Near-road NO_2 Monitoring Pilot Study – Boise, Idaho

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2012 NW Airquest Annual Meeting
Pullman, WA

Pilot Study Objectives

- Site selection process
- Assist with EPA's Technical Assistance Document
- Participate in National Passive Monitoring Study
- Follow CASAC AAMS recommendations for additional parameters and evaluation of new technologies and instruments
- Assess/reconcile near-road effects on ambient air pollutant concentrations

Network and Site Selection

What information is needed?

- AADT for major roads in the area
- AADT for local roadways *
- Fleet mix data *
- Congestion Patterns *
- Existing NO2 Monitor Locations
- Prevailing wind patterns
- Population density maps
- Locations of schools and/or vulnerable and susceptible populations *

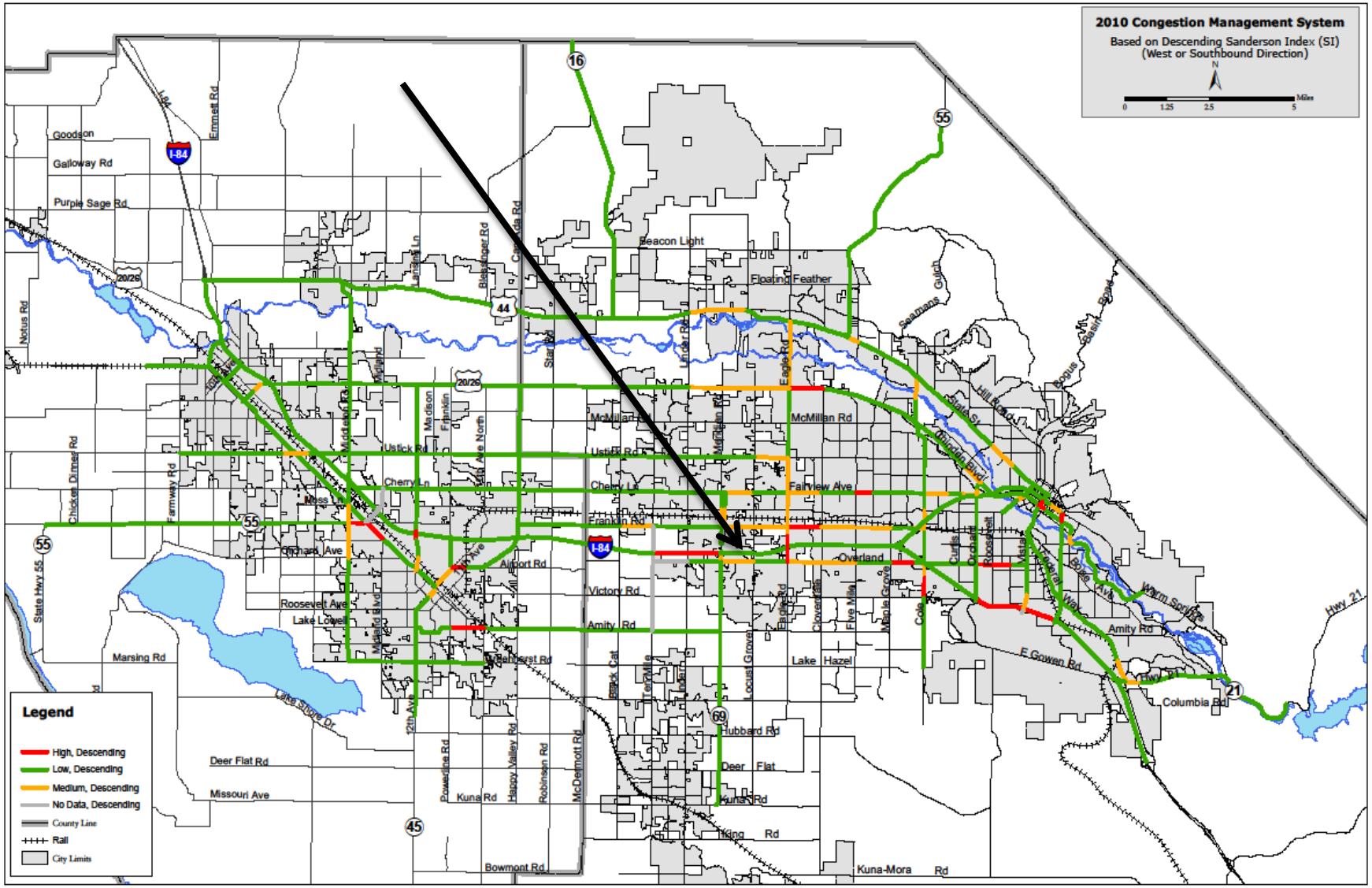
*data may be available only from local sources

Southwest Idaho – Treasure Valley

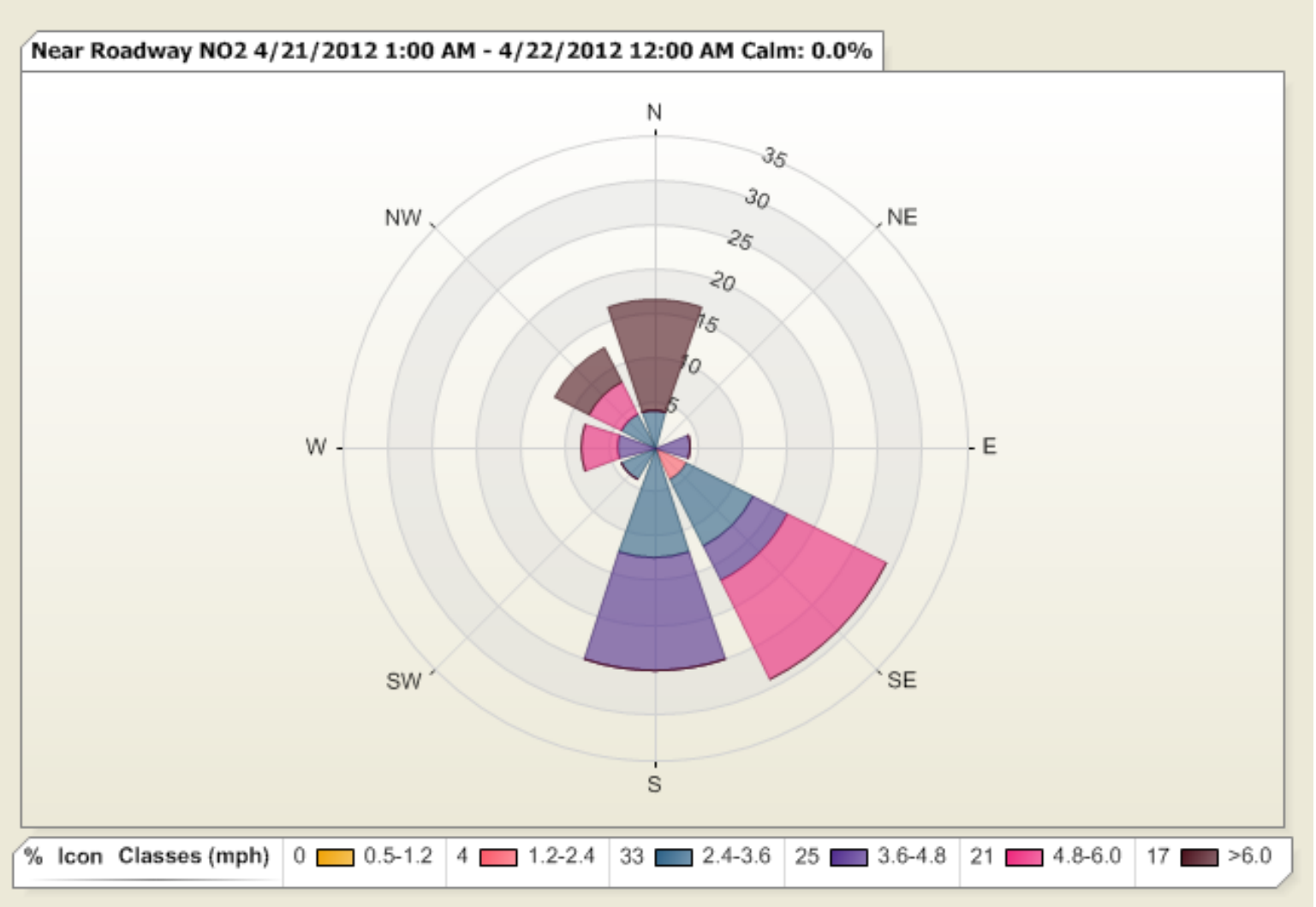
Top 20 Road Segments Using HPMS and Local HD Data

HPMS ID	Location	ROUTE	LANES	AADT-RANK	AADT	HD-Rank	Estimated HD	ModAADT
19	I-84 east of Five Mile to Eagle Road	84	6	1	104,728	1	6,900	166,828
18	I-84 Eagle Road to east of Meridian Road	84	6	2	102,538	3	6,700	162,838
17	I-84 small segment east of Meridian Road	84	6	3	95,500	3	6,700	155,800
16	I-84 small segment east of Meridian Road	84	6	3	95,500	3	6,700	155,800
20	I-84 Y to east of Five Mile	84	8	6	81,902	1	6,900	144,002
15	I-84 Meridian Road to Linder	84	4	5	85,096	10	6,400	142,696
21	I-84 Cole to Y	84	6	7	81,372	16	6,100	136,272
22	I-84 Targee to Cole	84	6	12	75,500	6	6,600	134,900
14	I-84 Linder to east of Ten Mile	84	4	8	76,000	10	6,400	133,600
13	I-84 east of Ten Mile to Ten Mile	84	4	8	76,000	10	6,400	133,600
12	I-84 Ten Mile to County Line	84	4	8	76,000	10	6,400	133,600
843	I-84 County Line to Flamingo	84	4	8	76,000	10	6,400	133,600
23	I-84 Orchard to Targee	84	4	13	74,188	6	6,600	133,588
24	I-84 Owyhee to Orchard	84	4	14	63,253	6	6,600	122,653
842	I-84 Flamingo to Garrity	84	4	15	63,199	10	6,400	120,799
25	I-84 Vista to Owyhee	84	4	17	61,000	6	6,600	120,400
121	184 Curtis to Franklin	184	6	16	63,033	18	2,900	89,133
120	184 Franklin to I-84	184	4	18	57,236	18	2,900	83,336
122	184 Orchard to Curtis	184	7	19	54,936	17	3,000	81,936
56	Eagle Road Franklin to Fairview	)00SH05	4	20	50,000	20	900	58,100

