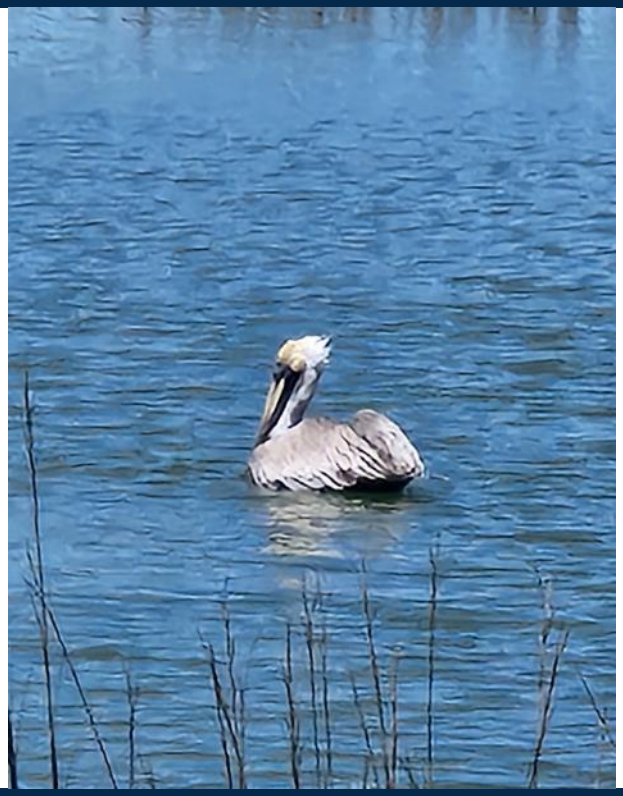
IMPROVE Steering Committee Meeting

Bosque del Apache NWR, NM October 2024

Tracy Dombek, Ions Report



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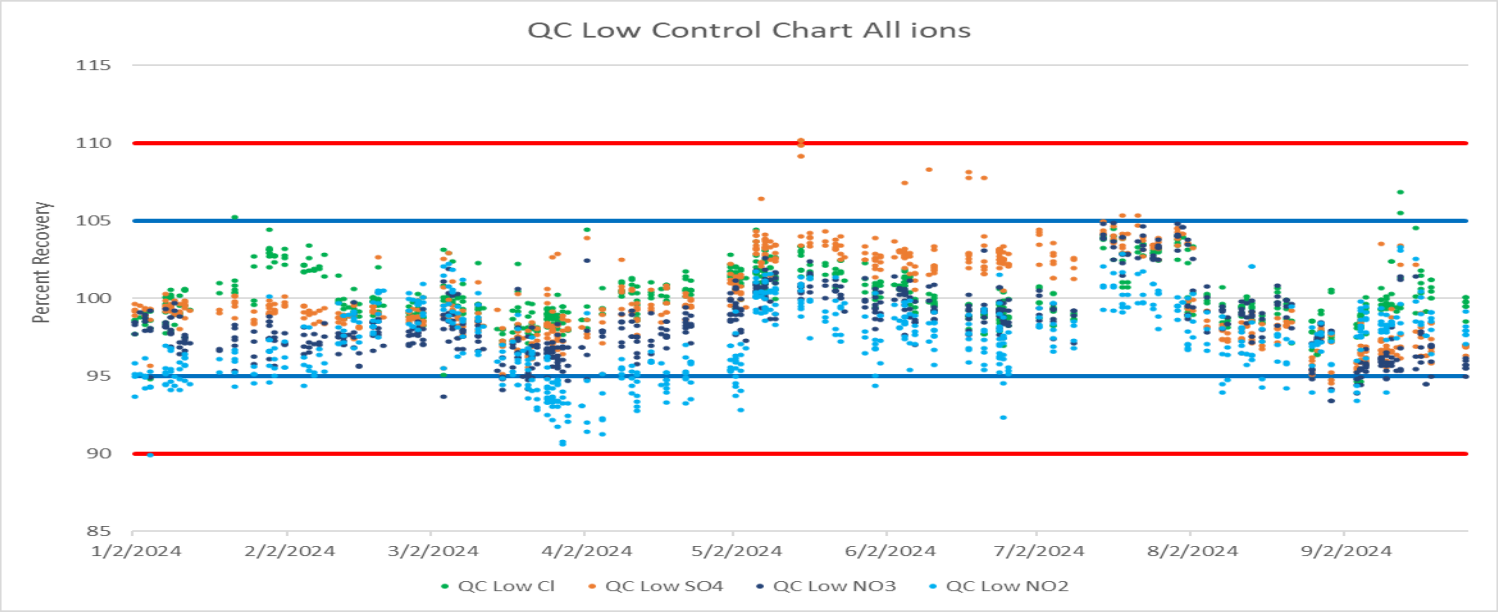
Minimum Detection Limits & Process

- Extract nylon filters in 20 mL of DI water.
- Calibrate systems daily using primary stock standards.
- Quality Controls using secondary source standards before and after every ten samples analyzed.
- Duplicates at a rate of 3 per batch of 50 samples.
- Perform matrix spikes at a rate of 2 per batch of 50 samples.
- Random reanalysis of 5% of the sample total.
- Re-extraction of filters to evaluate extraction efficiencies.

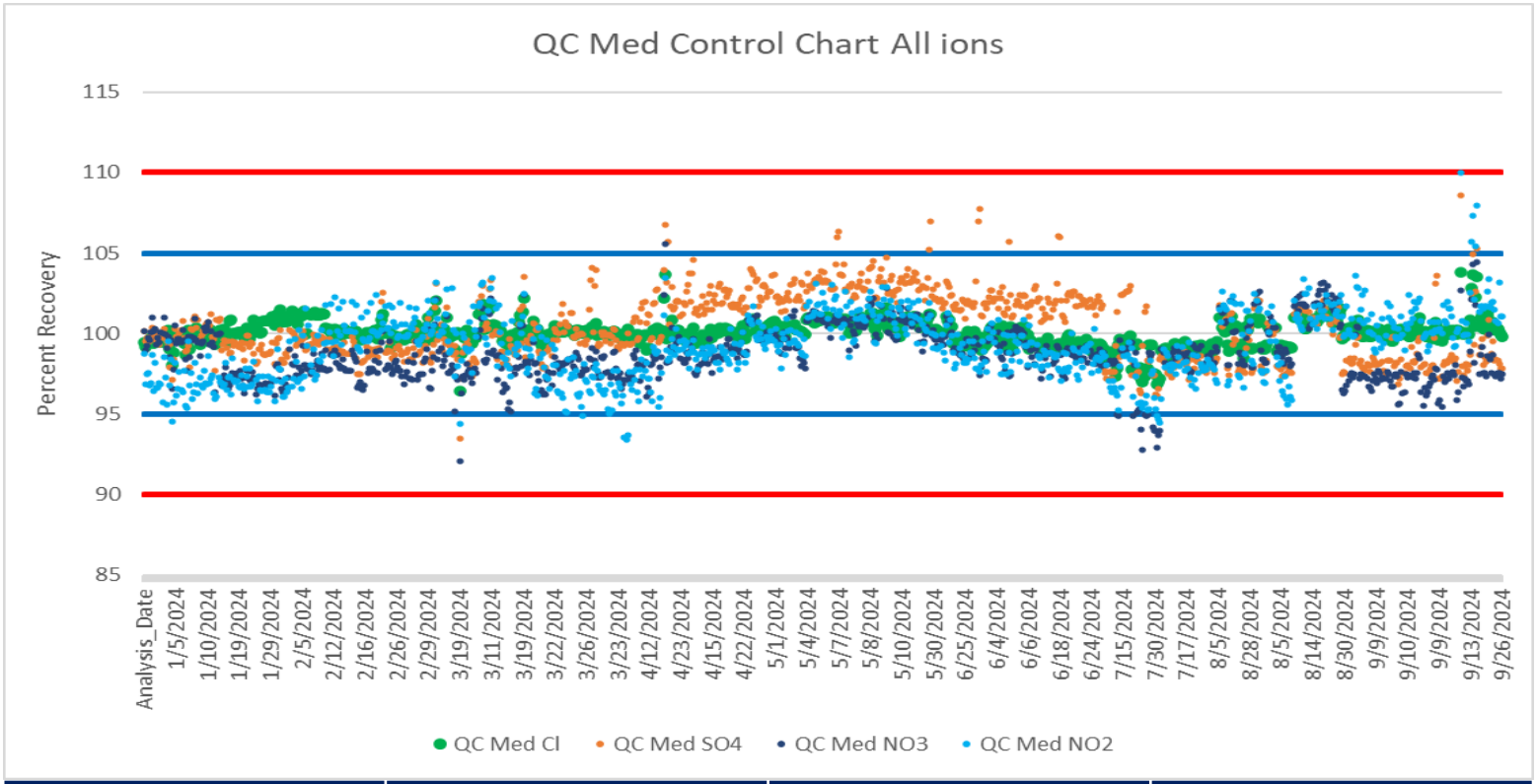
	Chloride	Nitrite	Nitrate	Sulfate
2023	0.006 ppm	0.010 ppm	0.008 ppm	0.011 ppm
2024	0.006 ppm	0.010 ppm	0.014 ppm	0.012 ppm

