# How ERG is developing interactive apps (via Qlik Sense®) to facilitate air toxics data review

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EASTERN RESEARCH GROUP, INC.

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# NMP Program and Data Review

Eastern Research Group, Inc (ERG) is the contract laboratory for EPA's National Monitoring Programs (NMP)*, which includes the following programs:

- Urban Air Toxics Monitoring Program (UATMP),
- National Air Toxics Trends Stations (NATTS) network,
- Community-Scale Air Toxics Ambient Monitoring (CSATAM) program, and
- Photochemical Assessment Monitoring Stations (PAMS) program.

These programs have extensive data verification and validation requirements. ERG is developing interactive apps (via Qlik Sense®) to help facilitate air toxics data review for these programs.

*NHAPs = formerly NMP

# What is Qlik Sense®?

Qlik Sense is a data analytics tool that allows for the development of app(s) that enable interactive data exploration by different users.

https://www.qlik.com/us/products/qlik-sense

EPA is using Qlik Sense as one means of inter-actively viewing data and thus, we at ERG are utilizing it as well.

# Internal Data Visualization

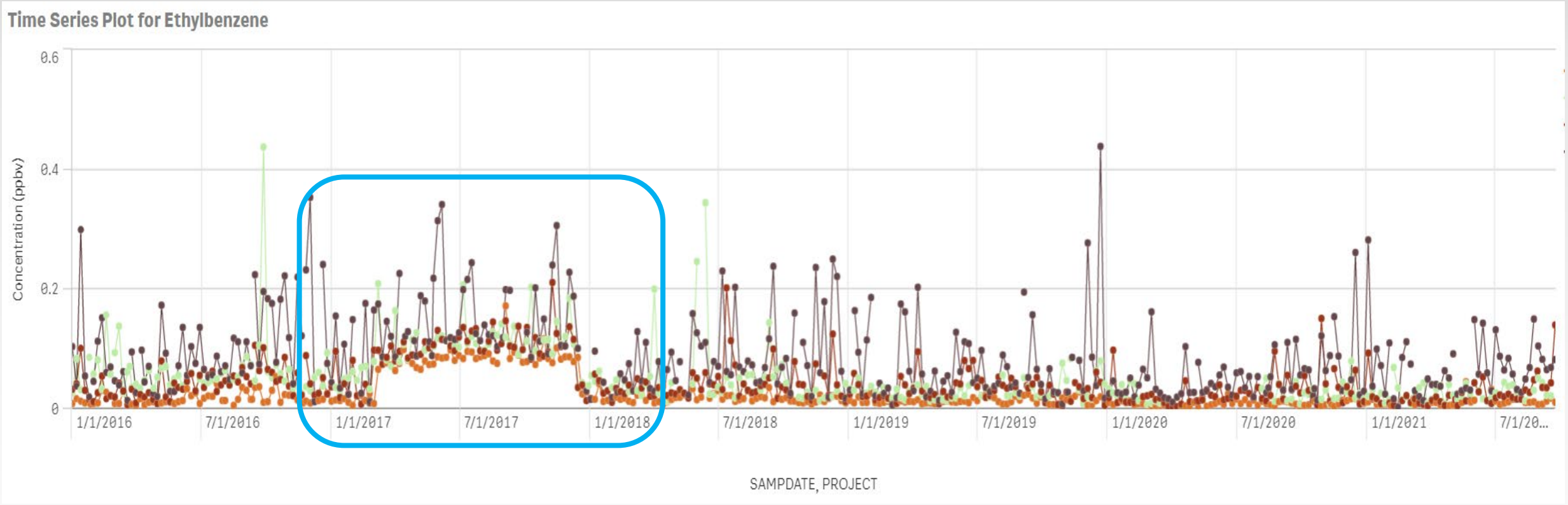
The ERG lab's first development of a data visualization app was for internal data visualization.

Essentially, the app allowed us to quickly review data to make sure everything looked as expected.

Doing this step in our QA has revealed to us, as a few examples,

- outliers at a given monitoring site
  - the identification of a sample line leak;
  - an unknown parking lot resurfacing operation;
  - impacts of nearby burning;
  - or the effects of extreme heat,
- an internal standard contamination issue at the lab
- changes in concentrations trends at a monitoring site.

# Internal Data Visualization



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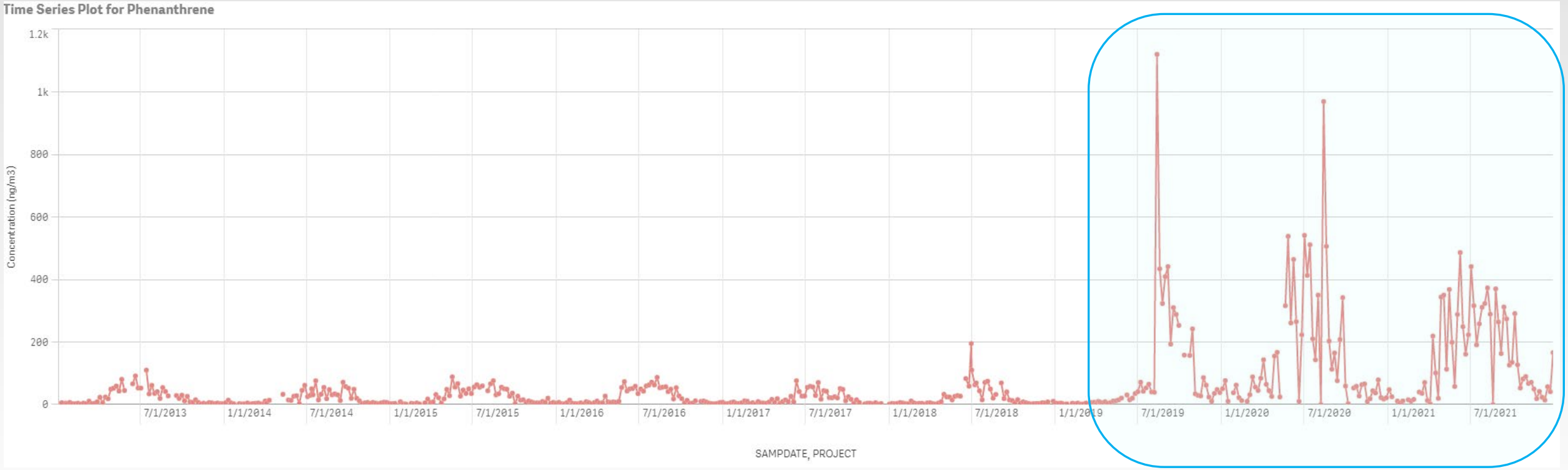
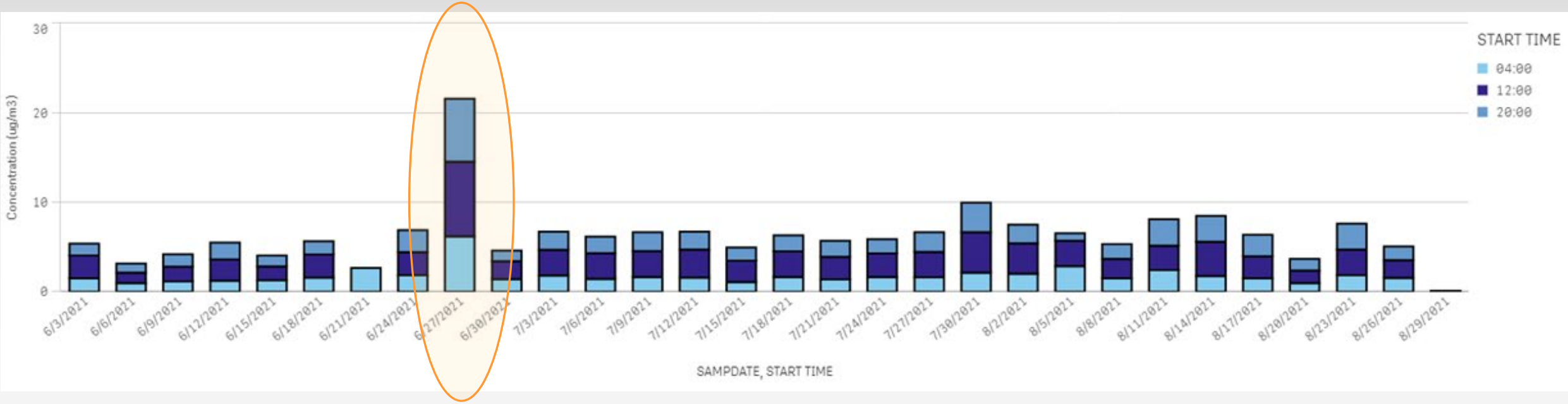