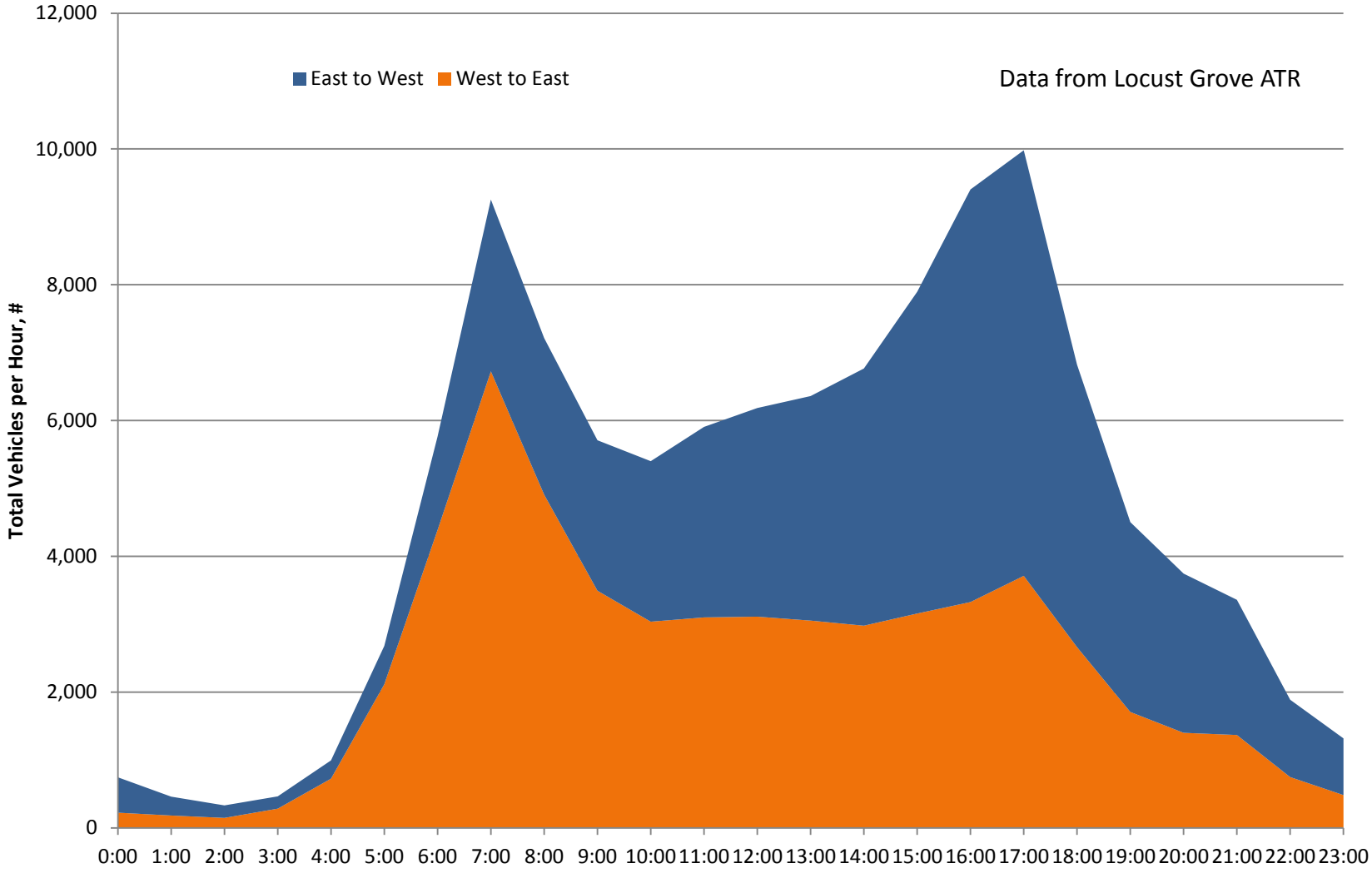
COMPASS (MPO) Congestion Map – 2010 CMS Report – Sanderson Index, North/East Direction



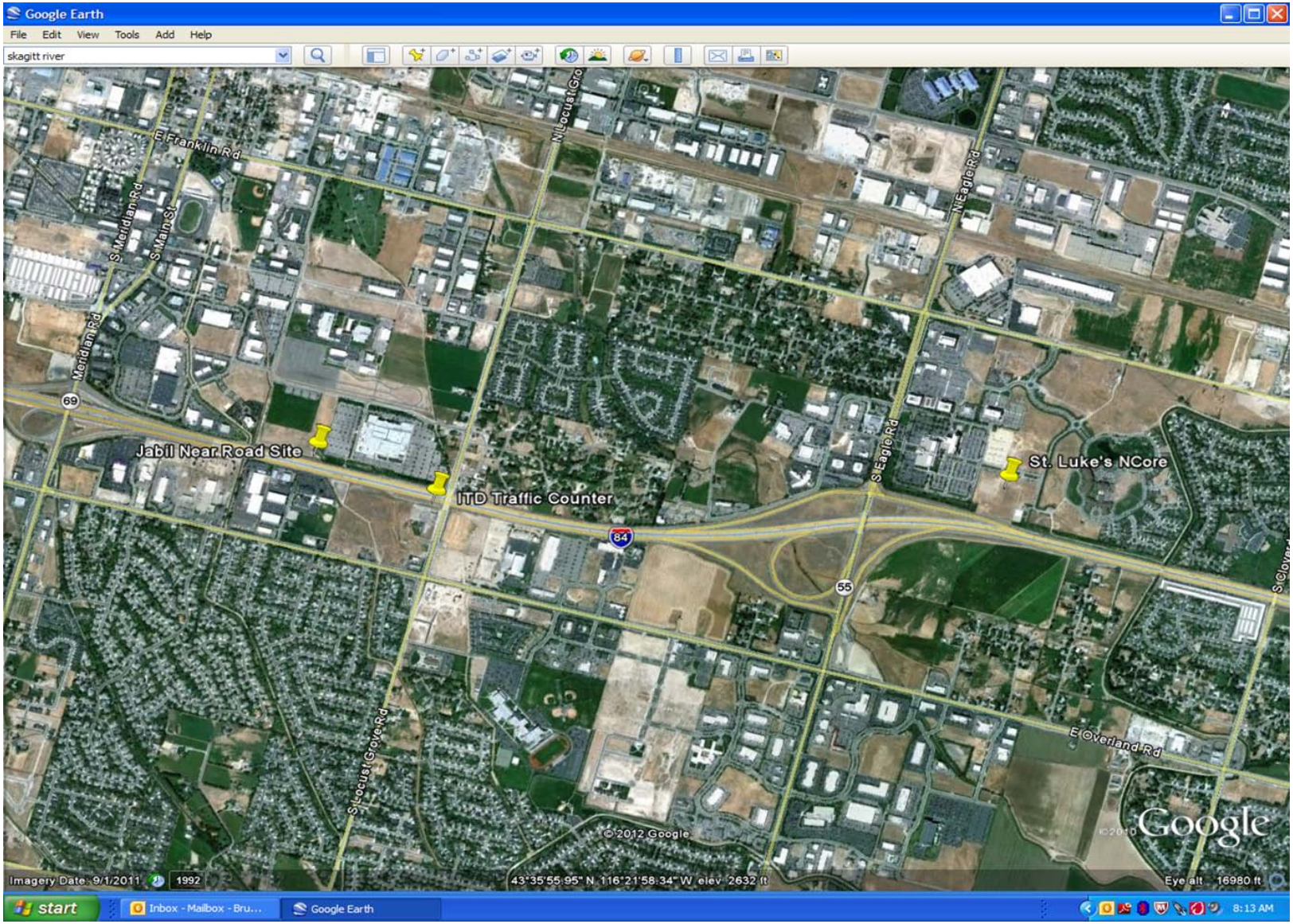
Near–road Wind Data, Typical Daily Wind Distribution (April 21, 2012)



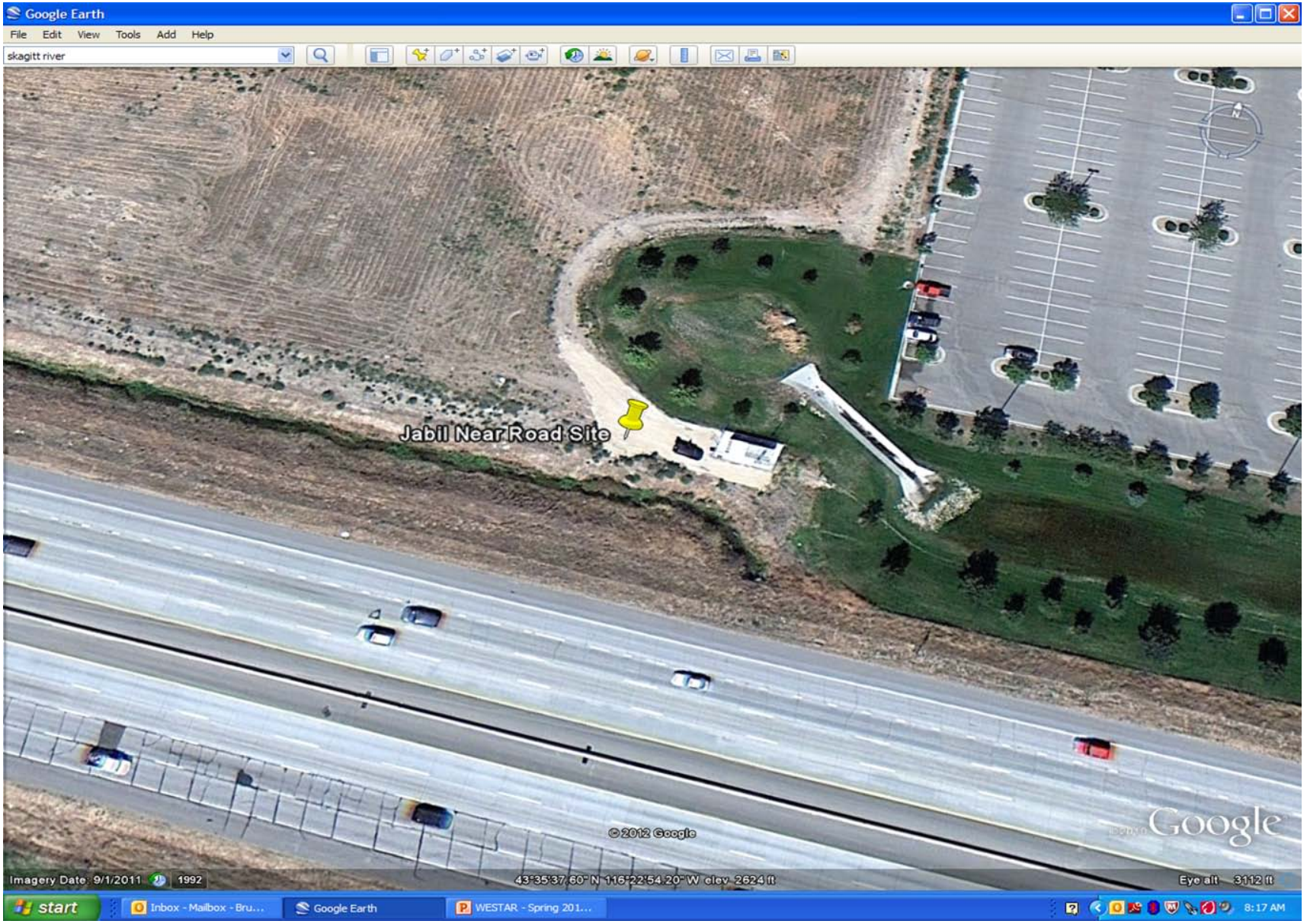
I-84 Hourly Traffic - Thursday February 16, 2012



Treasure Valley Near-road NO2 Monitoring Site



Treasure Valley Near-road NO2 Monitoring Site



American Ecotech Monitoring Shelter – 20’x 8’

