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NORTH CAROLINA
Environmental Quality

DAQ-15-005.5 Standard Operating Procedure (SOP)

Data Validation for Continuous Gaseous Monitors and Meteorological Data Raleigh Central Office Responsibilities

Revision 2.0

NORTH CAROLINA
Department of Environmental Quality

1.0 Approval Sign Off-Sheet

I certify that I have read and approve of the contents of the Data Validation of Continuous Gaseous Monitors and Meteorological Data Standard Operating Procedure with an effective date of May 1, 2022.

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Disclaimer: This SOP is intended for use by the North Carolina Division of Air Quality (DAQ) personnel as an aide and guidance for performing the processes and procedures described within the document. It is not, and is not intended to be, a substitute for the education, training, experience and commitment required to perform these functions.

Table of Contents

List of Tables

2.0 Scope and Purpose

Data validation is the final step in a three-tiered process designed to ensure all data produced by DAQ meets the minimum requirements for use in determining compliance with the National Ambient Air Quality Standards or NAAQS. As stated in the relevant Quality Assurance Project Plans, or QAPPs, the validation process, defined as the Level 3 Review, will identify data with errors, biases, and physically unrealistic values before DAQ or the United States Environmental Protection Agency (EPA) uses them for the identification of NAAQS exceedances, determination of compliance with the NAAQS, further analysis or for modeling. The Level 3 Review is performed by Raleigh Central Office, or RCO chemists. Utilizing their education, training and experience, in conjunction with the processes outlined in this document, the RCO chemists will identify, correct, flag or invalidate aberrant data, initiate and document any corrective actions needed to address monitor-related issues, and verify that each of the network's analytical instruments has successfully undergone the periodic audits, required Quality Control (QC) checks and annual or seasonal calibrations required for the collection of pollutant data. The DAQ verifies and validates routine and associated QC data from continuous monitors monthly. The block of data generated by an individual monitor in one month is defined as the data set. Monthly review has proven to be the most efficient period for these verification and validation activities. DAQ has determined that control of measurement uncertainty each month is sufficient to maintain the overall measurement uncertainty for the precision and bias data quality objectives, or DQOs. At the conclusion of the data validation process, the RCO chemist will notify the Data Base Manager that the data set under review is ready for upload to the EPA's Air Quality System, or AQS.

3.0 Overview

After the previous month of data becomes available from an individual monitor, the level 1 and 2 reviewers (the regional monitoring technician and regional monitoring coordinator, respectively, or the Asheville-Buncombe Air Quality Agency (ABAQA) Staff) conduct a thorough review of the data for completeness and accuracy. Once the database manager enters the data into the Envista Air Resources Manager, or ARM, database, the regional monitoring technician or ABAQA staff will review the data for routine data outliers and conformance to acceptance criteria. The regional monitoring technician or ABAQA staff will void or flag as appropriate, unacceptable, or questionable data. The coordinator or ABAQA staff will verify all flagged data again to ensure that the regional monitoring technician or another ABAQA staff member entered the flags and voids correctly and that the data are acceptable for use. The level 1 and 2 reviewers document their review in Envista ARM along with their data review decisions. Level 1 and 2 reviews should be completed within 20 calendar days of the end of the month. After the completion of the Level 2 review by the regional monitoring coordinator or ABAQA staff member, the level 3 review may begin. The level 3 review should at a minimum:

- Ensure the proper null codes have been applied.
- Ensure the level 1 and 2 reviewers bracketed all invalidated data with the appropriate void codes and the correct checks of analyzer accuracy.
- Ensure all data falls within the acceptable ranges as stated in the measurement quality objectives, or MQOs, of the appropriate QAPP.
- Ensure all data are acceptable and can be used for its intended purpose.
- Include a review of the minute data as needed when completing the level 3 review procedures.
- Add informational AQS flags to describe data that is out of the ordinary but may be considered "valid."
- Provide final validation signature.

3.1 Reporting Units and Rounding Conventions for Uploaded Data

Section 3.1 Table 1 provides the reporting units and rounding conventions for uploaded gaseous pollutant data. Note that the EPA requires ozone (O_3) data to be reported as parts per million (ppm) truncated to 3 places after the decimal but DAQ reports O_3 data as parts per billion (ppb) truncated to zero places after the decimal.

Section 3.1 Table 1 Reporting Units and rounding Conventions of Uploaded Data

Pollutant	Standard Reporting Units	Rounding Convention for Data reported to AQS
Ozone	Parts per million [1]	3 places after decimal with digits to right truncated
Trace Level Carbon Monoxide	Parts per billion	Digits to right of decimal truncated
Nitrogen Dioxide (NO_2), Nitric Oxide (NO), and Oxides of Nitrogen (NO_x)	Parts per billion	1 place after decimal with digits to right truncated
Sulfur Dioxide (SO_2)	Parts per billion	1 place after decimal with digits to right truncated
Reactive Oxides of Nitrogen (NO_y) and Nitric Oxide	Parts per billion	1 place after decimal with digits to right truncated

[1] AQS/EPA/Code of Federal Regulations (CFR) convention is that the data be reported as parts per million, presently DAQ report as parts per billion.

3.2 Performance Acceptance Criteria

Section 3.2 Tables 1 through 6 provide the performance acceptance criteria for gaseous pollutant data.

Section 3.2 Table 1 Ozone Performance Acceptance Criteria

Ozone 250 ppb Range						
Theoretical Concentration (ppb)	Calibration		Auto-Cal Check		Manual Cal Check	
	Calibrator	Monitor	Calibrator	Monitor	Calibrator	Monitor
0	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 2 ppb
65	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 3 ppb	Not applicable (NA)	NA
120	≤ ± 2 ppb	≤ ± 2 ppb	NA	NA	NA	NA
180	≤ ± 2 ppb	≤ ± 2 ppb	NA	NA	NA	NA
225	≤ ± 2 ppb	≤ ± 2 ppb	≤ ± 5 ppb	≤ ± 5 ppb	≤ ± 2 ppb	≤ ± 5 ppb

Section 3.2 Table 2 Sulfur Dioxide (SO_2) Performance Acceptance Criteria

SO_2 500 ppb Range		
Theoretical Concentration (ppb)	Calibration	Daily Auto-Cal Check
	DAQ Acceptance	DAQ Acceptance
0	± 1 ppb	± 3.1 ppb
20 or 50	± 7.0 percent (%)	± 10.1%
100	± 5.0%	NA
400	± 5.0%	± 10.1%
SO_2 100 ppb Range (National Core Monitoring [NCORE] Trace Level)		
0	± 1 ppb	± 3.1 ppb
7	± 7.0%	± 10.1%
45	± 5.0%	NA
85	± 5.0%	±10.1%

Section 3.2 Table 3 Carbon Monoxide Performance Acceptance Criteria

Carbon Monoxide 5000 ppb Range		
Theoretical Concentration (ppb)	Calibration	Manual Performance Check
	DAQ Acceptance	DAQ Acceptance
0	<± 30 ppb	<± 41 ppb
500	NA	<± 7.0 % (35 ppb)
1000	<± 2.1% or 30 ppb	NA
2000	<± 2.1% or 30 ppb	<± 5.0 % (100 ppb)
3000	<± 2.1% or 30 ppb	NA
4000	<± 2.1% or 30 ppb	<± 5.0 % (200 ppb)

Section 3.2 Table 4 Reactive Oxides of Nitrogen Performance Acceptance Criteria

Reactive Oxides of Nitrogen Criteria 200 ppb Range		
Theoretical Concentration (ppb)	Calibration	Manual Performance Check
	DAQ Acceptance	DAQ Acceptance
0	± 0.5 ppb	± 5 ppb
35	± 15%	≤± 15%
100	± 8%	NA
180	± 6%	≤ ± 6%

Section 3.2 Table 5 Nitrogen Dioxide (Chemiluminescence) Performance Acceptance Criteria

Nitrogen Dioxide Criteria 500 ppb Range		
Theoretical Concentration (ppb)	Calibration	Manual Performance Check
	DAQ Acceptance	DAQ Acceptance
0	± 1 ppb	< ± 1.5 ppb
60	± 5%	≤ ± 10%
425	*± 3%*	*≤ ± 10%*

Section 3.2 Table 6 Nitrogen Dioxide (Cavity Attenuated Phase Shift Spectroscopy) Performance Acceptance Criteria

Nitrogen Dioxide Criteria 200 ppb Range		
Theoretical Concentration (ppb)	Calibration	Manual Performance Check
	DAQ Acceptance	DAQ Acceptance
0	± 1 ppb	± 1 ppb
20	± 1.5 ppb or 2%	± 10%
180	± 1.5 ppb or 2%	± 10%

3.3 Data Reporting Requirements

All data within the data set must meet the following conventions:

- All data must be reported in Eastern Standard Time year-around.
- Hourly data are reported at the start of the hour (1:00-1:59 is time stamped as 01:00)
- All missing or invalid data must be accounted for by the use of proper null codes. The null codes must be accompanied by the identifying reasons for the missing or invalid data on the monthly data verification and validation pages.
- The level 1 and level 2 reviewers must initial, date and submit the monthly data set for level 3 review within 20 days of the collection month.
- The level 2 reviewer must initial, date and submit the monthly electronic logbooks, or e-logs, within 20 days of the collection month. E-logs are used as tools in the data review/validation process.
- All data, including any supporting documentation, must be kept for a minimum of three calendar years after the calendar year in which it was collected. Exceptions to this are discussed elsewhere in this SOP.
- Completeness - Data for comparison to the NAAQS are generally considered complete if 75 percent or more of the total possible number of observations are present. Completeness requirements are higher for data collected for use in modeling to demonstrate prevention of significant deterioration. Continuous measurement criteria for completeness for comparison to the NAAQS are listed in Section 3.3 Table 1.

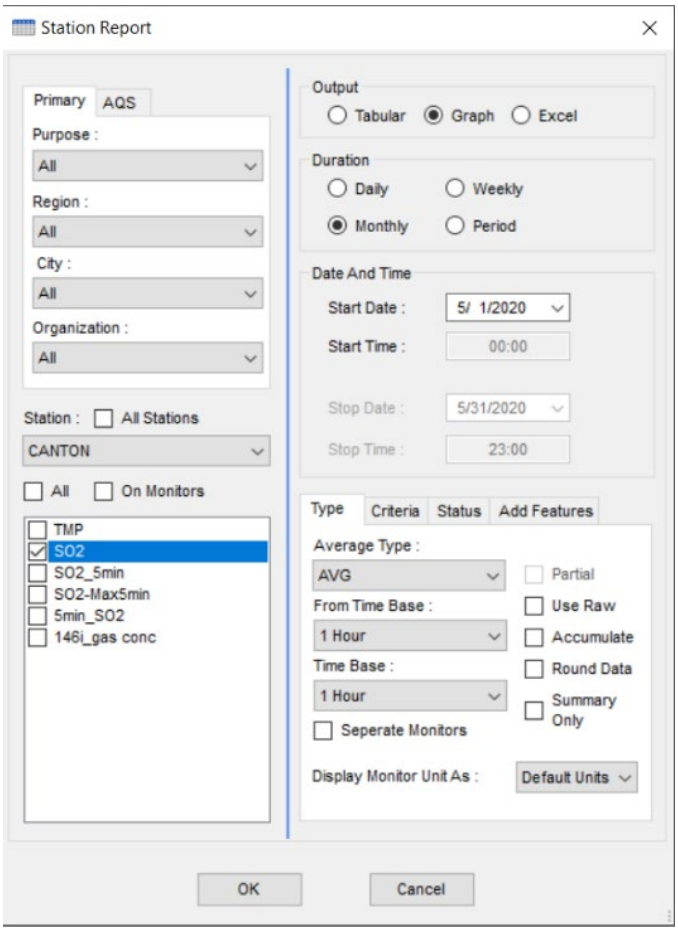
Section 3.3 Table 1 Completeness Criteria

Time Interval	**Minimum Observations**
Hour Average	45 1-minute averages
3-hour block averages	All 3 hours 75 % complete for SO_2
8-hour running average	6 1-hour observations
24-hour	18 1-hour averages for carbon monoxide (CO), nitrogen dioxide (NO_2), and SO_2 13 of 17 8-hour periods from 7 am to 11 pm for ozone (O_3)
Monthly	21 24-daily averages for months with 28 days 22 24-daily averages for months with 29 or 30 days 23 24-daily averages for months with 31 days
Quarterly	75 % of hourly values for CO, NO_2, and SO_2
Annual	4 complete quarters for CO, NO_2, and SO_2 75 % of days within season for O_3
3-Years	90 % complete days within the three O_3 seasons with each O_3 season having a minimum of 75 % complete days

4.0 Data Validation (Level 3 Review) Steps - General

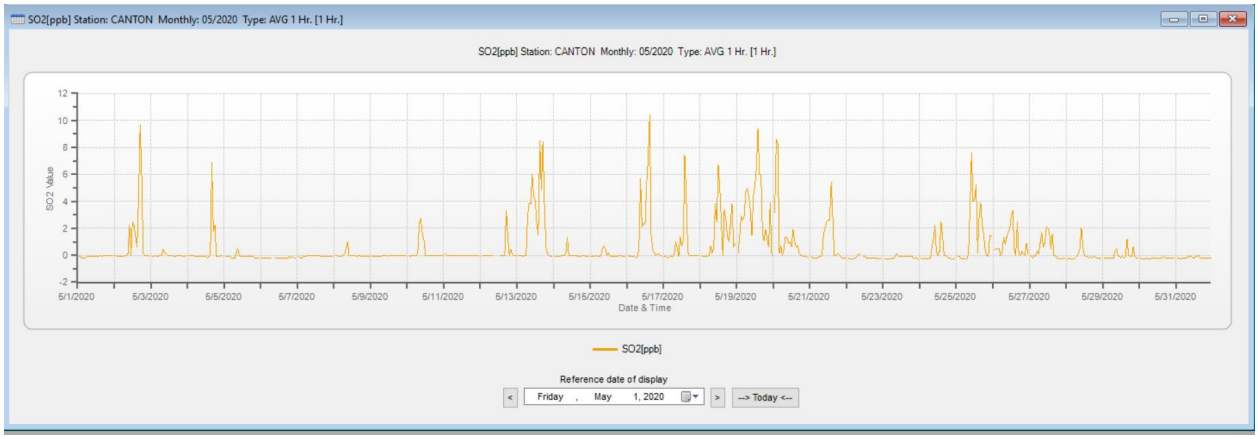
The following steps represent one approach to the data validation (Level 3 Review) process. These steps are applicable in general to all gaseous pollutants covered in this SOP. Addendums outlining additional pollutant specific processes used to validate the data set are detailed in Section 5.0 of this SOP.

1. Make a monthly graph of the data to be validated in Envista ARM**.** Select the station name (e.g., Canton), the monitoring parameter (in this case SO_2), output set as graph, monthly set as the duration and then set the start date (start date will automatically be the first of the month selected). The type of report will be average, made from an hourly time base *to* an hourly time base. Click OK.



2. Review the graph for
   - unusual spikes or drops in the data
   - readings that are missing all together
   - readings that show no change over a span of time are also of importance

Make note of these irregularities for future use in validation.

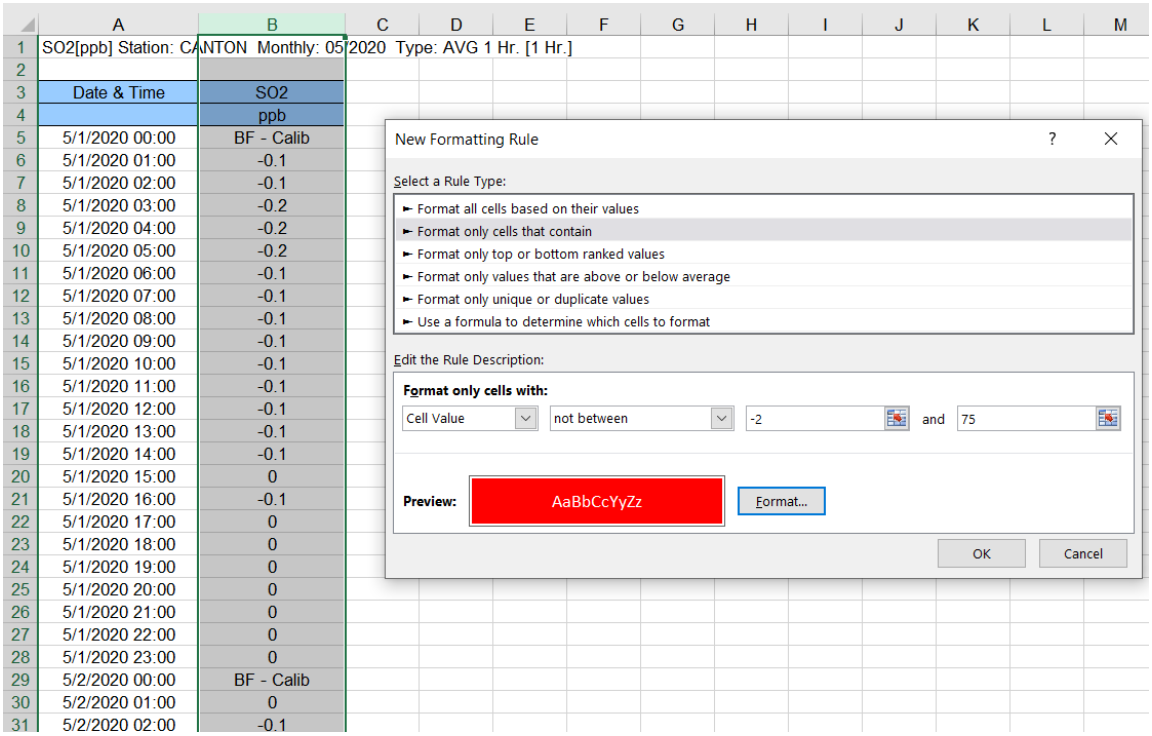


3. Run the same report again, but this time select Excel as the Output. Select OK. Check out the monthly synopsis at the bottom of the report for minimum and maximum readings and other statistics. Take note

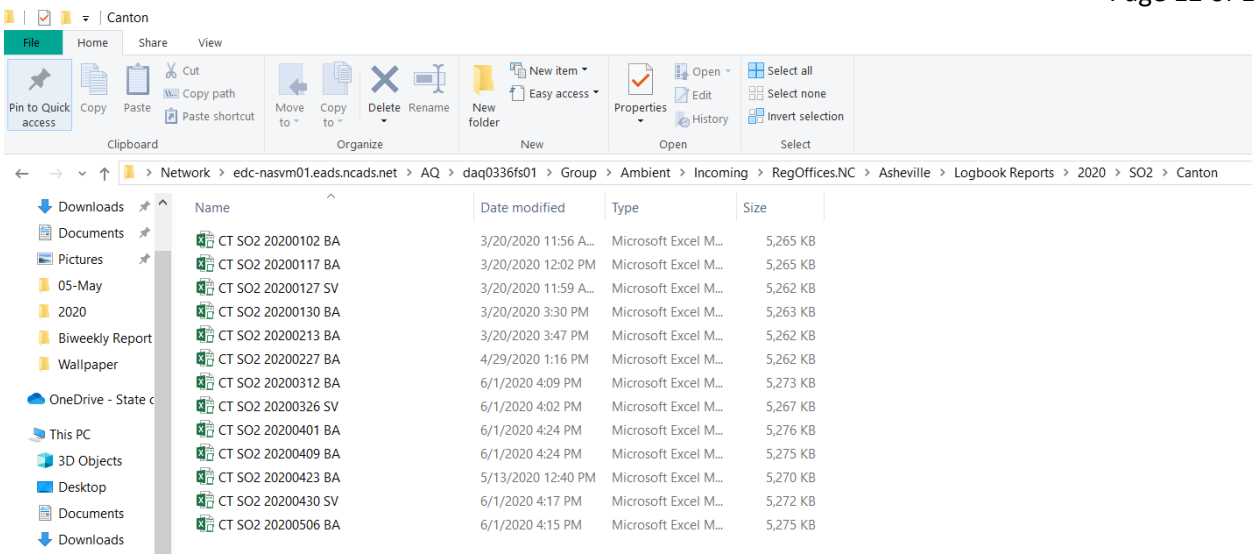
if the minimum reading is less than 0 ppb (we will run a report and highlight these later in the process). Take note of any maximum reading larger than the NAAQS standard for the pollutant under review: O_3- 70 ppb, SO_2 (1hour and 5-minute maximum)- 75ppb, and NO_2- 100 ppb. For other pollutants that are unlikely to exceed the NAAQS or are not criteria pollutants, take note of any maximum reading that could potentially be an outlier: CO- 1 ppm and above, trace-level reactive oxides of nitrogen (NO_yT) and oxides of nitrogen (NO_x) – 80 ppb and above, and nitric oxide (NO) – 60 ppb and above.

741	5/31/2020 16:00	-0.2
742	5/31/2020 17:00	-0.2
743	5/31/2020 18:00	-0.2
744	5/31/2020 19:00	-0.2
745	5/31/2020 20:00	-0.2
746	5/31/2020 21:00	-0.2
747	5/31/2020 22:00	-0.2
748	5/31/2020 23:00	-0.2
749	Minimum	-0.3
750	MinDate	5/22/2020 02:00
751	Maximum	10.4
752	MaxDate	5/16/2020 15:00
753	Avg	0.5
754	Num	706
755	Data[%]	94.8
756	STD	1.5

Use conditional formatting in Excel to highlight any values less than 0 (if you have them) in the data set. Save this for future validation use.



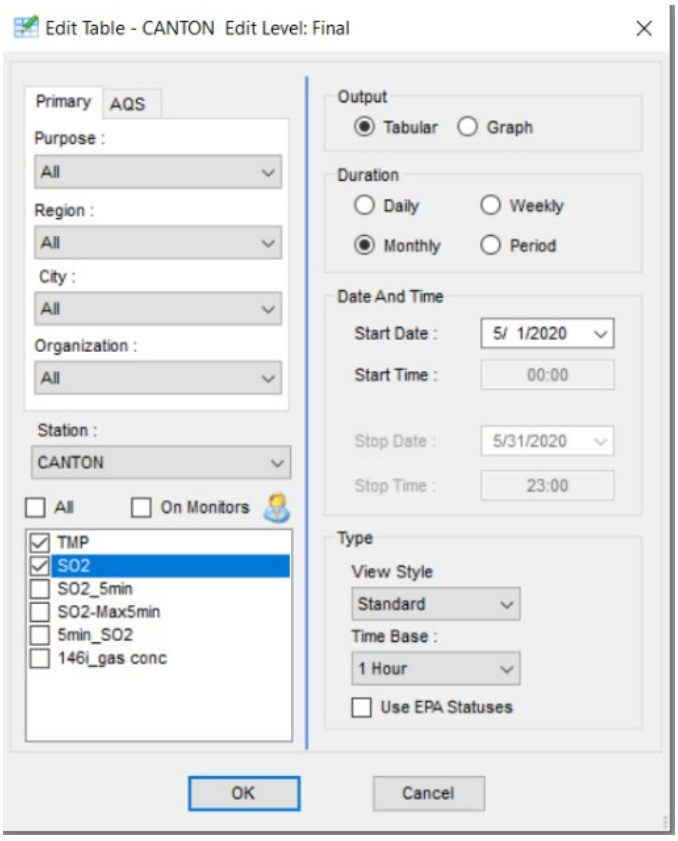
4. Now review all e-logs for the monitor in the month under review. Go to the P:\Ambient\Incoming\RegOffices.NC. In this example we will select the Asheville office, Logbook Reports, year 2020, SO_2, Canton and May. Open the e-log.



5. Check the dates and results of all calibrations, filter changes and maintenance activities. Make notes on this. Does the e-log paint a clear picture of what happened during the month? If not, contact the operator for clarification. Here are some important things to look for during your e-log review:

   - If a calibration was performed, what was the reason for the calibration, did a verification precede it to bracket the data? Did the operator capture the minute data documenting the event?
   - When was the last calibration performed?
   - When was the last filter change performed? Did it follow proper procedure? Is it documented correctly?
   - Was any other maintenance performed? Was any equipment replaced or adjusted? Is the work documented?
   - Does the raw data in Envista indicate that any other work was performed for which no e-log exists? Did Electronics and Calibration Branch (ECB) personnel perform work on the site? Are there 109 forms documenting that work?
   - Are all calibrators, cylinders, zero air packs, etc. still within their respective certification windows? Do the serial numbers listed for the various components match previous logbooks? Have any changes to equipment been properly documented?
   - Was required maintenance performed within the allotted time window? Was the filter changed, the computer restarted, the computer and monitor resynced, etc.?
   - Were any required 14-day checks performed? Did they pass? Were they performed within the allotted window of time?
   - Look behind a month and forward into the next month's e-log (if available). Do you see any glaring problems that may require data to be flagged or invalidated back into the month you are reviewing? Are there any problems in last month's data that need to be coded forward into the month you are reviewing?
   - If a monitor was swapped out - was an ending one-point QC check or precision-zero-span (PZS) done before the replacement occurred?
   - If a monitor stopped working, were the data voided back to the last good one-point QC check or PZS?

6. Now back to Envista ARM. Select the Edit tab, then Edit Table. Choose your station, parameter, make the output tabular, duration will be monthly (date and time will self-correct for the month) and report type will be standard with the time base of one hour. Click OK.



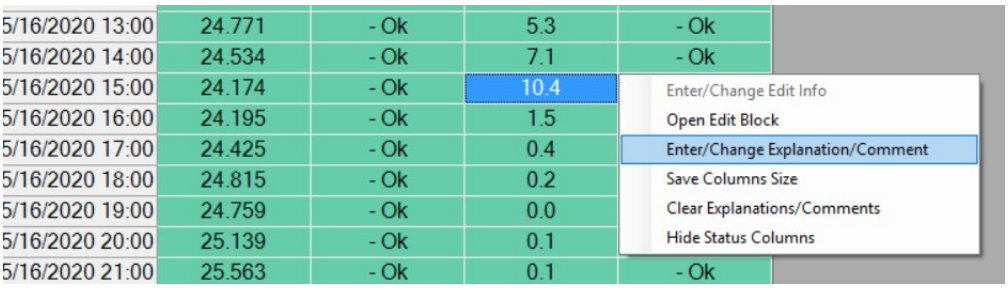
7. If the resulting report is green (see below) you are good to go. If it is light yellow, the second level review has not been performed. If it is brown, you have already signed off on these data.

Date & Time	TMP	Status	SO2	Status
	[DEGC]		[ppb]	
5/1/2020 00:00	23.059	- Ok	182.0	BF - Calib
5/1/2020 01:00	23.242	- Ok	-0.1	- Ok
5/1/2020 02:00	23.164	- Ok	-0.1	- Ok
5/1/2020 03:00	23.325	- Ok	-0.2	- Ok
5/1/2020 04:00	22.987	- Ok	-0.2	- Ok
5/1/2020 05:00	23.089	- Ok	-0.2	- Ok
5/1/2020 06:00	23.495	- Ok	-0.1	- Ok
5/1/2020 07:00	23.370	- Ok	-0.1	- Ok
5/1/2020 08:00	23.525	- Ok	-0.1	- Ok
5/1/2020 09:00	23.878	- Ok	-0.1	- Ok

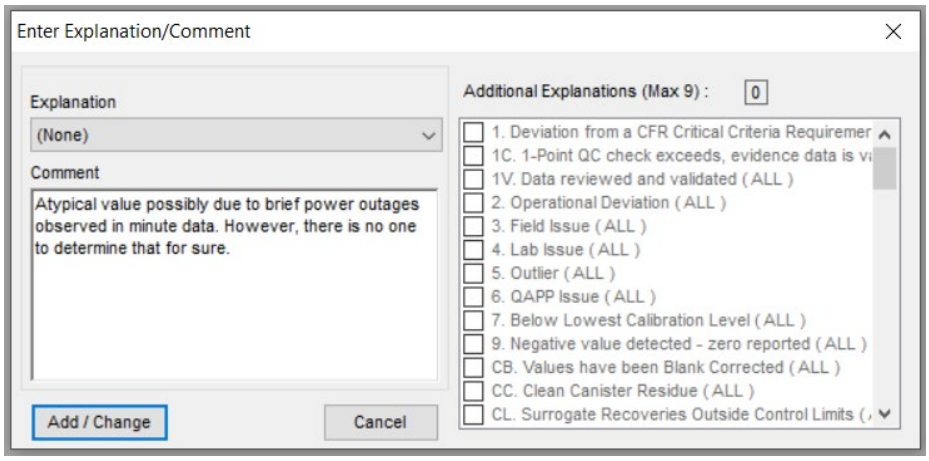
Another way to find the reviewing information is to use the Validation Settings option under the Edit tab, or, under the Reports tab, use the Validation report.

8. Now is when we bring all the reports together. Go through and take action on anything you found while performing the first step of graphing the data (high, low, stuck or missing). Apply codes accordingly to your review and inquiry.

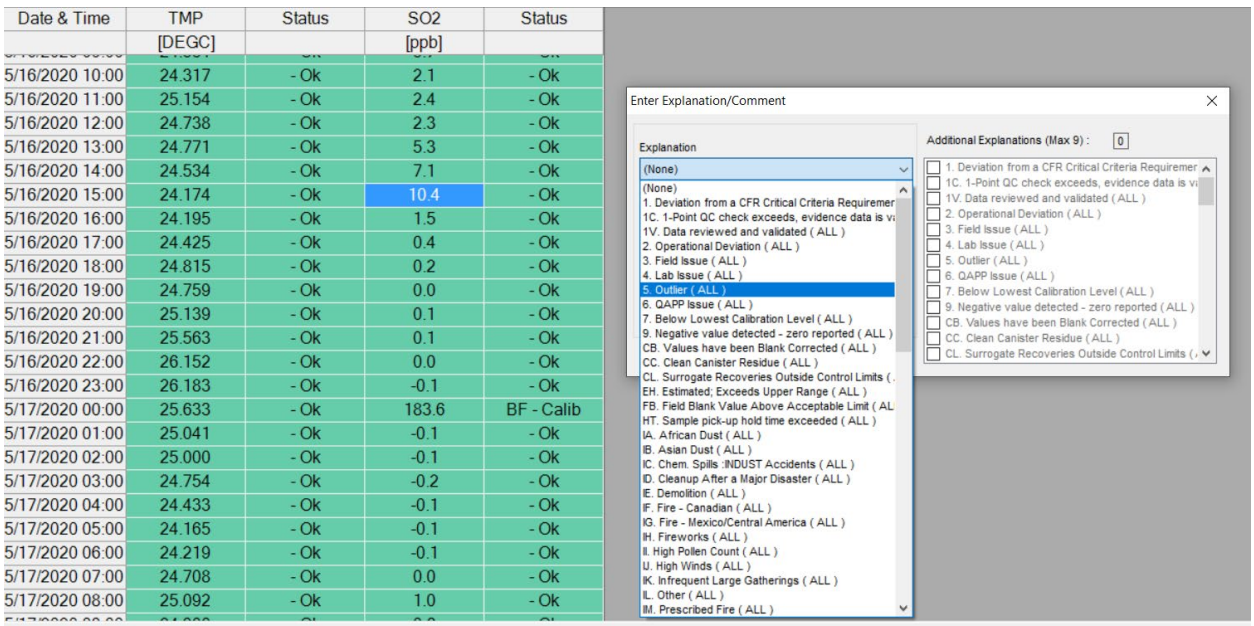
9. If you and the operator have done your due diligence, and the reading is deemed valid, you will need to add some flag codes. If the reading is not valid, you will need to use a void code. In this example we will flag it as valid. Select the value and right click. Select Enter/Change Comment Explanation/Comment.