# Internal Data Visualization



# Allowing clients to see what we see

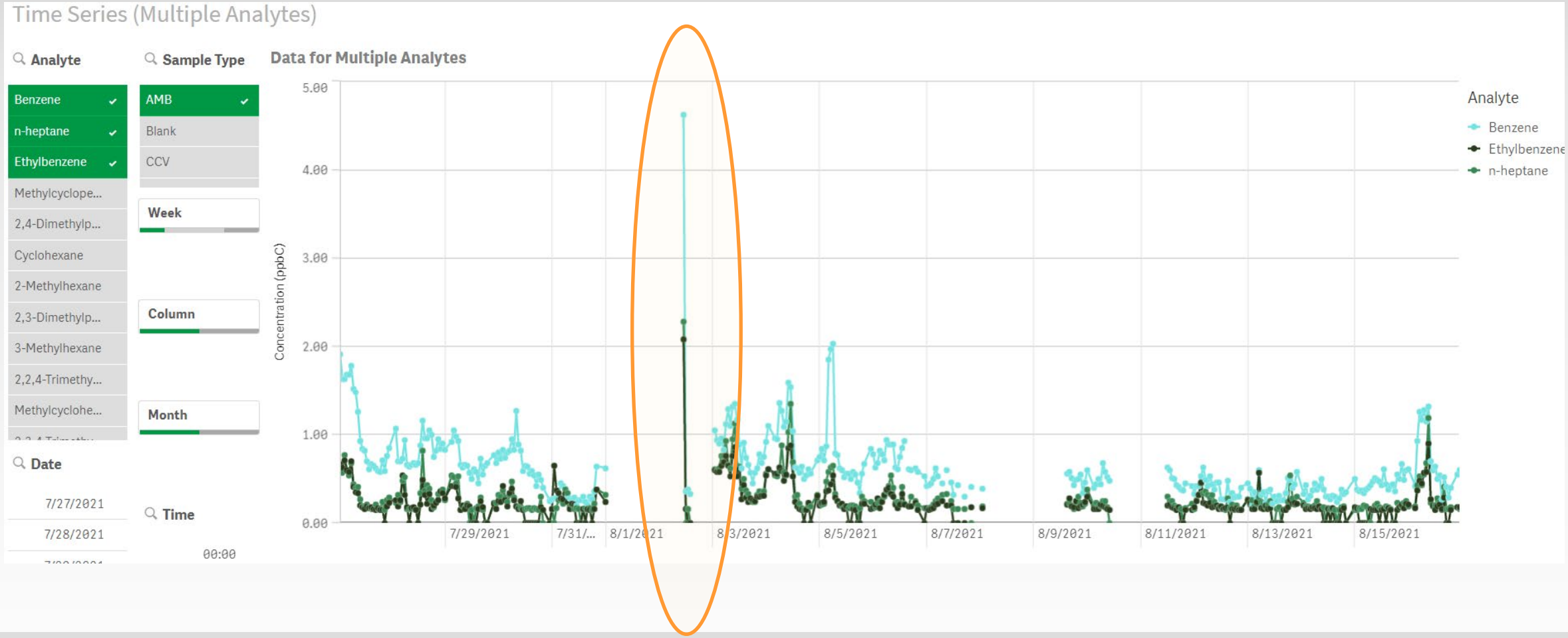
For the 2021 PAMS season, we developed site-specific apps to share with our individual clients to help them review AutoGC on their end while we were reviewing it on ours.

The app provided interactive:

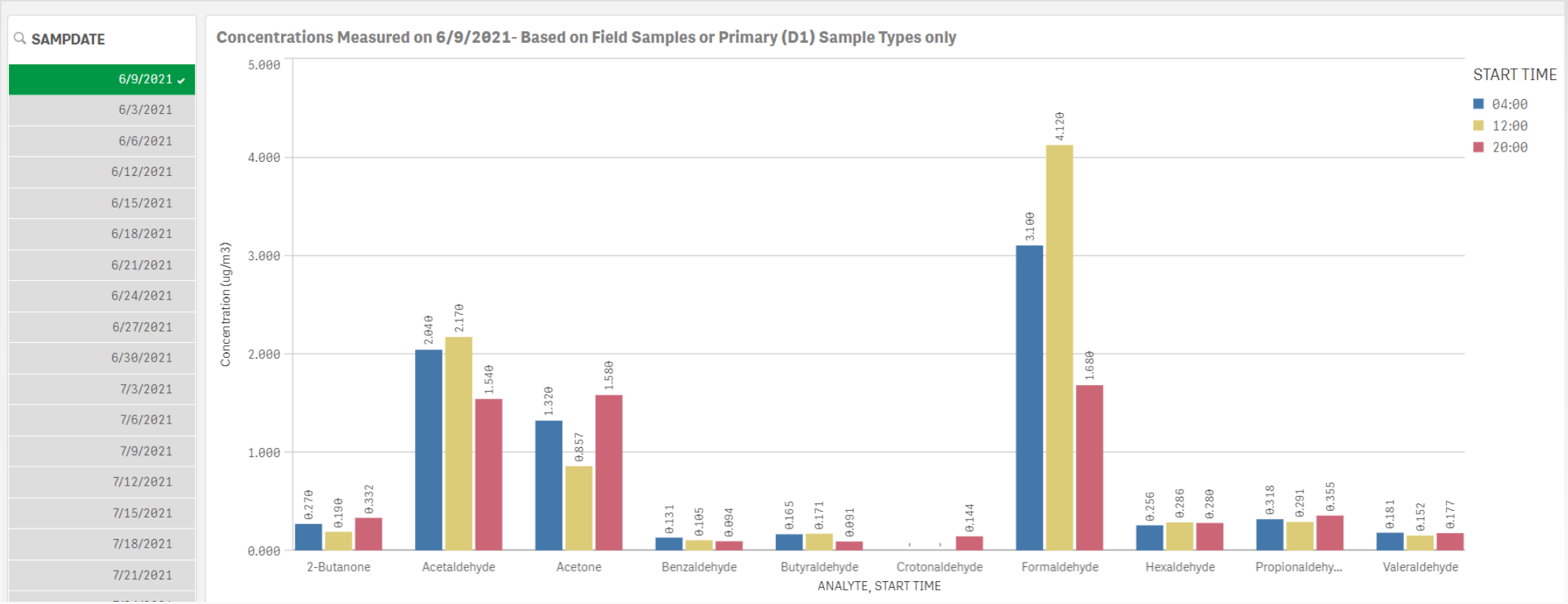
- time series plots
- statistical tables
- various bar charts
- AQS coding

Sites can provide us with feedback to help us enhance their app with requested formatting changes or additional data products.

# Allowing clients to see what we see



# Allowing clients to see what we see



# Modernizing Reports

**2015-2016 National Monitoring Programs Annual Report (UATMP, NATTS, and CSATAM)**

**Final Report**
**EPA Contract No. EP-D-14-030**

Prepared for:

Jeff Yane and David Shelow
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared by:

Eastern Research Group, Inc.
601 Keystone Park Drive, Suite 700
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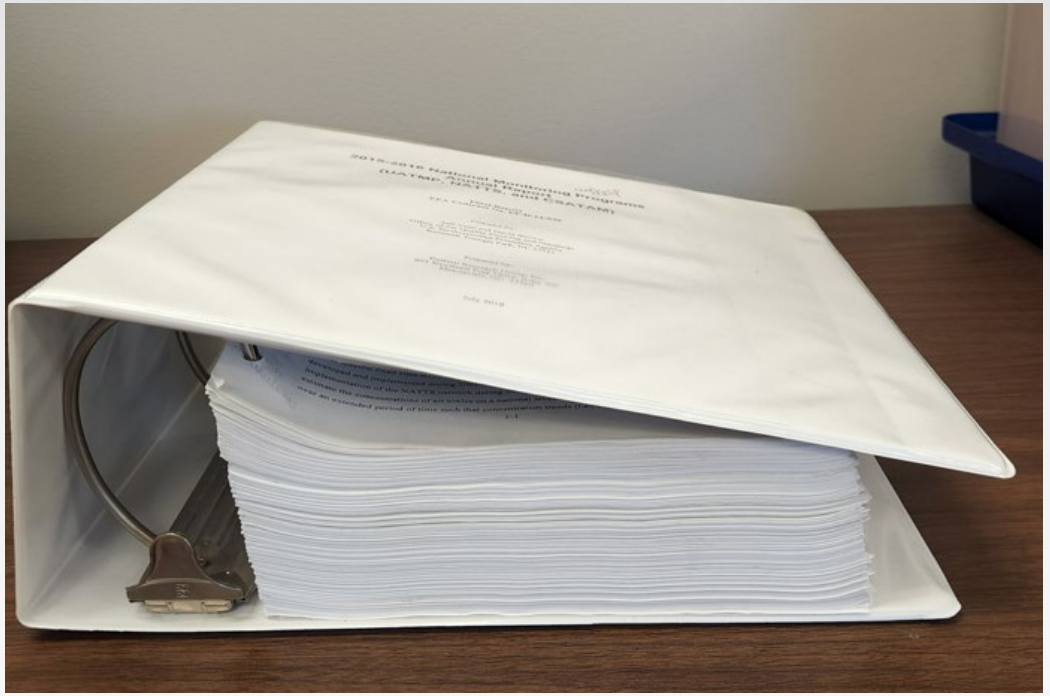


# Modernizing Reports

The Qlik Sense Dashboard for EPA's National Monitoring Program's (NMP) data is intended to replace the annual NMP report. We are starting with 2017 data.

- The app was developed and designed to increase awareness of the data products and tools developed by the contract laboratory and allows users greater flexibility in exploring those products on their own.
- The app is comprised of a number of tabs which provide filters that allow the user to explore data based on analytical method, pollutant, and geographical location.
- The app essentially presents most of the same tables and graphs as the written report but allows the user to simply click on a site or state of interest and all the tables and graphs bend to the will of the user.