Control Charts



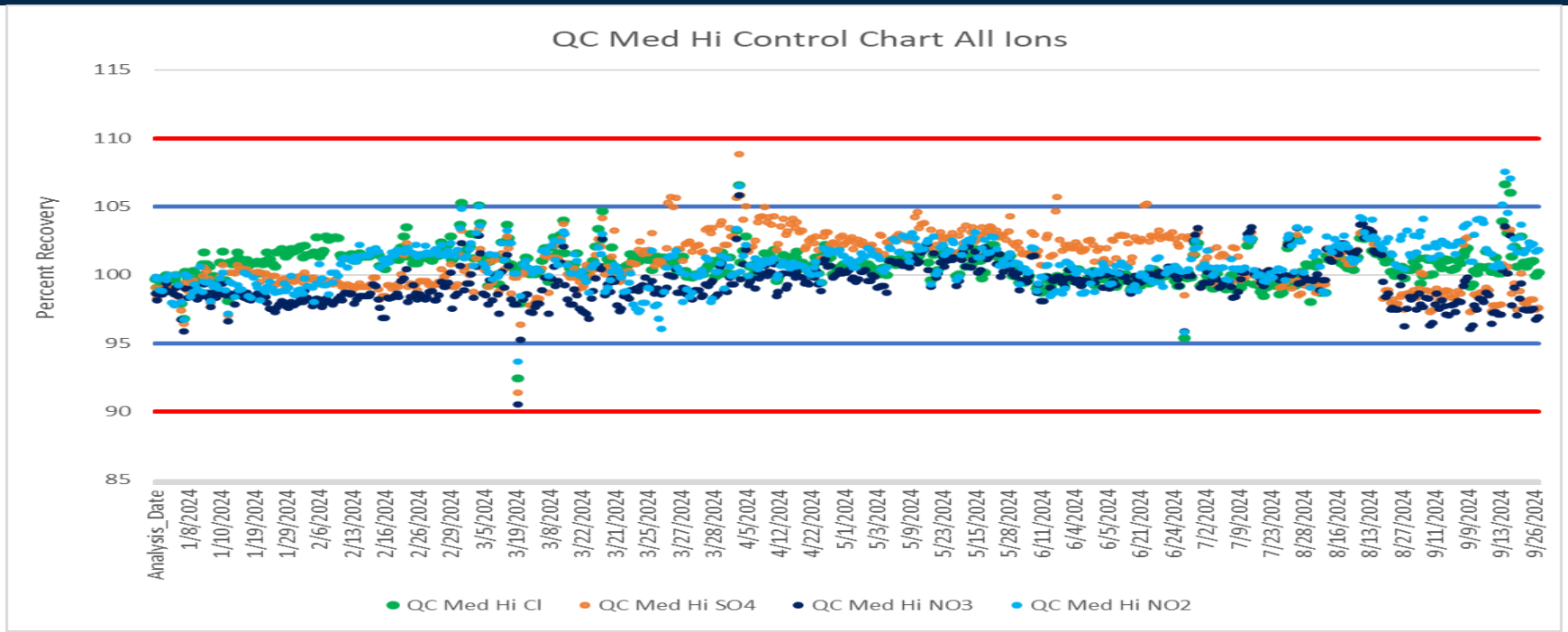
Ion	Median Percent Recovery	Average Percent Recovery	Count
Chloride	99.8%	100%	673
Sulfate	99.4%	100%	673
Nitrate	98.3%	98.4%	673
Nitrite	97.5%	97.3%	673

Control Charts



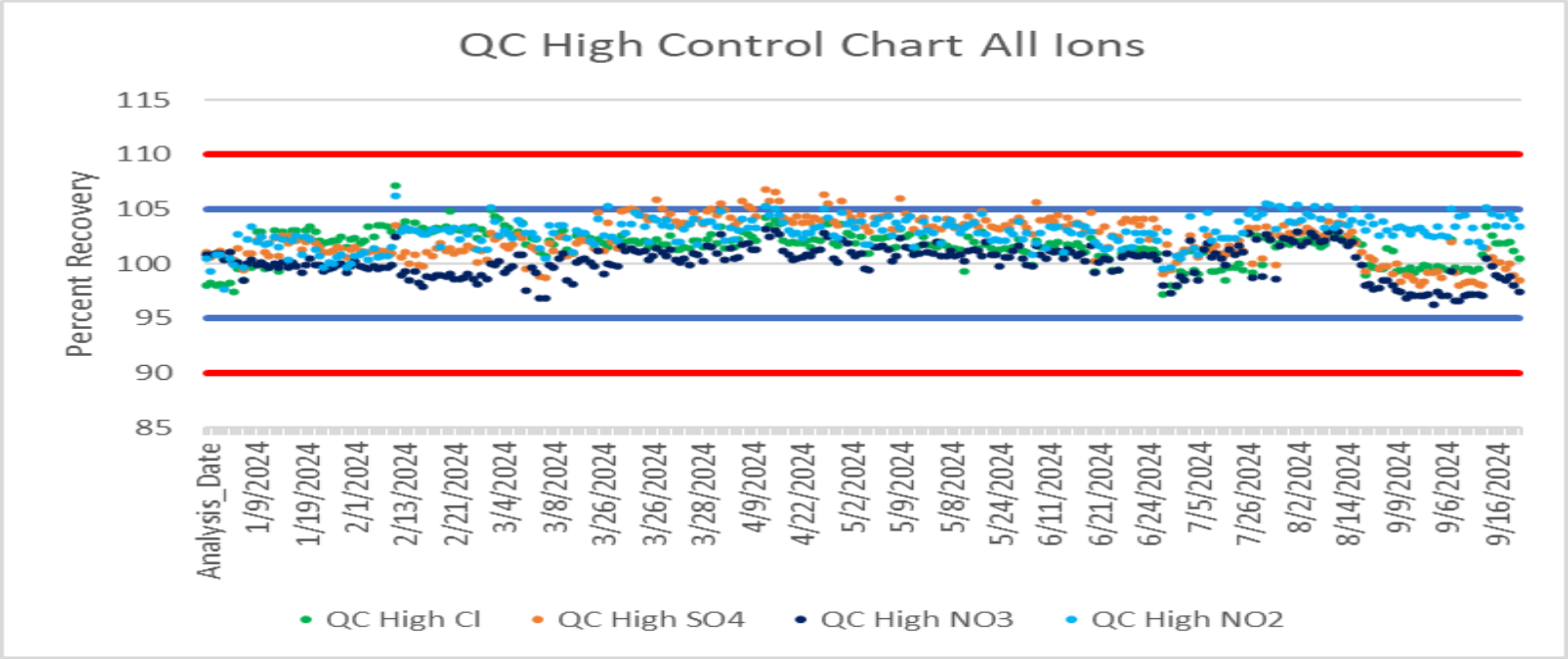
Ion	Median Percent Recovery	Average Percent Recovery	Count
Chloride	100%	100%	947
Sulfate	99.9%	100%	947
Nitrate	98.5%	98.8%	947
Nitrite	99.2%	99.3%	947