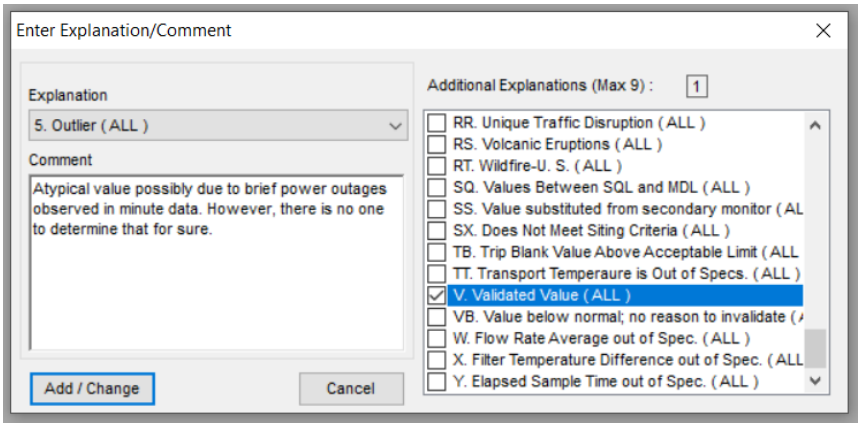
10. Next, we see that the operator or level two reviewer has inserted a comment stating that the reading was reported in the monitor's downloaded data as the same value. Be careful to not overwrite this comment.



11. First, from the drop-down menu, select a flag. In this example it was determined that the value was an outlier and must be flagged with a "5."



In some scenarios, multiple flags may be appropriate. From the additional explanation window, apply any additional flags for the validated value. This helps others know that there are other issues with this value and better describes the scenario in which that value was collected. The value will turn blue to show that comments or flags have been applied. This value is good to go.



12. Now, using your notes from the e-log review, apply codes to the incomplete hours in the edit table where calibrations, maintenance, filter changes, audits, etc. and other events took place. Review the list in step 5 for anything you may have missed.

5/6/2020 04:00	24.330	- Ok	-0.2	- Ok
5/6/2020 05:00	23.677	- Ok	-0.2	- Ok
5/6/2020 06:00	23.531	- Ok	-0.2	- Ok
5/6/2020 07:00	24.364	- Ok	-0.2	- Ok
5/6/2020 08:00	25.374	- Ok	-0.2	BA - Maintain
5/6/2020 09:00	25.941	- Ok	-0.2	BA - Maintain
5/6/2020 10:00	26.129	- Ok	-0.2	- Ok
5/6/2020 11:00	26.086	- Ok	-0.2	- Ok
5/6/2020 12:00	25.931	- Ok	-0.2	- Ok

13. Once you are happy with your review, click the save icon. Now go to Validation Settings in the Edit tab. Select the time range you would like to validate (usually a whole month at a time). Select the parameter at a site. Click Add. You are done.

5.0 Pollutant Specific Data Validation Details

The following sections cover validation procedures which are unique to a specific pollutant. The following steps represent the current approach to the data validation (Level 3 Review) process.

5.1 Ozone

The following steps represent the current approach to the O_3 data validation (Level 3 Review) process.

5.1.1 Daily Data Review Instructions

1. The RCO chemist reviews the North Carolina Department of Environmental Quality (DEQ) public webpage daily for accuracy and potential errors before proceeding to the Envista daily review. This is

imperative to review 'first thing' daily as it can send out inaccurate data to the public and it is DAQ's responsibility to correct the public webpage as soon as reasonably possible even though the data displayed are not yet validated raw data. An example of this daily report can be found at this address and is available to the public 24/7/365 on all pollutants: https://xapps.ncdenr.org/aq/ambient/AmbtPollutantEnvista.jsp?pollutant=00001&date=07%2F04%2F2017

2. The Chemist/Reviewer must select the pollutant (i.e., O_3 8 Hour Average*) in the dropdown box on the upper left and change the date to the current date in the upper right dropdown box. In the case of O_3, we are concerned with the daily 'rolling 8-hour average' values and we need to assure that no Exceedance values or erroneous high values are indicated in the Max Avg. column. This could be very misleading if for example a **105**-ppb value was displayed on a moderate day. If Exceedance values are displayed, the chemist will first confirm/deny with Envista data and correct via phone and/or email to the Database manager and assure that the Internet-Based Enterprise Application Management (IBEAM) database is updated as well.

Section 5.1 Table 1

Available Ambient Data by Pollutant

County	Site	Current Reading	Min	Max	Average/ Total	Unit	Status	Hour (EST)
Alexander	Taylorsville Liledoun	--	4	27	--	PPB	normal	--
Avery	Linville Falls	--	8	26	--	PPB	normal	--
Buncombe	Bent Creek	--	2	32	--	PPB	normal	--
Caldwell	Lenoir	--	10	33	--	PPB	normal	--
Caswell	Cherry Grove	--	14	41	--	PPB	normal	--
Cumberland	Honeycutt	--	11	31	--	PPB	off line	--
Cumberland	Wade	--	4	31	--	PPB	normal	--
Durham	Durham Armory	--	16	37	--	PPB	normal	--
Edgecombe	Leggett	--	4	38	--	PPB	normal	--
Graham	Joanna Bald	--	23	26	--	PPB	normal	--
Granville	Butner	--	17	40	--	PPB	normal	--
Guilford	Mendenhall	--	17	43	--	PPB	normal	--
Haywood	Frying Pan	--	26	38	--	PPB	normal	--
Haywood	Purchase Knob	--	24	31	--	PPB	normal	--
Haywood	Waynesville Elementary School	--	7	29	--	PPB	normal	--
Johnston	West Johnston	--	10	34	--	PPB	normal	--
Lee	Blackstone	--	7	30	--	PPB	normal	--
Lenoir	Lenoir Community College	--	7	32	--	PPB	normal	--
Lincoln	Crouse	--	4	33	--	PPB	normal	--
Marin	Jamesville	--	2	24	--	PPB	normal	--
New Hanover	Castle Hayne	--	8	31	--	PPB	normal	--
Person	Bushy Fork	--	18	42	--	PPB	normal	--
Pitt	Pitt County Ag Center	--	7	31	--	PPB	normal	--
Rockingham	Bethany	--	16	43	--	PPB	normal	--
Rowan	Rockwell	--	4	43	--	PPB	normal	--
Swain	Bryson City	--	5	25	--	PPB	normal	--
Union	Monroe Middle School	--	7	40	--	PPB	normal	--
Wake	Millbrook	--	20	42	--	PPB	normal	--
Yancey	Mt. Mitchell	--	--	--	--	PPB	off line	--

Available Ambient Data by Pollutant

To get the latest available ambient data for a particular pollutant or meteorological measurement, select that monitor from the drop-down list. The data will be displayed below once you have made your selection. To display data from a past date, click "Change date."

All current values and statistics are averages for one-hour durations, unless the name of the monitor indicates otherwise.

Ozone **Date:** 03/25/2021 (Change date) (or select by County..Site)

*In 2016, the EPA rule for calculating the Ozone 8-Hour Average was changed to exclude 8-hour averages with start hours between 12 AM and 6 AM. Therefore, the 8-hour average for the current date is not available until after the 2 pm Standard Time ozone value has been collected.

3. Once this table is checked and corrected (if necessary) then the chemist will proceed to review the previous daily data which is supplied by the resident Statistician or via Envista report. An example of this report is as displayed in Section 5.1 Table 2.

Section 5.1 Table 2

Region	Site	Param	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	N_obs	MAX	AVG	Warning
Ozone																														
ARO	BRYSON	O3	21	17	15	BF	9	7	8	14	30	45	50	50	49	49	50	50	49	48	47	41	31	31	24	21	**23**	**50**	**32.9**	
ARO	FRYPAN	O3	44	43	41	42	43	43	42	45	48	50	51	BA	BF	51	51	48	47	47	46	46	47	46	46	48	**22**	**51**	**46.1**	
ARO	JOANNA	O3	44	44	42	40	37	34	36	43	43	44	45	46	BF	47	48	49	47	50	50	47	45	45	45	47	**23**	**50**	**44.3**	
ARO	LENOIR	O3	12	9	5	BF	8	6	4	20	35	41	46	48	46	47	52	54	52	50	47	42	29	26	17	17	**23**	**54**	**31**	
ARO	LINVLFAL	O3	10	8	6	BF	4	4	3	13	45	49	50	50	49	49	50	52	53	55	54	46	36	29	20	15	**23**	**55**	**32.6**	
ARO	MTMITCH6	O3	45	45	44	48	47	47	48	49	54	54	56	56	BF	54	51	50	49	50	49	48	50	52	52	52	**23**	**56**	**50**	
ARO	PURCHASE	O3	45	46	45	45	44	42	45	49	50	53	56	55	BF	56	56	55	54	53	51	49	50	50	49	49	**23**	**56**	**49.9**	
ARO	WNVLELSC	O3	37	42	45	BF	42	28	19	40	47	49	52	54	55	53	53	52	52	51	50	45	43	31	22	17	**23**	**55**	**42.6**	
CASTNet	BEAUFORT	O3	34	24	AM	16	21	14	20	35	44	45	45	45	45	44	44	44	43	42	41	37	33	33	34	32	**23**	**45**	**35.4**	
CASTNet	CANDOR1	O3	33	31	AM	23	21	20	20	29	34	38	40	41	42	42	43	43	42	41	39	33	29	31	32	29	**23**	**43**	**33.7**	
CASTNet	COWEETA	O3	12	21	AM	39	35	23	18	27	39	41	42	43	44	44	44	45	45	46	46	34	29	25	22	18	**23**	**46**	**34**	
CASTNet	CRANBERY	O3	40	45	AM	42	43	50	51	51	50	48	49	49	50	49	50	50	51	52	53	50	44	36	32	31	**23**	**53**	**46.3**	
Forsyth	CLEMMONS	O3	36	35	34	32	29	22	23	28	36	42	45	48	48	52	58	58	57	55	51	48	42	39	36	30	**24**	**58**	**41**	
Forsyth	HATTIE A	O3	42	39	36	33	30	29	29	32	36	44	47	50	51	54	62	60	59	59	54	46	40	37	37	36	**24**	**62**	**43.4**	
Forsyth	UNIONCRS	O3	40	39	36	34	33	33	32	35	39	43	46	50	55	58	55	52	52	52	49	45	41	39	35	32	**24**	**58**	**42.7**	
FRO	HONEYCUTT	O3	36	33	28	BF	20	11	20	29	40	43	44	46	47	47	47	46	46	44	42	39	37	35	33	31	**23**	**47**	**36.7**	
FRO	WADE	O3	34	30	27	BF	21	15	17	24	36	42	45	47	47	46	45	45	45	43	41	37	36	34	33	31	**23**	**47**	**35.7**	
Mecklenburg	GARINGER	O3	40	38	36	30	25	AI	20	30	37	41	45	46	47	47	47	48	49	51	49	44	40	35	32	31	**23**	**51**	**39.5**	
Mecklenburg	UniMeadow	O3	41	39	35	33	32	AI	23	32	38	42	47	49	49	50	48	49	50	52	50	46	40	34	34	37	**23**	**52**	**41.3**	
MRO	CROUSE	O3	38	39	36	BF	23	21	25	31	38	42	44	45	43	44	44	44	44	44	41	37	36	33	28	23	**23**	**45**	**36.7**	
MRO	CSSRW	O3	41	39	36	BF	29	21	23	31	36	43	49	51	50	48	47	46	47	47	47	43	40	38	35	27	**23**	**51**	**39.7**	
MRO	MONROEMS	O3	BA	BA	BA	BA	BA	BA	BA	AI	BF	BF	BF	40	41	43	45	44	43	43	41	30	27	24	27	28	**13**	**45**	**36.6**	
MRO	TYLRV13	O3	36	34	34	BF	33	25	22	29	34	42	46	47	48	52	50	47	47	47	45	42	36	33	29	24	**23**	**52**	**38.3**	
RRO	BUSHYFRK	O3	34	33	32	BF	31	29	28	30	32	35	38	38	39	40	39	39	38	38	36	32	30	31	33	33	**23**	**40**	**34.3**	
RRO	BUTNER	O3	42	39	37	BF	33	29	28	31	36	42	45	48	49	48	48	47	48	47	46	43	39	36	34	33	**23**	**49**	**40.3**	
RRO	DUARMORY	O3	40	38	37	BF	33	28	26	30	37	40	43	45	45	46	44	45	45	45	43	40	37	34	35	32	**23**	**46**	**38.6**	
RRO	JOHNSTON	O3	40	38	35	BF	21	12	17	31	38	42	44	47	50	50	48	46	46	45	41	35	31	35	36	36	**23**	**50**	**37.6**	
RRO	MLLBRK	O3	39	37	35	BF	26	24	21	AI	AI	42	43	45	46	46	48	48	47	46	43	37	35	34	35	35	**21**	**48**	**38.7**	
SC	YORK LANDFILL	O3	38	36	33	25	17	12	12	26	35	38	38	38	39	41	42	43	44	43	41	37	23	21	19	AM	**23**	**44**	**32.2**	
WARO	JAMESVL2	O3	36	35	32	BF	25	25	25	31	34	35	37	38	39	41	41	39	36	36	36	34	32	31	30	27	**23**	**41**	**33.7**	
WARO	LCOLLEGE	O3	35	34	31	BF	21	7	19	33	39	42	43	45	45	43	41	41	41	41	38	37	35	34	32	29	**23**	**45**	**35**	
WARO	PITTAGCT	O3	39	38	36	BF	33	32	34	37	40	43	45	47	48	48	47	45	44	44	43	41	40	39	37	35	**23**	**48**	**40.7**	
WIRO	CASTLE H	O3	2	0	0	BF	0	0	8	33	44	44	44	45	45	44	44	43	43	41	39	31	23	12	8	6	**23**	**45**	**26**	
WNC	BNTCREEK	O3	25	21	21	BF	15	15	14	27	37	45	49	48	50	51	51	50	49	48	46	44	38	30	26	22	**23**	**51**	**35.7**	
WSRO	BETHANY	O3	42	42	41	BF	38	35	35	37	39	46	48	49	51	55	57	55	53	52	48	45	40	39	39	38	**23**	**57**	**44.5**	
WSRO	CHERRYGR	O3	40	38	37	BF	33	31	28	32	38	44	49	50	49	51	52	49	48	48	48	46	42	40	39	38	**23**	**52**	**42.2**	
WSRO	MENDNHAL	O3	40	40	39	BF	35	31	31	35	39	45	49	50	52	52	51	49	48	48	47	45	39	38	33	32	**23**	**52**	**42.1**	
Temperature																														
ARO	BRYSON	TMP	25	25	24	25	26	25	25	25	26	25	26	26	27	27	28	27	28	28	27	27	28	28	27	27	24	27.9	26.3	
ARO	Canton	TMP	26	25	25	25	25	24	24	25	25	25	25	25	25	24	24	24	24	24	24	24	25	25	26	25	24	25.8	24.7	
ARO	FRYPAN	TMP	23	23	23	23	23	23	23	23	22	23	22	23	23	23	23	23	23	23	23	23	23	23	23	23	24	23	22.8	
ARO	JOANNA	TMP	24	24	24	24	24	24	24	24	24	25	25	26	28	28	29	29	29	30	29	27	25	24	25	24	24	29.7	25.7	
ARO	LENOIR	TMP	24	24	24	24	24	25	24	24	24	25	26	27	28	28	28	28	27	26	26	26	25	24	24	24	24	28.1	25.4	
ARO	LINVLFAL	TMP	25	23	23	23	23	23	23	23	24	24	24	25	25	25	24	24	25	25	25	24	24	24	24	23	24	25	23.8	
ARO	MTMITCH6	TMP	20	22	21	21	20	21	22	21	20	20	23	21	22	21	21	21	21	21	22	22	22	22	22	22	24	22.5	21.2	
ARO	PURCHASE	TMP	24	24	23	24	24	24	24	24	24	25	25	25	26	27	27	27	27	27	27	26	26	25	24	24	24	27.2	25.2	
ARO	WNVLELSC	TMP	24	24	24	24	24	24	23	23	24	25	25	26	26	27	27	27	28	27	27	28	27	26	25	24	24	27.8	25.4	
FRO	CANDOR	TMP	23	24	24	24	24	24	24	25	26	26	27	27	27	28	28	27	28	28	27	26	27	26	26	26	24	27.8	25.9	
FRO	HONEYCUTT	TMP	27	27	27	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	25	25	26	26	26	26	24	26.7	25.4	
FRO	WADE	TMP	27	27	27	25	26	26	26	26	26	25	25	25	25	26	27	28	28	28	27	25	25	26	26	26	24	27.7	26	
MRO	CROUSE	TMP	24	24	23	24	24	24	24	24	27	27	27	27	27	27	27	27	27	27	26	25	26	25	25	24	24	27.4	25.5	
MRO	CSSRW	TMP	21	21	21	21	21	21	22	22	23	24	24	24	24	24	23	23	23	23	23	23	23	22	22	21	24	24.1	22.6	
MRO	MONROEMS	TMP	27	27	27	27	27	26	27	27	BA	BA	BA	34	34	34	34	34	34	34	33	32	31	29	28	27	21	33.9	30	
MRO	TYLRV13	TMP	23	23	23	23	23	23	23	24	25	24	23	24	23	23	23	23	23	23	23	25	25	24	23	23	24	24.8	23.4	
RRO	BUSHYFRK	TMP	27	27	27	27	27	27	27	26	27	26	26	26	26	26	26	26	26	26	26	27	27	27	27	27	24	26.9	26.5	
RRO	BUTNER	TMP	26	26	27	25	26	25	26	25	25	26	26	26	26	27	27	27	27	27	27	27	27	27	27	27	24	27.3	26.3	

4. These data are reviewed then entered into a 'Control chart' type table (*Section 5.1 Table 3*) which is utilized for the monthly data validation review (level 3) by the RCO chemist. This table is displayed

below with representative comments included from follow up with site technicians and regional monitoring coordinators or ABAQA staff. The comments are very useful when anomalies and 'issues' occur to help document and delineate Invalidation codes and logic behind data issues. Additionally, these data are compared to the Envista report generated at the end of the month and considered 2nd Level reviewed. It is compared for completeness and to assure it has been reviewed by site technicians and regional coordinators (or ABAQA staff) and is in agreement with any Invalidation codes or other issues.

Section 5.1 Table 3

	Building Temperature			O3 Concentration				Calibration Drift (ppb)			Monitor			Auto cal always runs at midnight and into the 1:00 hr
Date	Min	Max	Avg.	Min	Max	Avg	8 hr Avg Max	Span0	Span2	Span4	Span0	Span2	Span4	Comments
5/1/2020	26.1	28	27.26	24	46	35.04	**43.63**	0	65	225	0	65	225	
5/2/2020	26.4	28	27.45	2	51	32.09	47.75	0	65	225	0	65	225	
5/3/2020	26.2	34.9	29.63	23	52	44.35	50.38	0	65	225	0	65	225	
5/4/2020	27.5	32.9	29.73	26	55	44.30	53.63	0	65	225	0	65	225	
5/5/2020	27.1	31.3	28.35	27	44	38.74	42.13	0	65	225	0	65	225	
5/6/2020	25.5	28.2	26.78	3	47	29.68	44.43	0	65	225	0	65	225	
5/7/2020	24.6	27	26.05	22	53	37.22	50.63	0	65	225	0	65	224	
5/8/2020	25.8	26.9	26.44	15	42	29.22	36.38	0	65	225	0	65	225	
5/9/2020	25	26.9	26.22	3	47	32.83	45.63	0	65	225	0	65	225	
5/10/2020	24.6	27	26.12	9	48	33.83	46.63	0	65	225	0	65	224	
5/11/2020	26.4	27	26.72	28	47	37.91	44.75	0	65	225	0	65	224	
5/12/2020	25.2	27	26.41	**0**	**43**	**15.74**	32.88	0	65	225	0	65	224	**dropped to 0 after 2:30 pm---line disconn. Or ???**
5/13/2020	26.6	27.8	27.08	**0**	**0**	**0.00**	#DIV/0!	0	65	225	0	**0**	**0**	**Pump down; ECB to replace on 5/14!**
5/14/2020	25.7	33.9	29.08											
5/15/2020	26.4	33.9	30.01	24	45	36.62	42.71	0	65	225	0	65	225	**A/C unit went bad, 93F at site; Matt trying to calibrate, but may be delayed**
5/16/2020	24.2	35.9	30.10	11	45	30.65	43.25	0	65	225	0	65	225	
5/17/2020	24.4	36.6	30.69	8	34	24.70	31.88	0	65	225	0	65	226	
5/18/2020	22.4	29.5	24.92	7	28	20.04	25.88	0	65	225	0	65	226	
5/19/2020	22.5	22.9	22.73	17	31	21.70	24.75	0	65	225	0	65	225	
5/20/2020	22.3	23	22.65	21	27	23.30	23.13	0	65	225	0	65	225	
5/21/2020	22.4	23	22.73	14	34	23.22	29.13	0	65	225	0	65	225	
5/22/2020	22.5	23.2	22.72	16	40	26.52	35.75	0	65	225	0	65	225	
5/23/2020	22.3	23	22.70	3	40	24.00	35.13	0	65	225	0	65	225	
5/24/2020	22.4	23	22.80	1	43	23.70	40.25	0	65	225	0	65	225	
5/25/2020	22.5	23	22.84	7	23	17.70	20.13	0	65	225	0	65	225	
5/26/2020	22.4	23.1	22.91	10	30	21.35	27.38	0	65	225	0	65	225	
5/27/2020	22.4	23.1	22.85	14	21	16.74	17.00	0	65	225	0	65	225	
5/28/2020	22.4	23	22.78	5	35	19.61	28.13	0	65	225	0	65	225	
5/29/2020	22.4	23.1	22.79	7	35	21.04	28.88	0	65	225	0	65	225	
5/30/2020	22.2	23.1	22.76	7	42	27.83	38.63	0	65	225	0	65	225	
5/31/2020	22.4	23.1	22.71	7	36	27.70	35.75	0	65	225	0	65	225	

5.1.2 Monthly Data Control Charting with Monitors and Calibrators and Relevant Daily Parameters

1. Monthly data control charting is an easy way to view monthly activity at each site (in a 29-tab (site) workbook). One can follow patterns, potential drift, and other anomalies with commentary as needed. It is populated daily for each site and one can create graphs (control charts as needed) for each parameter. Again, this table is compared to '2nd Level Final reviewed' Envista data to assure all items have been addressed, commented on, and notated. This table (Section 5.1 Table 3) is also an aid when preparing the precision data report which will be discussed in Section 7.1.

2. Once the Monthly data have been reviewed by Regional Site Technicians (Level 1) and Regional Ambient Monitoring Coordinators (Level 2) (or ABAQA staff) then it is submitted for Level 3 Review by RCO Chemists. The Level 2 submittal is required to be in the Envista database within 20 days of the end of the month (i.e., March data would be required to be validated and submitted to RCO by April 20 for final (Level 3) validation.

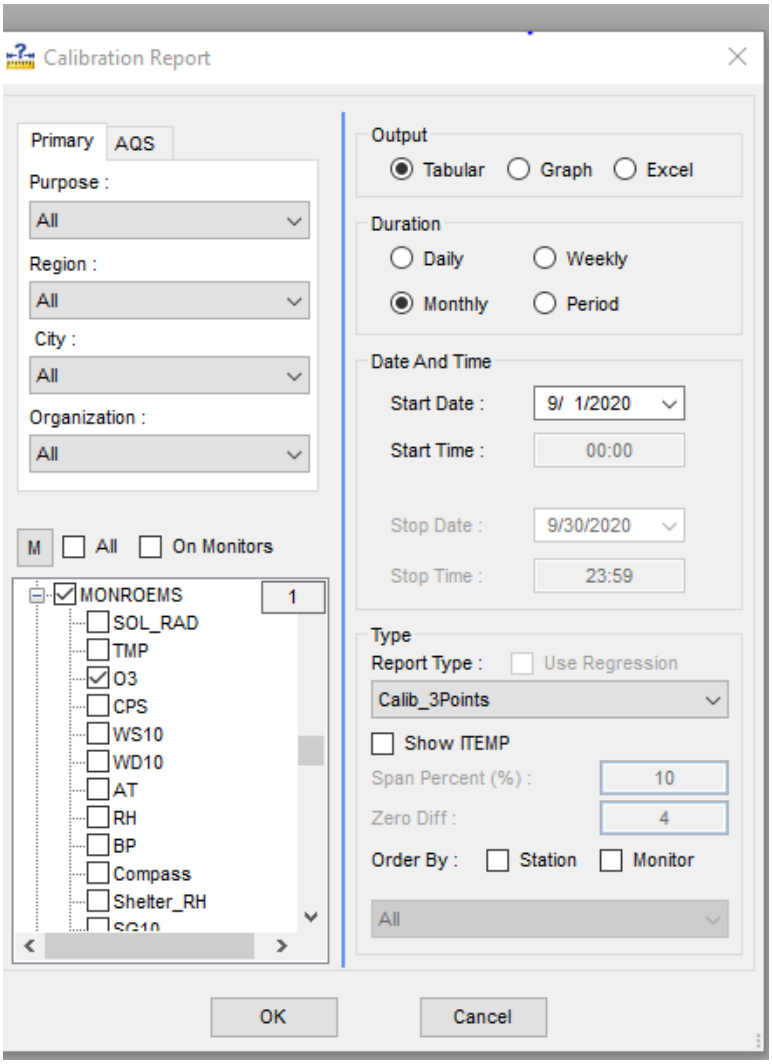
Due to the expansive North Carolina O_3 network (some 29 sites), the Precision data are reviewed by the RCO chemist and validated and submitted to the RCO Statistician or Database Manager for submittal to AQS via a sophisticated macro and Excel submittal form. An example of this form (completed by the RCO Chemist) is shown in Section 5.1 Table 4:

Section 5.1 Table 4

Cherry Grove - Ozone Daily Auto-Calibration Ch							/Ps Evaluation			Monitor Evaluatio														
	/Ps			Monitor			Comparison to Expecte			Comparison to /P			Temp. Range	Comment	AQI Forecast		Forecast Source	Temperature		StDev	Null Code		Comments
Date	Zero	Span1	Span	Zero	Span1	Span	0 ppb	65 ppb	225 ppb				5 - 40° C		Code	AQI		Tmin	Tmax		Span1 (Pr)	Zero Span	
8/1/2020	0	65	225	0	64	228	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.7	23.4	0.2			
8/2/2020	0	65	225	1	65	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.7	23.4	0.2			
8/3/2020	0	65	225	0	64	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.7	23.3	0.1			
8/4/2020	0	65	225	1	65	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.6	23.5	0.2			
8/5/2020	0	65	225	0	64	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.8	23.5	0.2			
8/6/2020	0	65	225	0	65	226	Pass	Pass	Pass	Pass	Pass	Pass	Pass					22.7	23.4	0.2			
8/7/2020	0	65	225	1	65	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	44	Triad	22.7	23.3	0.2			
8/8/2020	0	65	225	0	65	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Moderate	52	Triad	22.7	23.4	0.2			
8/9/2020	0	65	225	0	65	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Moderate	52	Triad	22.8	23.5	0.2			
8/10/2020	0	65	225	0	64	225	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	50	Triad	22.3	23.5	0.4			
8/11/2020	0	65	225	0	65	226	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	46	Triad	22.4	23.0	0.2			
8/12/2020	0	65	225	1	67	228	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	48	Triad	22.3	22.9	0.1			
8/13/2020	0	65	225	3	68	229	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	46	Triad	22.4	23.7	0.5	1C	AN	Bad ZAP, replaced
8/14/2020	1	1	1	4	3	3	Pass	Fail	Fail	Pass	Pass	Pass	Pass		Green	44	Triad	22.9	23.6	0.2	1C	AN	Bad ZAP, replaced
8/15/2020	0	65	225	0	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	32	Triad	22.8	23.5	0.2			
8/16/2020	0	65	225	1	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	38	Triad	22.6	24.1	0.3			
8/17/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	46	Triad	22.6	23.6	0.2			
8/18/2020	0	65	225	1	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Moderate	52	Triad	22.4	23.9	0.3			
8/19/2020	0	65	225	0	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	50	Triad	22.6	23.8	0.2			
8/20/2020	0	65	225	0	65	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	48	Triad	22.8	23.4	0.2			
8/21/2020	0	65	225	0	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	40	Triad	22.7	23.4	0.2			
8/22/2020	0	65	225	1	67	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	42	Triad	23.0	23.4	0.1			
8/23/2020	0	65	225	0	64	224	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	42	Triad	22.9	23.4	0.1			
8/24/2020	0	65	225	2	66	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	35	Triad	22.9	23.4	0.1			
8/25/2020	0	65	225	0	64	221	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	45	Triad	22.8	23.6	0.2			
8/26/2020	0	65	225	0	64	222	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Moderate	67	Triad	22.6	23.5	0.2			
8/27/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Moderate	58	Triad	22.7	23.5	0.2			
8/28/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	46	Triad	22.8	23.4	0.1			
8/29/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	50	Triad	22.8	23.3	0.1			
8/30/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	48	Triad	22.7	23.5	0.2			
8/31/2020	0	65	225	0	64	223	Pass	Pass	Pass	Pass	Pass	Pass	Pass		Green	35	Triad	22.6	23.4	0.2			

3. One can observe from this PZS data table that on **8/13-8/14** a problem occurred at this particular site and the Monitor Zero, Span, and Precision values exhibited unacceptable drift. This was documented in the 'Null Code' columns for Span 1 (Precision value) and Zero/Span (second column) with a Null code. In the 'Comments' column, an appropriate description of the event should be made. In this case, a description of the instrument failure was made. This was checked by the RCO chemist by documenting in the aforementioned Daily log (Table 3 above) as well as Envidas verification and consulting with Site Technician and Regional Monitoring Coordinator. The *Section 5.1 Table 4* data, once edited by the RCO Chemist (Level 3) is created for each of the 29 Monitoring sites and then submitted to the RCO Statistician or the Database Manager to be submitted to AQS.