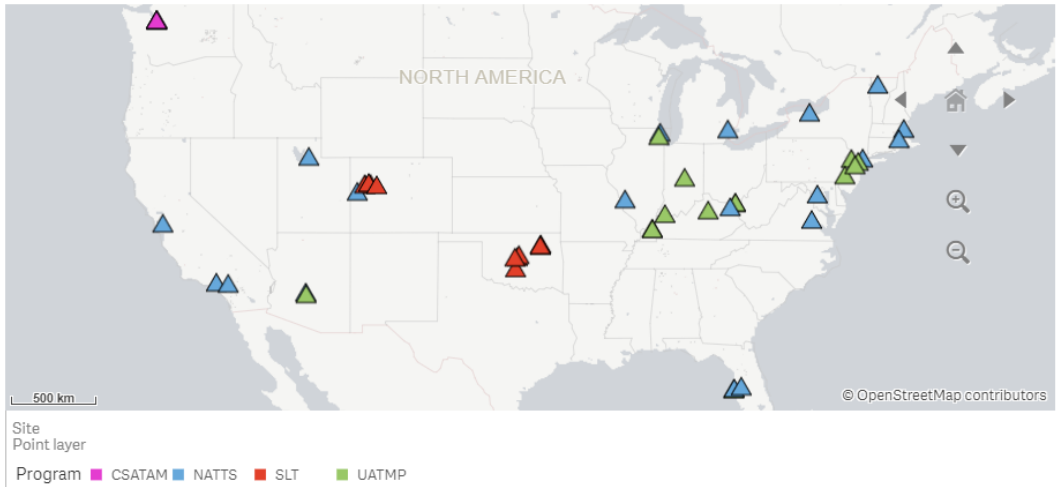
# Modernizing Reports

## National Monitoring Programs Annual Report

About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

| NMP Year | State | Region |
|---|---|---|
| 2017 | AZ | 1 |
| | CA | 2 |
| | CO | 3 |

**2017 NMP Site Locations**




**2017 NMP Sites, Methods, and Date Range of Sampling**

| Site - Location | Method / Values | Metals Analysis | | Methane | |
|---|---|---|---|---|---|
| | | 1st Date | Last Date | 1st Date | Last Date |
| ASKY - Ashland, KY | | - | - | - | - |
| ASKY-M - Ashland, KY | | 1/1/2017 | 12/27/2017 | - | - |
| AZFL - St. Petersburg, FL | | - | - | - | - |
| BAKY - Baskett, KY | | 1/1/2017 | 12/27/2017 | - | - |
| BKWA - Seattle, WA | | 1/1/2017 | 9/28/2017 | - | - |
| BLKY - Smithland, KY | | 1/1/2017 | 12/27/2017 | - | - |
| BMCO - Battlement Mesa, CO | | - | - | - | - |
| BOMA - Boston, MA | | 1/1/2017 | 12/27/2017 | - | - |
| BRCO - Silt, CO | | - | - | - | - |
| BROK - Bradley, OK | | - | - | 1/1/2017 | 6/30/2017 |
| BTUT - Bountiful, UT | | 1/1/2017 | 12/27/2017 | - | - |
| BXNY - New York, NY | | - | - | - | - |
| CELA - Los Angeles, CA | | - | - | - | - |
| CHNJ - Chester, NJ | | - | - | - | - |
| CSNJ - Camden, NJ | | - | - | - | - |
| DEMI - Dearborn, MI | | - | - | - | - |

# Status of 2017 NMP app

Currently, the app is housed on EPA's server and awaiting approval to go public.

# Acknowledgements

Special shout-out to Matthew Heyward with ERG for his superb Qlik/Java/Web skills!

Thanks to Julie Swift and other ERG lab folks for getting the NMP app where it is now.

Thanks to Doris Chen and other EPA folks for supporting these efforts.

# Questions?

My contact information:

Jaime Hauser

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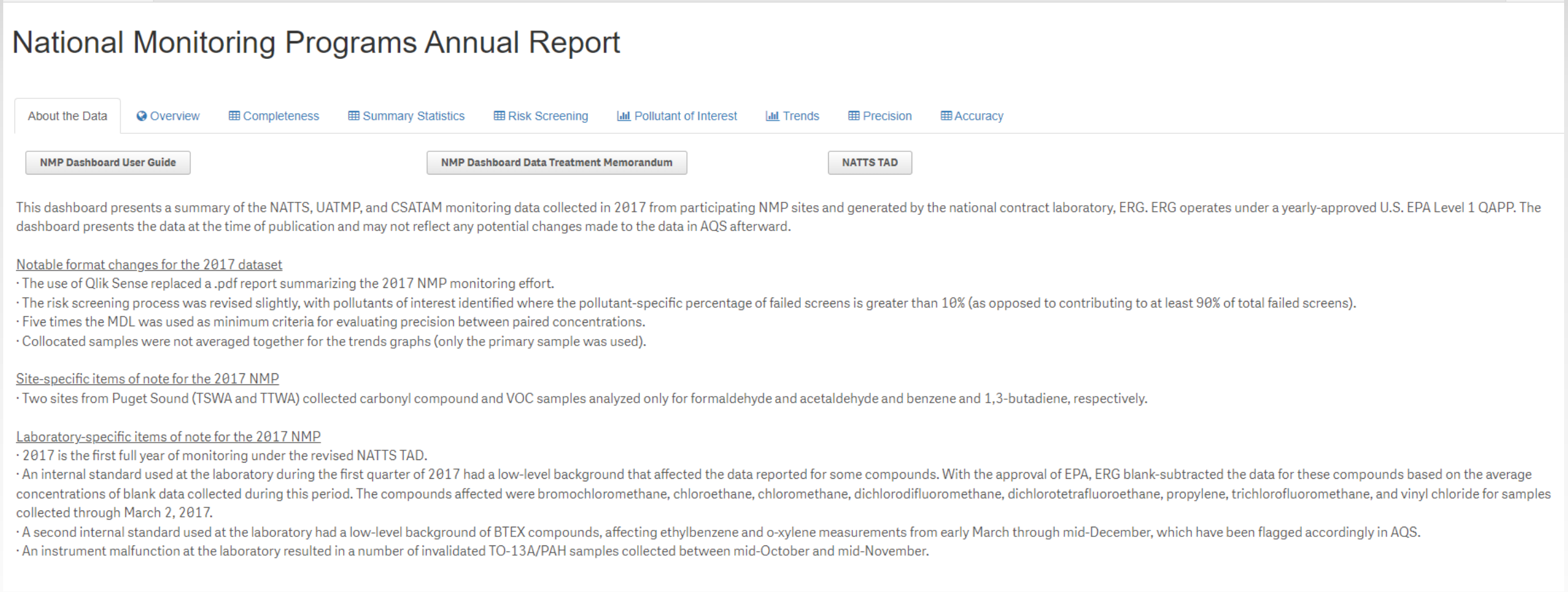
919-468-7813

# NMP App Screenshots – About the Data



# NMP App Screenshots - Overview

About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

| NMP Year | State | Region |
|---|---|---|
| 2017 | AZ | 1 |
| | CA | 2 |
| | CO | 3 |

**2017 NMP Site Locations**

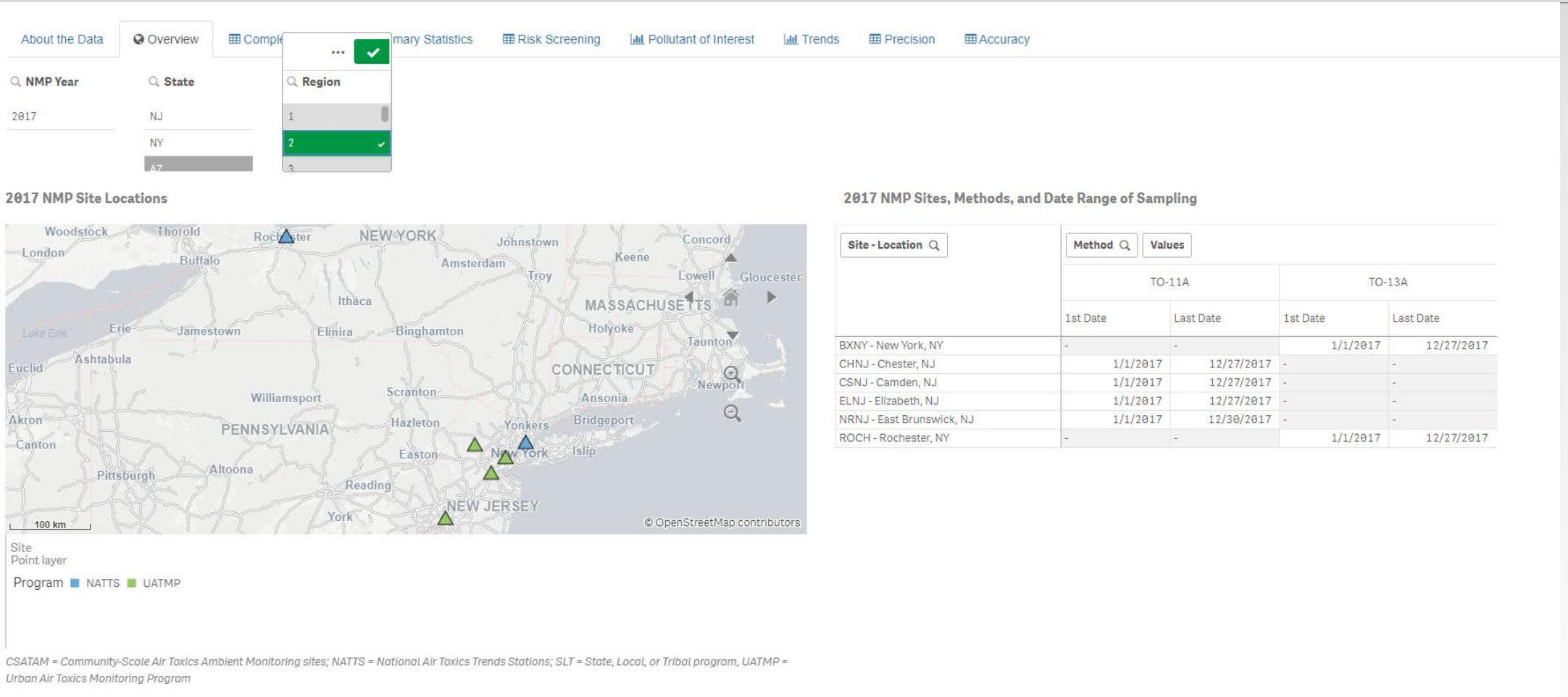
Site
Point layer
Program ■ CSATAM ■ NATTS ■ SLT ■ UATMP

