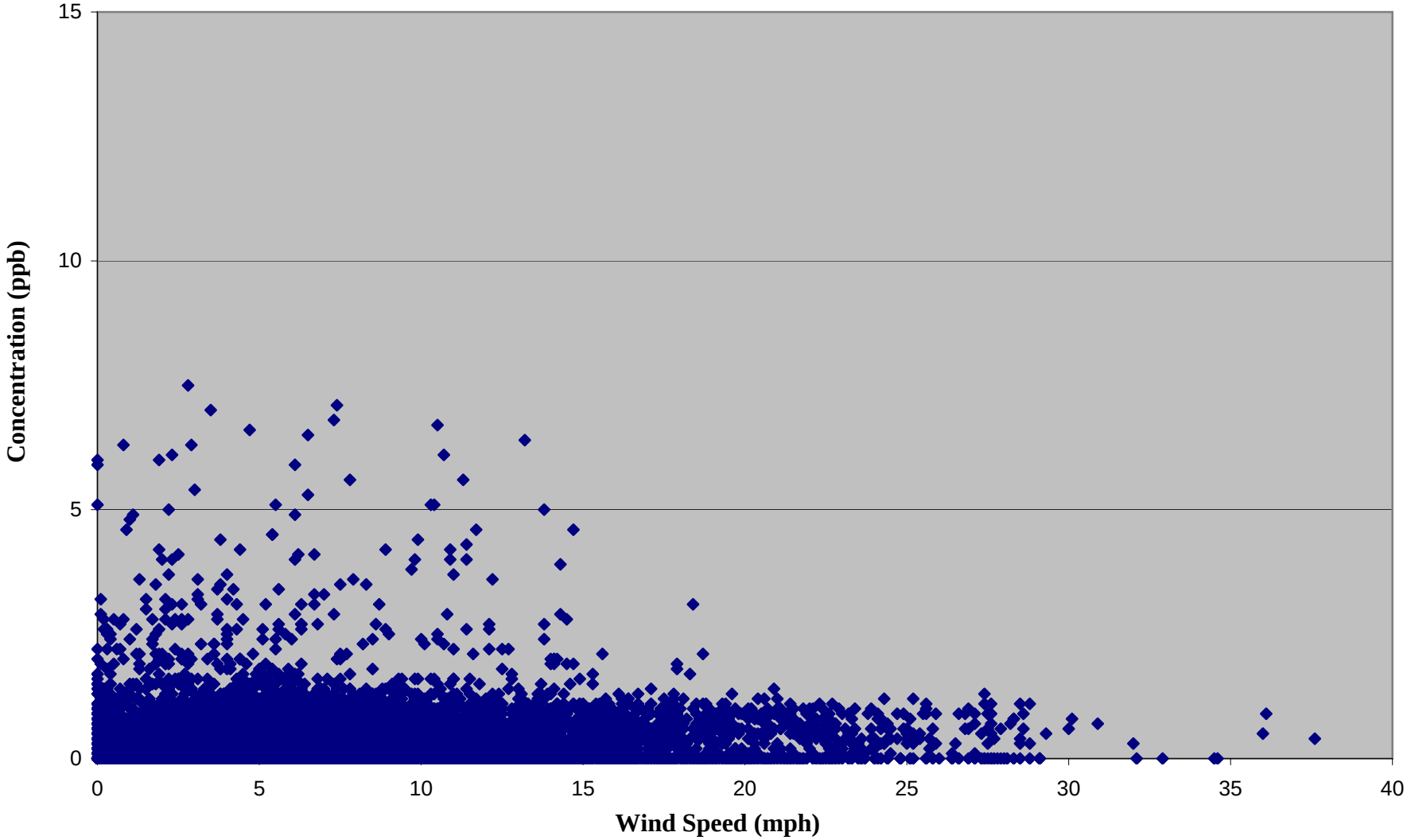
Kanawha CAFO: Hydrogen Sulfide vs Time



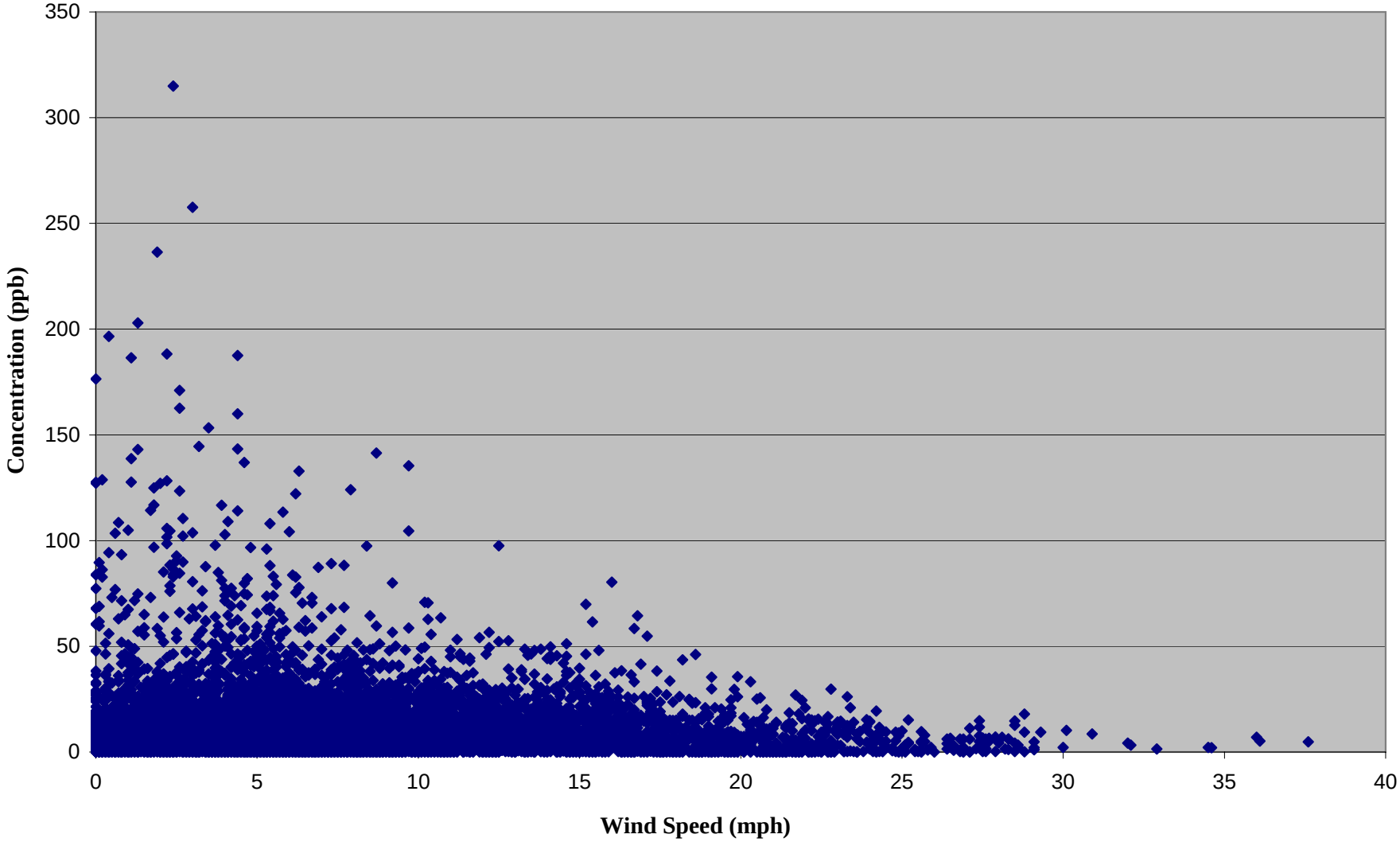
Kanawha CAFO: Ammonia vs Time



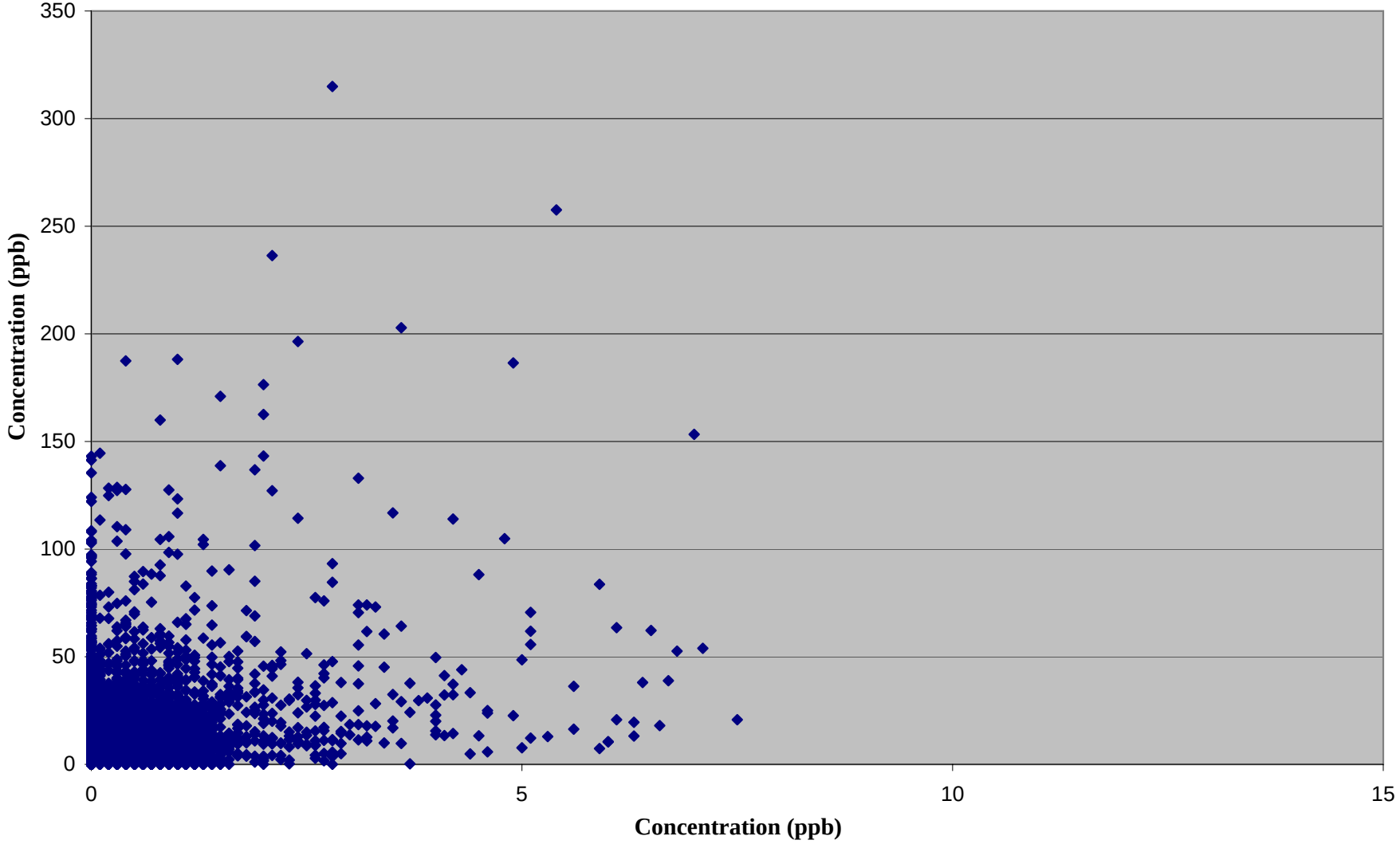
Kanawha CAFO: Hydrogen Sulfide vs Wind Speed



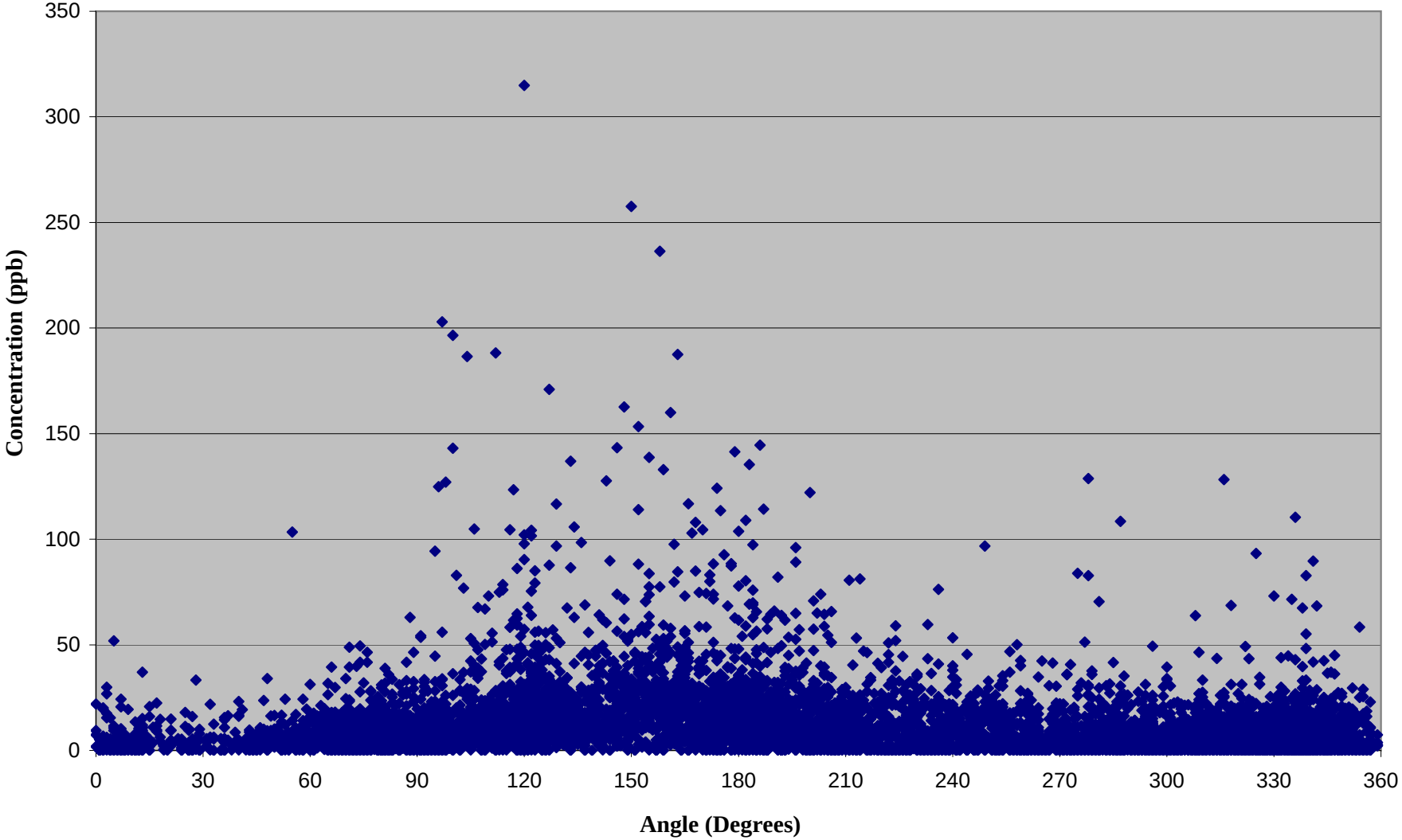
Kanawha CAFO: Ammonia vs Wind Speed



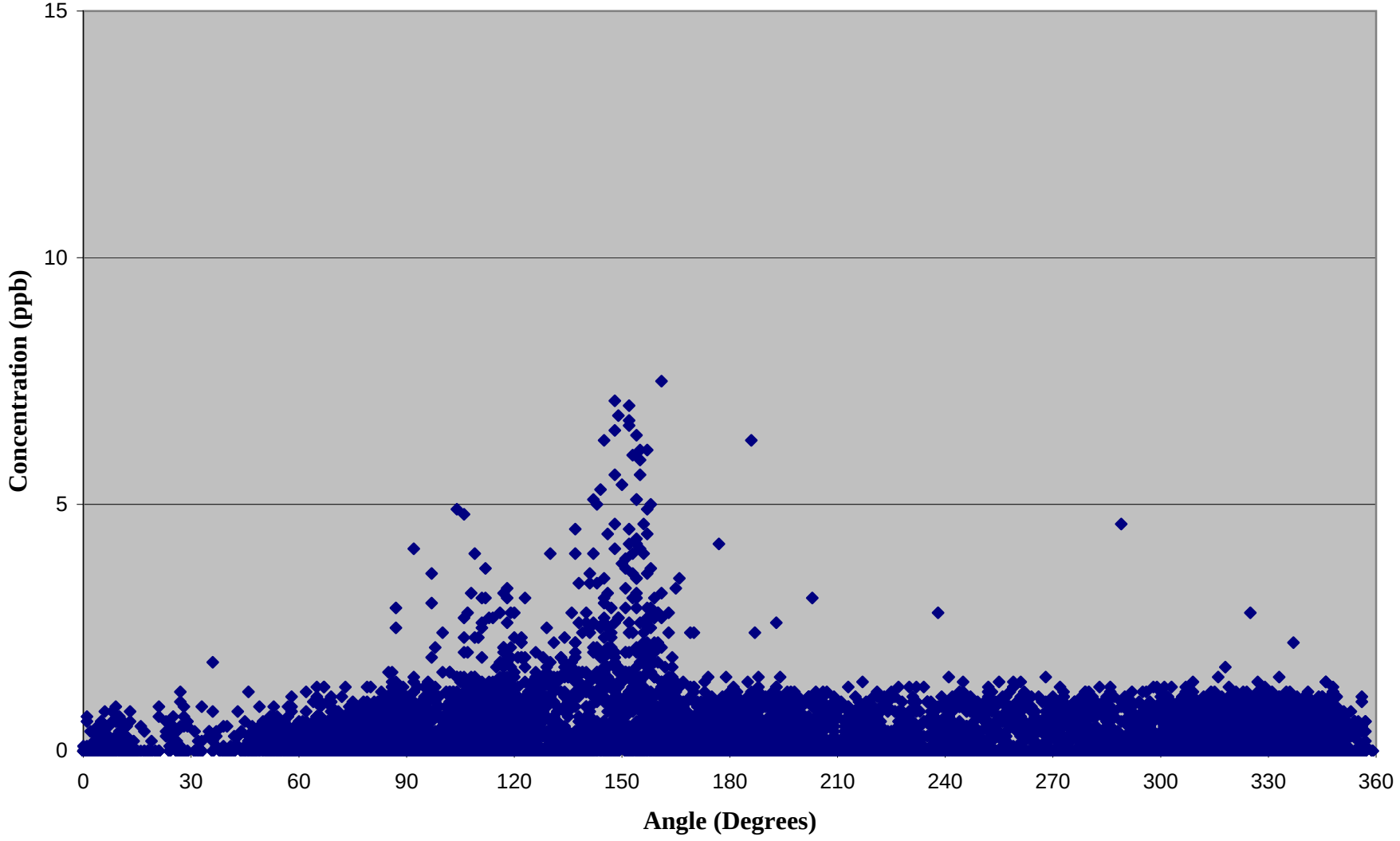
Kanawha CAFO: Ammonia vs Hydrogen Sulfide



