

Providence, RI NATTS Network Assessment Review

- Established 2003: Carbonyls, PM₁₀ Metals, and VOCs
 - Chromium VI added in 2005; ended in in 2013
 - PAHs added in 2008
- For the NATTS Network Assessment (2003-2018):
 - 18 of 18 Method Quality Objective (MQO) Core HAPs were included in the national trends
 - 254 of 268 pollutant datasets were suitable for trends analysis
 - Annual Average and 3-Year Rolling Average Concentrations were generally flat over time, with the exception of a few pollutants (benzene, 1,3-butadiene, naphthalene, nickel (PM₁₀), tetrachloroethylene, and trichloroethylene).
 - 100% Reporting of Datasets
- Method Quality Objectives (MQO): 2003-2018
 - Completeness: Met 85% completeness in 254 of 268 pollutant datasets
 - Method Detection Limits: Met MDL Target Ratio of 1.00 in 252 of 271 pollutant datasets
 - Bias: Met ±25% for 204 of 216 pollutant datasets
 - Overall Method Precision: Met ≤15% CV for 76 of 108 pollutant datasets
 - Analytical Method Precision: Met ≤15% CV for 92 of 117 pollutant datasets
- Analytical Laboratories for 2018

| | | | | |
|-------|----------|-------------------------|-------------|------|
| VOC | Carbonyl | PM ₁₀ Metals | Chromium VI | PAHs |
| RIDOH | RIDOH | RIDOH | NA | ERG |

- Equipment Year Deployed

| Equipment Type | VOC | Carbonyl | PM ₁₀ Metals | Chromium VI | PAHs |
|-----------------------|------|----------|-------------------------|-------------|------|
| Sampler | 2004 | 2015 | 2014 | 2005 | 2011 |
| Analytical | 2005 | 2007 | 2015 | 2001 | 2015 |
| Preconcentrator | 2015 | NA | NA | NA | NA |
| Standards Preparation | 2010 | NA | NA | NA | NA |
| Canister Cleaning | 2016 | NA | NA | NA | NA |
| Extraction | NA | NA | 2006 | 2011 | 2004 |

National Summary: NATTS data were collected at 27 locations across the United States, with sites beginning in 2003 or later (Figure 1) for 19 core HAPs. Over 528,000 concentrations (primary, secondary, and replicate) were generated and analyzed for this assessment. Pollutant datasets were scored to assess whether they were suitable for trends analysis. Each pollutant dataset was evaluated against four MQOs: Completeness; Sensitivity; Bias; and Precision. Datasets that were suitable (A- or B-rated) for six consecutive years were used for national trends analysis (Table 1).

National trends were determined by comparing the most recent 3-year blocked averages (e.g., 2013-2015 vs. 2016-2018) to determine if the NATTS Trends DQO was being met:

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

Of the 19 core HAPs, 18 were assessed for the NATTS Trends DQO. Due to sampling and analytical issues, acrolein was not considered for trends analysis (Table 2). This assessment showed that across the network, 15 of those 18 pollutants were decreasing between the 3-year blocks, while two of those pollutants were increasing between the 3-year blocks. One pollutant did not exhibit a trend.

Figure 1. NATTS Site and Year Established

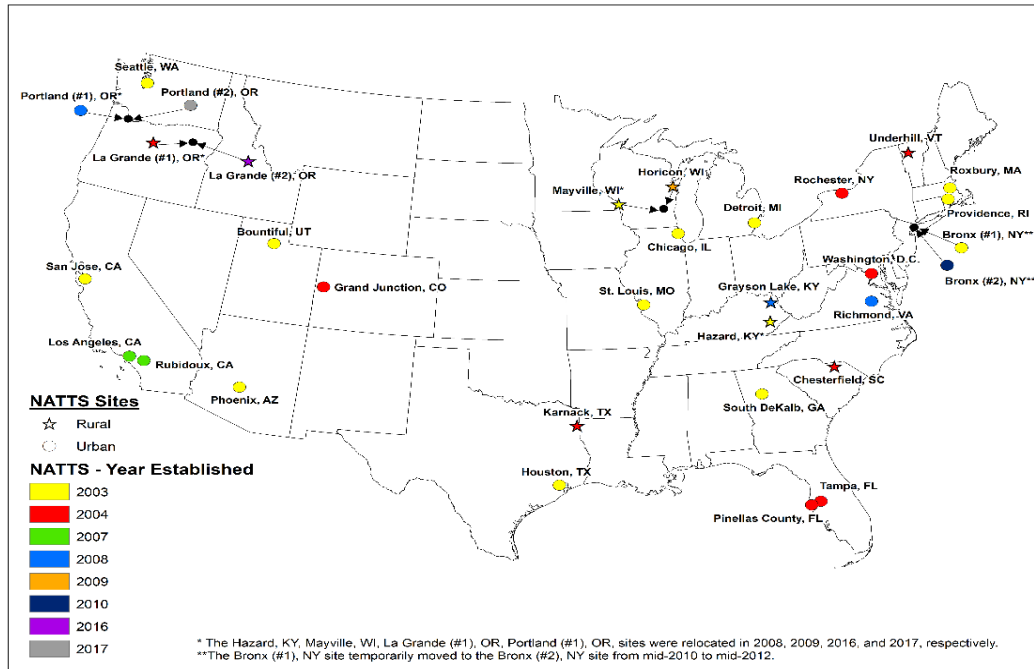


Table 1. NATTS Network Assessment: Count and Percentage of Suitable Datasets by Pollutant Group

| Pollutant Group | A-rated | | B-rated | | Does Not Meet | |
|-------------------------|---------|-----|---------|-----|---------------|-----|
| | # | % | # | % | # | % |
| VOCs | 1,452 | 53% | 737 | 27% | 555 | 20% |
| Carbonyls | 523 | 67% | 193 | 25% | 66 | 8% |
| PM ₁₀ Metals | 1,418 | 61% | 685 | 30% | 213 | 9% |
| Chromium VI | 159 | 74% | 29 | 13% | 27 | 13% |
| PAHs | 410 | 74% | 124 | 22% | 18 | 3% |
| Total = 6,609 | 3,962 | 60% | 1,768 | 27% | 879 | 13% |

Table 2. Three-Year Block Averages for National Trends

| Pollutant | Units | # Sites | Block 1 | Block 2 | % Difference |
|-------------------------------|-------------------|---------|---------|---------|--------------|
| Acetaldehyde | µg/m ³ | 19 | 1.51 | 1.39 | -7.7% |
| Arsenic (PM ₁₀) | ng/m ³ | 21 | 0.71 | 0.68 | -3.2% |
| Benzene | µg/m ³ | 19 | 0.65 | 0.59 | -10.2% |
| Benzo(a)pyrene | ng/m ³ | 21 | 0.113 | 0.087 | -23.2% |
| Beryllium (PM ₁₀) | ng/m ³ | 20 | 0.012 | 0.009 | -26.4% |
| Butadiene, 1,3- | µg/m ³ | 19 | 0.071 | 0.063 | -10.9% |
| Cadmium (PM ₁₀) | ng/m ³ | 21 | 0.170 | 0.097 | -43.0% |
| Carbon Tetrachloride | µg/m ³ | 15 | 0.59 | 0.56 | -4.7% |
| Chloroform | µg/m ³ | 20 | 0.256 | 0.255 | -0.4% |
| Chromium VI | ng/m ³ | 18 | 0.029 | 0.026 | -7.7% |
| Formaldehyde | µg/m ³ | 19 | 2.77 | 2.68 | -3.3% |
| Lead (PM ₁₀) | ng/m ³ | 21 | 3.08 | 2.81 | -8.9% |
| Manganese (PM ₁₀) | ng/m ³ | 20 | 8.06 | 7.93 | -1.6% |
| Naphthalene | ng/m ³ | 20 | 66.70 | 51.08 | -23.4% |
| Nickel (PM ₁₀) | ng/m ³ | 19 | 1.28 | 1.05 | -18.0% |
| Tetrachloroethylene | µg/m ³ | 19 | 0.149 | 0.174 | 17.2% |
| Trichloroethylene | µg/m ³ | 19 | 0.020 | 0.022 | 10.7% |
| Vinyl Chloride | µg/m ³ | 17 | 0.0051 | 0.0048 | -5.5% |

NATTS Monitoring Site Report: Providence, RI

Site Information

| | |
|------------------------|----------------------------------|
| Region | 1 |
| NATTS Site Type | Urban |
| County | Providence |
| AQS Site Code | 44-007-0022 |
| NATTS Operating Agency | RI Department of Env. Management |
| Latitude | 41.807949 |
| Longitude | -71.415 |
| AQS Land Use | Residential |
| AQS Location Setting | Urban/City Center |
| 10-Mile Population | 628,600 |

Figure 2. NATTS Site Location



Pollutant Datasets Evaluation: Suitable for Trends (Y=yes; Y(T)=yes, and used for DQO Trends; N=No; "--"=not rated)

| Final Pollutant Name | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------------------------|----------------|----------------|----------------|----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Acetaldehyde | N ^a | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Arsenic (PM ₁₀) | N ^a | N ^b | N ^b | N ^b | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Benzene | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Beryllium (PM ₁₀) | N ^c | N ^b | N ^b | N ^b | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Butadiene, 1,3- | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Cadmium (PM ₁₀) | N ^a | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Carbon tetrachloride | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Chloroform | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Chromium VI | -- | -- | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | -- | -- | -- | -- | -- | -- |
| Formaldehyde | N ^a | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Lead (PM ₁₀) | N ^a | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Manganese (PM ₁₀) | N ^c | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Naphthalene | -- | -- | -- | -- | -- | -- | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Nickel (PM ₁₀) | N ^a | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Tetrachloroethylene | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Trichloroethylene | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |
| Vinyl chloride | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) | Y(T) |

^a: No MDL reported to EPA.

^b: Pollutant was expected, but not sampled at this site for this year.

^c: Reported MDL to NATTS Target Ratio greater than 2.0

Table 3. NATTS Network Assessment Data (2003-2018) - National Distribution Statistics By Type^a

| Analyte | Units | Site Type | # Data Records | % Detections | Arithmetic Mean ^b | Percentile Value ^c | | | | | | |
|-------------------------------|-------------------|-----------|----------------|--------------|------------------------------|-------------------------------|-------|---------|-------|-------|-------|-------|
| | | | | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| Acetaldehyde | µg/m ³ | Urban | 15,704 | 100% | 1.77 ± 0.02 | 0.50 | 0.66 | 0.97 | 1.45 | 2.19 | 3.24 | 4.04 |
| | µg/m ³ | Rural | 4,930 | 100% | 1.20 ± 0.04 | 0.36 | 0.46 | 0.65 | 0.93 | 1.38 | 2.02 | 2.76 |
| | µg/m ³ | All Sites | 20,634 | 100% | 1.63 ± 0.02 | 0.44 | 0.58 | 0.86 | 1.31 | 2.00 | 3.02 | 3.86 |
| Arsenic (PM ₁₀) | ng/m ³ | Urban | 14,968 | 97% | 0.89 ± 0.04 | 0.10 | 0.19 | 0.34 | 0.58 | 0.99 | 1.70 | 2.41 |
| | ng/m ³ | Rural | 4,622 | 96% | 0.49 ± 0.02 | 0.04 | 0.08 | 0.17 | 0.35 | 0.59 | 0.94 | 1.28 |
| | ng/m ³ | All Sites | 19,590 | 97% | 0.79 ± 0.03 | 0.06 | 0.14 | 0.29 | 0.52 | 0.89 | 1.54 | 2.19 |
| Benzene | µg/m ³ | Urban | 15,984 | 99% | 0.86 ± 0.01 | 0.25 | 0.30 | 0.43 | 0.66 | 1.05 | 1.64 | 2.21 |
| | µg/m ³ | Rural | 2,494 | 95% | 0.43 ± 0.02 | 0.04 | 0.13 | 0.21 | 0.33 | 0.52 | 0.78 | 1.01 |
| | µg/m ³ | All Sites | 18,478 | 99% | 0.81 ± 0.01 | 0.19 | 0.26 | 0.39 | 0.61 | 0.98 | 1.55 | 2.09 |
| Benzo(a)pyrene | ng/m ³ | Urban | 12,336 | 70% | 0.096 ± 0.004 | ND | ND | ND | 0.04 | 0.11 | 0.24 | 0.37 |
| | ng/m ³ | Rural | 3,179 | 36% | 0.067 ± 0.009 | ND | ND | ND | ND | 0.02 | 0.13 | 0.37 |
| | ng/m ³ | All Sites | 15,515 | 63% | 0.090 ± 0.004 | ND | ND | ND | 0.03 | 0.10 | 0.23 | 0.37 |
| Beryllium (PM ₁₀) | ng/m ³ | Urban | 15,783 | 75% | 0.051 ± 0.006 | ND | ND | 0.00003 | 0.005 | 0.018 | 0.050 | 0.101 |
| | ng/m ³ | Rural | 4,687 | 49% | 0.023 ± 0.003 | ND | ND | ND | ND | 0.005 | 0.017 | 0.072 |
| | ng/m ³ | All Sites | 20,470 | 69% | 0.045 ± 0.005 | ND | ND | ND | 0.003 | 0.012 | 0.049 | 0.100 |
| Butadiene, 1,3- | µg/m ³ | Urban | 15,388 | 81% | 0.092 ± 0.002 | ND | ND | 0.025 | 0.058 | 0.114 | 0.215 | 0.302 |
| | µg/m ³ | Rural | 2,185 | 29% | 0.012 ± 0.001 | ND | ND | ND | ND | 0.017 | 0.046 | 0.059 |
| | µg/m ³ | All Sites | 17,573 | 75% | 0.082 ± 0.002 | ND | ND | ND | 0.049 | 0.104 | 0.199 | 0.287 |
| Cadmium (PM ₁₀) | ng/m ³ | Urban | 16,360 | 92% | 0.21 ± 0.02 | ND | 0.01 | 0.05 | 0.09 | 0.17 | 0.42 | 0.63 |
| | ng/m ³ | Rural | 4,684 | 87% | 0.10 ± 0.01 | ND | ND | 0.03 | 0.06 | 0.11 | 0.20 | 0.29 |
| | ng/m ³ | All Sites | 21,044 | 91% | 0.18 ± 0.01 | ND | 0.01 | 0.04 | 0.08 | 0.16 | 0.35 | 0.56 |
| Carbon Tetrachloride | µg/m ³ | Urban | 14,713 | 99% | 0.569 ± 0.003 | 0.361 | 0.433 | 0.496 | 0.562 | 0.651 | 0.737 | 0.798 |
| | µg/m ³ | Rural | 2,189 | 92% | 0.534 ± 0.016 | ND | 0.180 | 0.402 | 0.537 | 0.633 | 0.727 | 0.798 |
| | µg/m ³ | All Sites | 16,902 | 98% | 0.565 ± 0.003 | 0.304 | 0.408 | 0.490 | 0.559 | 0.649 | 0.736 | 0.798 |
| Chloroform | µg/m ³ | Urban | 16,068 | 87% | 0.265 ± 0.022 | ND | ND | 0.093 | 0.132 | 0.217 | 0.420 | 0.668 |
| | µg/m ³ | Rural | 3,802 | 43% | 0.052 ± 0.003 | ND | ND | ND | ND | 0.095 | 0.144 | 0.230 |
| | µg/m ³ | All Sites | 19,870 | 79% | 0.224 ± 0.018 | ND | ND | 0.064 | 0.113 | 0.196 | 0.364 | 0.586 |
| Chromium VI | ng/m ³ | Urban | 8,414 | 74% | 0.036 ± 0.002 | ND | ND | ND | 0.020 | 0.042 | 0.081 | 0.120 |
| | ng/m ³ | Rural | 2,586 | 41% | 0.018 ± 0.004 | ND | ND | ND | ND | 0.017 | 0.031 | 0.051 |
| | ng/m ³ | All Sites | 11,000 | 66% | 0.032 ± 0.001 | ND | ND | ND | 0.016 | 0.036 | 0.073 | 0.114 |

Table 3. NATTS Network Assessment Data (2003-2018) - National Distribution Statistics By Type^a

| Analyte | Units | Site Type | # Data Records | % Detections | Arithmetic Mean ^b | Percentile Value ^c | | | | | | |
|-------------------------------|-------------------|-----------|----------------|--------------|------------------------------|-------------------------------|-------|-------|-------|-------|--------|--------|
| | | | | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| Formaldehyde | µg/m ³ | Urban | 16,118 | 100% | 3.11 ± 0.04 | 0.66 | 0.99 | 1.60 | 2.47 | 3.84 | 5.63 | 7.25 |
| | µg/m ³ | Rural | 5,002 | 100% | 2.22 ± 0.05 | 0.53 | 0.68 | 1.06 | 1.69 | 2.74 | 4.19 | 5.45 |
| | µg/m ³ | All Sites | 21,120 | 100% | 2.90 ± 0.04 | 0.61 | 0.86 | 1.43 | 2.29 | 3.59 | 5.38 | 6.96 |
| Lead (PM ₁₀) | ng/m ³ | Urban | 16,366 | 100% | 4.21 ± 0.13 | 0.72 | 0.98 | 1.55 | 2.64 | 4.56 | 8.35 | 11.90 |
| | ng/m ³ | Rural | 4,680 | 99% | 2.10 ± 0.16 | 0.37 | 0.50 | 0.84 | 1.41 | 2.37 | 3.91 | 5.36 |
| | ng/m ³ | All Sites | 21,046 | 99% | 3.74 ± 0.11 | 0.55 | 0.80 | 1.31 | 2.31 | 4.04 | 7.41 | 10.56 |
| Manganese (PM ₁₀) | ng/m ³ | Urban | 16,141 | 100% | 9.80 ± 0.32 | 1.09 | 1.51 | 2.52 | 4.92 | 10.21 | 20.10 | 30.08 |
| | ng/m ³ | Rural | 4,627 | 99% | 3.96 ± 0.14 | 0.46 | 0.73 | 1.36 | 2.57 | 4.75 | 8.54 | 12.13 |
| | ng/m ³ | All Sites | 20,768 | 100% | 8.50 ± 0.25 | 0.85 | 1.23 | 2.15 | 4.18 | 8.89 | 17.98 | 26.70 |
| Naphthalene | ng/m ³ | Urban | 12,332 | 100% | 74.63 ± 1.14 | 15.62 | 21.27 | 33.55 | 55.89 | 94.64 | 150.05 | 196.16 |
| | ng/m ³ | Rural | 3,301 | 100% | 24.47 ± 1.38 | 3.74 | 4.73 | 7.74 | 13.86 | 26.25 | 50.88 | 79.17 |
| | ng/m ³ | All Sites | 15,633 | 100% | 64.04 ± 1.00 | 6.58 | 10.92 | 23.37 | 45.59 | 83.31 | 137.54 | 181.75 |
| Nickel (PM ₁₀) | ng/m ³ | Urban | 16,125 | 97% | 1.85 ± 0.05 | 0.25 | 0.41 | 0.67 | 1.11 | 2.00 | 3.52 | 5.27 |
| | ng/m ³ | Rural | 4,623 | 85% | 0.65 ± 0.08 | ND | ND | 0.10 | 0.28 | 0.64 | 1.15 | 1.89 |
| | ng/m ³ | All Sites | 20,748 | 94% | 1.58 ± 0.04 | ND | 0.15 | 0.47 | 0.92 | 1.73 | 3.14 | 4.74 |
| Tetrachloroethylene | µg/m ³ | Urban | 15,612 | 86% | 0.25 ± 0.01 | ND | ND | 0.06 | 0.13 | 0.25 | 0.48 | 0.74 |
| | µg/m ³ | Rural | 2,272 | 36% | 0.09 ± 0.04 | ND | ND | ND | ND | 0.04 | 0.08 | 0.16 |
| | µg/m ³ | All Sites | 17,884 | 79% | 0.23 ± 0.01 | ND | ND | 0.04 | 0.11 | 0.22 | 0.44 | 0.70 |
| Trichloroethylene | µg/m ³ | Urban | 15,843 | 41% | 0.040 ± 0.002 | ND | ND | ND | ND | 0.051 | 0.107 | 0.164 |
| | µg/m ³ | Rural | 3,388 | 13% | 0.021 ± 0.003 | ND | ND | ND | ND | ND | 0.017 | 0.250 |
| | µg/m ³ | All Sites | 19,231 | 36% | 0.037 ± 0.002 | ND | ND | ND | ND | 0.041 | 0.105 | 0.167 |
| Vinyl Chloride | µg/m ³ | Urban | 14,778 | 19% | 0.0044 ± 0.0003 | ND | ND | ND | ND | ND | 0.0137 | 0.0257 |
| | µg/m ³ | Rural | 2,444 | 8% | 0.0040 ± 0.0009 | ND | ND | ND | ND | ND | ND | 0.0156 |
| | µg/m ³ | All Sites | 17,222 | 17% | 0.0043 ± 0.0003 | ND | ND | ND | ND | ND | 0.0126 | 0.0254 |

^a Statistics presented are from pollutant datasets which were suitable for trends.