AQ Monitoring Instrumention Installed

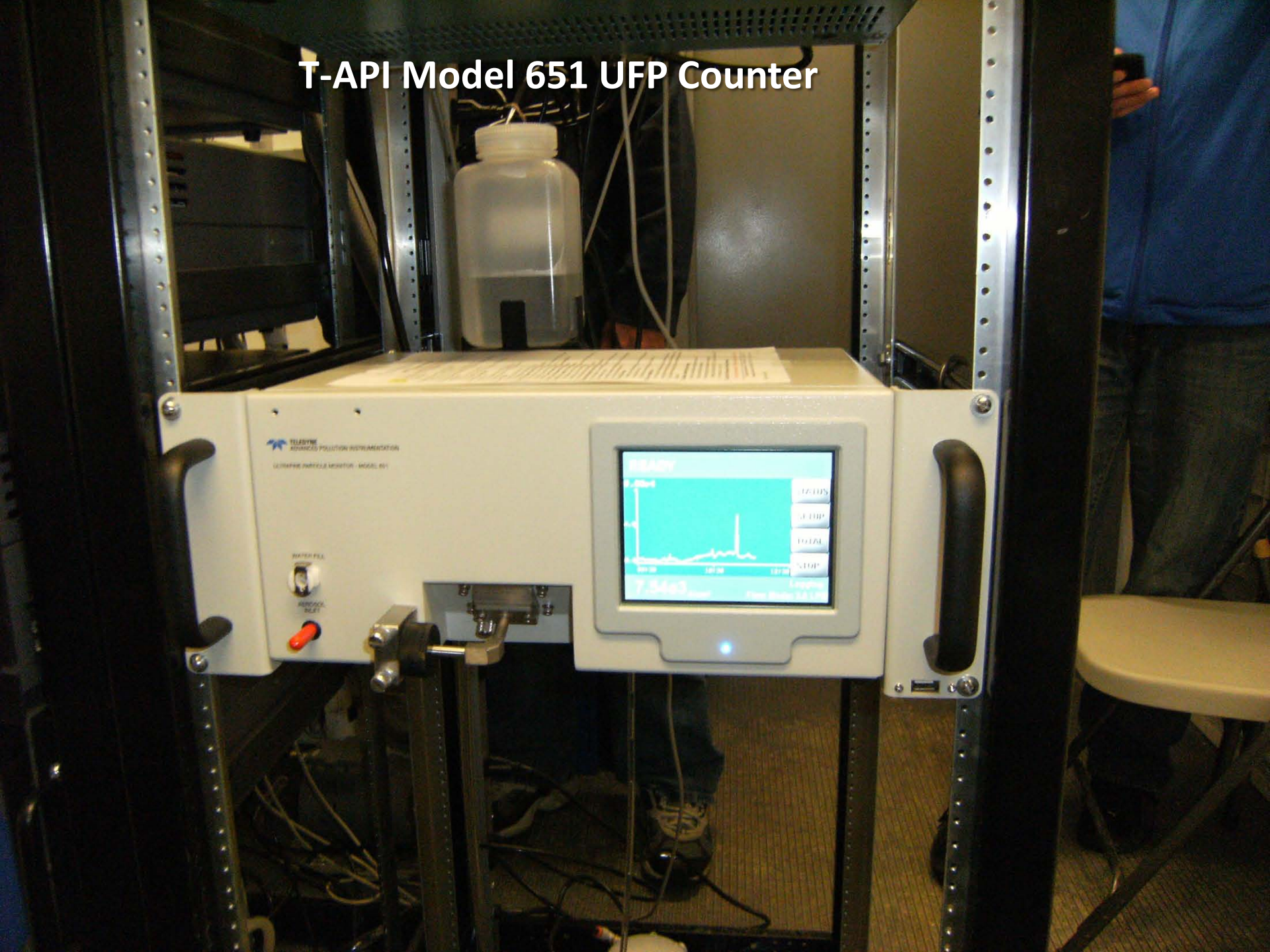
- NO_x
  - T-API Model T200U trace analyzer w/ photolytic convertor option
  - T-API Model 200E ambient analyzer w/ molybdenum convertor
- CO
  - T-API Model 300U trace analyzer
- Meteorological
  - RM Young Model 81000 Ultrasonic 3D Anemometer
  - RM Young Model 05305 Wind AQ monitor (propeller)
- Particles
  - TSI Model 3031 UFP monitor (20 – 800 nm, 6 size bins)
  - T-API Model 651 Particle monitor (total UFP < 1µm).
- Carbon – Aethalometer
  - T-API Model 633 – 7 wavelength spectrum
  - Magee Model AE 21 – BC and UV channels
- Envidas Ultimate

Equipment and Site Set-up Costs ~ $250K

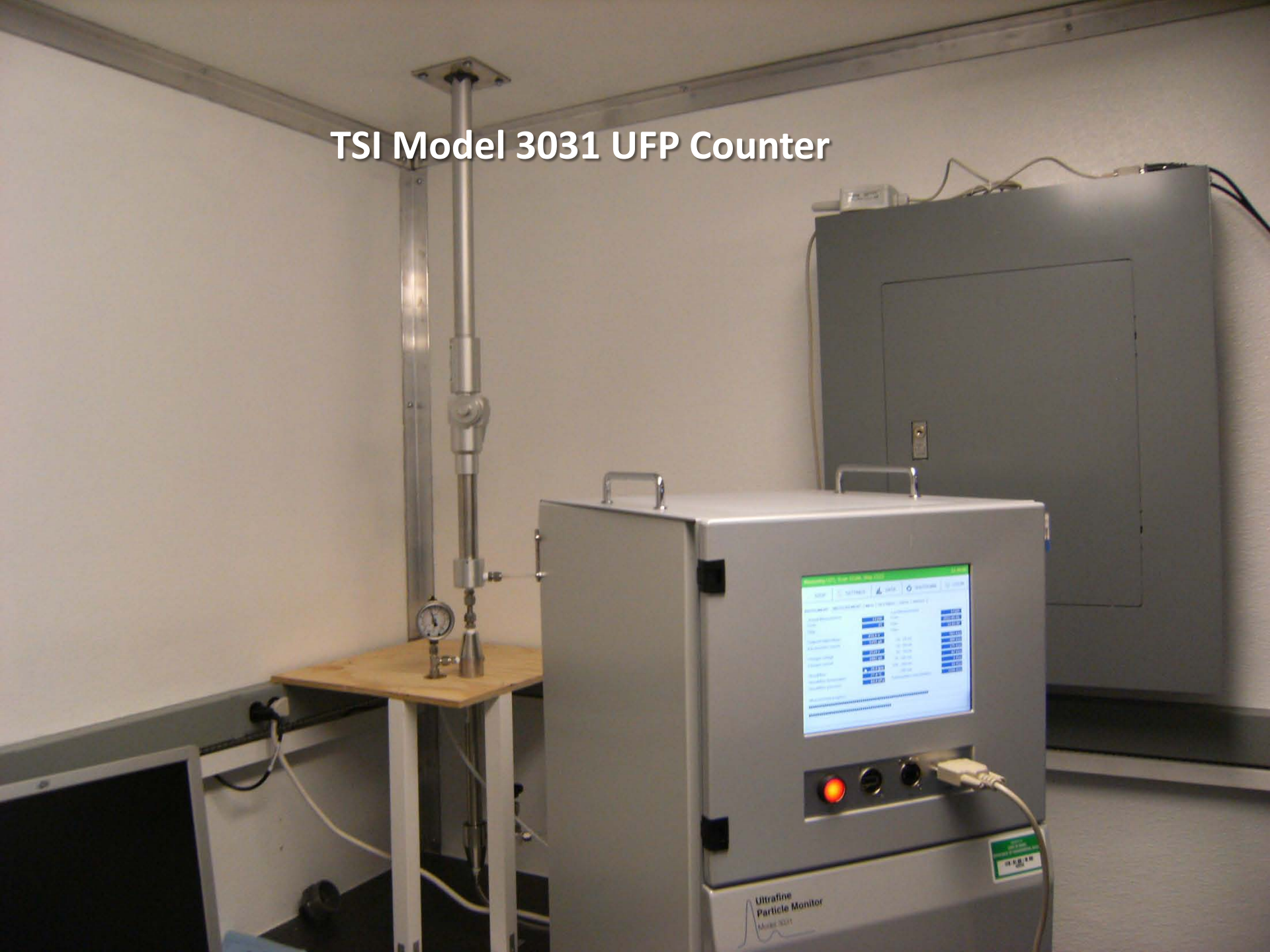
• Shelter	$56K
• T-API trace NOx w/ photolytic	$26K
• T-API trace CO	$13K
• T-API 633 Aethalometer	$21K
• TSI 3031 UFP Counter	$67K
• Zero Air Generator	$8K
• Gas Calibrator	$20K
• Met sensors	$6K
• Computing, data acquisition	$10K
• Site preparation	$16K
• Training and supplies	$8K


TELEDYNE
ADVANCED POLLUTION INSTRUMENTATION
HOME MAIN SETTINGS ABOUT
BC 125 ng/m³
UVPM 139 ng/m³
FLOW 5.0 LPM
STATUS 0
May 01 2012 11:52:40
AETHALOMETER - MODEL 633
INDUSTRIAL COMPUTER
ADVANTECH
Magee Scientific
Aethalometer™