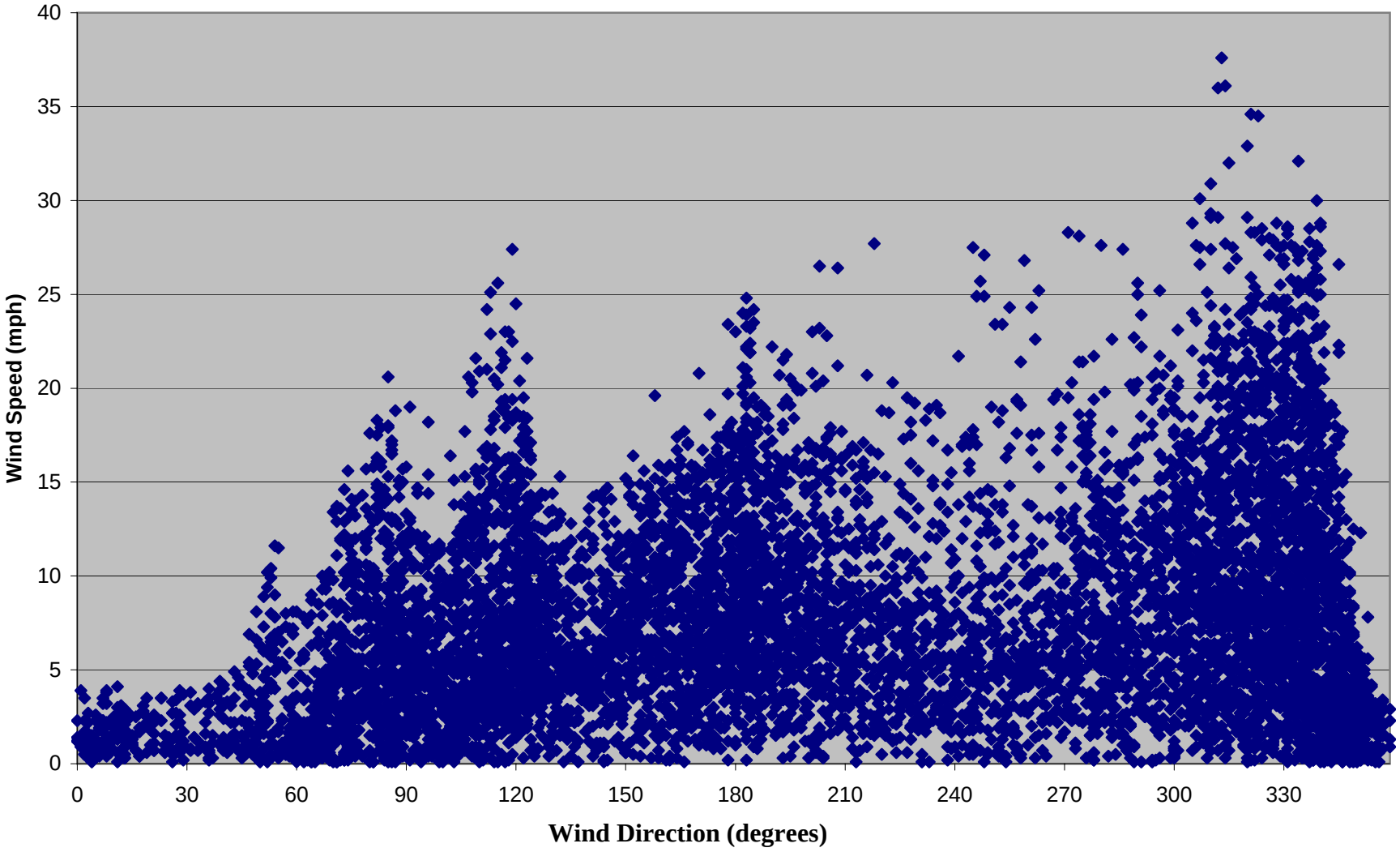
Kanawha CAFO: Ammonia vs Wind Direction



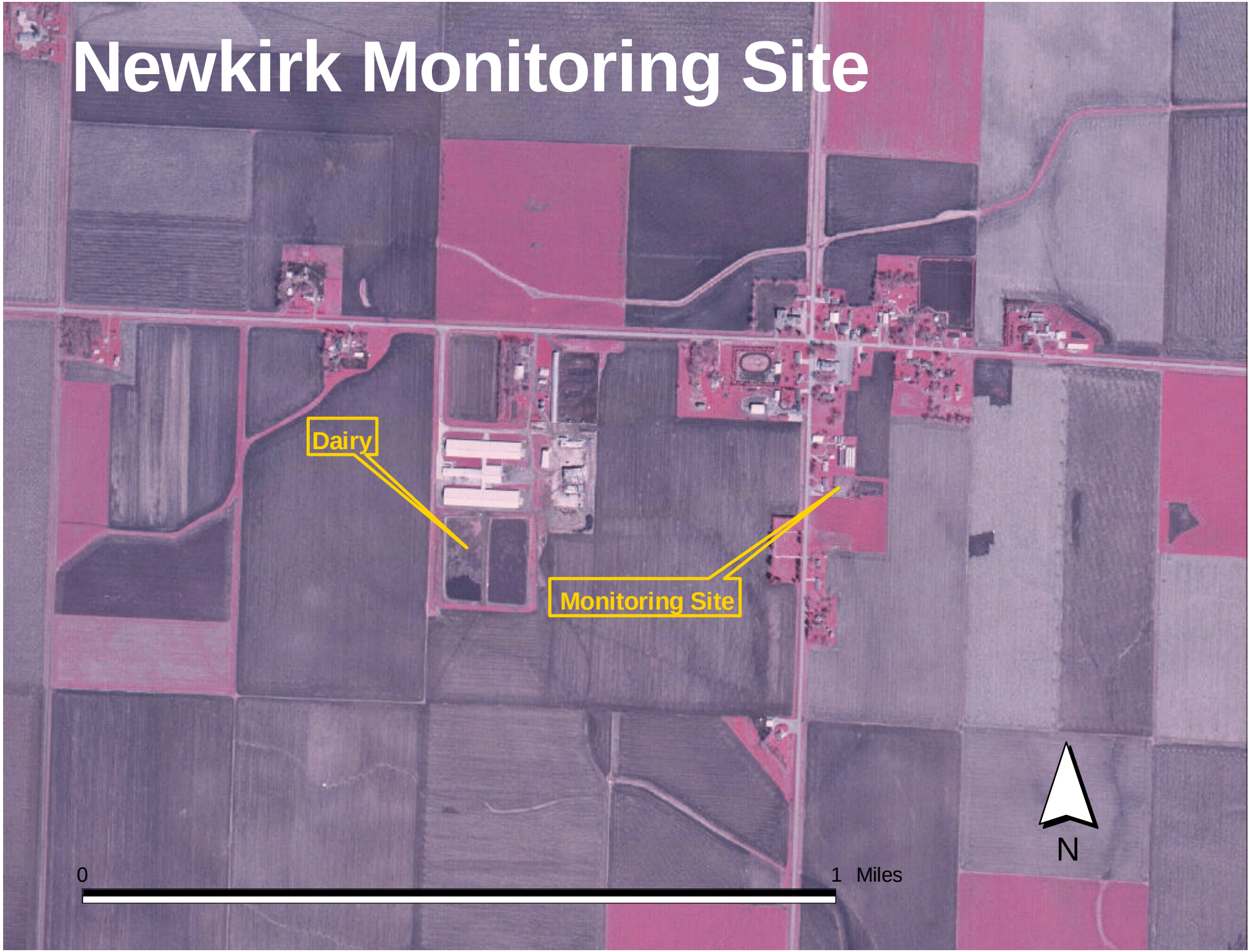
Kanawha CAFO-Hydrogen Sulfide vs Wind Direction



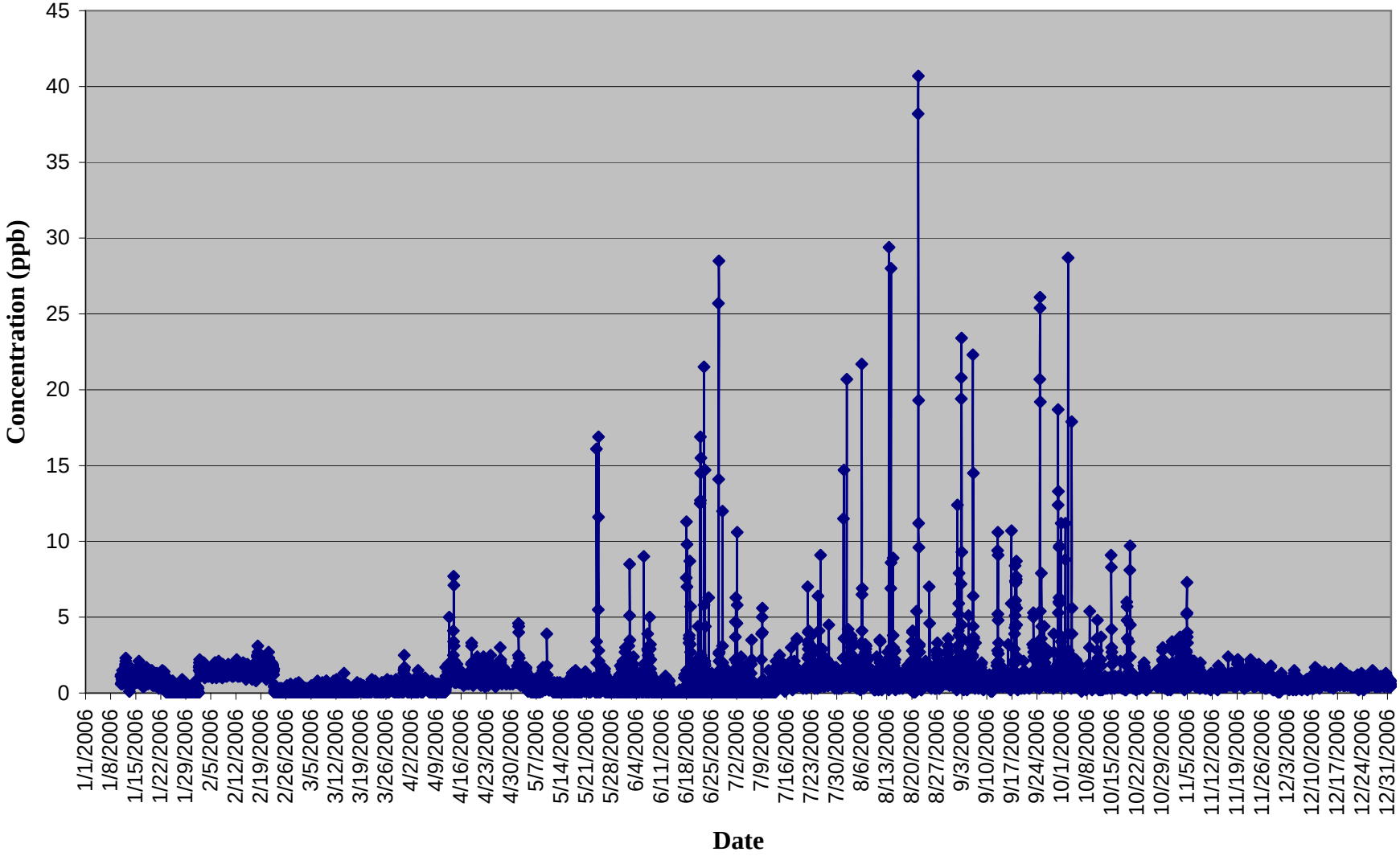
Kanawha CAFO: Wind Speed vs Wind Direction



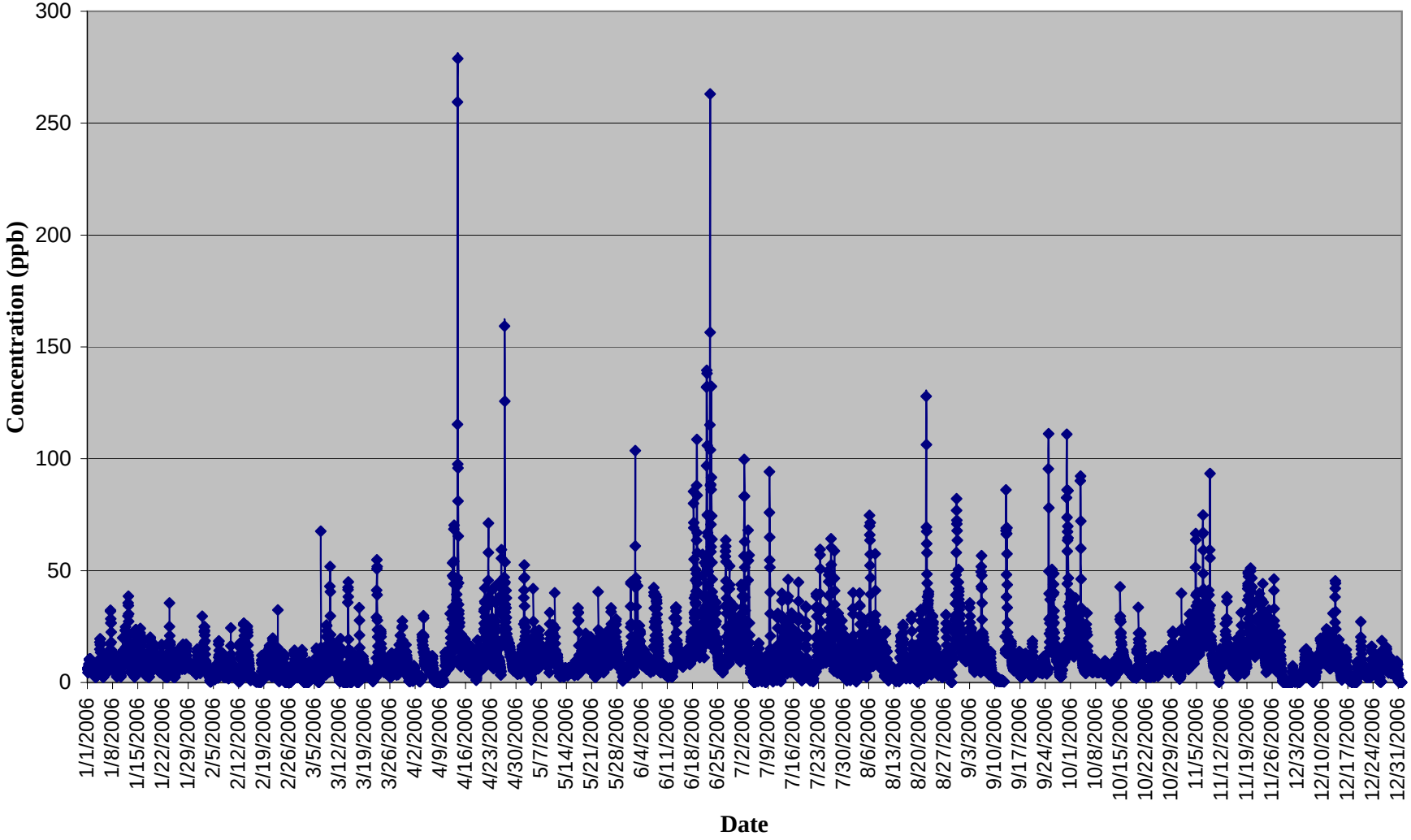
Newkirk Monitoring Site



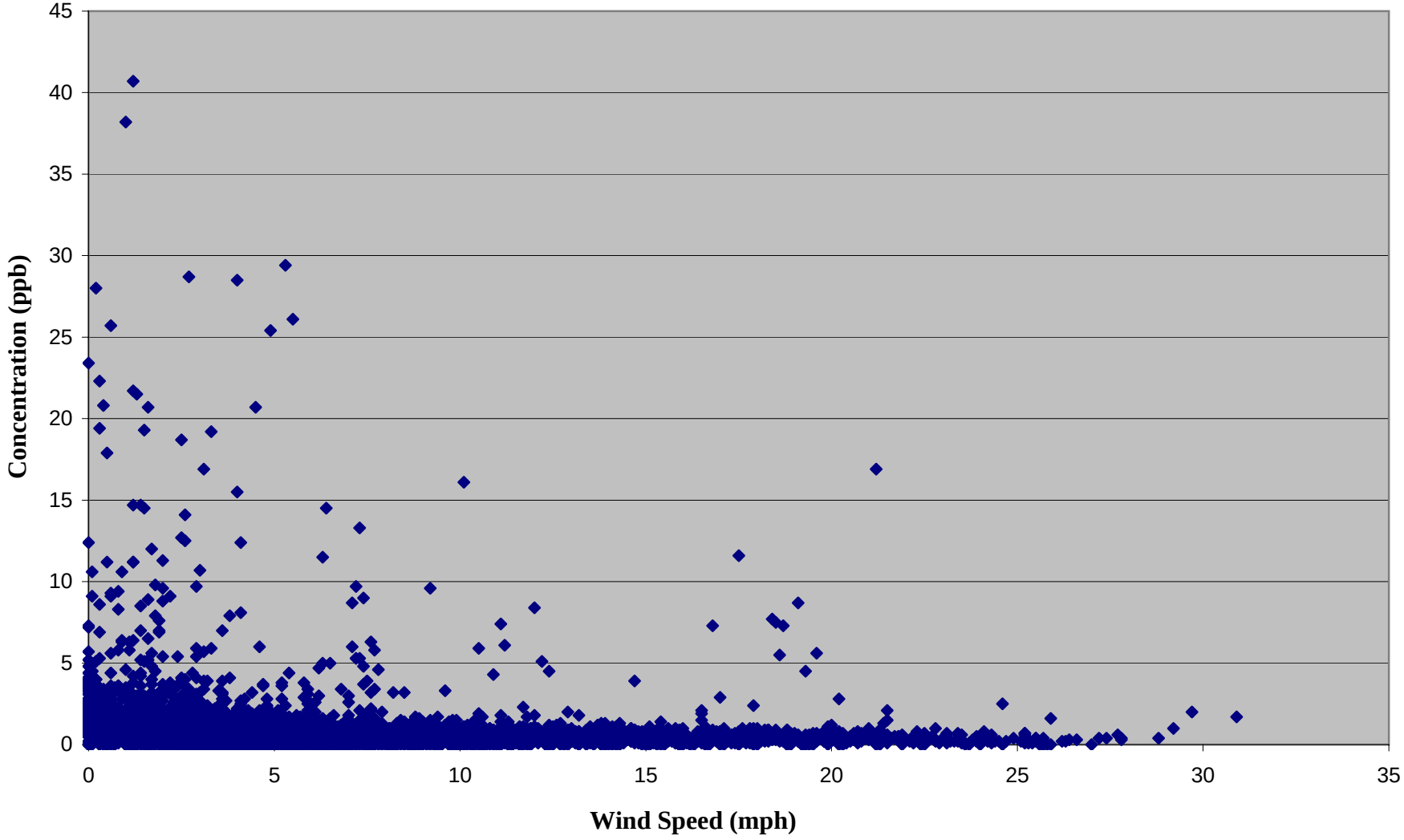
Newkirk CAFO: Hydrogen Sulfide vs Time



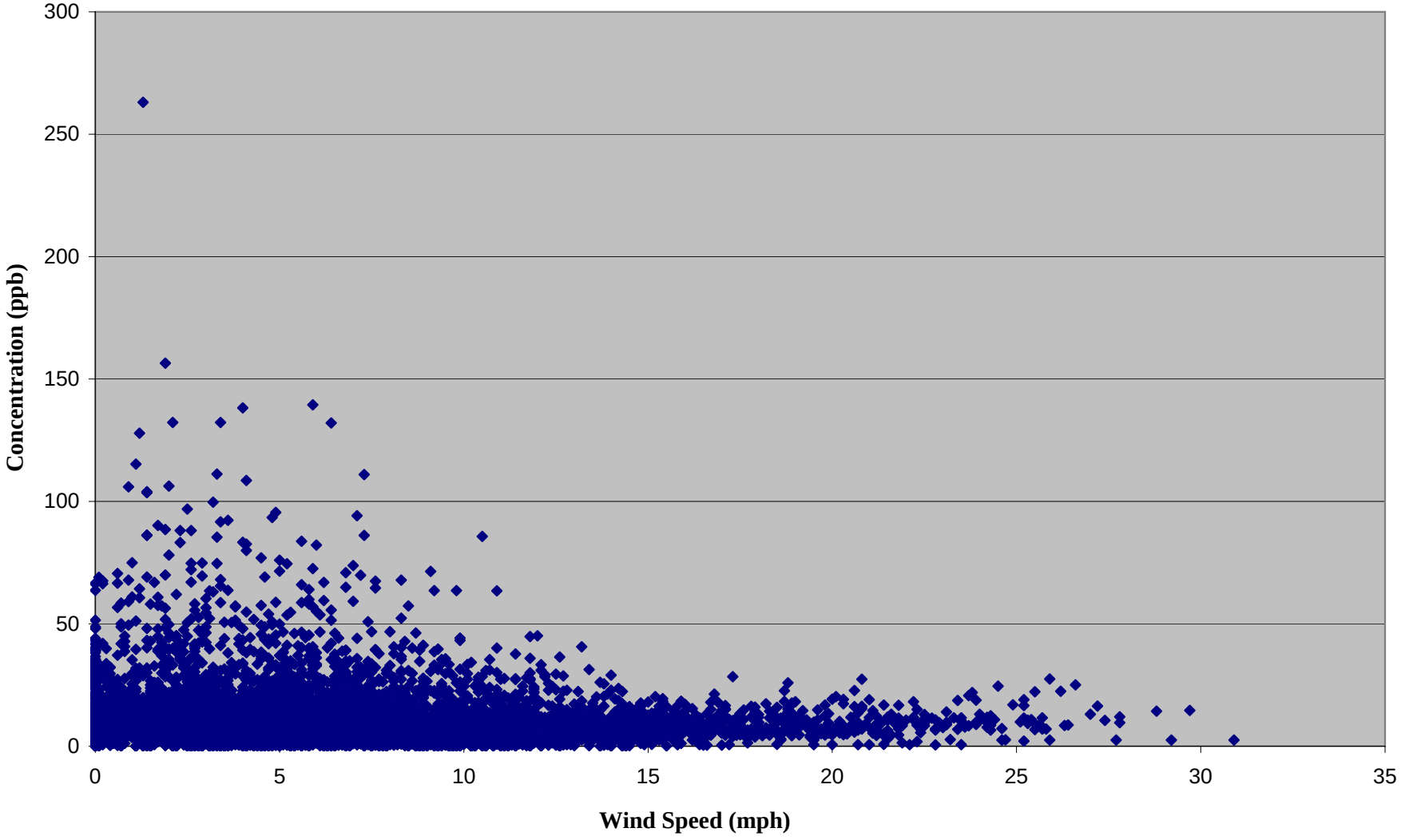
Newkirk CAFO: Ammonia vs Time



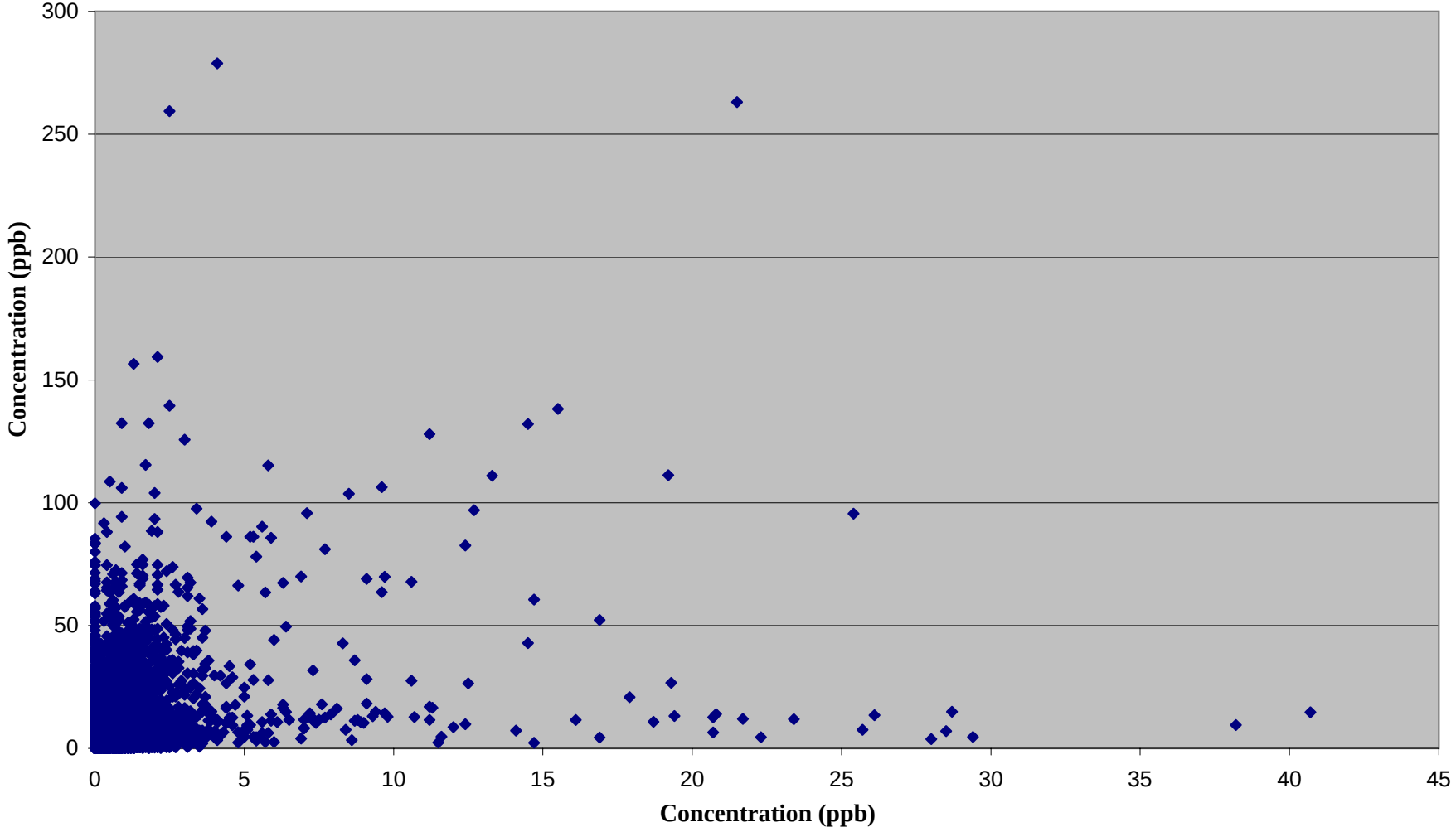
Newkirk CAFO: Hydrogen Sulfide vs Wind Speed