^b The arithmetic mean is the average of all samples results which include actual measured values. If no chemical was registered, then a value of zero is used when calculating the mean.

^c ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 4. Summary Statistics for Providence, RI

| Analyte | Units | # Data Records | % Detection | Arithmetic Mean ^a | Percentile Value ^b | | | | | | |
|-------------------------------|-------------------|----------------|-------------|------------------------------|-------------------------------|-------|-------|--------|--------|--------|--------|
| | | | | | 5th | 10th | 25th | 50th | 75th | 90th | 95th |
| Acetaldehyde | µg/m ³ | 896 | 100% | 1.49 ± 0.05 | 0.72 | 0.77 | 1.00 | 1.36 | 1.77 | 2.37 | 2.85 |
| Arsenic (PM ₁₀) | ng/m ³ | 937 | 67% | 0.41 ± 0.10 | ND | ND | ND | 0.23 | 0.50 | 0.83 | 1.17 |
| Benzene | µg/m ³ | 894 | 100% | 0.79 ± 0.04 | 0.26 | 0.31 | 0.42 | 0.63 | 0.98 | 1.46 | 1.95 |
| Benzo(a)pyrene | ng/m ³ | 613 | 96% | 0.17 ± 0.02 | 0.02 | 0.03 | 0.05 | 0.09 | 0.19 | 0.35 | 0.51 |
| Beryllium (PM ₁₀) | ng/m ³ | 874 | 56% | 0.0022 ± 0.0003 | ND | ND | ND | 0.0007 | 0.0031 | 0.0060 | 0.0084 |
| Butadiene, 1,3- | µg/m ³ | 894 | 99% | 0.102 ± 0.006 | 0.027 | 0.033 | 0.047 | 0.069 | 0.121 | 0.212 | 0.299 |
| Cadmium (PM ₁₀) | ng/m ³ | 936 | 57% | 0.06 ± 0.02 | ND | ND | ND | 0.02 | 0.06 | 0.10 | 0.14 |
| Carbon Tetrachloride | µg/m ³ | 887 | 100% | 0.55 ± 0.01 | 0.42 | 0.45 | 0.49 | 0.54 | 0.59 | 0.65 | 0.69 |
| Chloroform | µg/m ³ | 892 | 99% | 0.121 ± 0.003 | 0.063 | 0.075 | 0.089 | 0.108 | 0.143 | 0.181 | 0.214 |
| Chromium VI | ng/m ³ | 508 | 64% | 0.017 ± 0.002 | ND | ND | ND | 0.012 | 0.022 | 0.038 | 0.058 |
| Formaldehyde | µg/m ³ | 901 | 100% | 2.57 ± 0.09 | 0.99 | 1.17 | 1.64 | 2.25 | 3.24 | 4.33 | 5.05 |
| Lead (PM ₁₀) | ng/m ³ | 937 | 99% | 4.53 ± 1.62 | 0.88 | 1.24 | 1.88 | 2.97 | 4.43 | 7.11 | 9.36 |
| Manganese (PM ₁₀) | ng/m ³ | 874 | 97% | 3.02 ± 0.14 | 0.66 | 0.98 | 1.61 | 2.53 | 4.00 | 5.56 | 7.07 |
| Naphthalene | ng/m ³ | 613 | 100% | 63.44 ± 3.44 | 21.16 | 24.84 | 35.33 | 52.28 | 75.61 | 116.02 | 150.86 |
| Nickel (PM ₁₀) | ng/m ³ | 937 | 98% | 2.19 ± 0.35 | 0.13 | 0.22 | 0.42 | 0.88 | 2.29 | 4.29 | 7.01 |
| Tetrachloroethylene | µg/m ³ | 894 | 99% | 0.207 ± 0.013 | 0.042 | 0.054 | 0.081 | 0.143 | 0.257 | 0.437 | 0.577 |
| Trichloroethylene | µg/m ³ | 894 | 94% | 0.107 ± 0.011 | ND | 0.011 | 0.023 | 0.050 | 0.113 | 0.279 | 0.408 |
| Vinyl Chloride | µg/m ³ | 894 | 43% | 0.0015 ± 0.0001 | ND | ND | ND | ND | 0.0027 | 0.0029 | 0.0056 |

^a: The arithmetic mean is the average of all samples results which included actual measured values. If no chemical was registered, then a value of zero is used.

^b ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 5. Analytical Labs Supporting this Site

| Pollutant Group | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------------------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| VOCs | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH |
| Carbonyls | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH |
| PM ₁₀ Metals | EPAR1 | EPAR1 | EPAR1 | EPAR1 | EPAR1/ERG | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH | RIDOH |
| Chromium VI | -- | -- | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG | -- | -- | -- | -- | -- |
| PAHs | -- | -- | -- | -- | -- | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG | ERG |

--: Not Applicable

RIDOH: Rhode Island Department of Health

ERG: Eastern Research Group, Inc.

EPAR1: EPA Region 1 Laboratory

Figure 3. Providence, RI Annual Average Concentrations

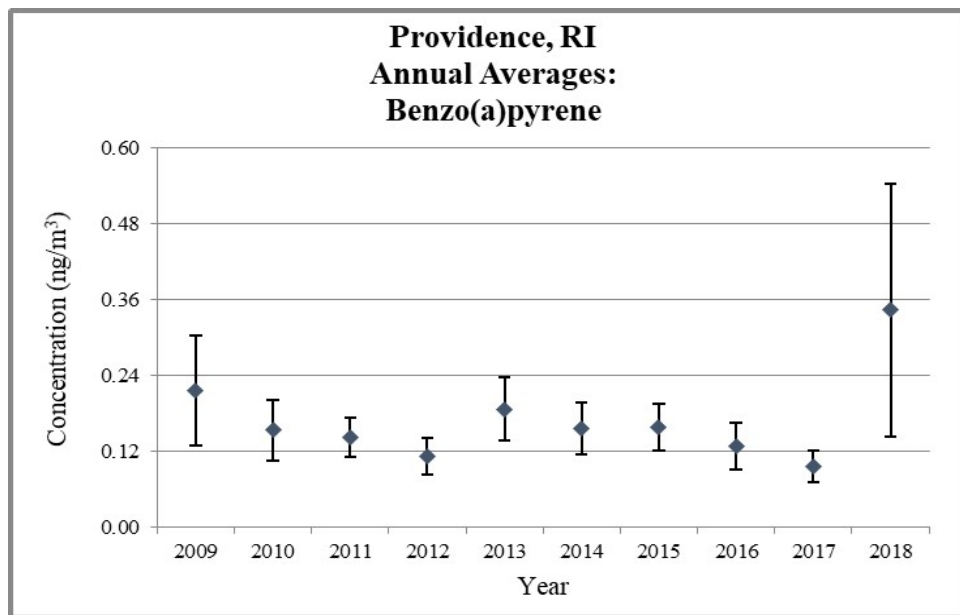
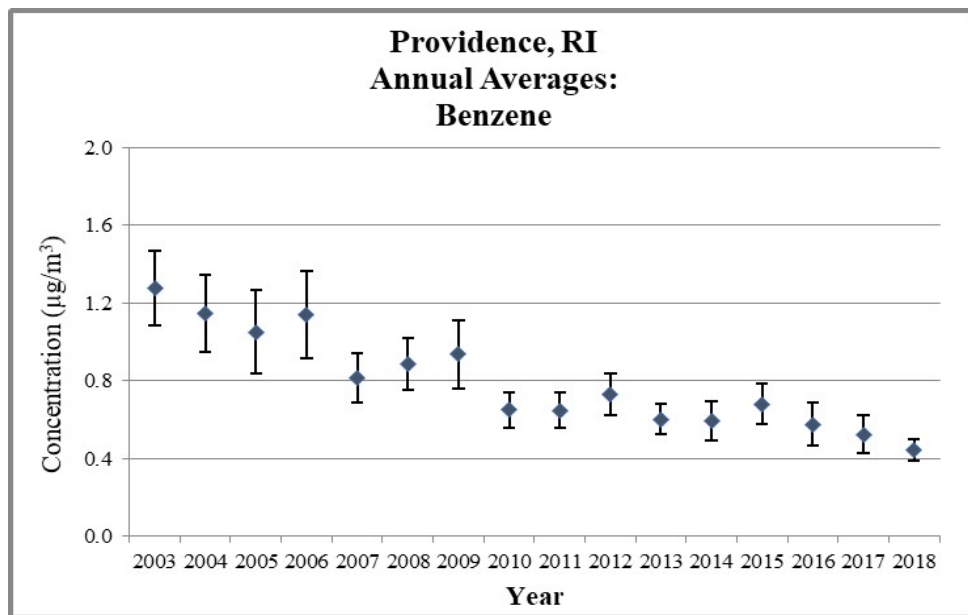
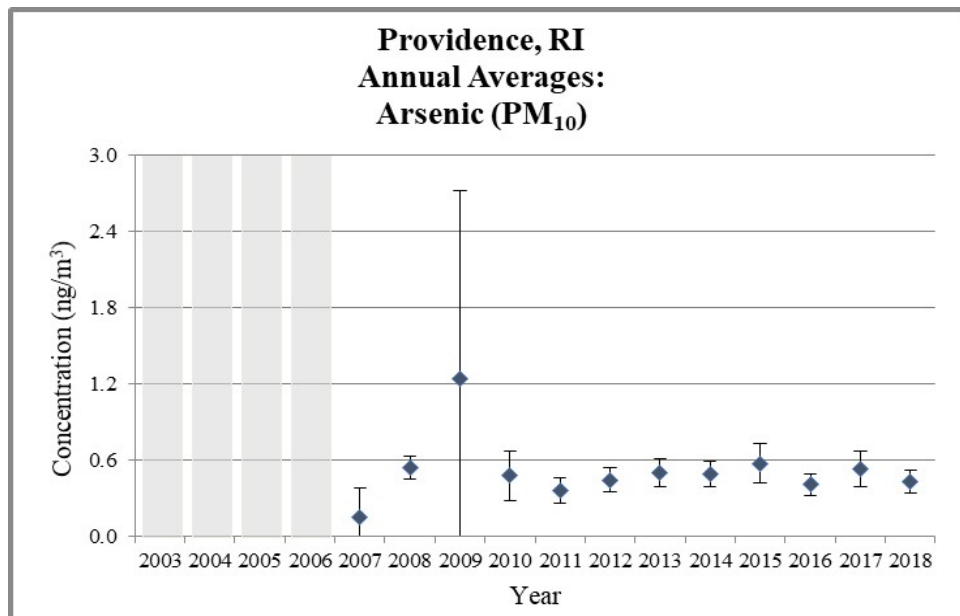
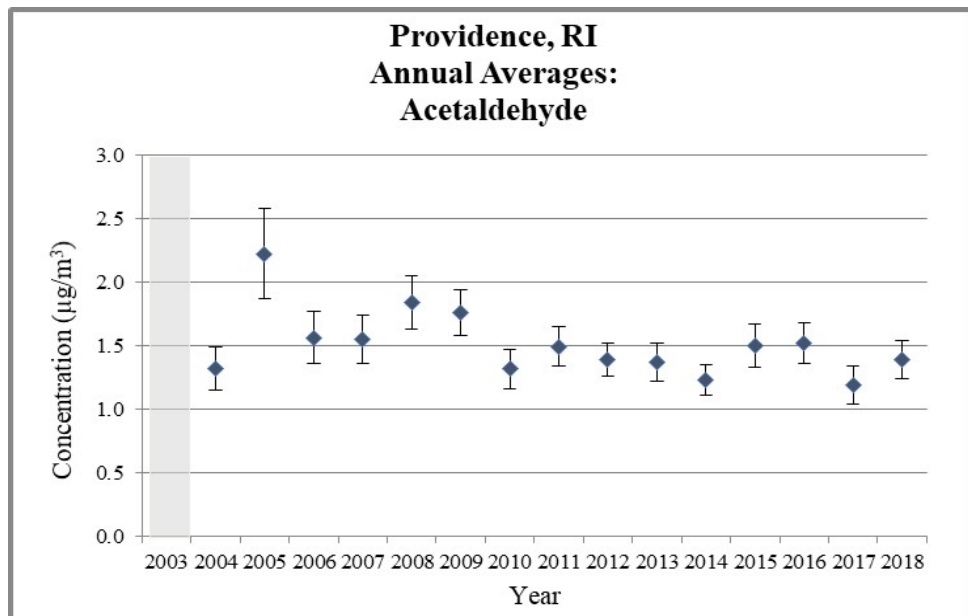


Figure 3. Providence, RI Annual Average Concentrations

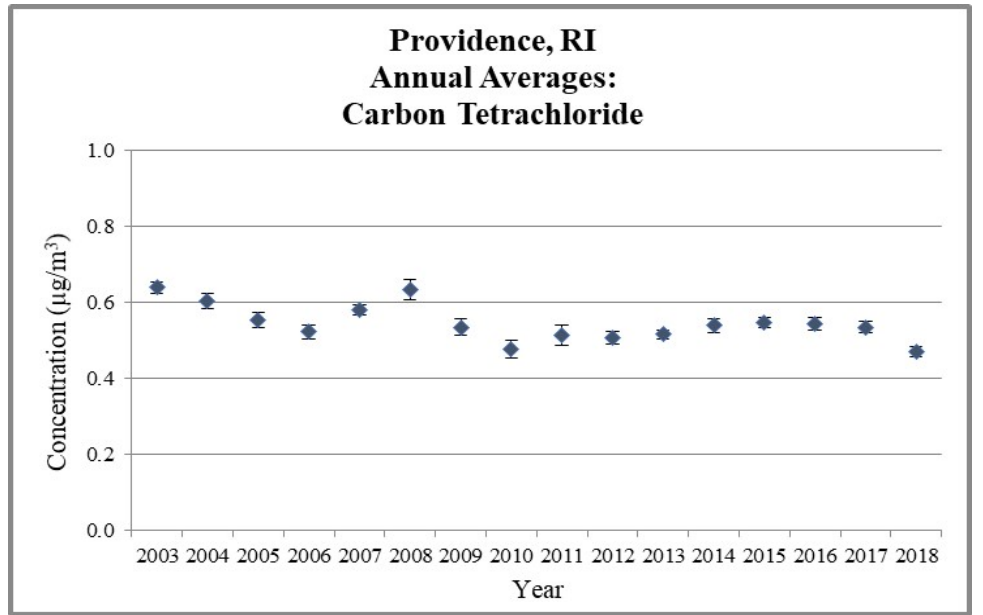
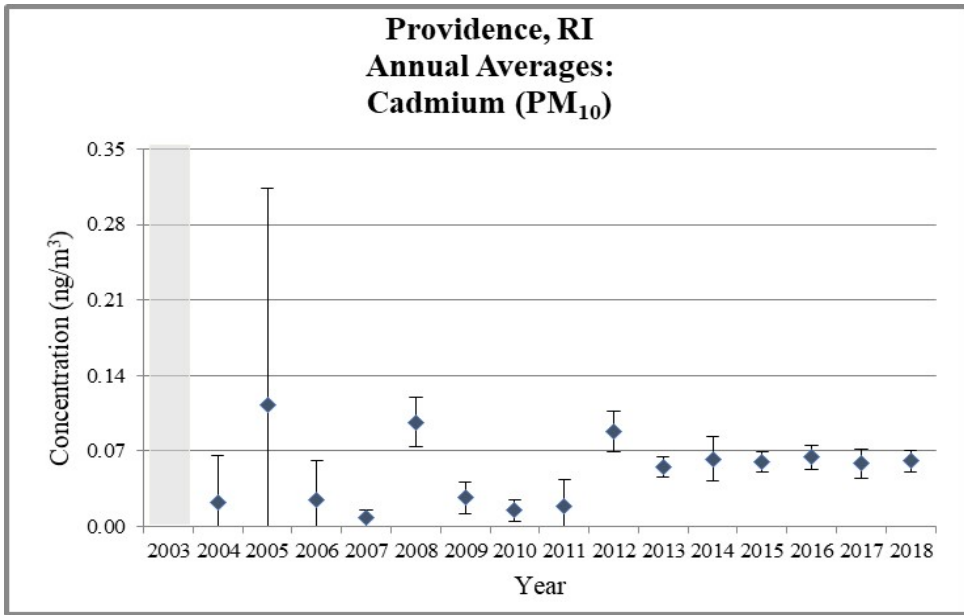
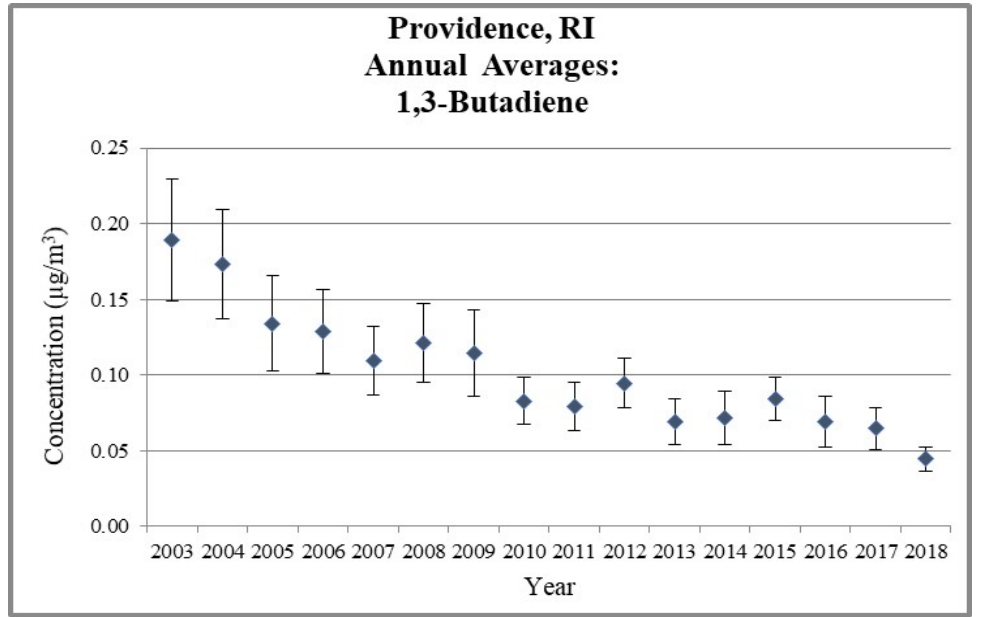
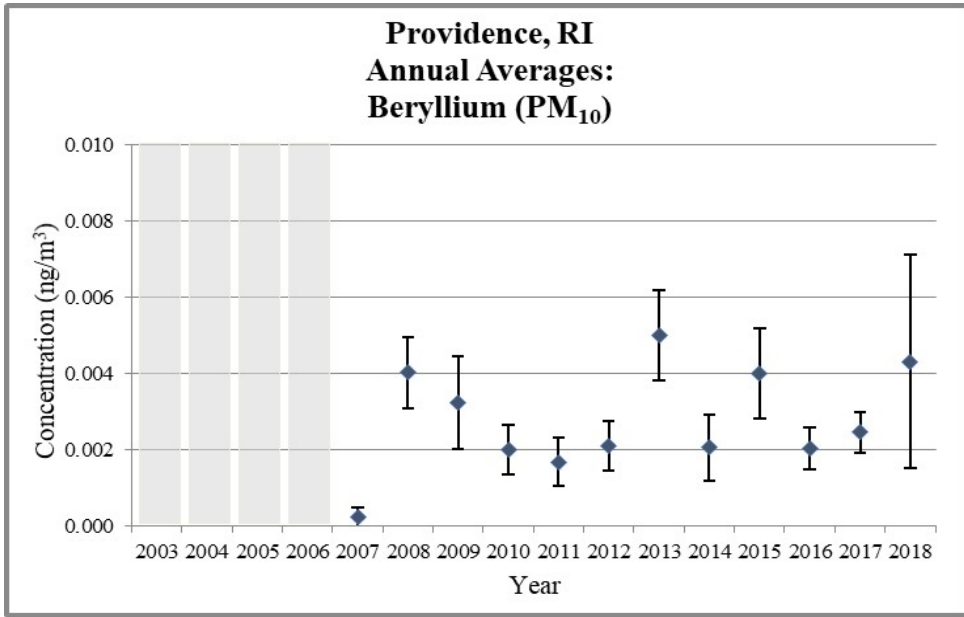