*CSATAM = Community-Scale Air Toxics Ambient Monitoring sites; NATTS = National Air Toxics Trends Stations; SLT = State, Local, or Tribal program, UATMP = Urban Air Toxics Monitoring Program*

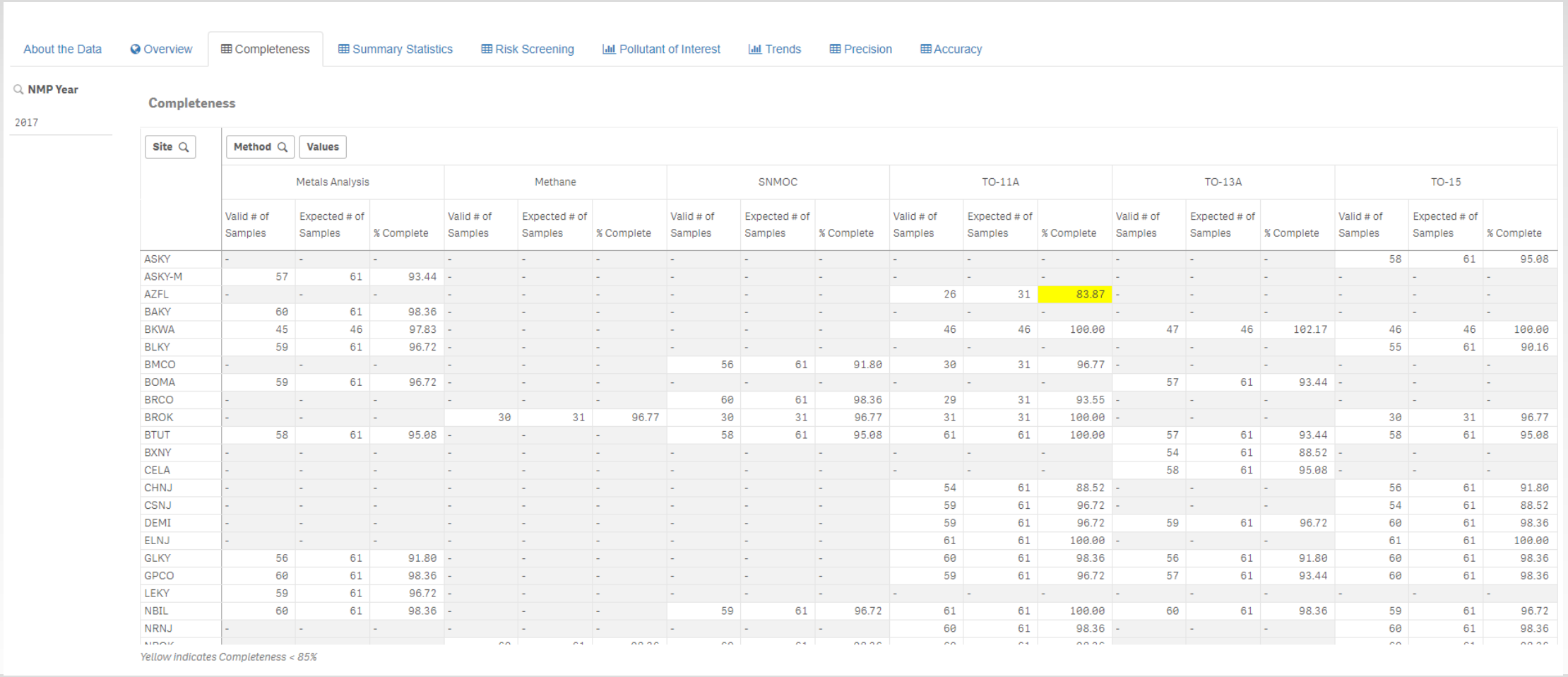
**2017 NMP Sites, Methods, and Date Range of Sampling**

| Site - Location | Method / Values | | | |
|---|---|---|---|---|
| | Metals Analysis | | Methane | |
| | 1st Date | Last Date | 1st Date | Last Date |
| ASKY - Ashland, KY | - | - | - | - |
| ASKY-M - Ashland, KY | 1/1/2017 | 12/27/2017 | - | - |
| AZFL - St. Petersburg, FL | - | - | - | - |
| BAKY - Baskett, KY | 1/1/2017 | 12/27/2017 | - | - |
| BKWA - Seattle, WA | 1/1/2017 | 9/28/2017 | - | - |
| BLKY - Smithland, KY | 1/1/2017 | 12/27/2017 | - | - |
| BMCO - Battlement Mesa, CO | - | - | - | - |
| BOMA - Boston, MA | 1/1/2017 | 12/27/2017 | - | - |
| BRCO - Silt, CO | - | - | - | - |
| BROK - Bradley, OK | - | - | 1/1/2017 | 6/30/2017 |
| BTUT - Bountiful, UT | 1/1/2017 | 12/27/2017 | - | - |
| BXNY - New York, NY | - | - | - | - |
| CELA - Los Angeles, CA | - | - | - | - |
| CHNJ - Chester, NJ | - | - | - | - |
| CSNJ - Camden, NJ | - | - | - | - |
| DEMI - Dearborn, MI | - | - | - | - |
| ELNJ - Elizabeth, NJ | - | - | - | - |
| GLKY - Grayson Lake, KY | 1/1/2017 | 12/27/2017 | - | - |
| GPCO - Grand Junction, CO | 1/1/2017 | 12/29/2017 | - | - |