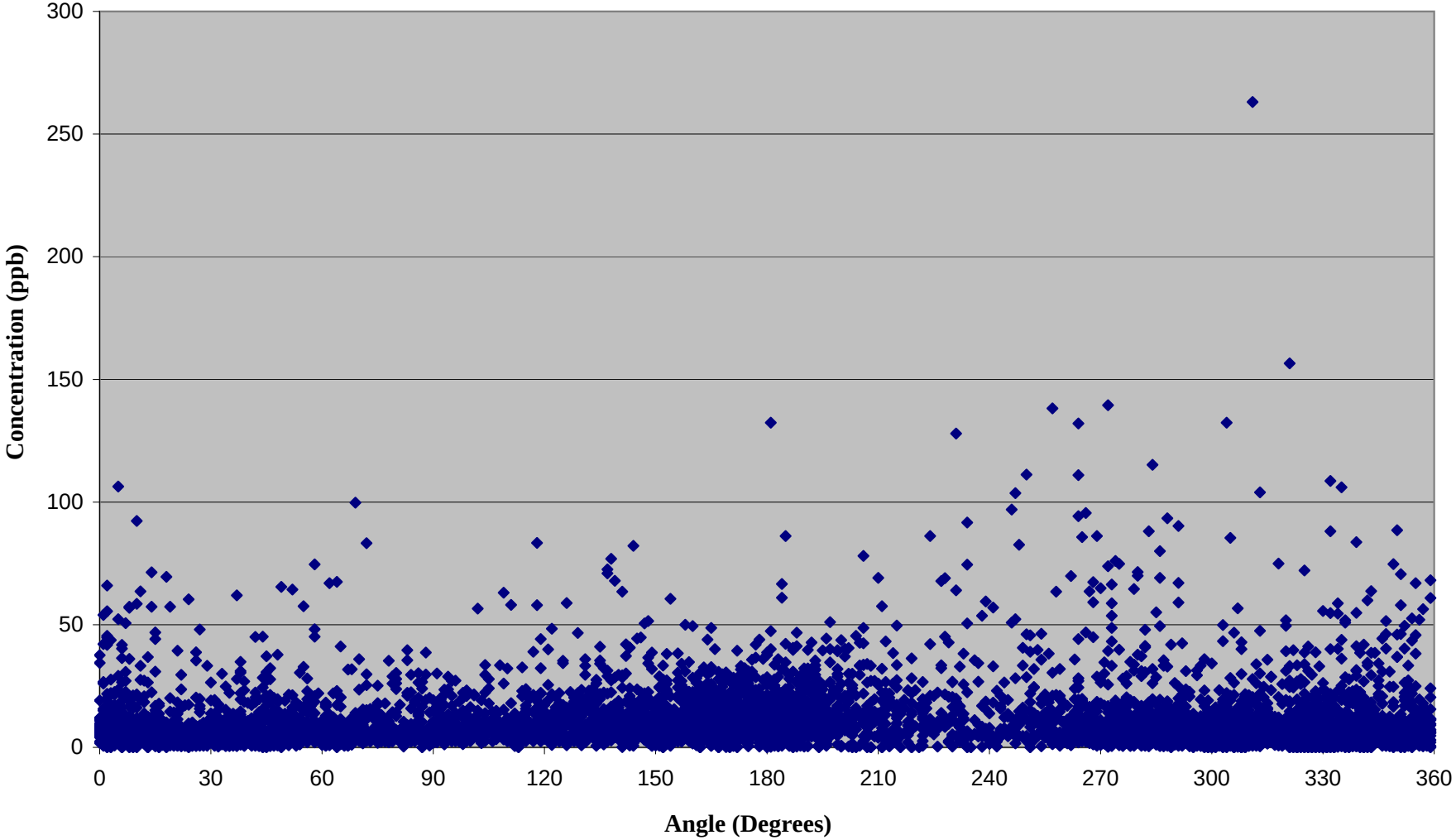
Newkirk CAFO: Ammonia vs Wind Speed



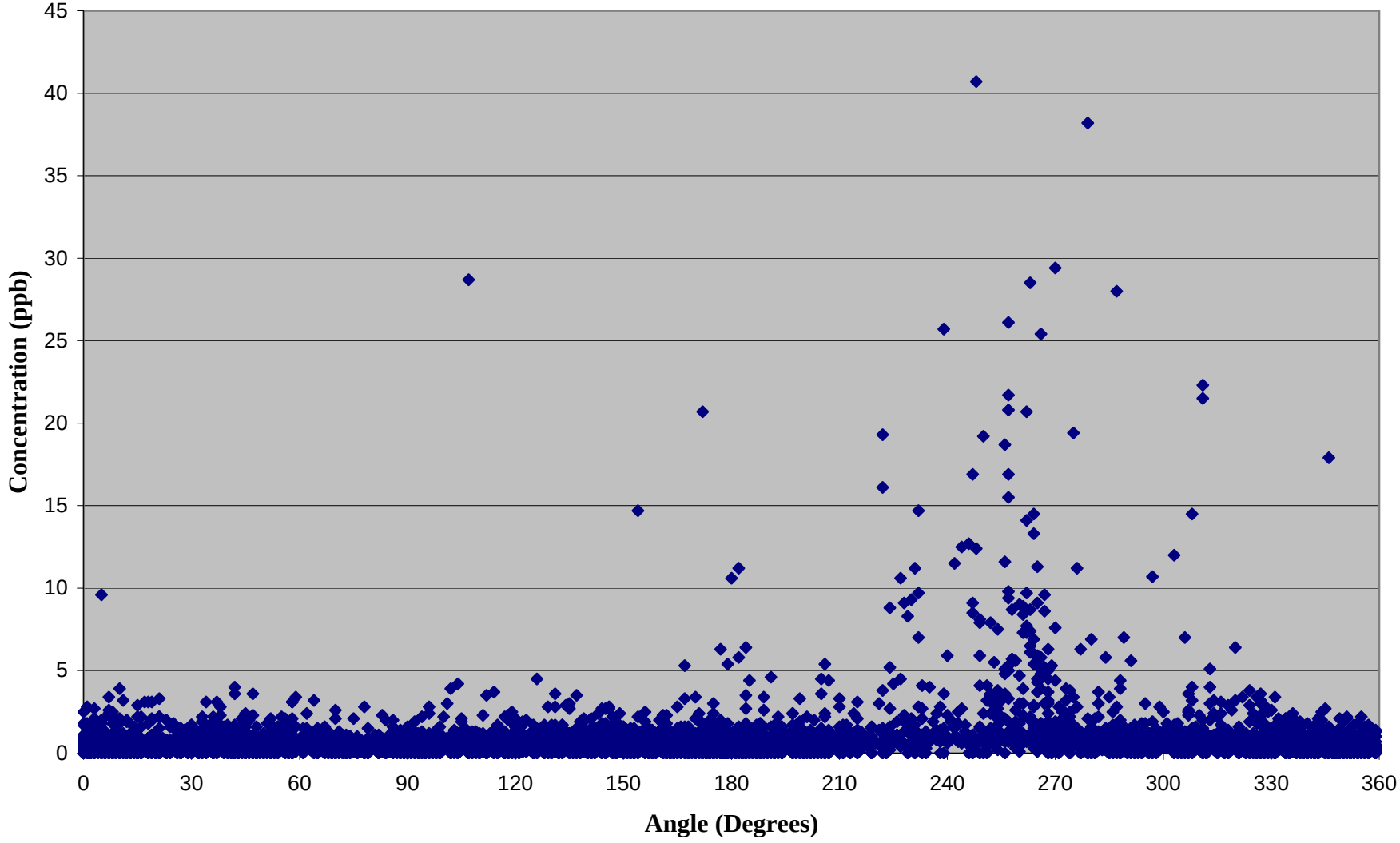
Newkirk CAFO: Ammonia vs Hydrogen Sulfide



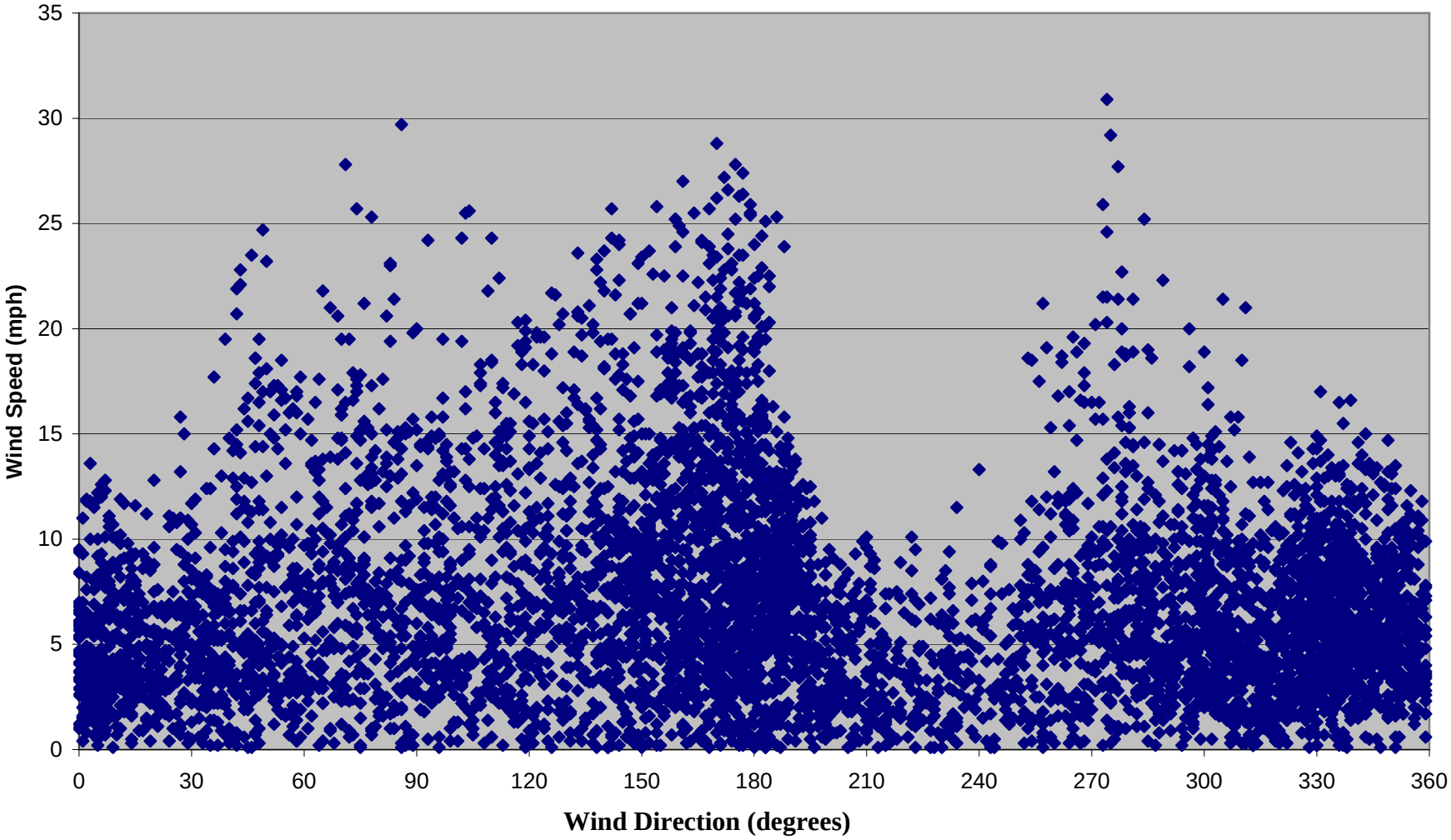
Newkirk CAFO: Ammonia vs Wind Direction



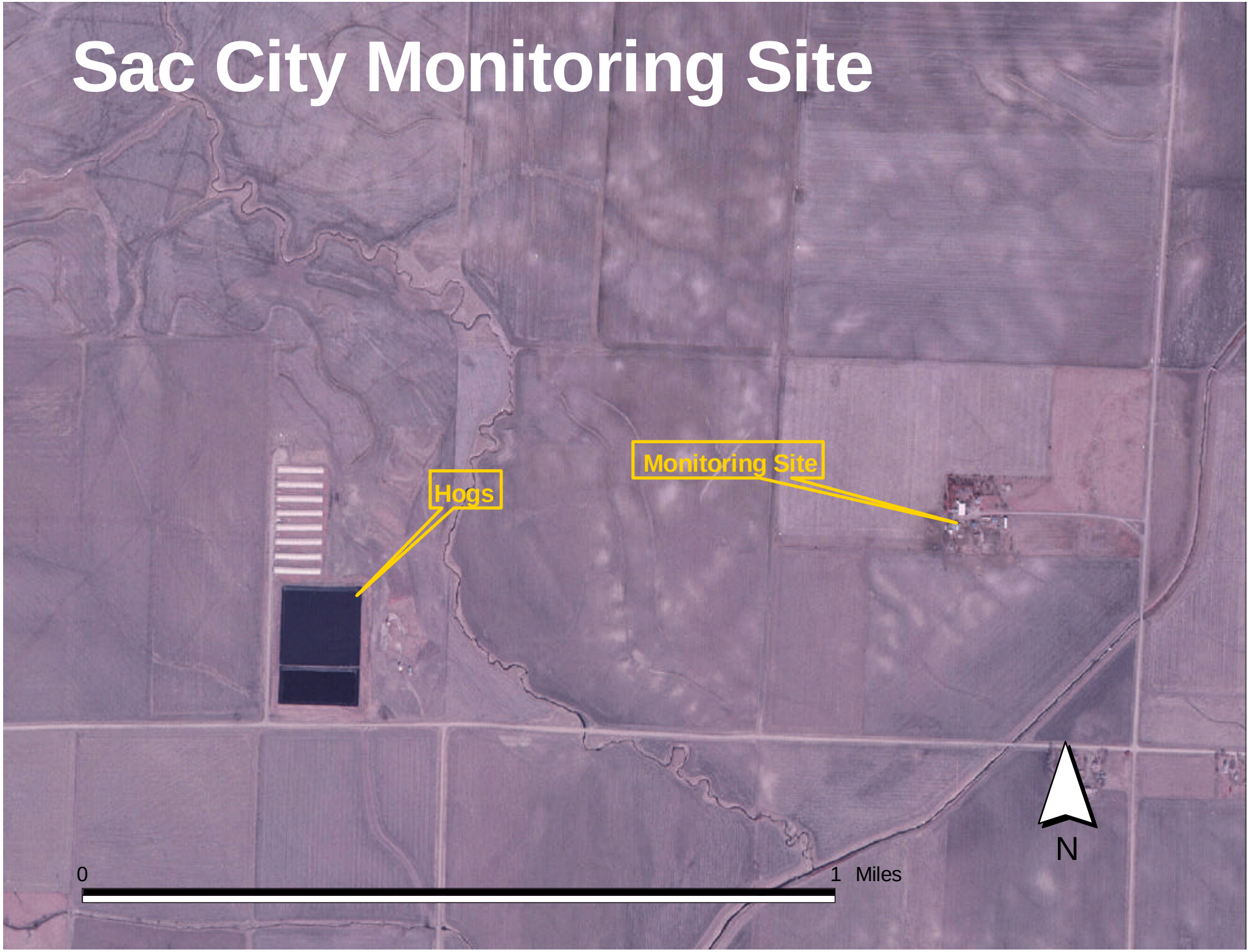
Newkirk CAFO-Hydrogen Sulfide vs Wind Direction



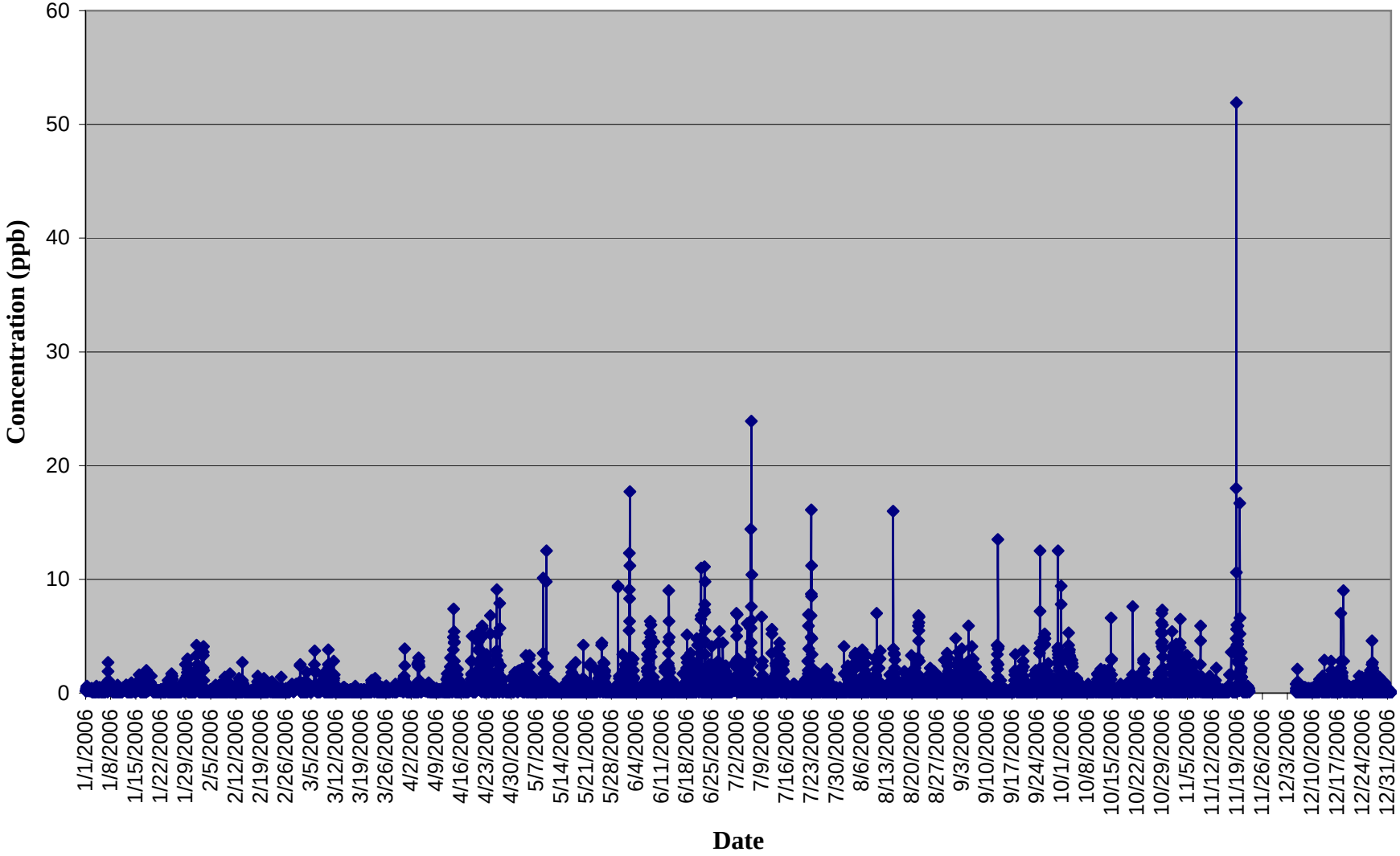
Newkirk CAFO: Wind Speed vs Wind Direction