Figure 3. Providence, RI Annual Average Concentrations

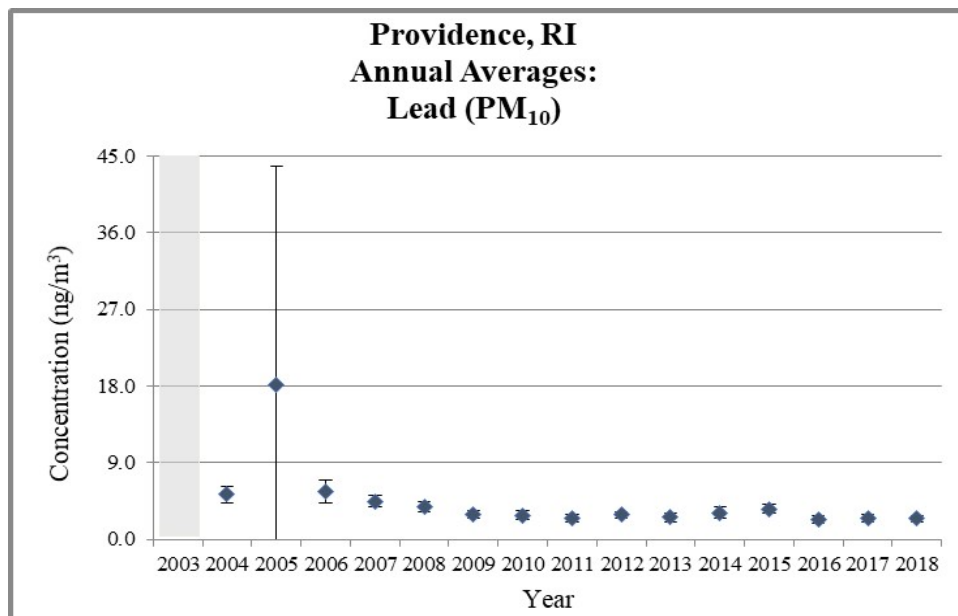
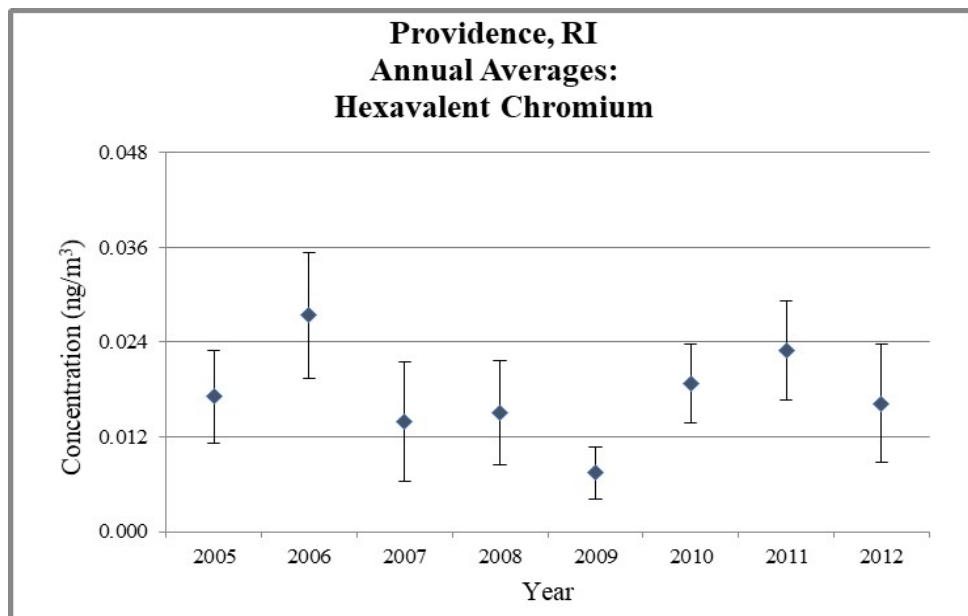
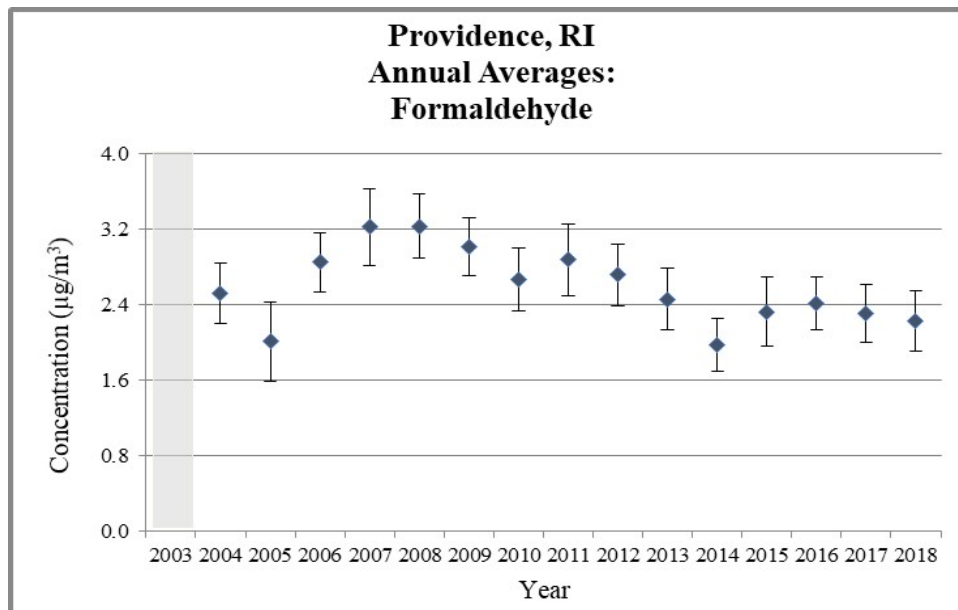
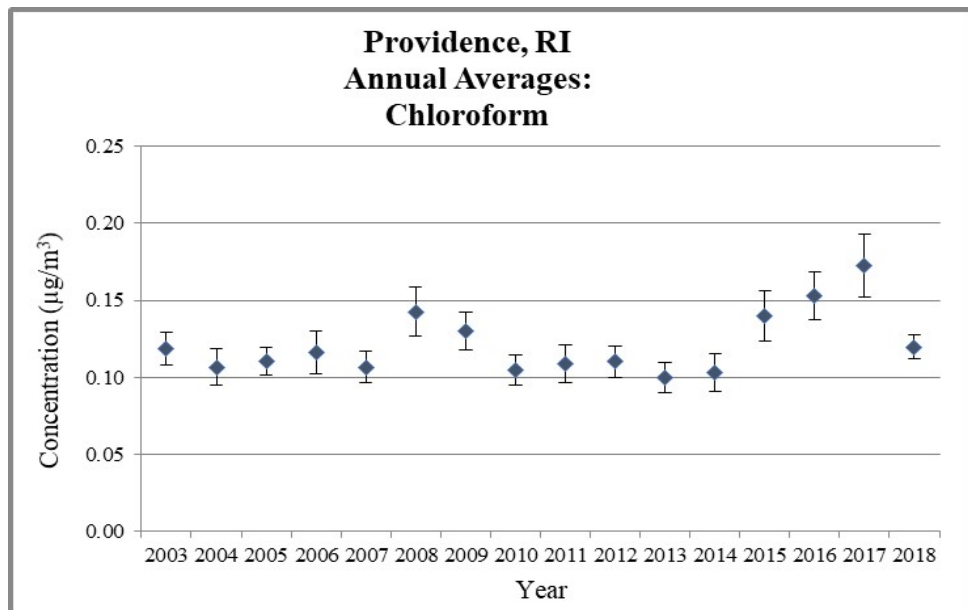


Figure 3. Providence, RI Annual Average Concentrations

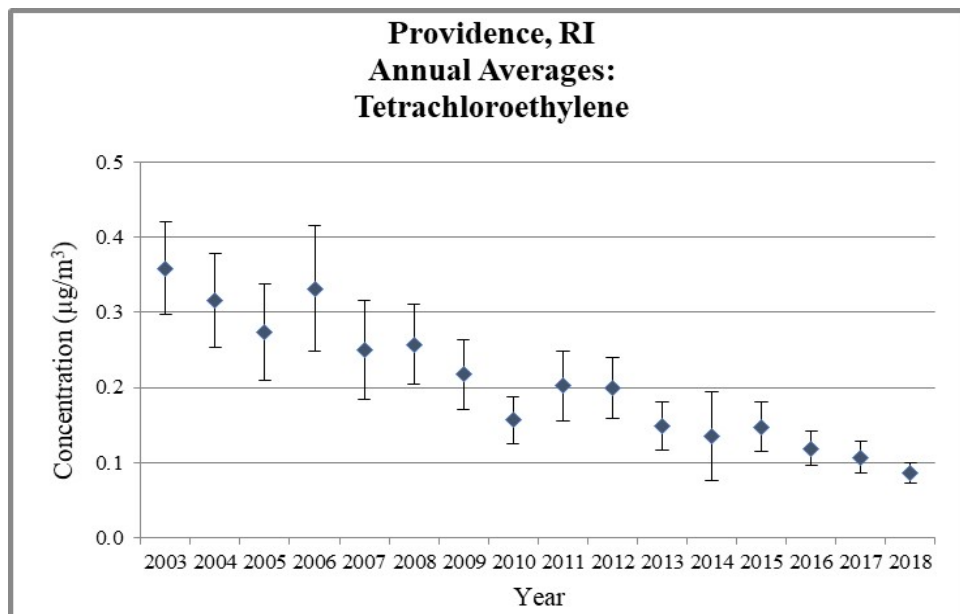
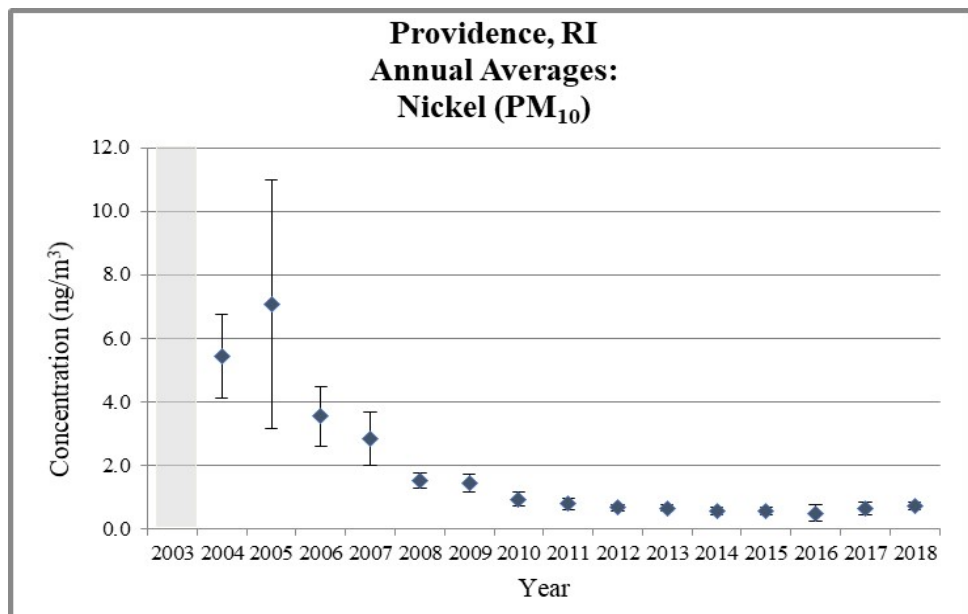
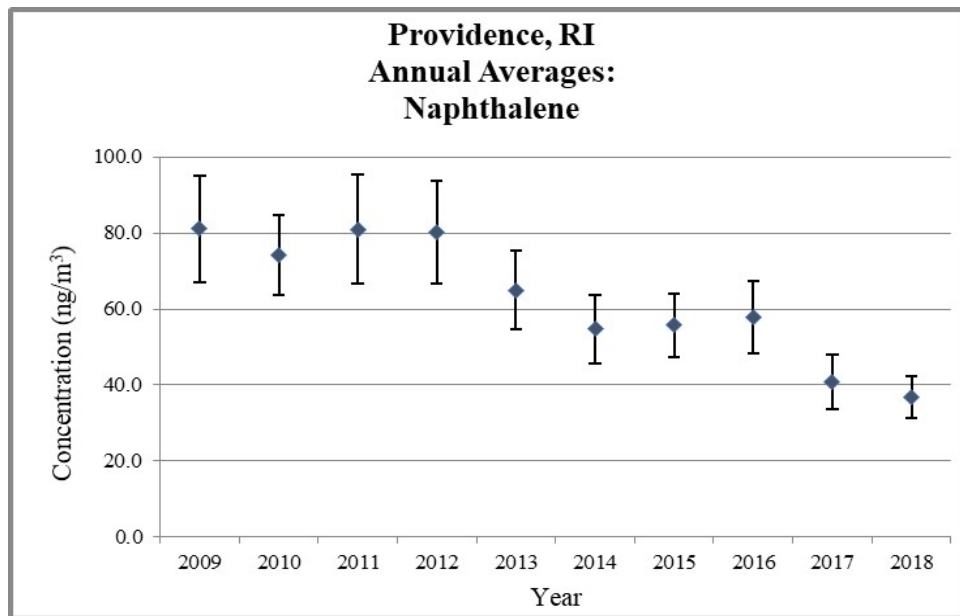
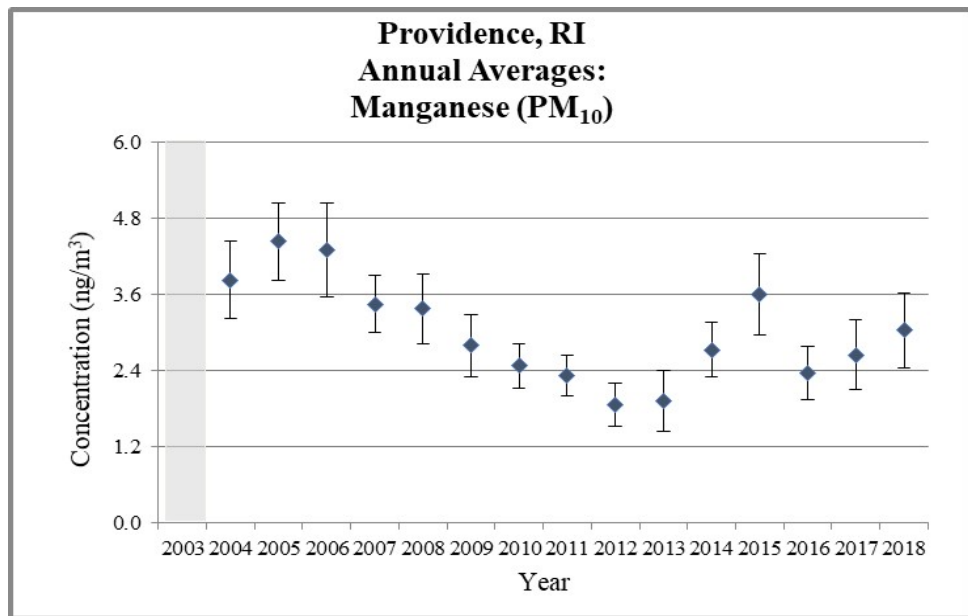
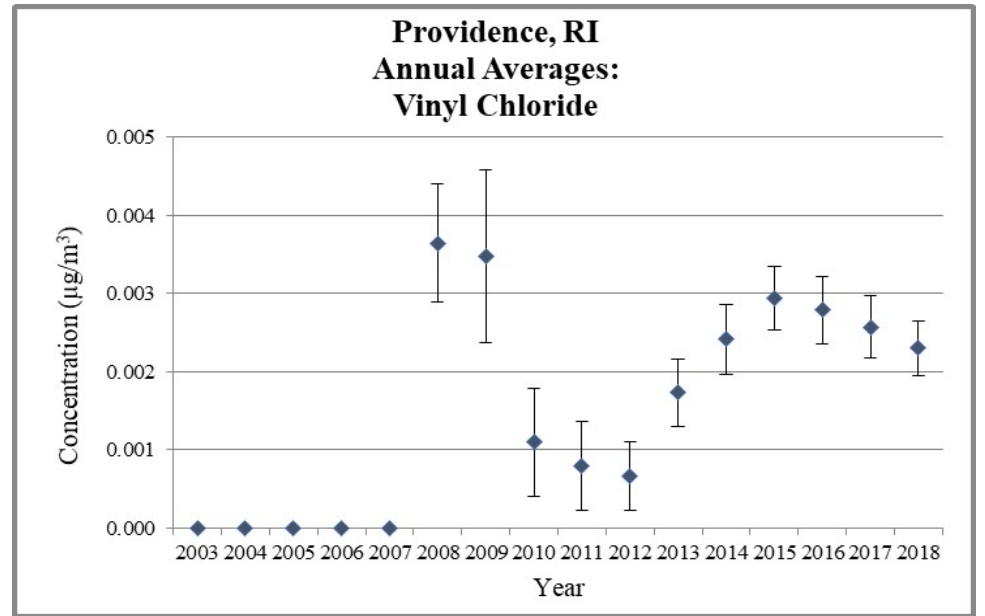
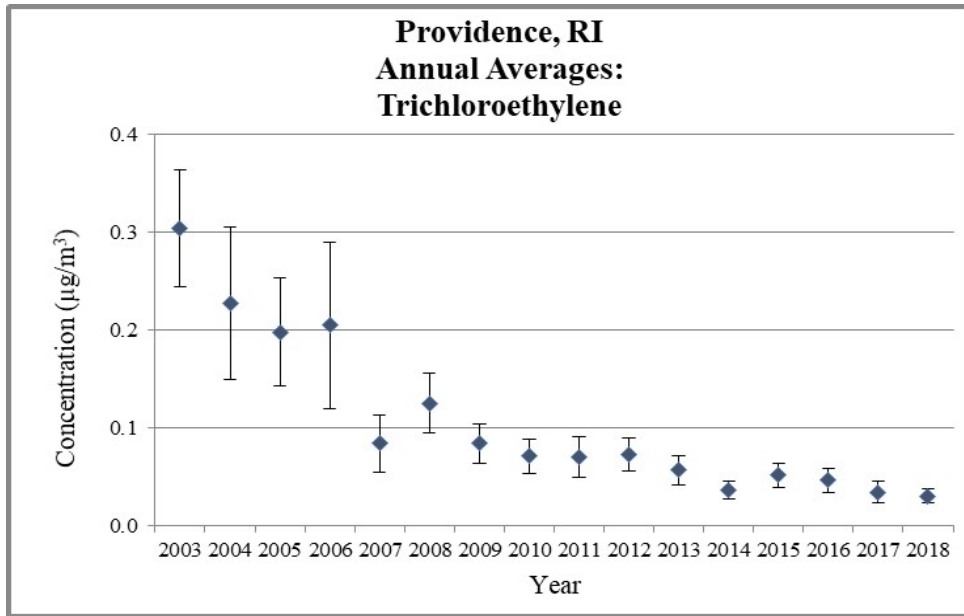