# NMP App Screenshots - Overview



# NMP App Screenshots - Completeness



About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

NMP Year

2017

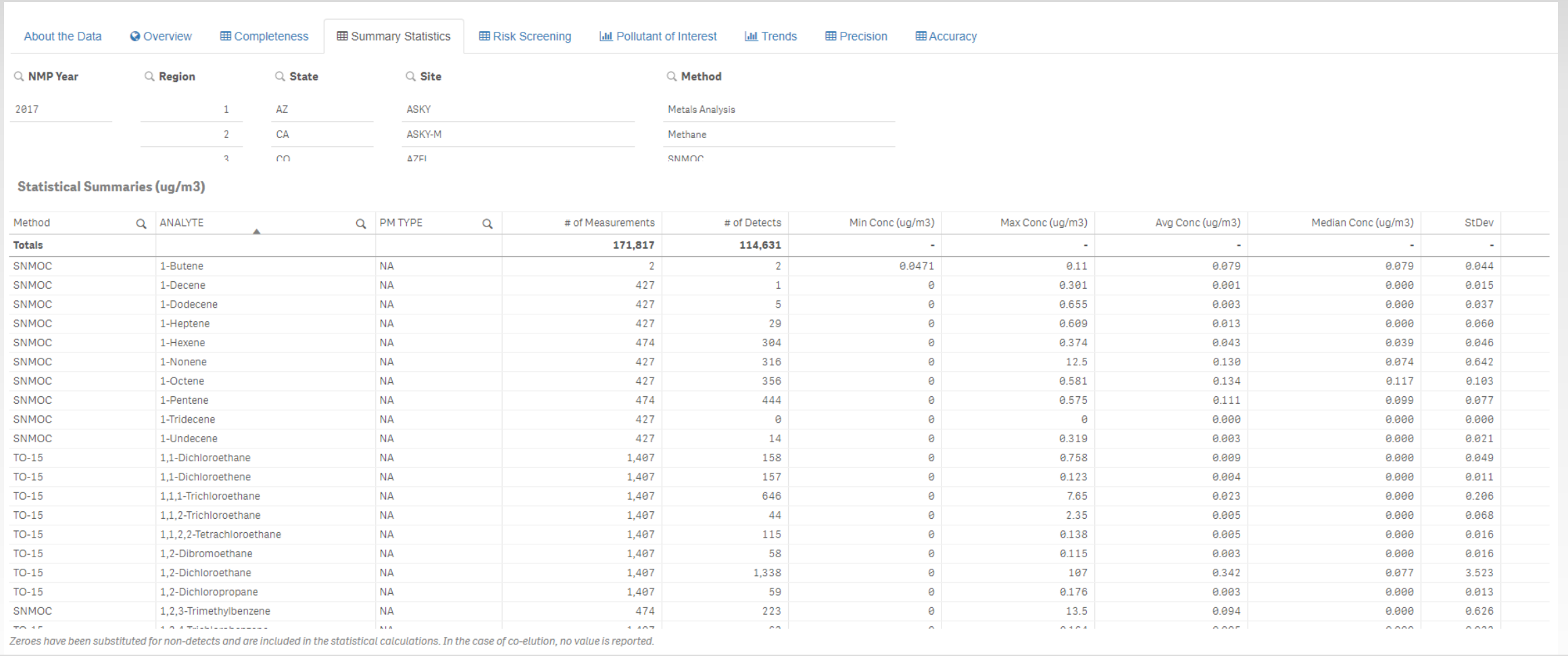
**Completeness**

Site | Method | Values

| | Metals Analysis | | | Methane | | | SNMOC | | | TO-11A | | | TO-13A | | | TO-15 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Valid # of Samples | Expected # of Samples | % Complete | Valid # of Samples | Expected # of Samples | % Complete | Valid # of Samples | Expected # of Samples | % Complete | Valid # of Samples | Expected # of Samples | % Complete | Valid # of Samples | Expected # of Samples | % Complete | Valid # of Samples | Expected # of Samples | % Complete |
| ASKY | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 58 | 61 | 95.08 |
| ASKY-M | 57 | 61 | 93.44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| AZFL | - | - | - | - | - | - | - | - | - | 26 | 31 | 83.87 | - | - | - | - | - | - |
| BAKY | 60 | 61 | 98.36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| BKWA | 45 | 46 | 97.83 | - | - | - | - | - | - | 46 | 46 | 100.00 | 47 | 46 | 102.17 | 46 | 46 | 100.00 |
| BLKY | 59 | 61 | 96.72 | - | - | - | - | - | - | - | - | - | - | - | - | 55 | 61 | 90.16 |
| BMCO | - | - | - | - | - | - | 56 | 61 | 91.80 | 30 | 31 | 96.77 | - | - | - | - | - | - |
| BOMA | 59 | 61 | 96.72 | - | - | - | - | - | - | - | - | - | 57 | 61 | 93.44 | - | - | - |
| BRCO | - | - | - | - | - | - | 60 | 61 | 98.36 | 29 | 31 | 93.55 | - | - | - | - | - | - |
| BROK | - | - | - | 30 | 31 | 96.77 | 30 | 31 | 96.77 | 31 | 31 | 100.00 | - | - | - | 30 | 31 | 96.77 |
| BTUT | 58 | 61 | 95.08 | - | - | - | 58 | 61 | 95.08 | 61 | 61 | 100.00 | 57 | 61 | 93.44 | 58 | 61 | 95.08 |
| BXNY | - | - | - | - | - | - | - | - | - | - | - | - | 54 | 61 | 88.52 | - | - | - |
| CELA | - | - | - | - | - | - | - | - | - | - | - | - | 58 | 61 | 95.08 | - | - | - |
| CHNJ | - | - | - | - | - | - | - | - | - | 54 | 61 | 88.52 | - | - | - | 56 | 61 | 91.80 |
| CSNJ | - | - | - | - | - | - | - | - | - | 59 | 61 | 96.72 | - | - | - | 54 | 61 | 88.52 |
| DEMI | - | - | - | - | - | - | - | - | - | 59 | 61 | 96.72 | 59 | 61 | 96.72 | 60 | 61 | 98.36 |
| ELNJ | - | - | - | - | - | - | - | - | - | 61 | 61 | 100.00 | - | - | - | 61 | 61 | 100.00 |
| GLKY | 56 | 61 | 91.80 | - | - | - | - | - | - | 60 | 61 | 98.36 | 56 | 61 | 91.80 | 60 | 61 | 98.36 |
| GPCO | 60 | 61 | 98.36 | - | - | - | - | - | - | 59 | 61 | 96.72 | 57 | 61 | 93.44 | 60 | 61 | 98.36 |
| LEKY | 59 | 61 | 96.72 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| NBIL | 60 | 61 | 98.36 | - | - | - | 59 | 61 | 96.72 | 61 | 61 | 100.00 | 60 | 61 | 98.36 | 59 | 61 | 96.72 |
| NRNJ | - | - | - | - | - | - | - | - | - | 60 | 61 | 98.36 | - | - | - | 60 | 61 | 98.36 |

*Yellow indicates Completeness < 85%*

# NMP App Screenshots - Stats



About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

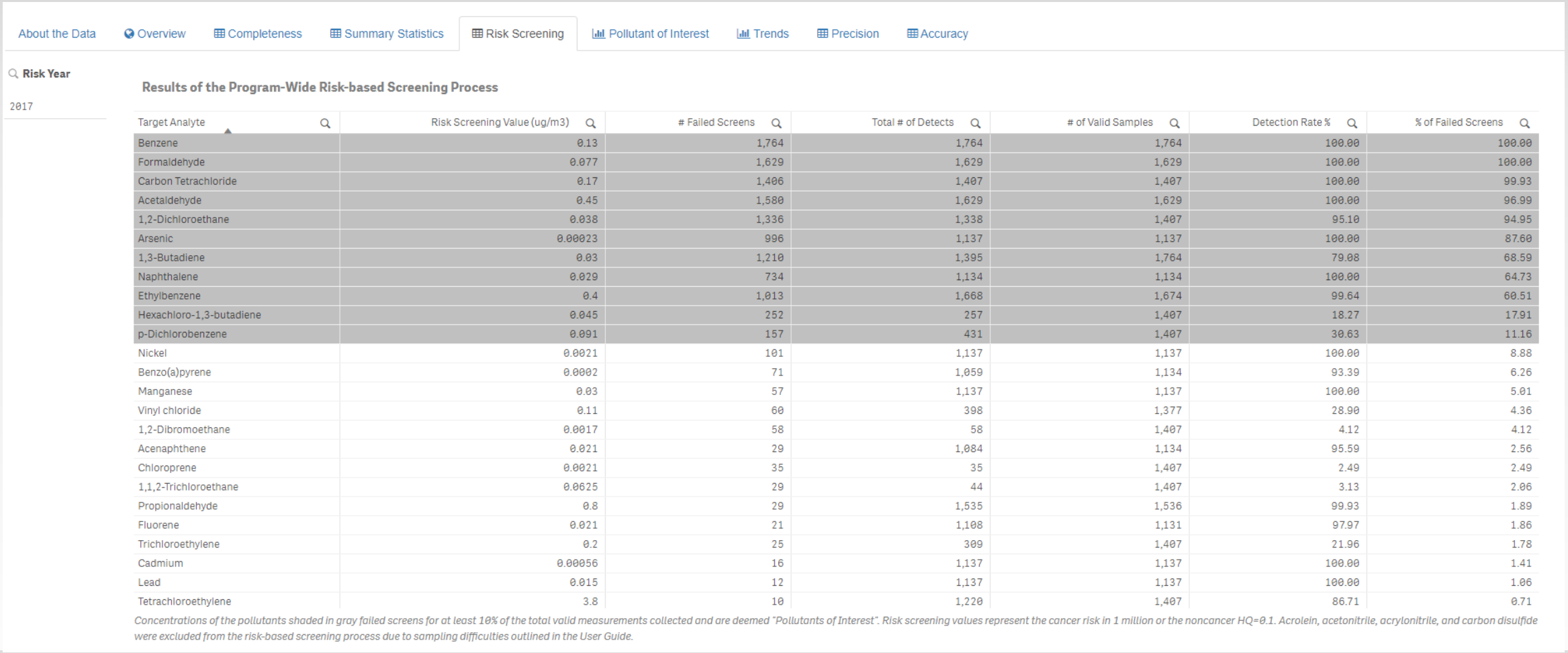
| NMP Year | Region | State | Site | Method |
|---|---|---|---|---|
| 2017 | 1 | AZ | ASKY | Metals Analysis |
| | 2 | CA | ASKY-M | Methane |
| | 3 | CO | AZFI | SNMOC |

**Statistical Summaries (ug/m3)**

| Method | ANALYTE | PM TYPE | # of Measurements | # of Detects | Min Conc (ug/m3) | Max Conc (ug/m3) | Avg Conc (ug/m3) | Median Conc (ug/m3) | StDev |
|---|---|---|---|---|---|---|---|---|---|
| **Totals** | | | **171,817** | **114,631** | - | - | - | - | - |
| SNMOC | 1-Butene | NA | 2 | 2 | 0.0471 | 0.11 | 0.079 | 0.079 | 0.044 |
| SNMOC | 1-Decene | NA | 427 | 1 | 0 | 0.301 | 0.001 | 0.000 | 0.015 |
| SNMOC | 1-Dodecene | NA | 427 | 5 | 0 | 0.655 | 0.003 | 0.000 | 0.037 |
| SNMOC | 1-Heptene | NA | 427 | 29 | 0 | 0.609 | 0.013 | 0.000 | 0.060 |
| SNMOC | 1-Hexene | NA | 474 | 304 | 0 | 0.374 | 0.043 | 0.039 | 0.046 |
| SNMOC | 1-Nonene | NA | 427 | 316 | 0 | 12.5 | 0.130 | 0.074 | 0.642 |
| SNMOC | 1-Octene | NA | 427 | 356 | 0 | 0.581 | 0.134 | 0.117 | 0.103 |
| SNMOC | 1-Pentene | NA | 474 | 444 | 0 | 0.575 | 0.111 | 0.099 | 0.077 |
| SNMOC | 1-Tridecene | NA | 427 | 0 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| SNMOC | 1-Undecene | NA | 427 | 14 | 0 | 0.319 | 0.003 | 0.000 | 0.021 |
| TO-15 | 1,1-Dichloroethane | NA | 1,407 | 158 | 0 | 0.758 | 0.009 | 0.000 | 0.049 |
| TO-15 | 1,1-Dichloroethene | NA | 1,407 | 157 | 0 | 0.123 | 0.004 | 0.000 | 0.011 |
| TO-15 | 1,1,1-Trichloroethane | NA | 1,407 | 646 | 0 | 7.65 | 0.023 | 0.000 | 0.206 |
| TO-15 | 1,1,2-Trichloroethane | NA | 1,407 | 44 | 0 | 2.35 | 0.005 | 0.000 | 0.068 |
| TO-15 | 1,1,2,2-Tetrachloroethane | NA | 1,407 | 115 | 0 | 0.138 | 0.005 | 0.000 | 0.016 |
| TO-15 | 1,2-Dibromoethane | NA | 1,407 | 58 | 0 | 0.115 | 0.003 | 0.000 | 0.016 |
| TO-15 | 1,2-Dichloroethane | NA | 1,407 | 1,338 | 0 | 107 | 0.342 | 0.077 | 3.523 |
| TO-15 | 1,2-Dichloropropane | NA | 1,407 | 59 | 0 | 0.176 | 0.003 | 0.000 | 0.013 |
| SNMOC | 1,2,3-Trimethylbenzene | NA | 474 | 223 | 0 | 13.5 | 0.094 | 0.000 | 0.626 |