T-API Model 651 UFP Counter

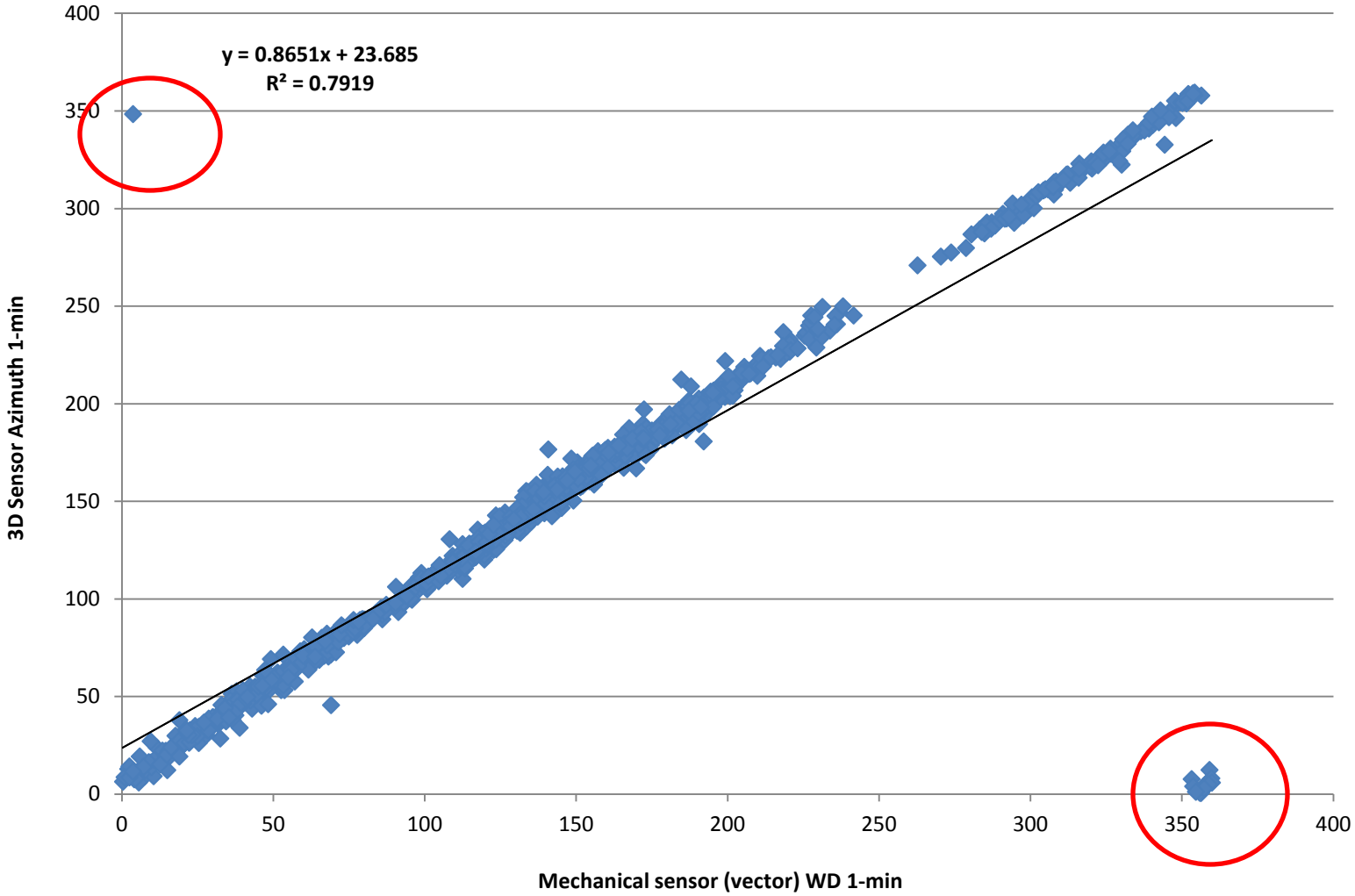


TSI Model 3031 UFP Counter



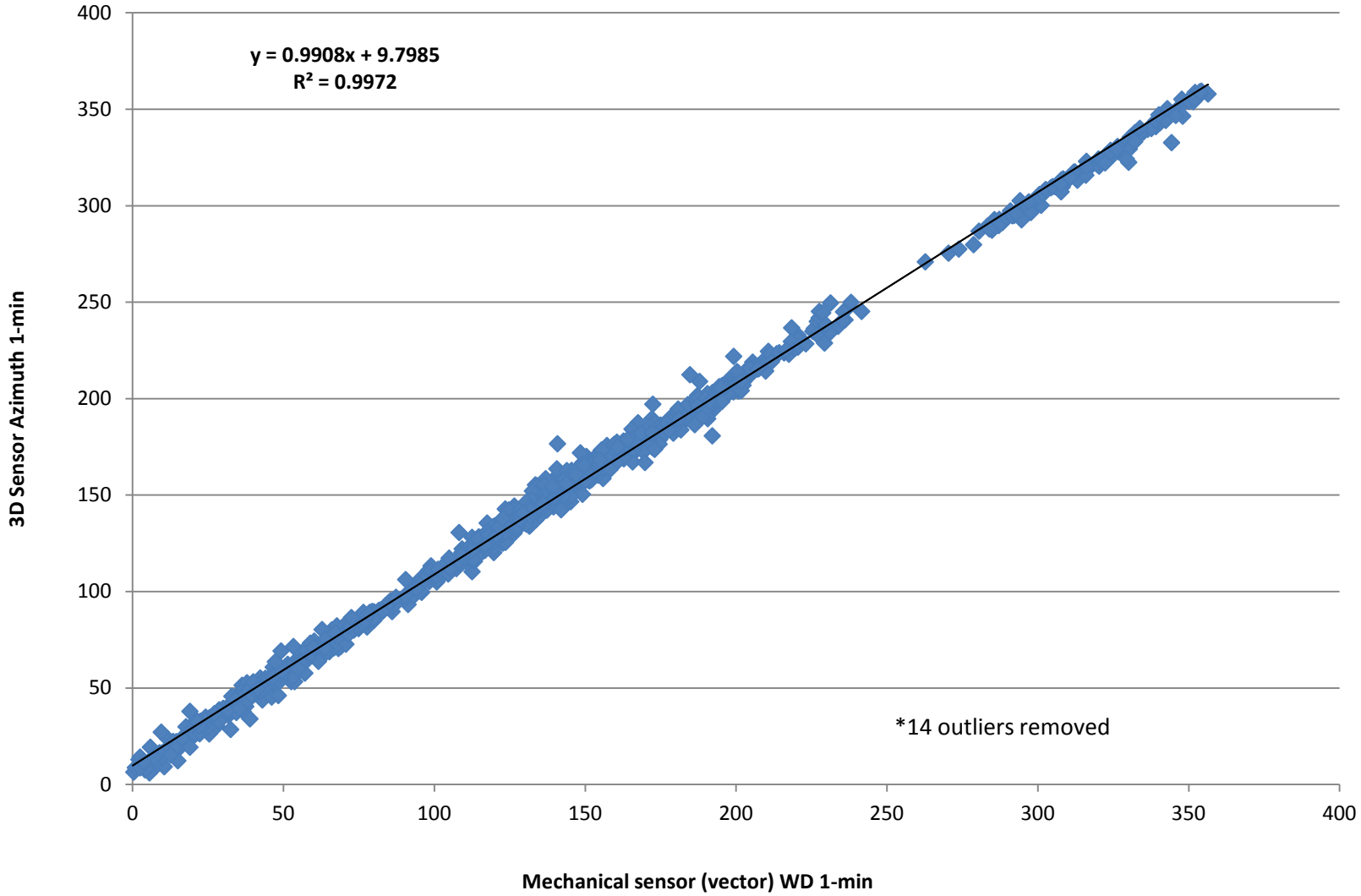
RM Young 81000 3D Anenometer Collocated With 05305 Mechanical Sensor – 10 meter height

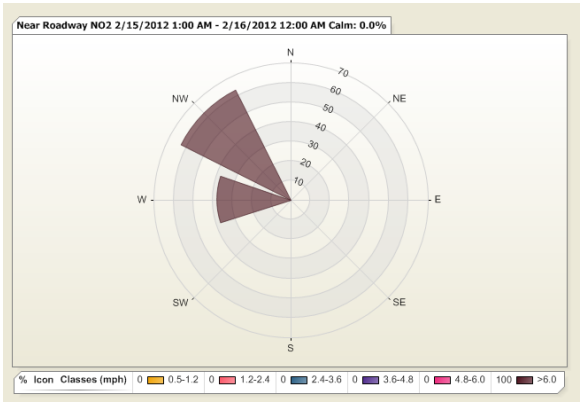
Feb 8, 1-min Mechanical WD (x) v. Sonic 3D Azimuth (y)

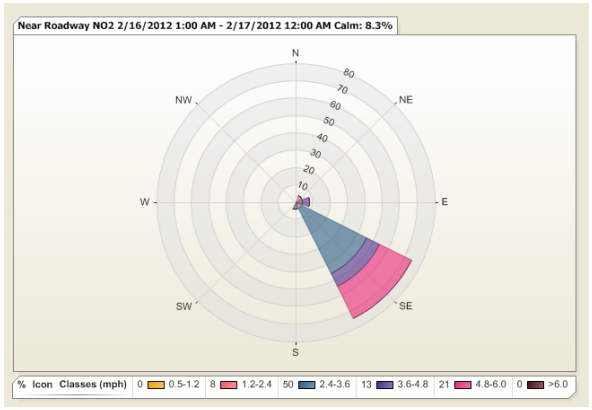


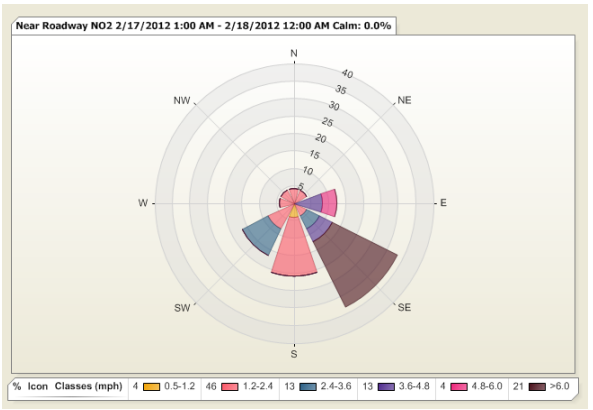
Data is preliminary and subject to change.

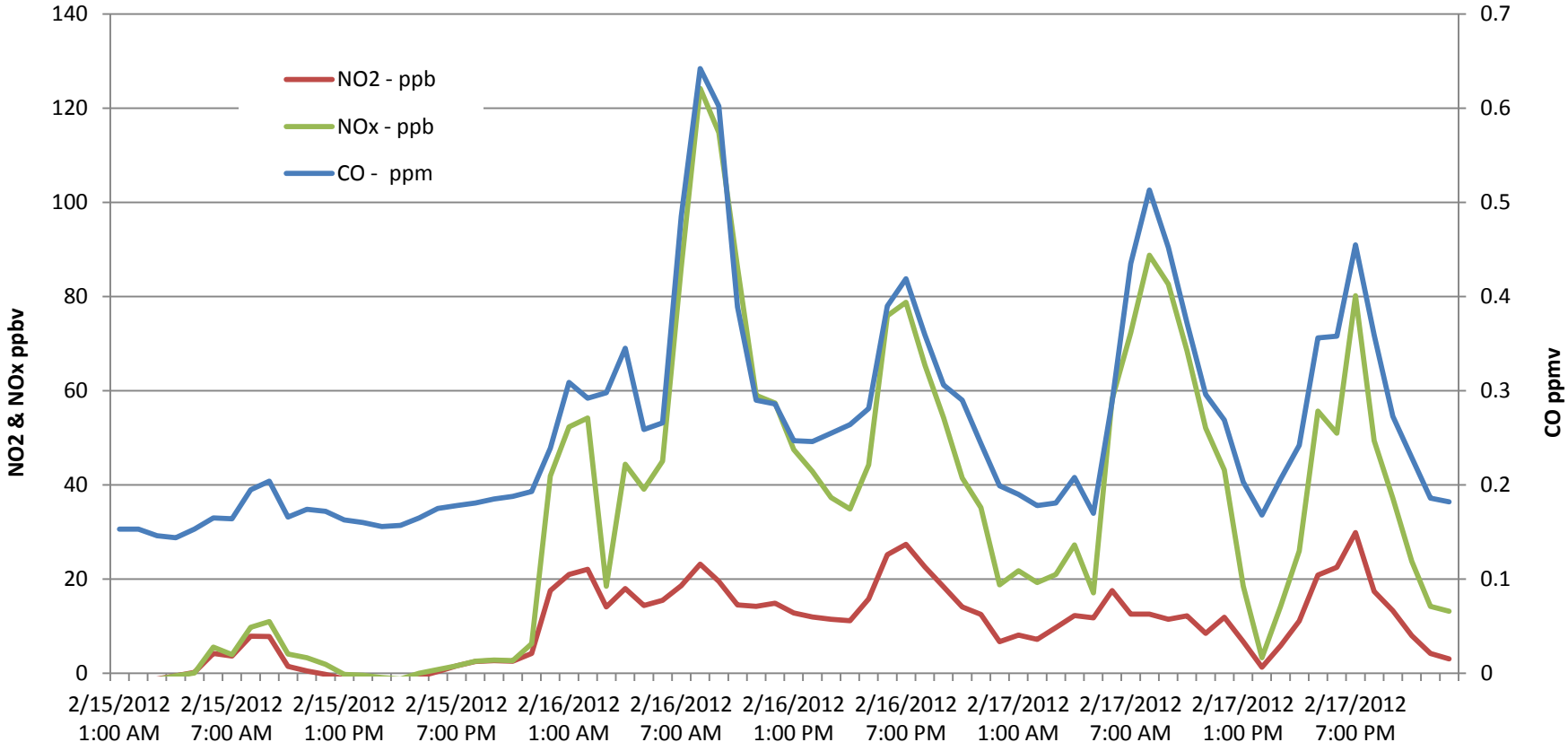
Feb 8, 1-min Mechanical WD v. 3D Azimuth*