Figure 3. Providence, RI Annual Average Concentrations



 Does not meet MQO

Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

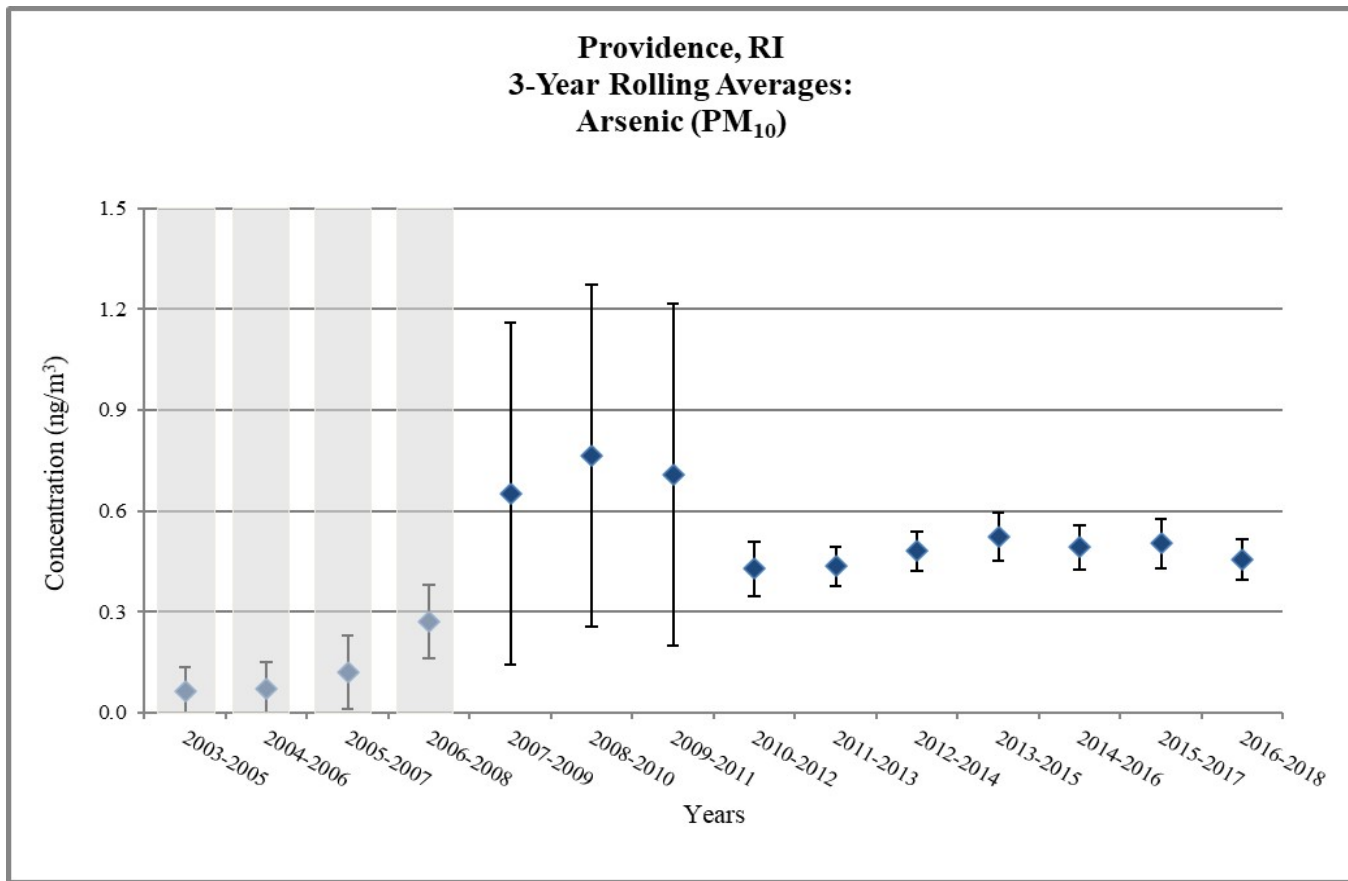
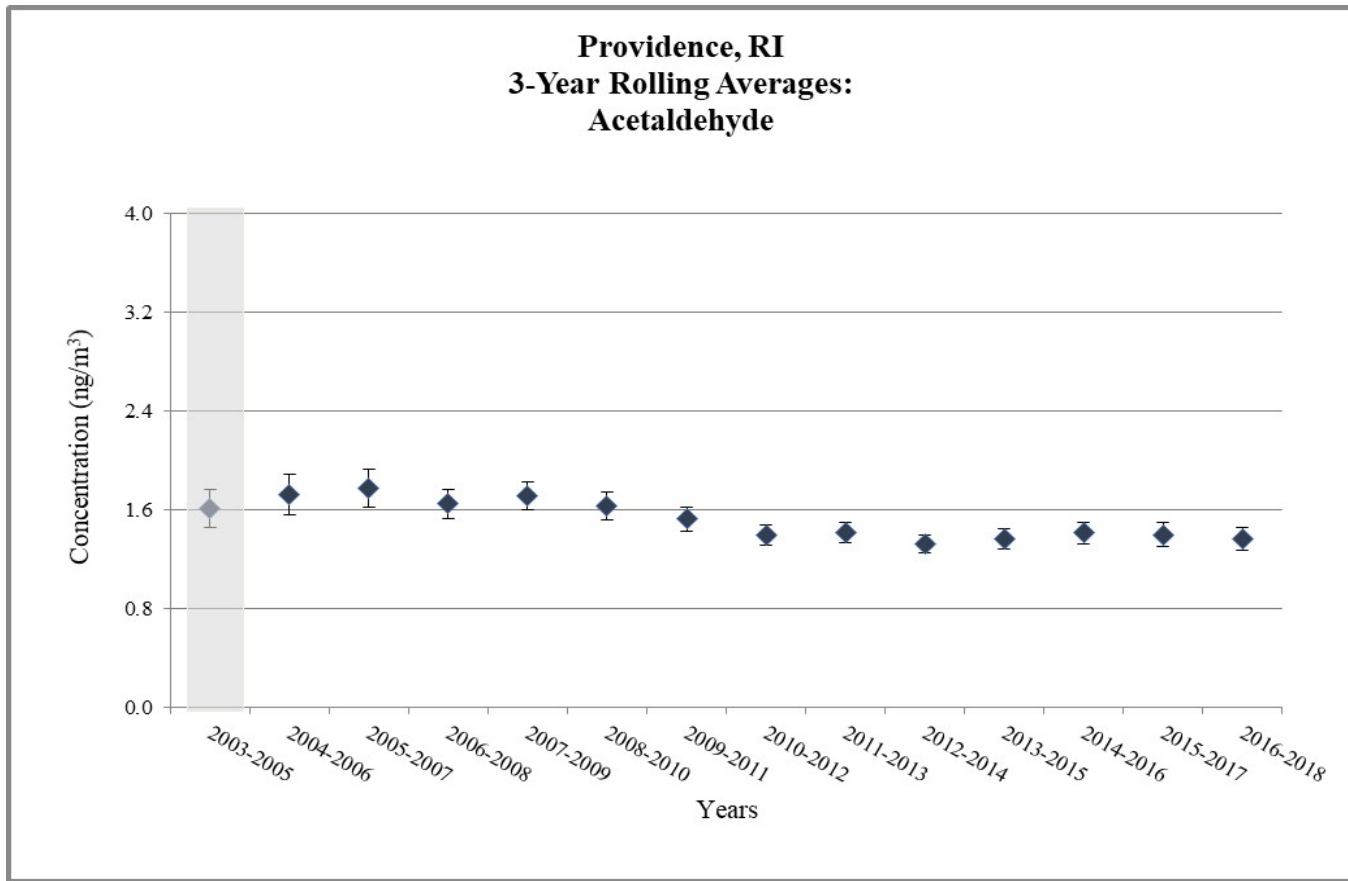


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

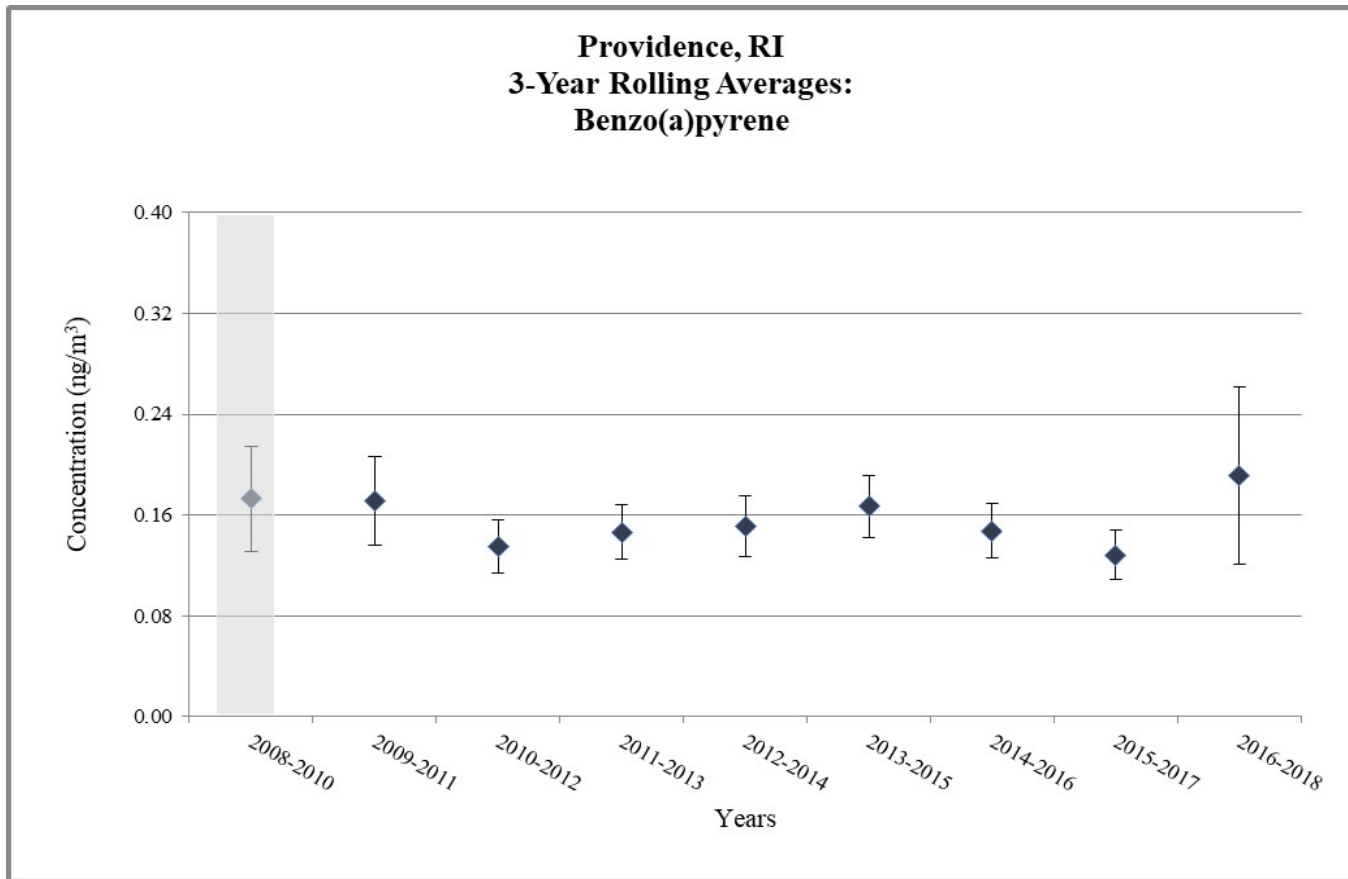
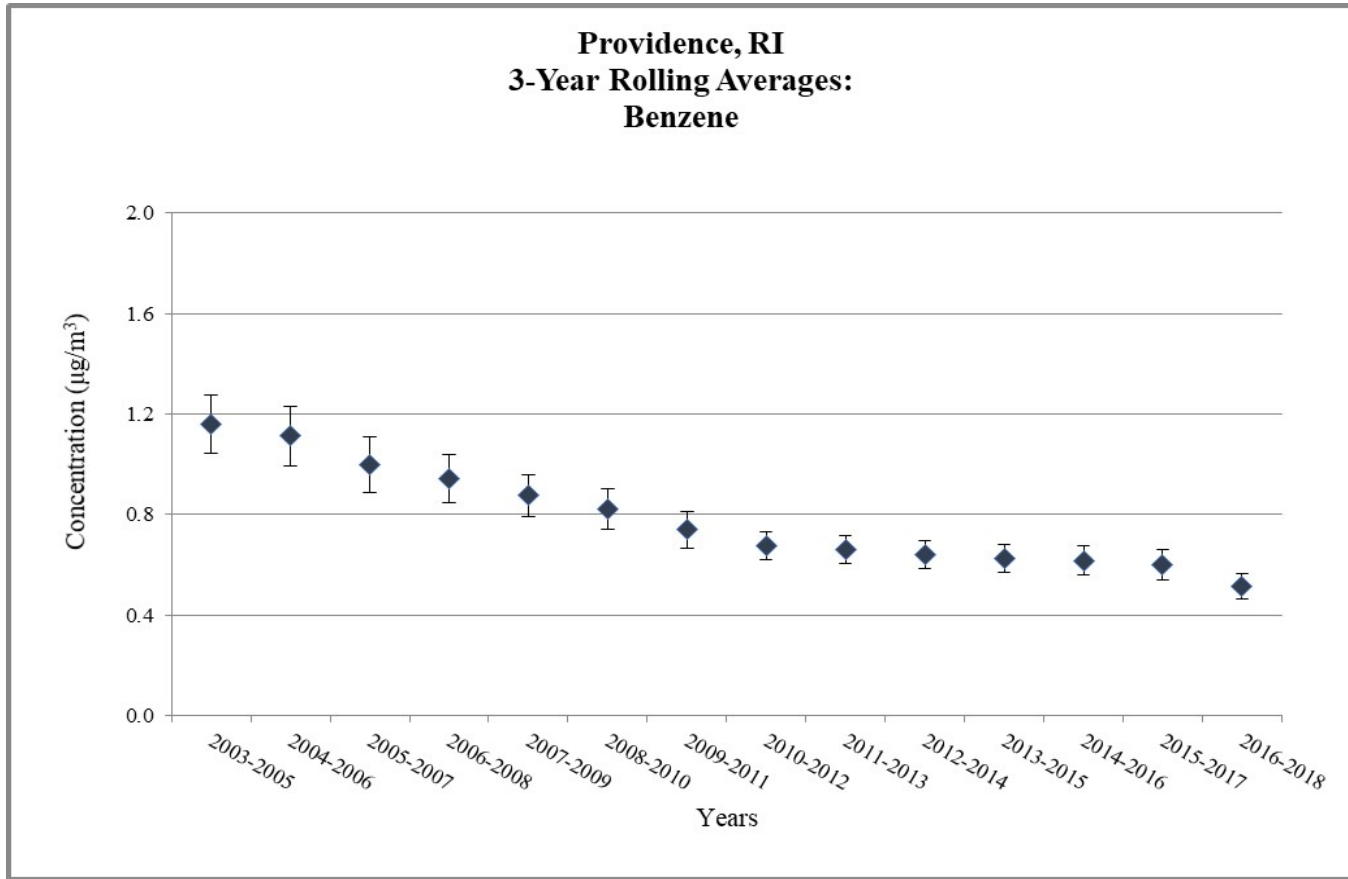