Control Charts



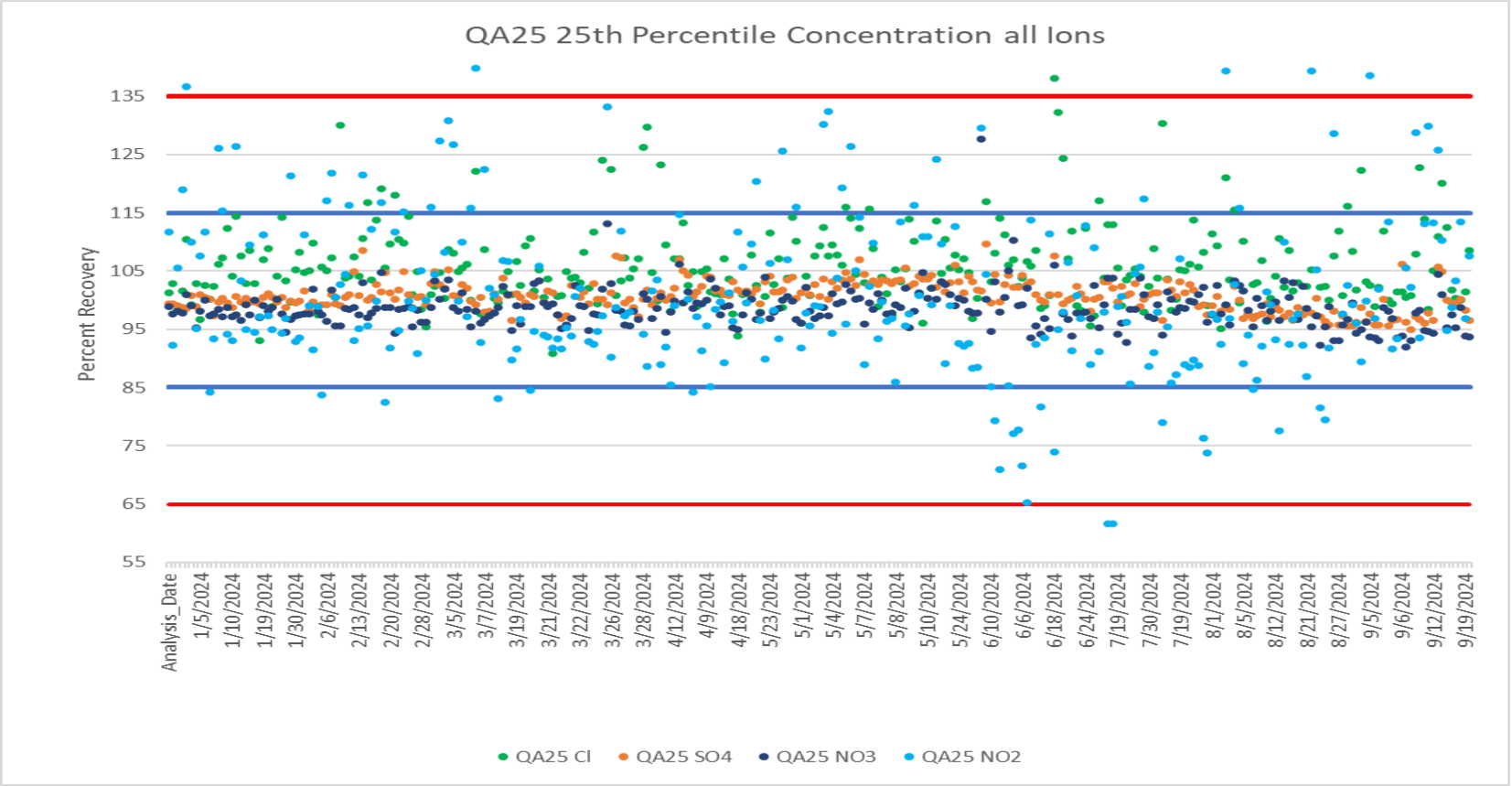
Ion	Median Percent Recovery	Average Percent Recovery	Count
Chloride	101%	101%	591
Sulfate	101%	101%	591
Nitrate	99.3%	99.4%	591
Nitrite	101%	101%	591

Control Charts



Ion	Median Percent Recovery	Average Percent Recovery	Count
Chloride	102%	101%	292
Sulfate	102%	102%	292
Nitrate	100%	99.3%	292
Nitrite	103%	103%	292