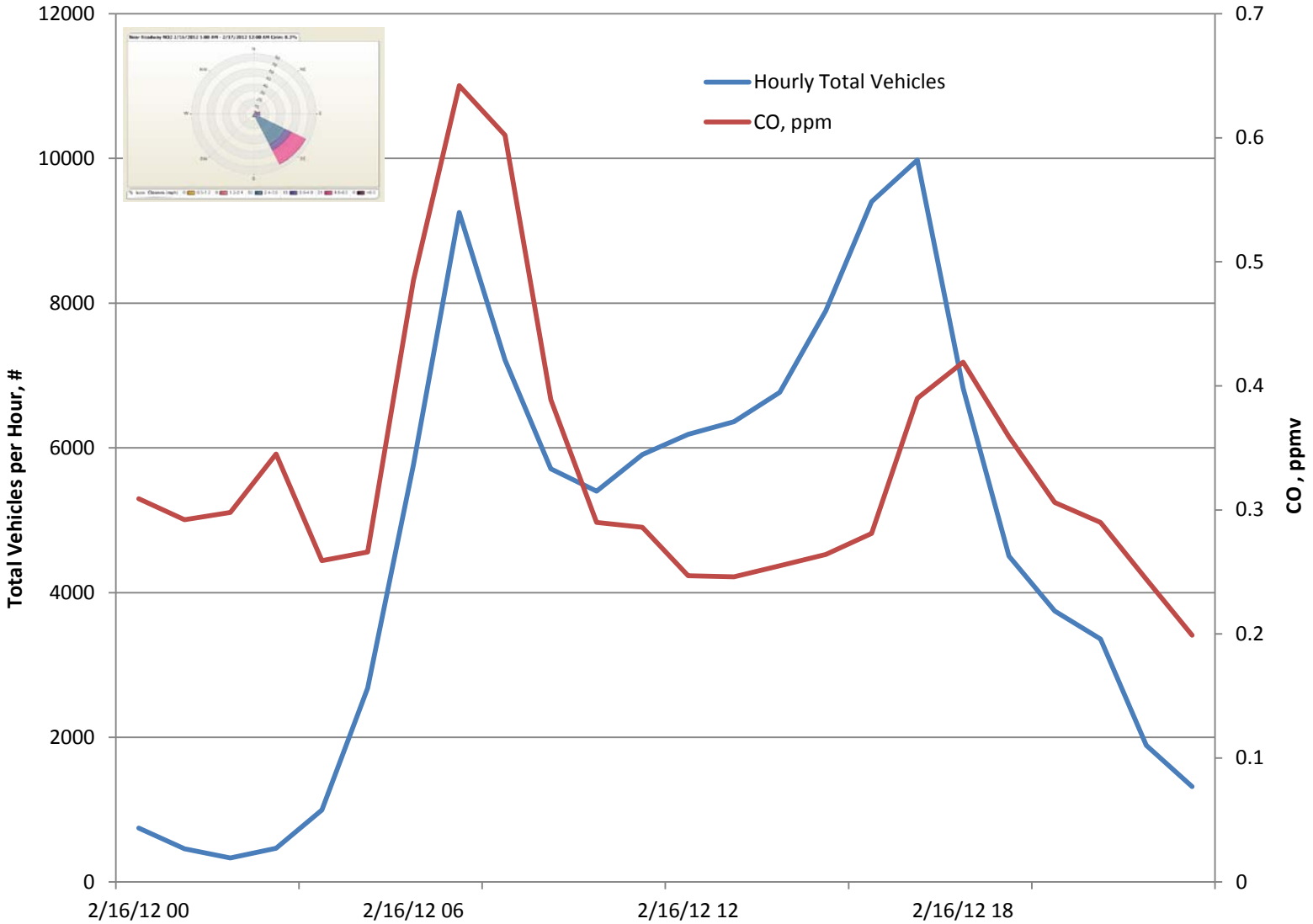

Near Roadway NO2 2/15/2012 1:00 AM - 2/16/2012 12:00 AM Calm: 0.0%
N
NE
E
SE
S
SW
W
NW
% Icon Classes (mph) 0 0.5-1.2 0 1.2-2.4 0 2.4-3.6 0 3.6-4.8 0 4.8-6.0 100 >6.0


Near Roadway NO2 2/16/2012 1:00 AM - 2/17/2012 12:00 AM Calm: 8.3%
N
NE
E
SE
S
SW
W
NW
% Icon Classes (mph) 0 0.5-1.2 8 1.2-2.4 50 2.4-3.6 13 3.6-4.8 21 4.8-6.0 0 >6.0


Near Roadway NO2 2/17/2012 1:00 AM - 2/18/2012 12:00 AM Calm: 0.0%
N
NE
E
SE
S
SW
W
NW
% Icon Classes (mph) 4 0.5-1.2 46 1.2-2.4 13 2.4-3.6 13 3.6-4.8 4 4.8-6.0 21 >6.0

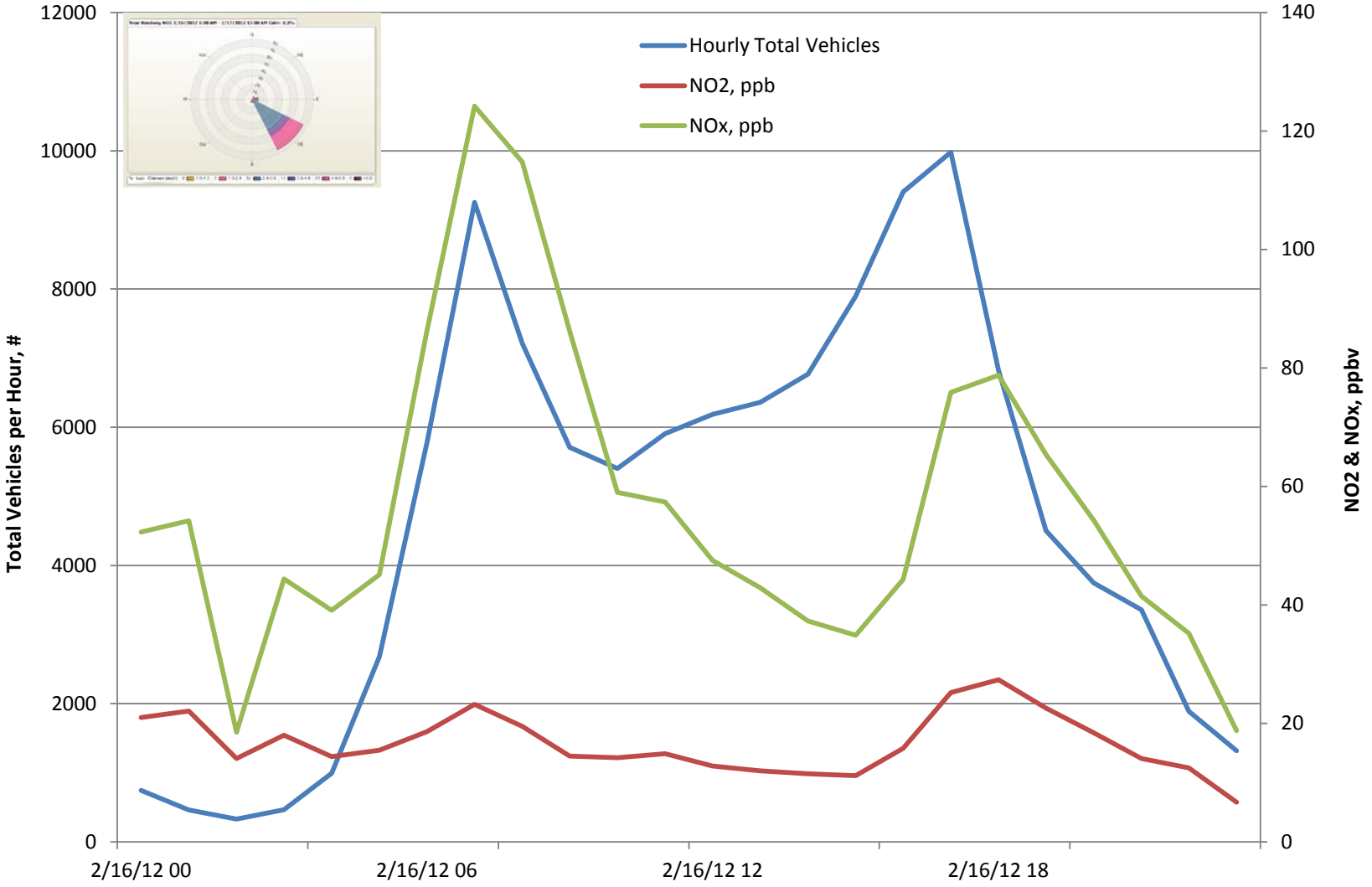

NO2 - ppb
NOx - ppb
CO - ppm
NO2 & NOx ppbv
CO ppmv
140
120
100
80
60
40
20
0
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2/15/2012 1:00 AM
2/15/2012 7:00 AM
2/15/2012 1:00 PM
2/15/2012 7:00 PM
2/16/2012 1:00 AM
2/16/2012 7:00 AM
2/16/2012 1:00 PM
2/16/2012 7:00 PM
2/17/2012 1:00 AM
2/17/2012 7:00 AM
2/17/2012 1:00 PM
2/17/2012 7:00 PM

Boise Near-road, CO v. Total Hourly Traffic Counts
February 16, 2012



Data is preliminary and subject to change.