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

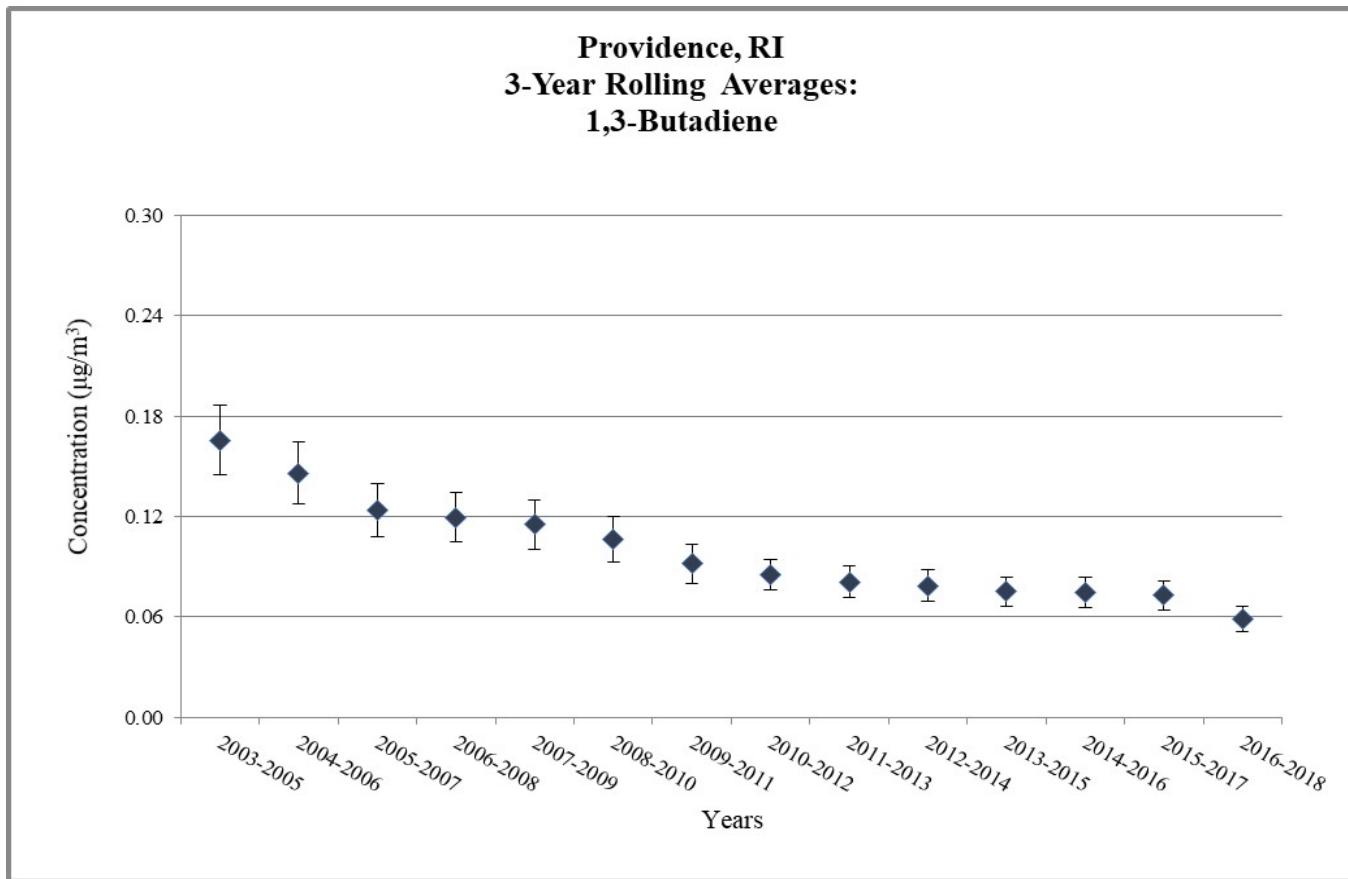
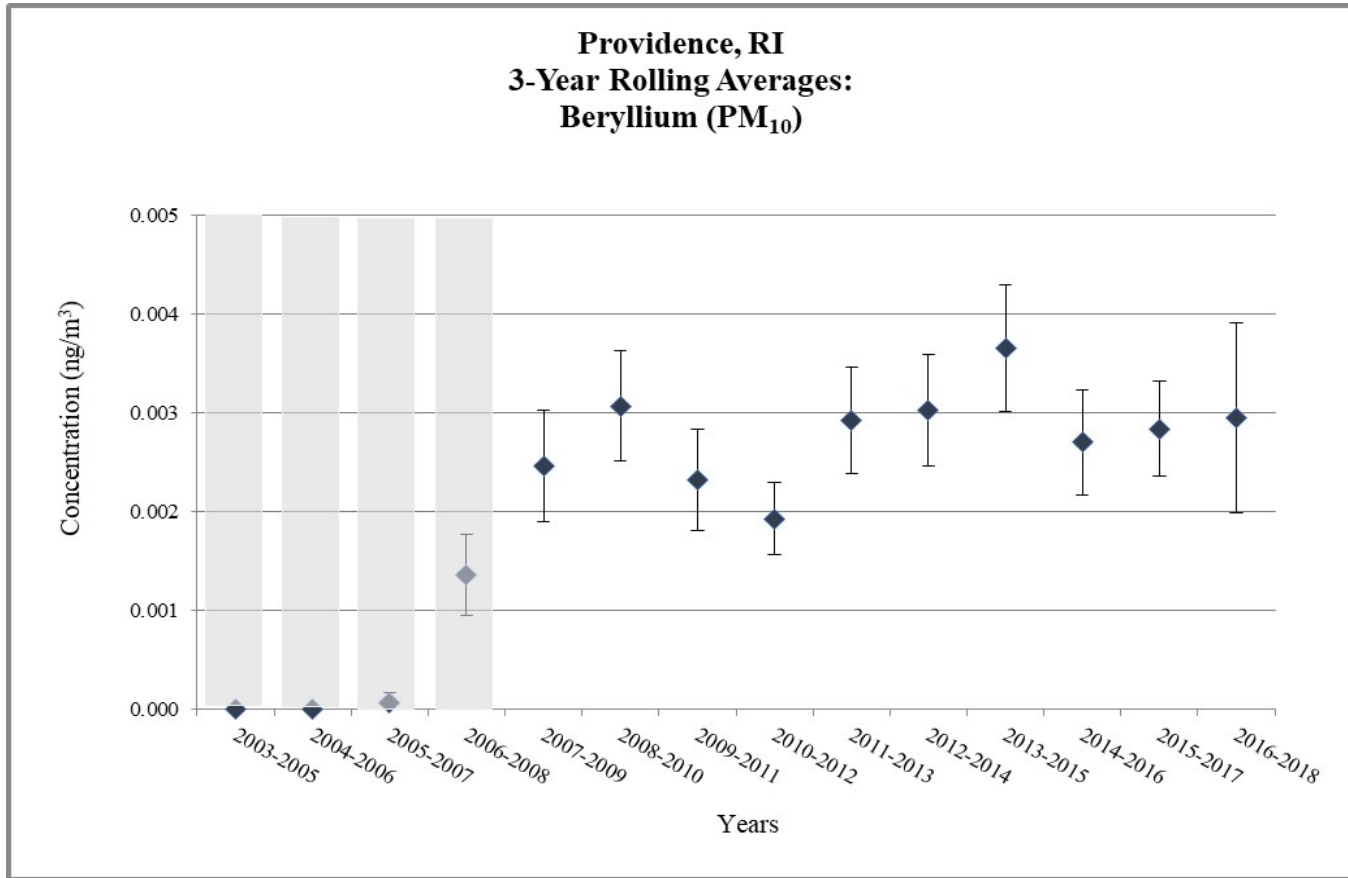


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

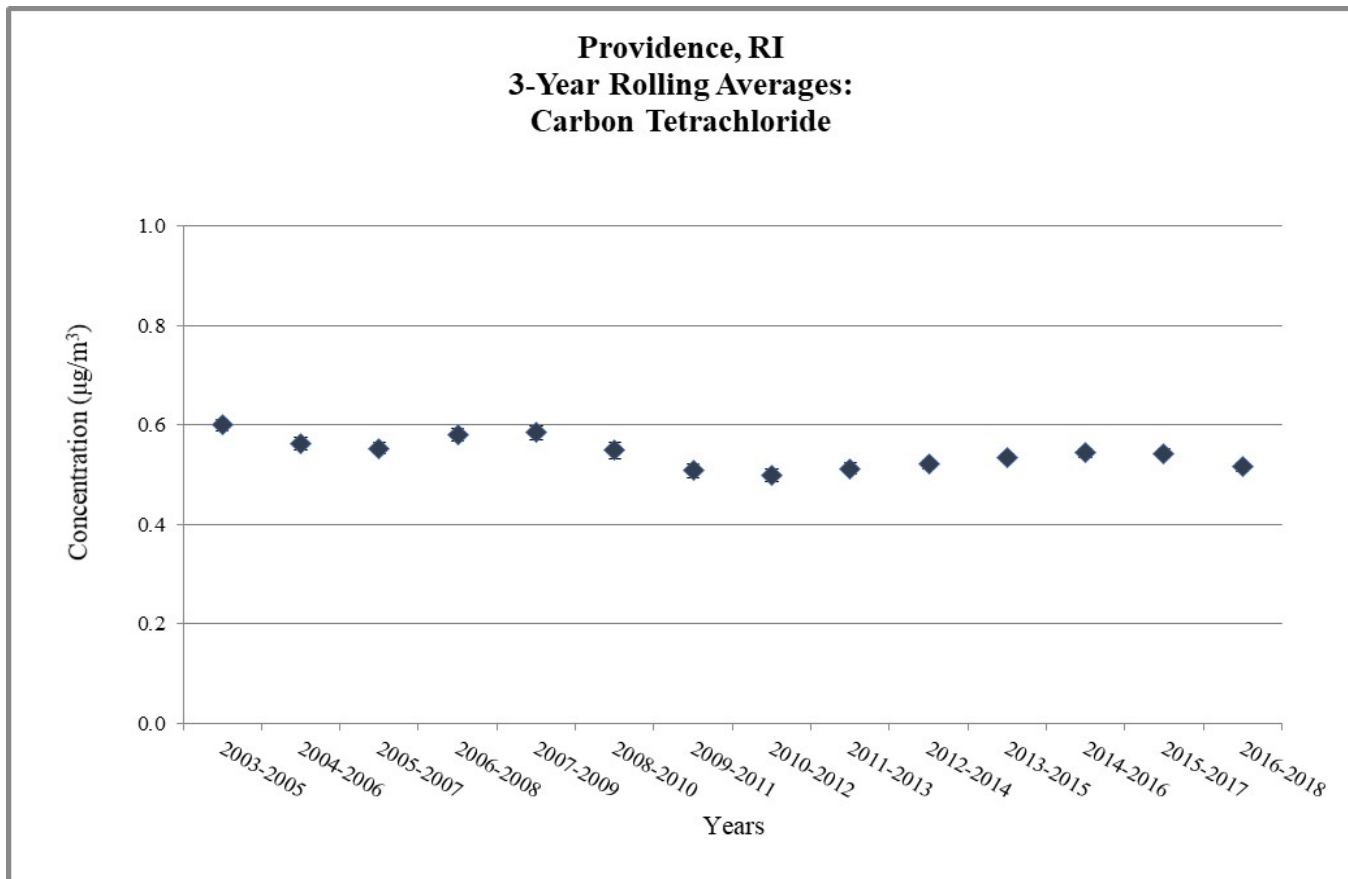
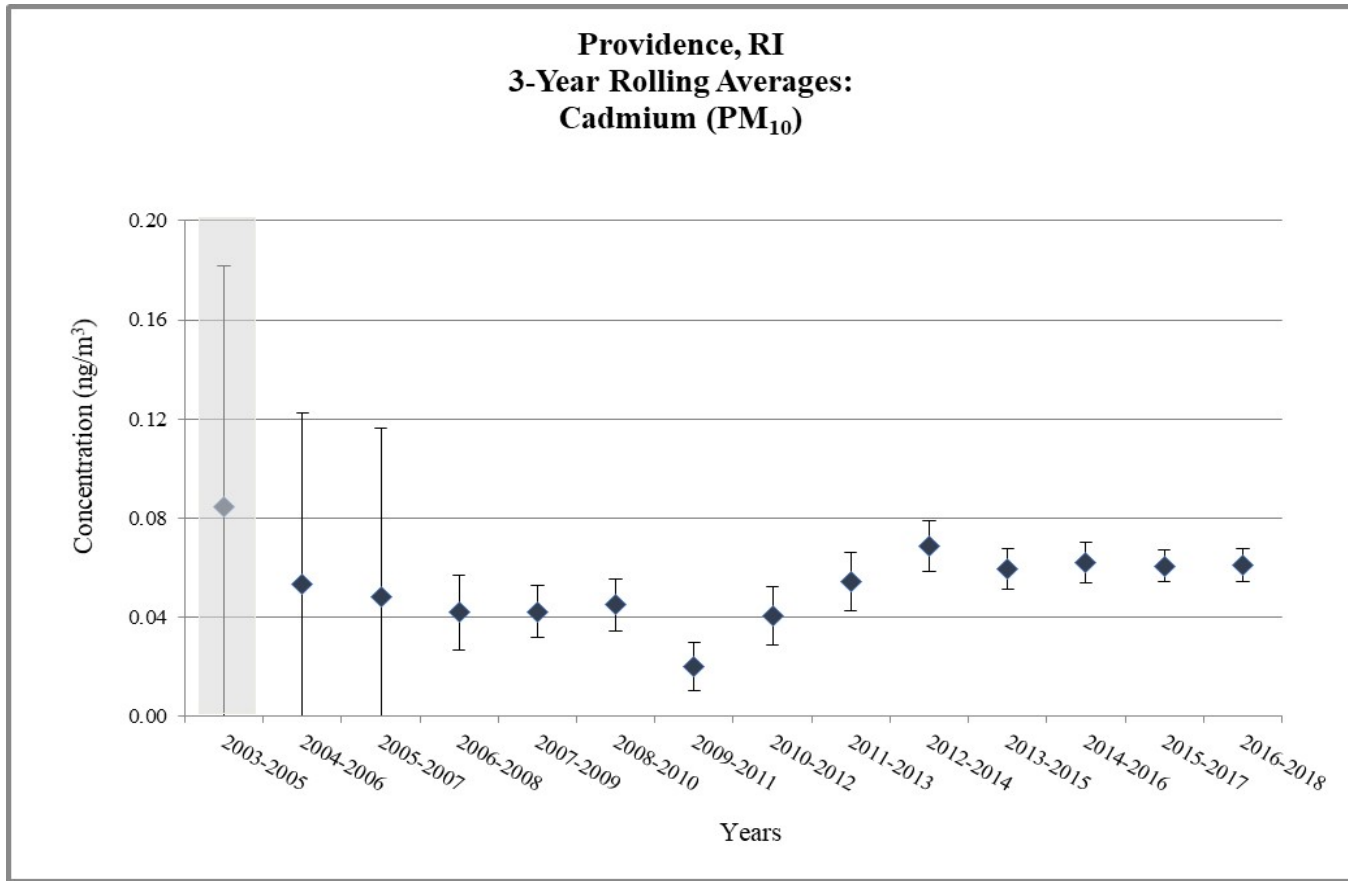


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

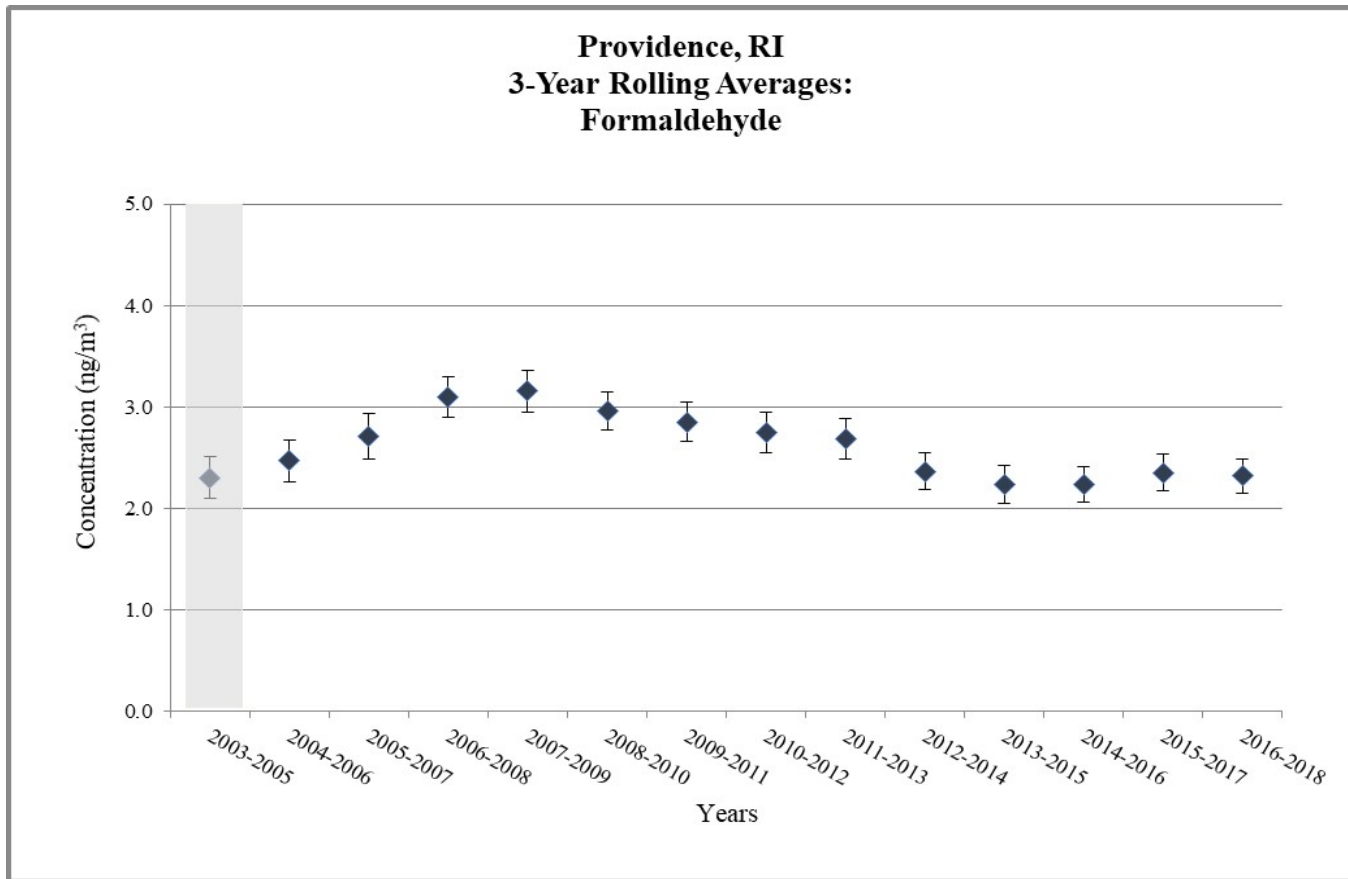
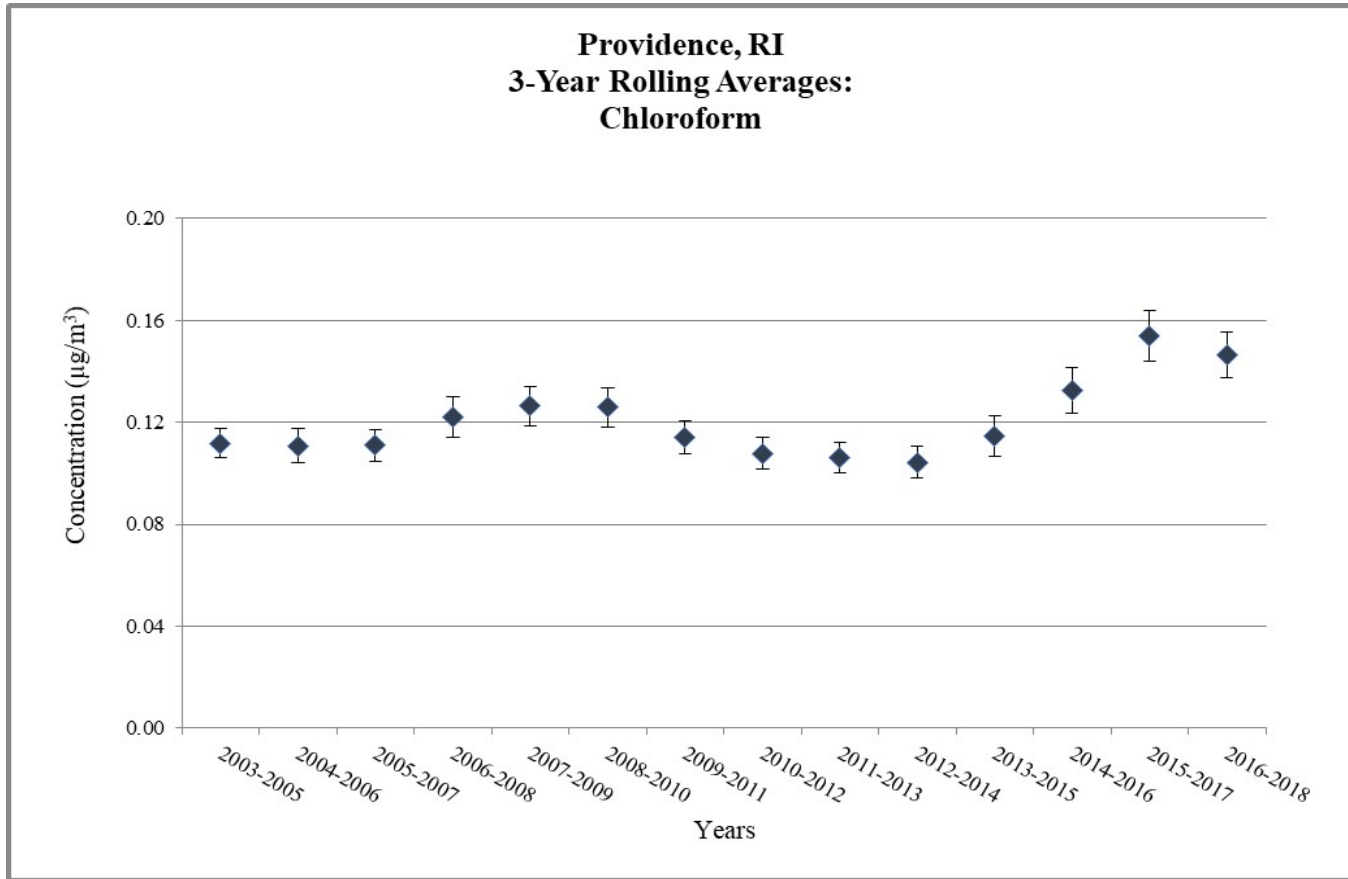