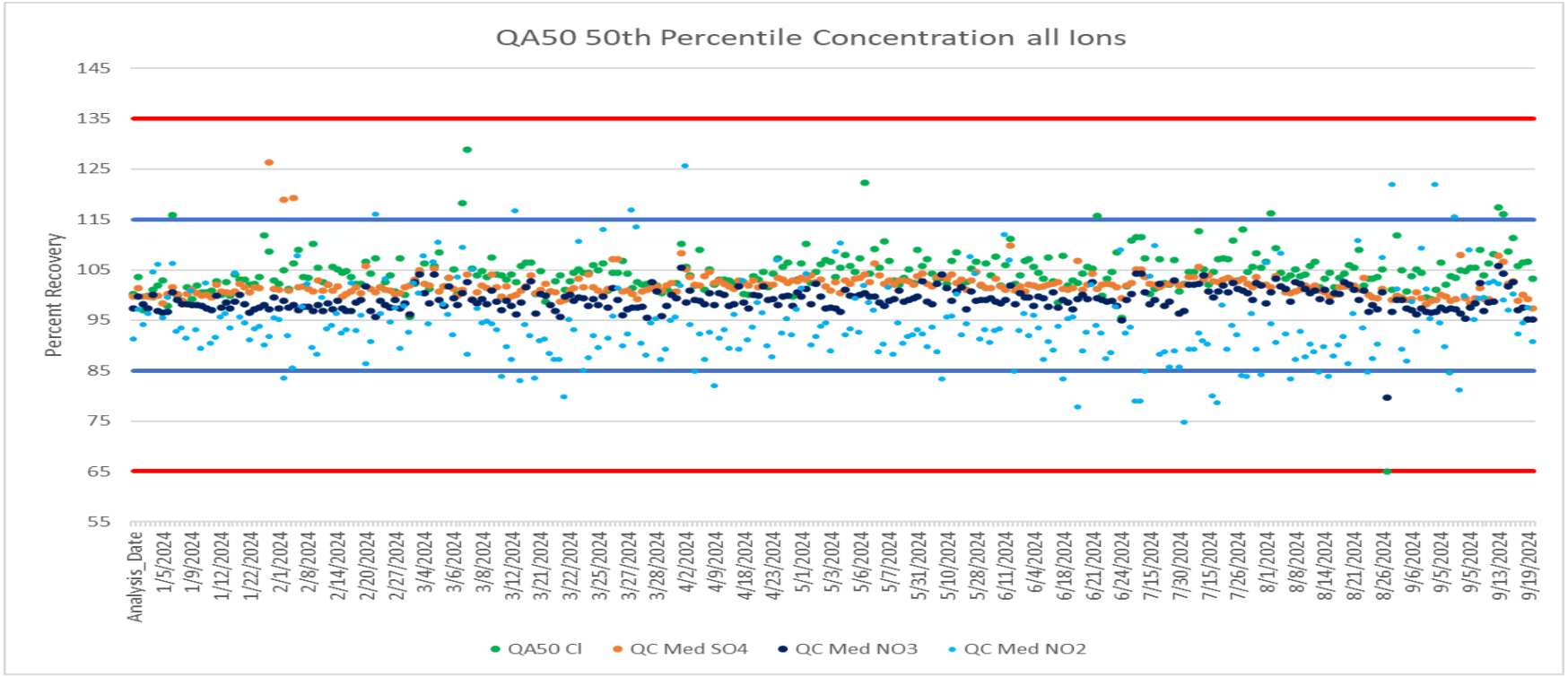
Control Charts



Approximate Air Concentration

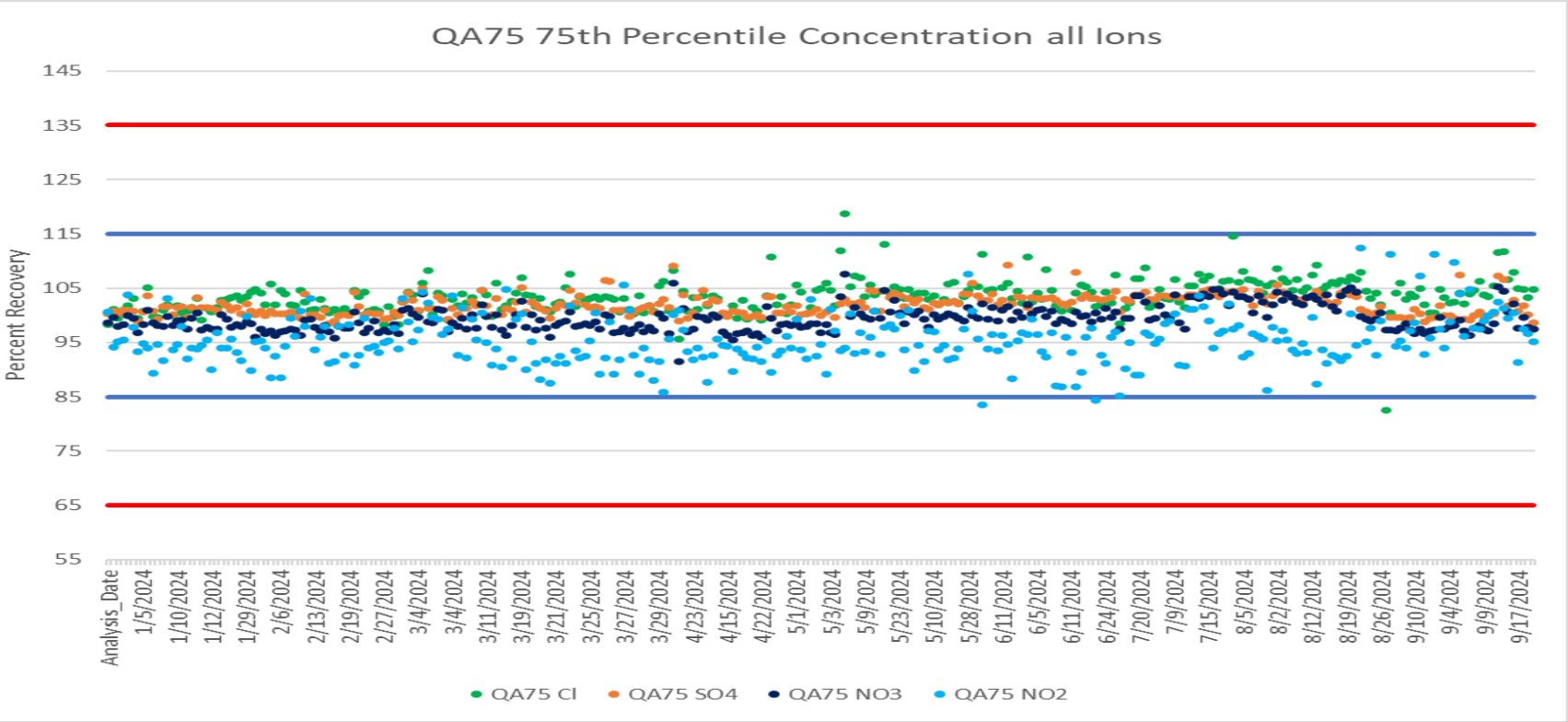
Chloride - 0.016 µg/m^3
Sulfate - 0.300 µg/m^3
Nitrate - 0.092 µg/m^3
Nitrite - 0.007 µg/m^3

Control Charts



Approximate Air Concentration

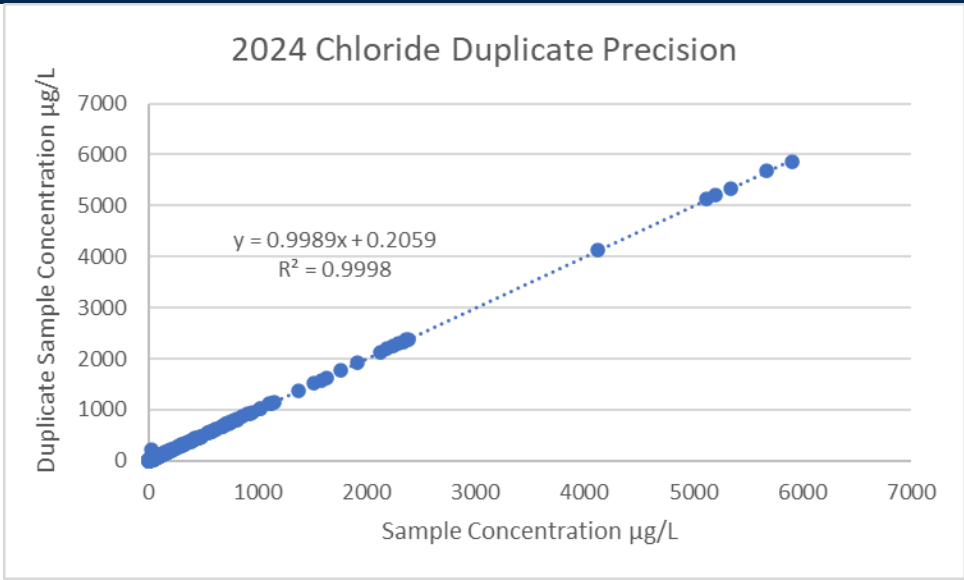
Chloride - 0.031 µg/m^3
Sulfate - 0.60 µg/m^3
Nitrate - 0.180 µg/m^3
Nitrite - 0.013 µg/m^3



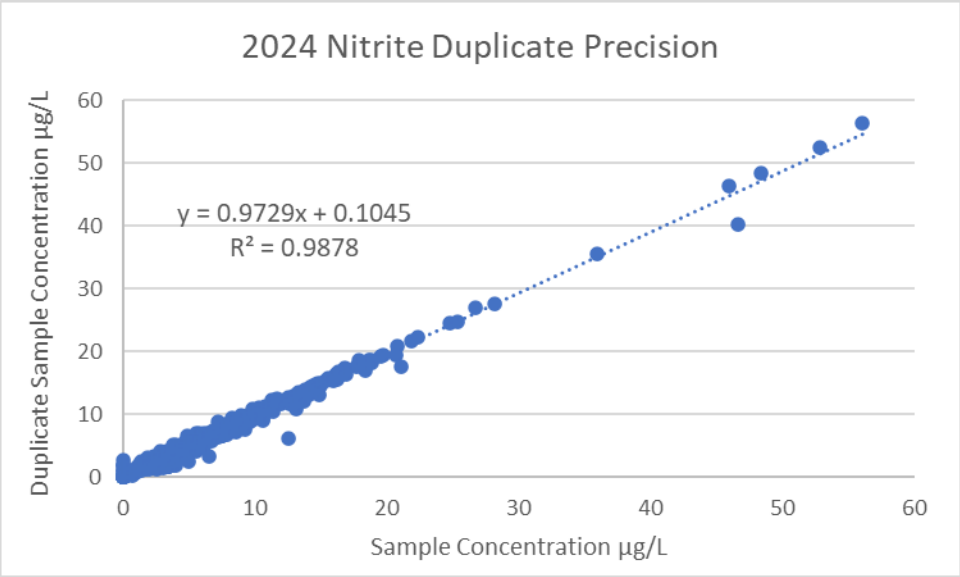
Approximate Air Concentration

Chloride - 0.061 µg/m^3
Sulfate - 1.2 µg/m^3
Nitrate - 0.36 µg/m^3
Nitrite - 0.026 µg/m^3