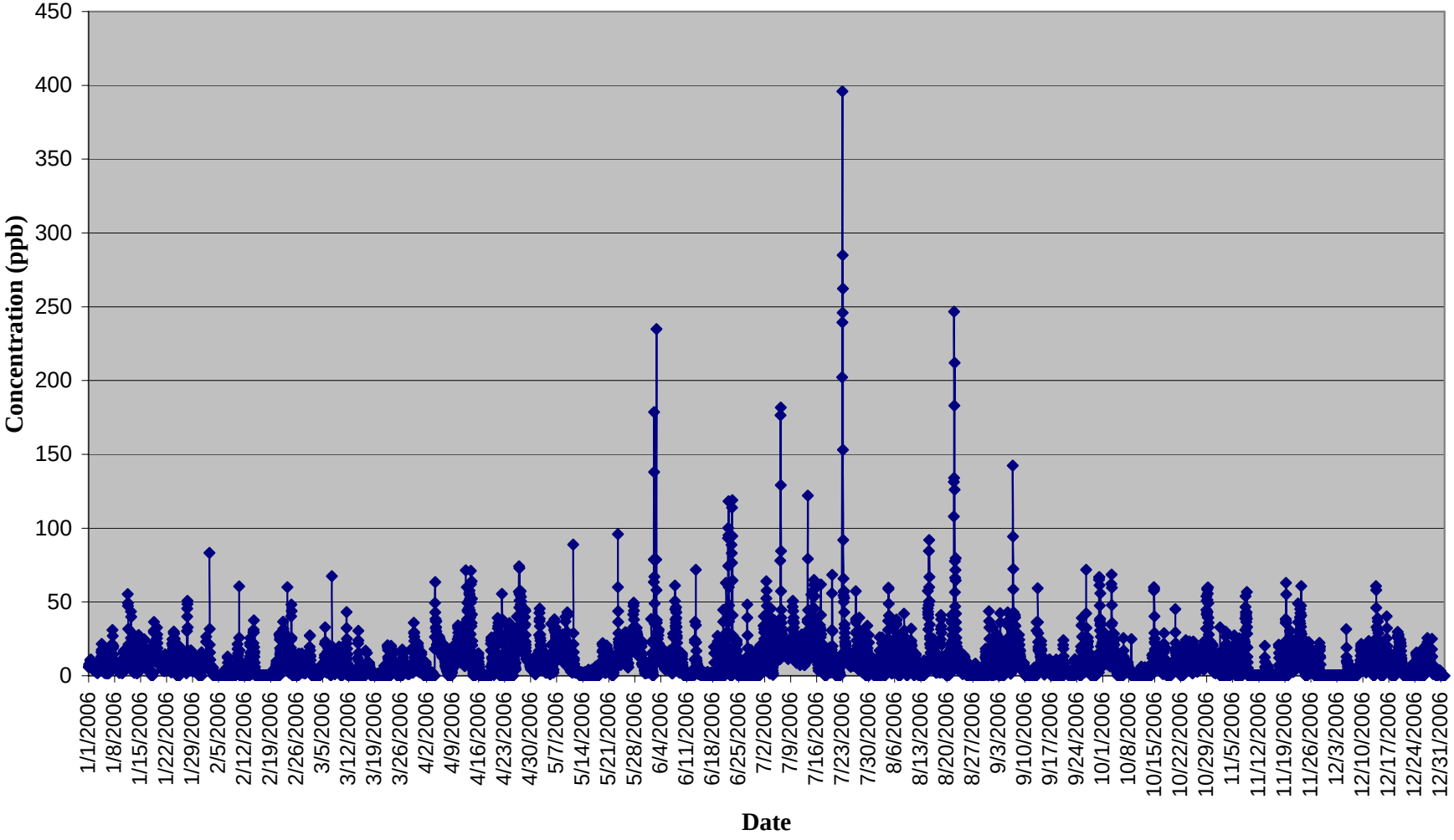
Sac City Monitoring Site



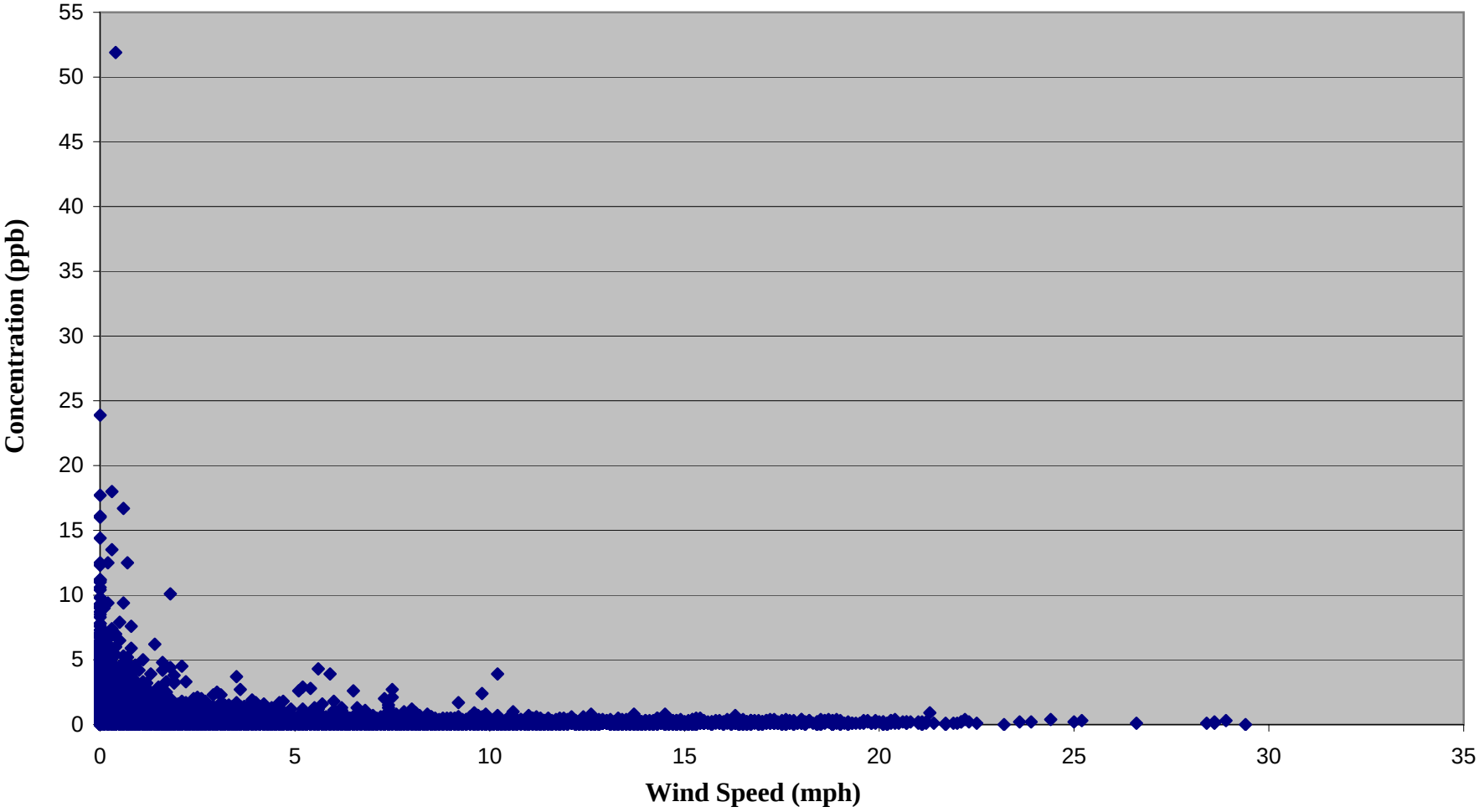
Sac City CAFO: Hydrogen Sulfide vs Time



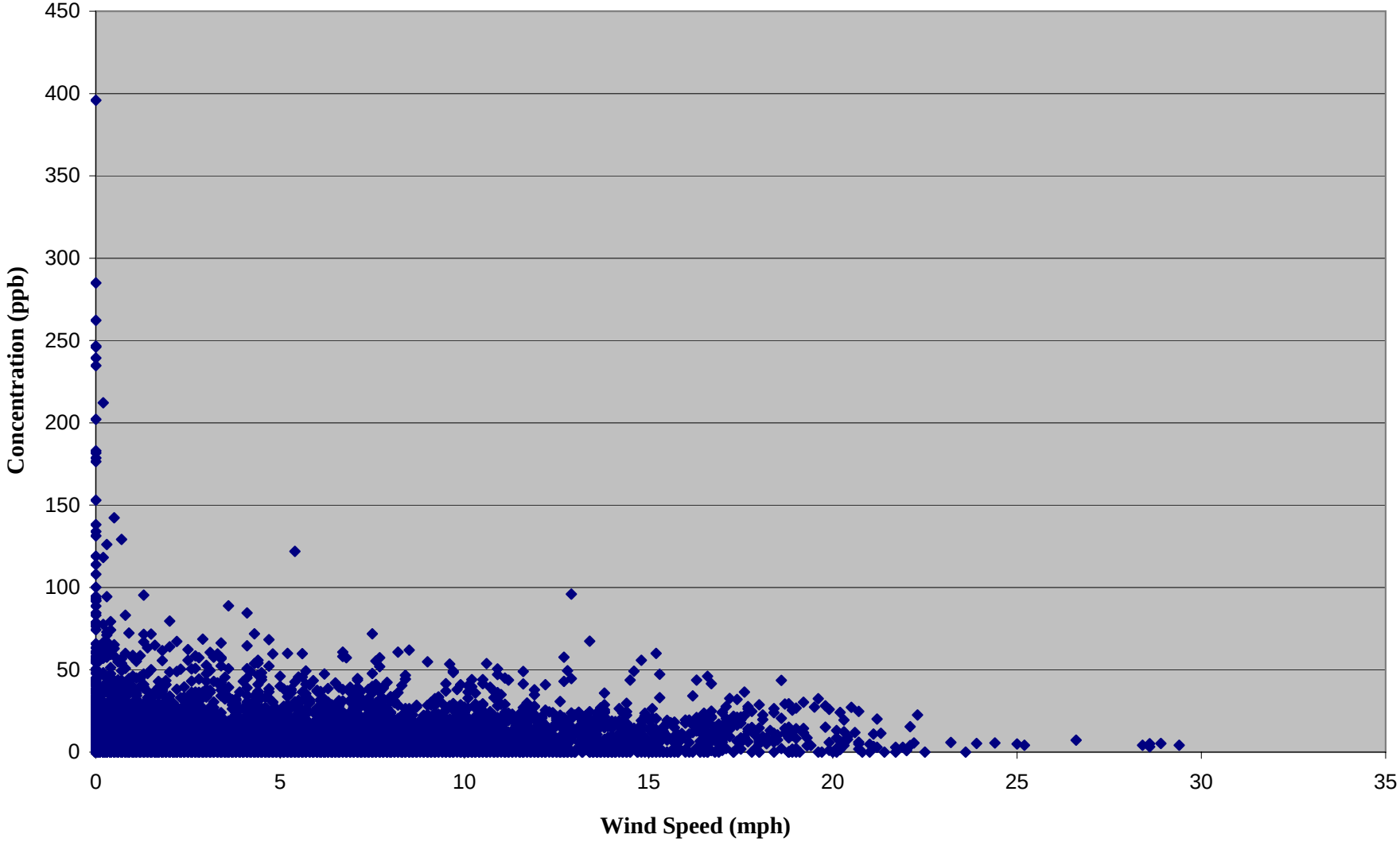
Sac City CAFO: Ammonia vs Time



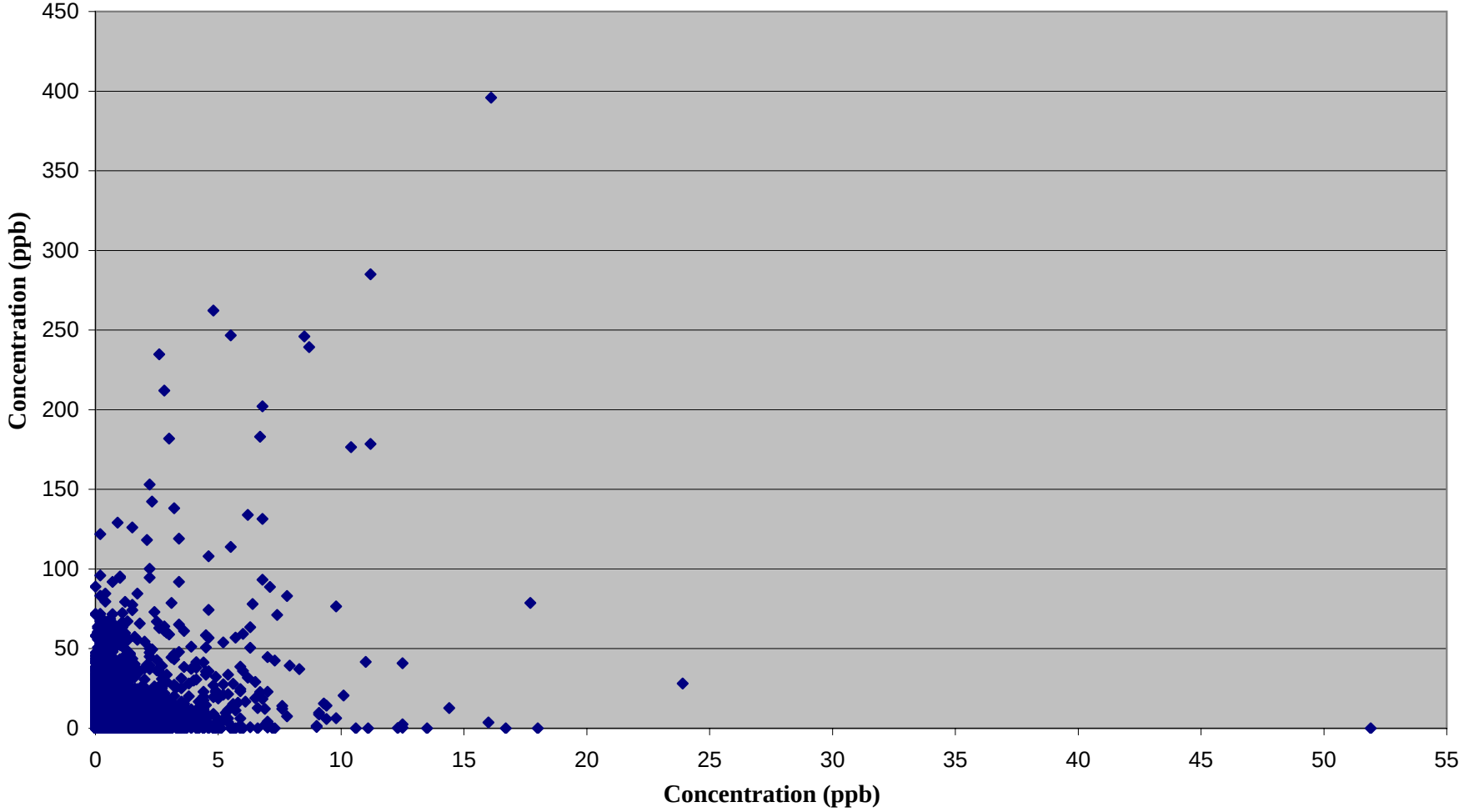
Sac City CAFO: Hydrogen Sulfide vs Wind Speed



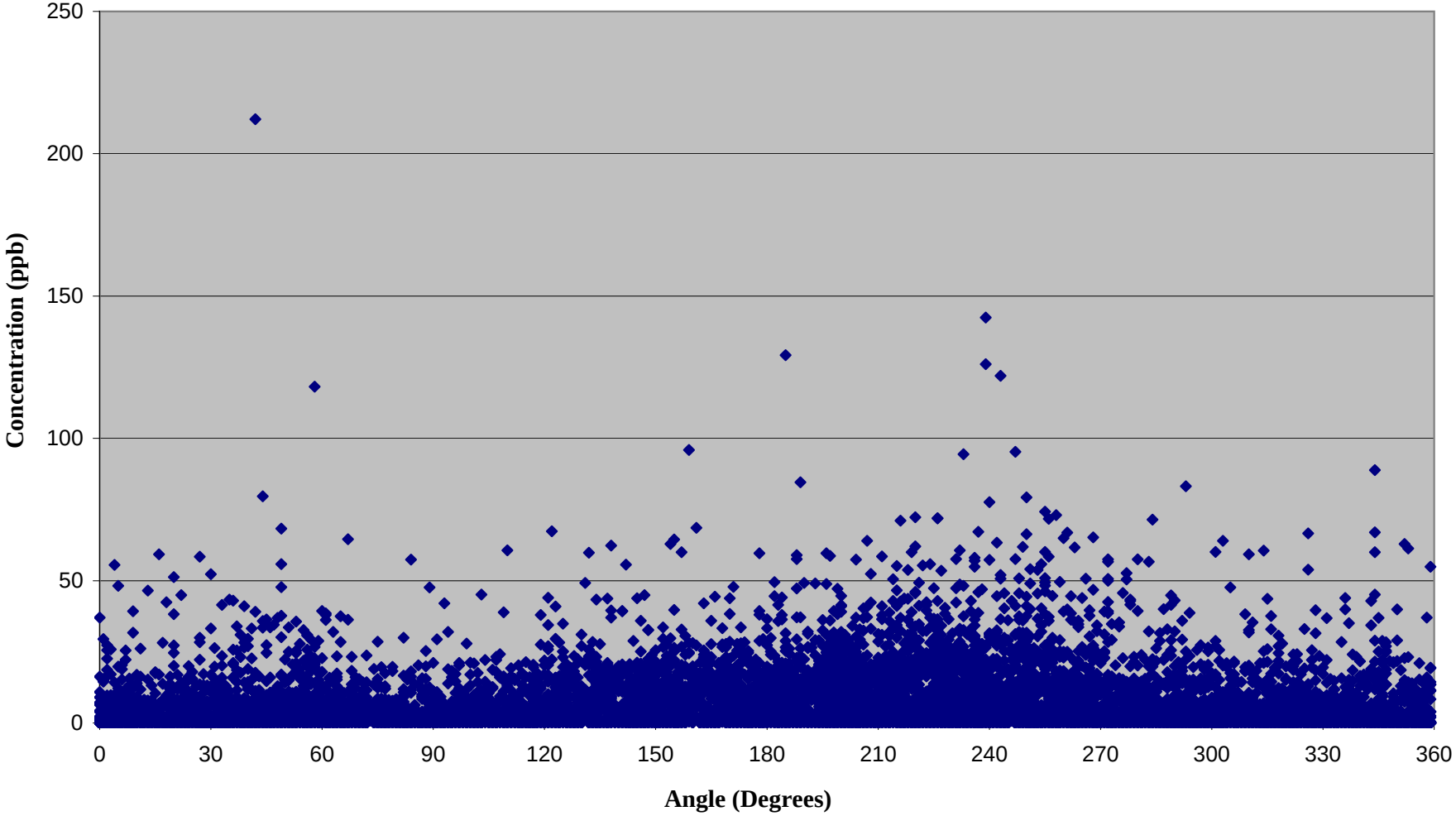
Sac City CAFO: Ammonia vs Wind Speed



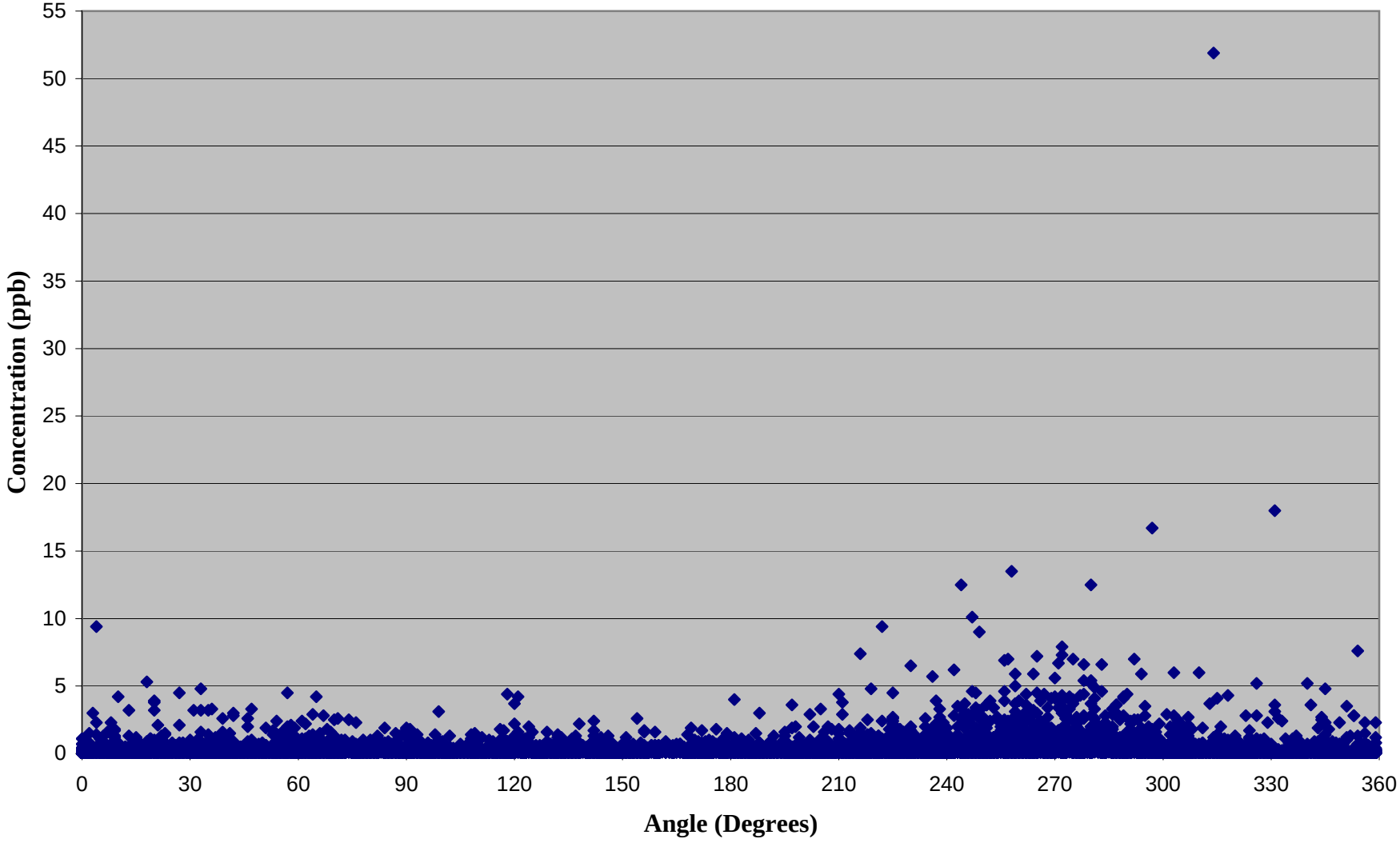
Sac City CAFO: Ammonia vs Hydrogen Sulfide



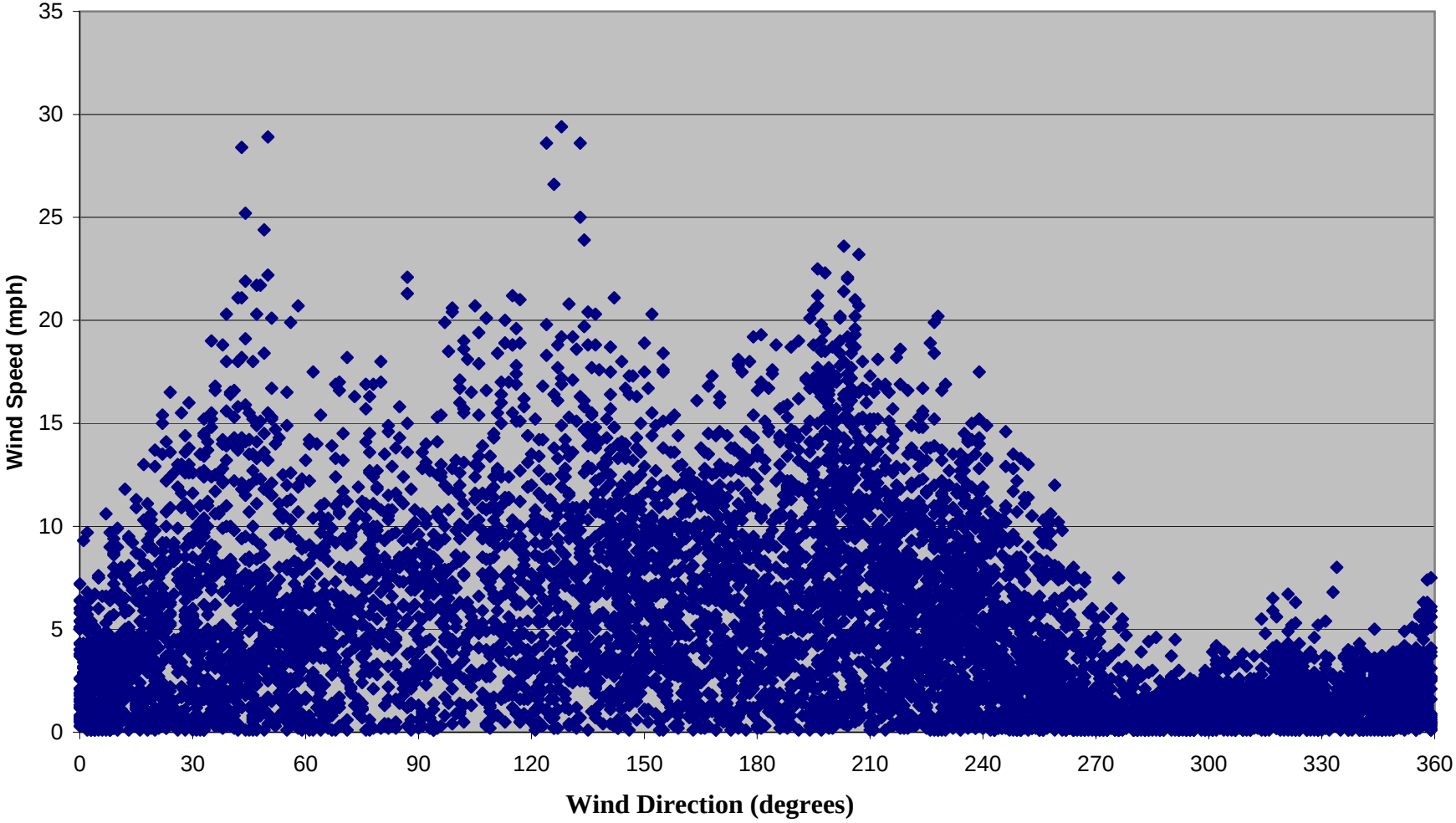
Sac City CAFO: Ammonia vs Wind Direction