4. The monthly O_3 data are processed via Envista collectively with the Precision data. The data are compared to the daily log (*Section 5.1, Tables 2 and 3*) as well as *Section 5.1 Table 4* for accuracy and the possibility of any anomalies and errors. The RCO chemist performs review and validation at the aforementioned plus 20-day submittal from each of the seven Regional Offices and the ABAQA, which is part of the DAQ Primary Quality Assurance Organization (PQAO). The first step of data review following the preparation of the PZS Table 4 is to confirm by reviewing all relevant e-logs pertaining to the data set(s). This would include all e-logs populated and documented during the month of review. The e-log entries must coincide with relevant dates and activities indicated on the submitted data. An example of this is exhibited below:



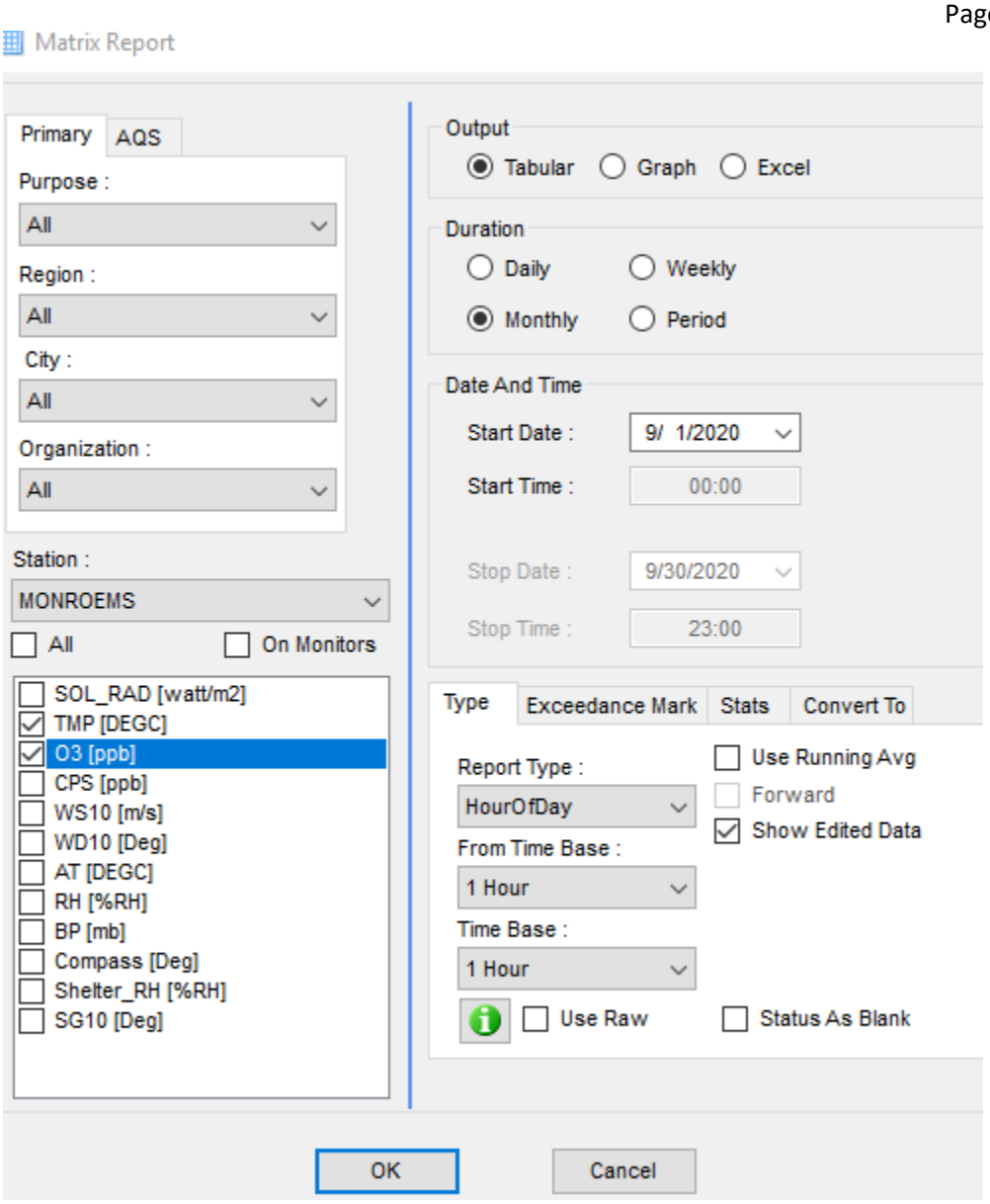
Example of Calibration report (below)

O3[ppb] Calibration: MONROEMS Monthly: 09/2020 Type: Calib_3Points											
Date			Monitor	Unit	Type	Ref	Meas	Value	Diff%	STD	Status
9/1/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid
					Span	225	222	1.008	-1.2	0	
					Span1	65	64	1	-2	0	
9/2/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid
					Span	225	222	1.008	-1.2	1	
					Span1	65	64	1	-2	0	
9/3/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid
					Span	225	223	1.006	-0.9	0	
					Span1	65	64	1	-1	0	
9/4/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid
					Span	225	223	1.007	-1	1	
					Span1	65	64	1	-1	0	
9/5/2020 4:04 AM			O3	ppb	Zero	0	-1	0	0	0	Valid
					Span	225	223	1.008	-1	0	
					Span1	65	64	1	-1	0	
9/6/2020 4:04 AM			O3	ppb	Zero	0	0	0	0	0	Valid
					Span	225	222	1.011	-1.2	0	
					Span1	65	64	1	-1	0	
9/7/2020 4:04 AM			O3	ppb	Zero	0	0	0	0	0	Valid
					Span	225	222	1.012	-1.3	0	
					Span1	65	64	1	-1	0	
9/8/2020 4:04 AM			O3	ppb	Zero	0	0	0	0	0	Valid
					Span	225	222	1.011	-1.3	1	
					Span1	65	64	1	-1	0	
9/9/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid
					Span	225	222	1.011	-1.3	0	
					Span1	65	64	1	-1	0	
9/10/2020 4:04 AM			O3	ppb	Zero	0	-1	-1	0	0	Valid

5. Next a Matrix Report will be generated for O_3 and Shelter Temperature at each site for an entire month and reviewed for completeness, accuracy, and any anomalies or invalidations which have been notated.

One method for generating this Matrix report is by Highlighting the Reports tab on the upper operational bar and then making the selections as follows (see below):

NOTE: **Output** = Tabular **Duration** = Monthly **Date and Time** = Month of Interest
Site Selection with Parameters = Ozone and Temp **Type** = 1-hour data Tabular Output
Duration = Monthly (for the month of interest) ✓ Show Edited Data



Envista Report Generated for O_3:

O3[ppb] Matrix: MONROEMS Monthly: 09/2020 Type: HourOfDay 1 Hr. [1 Hr.]

DateTime	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Min	Max	Avg	Rec.#	Data[%]
9/1/2020	7	6	3	**BF - Calib	4	4	8	12	14	15	19	21	25	29	32	32	32	30	25	18	15	11	13	14	3	32	17	23	95.8
9/2/2020	19	29	24	**BF - Calib	8	5	3	6	19	30	34	30	39	34	31	30	31	27	22	17	14	11	9	14	3	39	21	23	95.8
9/3/2020	17	16	16	**BF - Calib	14	11	9	15	20	25	28	29	30	30	29	33	32	29	24	21	17	16	20	20	9	33	22	23	95.8
9/4/2020	20	20	19	**BF - Calib	16	12	10	14	24	35	43	47	52	53	48	47	43	42	36	25	17	14	9	7	7	53	28	23	95.8
9/5/2020	8	21	23	**BF - Calib	20	21	26	27	30	33	36	37	38	39	40	41	41	39	36	32	32	27	25	26	8	41	30	23	95.8
9/6/2020	24	21	21	**BF - Calib	14	12	10	19	25	31	34	36	36	37	37	38	39	38	34	19	9	8	5	4	4	39	24	23	95.8
9/7/2020	2	3	2	**BF - Calib	2	4	4	14	23	29	35	36	37	38	38	39	38	37	34	19	13	7	14	13	2	39	21	23	95.8
9/8/2020	10	6	4	**BF - Calib	5	6	7	10	22	28	31	33	33	34	32	32	34	33	27	22	23	23	22	20	4	34	22	23	95.8
9/9/2020	19	19	18	**BF - Calib	16	15	14	16	BA - Maintain	BA - Maintain	18	19	20	20	20	21	20	18	13	13	11	11	11	10	10	21	16	21	87.5
9/10/2020	10	9	9	**BF - Calib	6	6	5	5	10	12	14	16	18	18	18	19	19	21	18	8	3	6	7	6	3	21	11	23	95.8
9/11/2020	2	1	1	**BF - Calib	2	1	2	9	19	24	26	27	28	29	28	29	30	30	23	19	15	14	11	10	1	30	17	23	95.8
9/12/2020	11	11	12	**BF - Calib	11	11	10	11	14	17	20	20	18	19	20	20	19	18	18	18	17	17	15	10	20	16	23	95.8
9/13/2020	14	15	16	**BF - Calib	17	18	19	21	24	25	26	28	28	27	27	26	26	25	24	21	19	16	9	7	7	28	21	23	95.8
9/14/2020	7	2	1	**BF - Calib	1	1	1	10	17	23	27	27	28	28	31	32	29	25	23	25	26	26	23	22	1	32	19	23	95.8
9/15/2020	20	19	20	**BF - Calib	21	18	21	21	23	26	27	29	30	33	38	36	37	36	31	28	27	26	22	20	18	38	26	23	95.8
9/16/2020	20	19	19	**BF - Calib	17	15	13	15	19	24	28	30	30	30	31	34	30	27	27	27	28	25	23	22	13	34	24	23	95.8
9/17/2020	19	17	14	**BF - Calib	10	9	10	10	10	10	11	11	11	13	14	14	14	14	12	11	12	16	18	19	9	19	13	23	95.8
9/18/2020	18	19	23	**BF - Calib	22	18	17	17	20	21	23	25	27	28	29	32	34	30	25	19	18	19	21	24	17	34	23	23	95.8
9/19/2020	26	27	26	**BF - Calib	23	22	21	21	22	23	25	27	28	29	28	27	27	28	26	25	24	23	20	20	20	29	25	23	95.8
9/20/2020	20	20	19	**BF - Calib	18	16	16	19	22	26	27	29	30	31	32	32	33	32	30	25	27	29	29	26	16	33	26	23	95.8
9/21/2020	24	22	20	**BF - Calib	18	14	15	18	22	26	29	30	30	30	31	30	29	28	25	24	23	23	15	14	14	31	23	23	95.8
9/22/2020	13	12	10	**BF - Calib	3	1	1	7	BA - Maintain	BA - Maintain	32	34	37	38	41	44	44	38	28	26	24	20	13	12	1	44	23	21	87.5
9/23/2020	9	9	12	**BF - Calib	6	6	4	5	7	14	27	34	39	39	39	38	37	35	28	26	18	18	16	12	4	39	21	23	95.8
9/24/2020	13	14	15	**BF - Calib	13	11	11	13	20	27	32	38	40	38	38	35	29	27	24	23	21	19	15	16	11	40	23	23	95.8
9/25/2020	17	15	14	**BF - Calib	18	19	18	16	15	16	19	19	19	18	17	17	17	16	14	13	14	11	10	10	10	19	16	23	95.8
9/26/2020	11	10	10	**BF - Calib	10	9	9	10	11	14	19	23	24	25	23	23	22	20	21	20	13	3	1	3	1	25	15	23	95.8
9/27/2020	4	4	4	**BF - Calib	7	6	5	6	13	21	29	31	32	31	26	21	19	19	11	10	10	11	10	9	4	32	15	23	95.8
9/28/2020	8	8	7	**BF - Calib	8	10	12	14	19	23	28	30	27	28	29	29	26	24	23	24	23	22	19	16	7	30	20	23	95.8
9/29/2020	15	14	14	**BF - Calib	11	10	11	12	17	18	18	20	23	23	24	25	21	19	18	19	18	17	14	10	10	25	17	23	95.8
9/30/2020	8	11	12	**BF - Calib	8	5	3	9	16	21	AZ - Audit	AZ - Audit	AZ - Audit	31	32	33	31	26	18	12	11	10	15	19	3	33	17	20	83.3
Min	2	1	1		1	1	1	5	7	10	11	11	11	13	14	14	14	14	11	8	3	3	1	3	1				
Min Date	9/7	9/11	9/11		9/14	9/11	9/14	9/10	9/23	9/17	9/17	9/17	9/17	9/17	9/17	9/17	9/17	9/17	9/27	9/10	9/10	9/26	9/26	9/26	9/11				
Max	26	29	26		23	22	26	27	30	35	43	47	52	53	48	47	44	42	36	32	32	29	29	26		53			
Max Date	9/19	9/2	9/19		9/19	9/19	9/5	9/5	9/5	9/4	9/4	9/4	9/4	9/4	9/4	9/4	9/22	9/4	9/4	9/5	9/5	9/20	9/20	9/5		9/4			
Avg	14	14	14		12	11	11	13	18	23	26	28	30	30	30	30	29	28	24	20	18	17	15	15			20		
Rec.#	30	30	30	0	30	30	30	30	28	28	29	29	29	30	30	30	30	30	30	30	30	30	30	30				683	
Data[%]	100	100	100	0	100	100	100	100	93.3	93.3	96.7	96.7	96.7	100	100	100	100	100	100	100	100	100	100	100					94.9
STD	7	7	7		6	6	6	5	5	6	7	7	8	8	8	8	8	7	7	6	7	7	6	6					

NOTE: Column E representing 03:00 a.m. (daily PZS) with **BF** code representing PZS. Also note Maintenance visit represented by **BA** on 9/9 and 9/22 at this site. This is also compared to site e-logs and Daily review table aforementioned above (Section 5.1 Table 3) and also concurrence with Section 5.1 Table 4 to confirm agreement on PZS checks if invalidated for any reason. Also note the **AZ** on 9/30 starting at 10:00 a.m. and indicating an ECB site Audit.

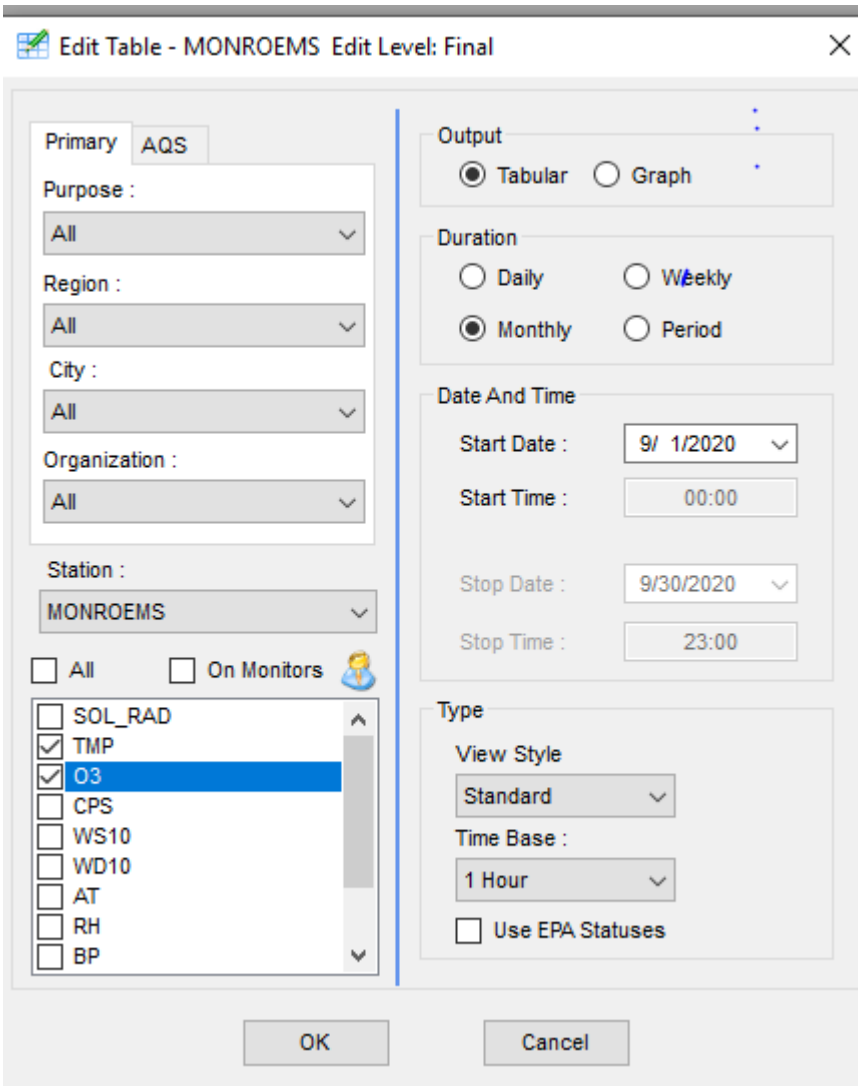
6. A similar report is generated for site temperature (see below) and is also compared to Monthly data and *Section 5.1 Tables 2, 3, and 4* for completeness and accuracy and to confirm the site(s) are meeting EPA criteria for operation.

TMP[DEGC] Matrix: MONROEMS Monthly: 09/2020 Type: HourOfDay 1 Hr. [1 Hr.]

DateTime	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Min	Max	Avg	Rec.#	Data[%]
9/1/2020	23.219	23.136	23.184	23.138	23.043	23.171	23.158	23.305	23.255	23.561	23.336	23.178	23.354	23.434	23.517	23.6	23.64	23.591	23.306	23.233	23.276	23.325	23.229	23.274	23.043	23.64	23.311	24	100
9/2/2020	23.348	23.145	23.148	23.11	23.1	23.391	23.113	23.242	23.312	23.402	23.686	23.828	23.939	23.994	24.031	24.089	24.09	23.897	23.611	23.255	23.528	23.293	23.453	23.265	23.1	24.09	23.511	24	100
9/3/2020	23.11	23.494	23.367	23.344	23.238	23.574	23.427	23.319	23.258	23.354	23.546	23.701	23.915	23.928	24.059	23.957	23.821	23.639	23.37	23.597	23.36	23.292	23.066	23.31	23.066	24.059	23.502	24	100
9/4/2020	23.303	23.528	23.249	23.198	23.123	23.223	23.643	23.305	23.538	23.487	23.429	23.592	23.642	23.682	23.706	23.714	23.864	23.626	23.325	23.383	23.393	23.457	23.205	23.379	23.123	23.864	23.458	24	100
9/5/2020	23.212	23.415	23.318	23.327	23.383	23.405	23.462	23.553	23.509	23.353	23.296	23.34	23.502	23.391	23.773	23.509	23.255	23.383	23.514	23.643	23.537	23.272	23.188	23.234	23.188	23.773	23.407	24	100
9/6/2020	23.047	23.091	23.093	22.986	23.14	23.168	23.441	23.098	23.056	23.446	23.603	23.492	23.317	23.506	23.325	23.444	23.452	23.478	23.694	23.686	23.245	23.279	22.972	23.177	22.972	23.694	23.302	24	100
9/7/2020	23.052	23.023	23.119	23.172	23.41	23.142	22.873	23.1	23.204	23.57	23.248	23.333	23.582	23.516	23.52	23.204	23.11	23.386	23.472	23.675	23.401	23.458	23.102	23.212	22.873	23.675	23.287	24	100
9/8/2020	23.089	23.034	23.391	23.058	23.012	23.013	22.972	23.224	23.382	23.353	23.363	23.397	23.696	23.439	23.769	23.505	23.36	23.298	23.242	23.504	22.963	23.473	23.223	23.438	22.963	23.769	23.3	24	100
9/9/2020	23.23	22.954	23.22	23.247	22.898	23.03	23.189	23.079	23.147	23.037	23.42	23.245	23.547	23.605	23.552	23.565	23.331	23.561	23.547	23.565	23.179	23.401	23.671	23.477	22.898	23.671	23.321	24	100
9/10/2020	23.263	23.669	23.582	23.446	23.364	23.448	23.428	23.383	23.658	23.55	23.703	23.548	23.582	23.414	23.795	23.482	23.787	23.694	23.846	23.42	23.39	23.561	23.628	23.522	23.263	23.846	23.548	24	100
9/11/2020	23.412	23.414	23.708	23.337	23.399	23.631	23.433	23.285	23.385	23.525	23.425	23.581	23.583	23.717	23.747	23.661	23.58	23.58	23.532	23.347	23.632	23.559	23.385	23.485	23.285	23.747	23.514	24	100
9/12/2020	23.484	23.528	23.6	23.492	23.297	23.489	23.45	23.404	23.208	23.471	23.33	23.417	23.561	23.381	23.336	23.2	23.624	23.197	23.487	23.35	23.324	23.422	23.428	23.199	23.197	23.624	23.403	24	100
9/13/2020	23.264	23.218	23.415	23.554	23.374	23.397	23.503	23.655	23.395	23.737	23.613	23.809	23.614	23.801	23.556	23.541	23.621	23.743	23.722	23.433	23.284	23.44	22.965	23.685	22.965	23.809	23.514	24	100
9/14/2020	23.724	23.536	23.453	23.373	23.268	23.4	23.495	23.519	23.458	23.657	23.381	23.594	23.427	23.56	23.539	23.524	23.798	23.572	23.304	23.482	23.56	23.17	23.736	23.584	23.17	23.798	23.505	24	100
9/15/2020	23.485	23.593	23.308	23.465	23.144	23.4	23.218	23.093	23.381	23.3	23.664	23.806	23.625	23.595	23.562	23.652	23.718	23.655	23.699	23.408	23.37	23.117	23.211	23.064	23.064	23.806	23.439	24	100
9/16/2020	23.068	23.177	23.361	23.05	23.002	23.482	23.002	23.157	23.249	23.226	23.542	23.255	23.265	23.558	23.354	23.55	23.481	23.674	23.407	23.649	23.301	23.688	23.702	23.559	23.002	23.702	23.365	24	100
9/17/2020	23.499	23.499	23.539	23.361	23.456	23.376	23.565	23.278	23.354	23.403	23.269	23.321	23.113	23.52	23.282	23.372	23.249	23.449	23.393	23.398	23.409	23.348	23.23	23.402	23.113	23.565	23.379	24	100
9/18/2020	23.531	23.484	23.521	23.428	23.271	23.417	23.428	23.482	23.307	23.526	23.244	23.473	23.517	23.455	23.448	23.456	23.51	23.328	23.527	23.567	23.381	23.105	23.325	23.071	23.071	23.567	23.408	24	100
9/19/2020	23.295	23.047	23.098	23.345	23.131	23.272	23.155	23	23.219	23.432	23.138	23.416	23.321	23.294	23.562	23.201	23.353	23.357	23.002	23.383	23.295	23.453	23.219	23.161	23	23.562	23.256	24	100
9/20/2020	23.252	23.182	23.263	23.41	22.908	23.776	23.122	23.073	23.555	23.398	23.261	23.391	23.402	23.502	23.306	23.58	23.325	23.462	23.053	23.264	23.048	23.614	23.257	23.527	22.908	23.776	23.33	24	100
9/21/2020	23.386	23.169	23.018	23.267	23.385	23.38	23.09	23.376	23.458	23.271	23.427	23.308	23.539	23.366	23.345	23.35	23.25	23.511	22.883	23.379	23.134	23.452	23.17	23.157	22.883	23.539	23.295	24	100
9/22/2020	23.232	23.101	23.381	23.223	23.215	23.676	23.283	23.311	23.121	23.148	24.291	24.752	24.736	24.605	24.653	24.724	24.725	24.777	24.978	24.811	24.97	24.753	24.95	24.976	23.101	24.978	24.141	24	100
9/23/2020	25.428	25.088	24.918	25.134	25.067	25.266	25.045	25.135	25.104	25.072	25.601	26.033	25.413	24.613	24.513	25.051	24.93	24.839	24.676	24.589	24.667	24.594	24.475	24.699	24.475	26.033	24.998	24	100
9/24/2020	24.757	24.668	24.963	24.228	24.844	24.701	24.75	24.892	24.548	24.506	24.917	25.033	25.128	25.148	25.038	24.856	24.825	24.616	24.687	24.514	24.639	24.785	24.536	24.493	24.228	25.148	24.753	24	100
9/25/2020	24.51	24.478	24.402	24.522	24.478	24.902	24.792	24.672	24.502	24.598	24.593	24.647	24.829	24.832	24.724	24.781	24.84	24.719	24.639	24.768	24.552	24.609	24.626	24.483	24.402	24.902	24.646	24	100
9/26/2020	24.631	24.625	24.509	24.614	24.37	24.666	24.508	24.55	24.465	24.619	24.77	24.805	24.87	24.973	25.048	24.987	24.885	24.791	24.66	24.672	24.484	24.561	24.618	24.563	24.37	25.048	24.677	24	100
9/27/2020	24.438	24.564	24.611	24.53	24.631	24.557	24.564	24.625	24.593	24.782	24.872	24.975	25.169	25.31	25.242	25.048	24.916	24.752	24.771	24.538	24.669	24.461	24.572	24.598	24.438	25.31	24.741	24	100
9/28/2020	24.457	24.417	24.586	24.523	24.568	24.499	24.487	24.668	24.667	24.858	24.972	24.737	24.861	24.796	24.832	24.824	24.843	24.685	24.859	24.849	24.892	24.722	24.676	24.745	24.417	24.972	24.709	24	100
9/29/2020	24.608	24.556	24.687	24.73	24.834	24.704	24.542	24.714	24.827	24.916	25.061	24.801	24.928	24.968	24.772	24.674	24.636	24.505	24.518	24.827	24.554	24.431	24.503	24.704	24.431	25.061	24.708	24	100
9/30/2020	24.627	24.758	24.34	24.504	24.482	24.577	24.468	24.512	23.72	23.283	23.815	24.332	24.829	25.5	25.736	25.628	25.718	25.581	25.844	25.758	25.85	25.71	25.794	25.727	23.283	25.85	24.962	24	100
Min	23.047	22.954	23.018	22.986	22.898	23.013	22.873	23	23.056	23.037	23.138	23.178	23.113	23.294	23.282	23.2	23.11	23.197	22.883	23.233	22.963	23.105	22.965	23.064	22.873				
Min Date	9/6	9/9	9/21	9/6	9/9	9/8	9/7	9/19	9/6	9/9	9/19	9/1	9/17	9/19	9/17	9/12	9/7	9/12	9/21	9/1	9/8	9/18	9/13	9/15	9/7				
Max	25.428	25.088	24.963	25.134	25.067	25.266	25.045	25.135	25.104	25.072	25.601	26.033	25.413	25.5	25.736	25.628	25.718	25.581	25.844	25.758	25.85	25.71	25.794	25.727		26.033			
Max Date	9/23	9/23	9/24	9/23	9/23	9/23	9/23	9/23	9/23	9/23	9/23	9/23	9/23	9/30	9/30	9/30	9/30	9/30	9/30	9/30	9/30	9/30	9/30	9/30		9/23			
Avg	23.665	23.653	23.678	23.637	23.595	23.738	23.654	23.667	23.661	23.728	23.827	23.905	23.96	23.98	23.988	23.958	23.951	23.912	23.852	23.865	23.776	23.794	23.737	23.772			23.79		
Rec.#	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30				720	
Data[%]	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100					100
STD	0.649	0.634	0.602	0.607	0.667	0.634	0.631	0.659	0.585	0.595	0.68	0.714	0.692	0.684	0.684	0.692	0.688	0.623	0.711	0.661	0.723	0.661	0.721	0.703					

7. Once these reports have been reviewed and confirmed by e-log comparison(s) as well as Section 5.1 Tables 2, 3, and 4, then we are ready to view the Edited data tables and to Validate them if correct.