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

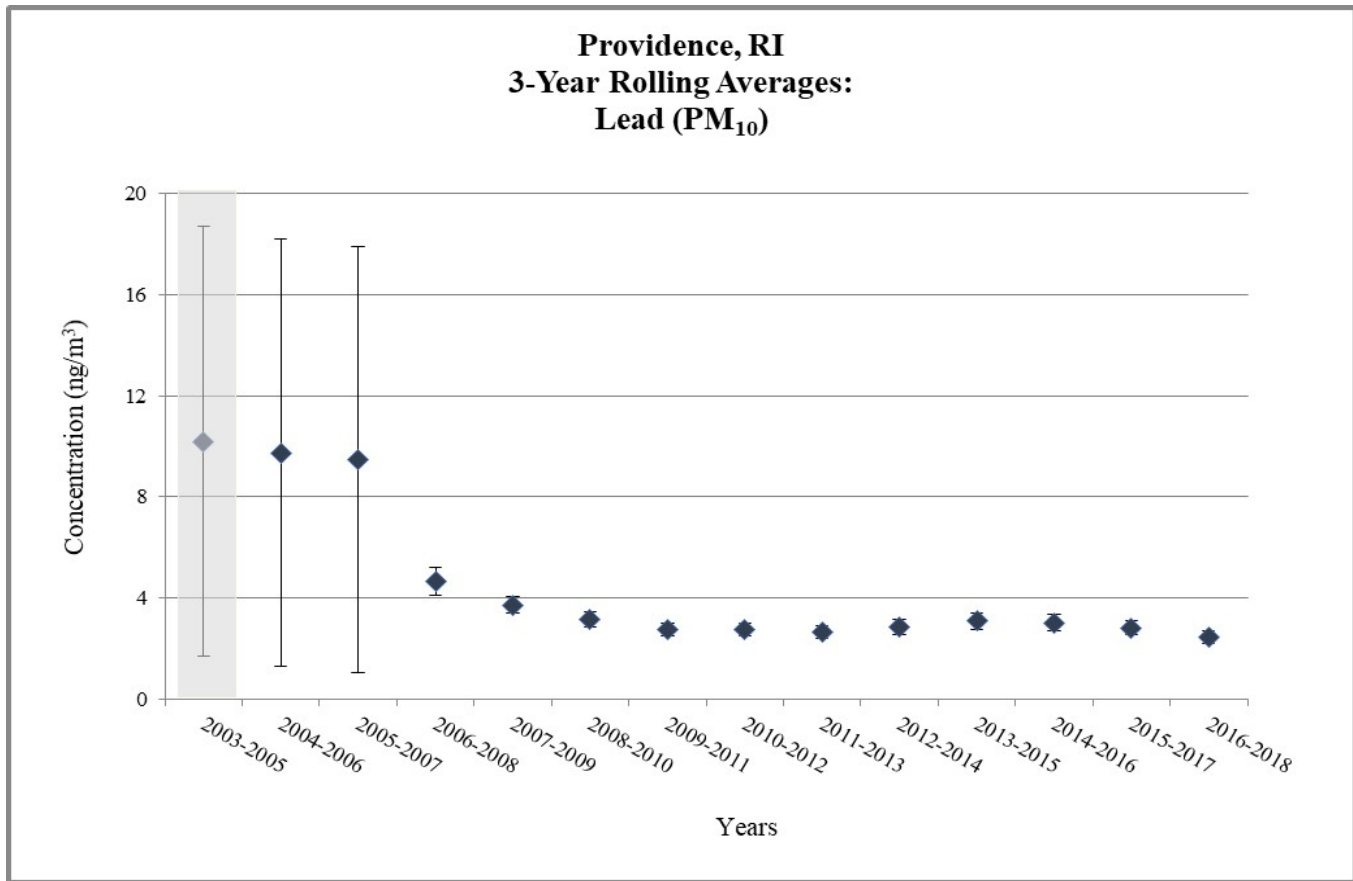
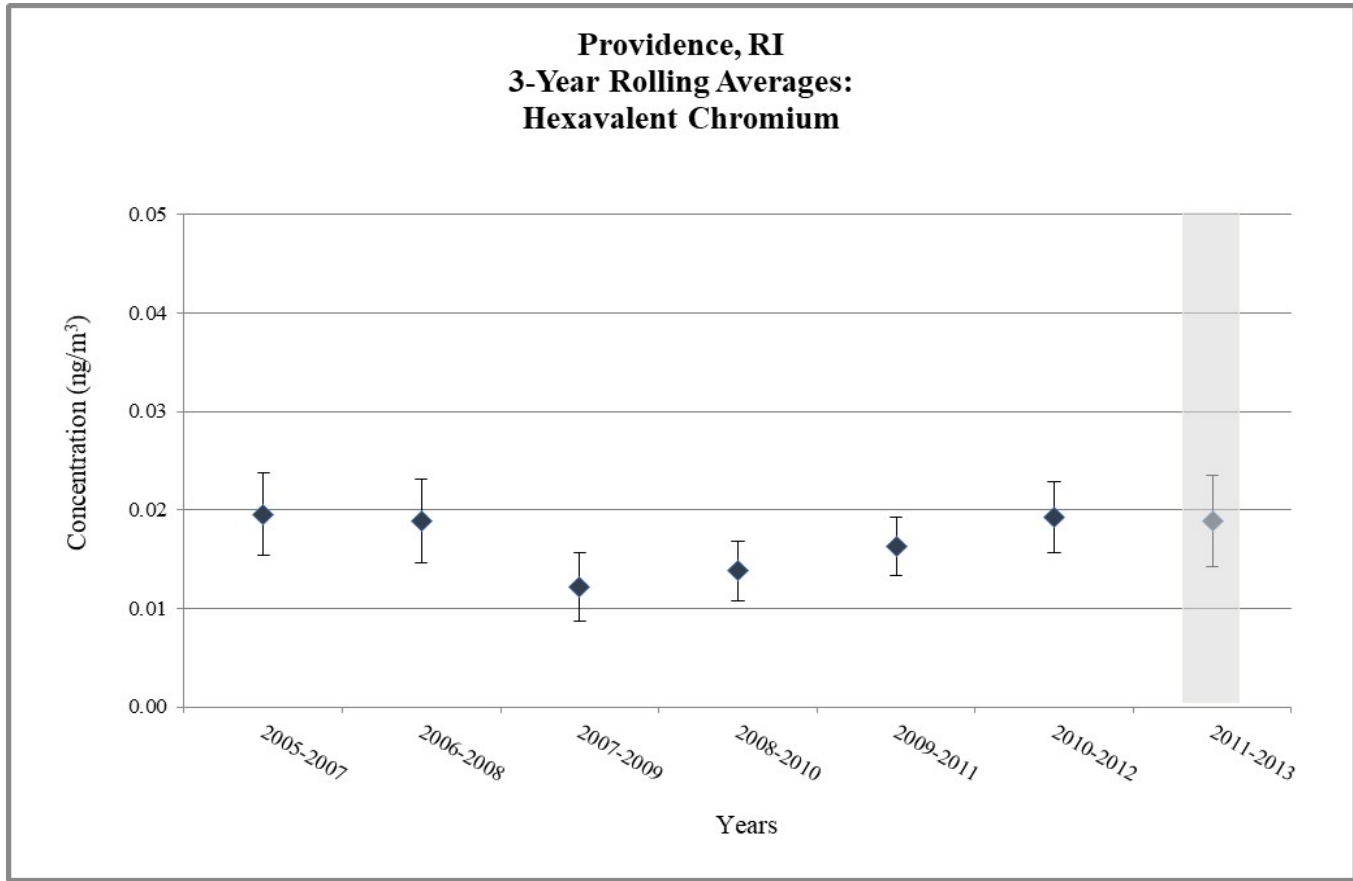


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

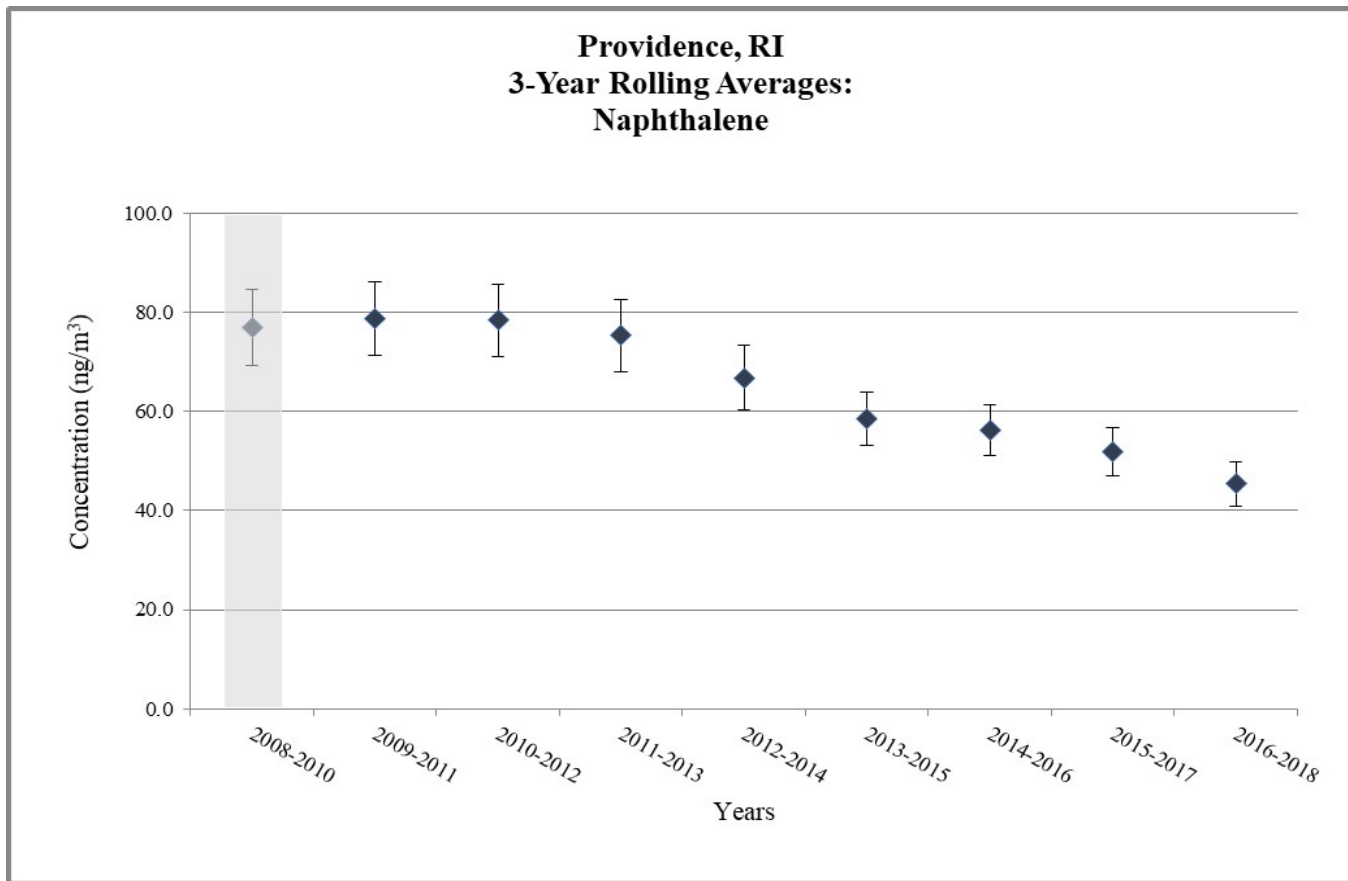
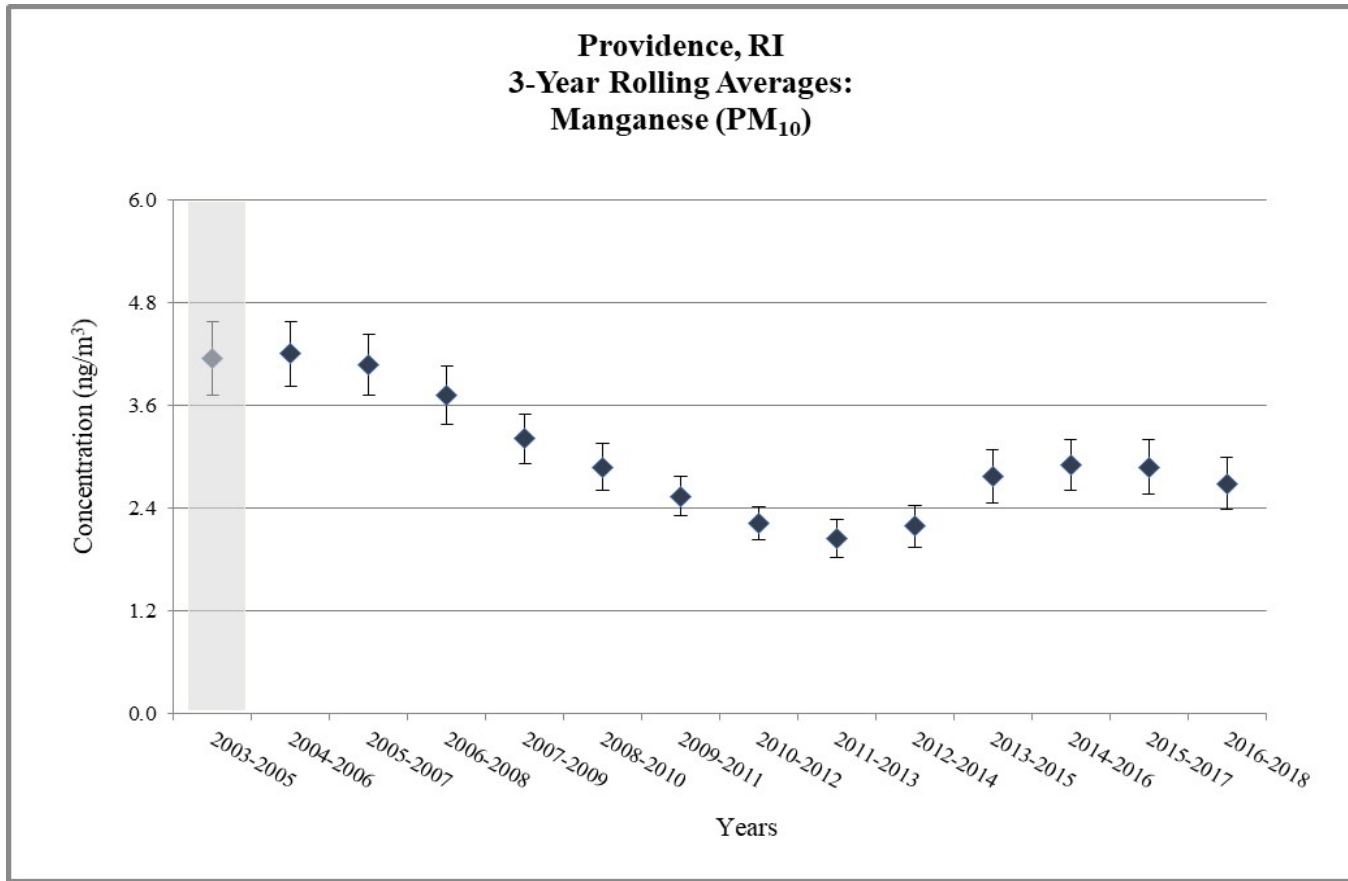