Boise Near-road, NO2 & NOx v. Total Hourly Traffic Counts
February 16, 2012



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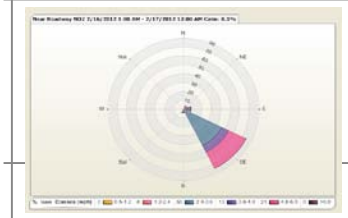
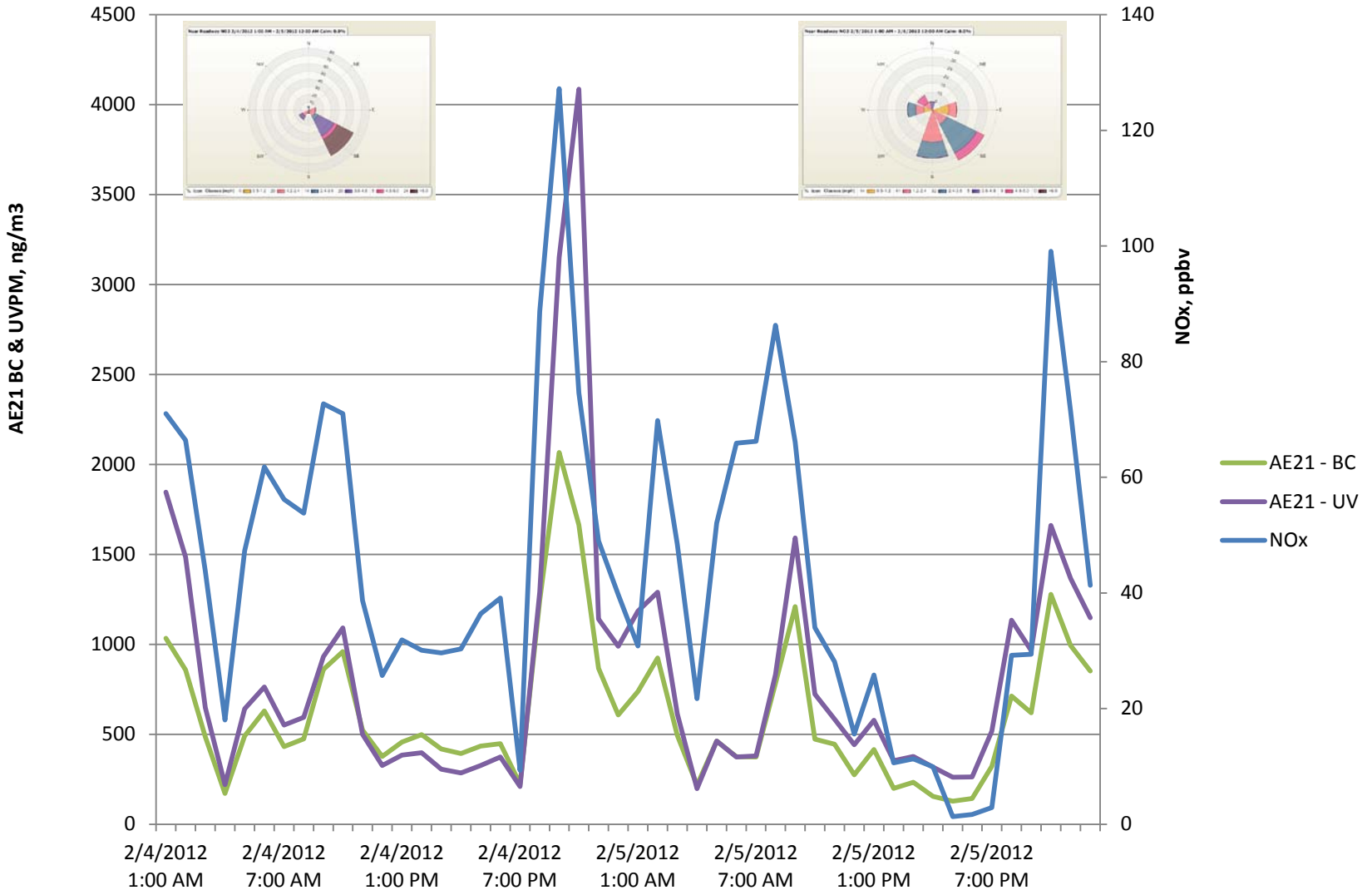
Boise Near-road BC, UVPM and Total UFP
February 16, 2012



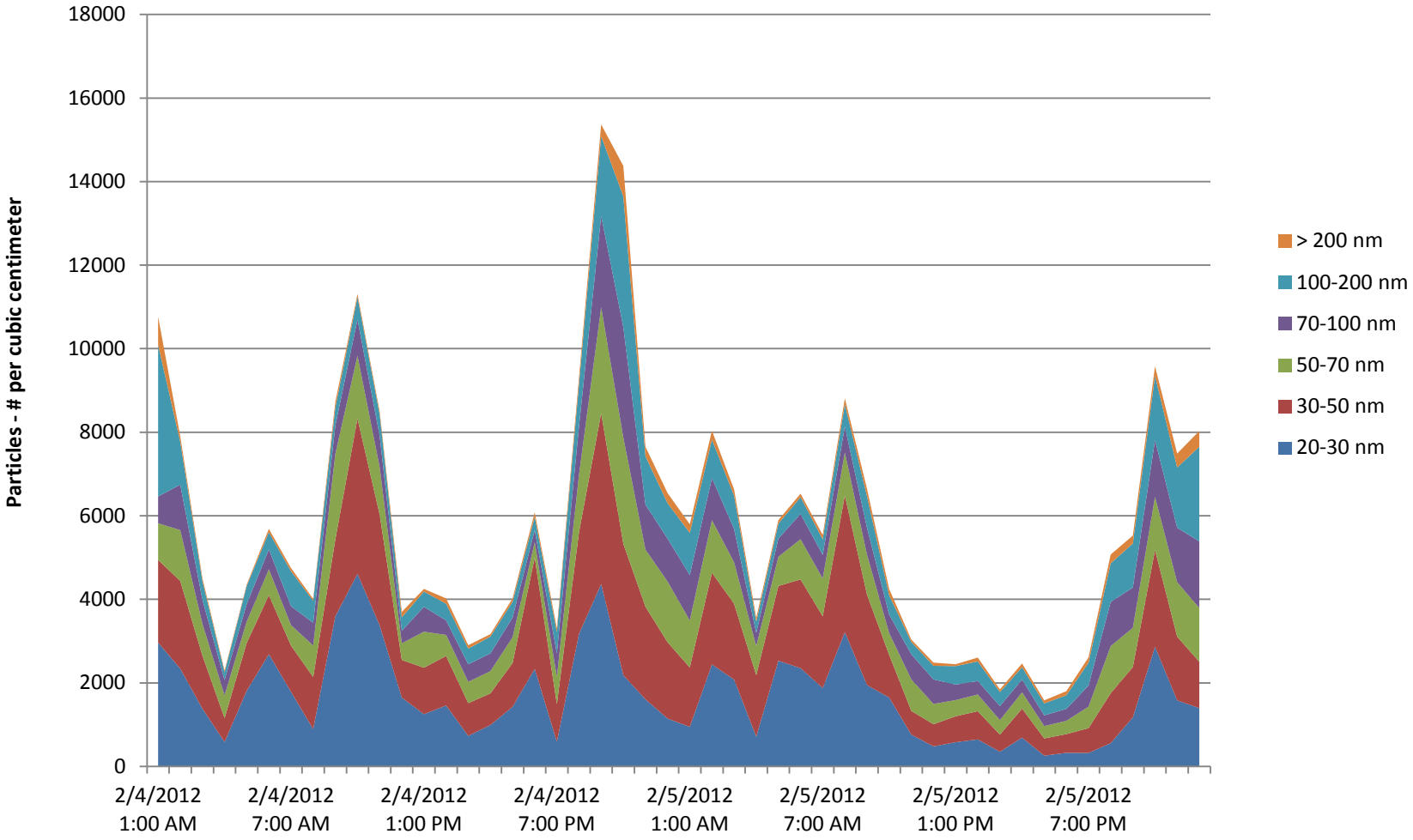
Data is preliminary and subject to change.

Boise Near-road, Saturday and Sunday, February 4 & 5

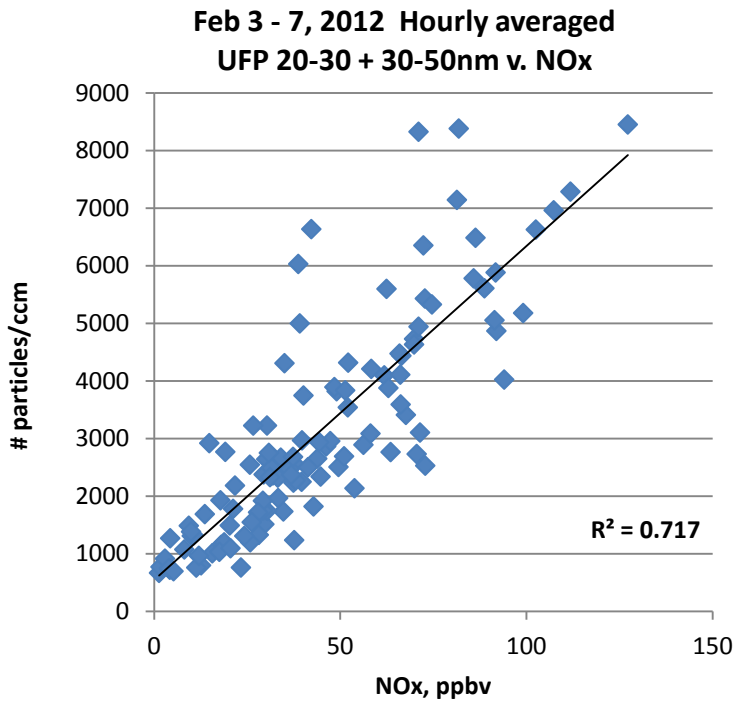


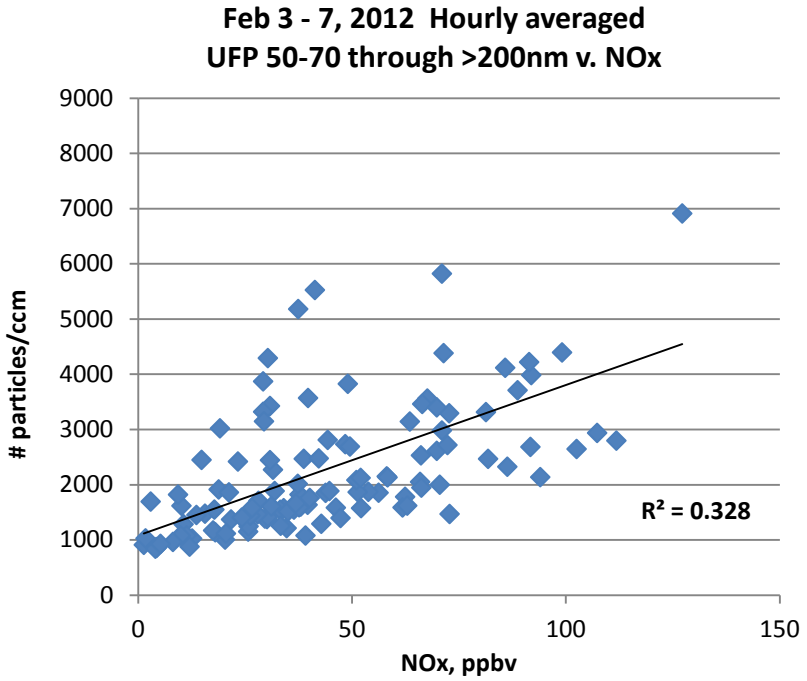
Data is preliminary and subject to change.