8. To start the Edit process, go to the Edit tab on the upper scroll of Envista and select Edit table tab and populate the following box:



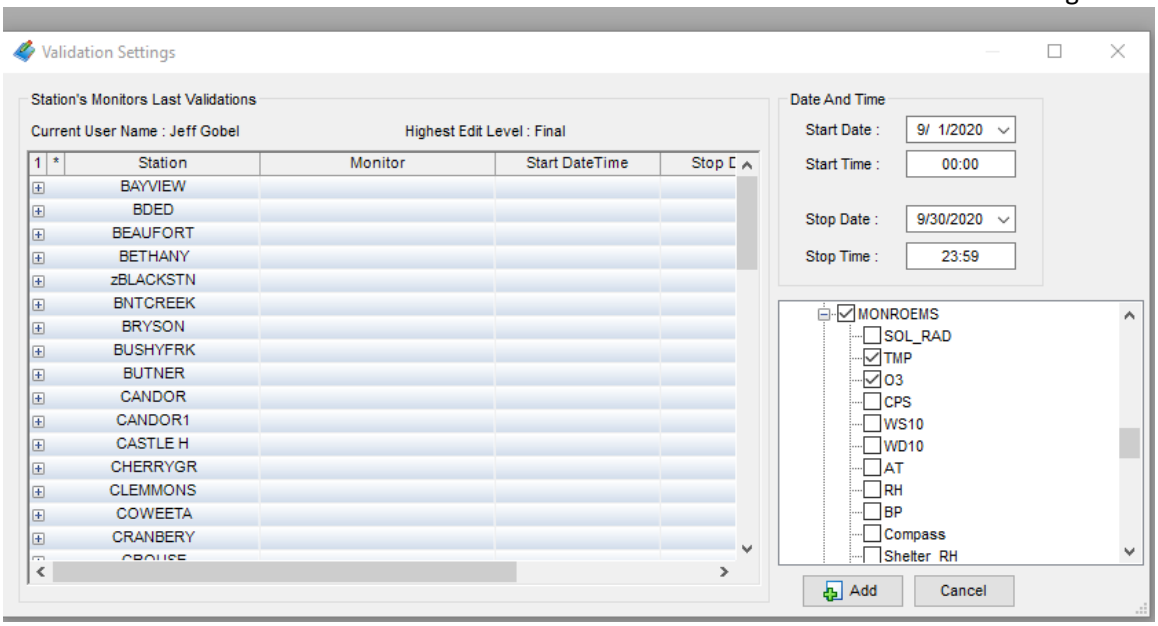
The output will result in a table (with comments if applicable) as below:

Edit Table: MONROEMS Monthly: 9/1/2020 12:00 AM - 9/30/2020 11:00 PM

Date & Time	TMP	Status	O3	Status
	[DEGC]		[ppb]	
9/1/2020 12:00 AM	23.219	- Ok	7	- Ok
9/1/2020 1:00 AM	23.136	- Ok	6	- Ok
9/1/2020 2:00 AM	23.184	- Ok	3	- Ok
9/1/2020 3:00 AM	23.138	- Ok	125	**BF - Calib
9/1/2020 4:00 AM	23.043	- Ok	4	- Ok
9/1/2020 5:00 AM	23.171	- Ok	4	- Ok
9/1/2020 6:00 AM	23.158	- Ok	8	- Ok
9/1/2020 7:00 AM	23.305	- Ok	12	- Ok
9/1/2020 8:00 AM	23.255	- Ok	14	- Ok
9/1/2020 9:00 AM	23.561	- Ok	15	- Ok
9/1/2020 10:00 AM	23.336	- Ok	19	- Ok
9/1/2020 11:00 AM	23.178	- Ok	21	- Ok
9/1/2020 12:00 PM	23.354	- Ok	25	- Ok
9/1/2020 1:00 PM	23.434	- Ok	29	- Ok
9/1/2020 2:00 PM	23.517	- Ok	32	- Ok
9/1/2020 3:00 PM	23.6	- Ok	32	- Ok
9/1/2020 4:00 PM	23.64	- Ok	32	- Ok
9/1/2020 5:00 PM	23.591	- Ok	30	- Ok
9/1/2020 6:00 PM	23.306	- Ok	25	- Ok
9/1/2020 7:00 PM	23.233	- Ok	18	- Ok
9/1/2020 8:00 PM	23.276	- Ok	15	- Ok
9/1/2020 9:00 PM	23.325	- Ok	11	- Ok
9/1/2020 10:00 PM	23.229	- Ok	13	- Ok
9/1/2020 11:00 PM	23.274	- Ok	14	- Ok
9/2/2020 12:00 AM	23.348	- Ok	19	- Ok
9/2/2020 1:00 AM	23.145	- Ok	29	- Ok
9/2/2020 2:00 AM	23.148	- Ok	24	- Ok
9/2/2020 3:00 AM	23.11	- Ok	125	**BF - Calib
9/2/2020 4:00 AM	23.1	- Ok	8	- Ok
9/2/2020 5:00 AM	23.391	- Ok	5	- Ok
9/2/2020 6:00 AM	23.113	- Ok	3	- Ok
9/2/2020 7:00 AM	23.242	- Ok	6	- Ok

9. This Table will be reviewed for the entire month for any discrepancies with the aforementioned Tables and updated if anything is coded incorrectly or if any comments need to be added or edited. Sometimes if anomalies occur, then 'minute' data will be downloaded and reviewed and corrected similarly. Once all data are reviewed and edited (if necessary) then the final step is to Validate the data (Level 3 Validation)

10. Final Level 3 Validation is achieved by going to the Edit tab on the upper scroll bar of Envista and selecting Validation Settings Action box. This will generate the following control box to populate:

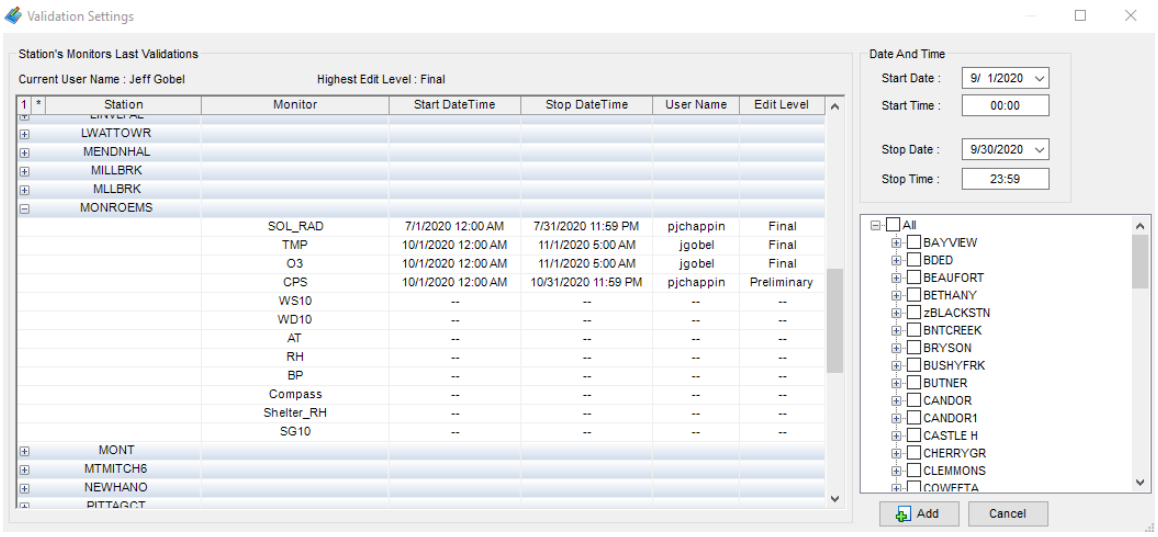


The reviewer must

- set the **Start Date** and **Time (00:00)**
- set the **Stop Date** and **Time (23:59)** (Envidas/Envista will no**t** auto populate or correct either of these items).
- Check the site in the right-side box
- Check which parameters you are validating (In this case its Monroe for TMP and O_3.)
- Proceed to the **Add box** and <u>press it</u> to activate.

A message will pop up and you will answer Yes to *activate the Validation*. A prompt will notify you when completed. It is a good idea to check that the site validated by clicking on it in the left-hand box and open it and confirm that it validated correctly. You are now finished with Validating at Level 3.

The confirmation report should look like this screen shot:



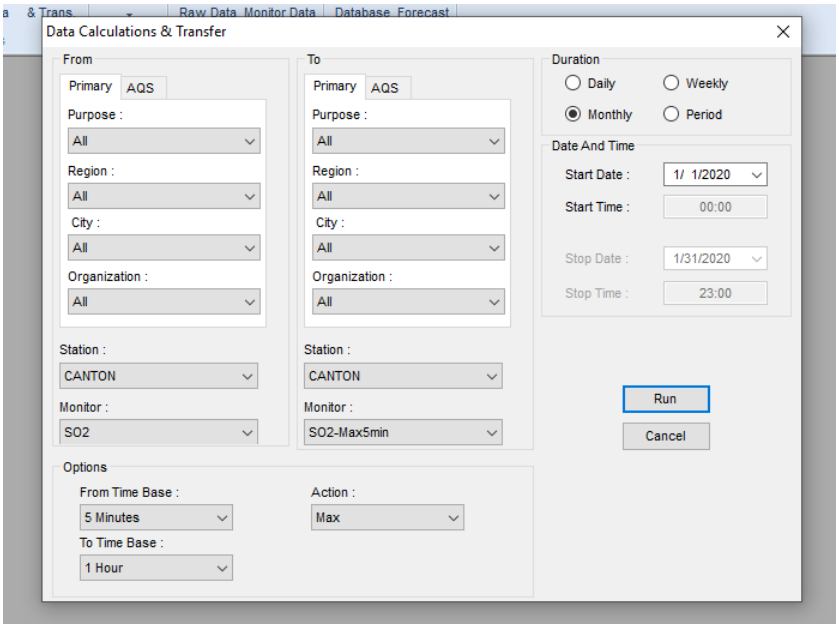
5.2 Sulfur Dioxide

The following steps represent the current approach to the data validation (Level 3 Review) process.

5.2.1 5-minute SO_2 Maximum Instructions

Until an automated process can be established, the RCO chemist will produce the 5-minute maximum values for each SO_2 site at the end of each month. These values will be produced by Envista ARM using its calculation functions and using data collected on the "SO2" Channel. These calculations will be placed in the "SO2-Max5min" channel. Since the process is manually initiated, it is important to note that the "SO2-Max5min" channel will contain no values until the calculation has been run. This process is described below:

1. In Envista ARM, Open the Edit Menu and Select "Data Calc and Trans"
2. On the dialog window that appears:
   - In the *From* area, select the station and "SO2" channel.
   - In the *To* area select the station and "SO2-Max5min" channel.
   - For the *From* Time Base box, select "5 Minutes."
   - For the *To* Time Base Box, select "1 Hour."
   - Select the Action as "Max"
   - Enter the date range for the calculation and click Run. (See Below)



NOTE: To prevent data entry errors, the RCO chemist should always double-check the information entered on this dialog window before clicking Run.

3. A Warning box will appear, select 'Yes' to continue
4. A final window will appear showing the progress of the calculation's completion. When that window displays the message 'Finish' close that window and proceed to validate the data following the same procedure as for hourly data.

5.2.2 Uploading Automated SO_2 PZS checks to AQS

Every night, a PZS runs to determine if the SO_2 Analyzer is running within specifications. Each month, the RCO statistician generates an excel file that contains the PZS checks for each site for the previous month. The RCO chemist will then use this file to validate the PZS checks, use Envista to add any missing PZS checks, add null codes where appropriate, and add comments where appropriate. This process is described below:

1. On the P drive, the precision data file is located at \\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\PUB\RegOffices.NC\Monthly Airs Output\INBOX\Envista.

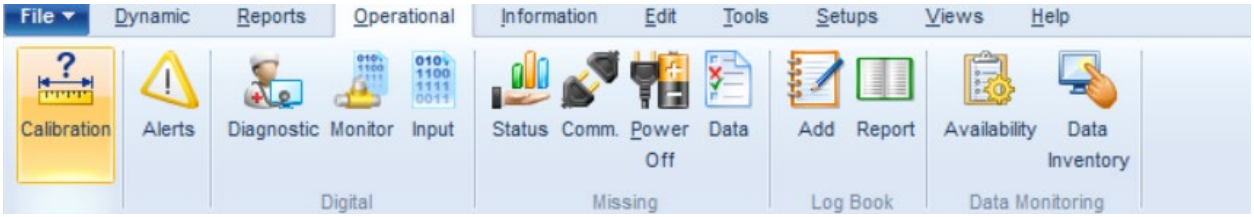
2. Choose the folder titled with the appropriate year. Then select the folder titled Precision. The file will be named following the nomenclature of 'XXX 2020_SO2_prec_1' where 'XXX' is the three-letter abbreviation for the month of interest. Open that file.

3. For each site, look for any missing PZS data. An example is seen below:

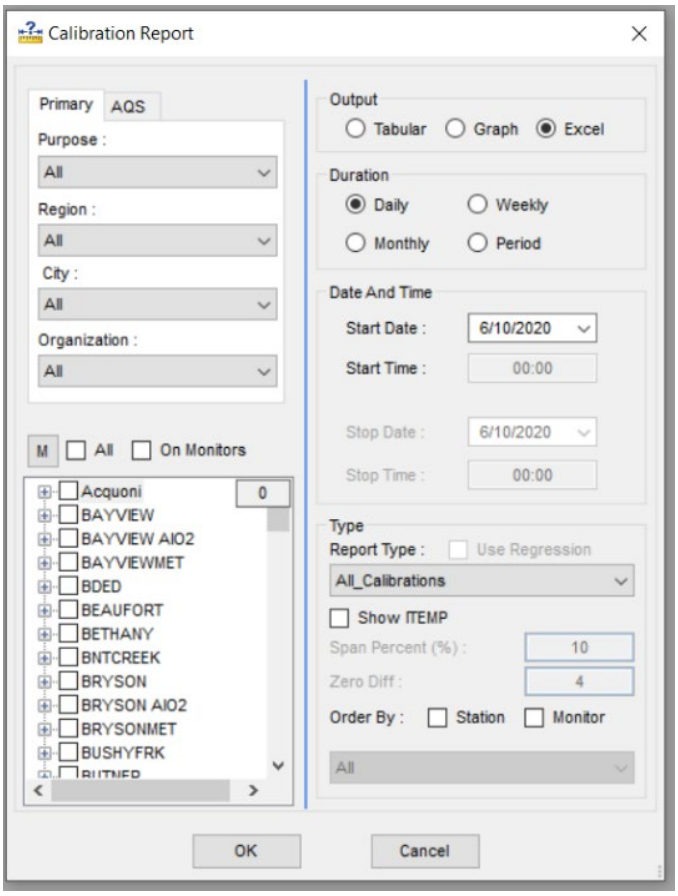
SO2 Daily Auto-Calibration Check and Precision Point Analysis							Comparison to Expected			Temp. Range	Temp. Control	Comment	Temperature		StDev	Null Code		Comments
	Monitor (ppb)			Expected Value (ppb)														
Date	Zero	Span_1	Span	Zero	Span_1	Span	Zero	Span_1	Span	20 ÷ 30°C			Tmin	Tmax		Span1 (Pr)	Zero Span	
4/1/2020	0.1	20.6	403.5	0	20	400.0	Pass	Pass	Pass	Pass	Pass		25.4	28.0	0.8			
4/2/2020	0.1	20.6	402.8	0	20	400.1	Pass	Pass	Pass	Pass	Pass		25.4	27.8	0.6			
4/3/2020	0.1	20.6	401.7	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.1	28.1	0.5			
4/4/2020	0.4	20.5	401.7	0	20	399.8	Pass	Pass	Pass	Pass	Pass		25.8	28.3	0.6			
4/5/2020	0.3	21.1	406.5	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.7	28.4	0.5			
4/6/2020	0.2	20.9	408.0	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.7	28.5	0.6			
4/7/2020	0.0	21.2	404.2	0	20	400.1	Pass	Pass	Pass	Pass	Pass		26.4	28.5	0.6			
4/8/2020	0.0	20.7	407.4	0	20	400.1	Pass	Pass	Pass	Pass	Pass		26.5	27.9	0.4			
4/9/2020	0.2	20.7	405.5	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.6	28.2	0.5			
4/10/2020	-0.1	20.6	404.7	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.0	28.3	0.5			
4/11/2020	-0.1	20.5	402.6	0	20	400.2	Pass	Pass	Pass	Pass	Pass		24.2	28.3	1.5			
4/12/2020	0.3	20.7	401.8	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.7	28.0	0.3			
4/13/2020	-0.1	20.5	404.4	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.8	28.0	0.3			
4/14/2020	-0.1	20.8	405.5	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.7	28.4	0.5			
4/15/2020	0.0	20.6	403.8	0	20	400.1	Pass	Pass	Pass	Pass	Pass		25.7	28.3	1.0			
4/16/2020										Pass	Pass		26.2	28.9	0.6			
4/17/2020	0.1	20.7	403.0	0	20	400.4	Pass	Pass	Pass	Pass	Pass		24.7	28.1	1.0			
4/18/2020	0.1	21.0	404.1	0	20	400.0	Pass	Pass	Pass	Pass	Pass		27.4	28.6	0.3			
4/19/2020	0.4	20.9	406.7	0	20	400.2	Pass	Pass	Pass	Pass	Pass		24.8	28.7	1.1			
4/20/2020	0.0	20.8	405.0	0	20	400.0	Pass	Pass	Pass	Pass	Pass		27.3	28.7	0.4			
4/21/2020	0.1	20.8	405.4	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.9	28.4	0.4			
4/22/2020	-0.2	20.5	402.4	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.3	28.2	0.6			
4/23/2020	0.2	20.6	401.8	0	20	400.1	Pass	Pass	Pass	Pass	Pass		27.2	28.0	0.3			
4/24/2020	0.1	20.8	404.6	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.5	27.5	0.3			
4/25/2020	-0.1	20.3	406.0	0	20	400.0	Pass	Pass	Pass	Pass	Pass		27.2	28.1	0.3			
4/26/2020	0.0	20.6	404.7	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.7	28.0	0.4			
4/27/2020	0.0	20.7	405.2	0	20	399.9	Pass	Pass	Pass	Pass	Pass		26.7	27.9	0.3			
4/28/2020	0.2	20.8	404.9	0	20	400.3	Pass	Pass	Pass	Pass	Pass		25.3	27.5	0.6			
4/29/2020	0.3	20.5	404.0	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.6	27.9	0.4			
4/30/2020	0.0	20.5	405.4	0	20	400.0	Pass	Pass	Pass	Pass	Pass		26.9	28.2	0.4			

4. The RCO chemist will then have to determine if a valid PZS ran that day. To find if this check did run:

   - Open Envista, select the Operational menu, and select the calibration button.



   - Find the site of Interest, select the SO_2 channel, select excel as the output, select the day of interest, and then select All_Calibrations as the report type. Click on OK.



- From the excel file generated, copy the values from the Ref column and put them in the P drive's excel file in the appropriate cells located under the header labeled Expected Value (ppb).
- Then from the excel file generated, copy the values from Meas column and put them in the P drive's excel file in the appropriate cells located under the header labeled Monitor (ppb).
- The RCO chemist should then double-check if the check passed. For the Zero, Span_1, and Span, type in Pass into the appropriate cells under Comparison to Expected.
- To be more transparent, any checks changed or added on the P drive's spreadsheet should be marked by changing the background of altered cells to Blue.

5. For each check, determine if there are any invalid checks by comparing to the raw data, e-logs, and comments in Envista. Apply the appropriate null code to each check that is invalid on the row for that day and under the Null Code columns. If the Precision is null coded, the Zero Span should be coded as well and vice versa. Add a comment under the column named 'Comments'. This comment will be applied to the Precision and Zero Span for that day.

6. Repeat for each site.

7. When finished in excel, select file and then Save As. In the same file location save the file as 'XXX 2020_SO2_prec_1_YYY' where 'XXX' is the three-letter abbreviation for the month of interest and 'YYY' is your initials.

8. Then an email should be sent to the RCO statistician or Database Manager to inform him or her that the PZS checks for that month should be ready to upload.

5.2.3 Uploading Manual Performance Checks to AQS

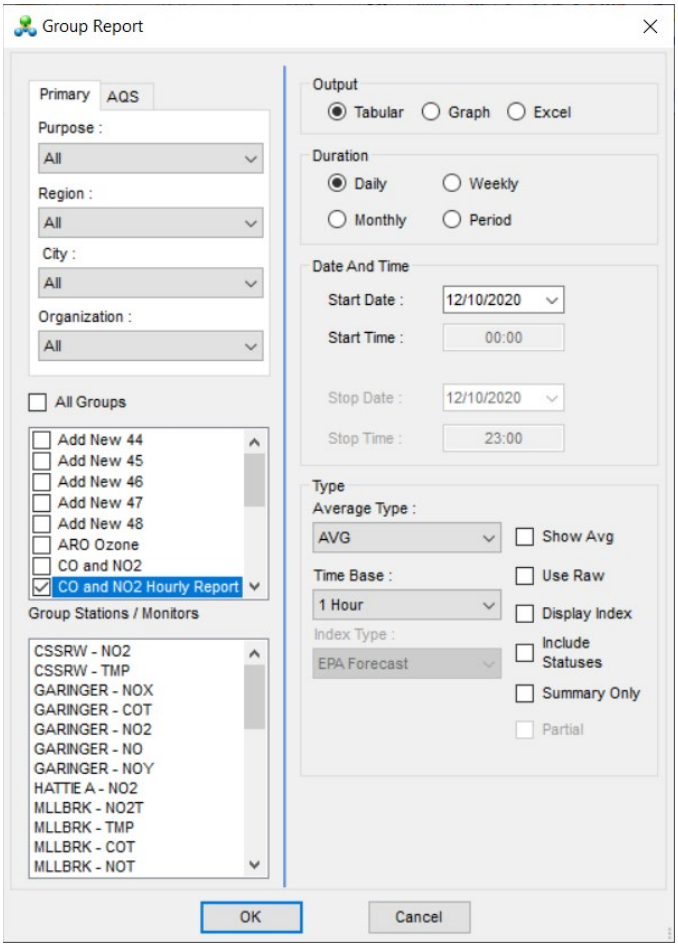
Occasionally, an operator may have to run a manual performance check to provide weight of evidence. These AQS codes are generated in the SO_2 e-log. Verify that the site information is correct and then copy the AQS code from the AQS tab in the SO_2 e-log. Paste this code or codes into a notepad file and then place this file on the P drive at: \\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\PUB\RegOffices.NC\AQS\Manual Upload Files. Then send an email to the database manager to inform him or her that the manual performance checks are ready to upload.

5.3 Nitrogen Dioxide (NO_2) and Total Reactive Oxides of Nitrogen (NOT/NOyT)

The following steps represent the current approach to the data validation (Level 3 Review) process.

5.3.1 Daily Data and Review Spreadsheets

The RCO chemist maintains a daily data spreadsheet monthly which contains NO, NO_2 and NOx, true NO_2, and trace-level nitric oxide (NOT), the difference between NOyT and NOT (NO2T) and NOyT observations as well as shelter temperature for the previous 24-hour period. The data can be generated by running a group report (CO and NO_2 Hourly Report) or by running a Multi-Station Report, selecting the sites and parameters of interest.



These spreadsheets are used to compile the daily review spreadsheet which contain minimum, maximum, average values and number of observations for each site. Any site or parameter that does not have the

expected 23 – 24 hours of values is highlighted for that specific day. The daily data spreadsheet is reviewed again to determine which hours are missing or if the monitors were off-line. Missing hours are noted on the daily review spreadsheet. The daily data and review spreadsheets are also reviewed for any atypical values, values that repeat and trends. Comments may be added to the daily review spreadsheets when reviewing e-logs. These comments aide in the validation process by being reminders of dates and time that need additional review.

5.3.2 Daily Diagnostic Check Tracking Charts

The RCO chemist maintains tracking charts for each site and monitor. These charts compare the "expected" with the "measured" values obtained during each nightly diagnostic check. Conditional formatting is used to highlight any out-of-range values. Using these tracking charts, monitor drift or sudden changes in the monitor's response can be detected. When needed, follow-up emails may be sent to the Operator, Regional Monitoring Coordinator or ECB for clarity or discussion.

5.3.3 Review of E-logs

Follow the guidance as listed in Section 4.0 Data Validation (Level 3 Review) Steps - General Step 5 listed above and record helpful comments in the daily review spreadsheets for later reference during the validation process. Record the results of Precision Checks, filter changes, audit, replacement of equipment or other occurrences on a System Audit form (created by this RCO chemist).

5.3.4 Monthly Validation of Multi-Pollutant Monitors

During validation of the NO-NO_2-NOx and the NO2T-NOT-NOyT data make sure that the hours voided are the same for each.

5.3.5 Uploading Manual Performance Checks to AQS (Quarterly)

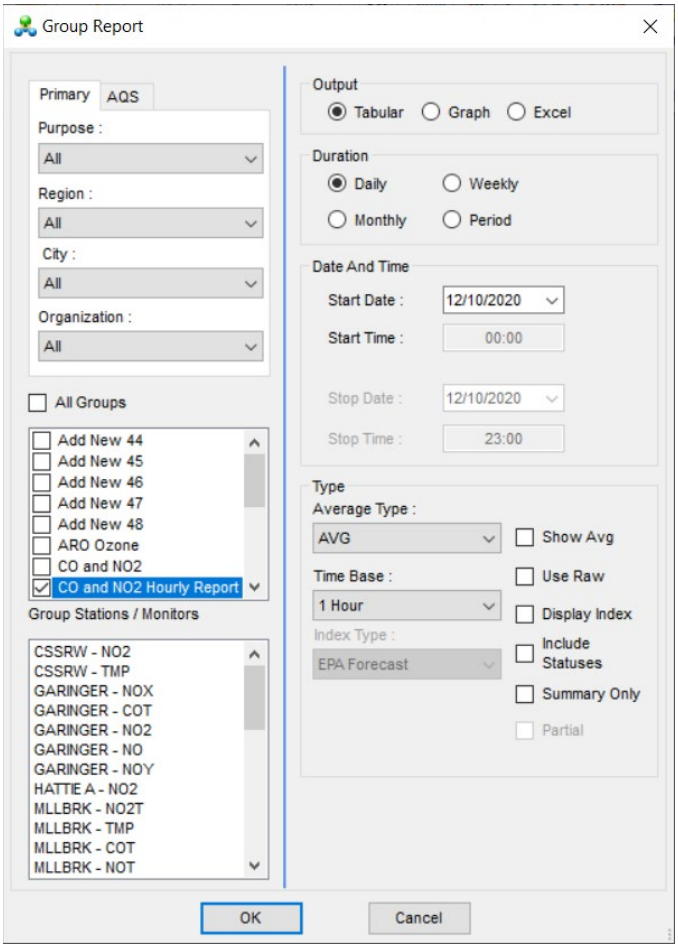
Every 14 days or less, Operators are required to run a manual performance check which consists of at least a precision point, a zero and a span. The results of the precision point are entered onto an AQ98 form. which is completed by the site Operator and reviewed by the Regional Monitoring Coordinator. These files can be found on the P drive at:
\\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\Incoming\RegOffices.NC\
in the Regional Office folder and AQ98 folder. The RCO chemist reviews the AQ98 forms for accuracy and completeness. Using the VSV tab, save the AQ98 form as a .txt file. Using the QA Transaction Generator, 'import' the .txt file. Once the data has been populated, all files should be green for each precision point. Click 'generate' and save the file as 'QA-1PtQC-XXXX-Q#-2020-YYY-ZZ aaa where 'XXXX' is the year, '#' is the quarter, 'YYY' is the regional office abbreviation, 'ZZ' is the two-letter abbreviation of the pollutant and 'aaa' is your initials on the P drive at:
\\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\PUB\RegOffices.NC\AQS\Manual Upload Files. Notify the database manager that the manual performance checks are ready to upload to AQS.

5.4 Carbon Monoxide

The following steps represent the current approach to the data validation (Level 3 Review) process.

5.4.1 Daily Data and Review Spreadsheets

The RCO chemist maintains a daily data spreadsheet monthly which contains CO observations as well as temperature for the previous 24-hour period. The data can be generated by running a group report (CO and NO_2 Hourly Report) or by running a Multi-Station Report by selecting the sites and parameters of interest.



These spreadsheets are used to compile the daily review spreadsheet which contain minimum, maximum, average values, and number of observations for each site. Any site or parameter that does not have the expected 23 – 24 hours of values is highlighted for that specific day. The daily data spreadsheet is reviewed again to determine which hours are missing or if the monitor was off-line. Missing hours are noted on the daily review spreadsheet. The daily data and review spreadsheets are also reviewed for any atypical values, values that repeat and trends. Comments may be added to the daily review spreadsheets when reviewing e-logs. These comments aide in the validation process by being reminders of dates and time that need additional review.

5.4.2 Daily Diagnostic Check Tracking Charts

The RCO chemist maintains tracking charts for each site and monitor. These charts compare the “expected” with the “measured” values obtained during each nightly diagnostic check. Conditional formatting is used to highlight any out-of-range values. Using these tracking charts, monitor drift or sudden changes in the monitor’s response can be detected. When needed follow-up emails may be sent to the Operator, Regional Monitoring Coordinator or ECB for clarity or discussion.

5.4.3 Review of E-logs

Follow the guidance, as listed in Section 4.0 Data Validation (Level 3 Review) Steps - General Step 5 listed above, and record helpful comments in the daily review spreadsheets for later reference during the validation process. Record the results of Precision Checks, filter changes, audit, replacement of equipment or other occurrences on a System Audit form (created by this RCO chemist).

5.4.4 Uploading Manual Performance Checks to AQS (Quarterly)

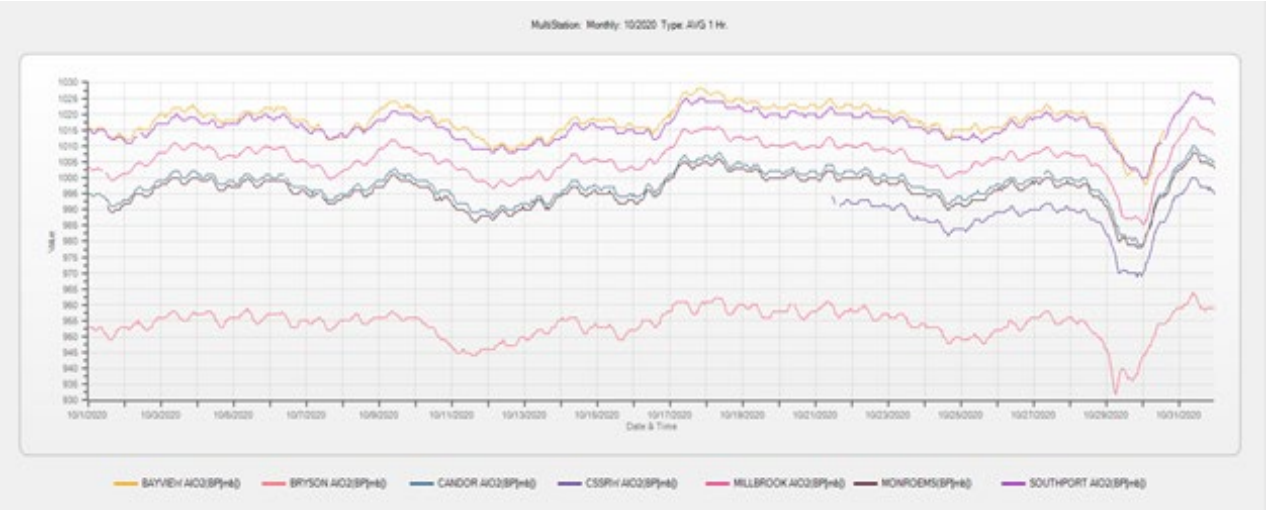
Every 14 days or less, Operators are required to run a manual performance check which consists of at least a precision point, a zero and a span. The results of the precision point are entered onto an AQ98 form, which is completed by the site Operator and reviewed by the Regional Monitoring Coordinator. These files can be found on the P drive at:
\\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\Incoming\RegOffices.NC\
in the Regional Office folder and AQ98 folder. The RCO chemist reviews the AQ98 forms for accuracy and completeness. Using the VSV tab, save the AQ98 form as a .txt file. Using the QA Transaction Generator, 'import' the .txt file. Once the data has been populated, all files should be green for each precision point. Click 'generate' and save the file as 'QA-1PtQC-XXXX-Q#-2020-YYY-ZZ aaa where 'XXXX' is the year, '#' is the quarter, 'YYY' is the regional office abbreviation, 'ZZ' is the two-letter abbreviation of the pollutant and 'aaa' is your initials on the P drive at:
\\edc-nasvm01.eads.ncads.net\AQ\daq0336fs01\Group\Ambient\PUB\RegOffices.NC\AQS\Manual Upload Files. Notify the database manager that the manual performance checks are ready to upload to AQS.