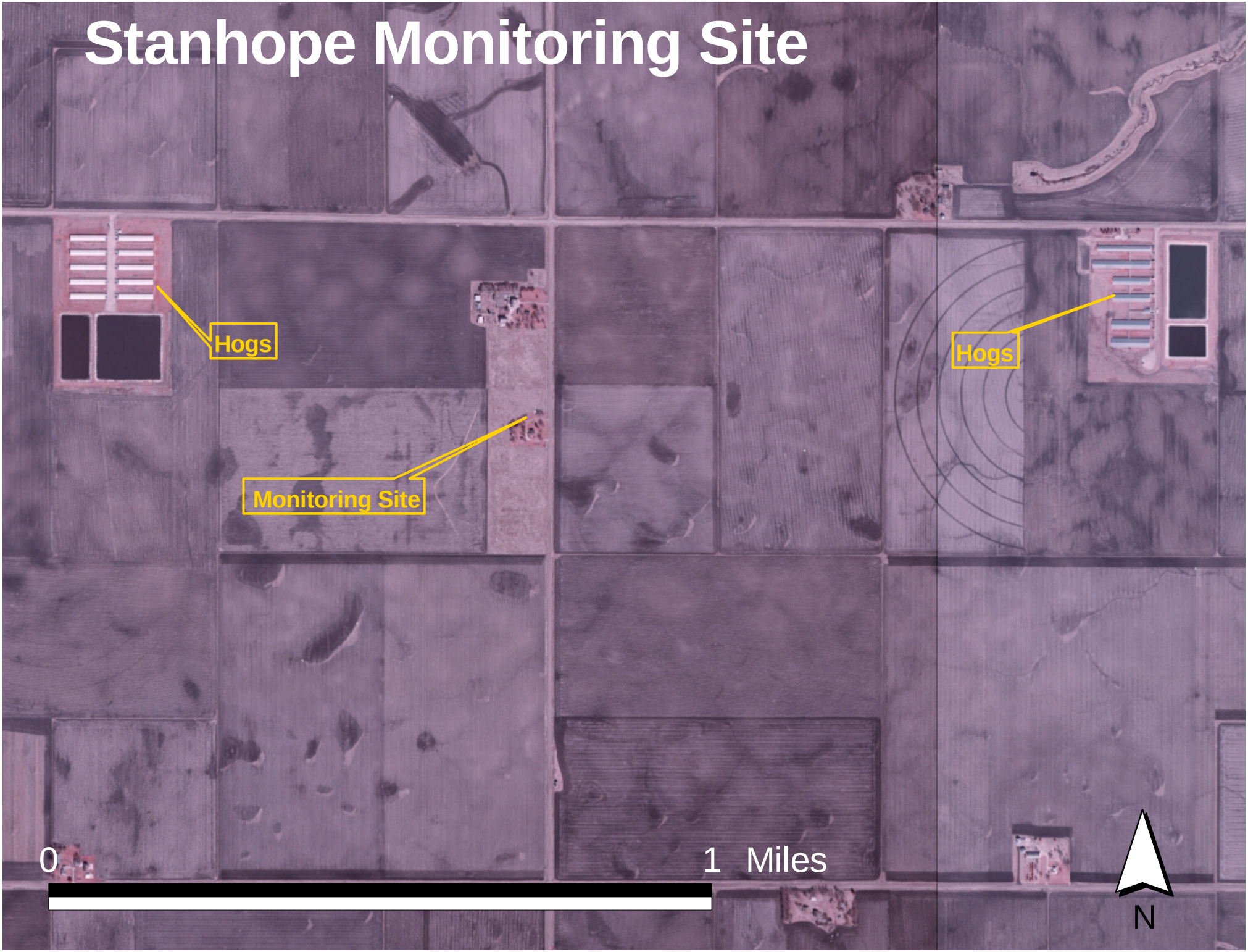


Sac City CAFO-Hydrogen Sulfide vs Wind Direction

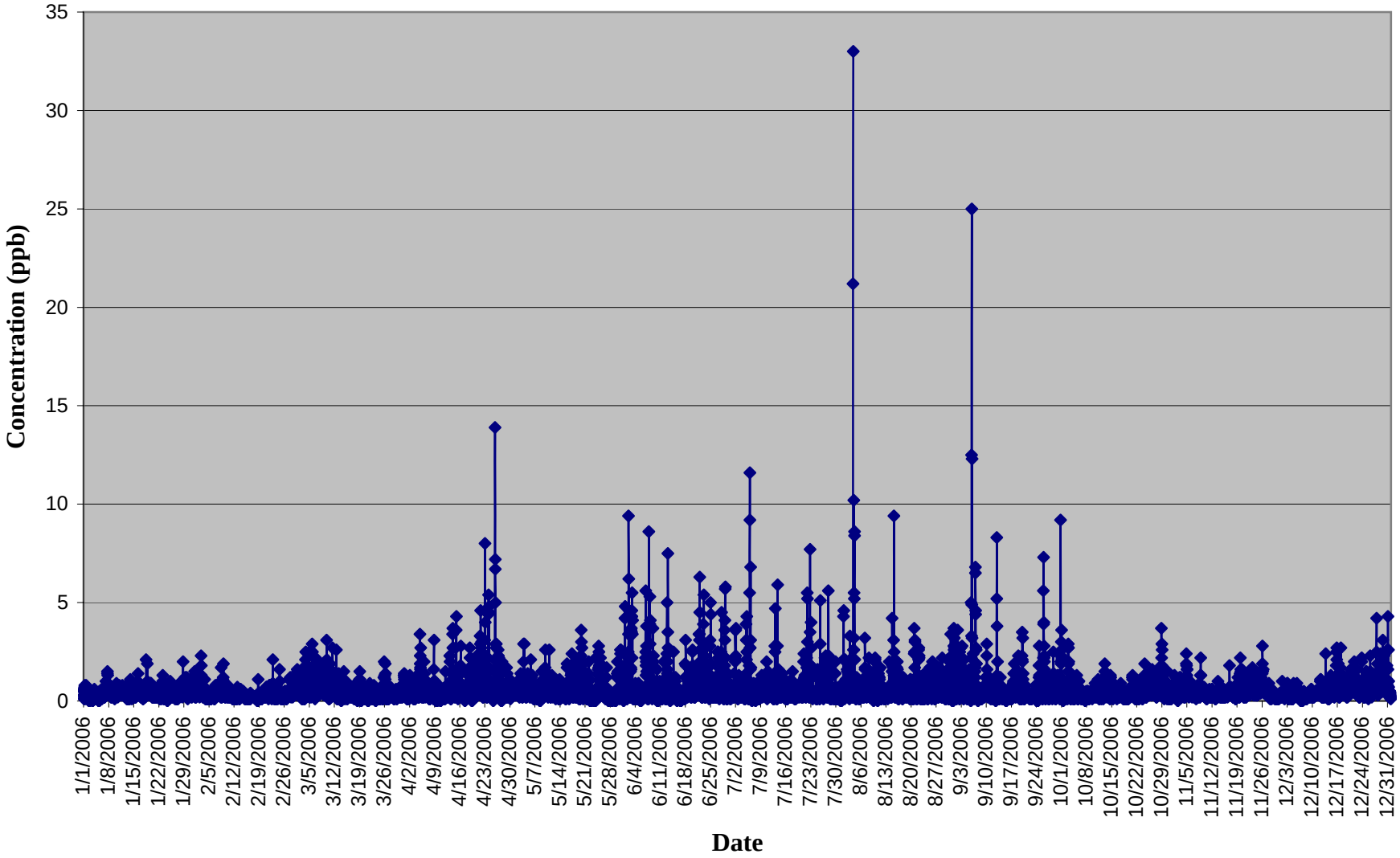


Sac City CAFO: Wind Speed vs Wind Direction

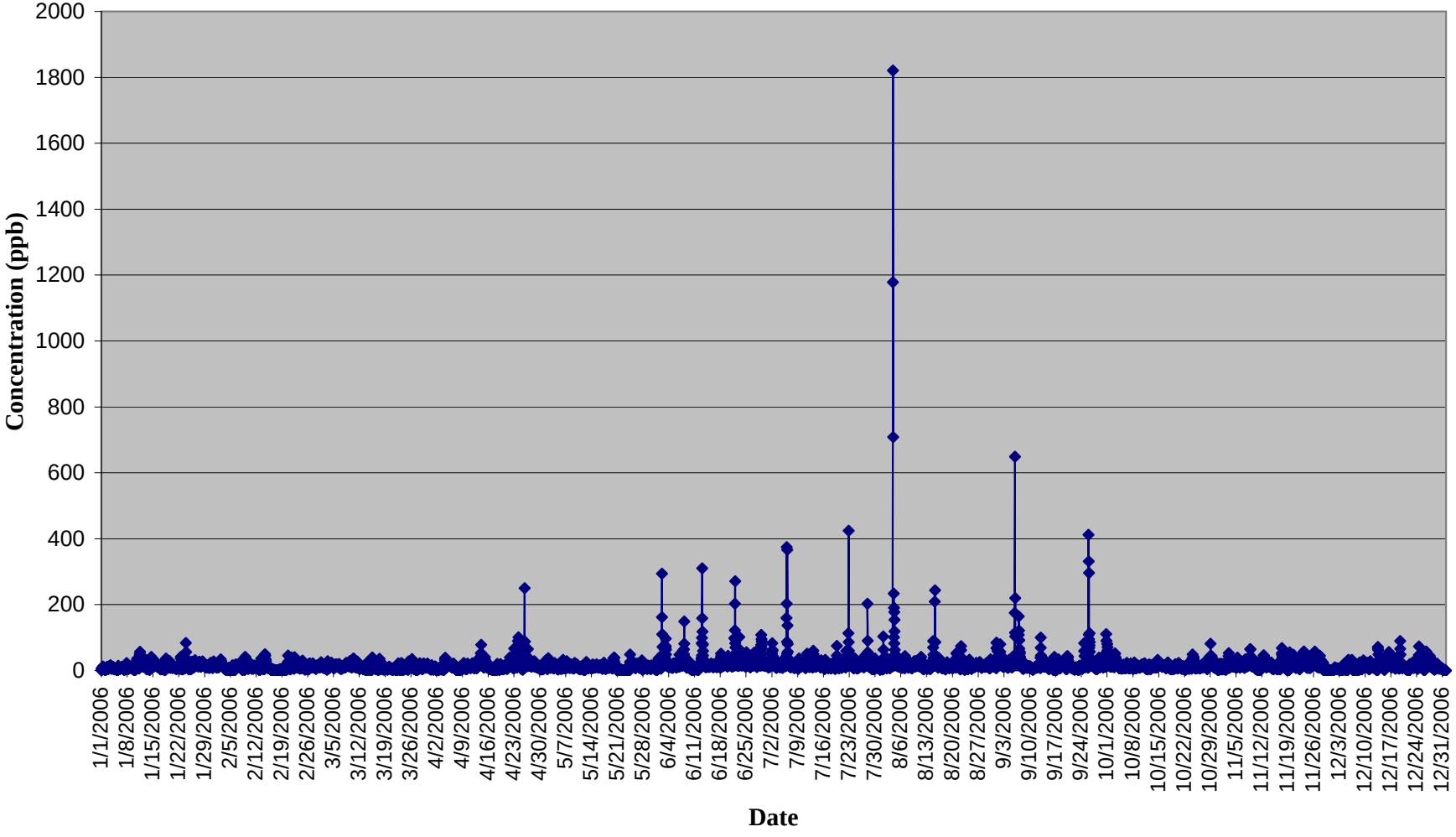



Stanhope Monitoring Site
Hogs
Hogs
Monitoring Site
0
1 Miles
N

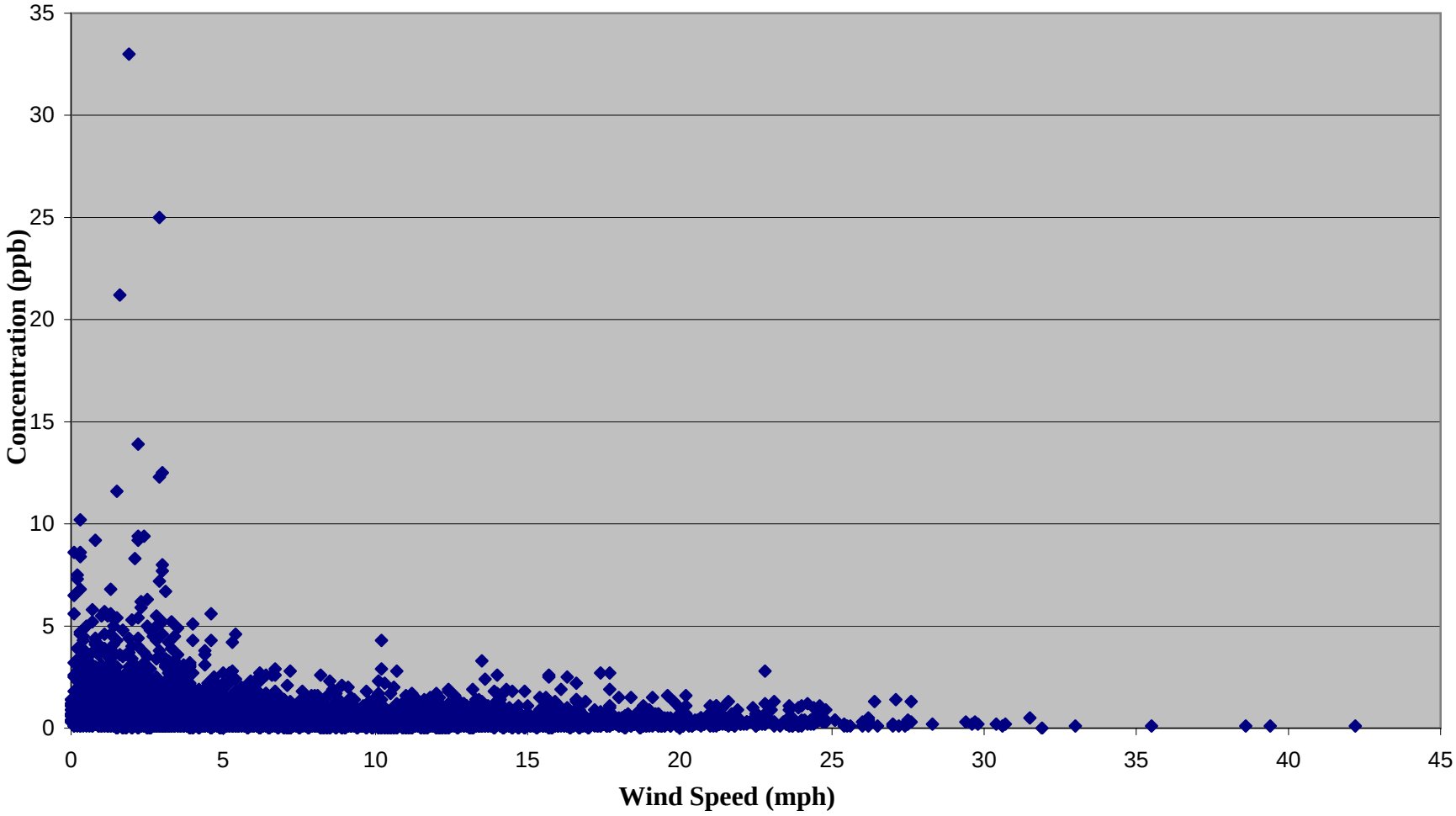
Stanhope CAFO: Hydrogen Sulfide vs Time



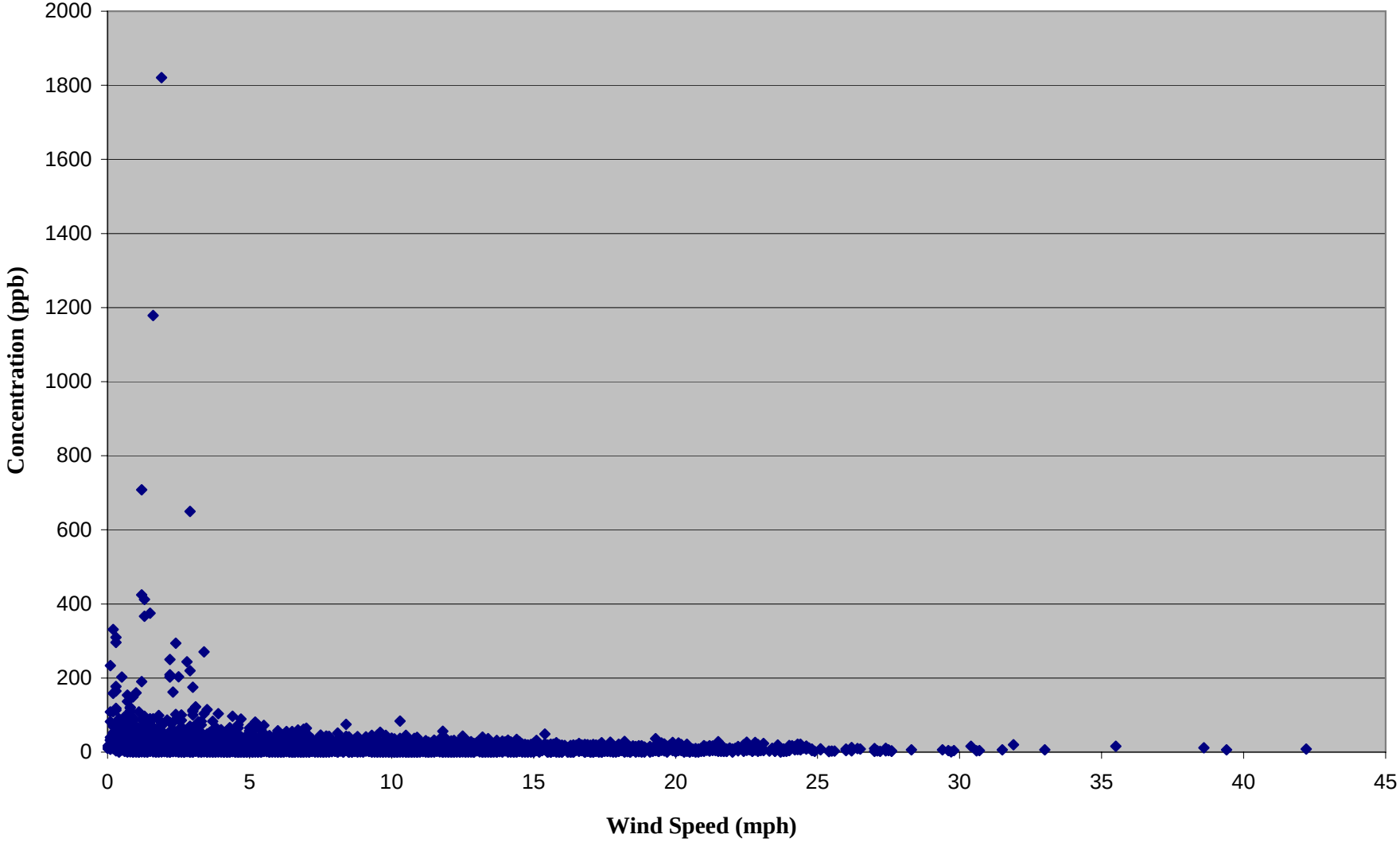
Stanhope CAFO: Ammonia vs Time



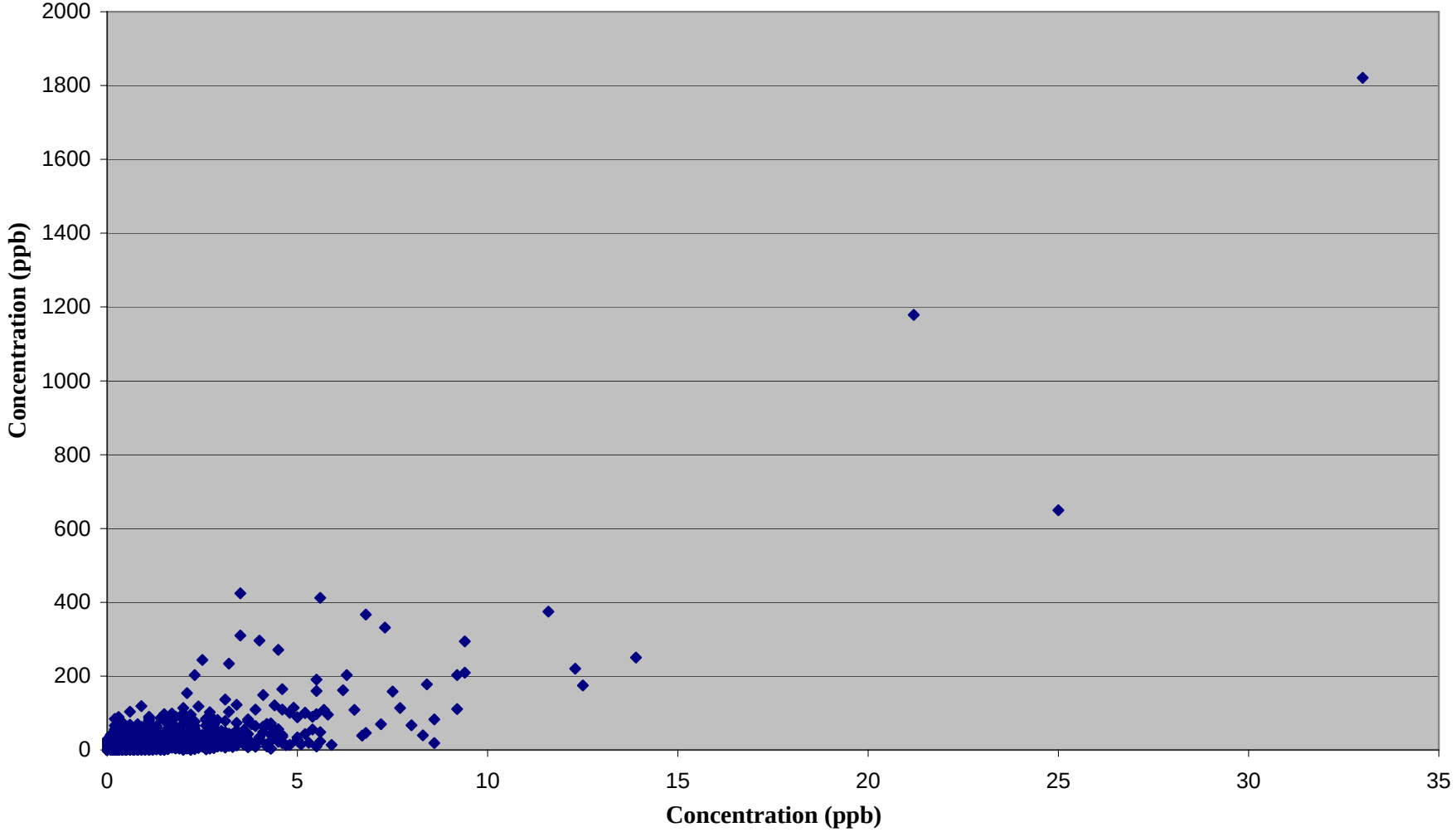
Stanhope CAFO: Hydrogen Sulfide vs Wind Speed