*Zeroes have been substituted for non-detects and are included in the statistical calculations. In the case of co-elution, no value is reported.*

# NMP App Screenshots - Risk



About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

**Risk Year**

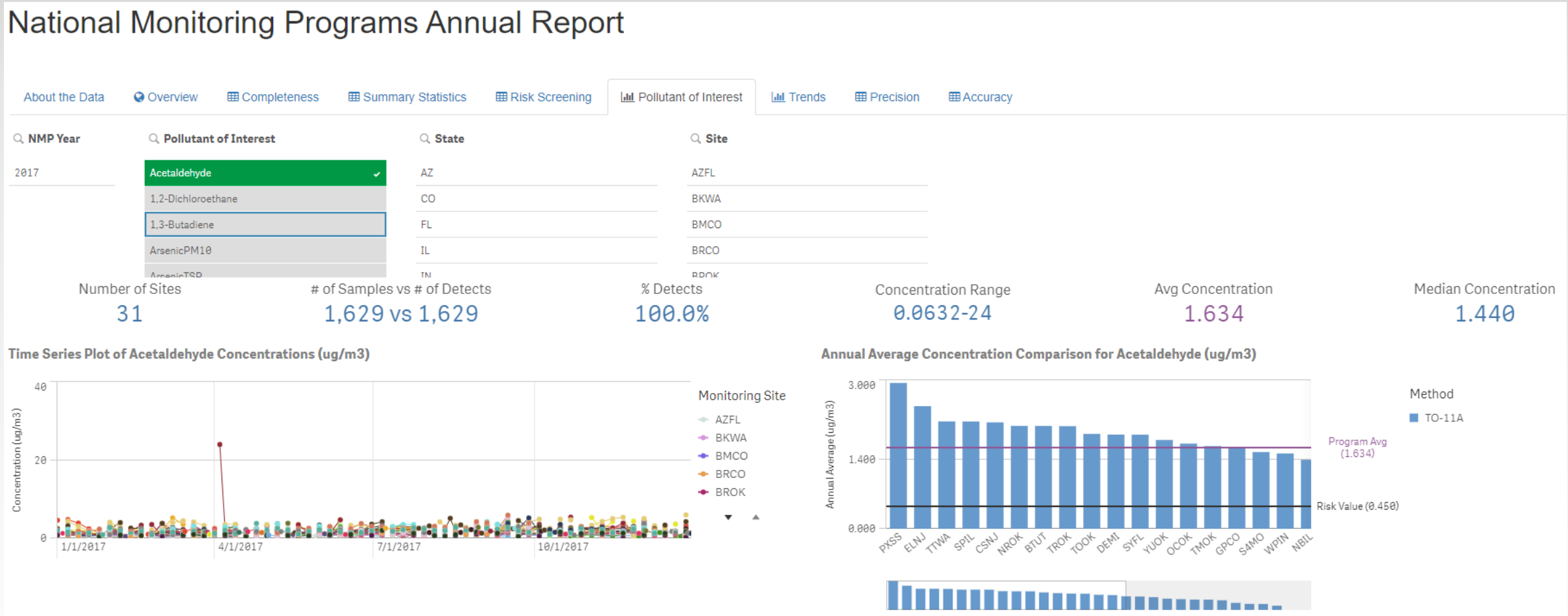
2017

**Results of the Program-Wide Risk-based Screening Process**

| Target Analyte | Risk Screening Value (ug/m3) | # Failed Screens | Total # of Detects | # of Valid Samples | Detection Rate % | % of Failed Screens |
|---|---|---|---|---|---|---|
| Benzene | 0.13 | 1,764 | 1,764 | 1,764 | 100.00 | 100.00 |
| Formaldehyde | 0.077 | 1,629 | 1,629 | 1,629 | 100.00 | 100.00 |
| Carbon Tetrachloride | 0.17 | 1,406 | 1,407 | 1,407 | 100.00 | 99.93 |
| Acetaldehyde | 0.45 | 1,580 | 1,629 | 1,629 | 100.00 | 96.99 |
| 1,2-Dichloroethane | 0.038 | 1,336 | 1,338 | 1,407 | 95.10 | 94.95 |
| Arsenic | 0.00023 | 996 | 1,137 | 1,137 | 100.00 | 87.60 |
| 1,3-Butadiene | 0.03 | 1,210 | 1,395 | 1,764 | 79.08 | 68.59 |
| Naphthalene | 0.029 | 734 | 1,134 | 1,134 | 100.00 | 64.73 |
| Ethylbenzene | 0.4 | 1,013 | 1,668 | 1,674 | 99.64 | 60.51 |
| Hexachloro-1,3-butadiene | 0.045 | 252 | 257 | 1,407 | 18.27 | 17.91 |
| p-Dichlorobenzene | 0.091 | 157 | 431 | 1,407 | 30.63 | 11.16 |
| Nickel | 0.0021 | 101 | 1,137 | 1,137 | 100.00 | 8.88 |
| Benzo(a)pyrene | 0.0002 | 71 | 1,059 | 1,134 | 93.39 | 6.26 |
| Manganese | 0.03 | 57 | 1,137 | 1,137 | 100.00 | 5.01 |
| Vinyl chloride | 0.11 | 60 | 398 | 1,377 | 28.90 | 4.36 |
| 1,2-Dibromoethane | 0.0017 | 58 | 58 | 1,407 | 4.12 | 4.12 |
| Acenaphthene | 0.021 | 29 | 1,084 | 1,134 | 95.59 | 2.56 |
| Chloroprene | 0.0021 | 35 | 35 | 1,407 | 2.49 | 2.49 |
| 1,1,2-Trichloroethane | 0.0625 | 29 | 44 | 1,407 | 3.13 | 2.06 |
| Propionaldehyde | 0.8 | 29 | 1,535 | 1,536 | 99.93 | 1.89 |
| Fluorene | 0.021 | 21 | 1,108 | 1,131 | 97.97 | 1.86 |
| Trichloroethylene | 0.2 | 25 | 309 | 1,407 | 21.96 | 1.78 |
| Cadmium | 0.00056 | 16 | 1,137 | 1,137 | 100.00 | 1.41 |
| Lead | 0.015 | 12 | 1,137 | 1,137 | 100.00 | 1.06 |
| Tetrachloroethylene | 3.8 | 10 | 1,220 | 1,407 | 86.71 | 0.71 |

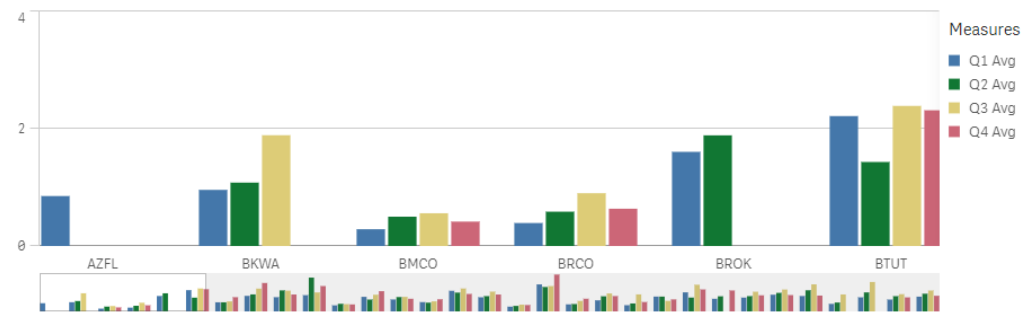
*Concentrations of the pollutants shaded in gray failed screens for at least 10% of the total valid measurements collected and are deemed "Pollutants of Interest". Risk screening values represent the cancer risk in 1 million or the noncancer HQ=0.1. Acrolein, acetonitrile, acrylonitrile, and carbon disulfide were excluded from the risk-based screening process due to sampling difficulties outlined in the User Guide.*

# NMP App Screenshots - POI



# NMP App Screenshots - POI

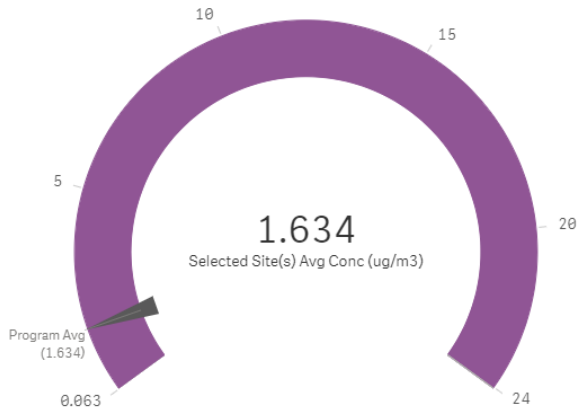
**Quarterly Average Concentration Comparison for Acetaldehyde (ug/m3)**




*Missing bar indicates that a quarterly average could not be calculated. Zeroes have been substituted for non-detects.*

**Site-Specific vs Program Acetaldehyde Concentrations (ug/m3)**

Site data in purple, NMP program data in gray.