5.5 Meteorological Data

Meteorological measurements have a unique challenge in that there is no way to verify the accuracy of their measurements daily with a precision check like the criteria pollutants. Instead, DAQ uses a weight of evidence approach to validating these parameters. Since Meteorological measurements are interconnected, they can be used together by the RCO Chemist to tell a reliable series of events supported by each different parameter. For this reason, these parameters should be validated together. The following steps represent the current approach to the data validation (Level 3 Review) process.

5.5.1 All In One Data (Wind Speed and Direction, Ambient Temperature, Barometric Pressure and Relative Humidity)

- Begin by selecting a multi-station report with all the barometric pressure readings across the state for a period of at least a month. Select to see the data as a graph.
- Observe the trend of the sites. Each site should produce a trend line of a similar shape. Sites located in the mountains should have the lowest values and sites near the coast should have the highest value. Look for aberrant peaks and dips in individual sites and investigate.



- Once all aberrant peaks and dips have been accounted for by invalidating or flagging with a QX qualifier, close the multi-station report.
- Open a station report for a station that is to be specifically validated for. Select the Compass parameter and ensure that common readings do not deviate by more than +/- 2 over a 24-hour period. If the readings do, invalidate the hours when the readings are not stable for wind speed, wind direction, and sigma. If the readings are not stable, the instrument either has a malfunctioning compass or the instrument is not mounted soundly on its tower on site. In either case, readings for that period are unreliable.
- Open a station report for barometric pressure and a station report for wind direction for a particular site. Select to see the data of both reports as a graph.

- Look for instances where barometric pressure drops. Wind direction should produce a constant change during that time as it indicates a front moving past the site. For aberrant changes in wind direction during those events, flag the data with a QX qualifier.
- Close the station report for wind direction and open a report for wind speed at the site.

- Compare barometric pressure with wind speed. As pressure decreases, an increase in wind speed should be observed. For aberrant changes in wind speed during those events, check nearby weather stations (via https://www.wunderground.com). If nearby weather stations do not show similar wind speeds, flag the data with a QX qualifier.
- Close the barometric pressure report and open a station report for ambient temperature. Look for periods of large temperature change. During such events, wind speed should increase. For periods that this is not true, check nearby weather stations (via https://www.wunderground.com). If nearby weather stations do not show similar wind speeds, flag the data with a QX qualifier.

- Close the report for station report for ambient temperature and open back up the station report for wind direction. As wind speed increases, there should be a change in wind direction. As wind speed decreases there should be little change in wind direction. For events where this is not observed, flag the wind direction data with a QX qualifier.

- Close both the wind direction report and wind speed report. Then open a report with a criteria pollutant, wind speed, wind direction, and sigma. Select to view the report as a table.
- Compare the criteria pollutant with Wind Speed and if the site is near a point source of that pollutant, compare it with wind direction. With high wind speed, there should be generally higher readings of pollutants. If near a point source of pollutants, there should be higher readings of that pollutant when the wind direction comes from that source. For extended periods where this is not true, the wind speed and/or wind direction data should be flagged with a QX qualifier.
- Scroll though the data to look for missing data or coded data for wind speed, wind direction, and sigma. If wind speed is invalid, invalidate wind direction and sigma. If wind direction is invalid, invalidate wind speed and sigma. If sigma is missing, calculate the value from minute data for wind direction.
- Close all open reports.

5.5.2 Checking All In One Precision and Bias

While it is encouraged that meteorological data's precision and bias be reviewed as often as possible, a site is only formally audited every six months or twice a year with another All In One Device. Some sites will have a CTS AIO2, which will be a secondary AIO2 located at the site for purposes of verification only. For sites collocated with a CTS AIO2, the RCO Chemist should compare All In One Devices to the CTS AIO2 at least once a season for a period of at least a month. The RCO Chemist should follow the below steps:

5.5.2.1 Wind Speed Checks

- Compare wind speeds for the All In One versus wind speeds for the CTS AIO2. Disregard all wind speeds for either device less than 1 meter per second and greater than 10 meters per second. Calculate the coefficient of determination (R^2) value and look for an R^2 value equal to or greater than 0.50. If the All In One does not meet this criterion, contact ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the R^2 criteria with the QX qualifier.
- To find the bias for wind speed, take all hours from the step above and find the true difference between the All In One's values from the CTS AIO2's. Then take the average of those values. If the average calculated is not less than or equal to 1 meter per second, contact the ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the bias criteria with the QX qualifier.

- To find the precision for wind speed, take the standard deviation of all the subtracted values calculated above. If the standard deviation of the wind speed is not equal to or less than 0.5 meters per second, contact the ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the precision criteria with the QX qualifier.

5.5.2.2 Wind Direction Checks

- Compare wind directions for the All In One versus wind directions for the CTS AIO2. Only compare wind directions for values between 50 to 300 degrees and for hours with wind speeds between 1 to 10 meters per seconds. Calculate the R^2 value and look for an R^2 value equal to or greater than 0.95. If the All In One does not meet this criterion, contact ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the R^2 criteria with the QX qualifier.
- To find the bias for wind direction, take all hours from the step above and calculate the true difference in wind direction of the All In One device from the CTS AIO2. Then take the average of the true differences. If the average calculated is not equal or less than 10 degrees, contact the ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the bias criteria with the QX qualifier.
- To find the precision for wind direction, take the standard deviation of all the true difference in wind direction values calculated above. If the standard deviation of the true differences in wind direction is not equal to or less than 10 degrees, contact the ECB to examine the siting of the All In One and to run an audit of the sensor. If the audit does not pass, flag back to the last time wind speeds passed the precision criteria with the QX qualifier.

5.5.2.3 Ambient Temperature, Relative Humidity and Barometric Pressure Checks

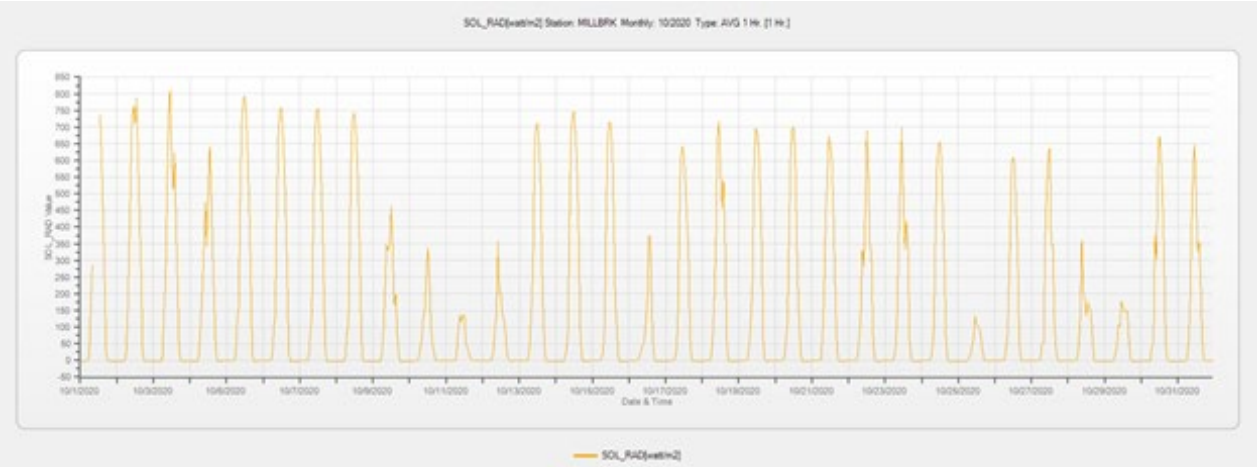
- If available, the RCO Chemist should follow a similar method for ambient temperature, relative humidity, and barometric pressure. The criteria for R^2, precision, and bias are presented below:

Section 5.5 Table 1 Criteria for R^2, Precision and Bias for Meteorological Measurements

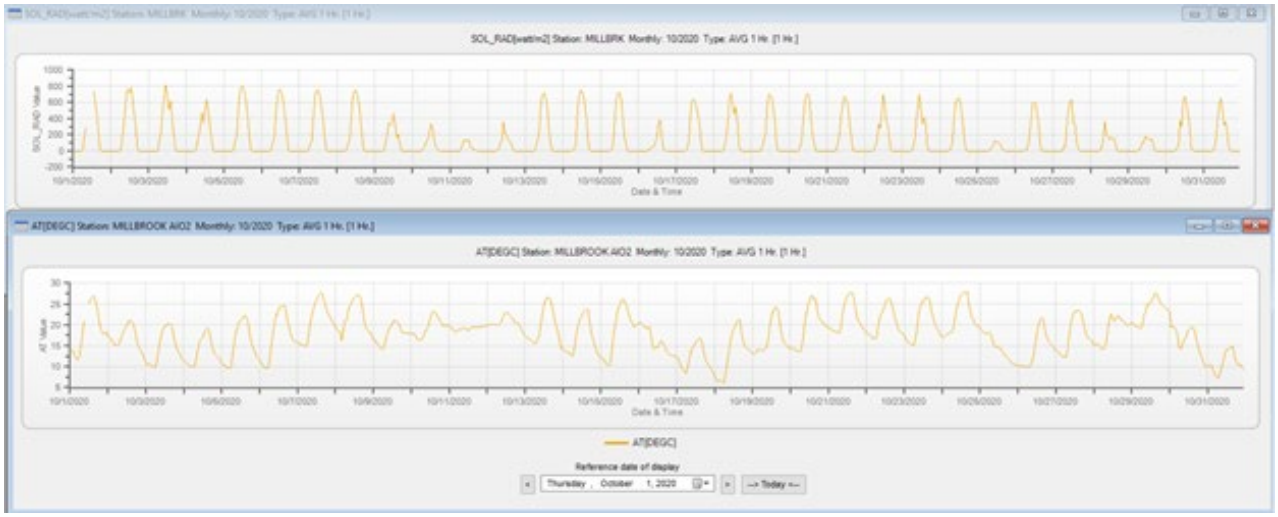
Meteorological Measurement	R^2	Precision	Bias
Ambient Temperature	0.95	0.5°C	0.5 °C
Relative Humidity (RH)	0.95	5%RH	5%RH
Barometric Pressure	0.95	1mb	1mb

5.5.3 Solar Radiation

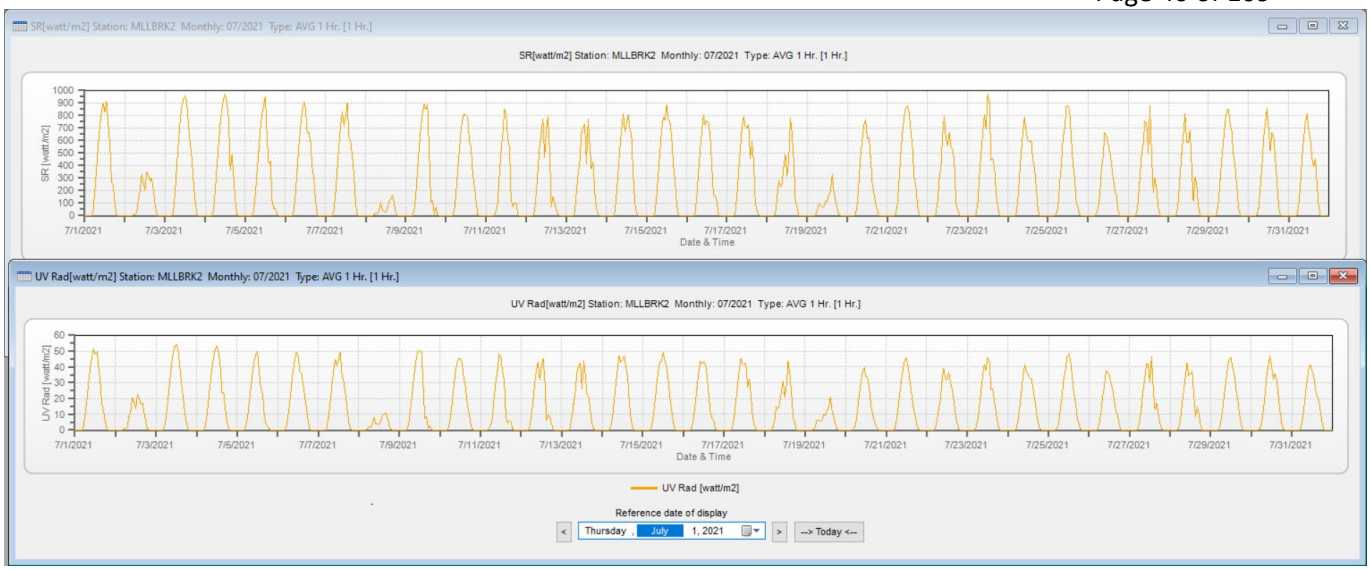
- Open a station report for solar radiation at the site. Select to see the data as a graph.



- Observe the data for near zero values during the night hours and high values during the day. For diminished peaks, check nearby weather stations (via https://www.wunderground.com) to see if that day was overcast. For diminished peaks that are not on cloudy days or aberrantly shaped peaks, flag the data with a QX qualifier.
- Open a station report for ambient temperature. Select to view the data as a graph.



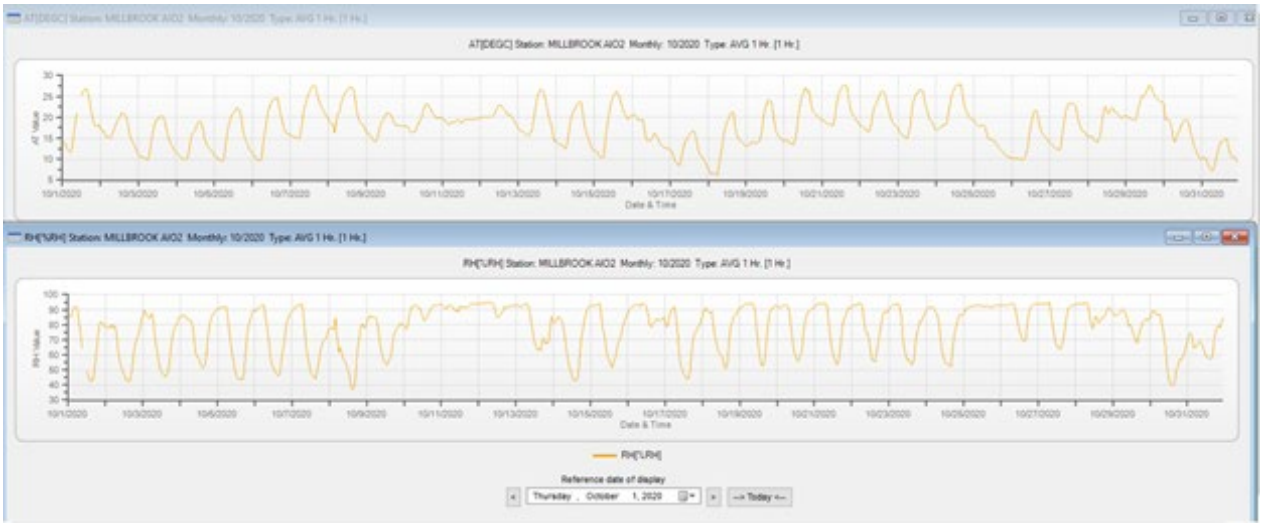
- Compare the ambient temperature with solar radiation. Ambient temperature should trend cooler at night and warmer during the day. For moments that fall outside this trend, check nearby weather stations (via https://www.wunderground.com). For ambient temperature that cannot be reasonably confirmed by nearby weather stations, flag the data with a QX qualifier.
- Close the station report for ambient temperature.
- Open a station report for UV radiation.



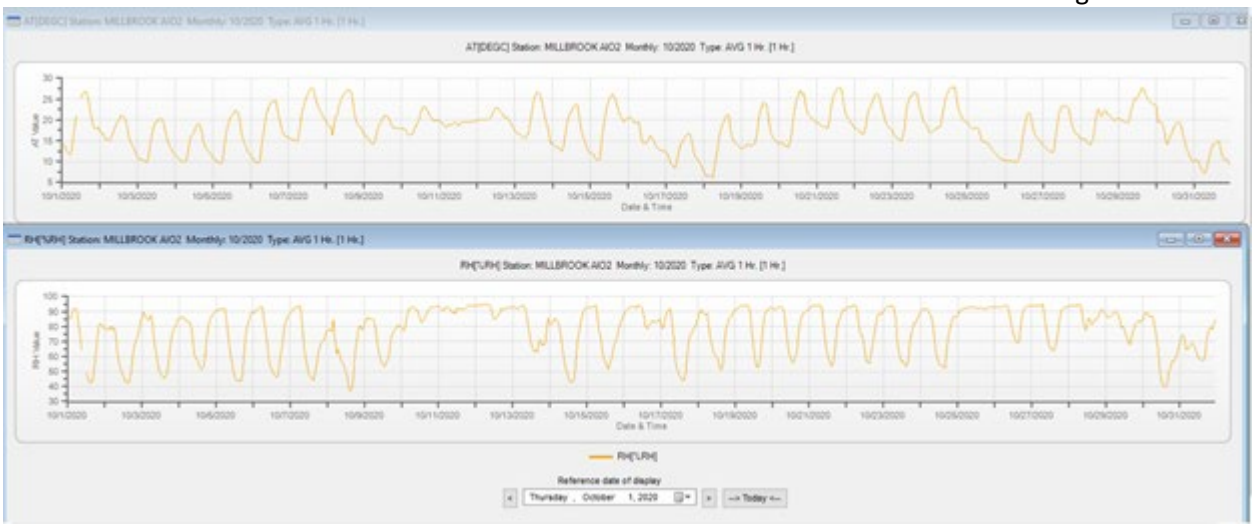
- Compare UV radiation to solar radiation. During the night, values for both parameters should be near zero. During the day, UV radiation should follow a similar trend as solar radiation. During periods of overcast, it is possible to have UV readings that do not match solar radiation. For moments that fall outside this trend, check nearby weather stations (via https://www.wunderground.com). For ambient temperature that cannot be reasonably confirmed by nearby weather stations, flag the data with a QX qualifier.
- Close the station report for solar radiation and UV radiation.

5.5.4 Rain Measurement

- If a station report for ambient temperature is not open, open it. Then open a station report for relative humidity.



- Compare ambient temperature with relative humidity. In general, relative humidity should go down as ambient temperature goes up. For moments where both relative humidity and ambient temperature are high, check nearby weather stations (via https://www.wunderground.com) for a rain event. For such events not explained by rain, flag relative humidity with a QX flag.
- Close the report for ambient temperature and open a station report for rain measurements.



- Compare relative humidity with rain measurements. As rain measurements are observed, relative humidity should increase. For rain measurements that do not show an increase in relative humidity, check nearby weather stations (via https://www.wunderground.com) for a rain event. For such events not explained by rain, flag rain measurements with a QX flag.
- Close all station reports that are open.

5.5.5 Relationships between the various Meteorological Parameters

The following relationships are additional checks that the RCO Chemist can use as weight of evidence. While the RCO Chemists are not required to extensively check these relationships, they are encouraged to do so. This is especially true when it is unclear which parameter to flag when comparing parameters during the normal validation process. In general, should any of the following relationships not hold true, the RCO Chemist should check nearby weather stations (via https://www.wunderground.com) for relative data and flag any data that cannot be reasonably supported by the nearby weather station's data with a QX qualifier. Additional relationships that the RCO Chemist can check include:

- Compare Wind Speed with Relative Humidity. When wind speeds are high, relative humidity should be lower. When wind speeds are low, relative humidity should be higher
- Compare Wind Speed with Solar Radiation. Leading up to and around periods of observed measurements of solar radiation, wind speed should show a general increase. During the night hours when there are near zero measurements of solar radiation, wind speeds should show a general decrease.
- Compare Barometric Pressure with Ambient Temperature. When barometric pressure is high, ambient temperature should read lower. When barometric pressure is low, ambient temperature should read higher.
- Compare Barometric Pressure with Solar Radiation. When barometric pressure is low or decreasing, there is more likely a chance of overcast skies and therefore less solar radiation. When barometric pressure is high or increasing, there is more likely a chance for a clear day and more solar radiation.
- Compare Barometric Pressure with Rain Measurements. When barometric pressure is low or decreasing, there is more likely a chance of rain measurements to be observed. When barometric pressure is high or increasing, there is less likely a chance for rain measurements to be observed.
- Compare Solar Radiation with Rain Measurements. Rain events are more likely to occur when solar radiation reads lower.
- Compare Wind Direction with Ambient Temperature. With greater changes in ambient temperature, a change in wind direction should be observed.

6.0 Independent Accuracy Audit Reporting

Annual performance audits are performed by ECB technicians annually. The DAQ also participates in the EPA Performance Evaluation Program (PEP) and National Performance Audit Program (NPAP) external audit programs.

6.1 ECB Annual Performance Evaluations of Gaseous Monitors

For the gaseous instruments, ECB electronics technicians will perform an annual performance evaluation at least every 365 days and once per calendar year and whenever request by the Ambient Monitoring Section chief, or chief, (except for the background monitors where a performance evaluation is completed every quarter). The evaluations are performed by comparing the analyzer measurements to independent standards or references. The audit concentrations selected for evaluation should include a value at or near the detection limit of the monitor, a value near the level of the NAAQS, and a value that is less than the 99th percentile of the data within the network. Performance evaluations will be conducted using a different gas cylinder and calibrator than what is used to calibrate the monitor and complete the nightly or biweekly QC checks. Performance audits will be conducted by ECB electronics technicians, who are not normally involve in the routine operational activities of the gaseous monitors, using dedicated Quality Assurance (QA) equipment.

6.1.1 Ozone Performance Audit Evaluation Criteria

The O_3 performance audit is a "Pass – Fail" evaluation. The criteria for evaluating the acceptance or failure of the O_3 monitor at a given site are listed in the table below.

Section 6.1 Table 1 Ozone Performance Audit Acceptance Limits

EPA Audit Level	Audit Concentration	Site Monitor
Zero	0	≤ ± 3 ppb
Level 2	15	≤ ± 1.4 ppb
Level 5	70	≤ ± 4.9 ppb
Level 6	100	≤ ± 7 ppb

6.1.2 Sulfur Dioxide Performance Audit Evaluation Criteria

The SO_2 performance audit is a "Pass – Fail" evaluation. The criteria for evaluating the acceptance or failure of the SO_2 monitor at a given site are listed in the table below.

Section 6.1 Table 2 Sulfur Dioxide Performance Audit Acceptance Limits

EPA Audit Level	Audit Concentration	Site Monitor
Zero	0	≤ ± 1.5 ppb
Level 1	2.5	≤ ± 1.5 ppb
Level 4	20 or 50	≤ ± 15.0%
Level 6	75	≤ ± 15.0%

6.1.3 Nitrogen Dioxide

The NO_2 performance audit is a "Pass – Fail" evaluation. The criteria for evaluating the acceptance or failure of the NO_2 monitor at a given site are listed in the table below.

Section 6.1 Table 3 Nitrogen Dioxide Performance Audit Acceptance Limits

EPA Audit Level	NO/NOx Audit Concentration	NO_2 Audit Concentration	Site Monitor
Zero	0	0	< ± 1.5 ppb or < ± 15.1 %
Level 1	2.5	2.5	< ± 1.5 ppb or < ± 15.1 %
Level 5	40	25	< ± 15.1 %

Section 6.1 Table 3 Nitrogen Dioxide Performance Audit Acceptance Limits

EPA Audit Level	NO/NOx Audit Concentration	NO_2 Audit Concentration	Site Monitor
Level 6	N/A	100	< ± 15.1 %
Level 7	160	N/A	< ± 15.1 %

6.1.4 Total Reactive Oxides of Nitrogen (NOT/NOyT)

The Total Reactive Oxides of Nitrogen performance audit is a "Pass – Fail" evaluation. The criteria for evaluating the acceptance or failure of the Total Reactive Oxides of Nitrogen and NO monitor at a given site are listed in the table below.

Section 6.1 Table 4 Reactive Oxides of Nitrogen Performance Audit Acceptance Limits

Audit Level	NOT/NOyT Audit Concentration	Site Monitor
Zero	0	< ± 1.5 ppb or < ± 15.1 %
Level 2	4	< ± 1.5 ppb or < ± 15.1 %
Level 5	22	< ± 15.1 %
Level 7	160	< ± 15.1 %

6.1.5 Carbon Monoxide

The Carbon Monoxide performance audit is a "Pass – Fail" evaluation. The criteria for evaluating the acceptance or failure of the Carbon Monoxide monitoring site are listed in the table below.

Section 6.1 Table 5 Carbon Monoxide Performance Audit Acceptance Limits

Audit Level	Audit Concentration	Site Monitor
Zero	0	< ± 30 ppb
Level 2	190	< ± 30 ppb or < ± 15.1 %
Level 4	1000	< ± 15.1 %
Level 5	3900	< ± 15.1 %

6.1.6 Processing of Performance Evaluation Reporting Forms

The detailed procedures for processing the performance evaluation forms are described in Appendix C: Detailed Procedures for Processing Performance Evaluation Documentation. In summary, the forms are transferred from the ECB supervisor to the Project and Procedures Branch (PPB) supervisor. The forms are reviewed and evaluated by the PPB staff, who sign off on them. The signed forms are scanned and archived in IBEAM. The scanned forms are also emailed to the supervisor of the operator and the regional monitoring coordinator with a summary of the results. The person reviewing and signing off on the form also creates transaction files of the audit results and transfers those forms to the database manager to upload into AQS.

6.2 External Agency Audits

The EPA defines a performance evaluation as a type of audit in which an independent party obtains the quantitative data generated in a measurement system and compares it with routinely obtained data to evaluate the proficiency of the site operator. The DAQ participates in the NPAP which only includes the regulatory monitors used for NAAQS determinations. Information on the NPAP is available at https://www.epa.gov/amtic/national-performance-audit-program-npap-gaseous-monitoring.

6.3 Meteorological Sensor Checks

The quality assurance regime for the meteorological sensors is described in Section 9.0 Accuracy Audits of SOP DAQ-07-003.1. The accuracy, precision and functionality of the meteorological sensor equipment will be evaluated using the collocated transfer standard (CTS) method described in Section 5.2 of SOP DAQ-07-003.1. The CTS check is required once a calendar year and every 365 days except for at Millbrook where the sensors should undergo a CTS check twice a calendar year and every 182 days. More frequent CTS checks are encouraged. The criteria for evaluating the acceptance or failure of the meteorological sensor equipment are listed in the table below. The DAQ follows the guidelines as detailed in the QA Handbook for Meteorological Measurements, available at: https://www.epa.gov/sites/default/files/2021-04/documents/volume_iv_meteorological_measurements.pdf

Section 6.3 Table 1 CTS Control Limits:[a]

	Wind Speed	Wind Direction	Ambient Temperature	Pressure	Relative Humidity
Average Difference (Bias)	±1.0 m/s	±10.0°	±0.50 °C	±2.0 hPa	±5.0%
Standard Deviation (Precision)	±0.5 m/s	±10°	±0.25 °C	±1.0 hPa	±2.5%

[a] These CTS Control limits were derived through CTS studies performed by DAQ

7.0 Calibration (Precision) Check Reporting

The following sections cover calibration (precision) check reporting procedures which are unique to a specific pollutant. The following steps represent the current approach to calibration (precision) check reporting (Level 3 Review) process.

7.1 Ozone

See Section 5.1.2 of this SOP for procedures used to upload automated PZS checks to AQS.

7.2 Sulfur Dioxide

See Section 5.2.2 of this SOP for procedures used to upload automated PZS checks to AQS and Section 5.2.3 of this SOP for procedures used to upload manual performance checks to AQS.

7.3 Nitrogen Dioxide and Total Reactive Oxides of Nitrogen (NOT/NOyT)

See Section 5.3.5 of this SOP for procedures used to upload manual performance checks to AQS.