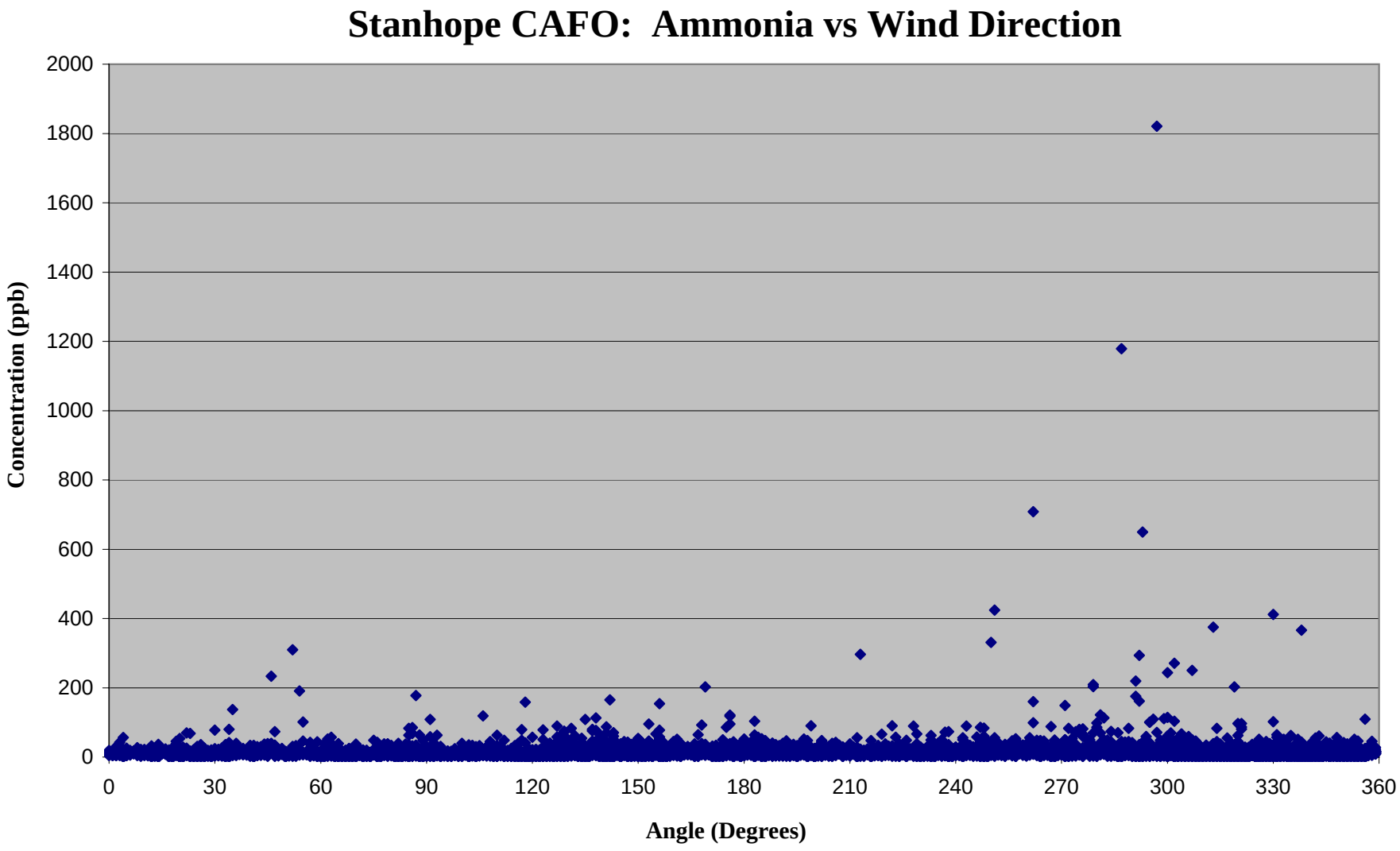


Stanhope CAFO: Ammonia vs Wind Speed

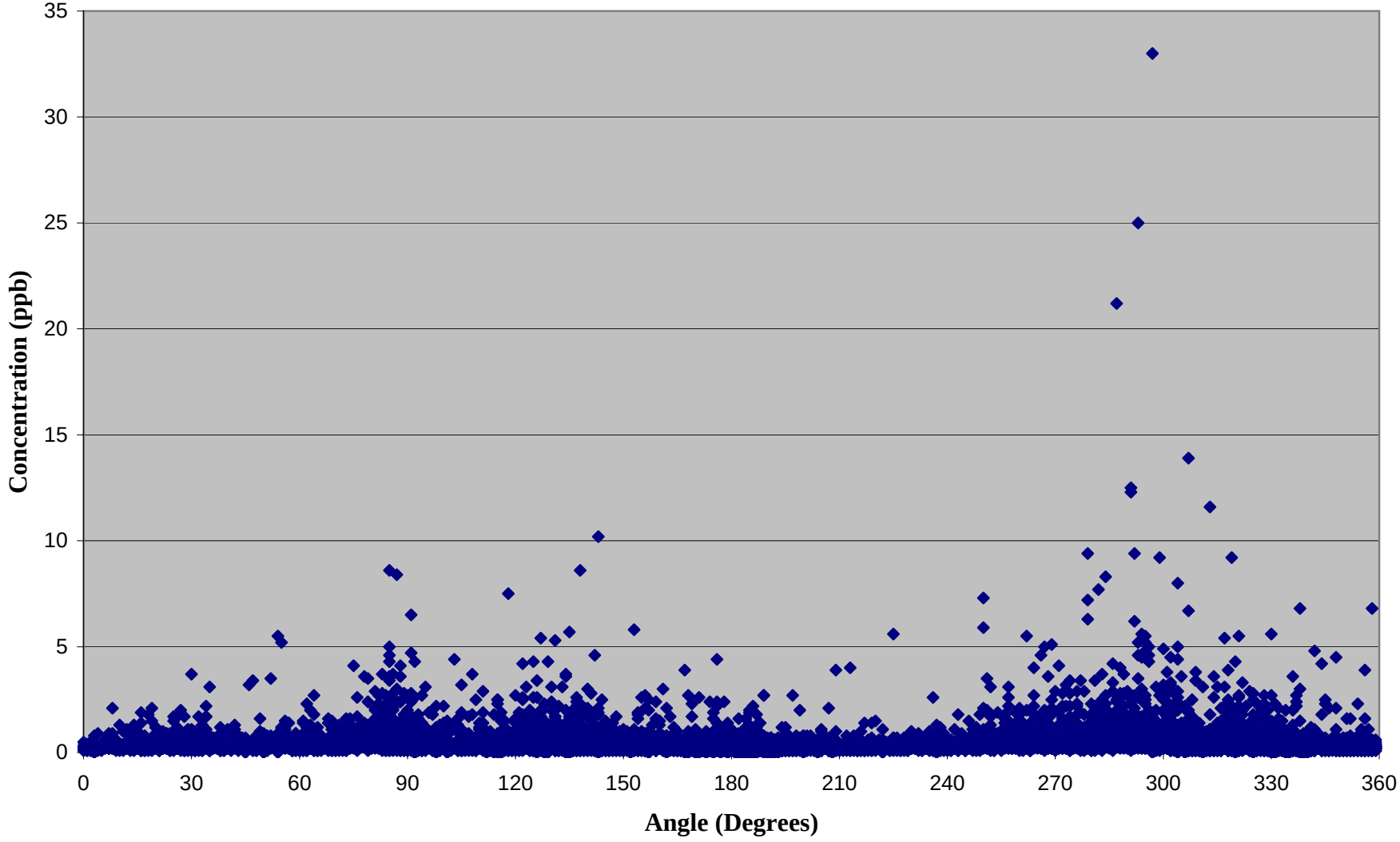


Stanhope CAFO: Ammonia vs Hydrogen Sulfide

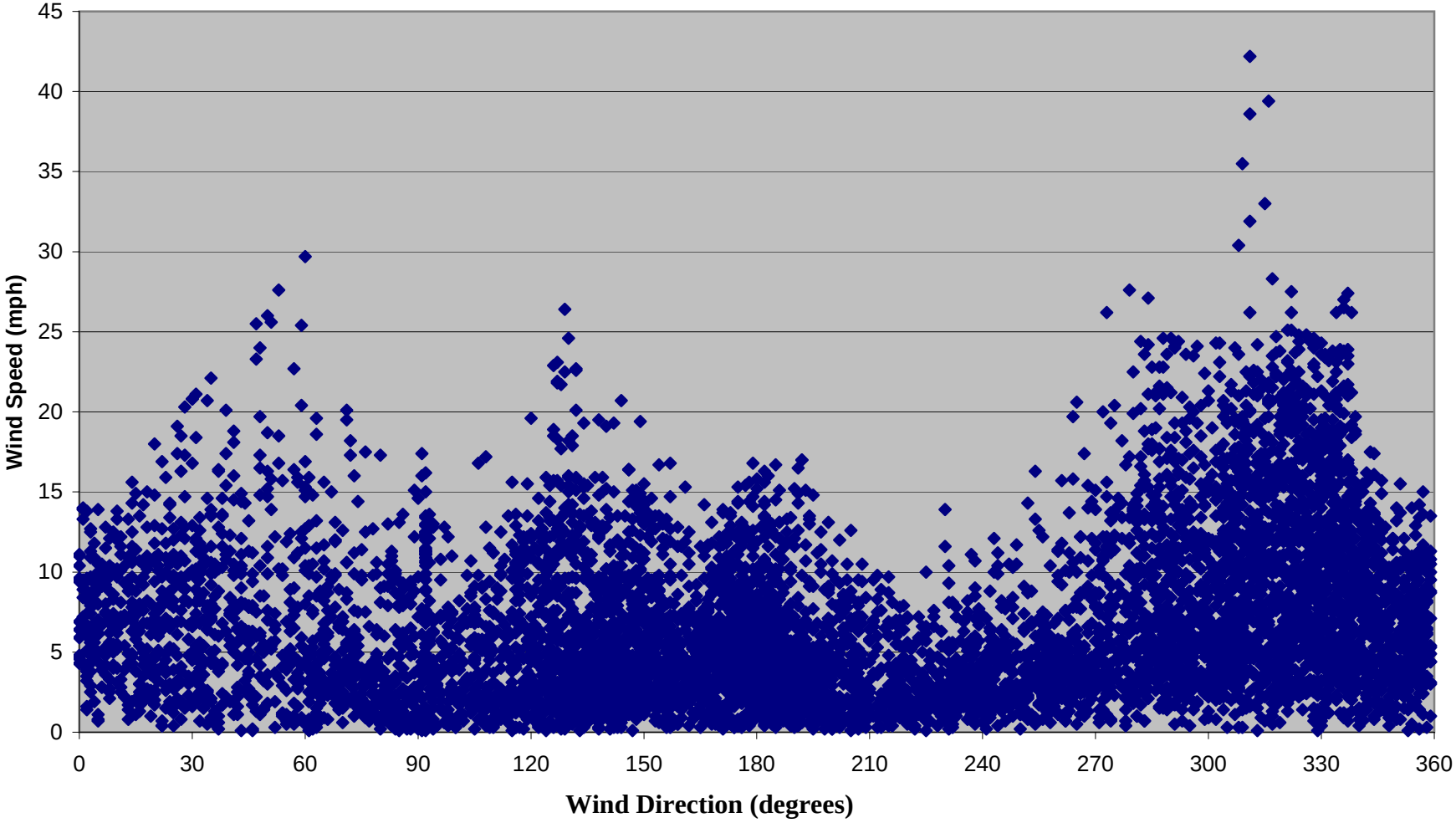


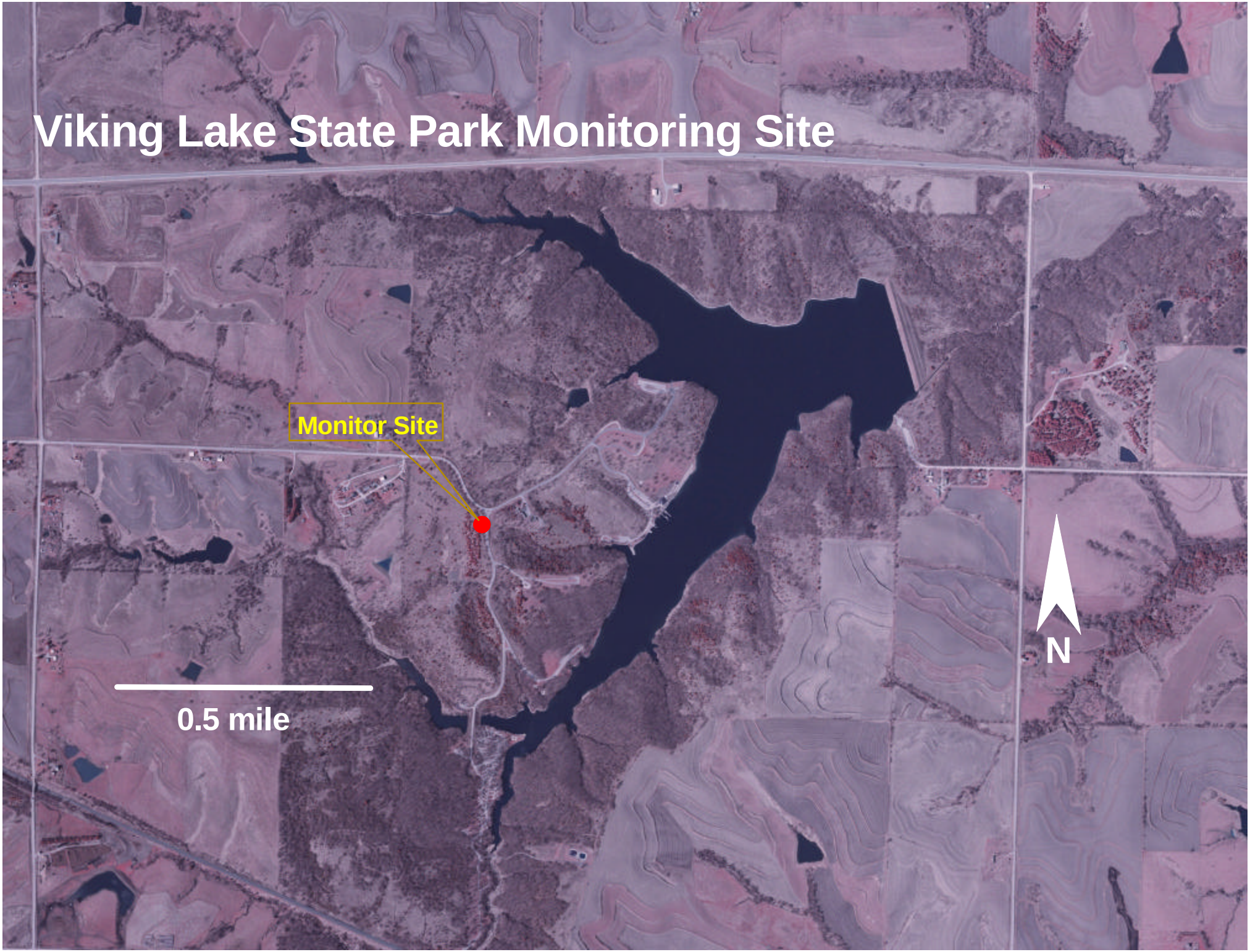

Stanhope CAFO: Ammonia vs Wind Direction
Concentration (ppb)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
30
60
90
120
150
180
210
240
270
300
330
360
Angle (Degrees)