Duplicate Precision

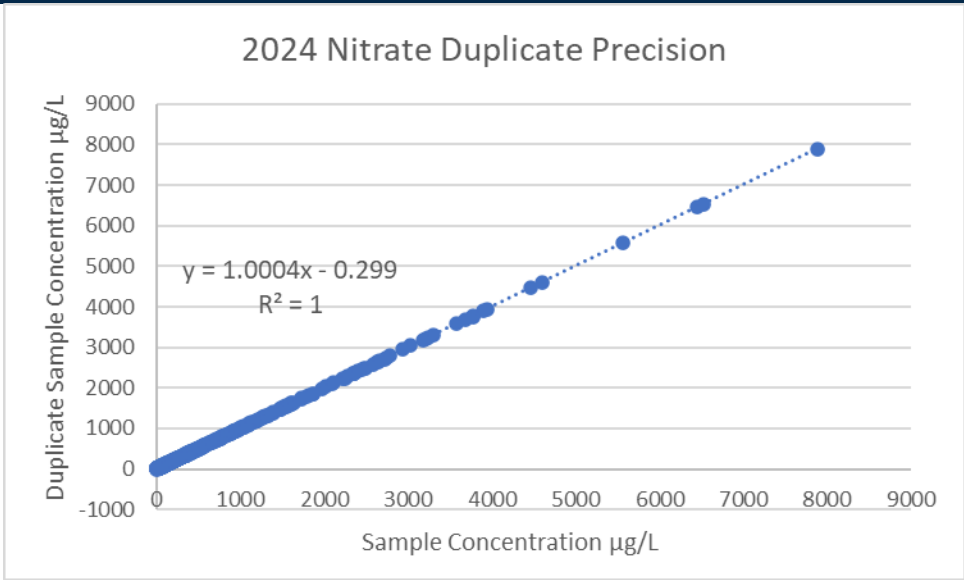


Chloride Percent Differences
Average = -0.73%
Median = -0.12%
Maximum = 165%
Minimum = -139%
Count = 778
Failures 0.39%

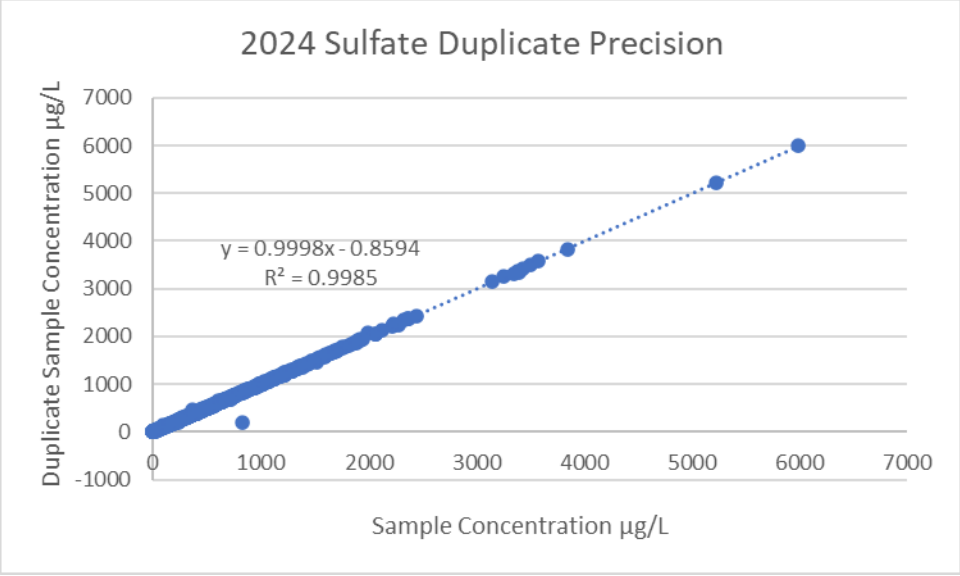


Nitrite Percent Differences
Average = -2.61%
Median = -0.40%
Maximum = 200%
Minimum = -200 %
Count = 778
Failures 0%

Duplicate Precision



Nitrate Percent Differences
Average = -0.12%
Median = -0.03%
Maximum = 200%
Minimum = -43.5 %
Count = 778
Failures 0.12%



Sulfate Percent Differences
Average = -0.91%
Median = -0.49%
Maximum = 200%
Minimum = -200%
Count = 778
Failures 0.51%

Reanalysis

	Chloride	Nitrite	Nitrate	Sulfate
2024 median RPD	-0.78%	2.09%	-0.67%	0.01%
2024Average RPD	-0.83%	-5.16%	-1.96%	-0.80%

- Roughly 5% of each batch of 400 NPS samples are reanalyzed after the original analysis.
- The Relative Percent Differences are calculated and verified against the DQO requirements.
- Any samples failing to meet DQO's are reanalyzed a third time to check.

Routine Filter Re-Extraction

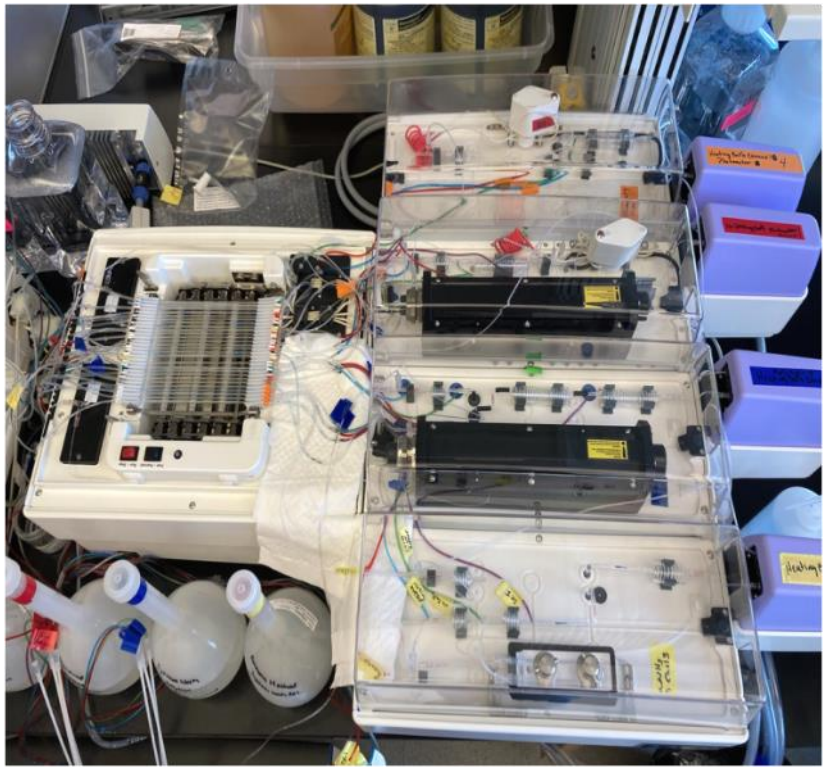
- Extraction efficiencies were evaluated on 281 samples.
- Efficiency is determined by dividing the result measured on the re-extracted filter by the sum of the original and re-extracted results.