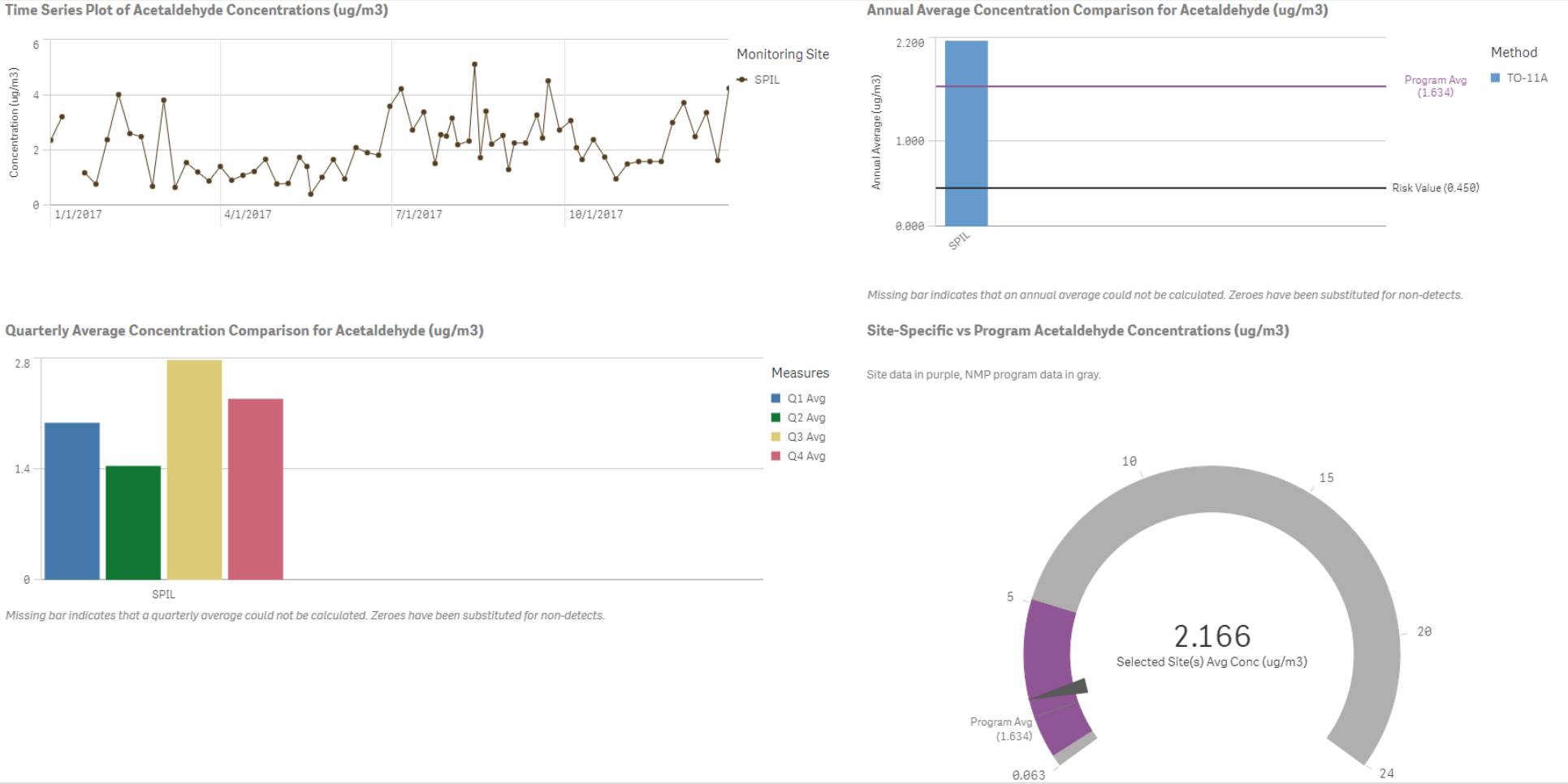



*Program Range: 0.0632 - 24 ug/m3; Program Avg: 1.634 ug/m3; Annual average criteria not applied to sub-program averages.*

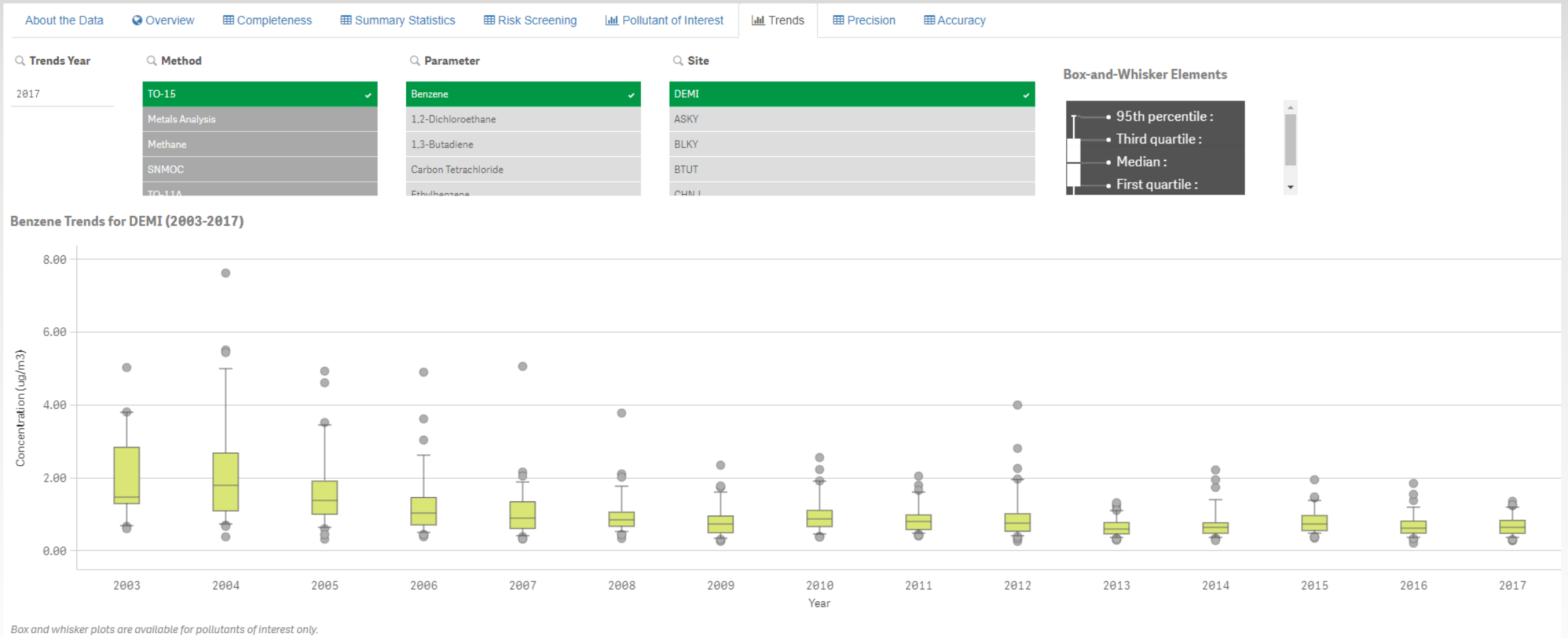
**Quarterly and Annual Average Concentrations of Acetaldehyde (ug/m3)**

| Site | Q1 Avg | Q2 Avg | Q3 Avg | Q4 Avg | Annl Avg |
|---|---|---|---|---|---|
| AZFL | 0.852 | - | - | - | - |
| BKWA | 0.957 | 1.081 | 1.889 | - | 1.304 |
| BMCO | 0.286 | 0.500 | 0.559 | 0.416 | 0.437 |
| BRCO | 0.392 | 0.585 | 0.900 | 0.636 | 0.620 |