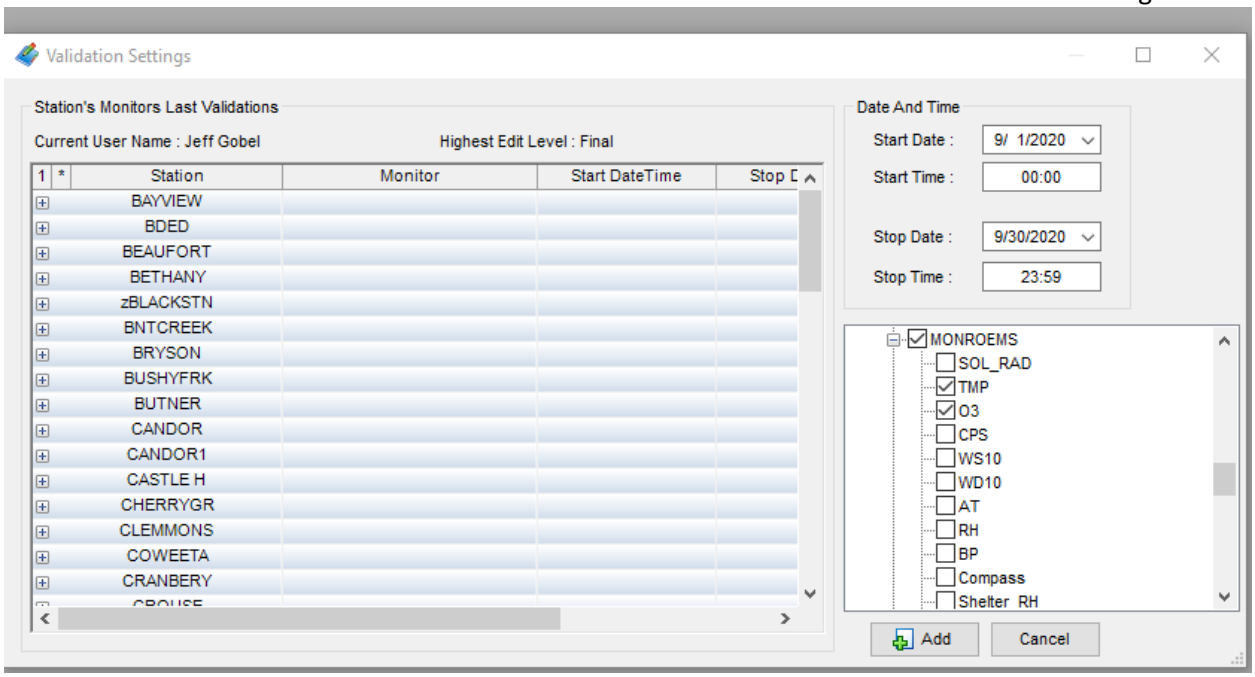
7.4 Carbon Monoxide

See Section 5.4.4 of this SOP for procedures used to upload manual performance checks to AQS

8.0 Data Validation and Certification

8.1 Data Validation Procedure using Envidas

8.1.1 Final Level 3 Validation is achieved by going to the Edit tab on the upper scroll bar of Envista and selecting Validation Settings Action box. This will generate the following control box to populate:

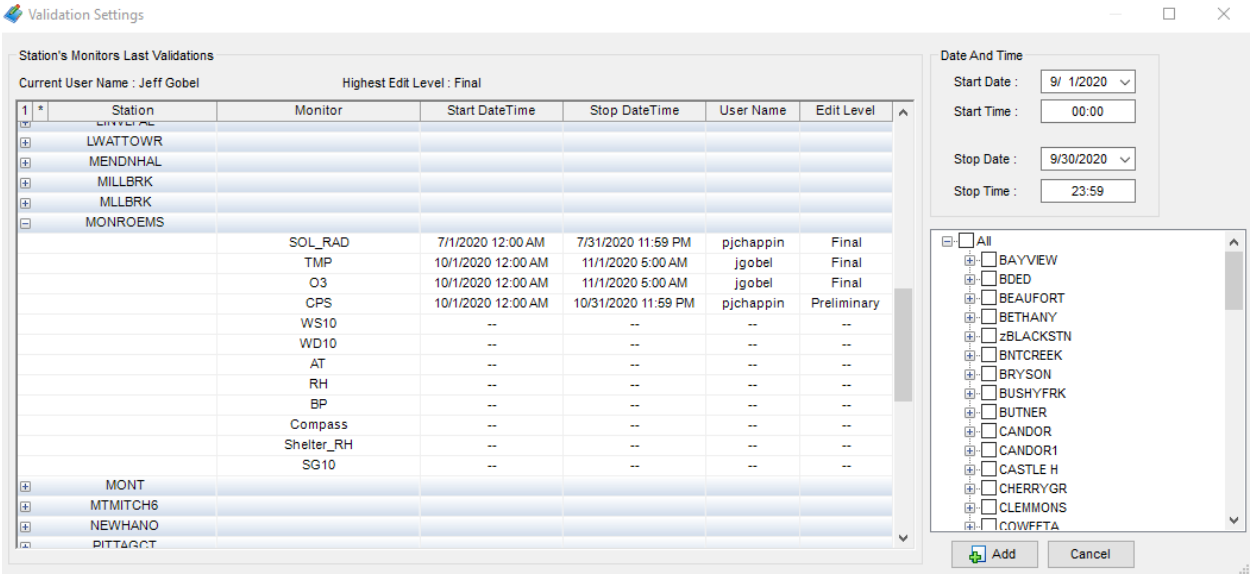


The reviewer must

- set the **Start Date** and **Time (00:00)**
- set the **Stop Date** and **Time (23:59)** (Envidas/Envista will no**t** auto populate or correct either of these items).
- Check the site in the right-side box
- Check which parameters you are validating (In this case its Monroe for TMP and O_3.)
- Proceed to the **Add box** and <u>press it</u> to activate.

A message will pop up and you will answer Yes to *activate the Validation*. A prompt will notify you when completed. It is a good idea to check that the site validated by clicking on it in the left-hand box and open it and confirm that it validated correctly. You are now finished with Validating at Level 3.

The confirmation report should look like this screen shot:



8.2 Annual Data Certification

Per 40 CFR Part 58.15, state and local government monitoring organizations must certify their ambient concentration data and quality assurance and quality control (QA/QC) data. For DEQ, the chief should certify all data submitted for all monitors specified in 40 CFR §58.15 within the PQAO. As required by 40 CFR 58.15, an annual air monitoring data certification letter, as shown in Section 8.2 Figure 1 is required to certify that the data collected by the federal reference method and federal equivalent method monitors for state and local air monitoring stations (SLAMS) and special purpose monitors (SPMs) in the DAQ networks meet criteria in 40 CFR Part 58, Appendix A from Jan. 1 to Dec. 31 of the previous year. A data certification letter signed by the chief should be sent to the applicable EPA Regional Administrator or the delegated official, addressed to the attention of the regional primary AQS contact. The chief should check with DAQ's Regional contact to determine the appropriate official recipient for the transmittal.

The letter must include the following two specific statements. The chief certifies that (i) the ambient concentration data and the quality assurance data are completely submitted to AQS, and that (ii) the ambient data are accurate to the best of his or her knowledge taking into consideration the quality assurance findings. The first part means that all of the ambient data and all of the quality assurance data that were collected, and that have completed and passed DAQ's data validation process have been submitted to AQS. The second part means that the chief has considered the results of all periodic quality control checks and other relevant performance assessments and has determined that the ambient data, quality assessment and QC data meets EPA regulatory requirements and the data quality requirements specified in DAQ's QAPPs. The letter must be clear regarding what combinations of site, monitor, pollutant, and Parameter Occurrence Code (POC) are the subject of the certification statement.

Along with the certification letter, the chief must submit to EPA an annual summary report of all the ambient air quality data collected by the monitors, as well as a summary of the precision and accuracy data, for the previous year. This requirement is met by submitting the AMP600 report. See Appendix D: Detailed Annual Data Certification Procedures for instructions on generating the AMP600 report for submittal to the EPA for the annual data certification.

Data certification is the final process of assessing the state's monitoring data for the previous calendar year. The DAQ verifies and validates data monthly, as discussed in Section 2 of this SOP. Additionally, the chief or his designee assesses the data on a quarterly basis when an RCO chemist generates specific AQS reports to assess the data quality indicators as discussed in SOP 2.39.4 Quarterly Data Review. With these assessments ongoing throughout the year, annual data certification, then, serves as the last assessment of the data – looking at it from an all-inclusive, annual perspective – to see if any unidentified anomalies or trends exist in the data that the data reviewers did not previously identify. The annual data certification process starts with running and reviewing AMP reports contained in AQS. The reports typically queried include the following:

- AMP350 Raw Data
- AMP251 QA Data
- AMP430 Data Completeness
- AMP600 Certification Evaluation
- AMP256 Data Quality Indicator
- AMP504 Extract QA Data
- AMP450 Quicklook Criteria Parameters
- AMP450NC Quicklook All Parameters

An RCO audit chemist and the PPB supervisor review these reports and confirm everything is complete and accurate. The RCO audit chemist and PPB supervisor also review the reports to ensure the statistical results

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
MICHAEL ABRACZINSKAS
Director

NORTH CAROLINA
Environmental Quality

May 1, 2020

Dr. Kenneth L. Mitchell, Acting Director
Air and Radiation Division
United States Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street S.W.
Atlanta, Georgia 30303-8960

Subject: Certification of Ambient Data for North Carolina for 2019 Calendar Year

Dear Dr. Mitchell:

This letter certifies that for the ambient air monitors and date periods indicated in the attached AQS summary reports, *concentration data and quality assurance data are completely submitted to AQS and that the ambient data are accurate to the best of my knowledge, taking into consideration the quality assurance findings and the recent Technical Systems Audit recommendations*.

This certification does not cover monitors operated by Mecklenburg County Air Quality (Reporting Organization 0669) and Forsyth County Office of Environmental Assistance and Protection (Reporting Organization 0403). Those local programs certify their data separately from the North Carolina Division of Air Quality (Reporting Organization 0776).

The AQS AMP600 and AMP450NC reports that are required by the USEPA to affirm certifications have been included in the email distribution list. Annual certification of ambient monitoring data is required by provisions in 40 CFR 58.15.

If you need more information concerning this certification, or have other questions, please contact me at patrick.butler@ncdenr.gov or (919) 707-8719.

Sincerely,

Patrick Butler, P.E.
Ambient Monitoring Section Chief

Attachments (email distribution only):
AMP600 documents (originals signed)
AMP450NC document

North Carolina Department of Environmental Quality | Division of Air Quality
217 West Jones Street | 1641 Mail Service Center | Raleigh, North Carolina 27699-1641
919.707.8400

Section 8.2 Figure 1. Example Annual Certification Letter

indicate the monitoring data were in control over the course of the entire year and met the DQOs. If they identify problems, the RCO audit chemist investigates them in accordance with Section 9 of this SOP. Ultimately, this process verifies that the DAQ monitoring data submitted to AQS is correct and complete.

Once the RCO chemists, statistician and database manager complete any necessary corrections, additions or deletions in AQS and the RCO chemists and PPB supervisor finalize the dataset, the chief officially recommends the data for certification to EPA Region 4. The data certification package provided to EPA includes a signed copy of the AMP600 report, along with a letter signed by the chief, certifying that the ambient concentration and QA data in AQS are complete and accurate, taking into consideration the QA findings, to the best of his or her knowledge. If coarse particle data ($PM_{10-2.5}$) or 5-minute SO2 data, including maximum hourly 5-minute SO2 data, need to be certified, the certification package should also include an AMP450NC report. The annual data certification package is due to EPA Region 4 by May 1 of each year.

9.0 Troubleshooting and Corrective Actions

9.1 Troubleshooting

Troubleshooting is the final step in the data validation process. After data review is complete the assigned pollutant chemist, or level 3 reviewer, will assess whether the program is meeting the data quality objectives defined in the relevant QAPP. The assigned pollutant chemist will work with regional staff as necessary to correct any deficiencies and to refine or adapt procedures to ensure data quality objectives are met.

9.2 Corrective Actions

The audit chemist will review previously validated data on a quarterly basis. When the review and audit are completed the audit chemist will create an AQS Audit Report and Data Update Form (revision 9.0). The form will contain general program comments as well as specific observations and questions relating to the validated data as reported in AQS. The form will identify any issues that may impact data quality, completeness, storage and reporting. The data validator (level 3 reviewer) will review the completed audit form, carefully consider the audit chemist's remarks and note on the form any corrections that may need to be made. The data validator will then forward the completed audit form to the database manager, along with documentation for any changes that need to be uploaded to AQS. The database manager will make the appropriate data uploads to AQS and document the completion of the process on the audit report. The audit chemist will then verify the corrections are complete in AQS and document completion of the process. Copies of both the original audit reports and the completed audit reports are then archived in IBEAM.

10.0 Revision History

The following revisions were made to this SOP:

Date	Person Revising Document	Revision	Page No.	Approved by/ Date
3/15/2022	Jeremy Pope	Corrected CTS Control Limits in Section 6.3 Table 1.	44	Joette Steger/ 03/15/2022
3/24/2022	Joette Steger	Corrected Effective Date	2	oette Steger/ 03/24/2022

11.0 Appendices

Appendix A: AQS Audit Report and Data Update Form (revision 9.0).
Appendix B: Audit Sheets for Carbon Monoxide and Nitrogen Oxides
Appendix C: Detailed Procedures for Processing Performance Evaluation Documentation
Appendix D: Generating the Statistician's Daily Reports
Appendix E: List of Acronyms

Appendix A: Example of AQS Audit Report and Data Update Form (revision 9.0)

Instructions

This form (AQS Audit Report and Data Revision Form) combines an AQS Audit Report and a Data Update Form into one. As an AQS Audit Report, this form is typically created by the Central Office Audit Chemist for a quarterly data review. Problems that may impact or potentially impact data quality, completeness, storage, or reporting are formally tracked, documented, identified and resolved using this form.

As a Data Update Form, this form is typically used by PPB Supervisors, Statisticians, Chemist, etc. to document requests for change, update, edit, replace, Import, upload, etc. data that has previously been validated and sent to AQS. Note: The Data Update Form (2.2 June 2019 will be discontinue).

Date Issued

Quarter/Year of Audit

Quarter Choose an item. Year Choose an item.

Parameter Choose an item.

Findings

Audit ☐ Data Error ☐

Responses/Actions

Data Types to be Updated/Uploaded

Data Type Choose an item. N/A

(Enter manually if more than one).

Location of Data to Be Updated/Uploaded

AQS ☐ AirNow-Tech ☐ IBEAM ☐ Envista ☐

Sites

Sites Choose an item.

(Enter manually if more than one). N/A

Parameters

Parameter Choose an item. N/A

(Enter manually if more than one).

Dates and Times of Data Update/Upload

(Enter manually). N/A

Staff Involved in Update/Upload

Staff Choose an item. N/A

(Enter manually if more than one).

Date and Time of Final Edits by Steven Rice

(Enter manually).

Date and Time of Final Review by Mike Lane

Appendix B: Audit Sheets for Carbon Monoxide and Nitrogen Oxides

Region: _______ Site: ________________Year: _________ SYSTEMS AUDIT FORM: Carbon Monoxide

Calibration Checks (x=max.dev.) Every 14 days or less [1] >14 days

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Filter Changes, Every 30 days

Jan		Feb		Mar		Apr		May		Jun	
Jul		Aug		Sep		Oct		Nov		Dec	

Reported to AQS via AQ98 Form

Date	COT ppb Standard	COT ppb Monitor	% Diff	Date	COT ppb Standard	COT ppb Monitor	% Diff

Calibration / Verification: Every 365 days or less

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Completeness

1st Q			2nd Q			3rd Q			4th Q		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Year:											

Highest Monthly Reading

Date	(ppb)	Hour	Date	(ppb)	Hour	Date	(ppb)	Hour
Jan			May			Sep		
Feb			Jun			Oct		
Mar			Jul			Nov		
Apr			Aug			Dec		

Gas Dilution Calibrator Certification: _____ - _____- _____ Replaced: _____ - _____ - _____

Zero Air Generator: _____ - _____- _____ Replaced: _____ - _____ - _____

Notes: _____

Region:_____ Site:_____ Year:_____ SYSTEMS AUDIT FORM: NO2

Calibration Checks and NO2 Converter Efficiency (x=max.dev.) Every 14 days or less [1] >14 days

Jan	GPT % Δ	Feb	GPT % Δ	Mar	GPT % Δ	Apr	GPT % Δ	May	GPT % Δ	Jun	GPT % Δ
Jul	**GPT % Δ**	**Aug**	**GPT % Δ**	**Sep**	**GPT % Δ**	**Oct**	**GPT % Δ**	**Nov**	**GPT % Δ**	**Dec**	**GPT % Δ**

Filter Changes, Every 14 days

Jan		Feb		Mar		Apr		May		Jun
Jul		Aug		Sep		Oct		Nov		Dec

Highest Monthly Reading

Date	NO (ppb)	Hour	Date	NO_2 (ppb)	Hour	Date	NOx (ppb)	Hour
Jan			Jan			Jan		
Feb			Feb			Feb		
Mar			Mar			Mar		
Apr			Apr			Apr		
May			May			May		
Jun			Jun			Jun		
Jul			Jul			Jul		
Aug			Aug			Aug		
Sep			Sep			Sep		
Oct			Oct			Oct		
Nov			Nov			Nov		
Dec			Dec			Dec		

Calibration / Verification: Every 365 days or less

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Gas Dilution Calibrator Certification: _____ - _____- _____ Replaced: _____ - _____ - _____

Zero Air Generator: _____ - _____- _____ Replaced: _____ - _____ - _____

Completeness

1st Q			2nd Q			3rd Q			4th Q		
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Year:											

Reported to AQS via AQ98 Form

Date	NO ppb (Standard)	NO ppb (Monitor)	% Diff	NO_x ppb (Standard)	NO_x ppb (Monitor)	% Diff	NO_2 ppb (Standard)	NO_2 ppb (Monitor)	% Diff

Notes: _____

Region:_________ Site:__________________ Year:__________ SYSTEMS AUDIT FORM: NO2 CAPS

Calibration Checks Every 14 days or less [1] >14 days

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Reported to AQS via AQ98 Form

Date	NO2 ppb SPAN 2	NO2 ppb Monitor	% Diff	NO2 ppb SPAN 9	NO2 ppb Monitor	% Diff	Zero	Comments

Calibration / Verification: Every 365 days or less

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Completeness

1st Q			2nd Q			3rd Q			4th Q		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Year:											

Highest Monthly Reading

Date	(ppb)	Hour	Date	(ppb)	Hour	Date	(ppb)	Hour
Jan			May			Sep		
Feb			Jun			Oct		
Mar			Jul			Nov		
Apr			Aug			Dec		

Gas Dilution Calibrator Certification: _____ - _____- _____ Replaced: _____ - _____ - _____

Zero Air Generator: _____ - _____- _____ Replaced: _____ - _____ - _____

Notes: _____

Region: _ Site:_____ Year:_____ SYSTEMS AUDIT FORM: NOy

Calibration Checks and Converter Efficiency (x=max.dev.) Every 14 days or less [1] >14 days

Jan	CE %	Feb	CE %	Mar	CE %	Apr	CE %	May	CE %	Jun	%
Jul	**CE %**	**Aug**	**CE %**	**Sep**	**CE %**	**Oct**	**CE %**	**Nov**	**CE %**	**Dec**	**CE %**

Filter Changes, Every 30 days

Jan		Feb		Mar		Apr		May		Jun
Jul		Aug		Sep		Oct		Nov		Dec

Highest Monthly Reading

Date	NO_2T (ppb)	Hour	Date	NOT (ppb)	Hour	Date	NOyT (ppb)	Hour
Jan			Jan			Jan		
Feb			Feb			Feb		
Mar			Mar			Mar		
Apr			Apr			Apr		
May			May			May		
Jun			Jun			Jun		
Jul			Jul			Jul		
Aug			Aug			Aug		
Sep			Sep			Sep		
Oct			Oct			Oct		
Nov			Nov			Nov		
Dec			Dec			Dec		

Calibration [1] Every 90 days at NCore site

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Gas Dilution Calibrator Certification: _____ - _____- _____ Replaced: _____ - _____ - _____

Teledyne 701 Zero Air Generator: _____ - _____- _____ Replaced: _____ - _____ - _____

Reported to AQS via AQ98 Form

Date	NO ppb Standard	NO ppb Monitor	% Diff	NO_y ppb Standard	NO_y ppb Monitor	% Diff	NOTES:

Completeness

1st Q			2nd Q			3rd Q			4th Q		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Year:											

Notes: _____

_____

Appendix C: Detailed Procedures for Processing Performance Evaluation Documentation

This appendix contains detailed procedures for reviewing and evaluating the performance evaluation reports and reporting the results. This appendix also contains instructions on archiving the performance evaluation reports in IBEAM.

C.1 Review and Evaluation of the Performance Evaluation Reporting Form

After the ECB Supervisor or his designee reviews the Continuous Monitor Performance Audit Report (AQ-121 Form), the ECB Supervisor transfers the form to the PPB Supervisor, who then either reviews and evaluates the audit results or transfers the forms to the appropriate RCO chemist to review and evaluate the audit results. The first step in evaluating the form is to record the names of the regional supervisor, regional coordinator and RCO chemist (or the appropriate ABAQA staff) on the form to whom the signed record should be distributed. Current names are listed in Appendix C.1 Table 1.

Appendix C.1 Table 1 People to Whom Performance Evaluation Reports are Distributed

DEQ Region or External Program	Regional Supervisor	Regional Chemist	RCO Chemist
Asheville	Brendan Davey	Steve Ensley	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide
Fayetteville	Heather Carter	Stephen Allen	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide
Mooresville	Bruce Ingle	Paul Chappin	Jeff Gobel – Ozone Kay Roberts – Nitrogen Dioxide
Raleigh	Taylor Hartsfield	Timothy Skelding	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide Kay Roberts – Nitrogen Dioxide Kay Roberts – Carbon Monoxide Kay Roberts – Reactive Oxides of Nitrogen
Washington	Betsy Huddleston	Jennifer Sides	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide
Wilmington	Brad Newland	Tony Sabetti	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide
Winston-Salem	Ray Stewart	Chengqing Xiao	Jeff Gobel – Ozone Jeremy Pope – Sulfur Dioxide
Asheville-Buncombe Air Quality Agency	Kevin Lance	James Raiford	Jeff Gobel - Ozone
Forsyth County Environmental Assistance and Protection	Jason Bodenhamer		Jeff Gobel - Ozone
Mecklenburg County Air Quality	Danielle Jones		Jeff Gobel - Ozone
CASTNet	Marcus Stewart (CASTNet Reps)	Timothy Sharac; Kevin Mishoe	Jeff Gobel - Ozone
Transco	Cori Lincecum (Williams Contact)	Andrew Rengel (ERM Contact)	Kay Roberts – Nitrogen Dioxide

The second step is to review the results of the audit, comparing the test levels and the differences to the tolerances provided in Section 6.1 Tables 1 through 4. All of the audit levels should meet the criteria. If they do not, the reviewer needs to decide on whether the evaluation is "good" or "not acceptable." To make this determination, the reviewer may have discussions with the RCO chemist, the ECB auditor, the operator, and the coordinator. Sometimes if the average of the percent differences for all levels meets the criteria in the tables in Section 6.1, the reviewer may deem the evaluation as "acceptable." When the reviewer deems the evaluation as "acceptable" instead of "good," the reviewer should provide a reason for why the evaluation is still "acceptable" as opposed to "not acceptable." When the reviewer deems the evaluation as "not acceptable," the reviewer should also note whether additional action is needed or has already been taken to correct the situation or if data needs to be invalidated or flagged as a result of the failed performance evaluation. Generally, data are not invalidated as a result of a failed performance evaluation unless the evaluation identified an invalid operating condition, such as a leak in the sample line, or problem with a critical component of the monitor, such as the photomultiplier tube. For O_3 audits, evaluate the audit of the shelter temperature devices. The central processing unit (CPU) and HOBO temperatures should be within 2 degrees Celsius (°C) of the reference thermometer reading. For nitrogen oxide monitors that use a converter, check the measured converter efficiencies. The converter efficiencies for each audit level should be within 96 and 104 percent. If they are not, the reviewer should discuss the situation with the RCO chemist and ECB auditor to determine if the audit is "good" or "not acceptable." A signed performance evaluation form is shown below.

CONTINUOUS MONITOR PERFORMANCE AUDIT REPORT

ACCURACY AUDIT FOR 500 ppb____ RANGE

REGIONAL SUPERVISOR Patrick Butler REGIONAL CHEMIST Rik Tebeau RCO CHEMIST Kay Roberts

POLLUTANT		POLLUTANT		POLLUTANT		POLLUTANT		POLLUTANT	
( ) O3	44201-047-08-0	( ) NO	42601-200-08-1	( ) HSNO	42601-075-08-1	( ) HSNH3	42604-051-08-1	( ) NOY-TLE	42600-2-674-08-2
( ) CO	42101-054-07-1	( ) NO2	42602-200-08-1	( ) HSNOY	42600-075-08-1	( ) CO-TLE	42101-2-554-08-2	( ) SO2-TLE	42401-2-560-08-2
( ) SO2	42401-060-08-2	(X) NOX	42603-200-08-1	( ) HSNOX	42603-051-08-1	( ) NO-TLE	42601-2-674-08-2	( ) SO4	88403-875-08-2

AQS #: 37-105-0002	SITE: Blackstone		REG: RARO	QTR: 3rd	YR: ~~2016~~ 2017
ADT. DEV. MODEL #: T700U	SN: 170	# 4	CERT. DATE: 4/26/17		EXP. DATE: 1/26/18
ADT. ZAP MODEL #: 751H	SN: 97	# 2	CHEM. CHANGED DATE: 8/30/16		EXP. DATE: 8/30/17
ADT. CYL. #: EB0053059	TYPE: NO	CONC. 9.99 ppm / .07 ppm imp.		PSI: 1900	EXP. DATE: 6/14/19
ADT. CYL. #:	TYPE:	CONC.		PSI:	EXP. DATE:
SITE CAL. MODEL #: T700U	SN: 140	#1	CERT. DATE: 1/31/17		EXP. DATE: 1/31/18
SITE ZAP MODEL #: 701	SN: 5647	#71	CHEM. CHANGED DATE: 11/1/16		EXP. DATE: 11/1/17
SITE MON. MODEL #: T200UP	SN: 66	#3	MDL DATE: N/A		EXP. DATE: N/A
SITE CYL. #: EB0078629	TYPE: NO	CONC. 10.09 ppm / .04 ppm imp.		PSI: 1200	EXP. DATE: 6/14/19
SITE CYL. #:	TYPE:	CONC.		PSI:	EXP. DATE:
AUDITOR (S): Mark Yirka/Johnny Doctor/AH	DATE: 8/10/17	REVIEWED BY: Johnny Doctor			DATE: 8-21-17

AUDIT POINT PPB	EPA AUDIT LEVEL	GAS FLOW SCCM	ZERO FLOW SCCM	TOTAL FLOW SCCM	AUDIT DEVICE (CA) PPB	PRIMARY DATA LOGGER	
						READING (CM) PPB	Percent Difference (D1)
ZERO		0.0	3003.0	3003.0	0.0	0.1	N/A
60	6	30.0	4981.0	5011.0	59.8	58.3	-2.6
175	7	52.5	2962.0	3014.5	174.0	171.8	-1.3
425	8	127.6	2896.0	3023.6	421.6	414.1	-1.8

AUDITOR REMARKS: **80-90% FS CE%= 98.4 10-20% FS CE% = 100.4 2-5% FS CE% = 104.1**

AUDIT RESULTS: GOOD ✓ NOT ACCEPTABLE _____ INDICATE ACTION TAKEN BELOW:

____ ADDITIONAL OPERATIONAL CHECKS (SPECIFY): _____

____ DATA INVALIDATED FROM _____ TO _____

____ PREVENTIVE ACTION (DESCRIBE) _____

REMARKS: Average CE is 98% which is greater than 96% when calculated using slope

EVAL. DATE: Aug 29, 2017 EVALUATOR: Scott Stepp

REV 03/27/2015 AQ-121 (WORD) C:\Audit Forms\accuracy audit form

After the reviewer finishes evaluating the performance evaluation results for reported monitor concentrations, the shelter temperature audit results (for O_3 performance evaluations) and the converter efficiency results (for nitrogen oxide performance evaluations on monitors using converters), the reviewer should record any remarks or corrective actions needed on the form and the date of the reviewer's evaluation and sign the form.

C.2 Reporting of Performance Evaluation Data to AQS

After the reviewer finishes reviewing and evaluating the form, the next step is to upload the performance evaluation results to AQS. There are two ways to go about uploading the data. One way is to create transaction files. Transaction files can be created using the AQS Transaction Generator, which is no longer supported by the EPA and therefore will no longer be installed on state computers by the Department of Information Technology (DIT). Transaction files can also be created manually. The second way to upload the data to AQS is to upload it directly if one has screening group access.

To correctly create a transaction file or upload the data, first one has to be able to correctly interpret the information on the form. Below is an annotated form to help with interpreting the data. The "AQS #" box provides the state and county codes and the site ID. The "Pollutant" check box provides the parameter, method and unit codes. The date box provides the assessment date. The "EPA Audit Level" column provides the level. The "Audit Device" column provides the assessment concentration and the "Analyzer" "Reading" column provides the monitor concentration.

CONTINUOUS MONITOR PERFORMANCE AUDIT REPORT

ACCURACY AUDIT FOR 200 PPB RANGE

State Code, County Code, Site ID

REGIONAL SUPERVISOR Bruce Ingle REGIONAL CHEMIST Paul Clappin RCO CHEMIST Kay Roberts

Parameter Code, Method Code, Unit Code

POLLUTANT		POLLUTANT		POLLUTANT		POLLUTANT		POLLUTANT	
( ) O3	44201-047-08-0	( ) NO	42601-200-08-1	( ) HSNO	42601-075-08-1	( ) HSNH3	42604-051-08-1	( ) NOY-TLE	42600-2-674-08-2
( ) CO	42101-054-07-1	(X) NO2	42602-200-08-1	( ) HSNOY	42600-075-08-1	( ) CO-TLE	42101-2-554-08-2	( ) SO2-TLE	42401-2-560-08-2
( ) SO2	42401-060-08-2	( ) NOX	42603-200-08-1	( ) HSNOX	42603-051-08-1	( ) NO-TLE	42601-2-674-08-2	( ) SO4	88403-875-08-2

AQS #: 37-159-0021	SITE: Rockwell		REG: MRO	QTR: 2nd	YR: 2021
ADT. DEV. MODEL #: T700U	SN: 170	# 4	CERT. DATE: 6-7-21		EXP. DATE: 6-7-22
ADT. ZAP MODEL #: 751H	SN: 97	# 2	CERT. DATE: 12-08-20		EXP. DATE: 12-08-21
ADT. CYL. #: BR0012179	TYPE: NO	CONC. 10.04 ppm		PSI: 1800	EXP. DATE: 1-6-24
ADT. CYL. #:	TYPE:	CONC.		PSI:	EXP. DATE:
SITE CAL. MODEL #: T700U	SN: 205	# 6	CERT. DATE: 9-8-20		EXP. DATE: 9-8-21
SITE ZAP MODEL #: 701	SN: 5640	# 64	CERT. DATE: 10-20-20		EXP. DATE: 10-20-21
SITE MON. MODEL #: T500U	SN: 230	# 2	MDL DATE:		EXP. DATE:
SITE CYL. #: EB0045646	TYPE: NO	CONC. 9.92 ppm		PSI: 1300	EXP. DATE: 5-17-22
SITE CYL. #:	TYPE:	CONC.		PSI:	EXP. DATE:
AUDITOR (S): Mark Yirka/Alphonse Hakizimana		DATE: 06-16-2021 (Assessment Date)	REVIEWED BY: Johnny Doctor		DATE: 6-22-21

AUDIT POINT PPB	EPA AUDIT LEVEL	GAS FLOW SCCM	ZERO FLOW SCCM	TOTAL FLOW SCCM	AUDIT DEVICE (CA) PPB (Assessmnet Concentrations)	ANALYZER ENVIDAS AVERAGE READING (CM) PPB (Monitor Concentration)	Percent Difference (D1)
ZERO		0	2492.8	2492.8	0.0	.1	N/A
2.5	1	9.2	8832.6	8841.8	2.5	2.8	12.0
25.0	5	12.0 MJK 6-22-21	3968.2	3980.2 MJK 6-22-21	25.0	26.8	7.2
100.0	7	~~5.5~~ 55.0	4920.2	~~4925.7~~ 4975.2	100.0	107.1	7.1

AUDITOR REMARKS:

AUDIT RESULTS: GOOD ✓ NOT ACCEPTABLE INDICATE ACTION TAKEN BELOW:

____ ADDITIONAL OPERATIONAL CHECKS (SPECIFY):

____ DATA INVALIDATED FROM TO

____ PREVENTIVE ACTION (DESCRIBE)

REMARKS:

EVAL. DATE: 8 Aug 2021 EVALUATOR: Scott Styer

REV 12/20/2017 AQ-121 (WORD) C:\Audit Forms\accuracy audit form

There are several things to keep in mind. First, most of the POC numbers are "1" with the exceptions in Appendix C.2 Table 1. Second, when uploading O_3 data into AQS, the values must be converted from ppb (which is what is reported on the form) to ppm (which is what AQS accepts) by dividing the numbers on the form by 1,000. Third, for O_3 the 70-ppb assessment (EPA Audit Level 5) concentration sometimes ends up being 69 ppb (EPA Audit Level 4), which is a different EPA Audit Level but the form may list it as the same audit level as a 70-ppb assessment. For ready reference, the EPA Audit Levels are provided in Appendix C.2 Table 2.