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations

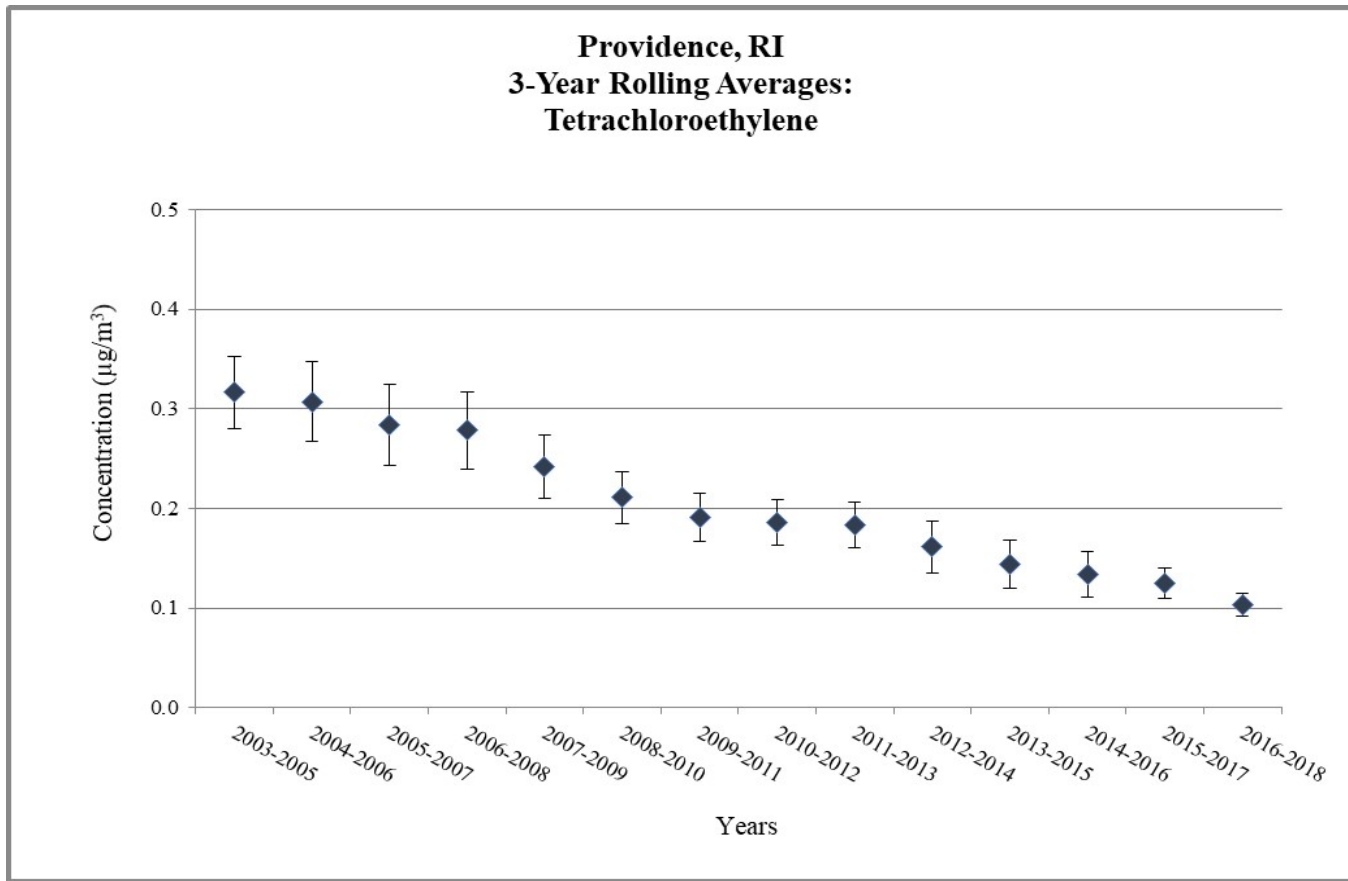
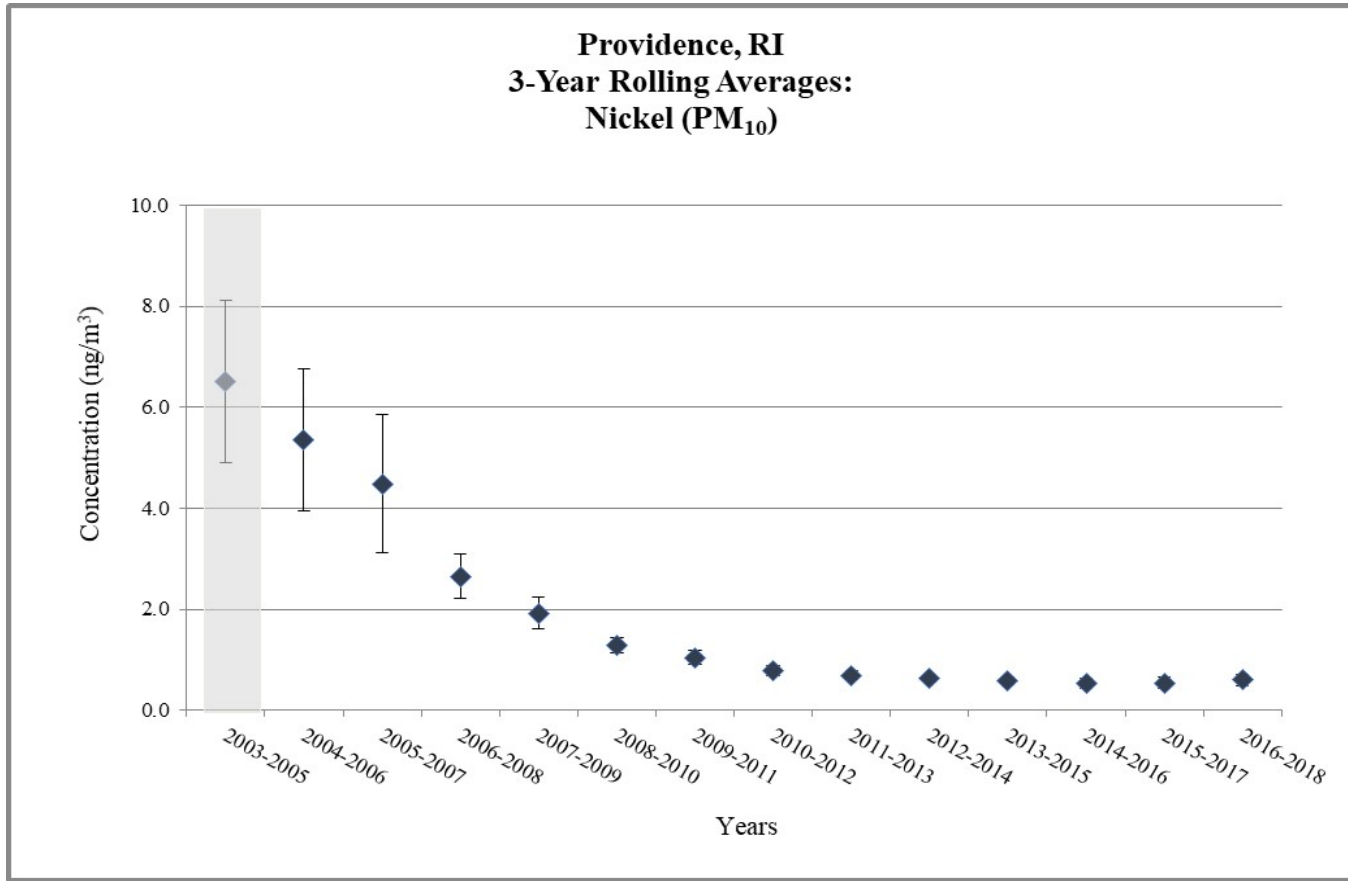
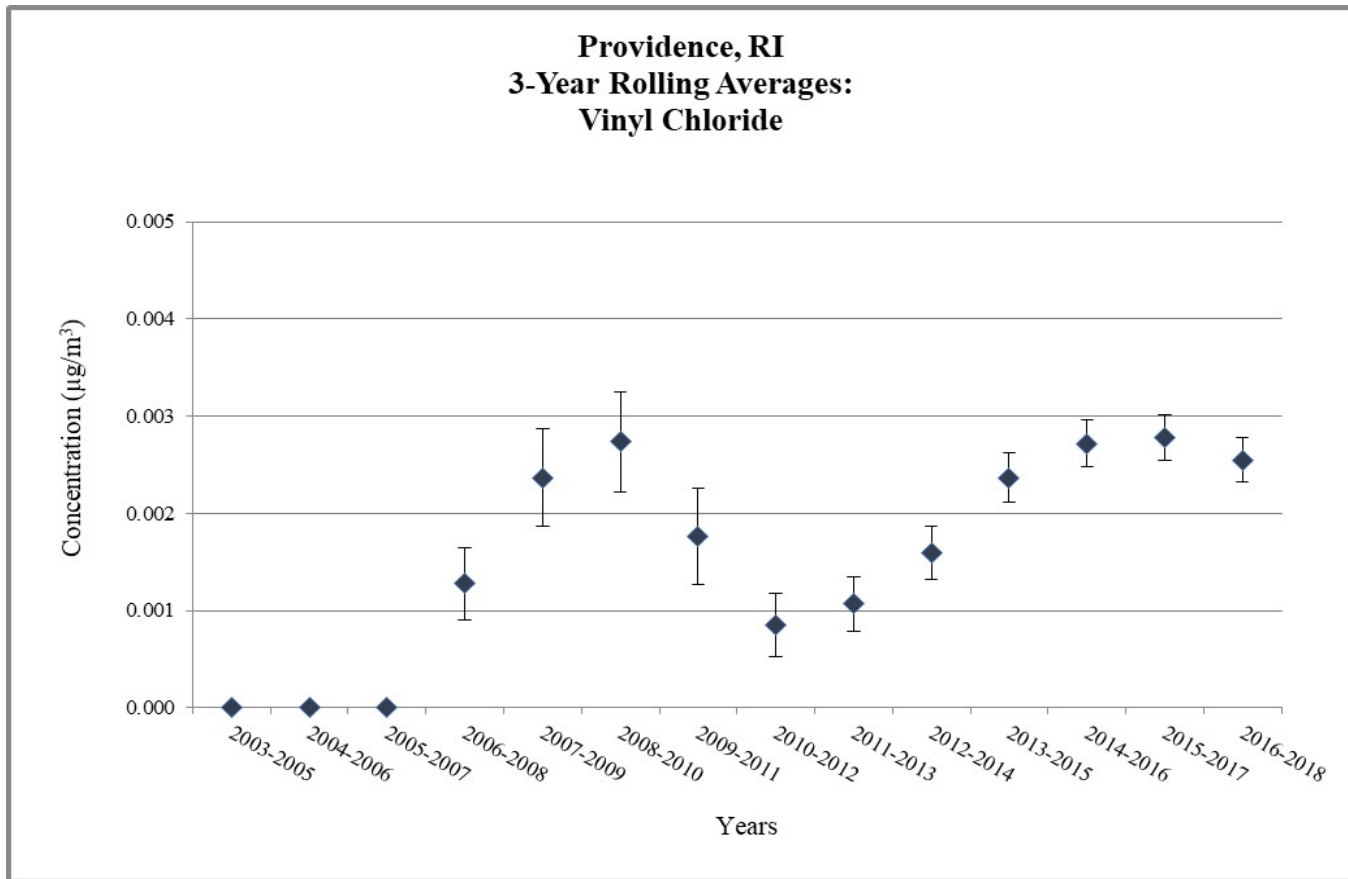
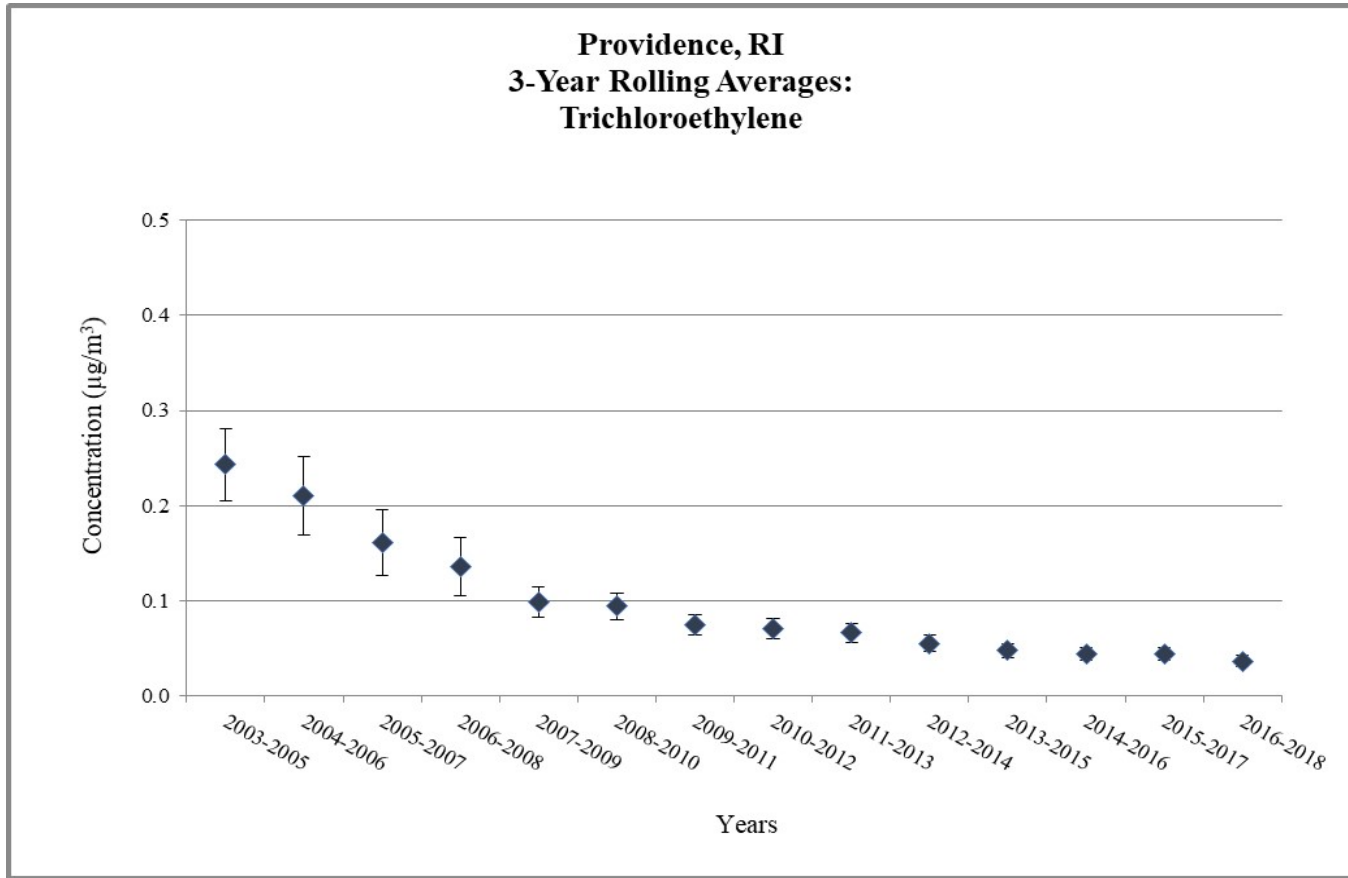


Figure 4. Providence, RI - 3-Year Rolling Average Concentrations



Does not meet MQO or wasn't able to collect enough samples

Table 6. NATTS Network Assessment: MQO#1 - Completeness Percentage at Providence, RI

| Pollutant Group | Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------------------|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Carbonyl | Acetaldehyde | 100 | 75 | 90 | 89 | 97 | 89 | 97 | 97 | 85 | 85 | 84 | 98 | 93 | 95 | 98 | 100 |
| Carbonyl | Formaldehyde | 100 | 79 | 89 | 95 | 97 | 89 | 97 | 97 | 85 | 85 | 84 | 98 | 93 | 95 | 98 | 100 |
| Chromium VI | Chromium VI | -- | -- | 95 | 100 | 100 | 100 | 98 | 98 | 93 | 100 | -- | -- | -- | -- | -- | -- |
| PAH | Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | 100 | 95 | 93 | 98 | 97 | 95 | 100 | 98 | 89 | 97 |
| PAH | Naphthalene | -- | -- | -- | -- | -- | -- | 100 | 95 | 93 | 98 | 97 | 95 | 100 | 98 | 89 | 97 |
| PM ₁₀ Metals | Arsenic (PM ₁₀) | 95 | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 92 | 98 | 98 | 95 | 97 | 97 |
| PM ₁₀ Metals | Beryllium (PM ₁₀) | a | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 92 | 98 | 98 | 95 | 97 | 97 |
| PM ₁₀ Metals | Cadmium (PM ₁₀) | 95 | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 90 | 98 | 98 | 95 | 97 | 97 |
| PM ₁₀ Metals | Lead (PM ₁₀) | 95 | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 92 | 98 | 98 | 95 | 97 | 97 |
| PM ₁₀ Metals | Manganese (PM ₁₀) | a | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 92 | 98 | 98 | 95 | 97 | 97 |
| PM ₁₀ Metals | Nickel (PM ₁₀) | 95 | 98 | 98 | 97 | 100 | 92 | 100 | 97 | 92 | 93 | 92 | 98 | 98 | 95 | 97 | 97 |
| VOC | Benzene | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 92 | 90 | 97 | 97 | 79 | 98 |
| VOC | Butadiene, 1,3- | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 92 | 90 | 97 | 97 | 79 | 98 |
| VOC | Carbon tetrachloride | 93 | 97 | 92 | 87 | 93 | 89 | 84 | 92 | 89 | 92 | 92 | 90 | 95 | 97 | 79 | 98 |
| VOC | Chloroform | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 89 | 90 | 97 | 97 | 79 | 98 |
| VOC | Tetrachloroethylene | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 92 | 90 | 97 | 97 | 79 | 98 |
| VOC | Trichloroethylene | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 92 | 90 | 97 | 97 | 79 | 98 |
| VOC | Vinyl chloride | 93 | 97 | 92 | 87 | 93 | 97 | 85 | 92 | 89 | 92 | 92 | 90 | 97 | 97 | 79 | 98 |

| | |
|----|-----------------------------|
| | A-rated: ≥85% |
| | B-rated: Between 75% to 85% |
| | Does not meet: ≤75% |
| -- | No data available |