Stanhope CAFO-Hydrogen Sulfide vs Wind Direction

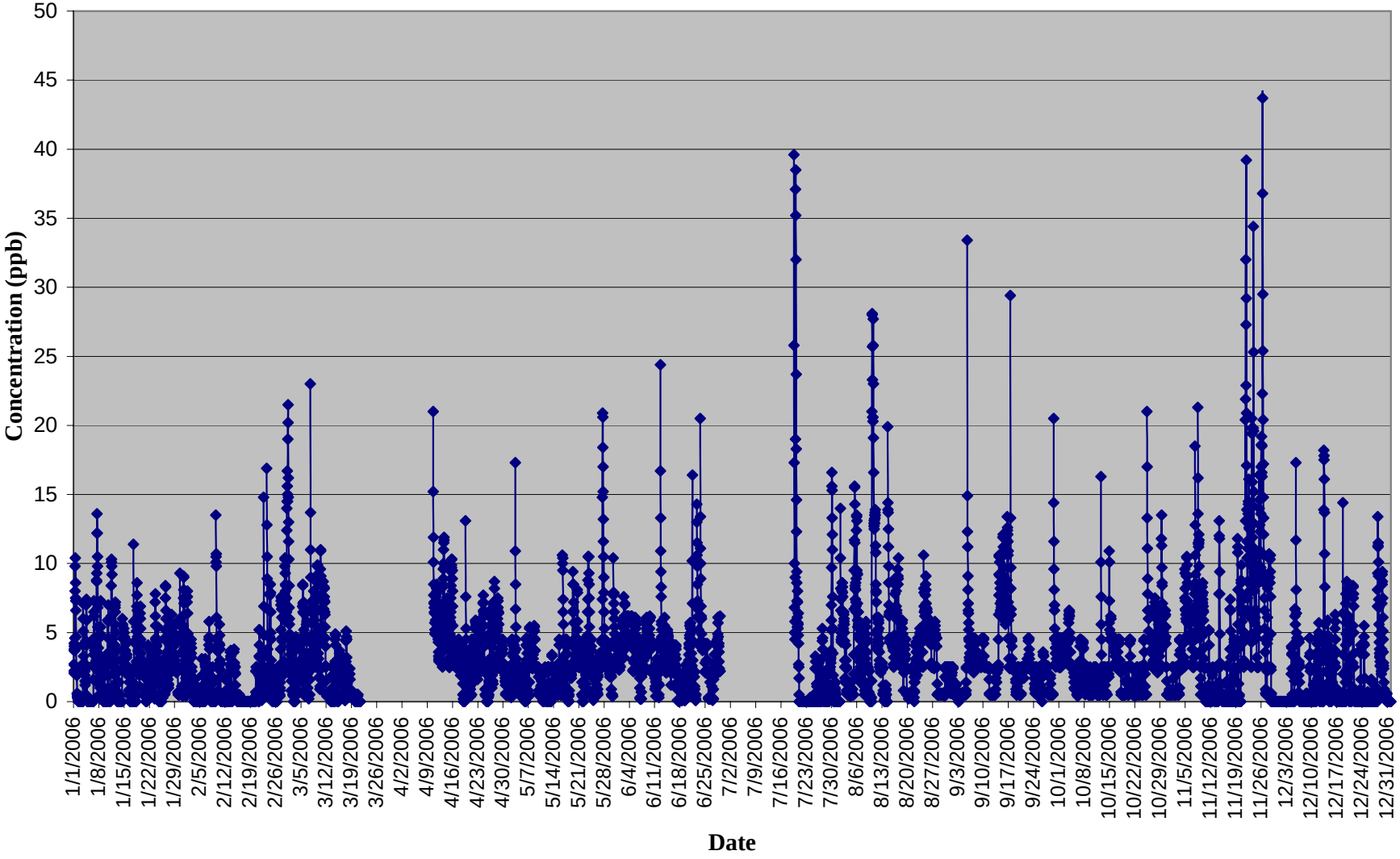


Stanhope CAFO: Wind Speed vs Wind Direction

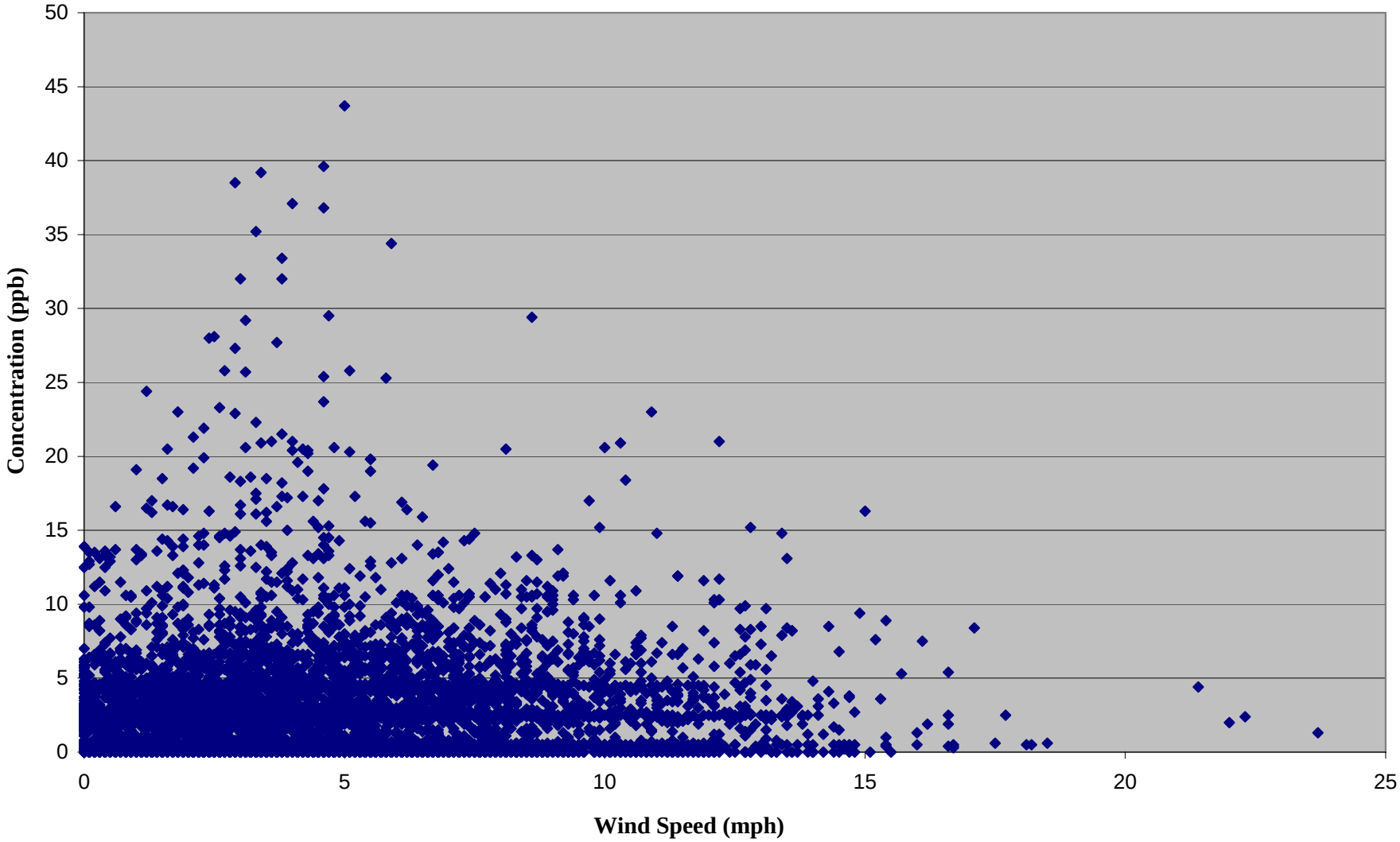



Viking Lake State Park Monitoring Site
Monitor Site
0.5 mile
N

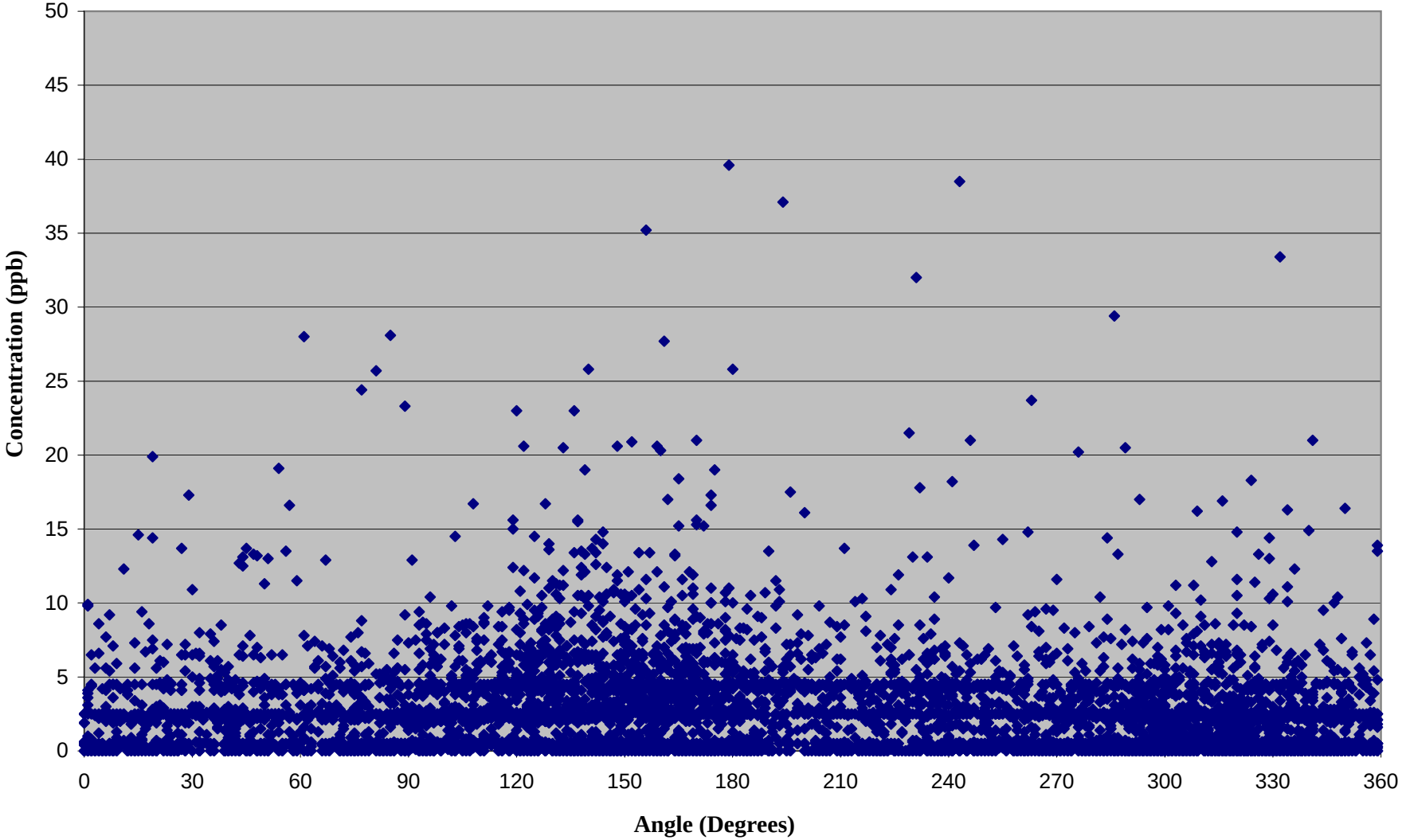
Viking Lake: Ammonia vs Time



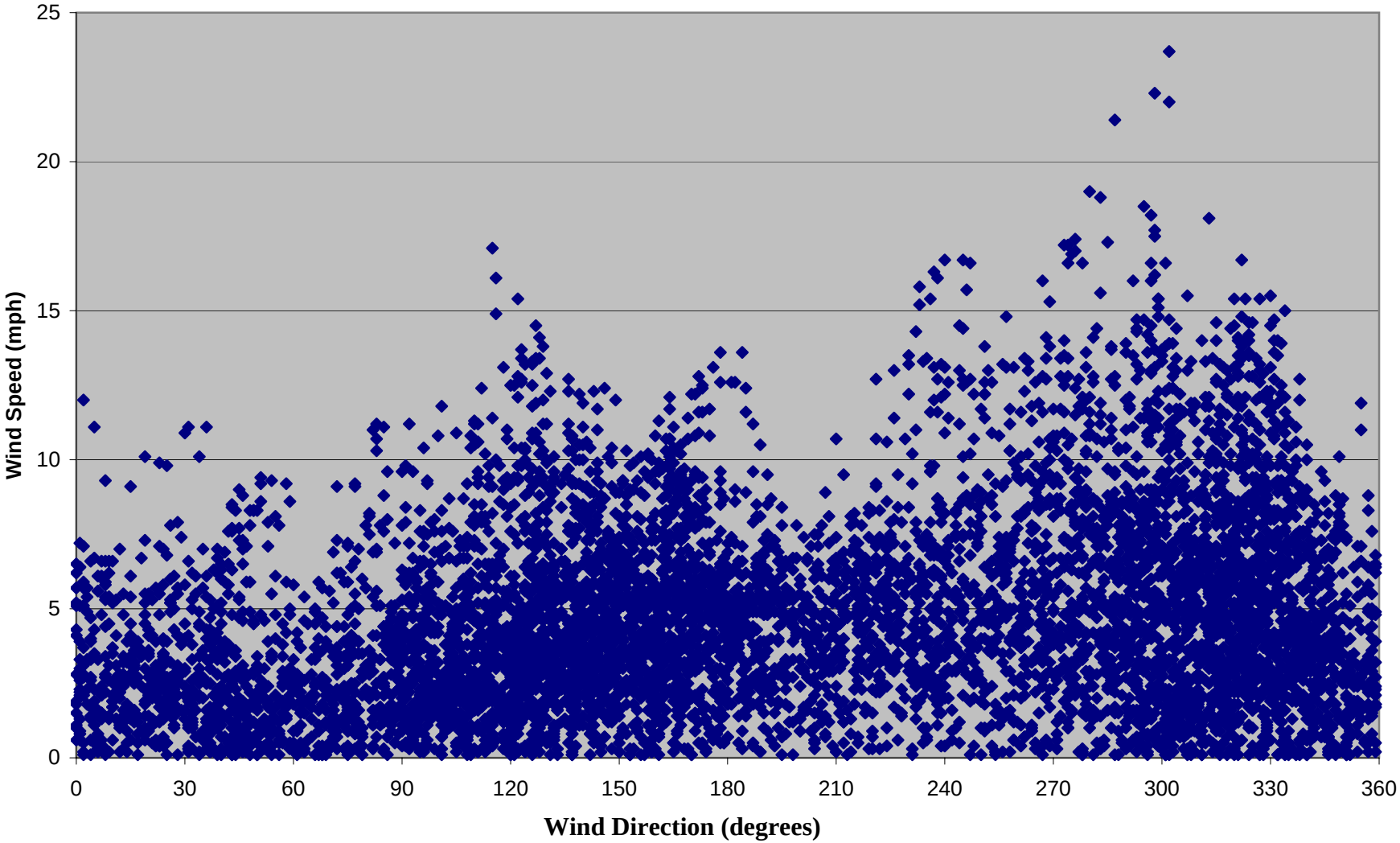
Viking Lake: Ammonia vs Wind Speed



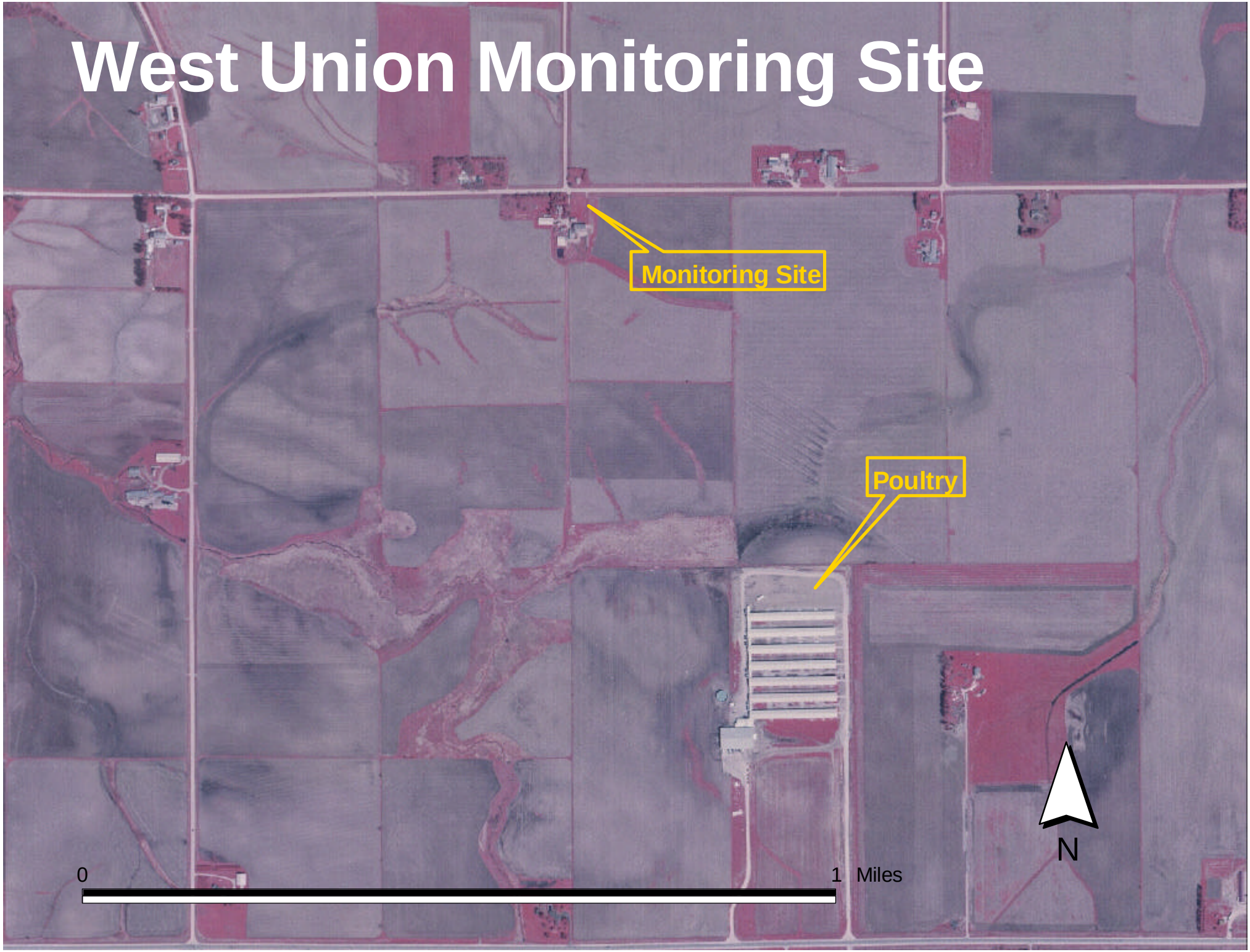
Viking Lake: Ammonia vs Wind Direction



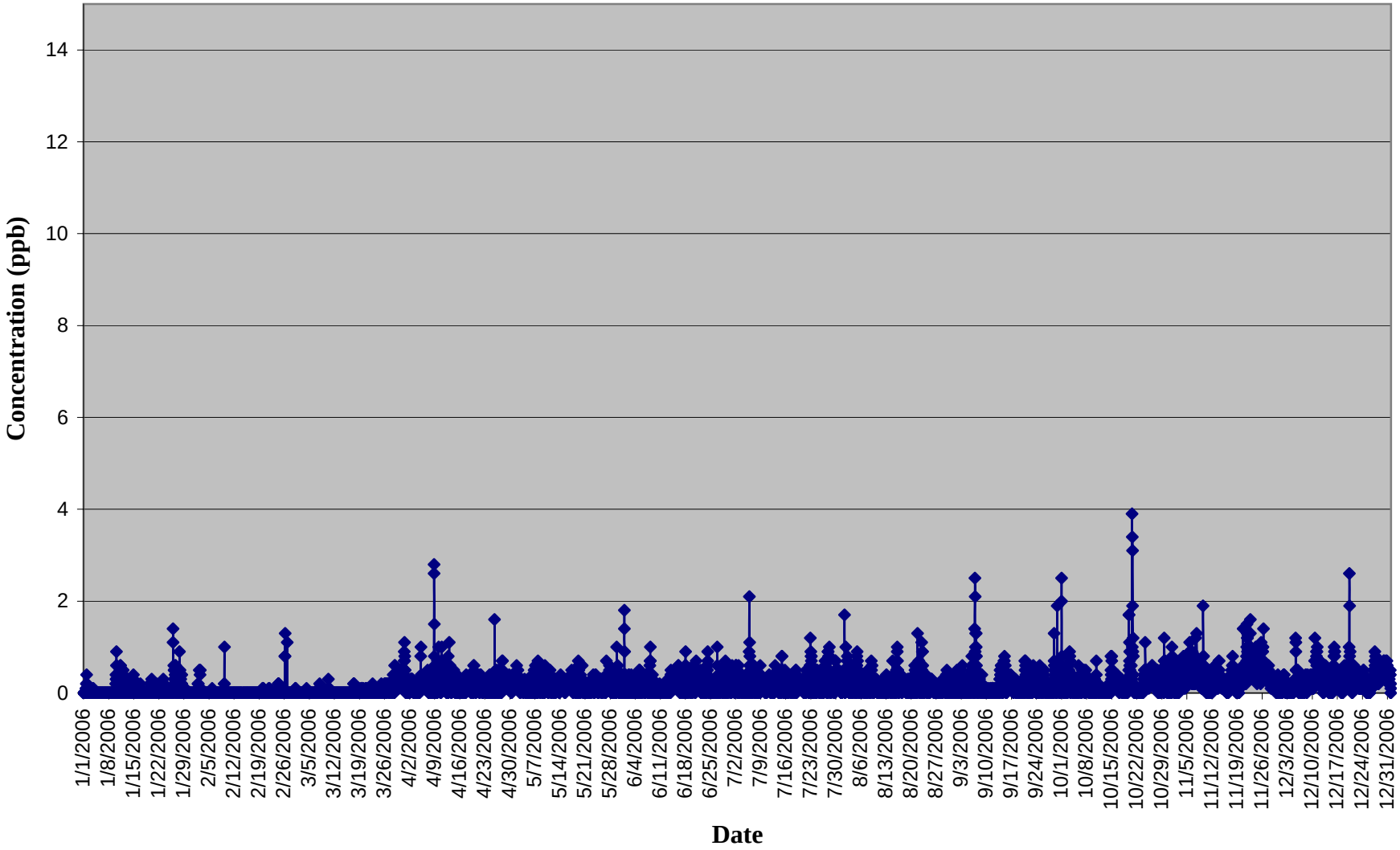
Viking Lake: Wind Speed vs Wind Direction



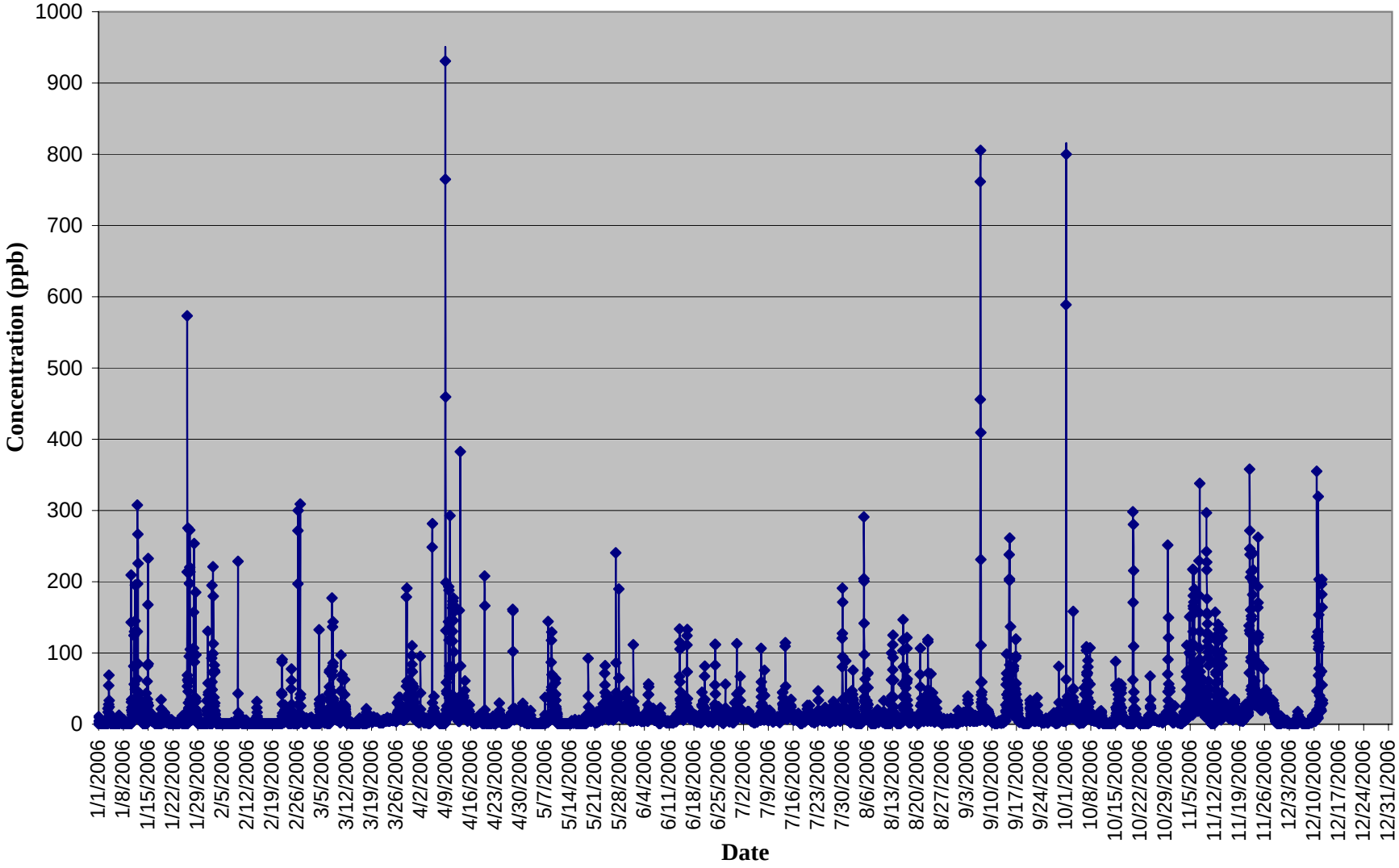
West Union Monitoring Site



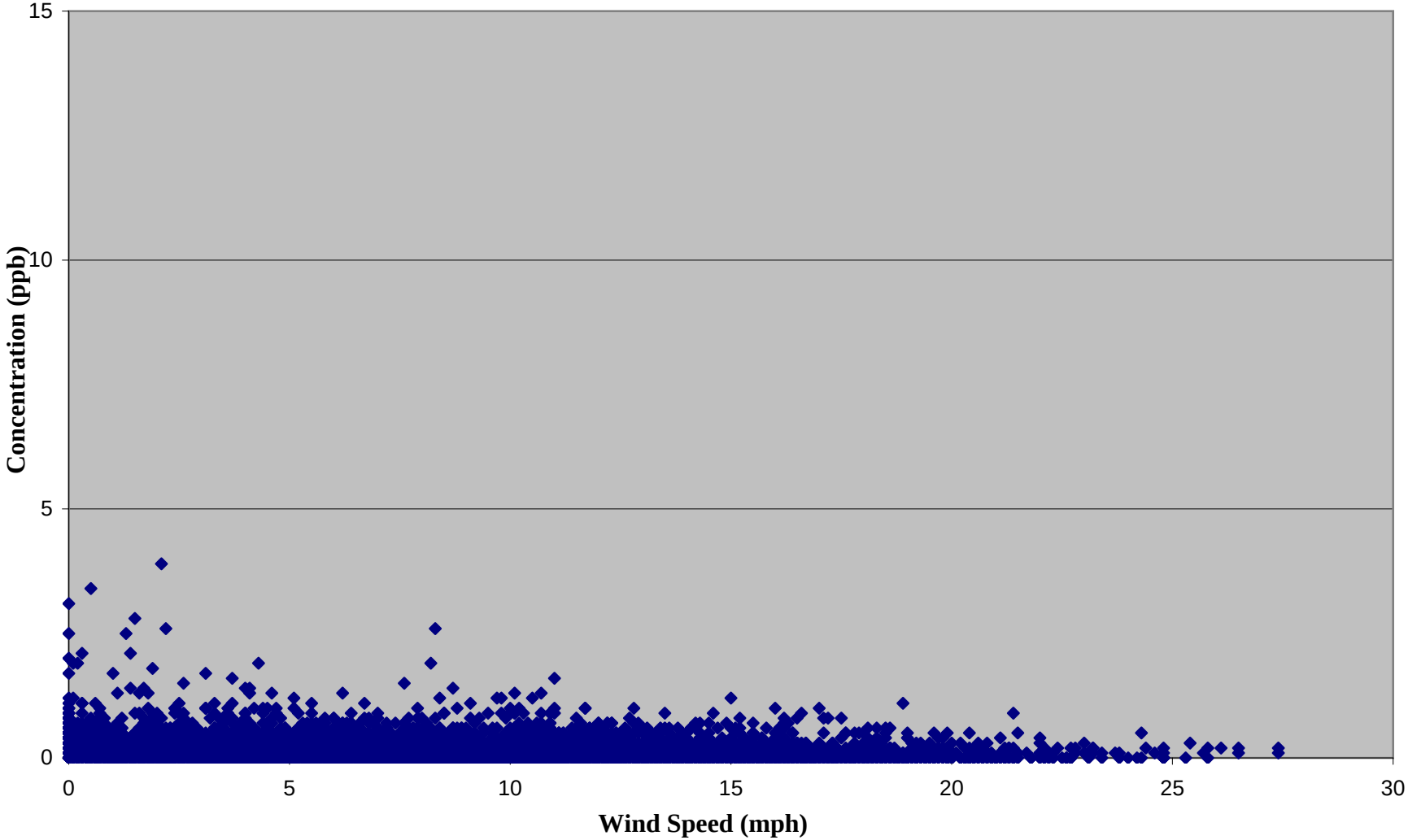
West Union CAFO: Hydrogen Sulfide vs Time