TSI 3031 Particle Counts – Saturday and Sunday, February 4-5, 2012

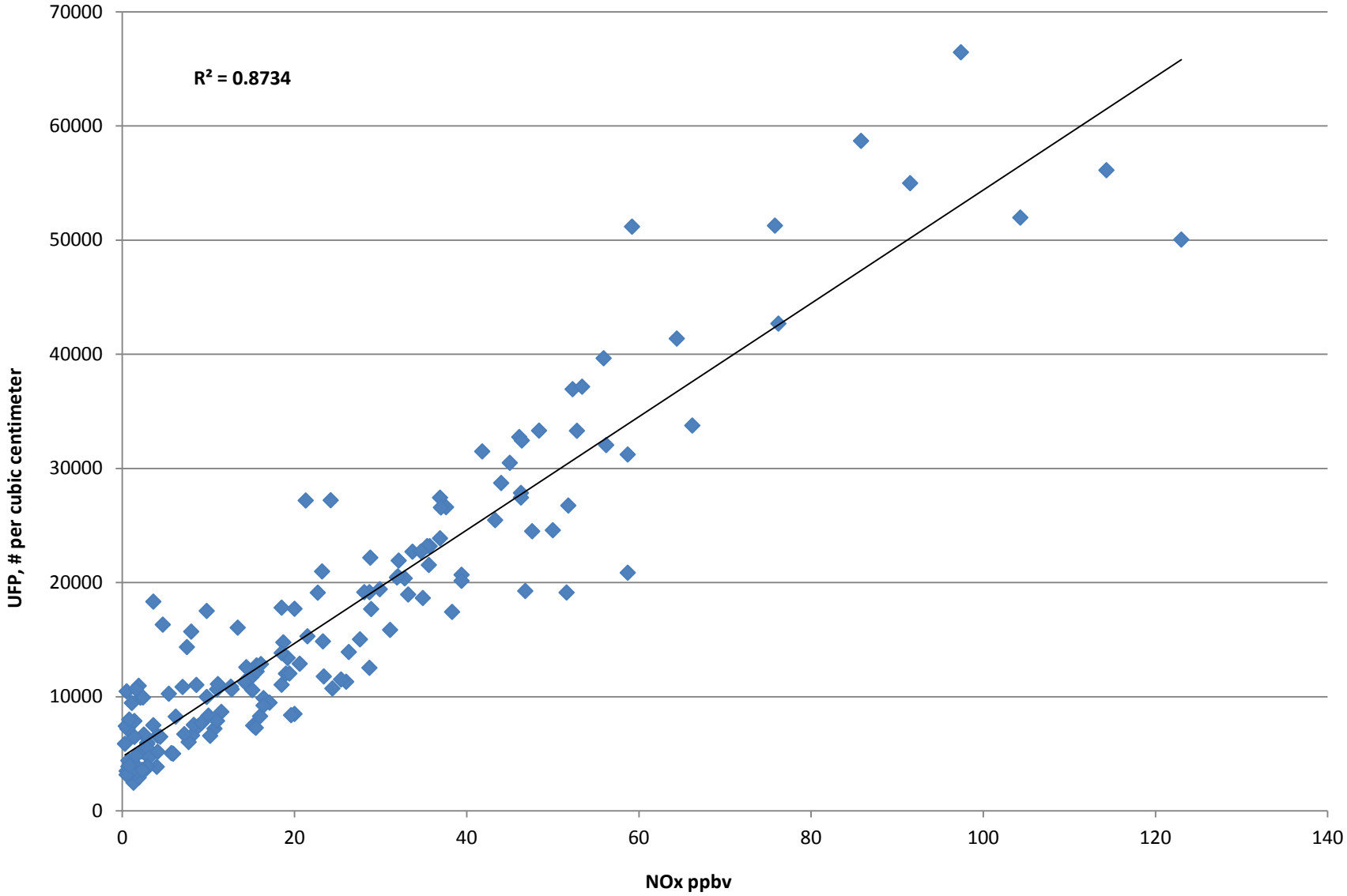


Data is preliminary and subject to change.


Feb 3 - 7, 2012 Hourly averaged
UFP 20-30 + 30-50nm v. NOx
particles/ccm
NOx, ppbv
R² = 0.717
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
50
100
150


Feb 3 - 7, 2012 Hourly averaged
UFP 50-70 through >200nm v. NOx
particles/ccm
NOx, ppbv
R² = 0.328
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
50
100
150

April 15 – 21, 2012 Total UFP (T-API 651) v. NOx



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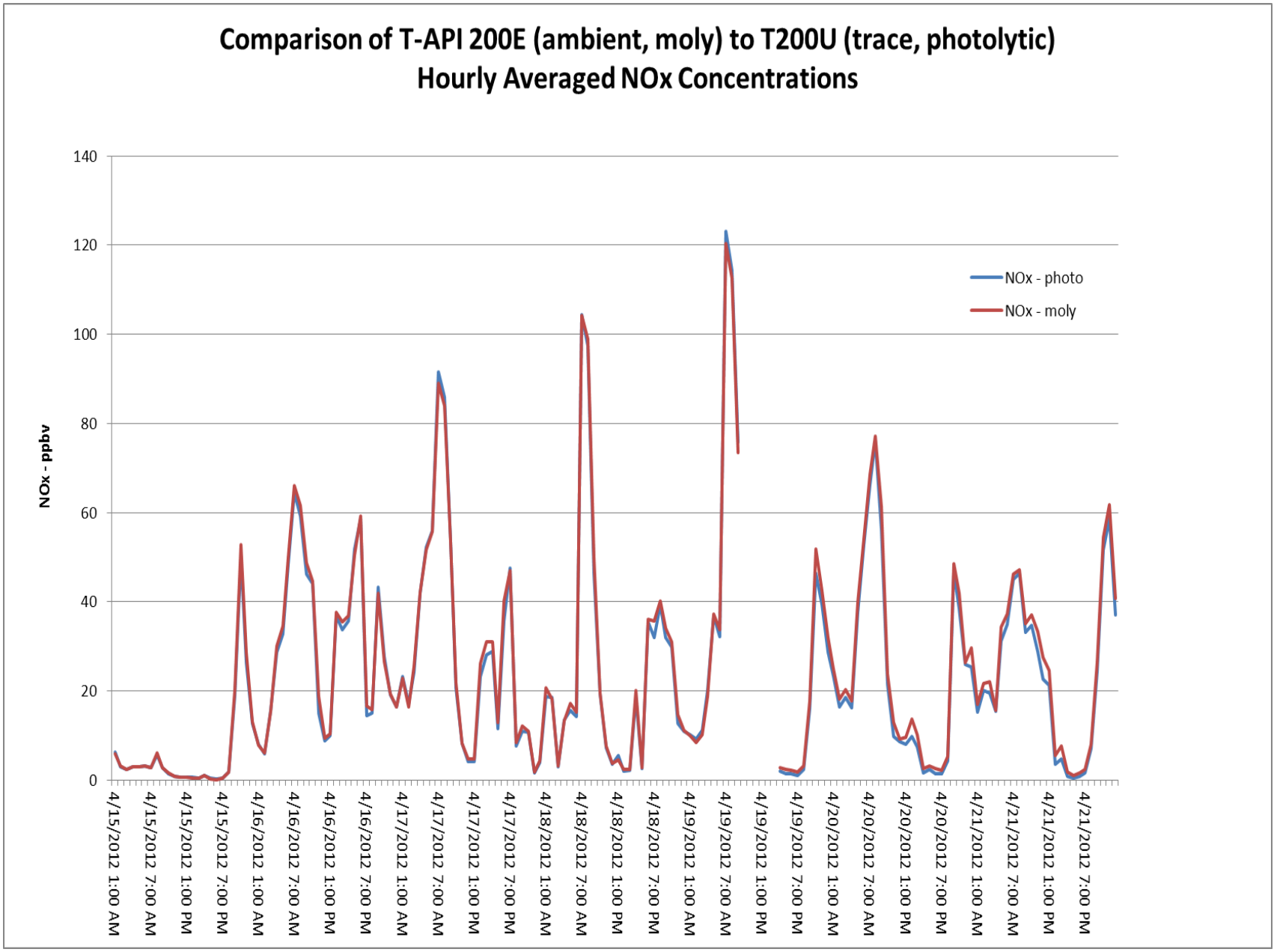

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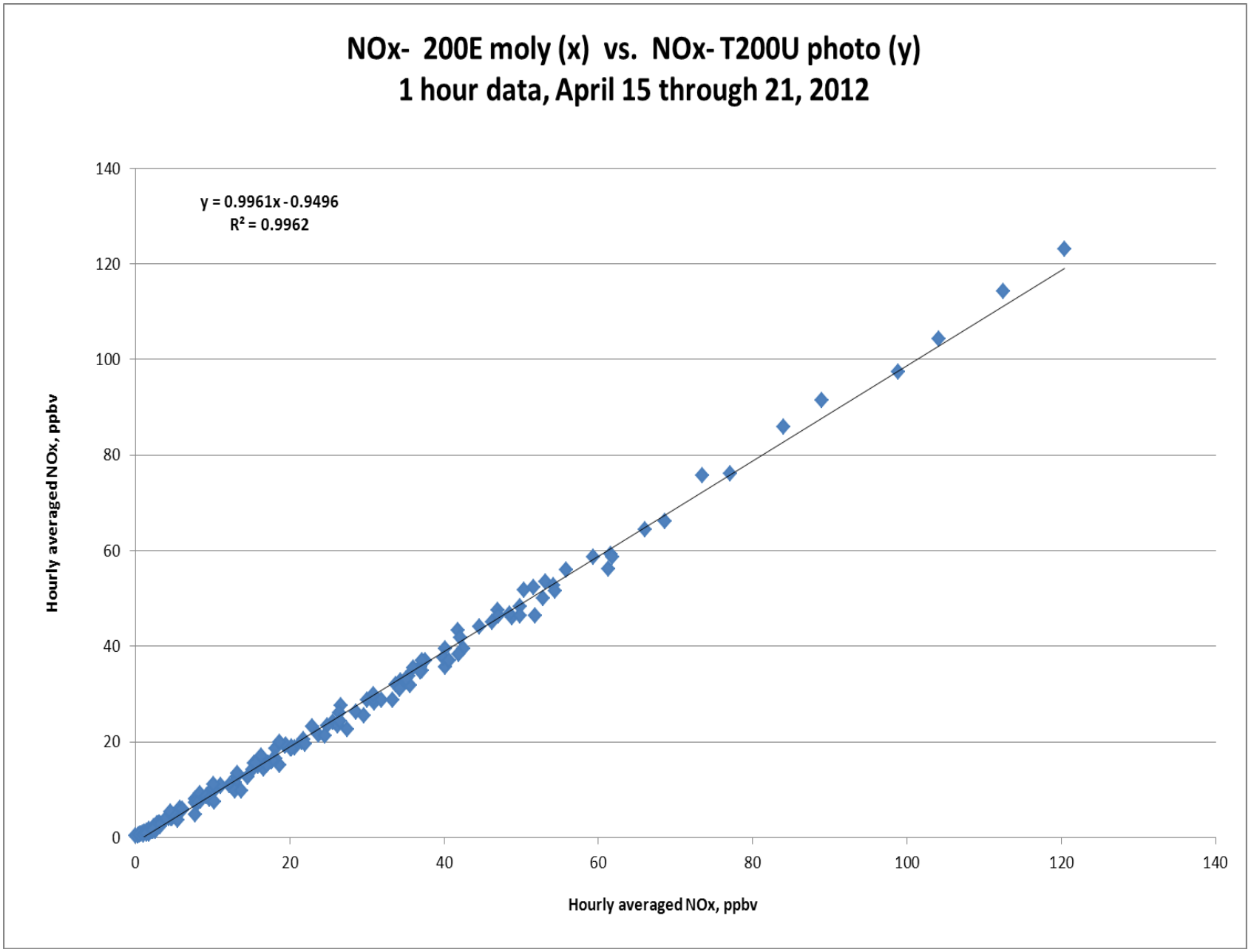