Table 7. NATTS Network Assessment: MQO#2 - Reported Method Detection Limits (MDLs) at Providence, RI

| Pollutant Group | Pollutant Name | Target MDL | Units | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------------------|-------------------------------|------------------------|-------------------|------|-------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Carbonyl | Acetaldehyde | 0.45 | µg/m ³ | b | 0.24 | 0.68 | 0.04 | 0.06 | 0.08 | 0.04 | 0.04 | 0.04 | 0.12 | 0.04 | 0.04 | 0.04 | 0.08 | 0.08 | 0.06 |
| Carbonyl | Formaldehyde | 0.98/0.08 ^a | µg/m ³ | b | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.46 | 0.05 | 0.09 | 0.11 | 0.11 | 0.11 |
| Chromium VI | Chromium VI | 0.08 | ng/m ³ | -- | -- | 0.15 | 0.07 | 0.09 | 0.08 | 0.05 | 0.01 | 0.05 | 0.04 | 0.04 | -- | -- | -- | -- | -- |
| PAH | Benzo(a)pyrene | 0.91 | ng/m ³ | -- | -- | -- | -- | -- | 0.07 | 0.05 | 0.04 | 0.05 | 0.05 | 0.06 | 0.03 | 0.13 | 0.07 | 0.02 | 0.01 |
| PAH | Naphthalene | 29.00 | ng/m ³ | -- | -- | -- | -- | -- | 0.015 | 0.006 | 0.011 | 0.003 | 0.004 | 0.007 | 0.013 | 0.005 | 0.027 | 0.065 | 0.063 |
| PM ₁₀ Metals | Arsenic (PM ₁₀) | 0.23 | ng/m ³ | b | 10.00 | 10.00 | 10.00 | 0.06 | 0.06 | 0.06 | 0.30 | 0.35 | 0.32 | 0.32 | 0.32 | 0.32 | 0.51 | 0.19 | 0.11 |
| PM ₁₀ Metals | Beryllium (PM ₁₀) | 0.42 | ng/m ³ | c | 2.86 | 2.86 | 2.86 | 0.01 | 0.01 | 0.01 | 0.04 | 0.12 | 0.13 | 0.13 | 0.14 | 0.14 | 0.29 | 0.03 | 0.03 |
| PM ₁₀ Metals | Cadmium (PM ₁₀) | 0.56 | ng/m ³ | b | 1.07 | 1.07 | 1.07 | 0.01 | 0.01 | 0.01 | 0.03 | 0.06 | 0.06 | 0.04 | 0.03 | 0.03 | 0.22 | 0.04 | 0.04 |
| PM ₁₀ Metals | Lead (PM ₁₀) | 15.0 | ng/m ³ | b | 0.08 | 0.08 | 0.08 | 0.0001 | 0.0001 | 0.0001 | 0.002 | 0.012 | 0.006 | 0.005 | 0.001 | 0.001 | 0.009 | 0.008 | 0.008 |
| PM ₁₀ Metals | Manganese (PM ₁₀) | 5.0 | ng/m ³ | c | 0.24 | 0.24 | 0.240 | 0.002 | 0.002 | 0.00 | 0.006 | 0.01 | 0.008 | 0.013 | 0.005 | 0.01 | 0.03 | 0.02 | 0.02 |
| PM ₁₀ Metals | Nickel (PM ₁₀) | 2.1 | ng/m ³ | b | 0.57 | 0.57 | 0.571 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.13 | 0.13 | 0.13 |
| VOC | Benzene | 0.13 | µg/m ³ | 0.25 | 0.11 | 0.29 | 0.22 | 0.29 | 0.20 | 0.15 | 0.27 | 0.25 | 0.29 | 0.05 | 0.05 | 0.07 | 0.07 | 0.12 | 0.22 |
| VOC | Butadiene, 1,3- | 0.10 | µg/m ³ | 0.44 | 0.28 | 0.31 | 0.29 | 0.35 | 0.07 | 0.13 | 0.18 | 0.18 | 0.11 | 0.07 | 0.07 | 0.09 | 0.02 | 0.02 | 0.18 |
| VOC | Carbon tetrachloride | 0.17 | µg/m ³ | 1.85 | 0.34 | 1.44 | 0.81 | 0.52 | 0.44 | 0.19 | 0.37 | 0.30 | 0.37 | 0.07 | 0.07 | 0.07 | 0.04 | 0.04 | 0.26 |
| VOC | Chloroform | 0.50 | µg/m ³ | 0.29 | 0.06 | 0.20 | 0.14 | 0.11 | 0.14 | 0.04 | 0.08 | 0.06 | 0.08 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.09 |
| VOC | Tetrachloroethylene | 0.17 | µg/m ³ | 0.80 | 0.21 | 0.72 | 0.68 | 0.60 | 0.48 | 0.24 | 0.44 | 0.40 | 0.28 | 0.12 | 0.12 | 0.12 | 0.08 | 0.08 | 0.32 |
| VOC | Trichloroethylene | 0.5/0.2 ^a | µg/m ³ | 0.21 | 0.10 | 0.23 | 0.19 | 0.13 | 0.13 | 0.06 | 0.10 | 0.10 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.19 |
| VOC | Vinyl chloride | 0.11 | µg/m ³ | 0.46 | 0.22 | 0.53 | 0.37 | 0.40 | 0.26 | 0.19 | 0.19 | 0.14 | 0.16 | 0.05 | 0.05 | 0.07 | 0.02 | 0.02 | 0.16 |

| | |
|--|--------------------------------------------------|
| | A-rated: MDL to Target MDL ratio ≤ 1 |
| | B-rated" MDL to Target MDL ratio between 1 and 2 |
| | Does Not Meet MDL to Target MDL ratio>2 |
| | -- No data available |

^a: For the 2012 sampling year, the Target MDL for this pollutant was reduced.

^b: Pollutant was sampled, but no MDL data were reported to AQS.

Table 8. NATTS Network Assessment: MQO#3 - Bias Percent Difference at Providence, RI

| Pollutant Group | Pollutant Name | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------------------------|-------------------------------|------|-------|-------|-------------------|------|-------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Carbonyls | Acetaldehyde | 4.7 | 8.0 | 0.2 | -0.5 | 8.6 | -1.1 | 3.9 | 0.5 | a | 8.4 | 6.0 | a | 0.9 | 11.5 | -6.0 |
| Carbonyls | Formaldehyde | 8.7 | 5.7 | -3.5 | -2.8 | 20.0 | -5.3 | 8.2 | 6.8 | a | 9.2 | 6.4 | a | -11.3 | 7.8 | 3.2 |
| Chromium VI | Chromium VI | -- | a | a | a | a | -5.6 ^b | 10.5 ^b | a | 19.5 | -6.5 | -- | -- | -- | -- | -- |
| PAH | Benzo(a)pyrene | -- | -- | -- | -- | a | -1.7 | -2.3 | -2.1 | 25.2 | -5.7 | -16.3 | -14.2 | -10.5 | -22.4 | -14.8 |
| PAH | Naphthalene | -- | -- | -- | -- | a | -7.7 | -17.1 | -13.9 | 21.4 | 25.5 | 0.7 | -11.4 | -9.5 | -11.6 | -20.7 |
| PM ₁₀ Metals | Arsenic (PM ₁₀) | c | -5.2 | -7.0 | 12.5 ^d | c | -24.4 | 56.1 | c | -28.8 | -22.8 | -29.4 | a | -0.8 | -14.7 | -15.0 |
| PM ₁₀ Metals | Beryllium (PM ₁₀) | e | 23.0 | 0.1 | 12.5 ^d | c | -8.5 | 41.4 | 49.0 | 21.0 | 19.1 | f | a | -0.9 | -12.3 | -0.6 |
| PM ₁₀ Metals | Cadmium (PM ₁₀) | c | -6.1 | -9.1 | 9.6 ^d | c | -21.5 | -6.0 | -16.1 | -8.2 | -12.7 | f | a | -1.8 | -11.6 | -9.0 |
| PM ₁₀ Metals | Lead (PM ₁₀) | c | -8.3 | -9.1 | 4.0 ^d | c | -36.3 | -5.1 | -5.4 | 4.0 | 0.8 | -17.8 | a | -8.9 | -8.7 | -5.2 |
| PM ₁₀ Metals | Manganese (PM ₁₀) | e | -4.1 | -10.3 | -8.6 ^d | c | -41.2 | 5.3 | 5.4 | -5.2 | 11.1 | 0.0 | a | -3.3 | -6.5 | -7.3 |
| PM ₁₀ Metals | Nickel (PM ₁₀) | c | -1.5 | 7.1 | 1.0 ^d | c | -32.9 | 5.5 | 1.9 | -10.8 | 6.4 | g | a | 23.3 | 55.6 | 0.4 |
| VOC | Benzene | 6.0 | 6.6 | 1.7 | -3.0 | 1.5 | 0.4 | -8.8 | 15.4 | a | 9.2 | 0.6 | -4.3 | -10.9 | -12.0 | -7.6 |
| VOC | Butadiene, 1,3- | 21.5 | -1.9 | -2.8 | -3.7 | -1.4 | -11.9 | 3.7 | 1.9 | a | 4.9 | -4.5 | 4.4 | -6.9 | -19.0 | -2.5 |
| VOC | Carbon tetrachloride | 32.9 | 3.3 | -3.6 | 0.6 | 24.2 | -9.2 | -2.0 | -3.6 | a | -7.8 | -3.0 | 15.7 | 10.5 | -1.0 | -7.3 |
| VOC | Chloroform | 7.3 | -3.4 | -5.4 | -7.5 | -2.9 | -3.4 | -7.2 | -10.7 | a | -9.1 | -2.2 | -0.6 | -0.3 | 4.1 | -6.9 |
| VOC | Tetrachloroethylene | 4.1 | -10.7 | -12.7 | -3.9 | 7.6 | -9.7 | -8.6 | 0.4 | a | -0.2 | 3.3 | -0.7 | -9.7 | -15.5 | -10.5 |
| VOC | Trichloroethylene | 11.6 | -6.2 | -2.4 | -3.4 | 4.2 | -13.7 | -12.8 | -11.9 | a | 2.2 | 2.8 | 2.2 | -10.9 | -10.1 | -11.4 |
| VOC | Vinyl chloride | -3.5 | -19.2 | -12.4 | 3.1 | 2.8 | -10.3 | -11.8 | -7.0 | a | -11.0 | 0.7 | -1.5 | -5.4 | -5.3 | -16.0 |

| | |
|--|-----------------------------------------------------|
| | A-rated: ±25% |
| | B-rated: Between 25% to 35% or between -25% to -35% |
| | Does not meet: >35% or <-35% |
| | -- No data available |

^a: No Proficiency Test samples were sent for this pollutant and year.

^b: Proficiency Test results are from the National Contract Lab for EPA's School Air Toxics Monitoring Program. The %Difference was -5.55% in 2009 and 10.53% in 2010.

^c: Pollutant was sampled at this site and year, but no bias data were reported.

^d: This site was supported by EPA Region 1 and another laboratory for this pollutant and year. However, only EPA Region 1 PT data were available.

^e: Pollutant was expected, but not sampled at this site for this year.

^f: The Proficiency Test sample for this pollutant was 0; the site reported a concentration as "< MDL", rather than 0. EPA accepted this result.

^g: Although a Proficiency Test sample was sent to the lab supporting this site and year, the results were nullified by EPA due to QA issues.

Table 9. NATTS Network Assessment: MQO#4 - Overall Method Precision %CV at Providence, RI

| Pollutant Group | Pollutant Name | Overall Method precision % CV | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| Carbonyls | Acetaldehyde | -- | 16.2 | 11.7 | 8.9 | 5.7 | 10.8 | 15.5 | 10.5 | 10.3 | 13.1 | 10.0 | 8.3 | 7.1 | 9.7 | 5.6 | 9.9 |
| Carbonyls | Formaldehyde | -- | 18.3 | 11.4 | 7.6 | 6.1 | 9.6 | 10.6 | 13.0 | 9.6 | 18.9 | 14.6 | 7.5 | 12.7 | 9.9 | 7.0 | 7.5 |
| Chromium VI | Chromium VI | -- | -- | 15.2 | 6.1 | 20.8 | 39.2 | 10.1 | 22.4 | 17.1 | 6.2 | 32.8 | -- | -- | -- | -- | -- |
| PAH | Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PAH | Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PM ₁₀ Metals | Arsenic (PM ₁₀) | -- | -- | 0 | a | 9.4 | 9.8 | 10.6 | 11.4 | 16.0 | 11.0 | 11.0 | 8.3 | 6.0 | 11.9 | 3.3 | 6.9 |
| PM ₁₀ Metals | Beryllium (PM ₁₀) | -- | -- | a | a | a | 12.3 | 20.0 | a | a | a | a | a | a | a | a | a |
| PM ₁₀ Metals | Cadmium (PM ₁₀) | -- | -- | 3.5 | a | 5.9 | 22.2 | 34.3 | 7.4 | a | 25.3 | 21.7 | 16.3 | 8.0 | 4.3 | 11.8 | 29.4 |
| PM ₁₀ Metals | Lead (PM ₁₀) | -- | -- | 6.4 | 9.0 | 7.7 | 8.4 | 15.2 | 9.7 | 14.0 | 9.6 | 10.3 | 12.9 | 5.3 | 9.4 | 7.7 | 11.0 |
| PM ₁₀ Metals | Manganese (PM ₁₀) | -- | -- | 12.1 | 8.1 | 8.1 | 10.9 | 11.8 | 22.0 | 13.9 | 16.5 | 10.5 | 7.2 | 3.7 | 8.7 | 21.2 | 16.9 |
| PM ₁₀ Metals | Nickel (PM ₁₀) | -- | -- | 7.0 | 13.7 | 8.2 | 15.0 | 16.4 | 15.1 | 37.2 | 28.8 | 26.9 | 20.6 | 19.9 | 16.8 | 17.2 | 9.7 |
| VOC | Benzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Butadiene, 1,3- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Carbon tetrachloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Chloroform | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Tetrachloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Trichloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VOC | Vinyl chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|--|---------------------------------------------------------------------------------------------------------|
| | A-rated: ≤ 15% CV |
| | B-rated: Between 15%CV to 25% CV |
| | Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012) |
| | -- No data available |

^a: Although both primary and secondary data were reported, both sets of values were less than the MDL. Thus no %CV was calculated.

Table 10. NATTS Network Assessment: MQO#4 - Analytical Precision %CV at Providence, RI

| Pollutant Group | Pollutant Name | Analytical Method precision % CV | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------|----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| Carbonyls | Acetaldehyde | -- | -- | -- | -- | -- | -- | -- | -- | 1.8 | 3.2 | 1.5 | 2.4 | 1.5 | 1.9 | 1.5 | 1.4 |
| Carbonyls | Formaldehyde | -- | -- | -- | -- | -- | -- | -- | -- | 0.3 | 0.5 | 0.2 | 1.9 | 1.0 | 3.4 | 1.3 | 1.0 |
| Chromium VI | Chromium VI | -- | -- | -- | 2.2 | 0.9 | 10.4 | 6.0 | 4.2 | 9.4 | 5.3 | 15.7 | -- | -- | -- | -- | -- |
| PAH | Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.8 | 3.7 | 4.7 | 0.8 | 3.1 | 1.1 | 1.3 |
| PAH | Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.1 | 4.3 | 3.9 | 1.8 | 0.6 | 0.8 | 1.3 |
| PM ₁₀ Metals | Arsenic (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | a | 2.6 | 2.8 | 15.6 | 7.4 | 2.9 | 8.9 |
| PM ₁₀ Metals | Beryllium (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | a | a | 2.1 | a | a | a | a |
| PM ₁₀ Metals | Cadmium (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | a | 8.6 | 7.4 | 4.7 | a | 3.0 | 2.3 |
| PM ₁₀ Metals | Lead (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | a | 2.6 | 3.5 | 1.8 | 0.4 | 3.2 | 5.1 |
| PM ₁₀ Metals | Manganese (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.5 | 1.4 | 3.3 | 7.1 | 1.4 | 7.5 | 4.5 |
| PM ₁₀ Metals | Nickel (PM ₁₀) | -- | -- | -- | -- | -- | -- | -- | -- | -- | 15.7 | 5.1 | 4.0 | 8.5 | 2.0 | 16.7 | 1.6 |
| VOC | Benzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 0.9 | 1.1 | 4.5 | 3.3 |
| VOC | Butadiene, 1,3- | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 3.7 | 2.9 | 6.4 | 4.3 |
| VOC | Carbon tetrachloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 1.4 | 1.7 | 4.7 | 2.3 |
| VOC | Chloroform | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 1.9 | 1.8 | 4.6 | 3.7 |
| VOC | Tetrachloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 4.1 | 1.2 | 6.0 | 2.5 |
| VOC | Trichloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | 7.0 | 4.8 | 6.4 | 5.6 |
| VOC | Vinyl chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | b | b | b | a | 0 | 0 | a |

| | |
|--|---------------------------------------------------------------------------------------------------------|
| | A-rated: ≤ 15% CV |
| | B-rated: Between 15%CV to 25% CV |
| | Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012) |
| | -- No data available |

^a: The primary and/or replicate value were less than the MDL, so no calculation could be made.

^b: Per the NATTS Workplan template, analytical replicates were required to be reported to AQS for this sampling year

Appendix A. Equipment Survey

| Pollutant Type | Year(s) | Manufacturer/Model, Extraction Type, and Year |
|----------------------------------------------------|----------------|----------------------------------------------------------------------|
| <i>Sampling Equipment</i> | | |
| Carbonyls | 2003-2004 | ATEC 100 Sampler (Year Deployed: unknown) |
| | 2005-2014 | ATEC 100 Sampler (Year Deployed: 2005) |
| | 2015-2018 | ATEC 2200 (Year Deployed: 2015) |
| Chormium VI | 2005-2013 | RM Environmental Systems 924 Toxic Air Sampler (Year Deployed: 2005) |
| PAHs | 2008-2012 | Andersen GPS-1 PUF Sampler (Year Deployed: <1999) |
| | 2013-2018 | Tisch PUF Hi-Vol (Year Deployed: 2011) |
| PM ₁₀ Metals | 2003-2009 | Andersen Hi-Volume PM10 Sampler (Year Deployed: <1999) |
| | 2010-2013 | Andersen GMW PM10 Hi-Vol Sampler (Year Deployed: 2010) |
| | 2014-2018 | Andersen Hi-Volume PM10 Sampler (Year Deployed: 2014) |
| VOCs | 2003-2004 | Xontech 910A Canister Sampler (Year Deployed: 1999) |
| | 2005-2013 | RM Environmental Systems 910A Canister Sampler (Year Deployed: 2005) |
| | 2014-2018 | Xontech 901A (Year Deployed: 2004) |
| <i>Analytical Equipment</i> | | |
| Carbonyls | 2003-2006 | Waters HPLC/model 2996 PDA (Year Deployed: 1993) |
| | 2007-2018 | HP/Agilent HPLC 1200 with UV detection (Year Deployed: 2007) |
| Chormium VI | 2005-2013 | Dionex 300 ion chromatography system (Year Deployed: 2001) |
| PAHs | 2008-2014 | HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008) |
| | 2015-2018 | HP/Agilent 7890B/5975C GC/MS (Year Deployed: 2015) |
| PM ₁₀ Metals | 2003-2006 | PE Sciex ELAN 6100 ICP-MS (Year Deployed: unknown) |
| | 2007-2014 | PE DRC II ICP (Year Deployed: 2006) |
| | 2015-2018 | Thermo iCAP Q ICP-MS (Year Deployed: 2015) |
| VOCs | 2003-2004 | Agilent 7890A/5973 GC/MS (Year Deployed: unknown) |
| | 2005-2018 | Agilent 7890A/5973 GC/MS (Year Deployed: 2005) |
| <i>Preconcentrator Equipment</i> | | |
| VOCs | 2003-2007 | Entech 7100A (Year Deployed: <1995) |
| | 2008-2014 | Entech 7100 (Year Deployed: 2008) |
| | 2015-2018 | Entech 7200 (Year Deployed: 2015) |
| <i>Standards Preparation Equipment</i> | | |
| VOCs | 2003-2009 | Entech 7100 (dynamic dilution) (Year Deployed: <2000) |
| | 2010-2018 | Entech 4100 (dynamic dilution) (Year Deployed: 2010) |
| <i>Canister Cleaning Equipment</i> | | |
| VOCs | 2003-2013 | Entech 3100 (Hot) (Year Deployed: <2000) |
| | 2014-2018 | Entech 3100 /3100D (Hot) (Year Deployed: <2000/2016) |
| <i>PM₁₀ Extraction Equipment</i> | | |
| PM ₁₀ Metals | 2003-2005 | unknown (Hotblock) (Year Deployed: <2004) |
| | 2006-2018 | Environmental Express SC100 (Hotblock) (Year Deployed: 2006) |
| <i>Chromium VI Extraction Equipment</i> | | |
| Chormium VI | 2005-2010 | Branson 8510 (Sonicator) (Year Deployed: 2001) |
| | 2011-2011 | Branson 8510 Sonicator/ Branson Shaker (Year Deployed: 2001/2011) |
| | 2012-2013 | Branson Shaker (Year Deployed: 2011) |
| <i>PAHs Extraction Equipment</i> | | |
| PAHs | 2008-2018 | Dionex -300 (ASE) (Year Deployed: 2004) |