Chloride	Nitrite	Nitrate	Sulfate
97.9%	98.2	97.3%	100%

Total Nitrogen Research

Segmented Flow Colorimetric measurement

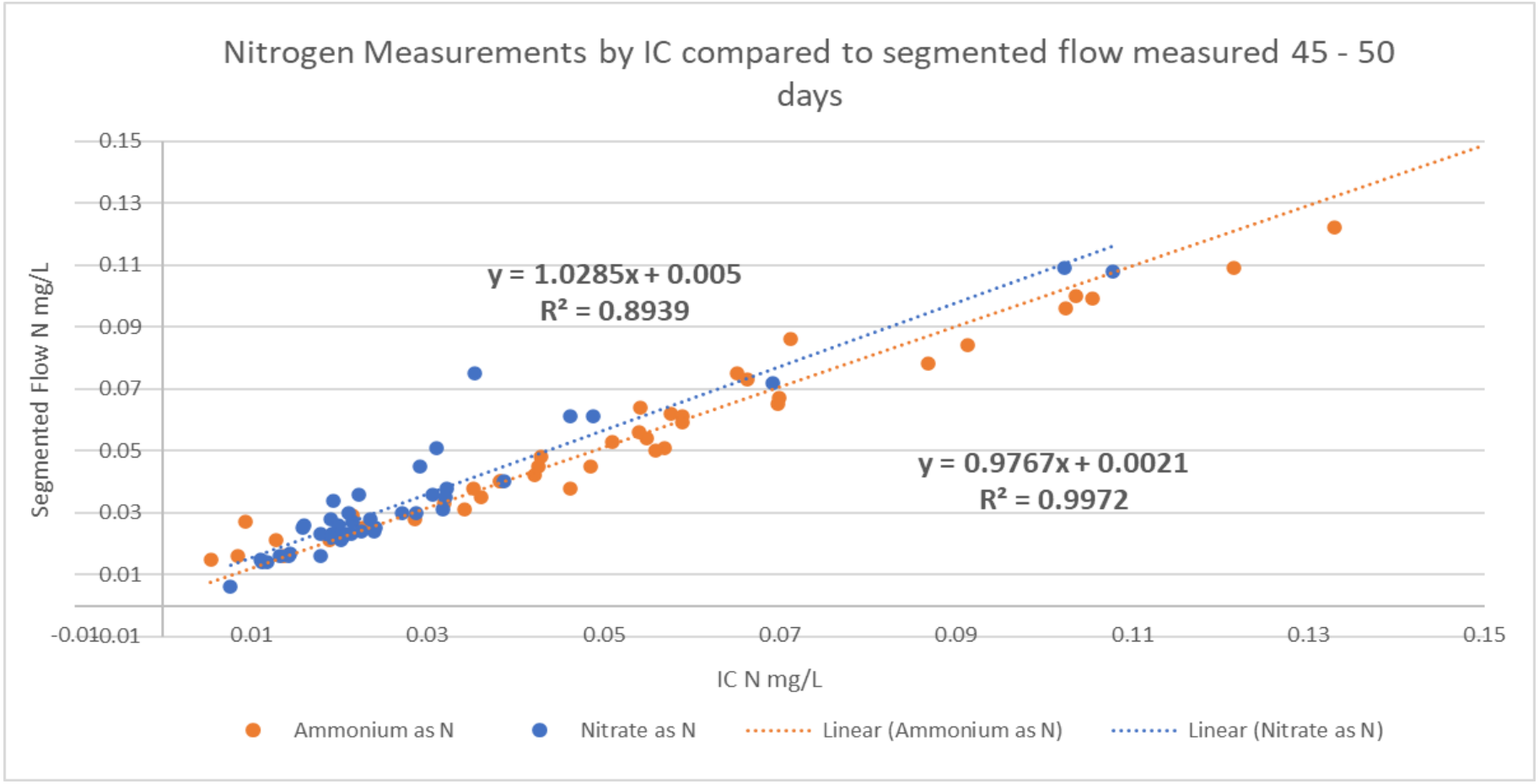
- NH_4^+
- $NO_x = NO_2^- + NO_3^-$
- Total Nitrogen inline persulfate/UV digestion)



Total Water Soluble Nitrogen (TWSN)
Total Water Soluble Organic Nitrogen (TWSON)
$TWSON = TWSN – (NH_4 + NO_x)$

Preliminary Data

TWSN	NH4	NO3	TWSON
0.025 mg/L	0.017 mg/L	0.003 mg/L	0.045 mg/L



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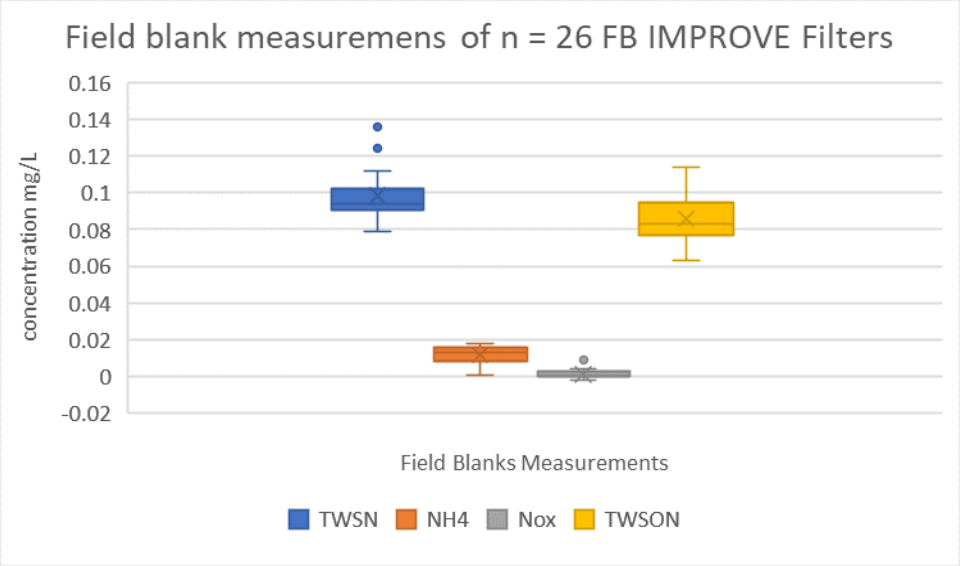
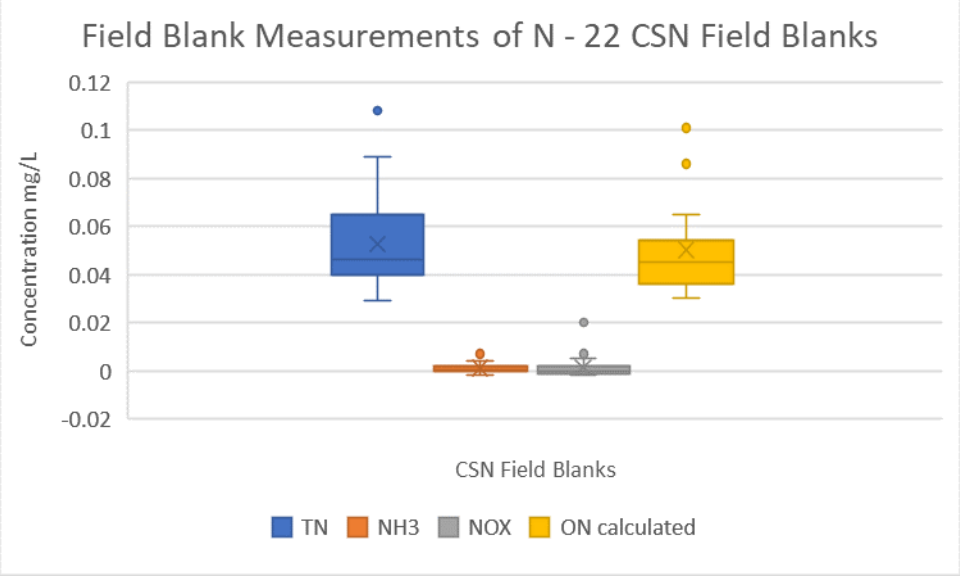