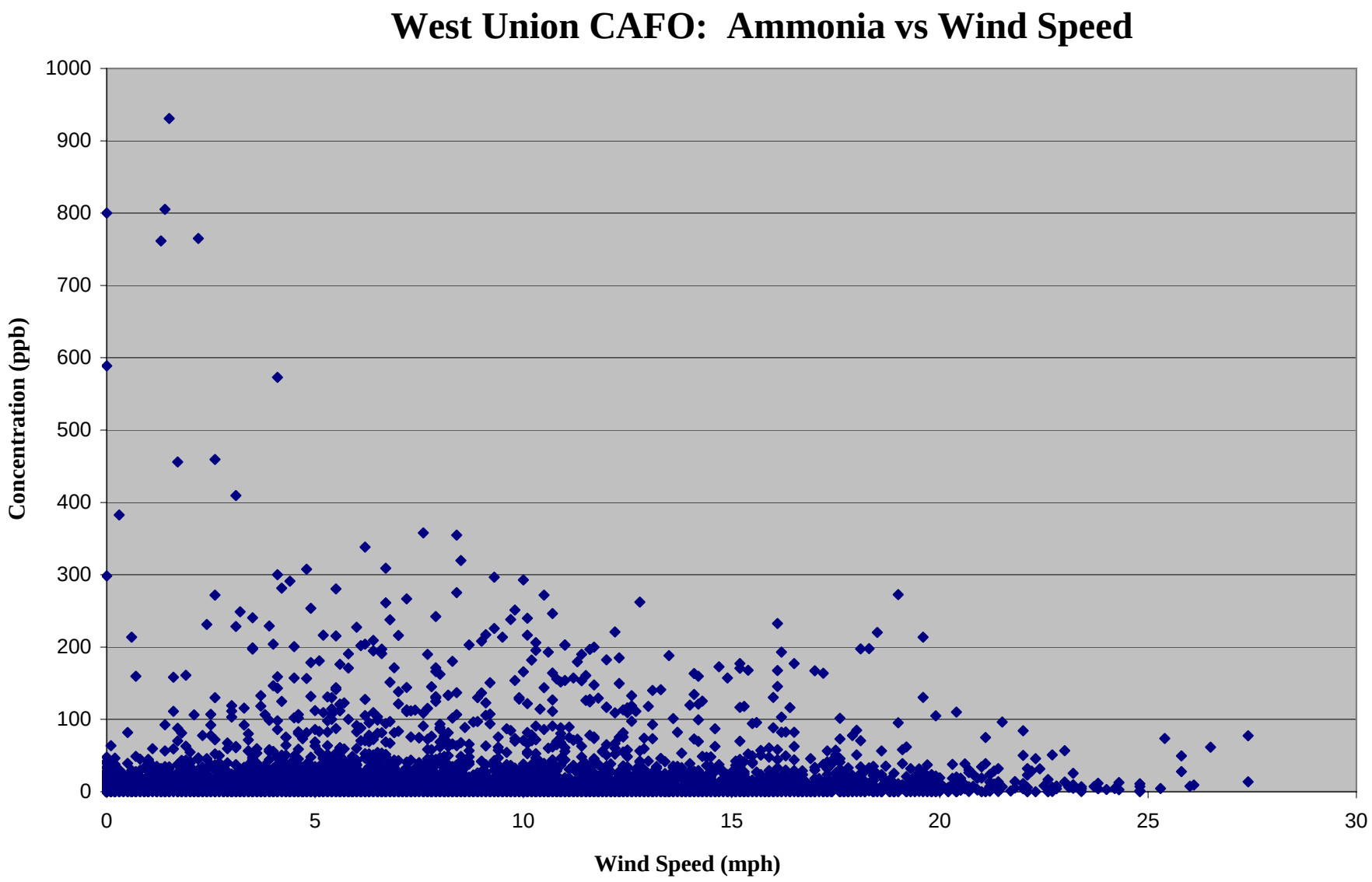


West Union CAFO: Ammonia vs Time

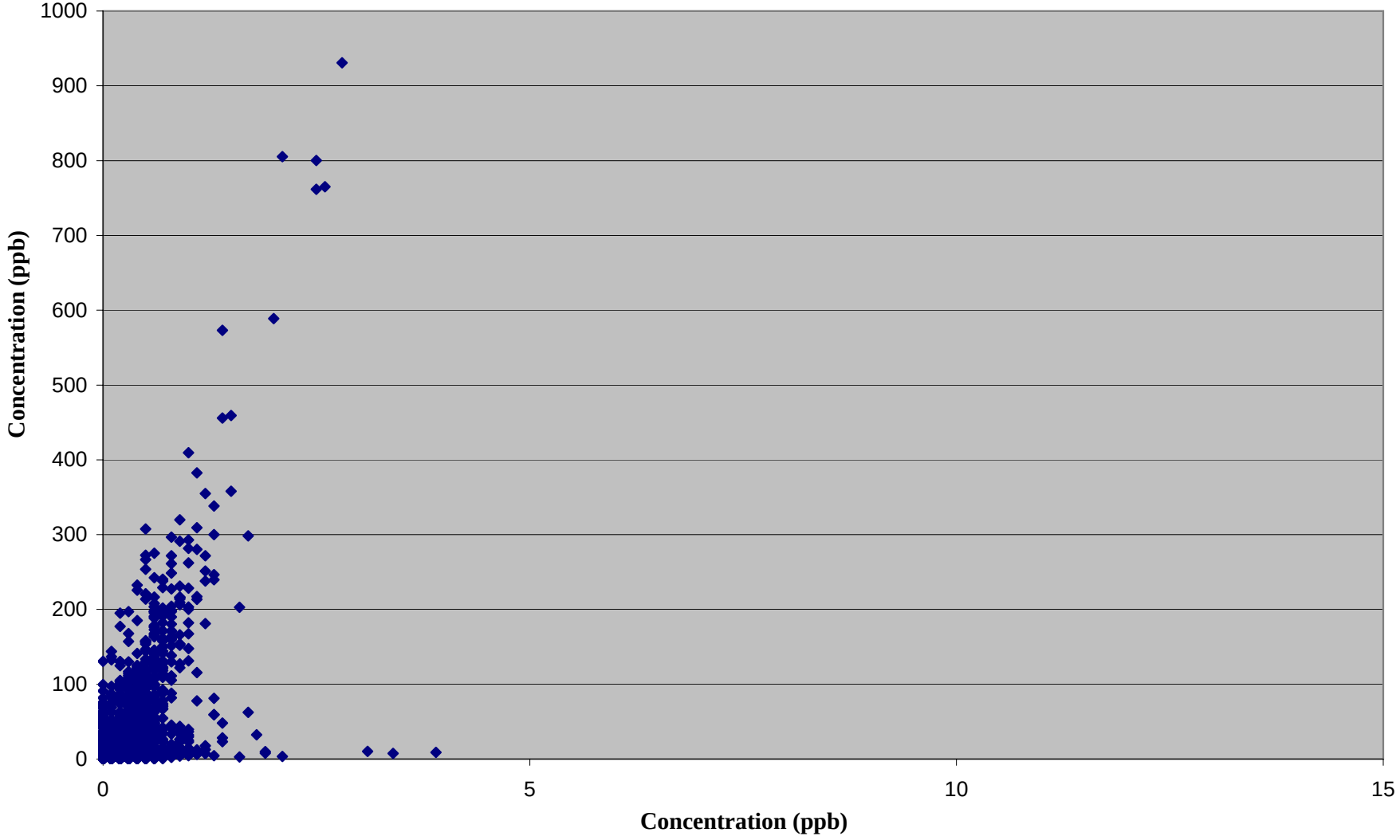


West Union CAFO: Hydrogen Sulfide vs Wind Speed

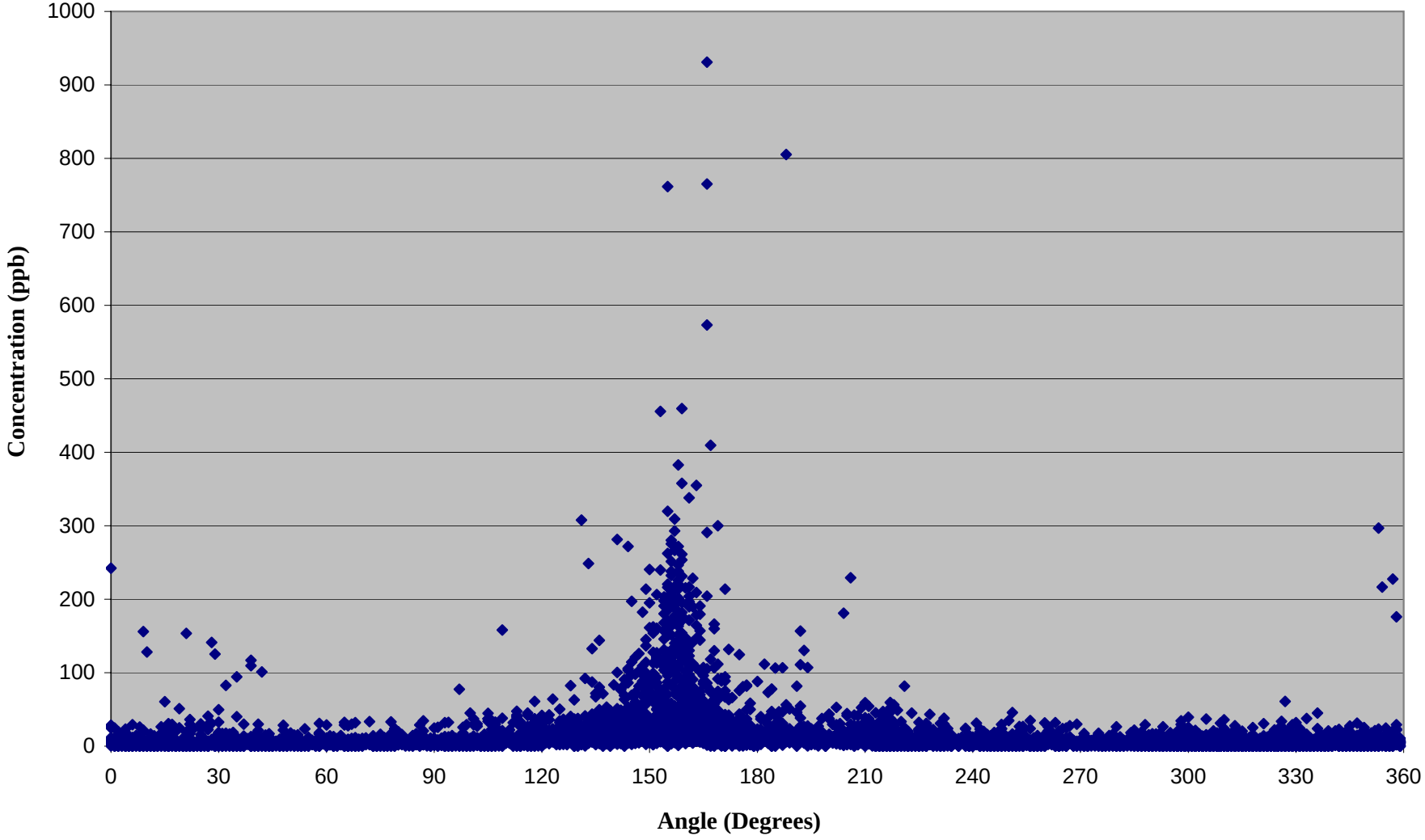



West Union CAFO: Ammonia vs Wind Speed
Concentration (ppb)
1000
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
Wind Speed (mph)

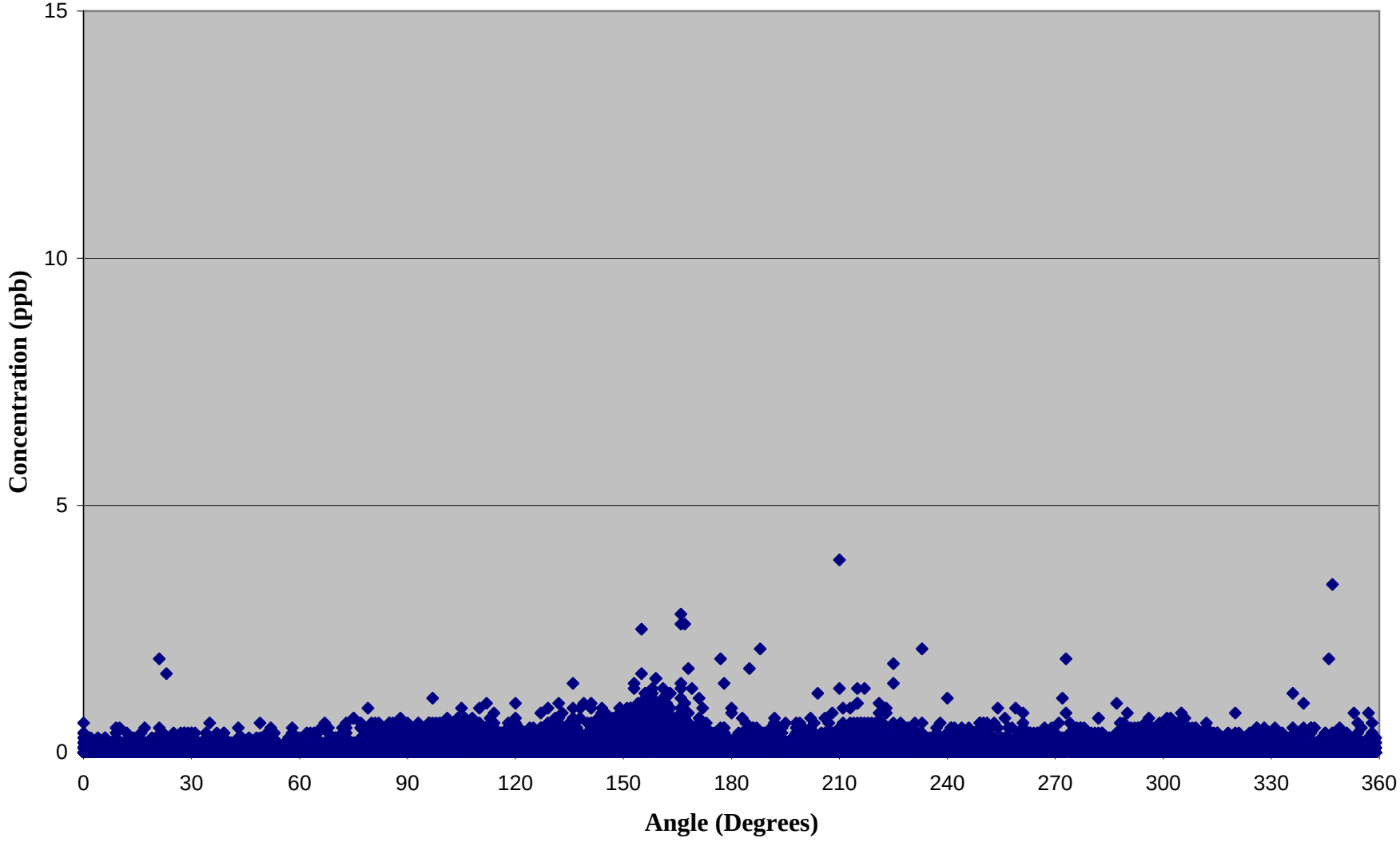
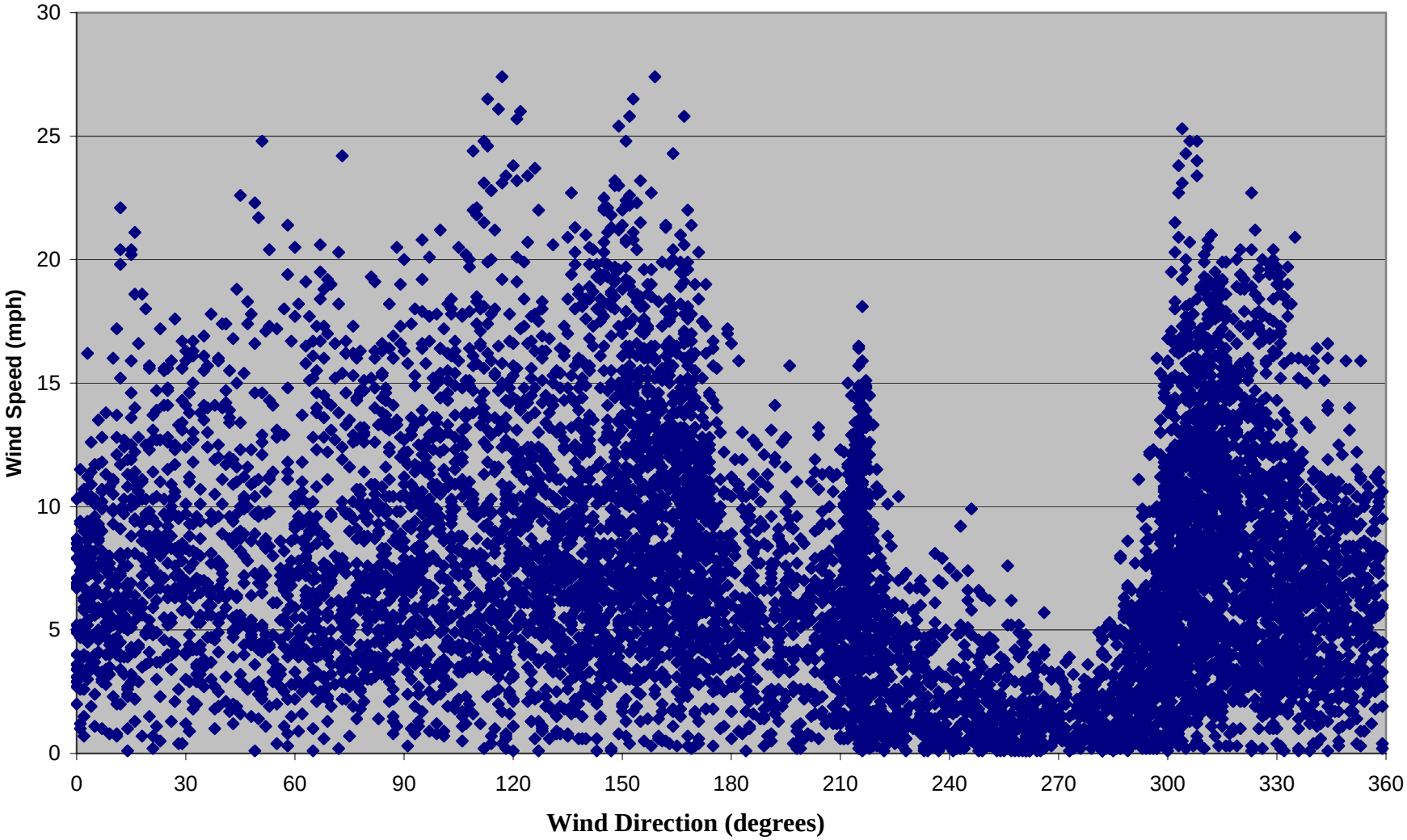
West Union CAFO: Ammonia vs Hydrogen Sulfide



West Union CAFO: Ammonia vs Wind Direction



West Union CAFO-Hydrogen Sulfide vs Wind Direction



West Union CAFO: Wind Speed vs Wind Direction