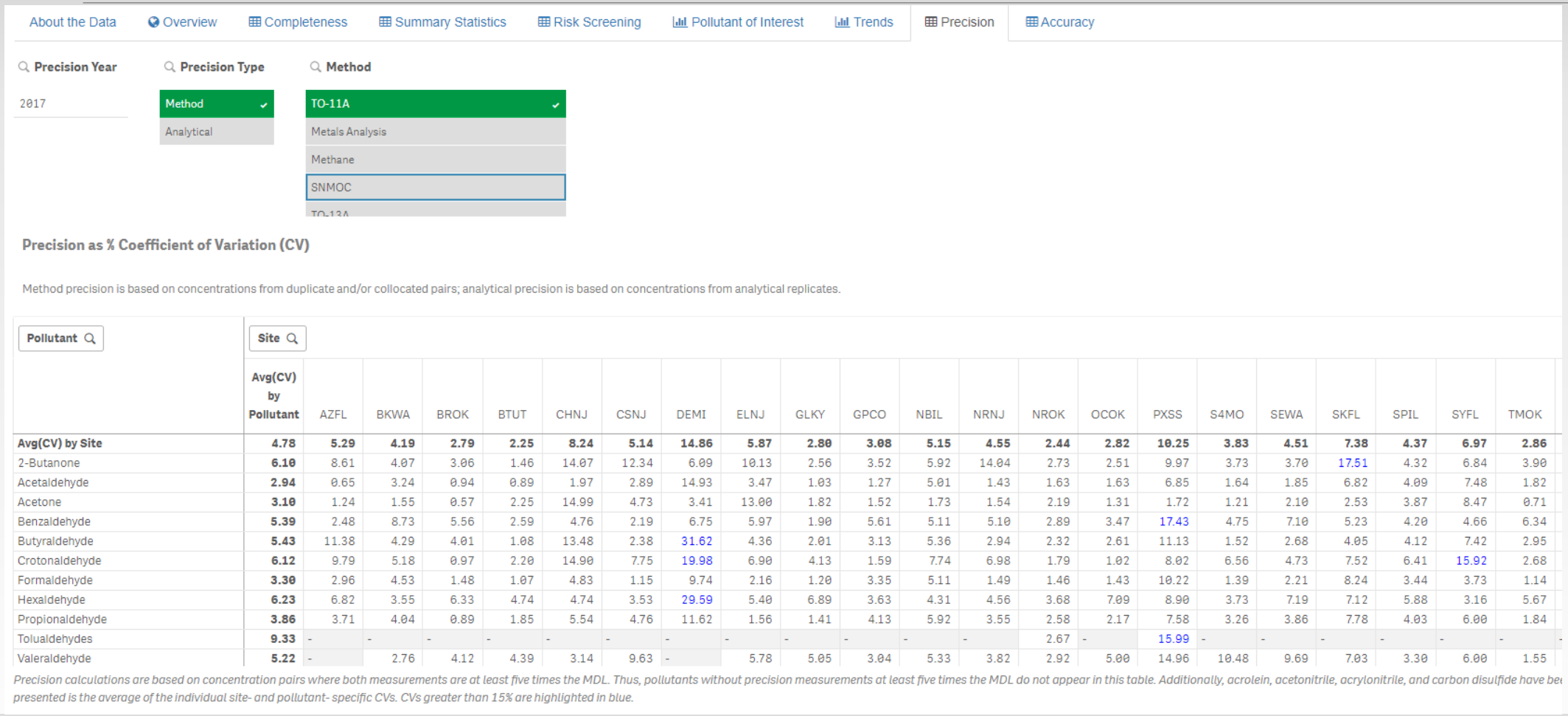
# NMP App Screenshots - POI



# NMP App Screenshots - Trends



# NMP App Screenshots - Precision



About the Data | Overview | Completeness | Summary Statistics | Risk Screening | Pollutant of Interest | Trends | Precision | Accuracy

**Precision Year**: 2017

**Precision Type**: Method ✓ / Analytical

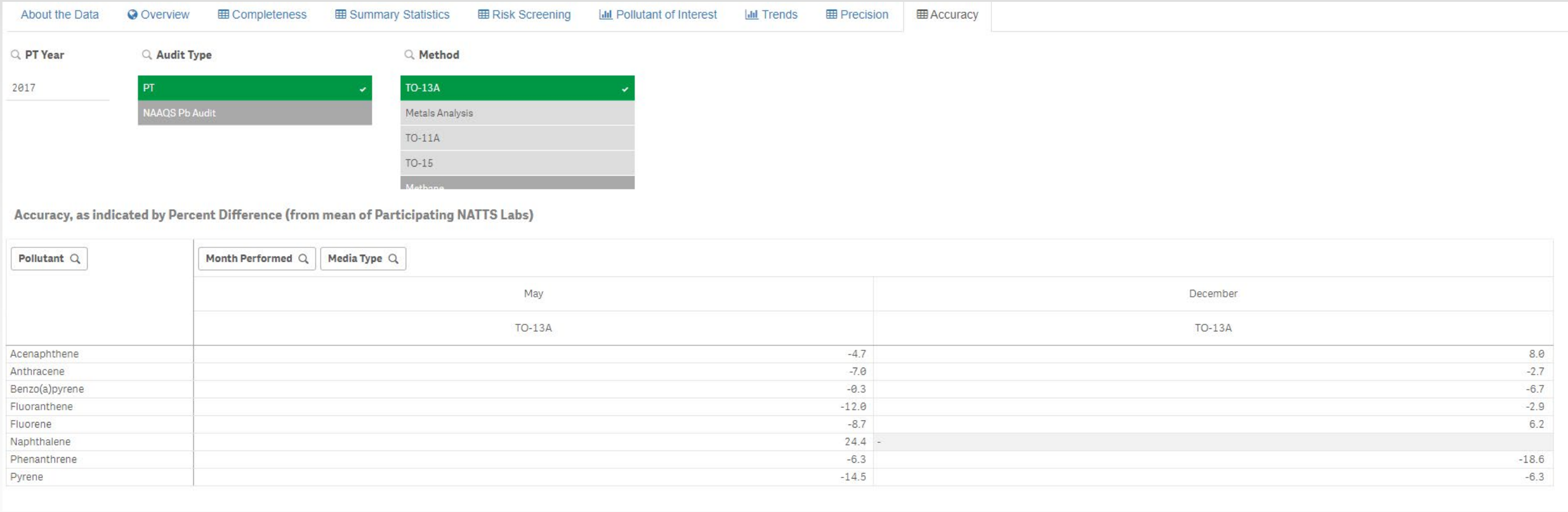
**Method**: TO-11A ✓ / Metals Analysis / Methane / SNMOC / TO-13A

**Precision as % Coefficient of Variation (CV)**

Method precision is based on concentrations from duplicate and/or collocated pairs; analytical precision is based on concentrations from analytical replicates.

Pollutant | Site

| Pollutant | Avg(CV) by Pollutant | AZFL | BKWA | BROK | BTUT | CHNJ | CSNJ | DEMI | ELNJ | GLKY | GPCO | NBIL | NRNJ | NROK | OCOK | PXSS | S4MO | SEWA | SKFL | SPIL | SYFL | TMOK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Avg(CV) by Site** | **4.78** | **5.29** | **4.19** | **2.79** | **2.25** | **8.24** | **5.14** | **14.86** | **5.87** | **2.80** | **3.08** | **5.15** | **4.55** | **2.44** | **2.82** | **10.25** | **3.83** | **4.51** | **7.38** | **4.37** | **6.97** | **2.86** |
| 2-Butanone | **6.10** | 8.61 | 4.07 | 3.06 | 1.46 | 14.07 | 12.34 | 6.09 | 10.13 | 2.56 | 3.52 | 5.92 | 14.04 | 2.73 | 2.51 | 9.97 | 3.73 | 3.70 | 17.51 | 4.32 | 6.84 | 3.90 |
| Acetaldehyde | **2.94** | 0.65 | 3.24 | 0.94 | 0.89 | 1.97 | 2.89 | 14.93 | 3.47 | 1.03 | 1.27 | 5.01 | 1.43 | 1.63 | 1.63 | 6.85 | 1.64 | 1.85 | 6.82 | 4.09 | 7.48 | 1.82 |
| Acetone | **3.10** | 1.24 | 1.55 | 0.57 | 2.25 | 14.99 | 4.73 | 3.41 | 13.00 | 1.82 | 1.52 | 1.73 | 1.54 | 2.19 | 1.31 | 1.72 | 1.21 | 2.10 | 2.53 | 3.87 | 8.47 | 0.71 |
| Benzaldehyde | **5.39** | 2.48 | 8.73 | 5.56 | 2.59 | 4.76 | 2.19 | 6.75 | 5.97 | 1.90 | 5.61 | 5.11 | 5.10 | 2.89 | 3.47 | 17.43 | 4.75 | 7.10 | 5.23 | 4.20 | 4.66 | 6.34 |
| Butyraldehyde | **5.43** | 11.38 | 4.29 | 4.01 | 1.08 | 13.48 | 2.38 | 31.62 | 4.36 | 2.01 | 3.13 | 5.36 | 2.94 | 2.32 | 2.61 | 11.13 | 1.52 | 2.68 | 4.05 | 4.12 | 7.42 | 2.95 |
| Crotonaldehyde | **6.12** | 9.79 | 5.18 | 0.97 | 2.20 | 14.90 | 7.75 | 19.98 | 6.90 | 4.13 | 1.59 | 7.74 | 6.98 | 1.79 | 1.02 | 8.02 | 6.56 | 4.73 | 7.52 | 6.41 | 15.92 | 2.68 |
| Formaldehyde | **3.30** | 2.96 | 4.53 | 1.48 | 1.07 | 4.83 | 1.15 | 9.74 | 2.16 | 1.20 | 3.35 | 5.11 | 1.49 | 1.46 | 1.43 | 10.22 | 1.39 | 2.21 | 8.24 | 3.44 | 3.73 | 1.14 |
| Hexaldehyde | **6.23** | 6.82 | 3.55 | 6.33 | 4.74 | 4.74 | 3.53 | 29.59 | 5.40 | 6.89 | 3.63 | 4.31 | 4.56 | 3.68 | 7.09 | 8.90 | 3.73 | 7.19 | 7.12 | 5.88 | 3.16 | 5.67 |
| Propionaldehyde | **3.86** | 3.71 | 4.04 | 0.89 | 1.85 | 5.54 | 4.76 | 11.62 | 1.56 | 1.41 | 4.13 | 5.92 | 3.55 | 2.58 | 2.17 | 7.58 | 3.26 | 3.86 | 7.78 | 4.03 | 6.00 | 1.84 |
| Tolualdehydes | **9.33** | - | - | - | - | - | - | - | - | - | - | - | - | 2.67 | - | 15.99 | - | - | - | - | - | - |
| Valeraldehyde | **5.22** | - | 2.76 | 4.12 | 4.39 | 3.14 | 9.63 | - | 5.78 | 5.05 | 3.04 | 5.33 | 3.82 | 2.92 | 5.00 | 14.96 | 10.48 | 9.69 | 7.03 | 3.30 | 6.00 | 1.55 |

*Precision calculations are based on concentration pairs where both measurements are at least five times the MDL. Thus, pollutants without precision measurements at least five times the MDL do not appear in this table. Additionally, acrolein, acetonitrile, acrylonitrile, and carbon disulfide have be presented is the average of the individual site- and pollutant- specific CVs. CVs greater than 15% are highlighted in blue.*

# NMP App Screenshots - Accuracy