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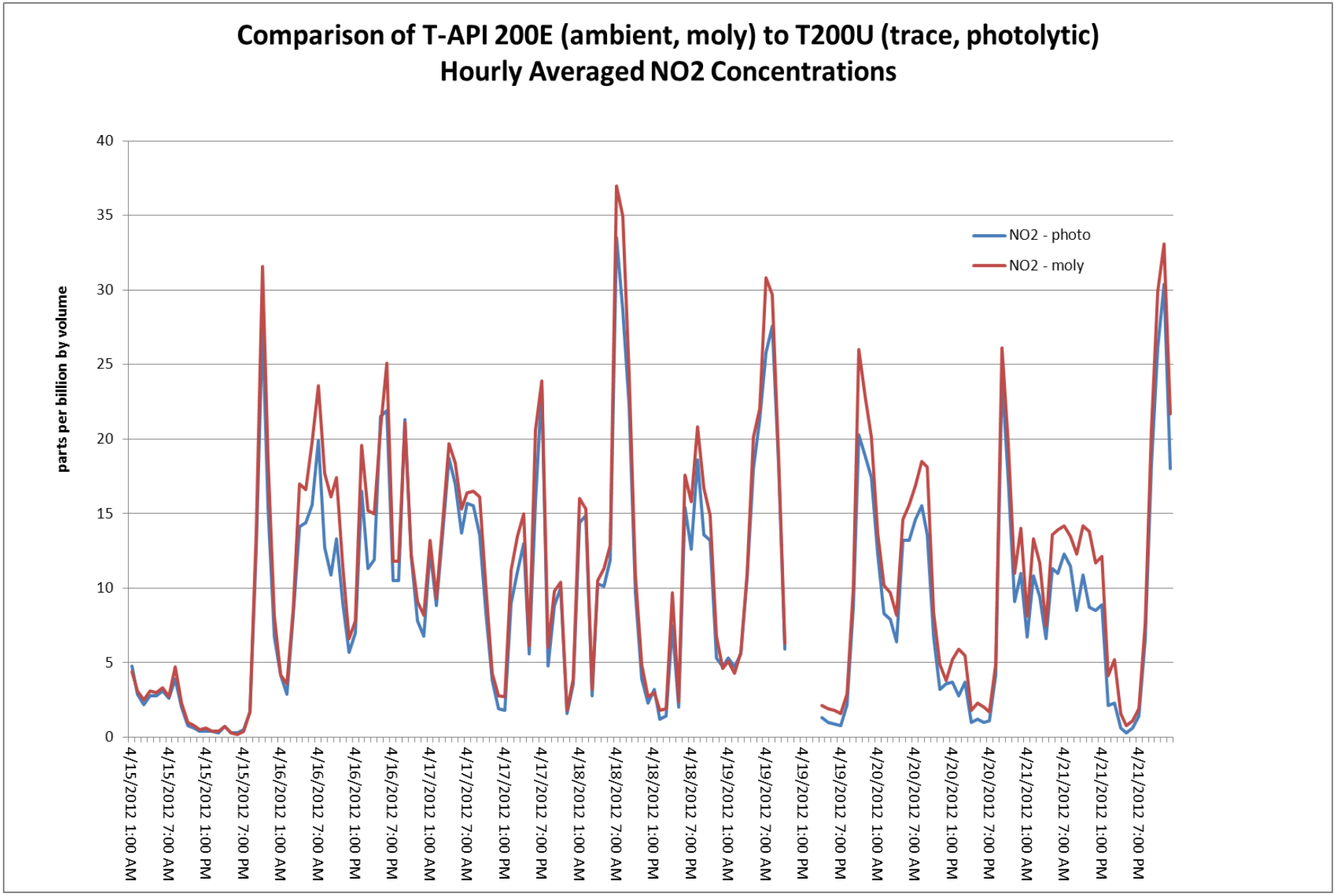
Comparison of T-API 200E (ambient, moly) to T200U (trace, photolytic)
Hourly Averaged NO2 Concentrations
parts per billion by volume
NO2 - photo
NO2 - moly
0
5
10
15
20
25
30
35
40
4/15/2012 1:00 AM
4/15/2012 7:00 AM
4/15/2012 1:00 PM
4/15/2012 7:00 PM
4/16/2012 1:00 AM
4/16/2012 7:00 AM
4/16/2012 1:00 PM
4/16/2012 7:00 PM
4/17/2012 1:00 AM
4/17/2012 7:00 AM
4/17/2012 1:00 PM
4/17/2012 7:00 PM
4/18/2012 1:00 AM
4/18/2012 7:00 AM
4/18/2012 1:00 PM
4/18/2012 7:00 PM
4/19/2012 1:00 AM
4/19/2012 7:00 AM
4/19/2012 1:00 PM
4/19/2012 7:00 PM
4/20/2012 1:00 AM
4/20/2012 7:00 AM
4/20/2012 1:00 PM
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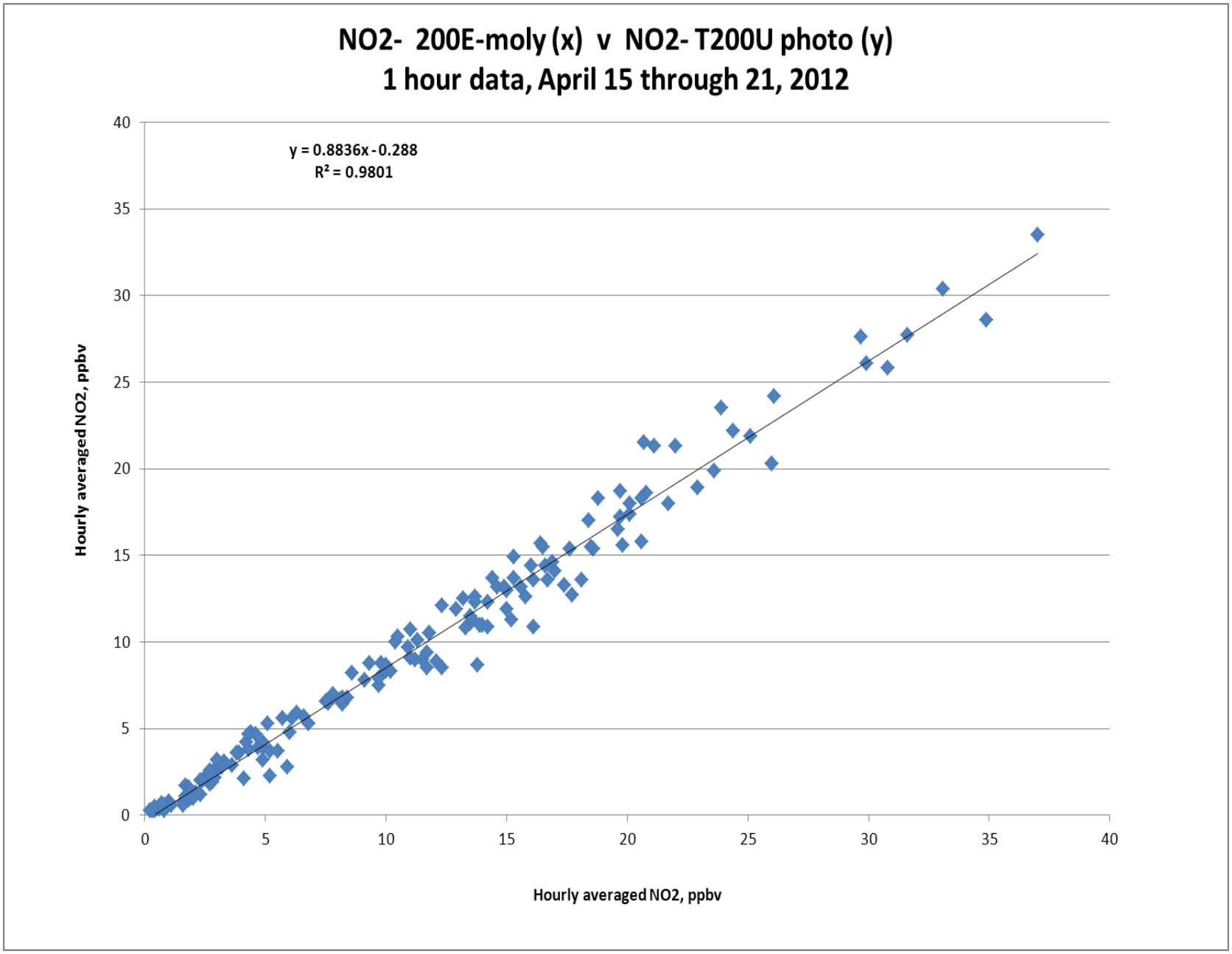
4/21/2012 7:00 AM
4/21/2012 1:00 PM
4/21/2012 7:00 PM



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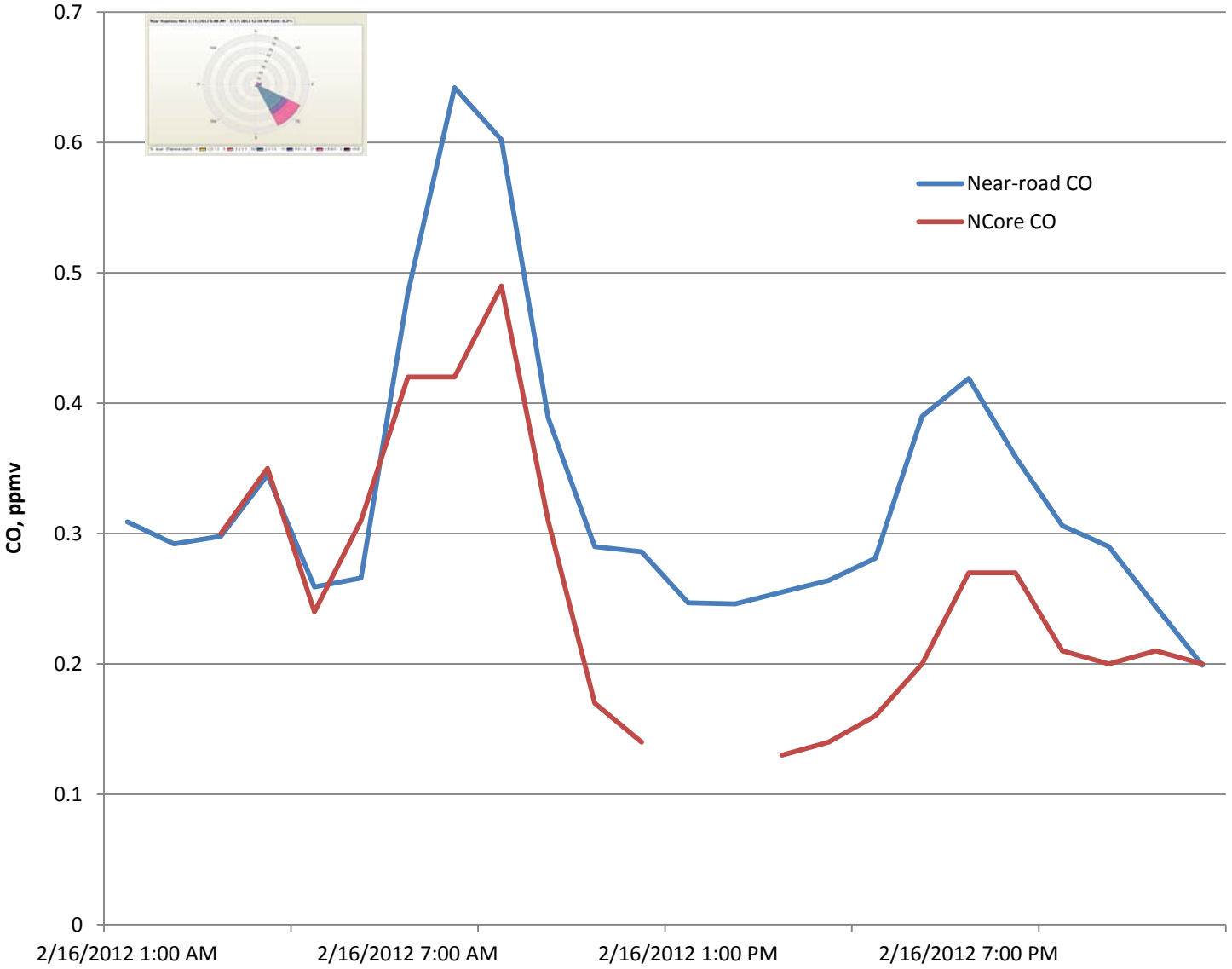
Boise Near-road and NCore CO - February 16, 2012



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Questions?