Appendix C.2 Table 1 Monitors with a Parameter Occurrence Code (POC) Other Than 1

Site Name and AQS #	Pollutant and Monitor	POC
Rockwell 37-159-0021	Nitrogen Dioxide Teledyne CAPS T500U	3
Millbrook 37-183-0014	Carbon Monoxide Thermo 48i TLE	2
Millbrook 37-183-0014	Sulfur Dioxide Thermo 43i TLE	2
Millbrook 37-183-0014	Reactive Oxides of Nitrogen Thermo 42i-Y Nitric Oxide (NO) Thermo 42i-Y	2 2
Millbrook 37-183-0014	Nitric Oxide (NO) Teledyne T200UP Nitrogen Dioxide Teledyne T200UP Oxides of Nitrogen Teledyne T200UP	3 2 3
Millbrook 37-183-0014	Nitrogen Dioxide Teledyne CAPS T500U	3

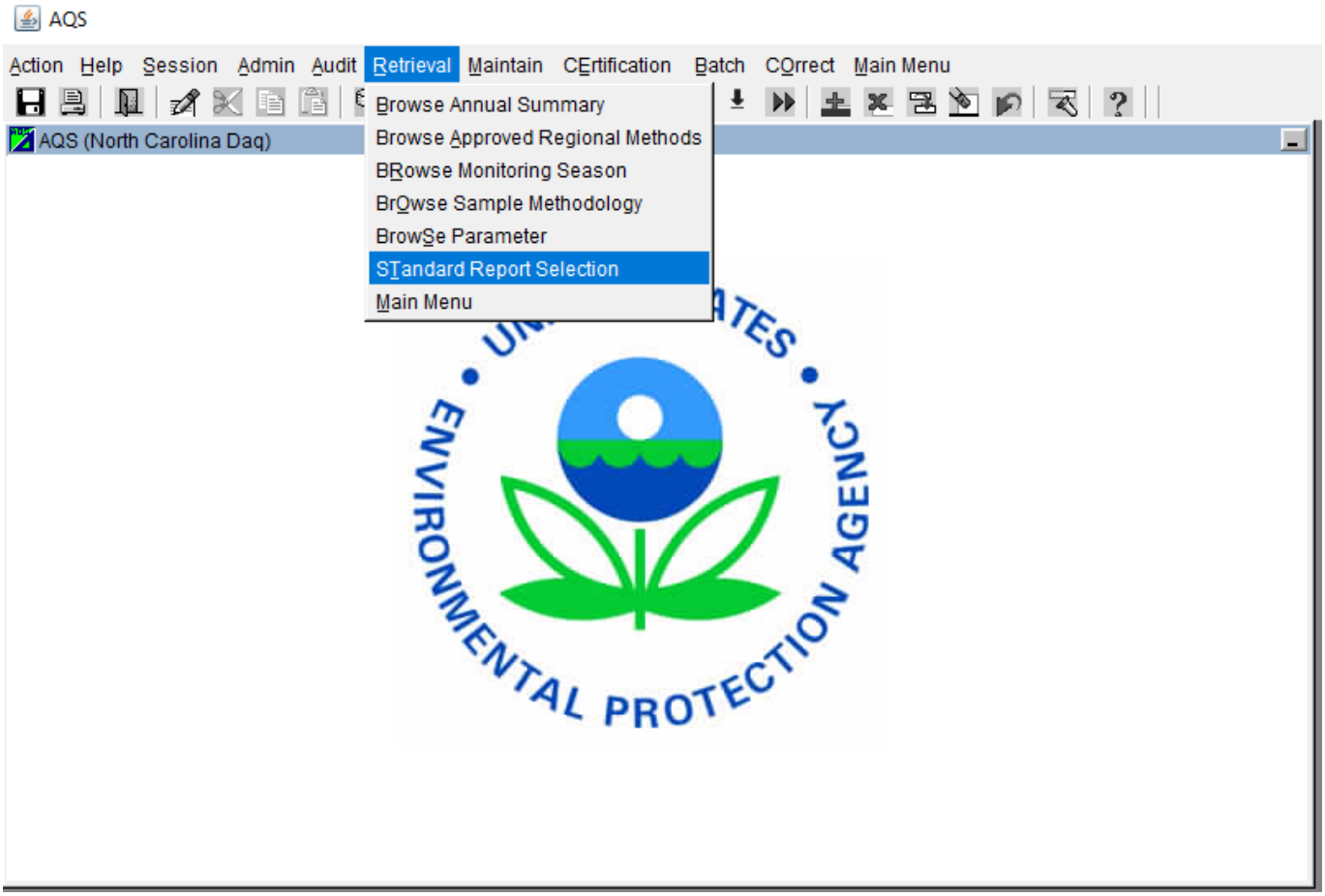
Appendix C.2 Table 2 EPA Audit Levels for Criteria Pollutants

Audit level	Concentration Range			
	O_3, ppm	SO_2, ppb	NO_2, ppb	CO, ppm
1	0.004-0.0059	0.3-2.9	0.3-2.9	0.020-0.059
2	0.006-0.019	3.0-4.9	3.0-4.9	0.060-0.199
3	0.020-0.039	5.0-7.9	5.0-7.9	0.200-0.899
4	0.040-0.069	8.0-19.9	8.0-19.9	0.900-2.999
5	0.070-0.089	20.0-49.9	20.0-49.9	3.000-7.999
6	0.090-0.119	50.0-99.9	50.0-99.9	8.000-15.999
7	0.120-0.139	100.0-149.9	100.0-299.9	16.000-30.999
8	0.140-0.169	150.0-259.9	300.0-499.9	31.000-39.999
9	0.170-0.189	260.0-799.9	500.0-799.9	40.000-49.999
10	0.190-0.259	800.0-1,000	800.0-1,000	50.000-60.000

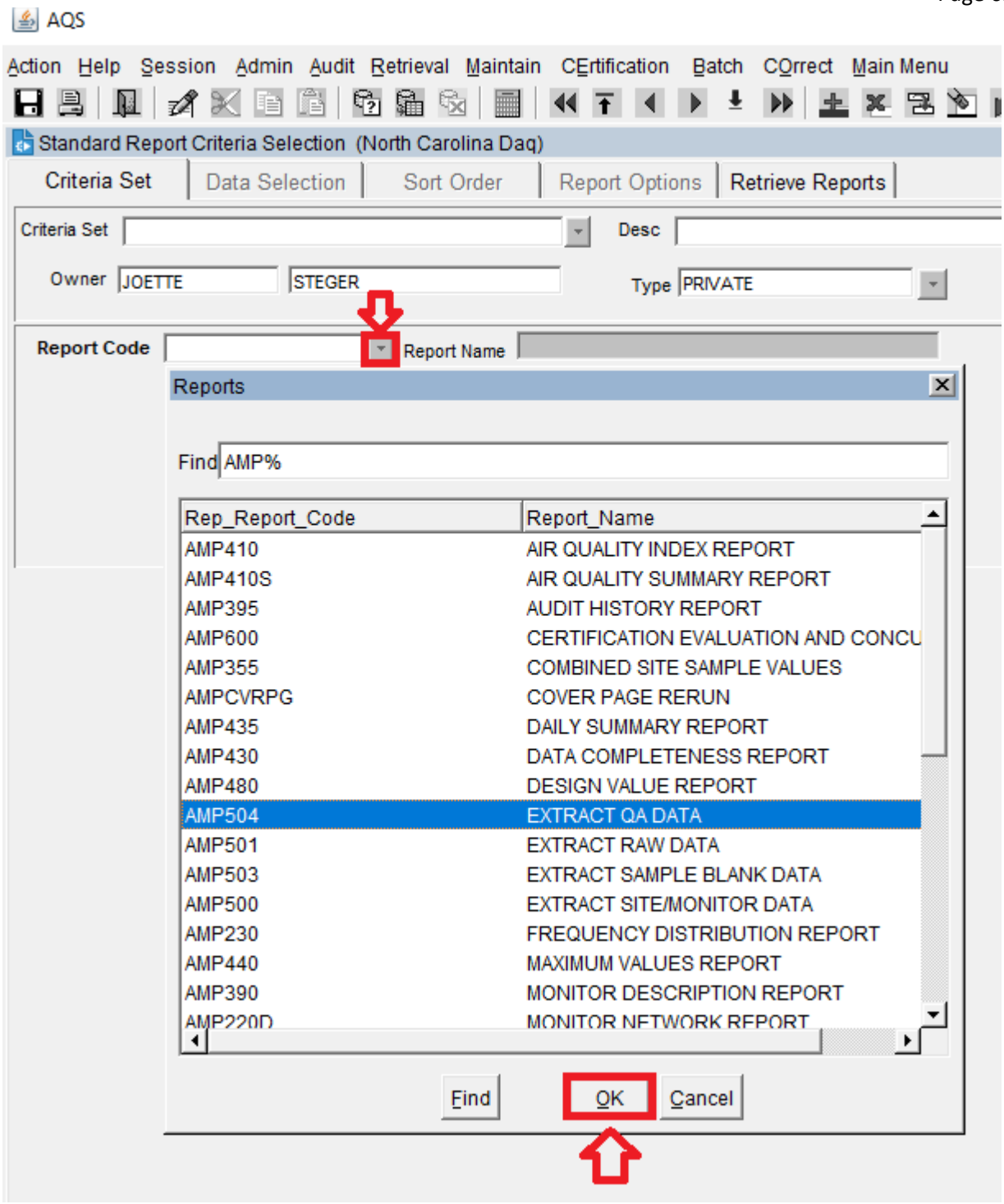
C.2.1 Creating Transaction Files

If you do not have screening group access to AQS, you will need to create a transaction file for the database manager to upload to AQS. There are various ways to create a transaction file but since you will probably not have access to the transaction generator, you may want to start with an existing transaction file. There are two ways to obtain an existing transaction file. One way is to run an AMP504 report. The other way is to find an appropriate transaction file from the P:\Ambient\PUB\RegOffices.NC\AQS\Manual Upload Files\Done folder. These instructions will use an AMP504 report to get the starting transaction file. After you log into

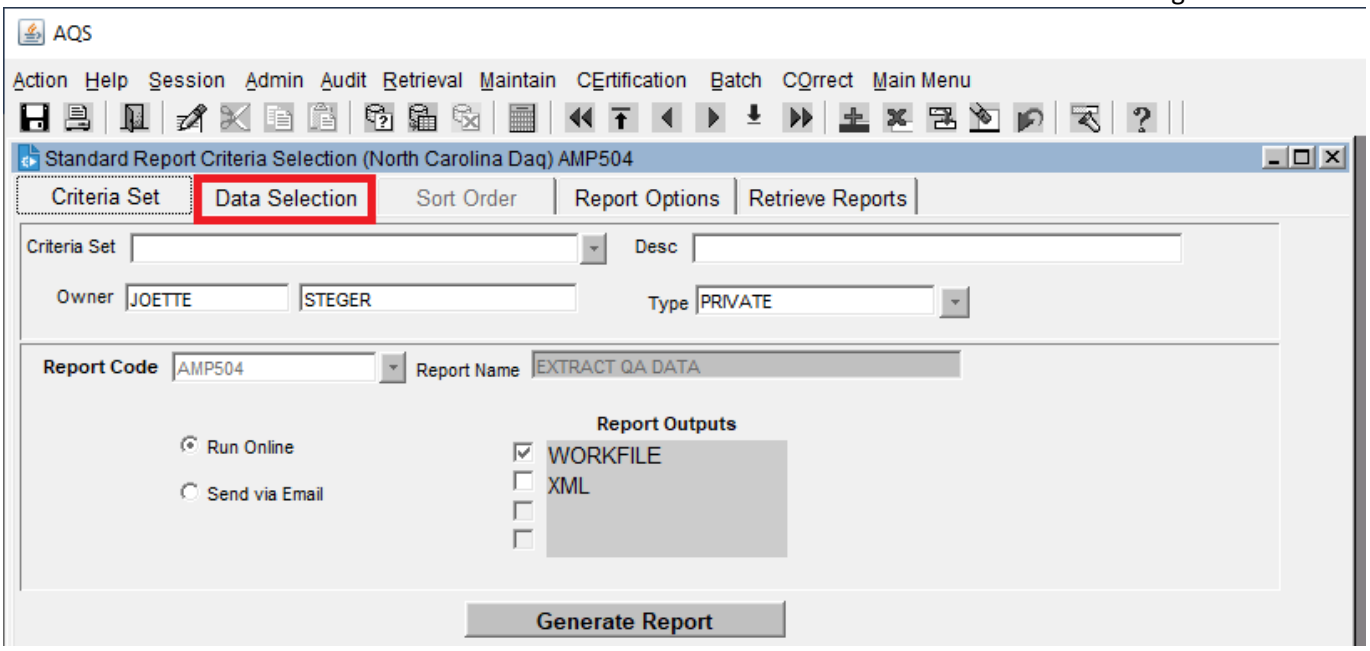
AQS, select “Retrieval” from the menu going across the top of the page and then select “STandard Report Selection” from the dropdown menu as shown below.



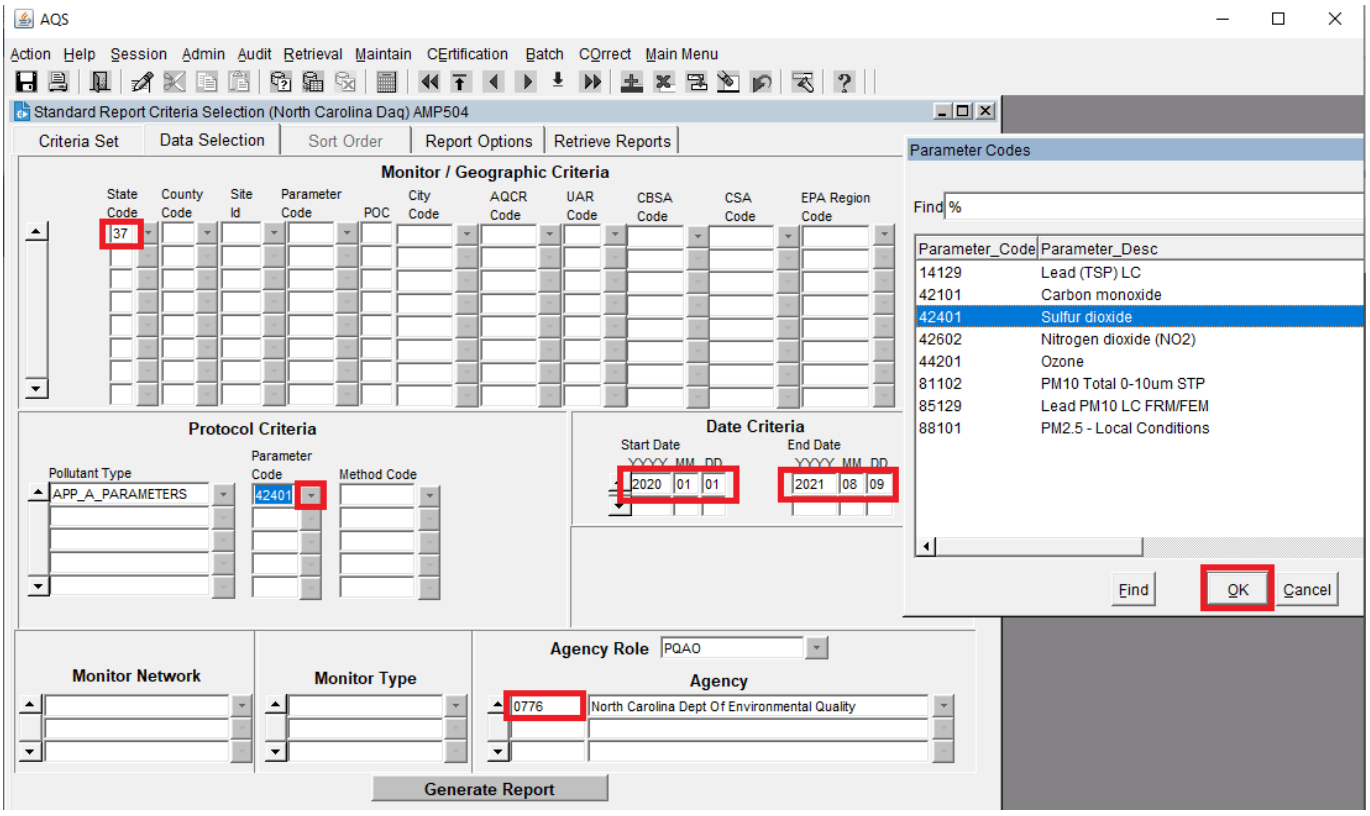
The screen shown below will pop up. Click on the “Report Name” button to get a dropdown list of reports listed alphabetically by report name. Click on the AMP504 Extract QA Data report and then click “OK.”



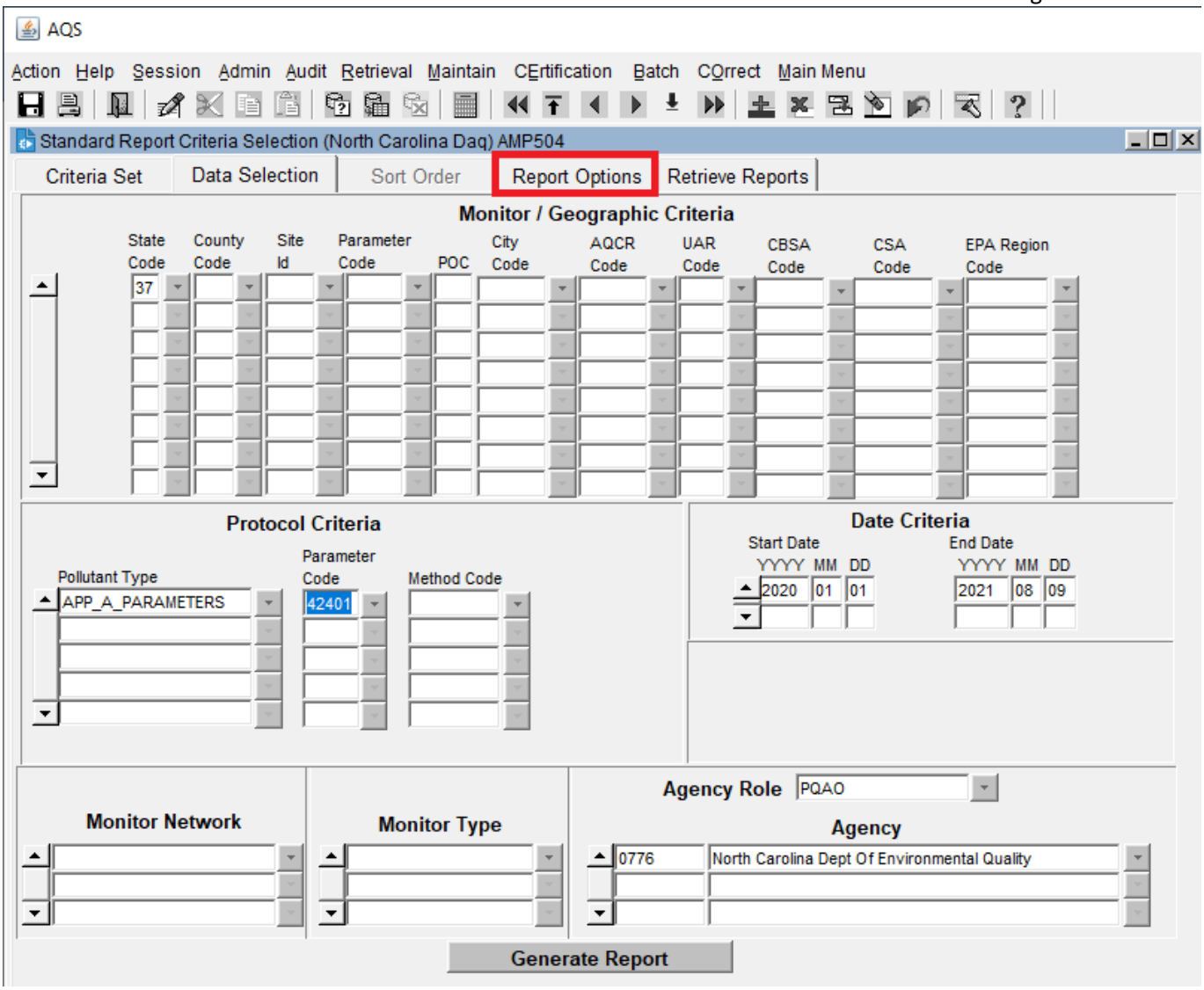
The screen shown below will appear. Click on “Data Selection.”



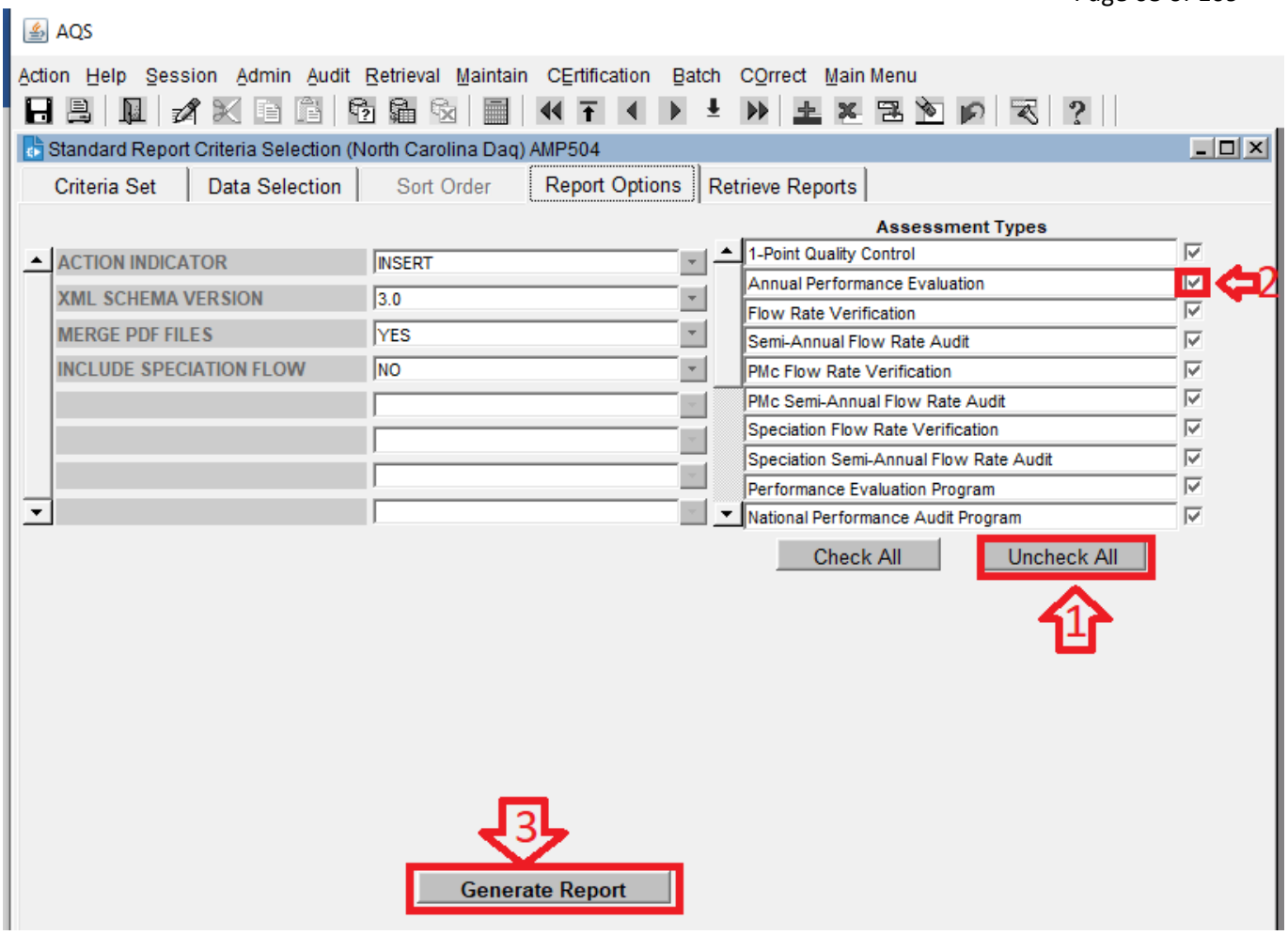
The screen below will appear. Enter in the criteria that fits the data you want to enter. In this case we want to enter SO_2 data for several sites so we entered in the state code of 37, a date range for last year and this year, the PQAO code of 0776, and the parameter code of 42401. If you don't know the parameter code, you can click on the button to get a dropdown list from which you can select the parameter code you want and hit OK.



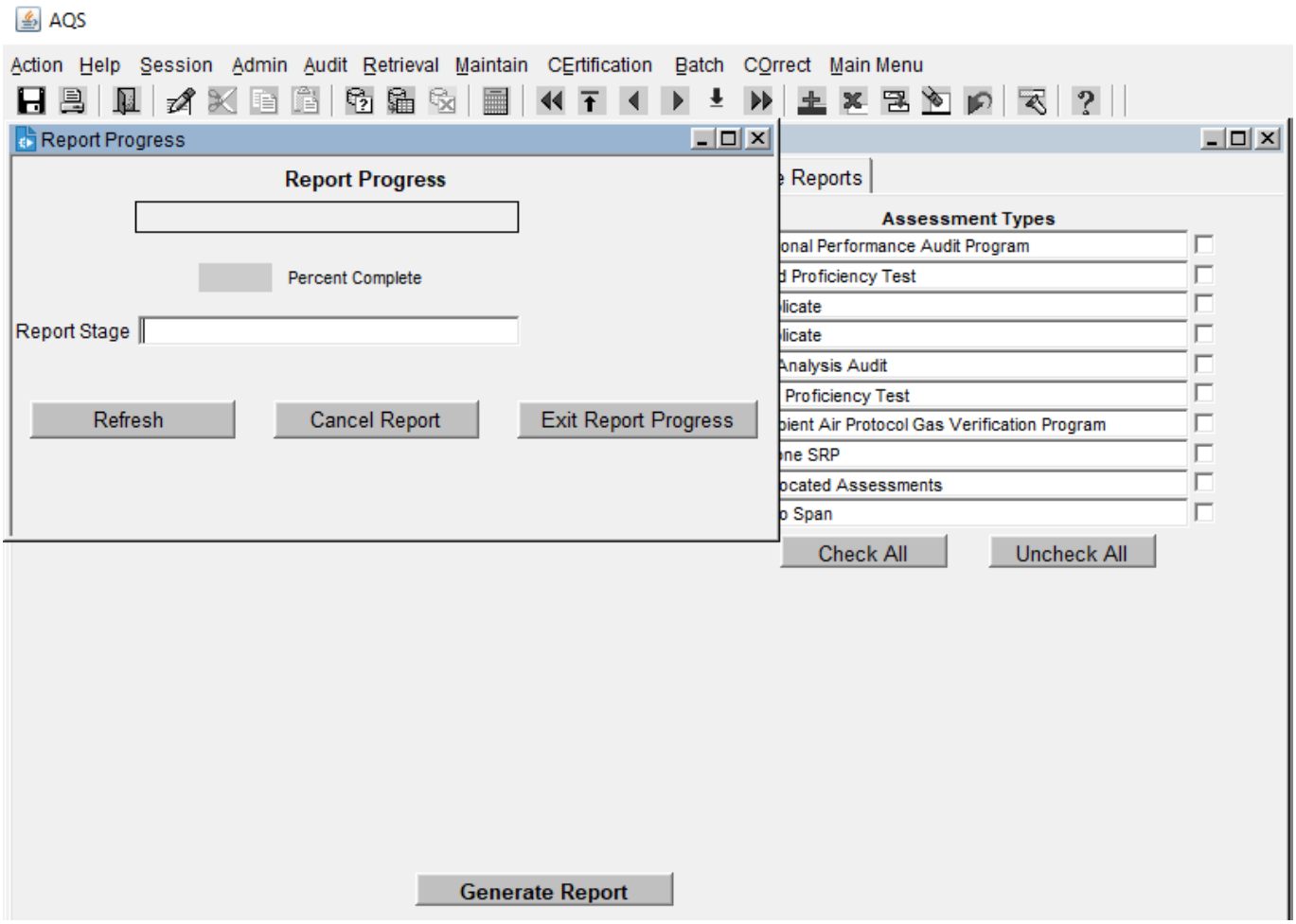
Next you want to select report options.



The screen below will appear. First click on “Uncheck All” and then recheck “Annual Performance Evaluation” on the dropdown list. Finally, click on “Generate Report.”



A popup box as shown below will appear with information on the report progress.