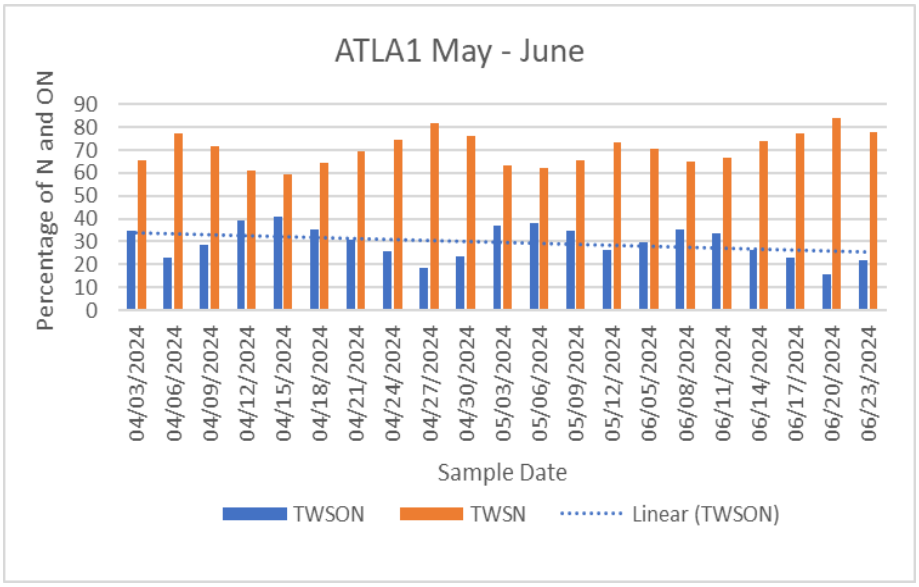


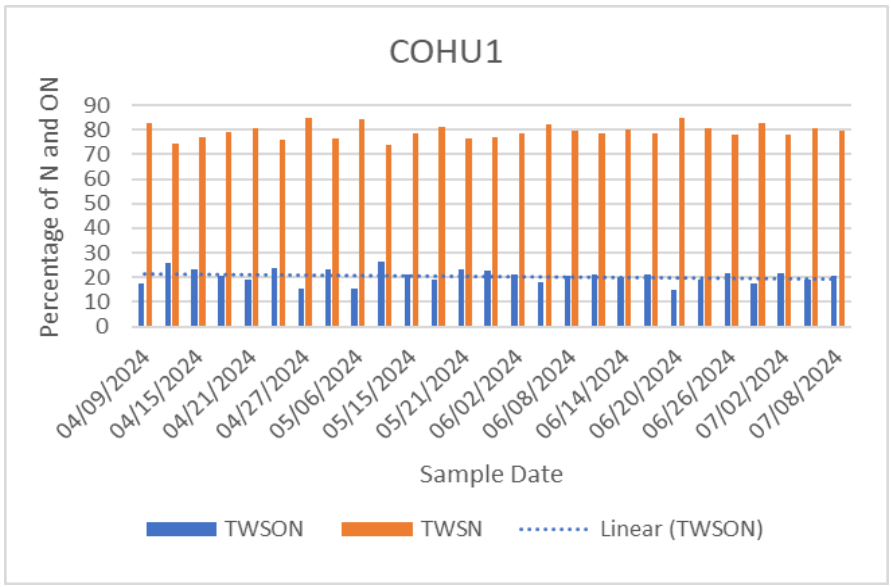
Preliminary data

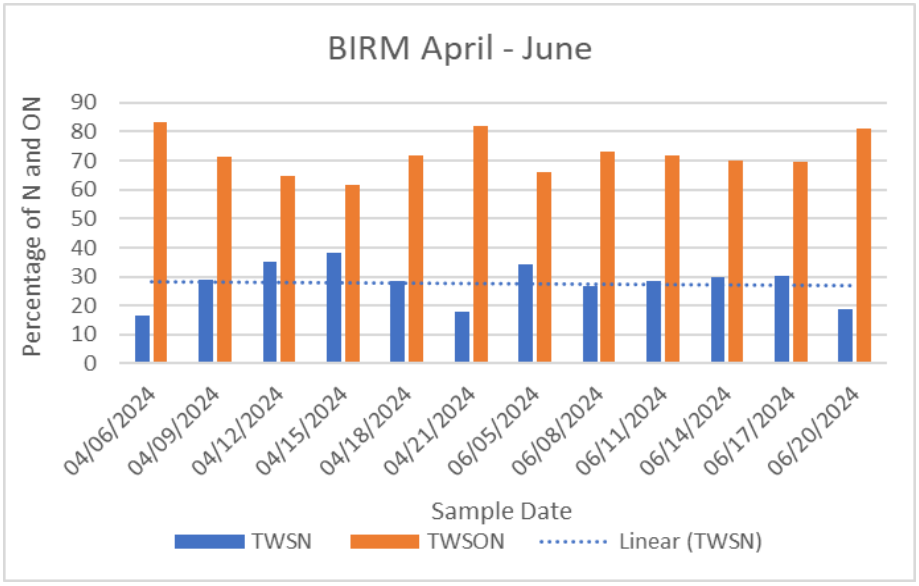
Site	Average % TWSON/TWSN	TWSON µg/m³ average
EVER1	47	0.126
Broward County Ncore (FL)	67	0.138
LIGO1	28	0.053
Winston-Salem: Hattie Ave (NC)	37	0.126
SHRO1	31	0.062
Garinger High School (NC)	29	0.072
COHU1	25	0.056
Rossville-Williams(GA)	38	0.098
ATLA1	36	0.078
South Dekalb (GA)	54	0.156
Rome- Elementary School (GA)	46	0.118
BIRM1	33	0.110
SIPS1	35	0.084
Birmingham: North Birmingham (AL)	35	0.106
BRIS1	37	0.119
Capitol (LA)	37	0.122

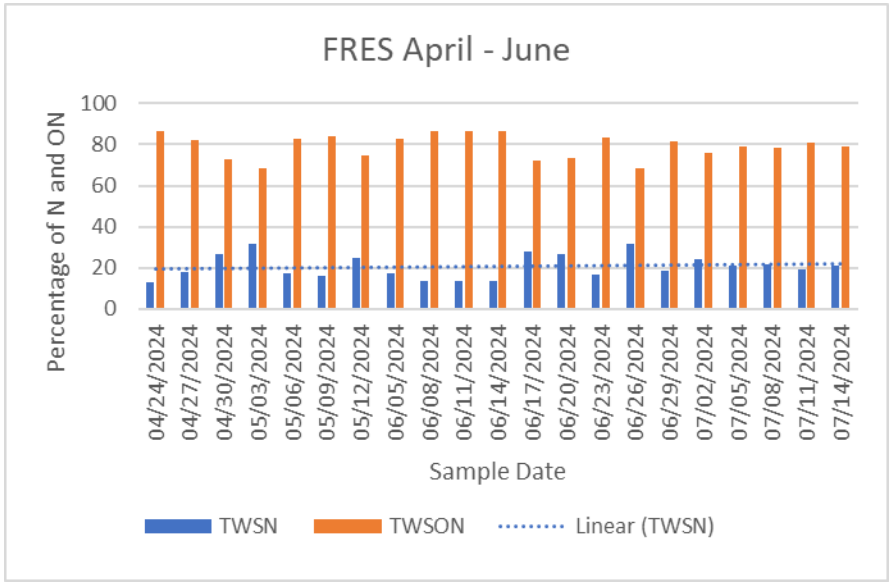
Preliminary Data

Site	Average % TWSON:TWSN	TWSON µg/m³ average
MOZI1	39	0.048
FOCO1	27	0.063
ROMO1	40	0.041
Cheyenne Ncore (WY)	41	0.117
Platteville (CO)	16	0.048
Adam's County: Birch Street (CO)	37	0.145
La Casa (CO)	38	0.088
MAKA2	47	0.035
MORA1	60	0.039
Seattle: Beacon Hill (WA)	36	0.141
WHPA1	49	0.033
Yakima: 4th Ave (WA)	50	0.095
PORE1	22	0.032
San Jose: Jackson Street (CA)	24	0.088
FRES1	24	0.102
SEQU1	26	0.151
Fresno-Garland(CA)	25	0.119
DOME1	22	0.085
Bakersfield: California Ave (CA)	27	0.143
AGTI1	16	0.074
Los Angeles: North Main Street (CA)	11	0.194
Riverside-Rubidoux (CA)	11	0.174
El Cajon: Lexington Elementary (CA)	11	0.086


ATLA1 May - June
Percentage of N and ON
0
10
20
30
40
50
60
70
80
90
04/03/2024
04/06/2024
04/09/2024
04/12/2024
04/15/2024
04/18/2024
04/21/2024
04/24/2024
04/27/2024
04/30/2024
05/03/2024
05/06/2024
05/09/2024
05/12/2024
06/05/2024
06/08/2024
06/11/2024
06/14/2024
06/17/2024
06/20/2024
06/23/2024
Sample Date
TWSON
TWSN
Linear (TWSON)


COHU1
Percentage of N and ON
0
10
20
30
40
50
60
70
80
90
04/09/2024
04/15/2024
04/21/2024
04/27/2024
05/06/2024
05/15/2024
05/21/2024
06/02/2024
06/08/2024
06/14/2024
06/20/2024
06/26/2024
07/02/2024
07/08/2024
Sample Date
TWSON
TWSN
Linear (TWSON)


BIRM April - June
Percentage of N and ON
0
10
20
30
40
50
60
70
80
90
04/06/2024
04/09/2024
04/12/2024
04/15/2024
04/18/2024
04/21/2024
06/05/2024
06/08/2024
06/11/2024
06/14/2024
06/17/2024
06/20/2024
Sample Date
TWSN
TWSON
Linear (TWSN)


FRES April - June
Percentage of N and ON
0
20
40
60
80
100
04/24/2024
04/27/2024
04/30/2024
05/03/2024
05/06/2024
05/09/2024
05/12/2024
06/05/2024
06/08/2024
06/11/2024
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06/23/2024
06/26/2024
06/29/2024
07/02/2024
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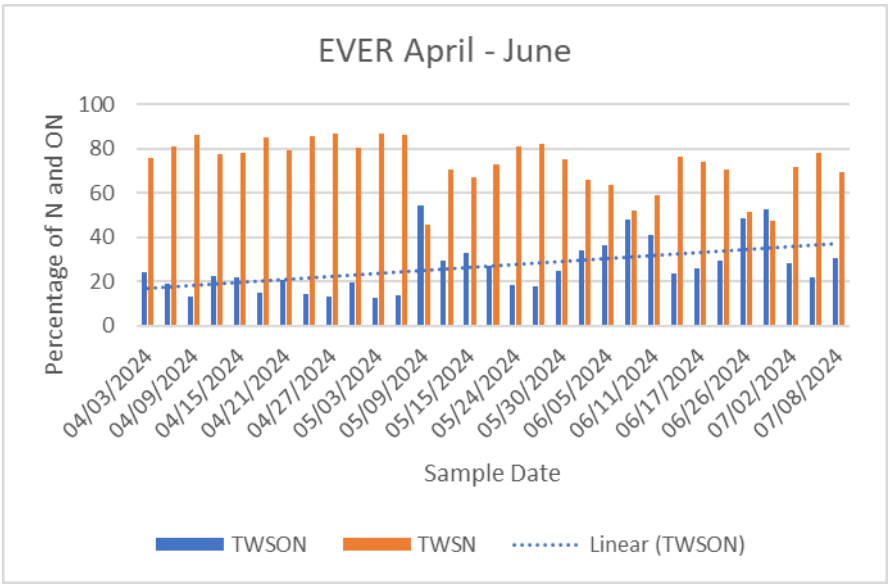
07/11/2024
07/14/2024
Sample Date
TWSN
TWSON
Linear (TWSN)


EVER April - June
Percentage of N and ON
100
80
60
40
20
0
04/03/2024
04/09/2024
04/15/2024
04/21/2024
04/27/2024
05/03/2024
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05/30/2024
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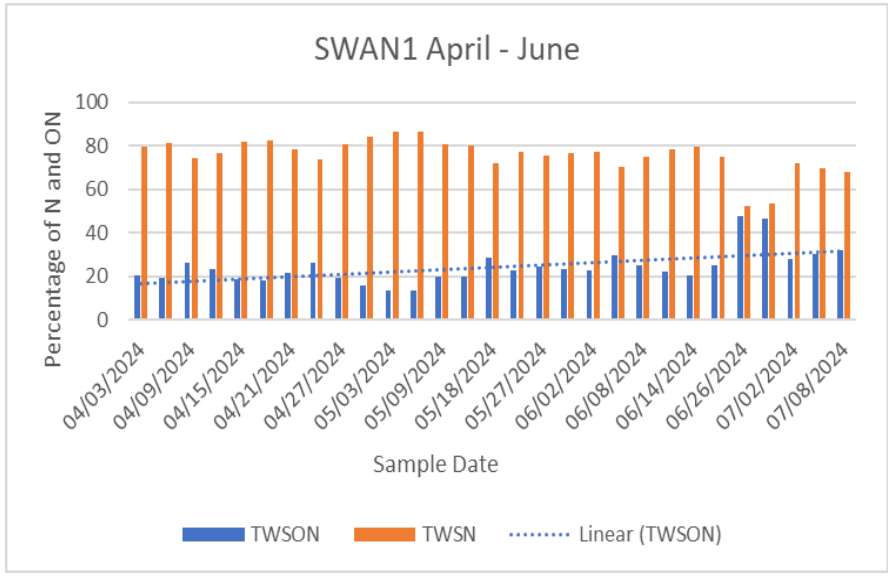
07/08/2024
Sample Date
TWSON
TWSN
Linear (TWSON)


SWAN1 April - June
Percentage of N and ON
100
80
60
40
20
0
04/03/2024
04/09/2024
04/15/2024
04/21/2024
04/27/2024
05/03/2024
05/09/2024
05/18/2024
05/27/2024
06/02/2024
06/08/2024
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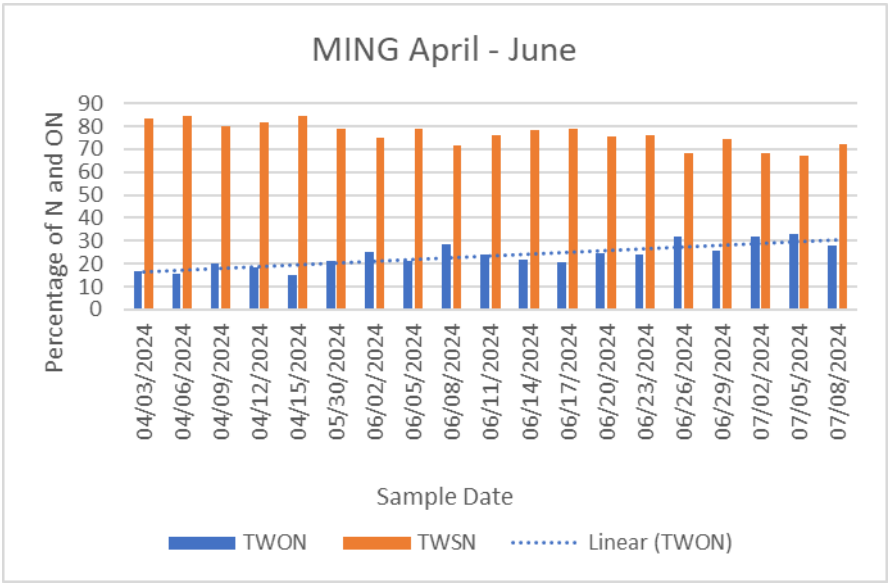
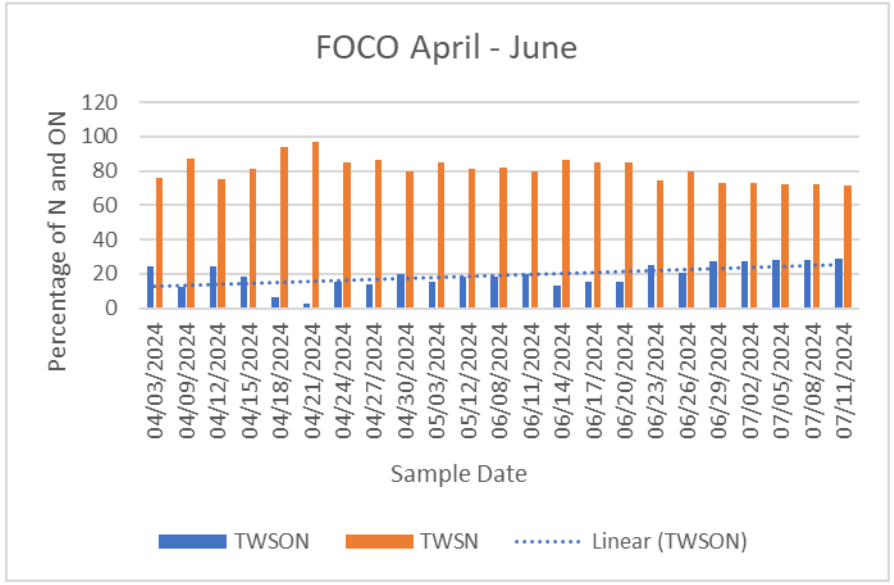
06/26/2024
07/02/2024
07/08/2024
Sample Date
TWSON
TWSN
Linear (TWSON)


MING April - June
Percentage of N and ON
90
80
70
60
50
40
30
20
10
0
04/03/2024
04/06/2024
04/09/2024
04/12/2024
04/15/2024
05/30/2024
06/02/2024
06/05/2024
06/08/2024
06/11/2024
06/14/2024
06/17/2024
06/20/2024
06/23/2024
06/26/2024
06/29/2024
07/02/2024
07/05/2024
07/08/2024
Sample Date
TWON
TWSN
Linear (TWON)


FOCO April - June
Percentage of N and ON
120
100
80
60
40
20
0
04/03/2024
04/09/2024
04/12/2024
04/15/2024
04/18/2024
04/21/2024
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06/26/2024
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07/02/2024
07/05/2024
07/08/2024
07/11/2024
Sample Date
TWSON
TWSN
Linear (TWSON)

Acknowledgements

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RTI International

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for global good

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