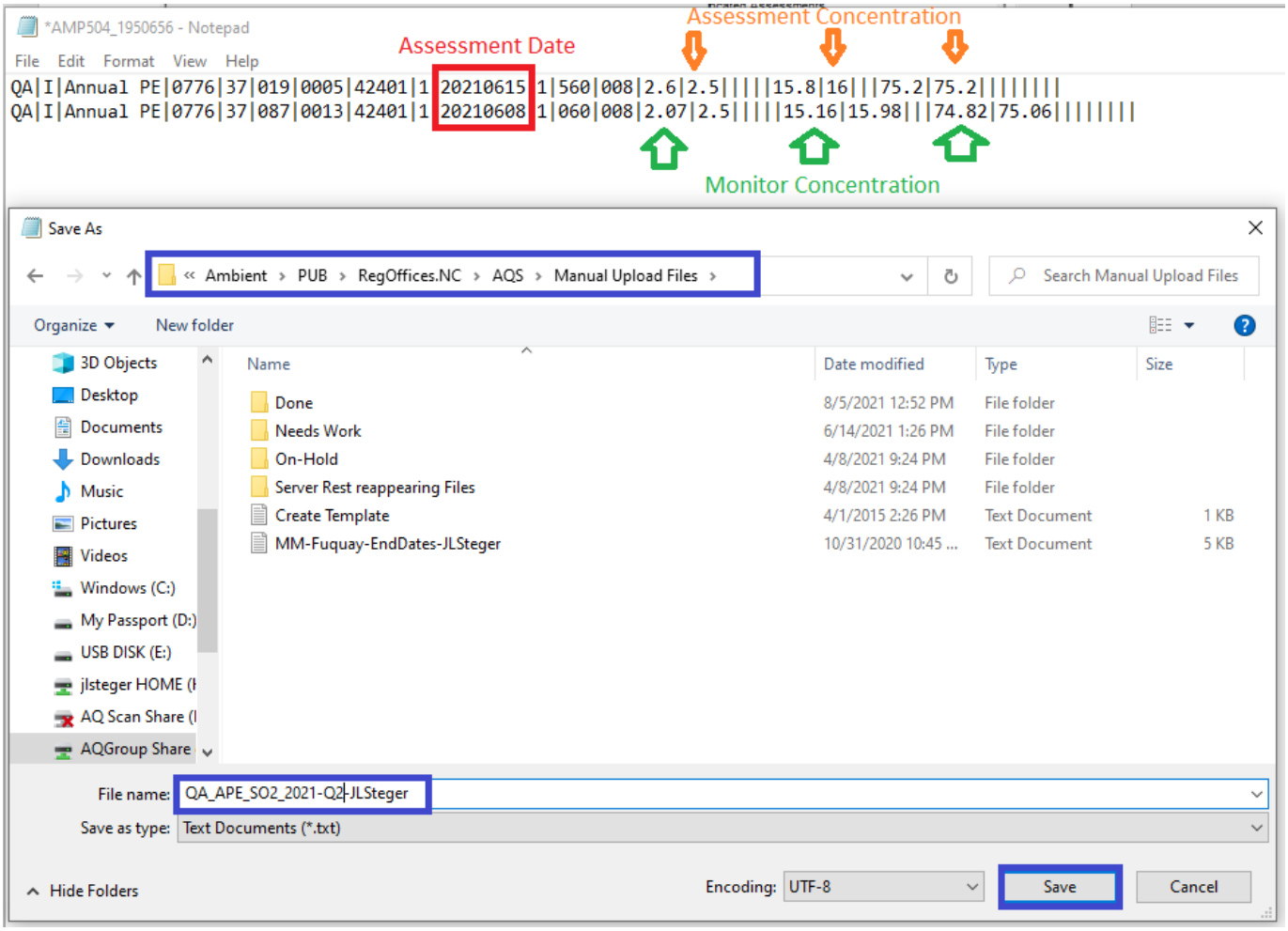
When the report finishes running, a text file, as shown below, will be generated that can be opened and edited using Notepad. In this case we want to add data for Southport (37-019-0005) and Canton (37-087-0013) so we will extract those two lines out of the file and update the date and the concentration values.

AMP504_1950656 - Notepad

File Edit Format View Help

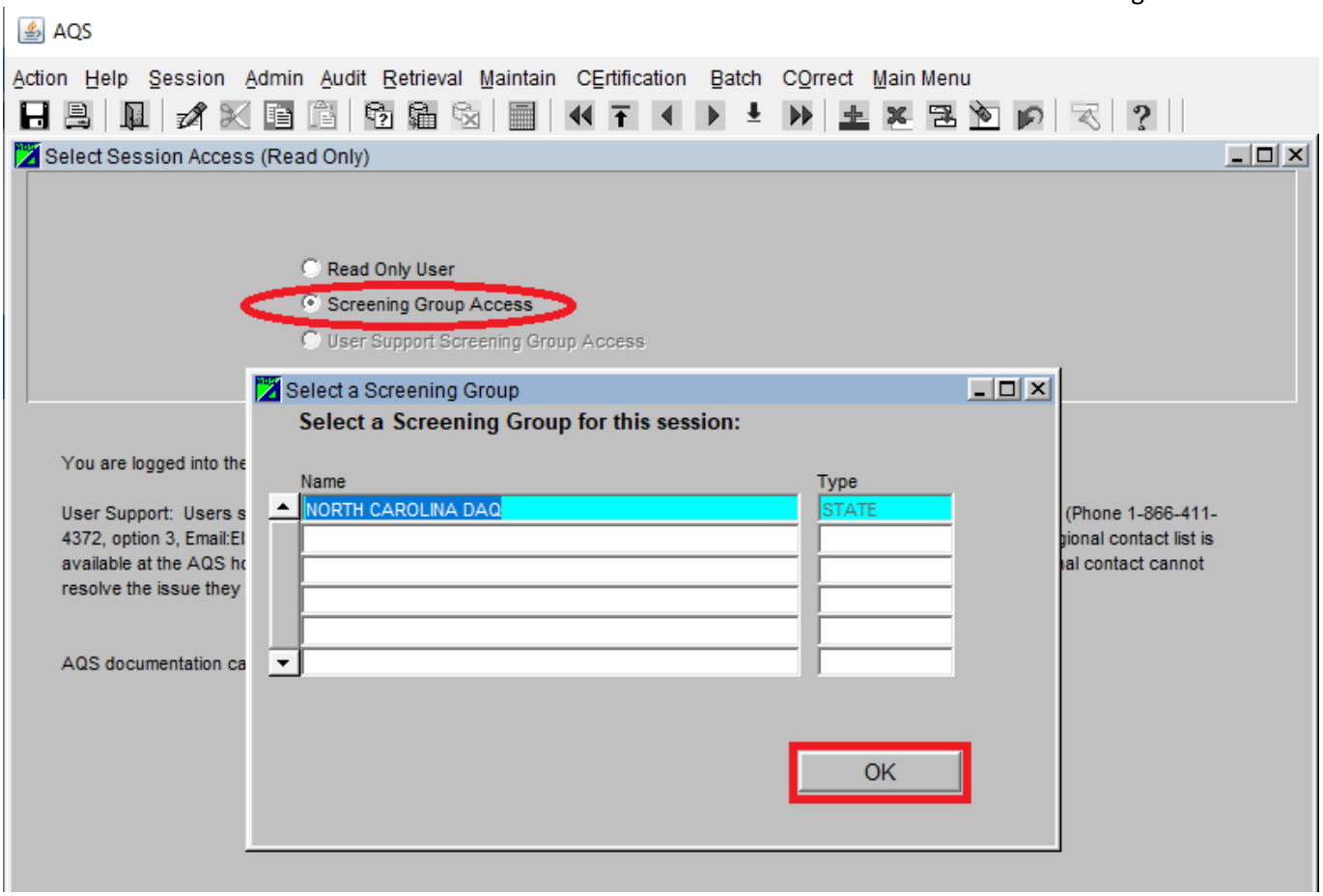
```
#Transaction Type|Action Indicator|Assessment Type|Performing Agency|State Code / Tribal Indicator|County Code
QA|I|Annual PE|0776|37|013|0151|42401|1|20200922|1|060|008|2.6|2.49|||||15.3|15.97|||71.65|74.69|||||||
QA|I|Annual PE|0776|37|019|0005|42401|1|20200528|1|560|008|2.8|2.5|||||15.9|16|||74.9|75.1|||||||
QA|I|Annual PE|0776|37|021|0037|42401|1|20200218|1|560|008|2.76|2.5|||||16.58|15.98|||77.34|74.42|||||||
QA|I|Annual PE|0776|37|021|0037|42401|1|20200630|1|560|008|2.44|2.5|||||16.02|15.98|||76.56|75.06|||||||
QA|I|Annual PE|0776|37|027|0003|42401|1|20200218|1|060|008|1.98|2.5|3.68|4.5|||||74.73|75.03|||||||
QA|I|Annual PE|0776|37|063|0015|42401|1|20201208|1|060|008|3.05|2.49|||||15.21|15.98|||71.4|74.76|||||||
QA|I|Annual PE|0776|37|063|0015|42401|1|20210330|1|060|008|2.66|2.49|||||15.68|15.97|||74.68|75.18|||||||
QA|I|Annual PE|0776|37|087|0013|42401|1|20200512|1|060|008|2.77|2.53|||||15.8|16.02|||73.48|75.06|||||||
QA|I|Annual PE|0776|37|117|0001|42401|1|20200324|1|060|008|2.36|2.49|4.44|4.49|||||75.22|74.97|||||||
QA|I|Annual PE|0776|37|145|0004|42401|1|20200317|1|560|008|2.66|2.5|||||16.18|15.98|||76.28|75.05|||||||
QA|I|Annual PE|0776|37|145|0004|42401|1|20200626|1|560|008|2.74|2.5|||||16.34|15.98|||76.92|75.16|||||||
QA|I|Annual PE|0776|37|145|0004|42401|1|20200930|1|560|008|2.46|2.5|||||15.9|15.98|||75.12|74.94|||||||
QA|I|Annual PE|0776|37|145|0004|42401|1|20201218|1|560|008|2.82|2.49|||||15.58|15.98|||72.14|75.06|||||||
QA|I|Annual PE|0776|37|157|0099|42401|1|20200923|1|060|008|2.91|2.5|4.89|4.5|||||74.06|75.06|||||||
QA|I|Annual PE|0776|37|157|0099|42401|1|20210317|1|060|008|2.33|2.52|||||15.61|15.98|||74.98|75.09|||||||
QA|I|Annual PE|0776|37|183|0014|42401|2|20201215|1|560|008|2.41|2.5|4.19|4.5|||||71.59|74.49|||||||
#END OF FILE - 16 ROWS
```

The assessment date field is highlighted in red below. The date should be entered in the format YYYYMMDD. Note that in the transaction file, the monitor concentration is listed first (green arrows). The monitor concentration is listed second on the continuous monitor performance audit report. The assessment concentration is listed second (orange arrows). Note that the assessment concentration is listed first on the continuous monitor performance audit report. After the performance evaluation data are entered in the Notepad file, save the file in the P:\Ambient\PUB\RegOffices.NC\AQS\Manual Upload Files folder. Name the document as shown below (QA_APE_Pollutant Code_Year_Q#_Initials). Then hit save. Send an email to the database manager that the file is ready to upload to AQS. After the database manager responds via email that the file has been uploaded, run an AMP251 report to confirm that the data are in AQS.

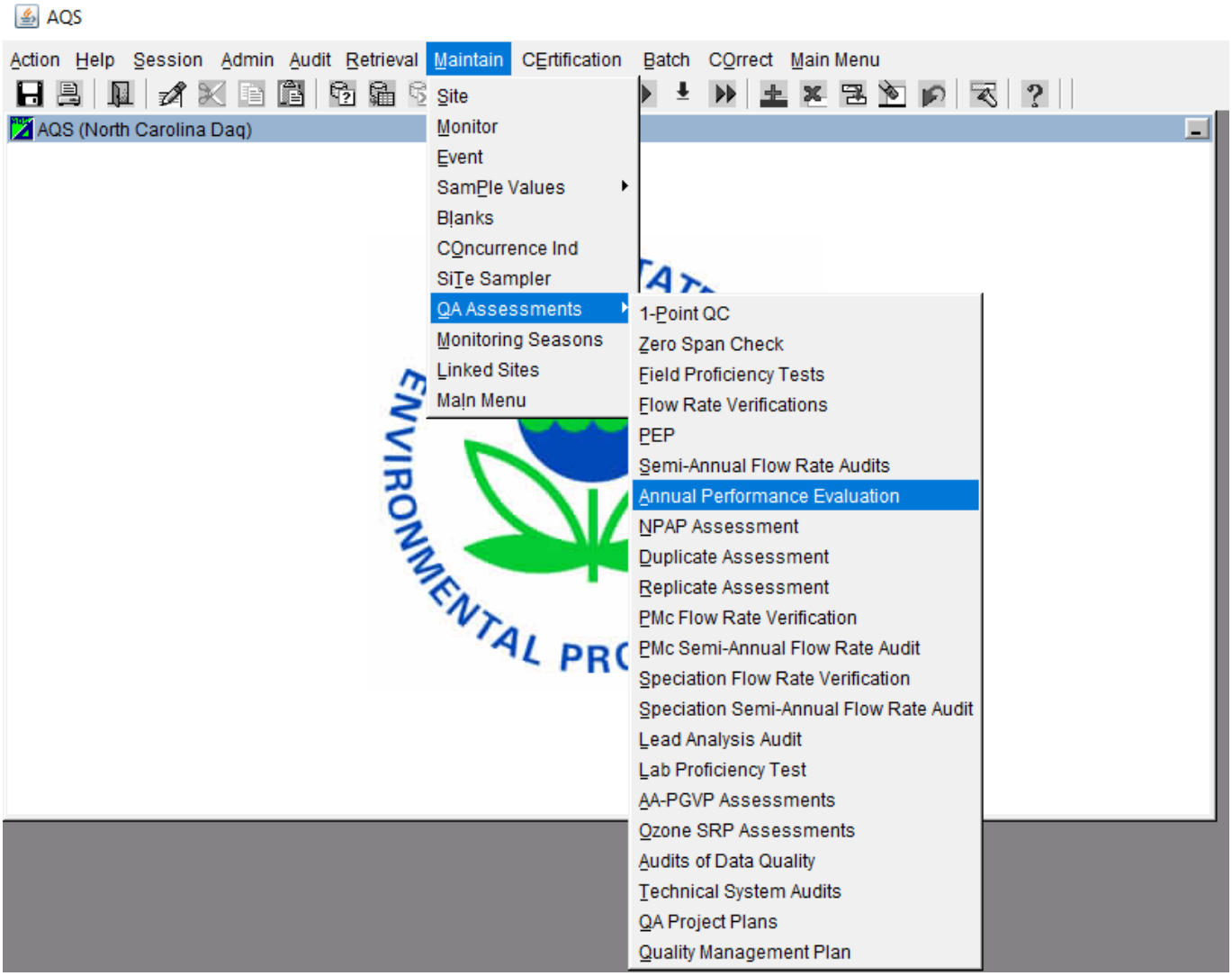


C.2.2 Uploading Performance Evaluation Data to AQS Via Screening Group Access

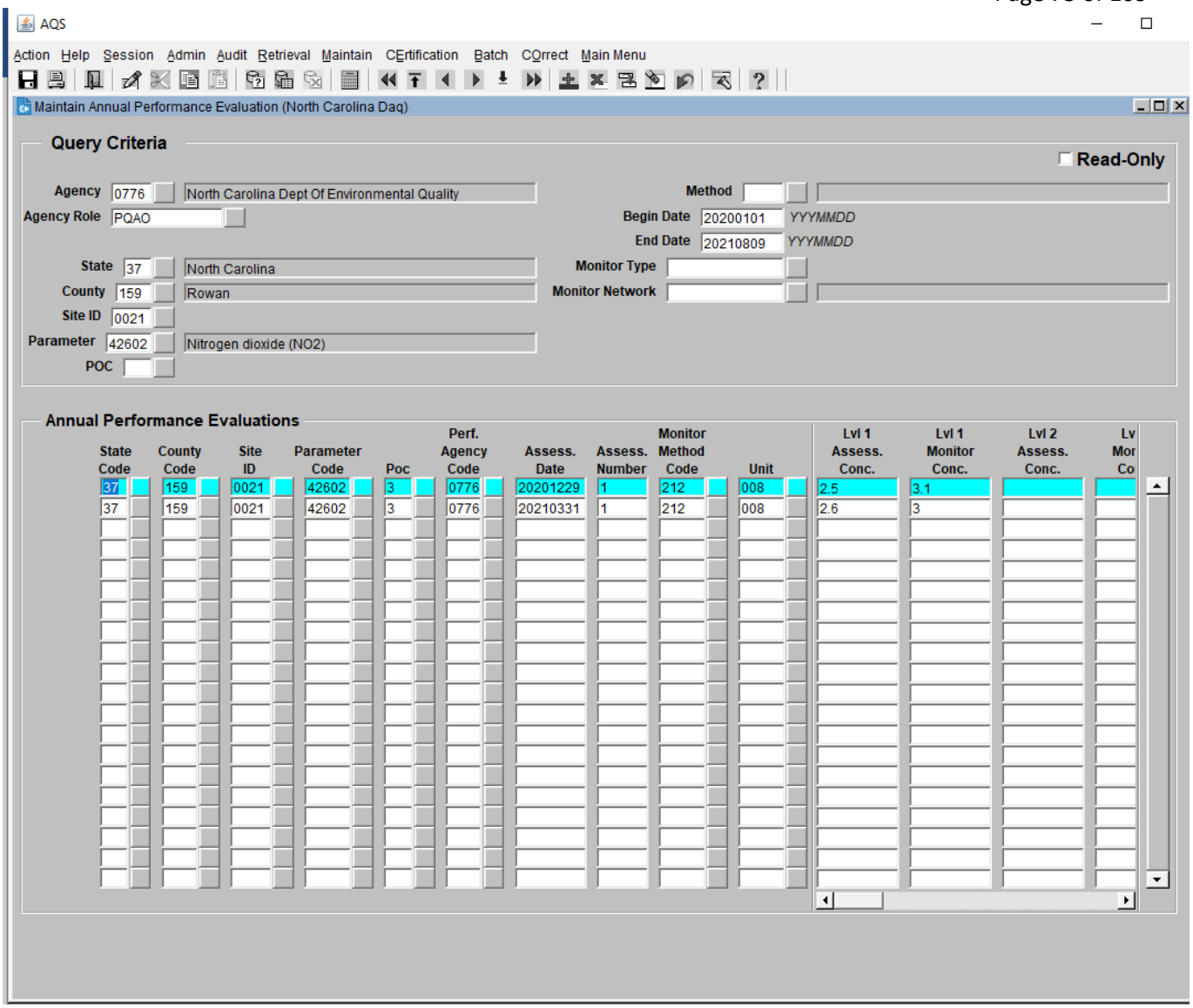
After all the performance evaluation reports are reviewed, evaluated, and signed, someone who has "Screening Group Access" can log in to AQS by selecting the button next to "Screening Group Access," then selecting the "North Carolina DAQ" Screening Group and hitting the OK button as shown below.



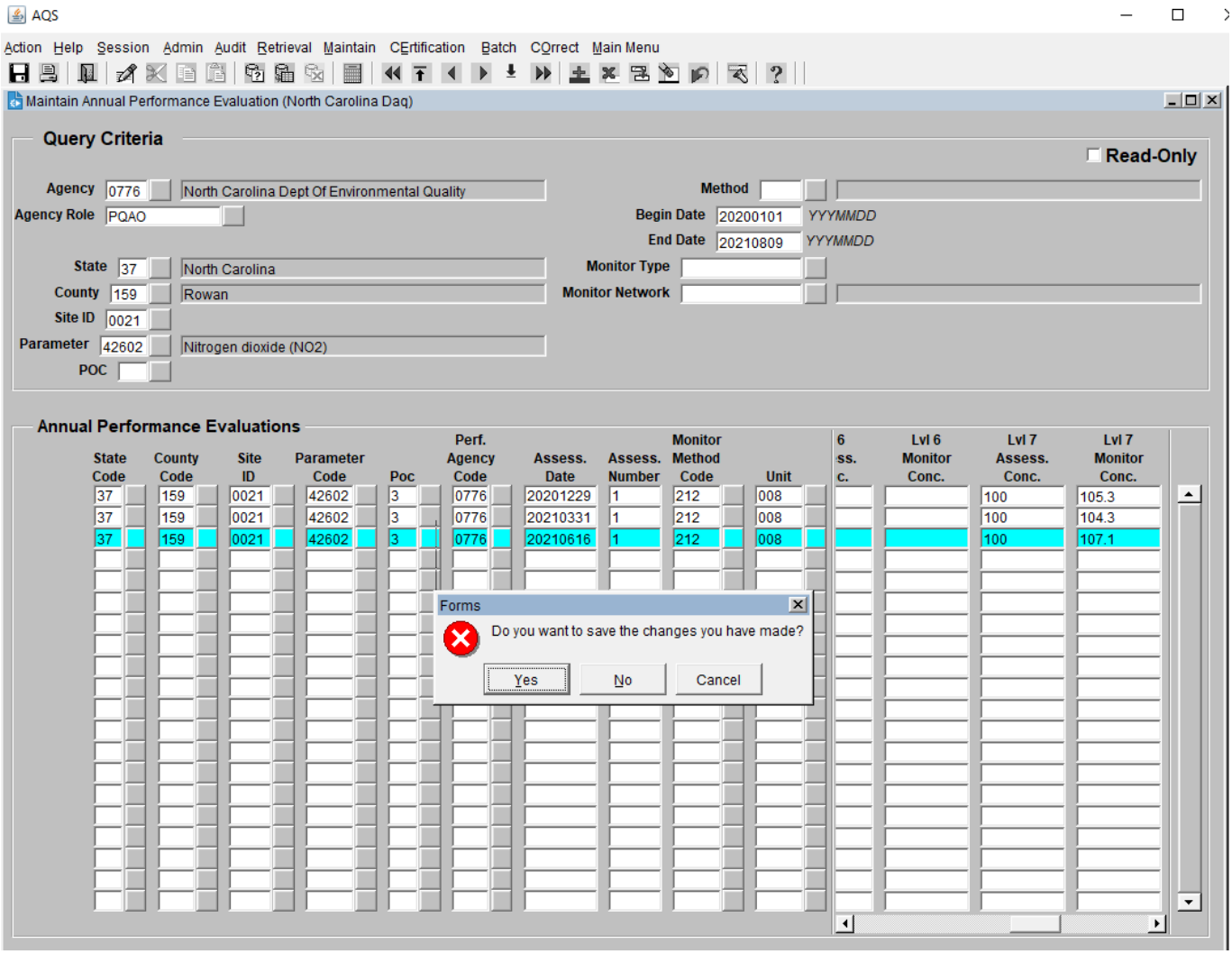
Once logged in to the North Carolina DAQ Screening Group, select “Maintain” from the menu on the top and from the dropdown list select “QA Assessments” and then “Annual Performance Evaluation” as shown below.



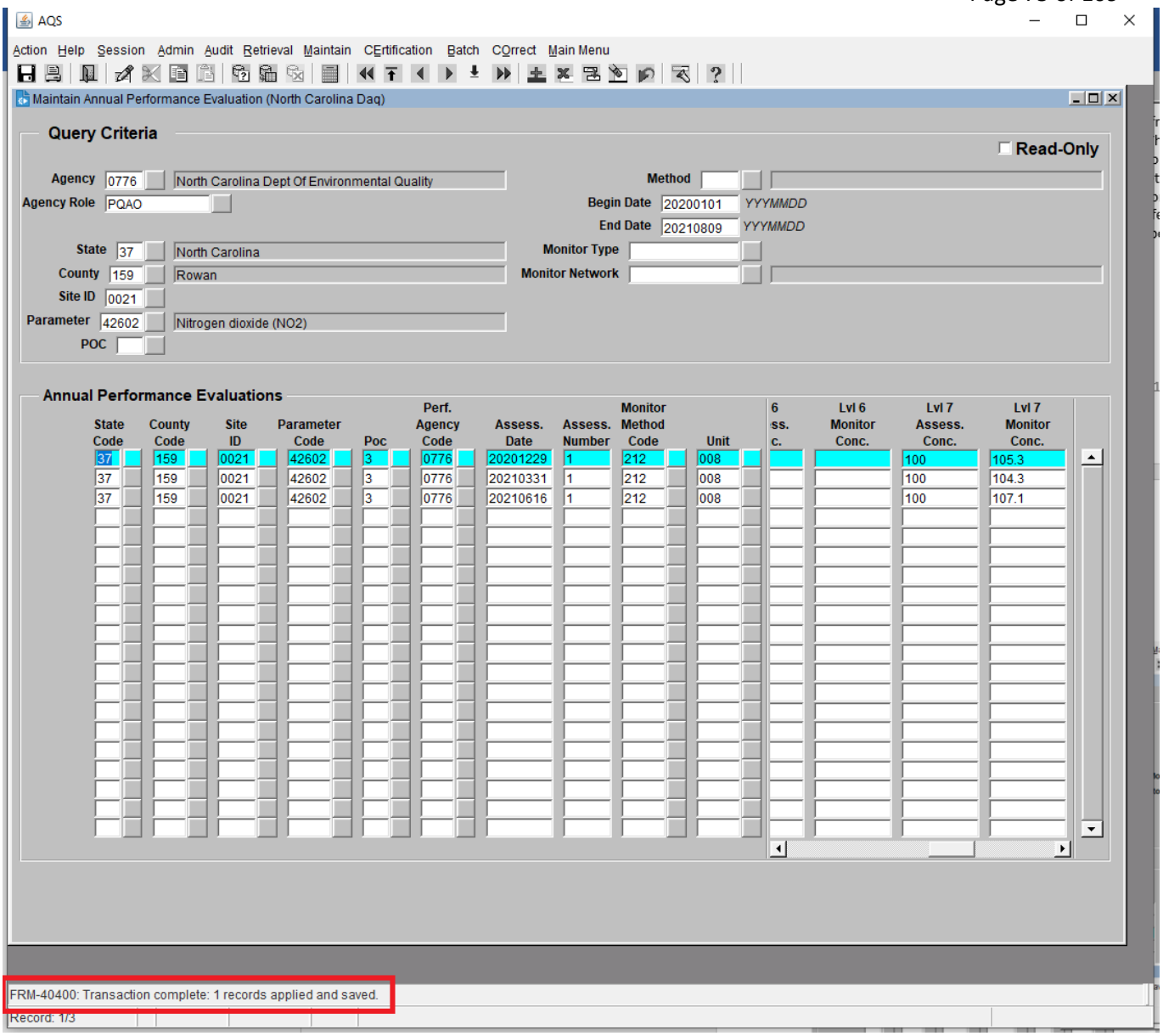
A screen will appear like the one shown below that is blank except for the Agency and Agency Role. You can enter the data on this screen without doing a query but querying recent data may make it easier to add the new data because you can just copy most of it except for the assessment date and assessment and monitor concentrations. If you choose to do a query enter in the appropriate information for the query you want to do. Below the query asked for the NO_2 data at Rockwell for the previous year and this year.



Enter in the assessment data, copying the information from the line above. The form automatically fills in the performing agency code. Enter the assessment data. The assessment number is always one unless for some reason two assessments were done on the same day (for example if one assessment failed and a problem was found and fixed and a second assessment was done on the same day). This situation is extremely rare – so rare it is practically nonexistent. Be sure to enter the concentration data under the correct level. If you are unsure of the correct level to record the data under, refer back to Appendix C.2 Table 2. After you have entered all of the data, hit F8. A popup box, as shown below, will appear asking if you want to save the data. Hit yes.



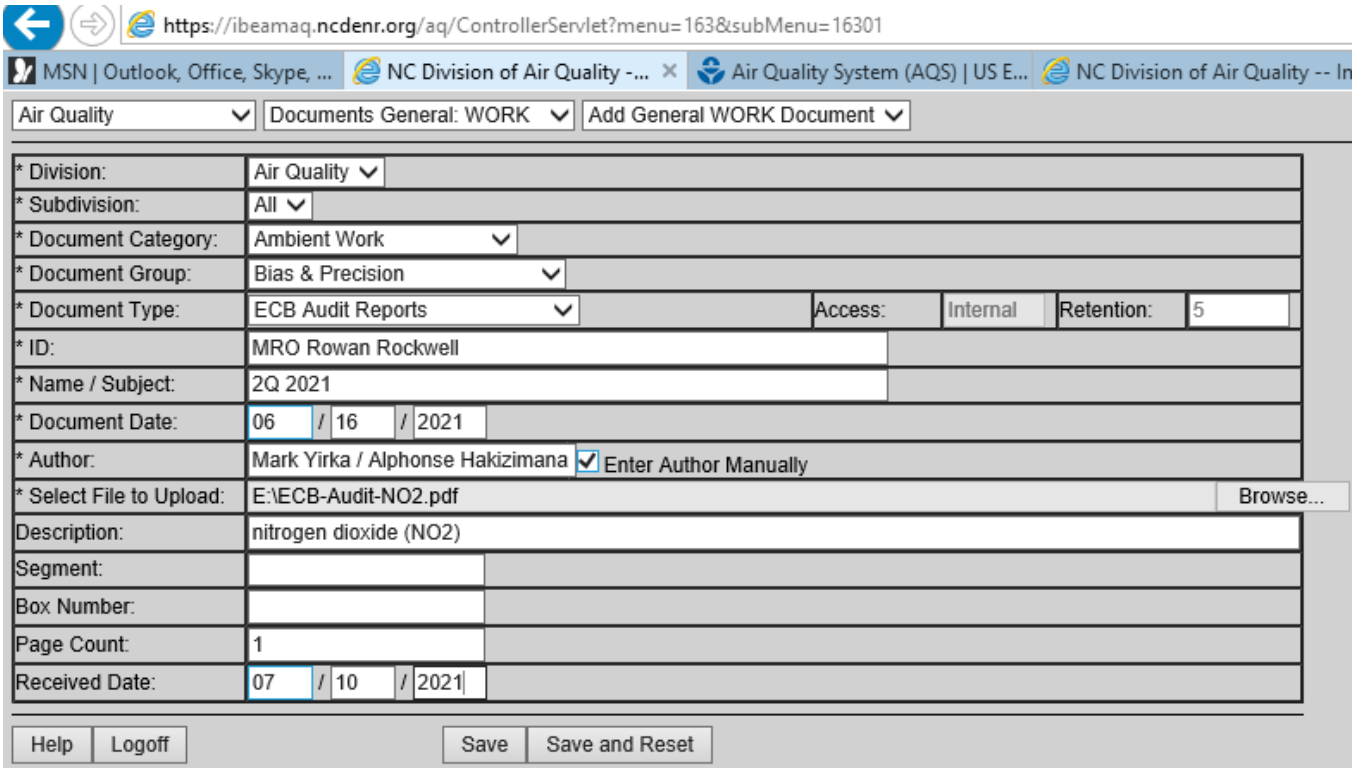
After you hit yes, the data will be saved and a message will appear at the bottom of the page indicating that the transaction is complete and the record was saved as shown below. If you have the option to enter the data this way, this process is the easiest process to use.

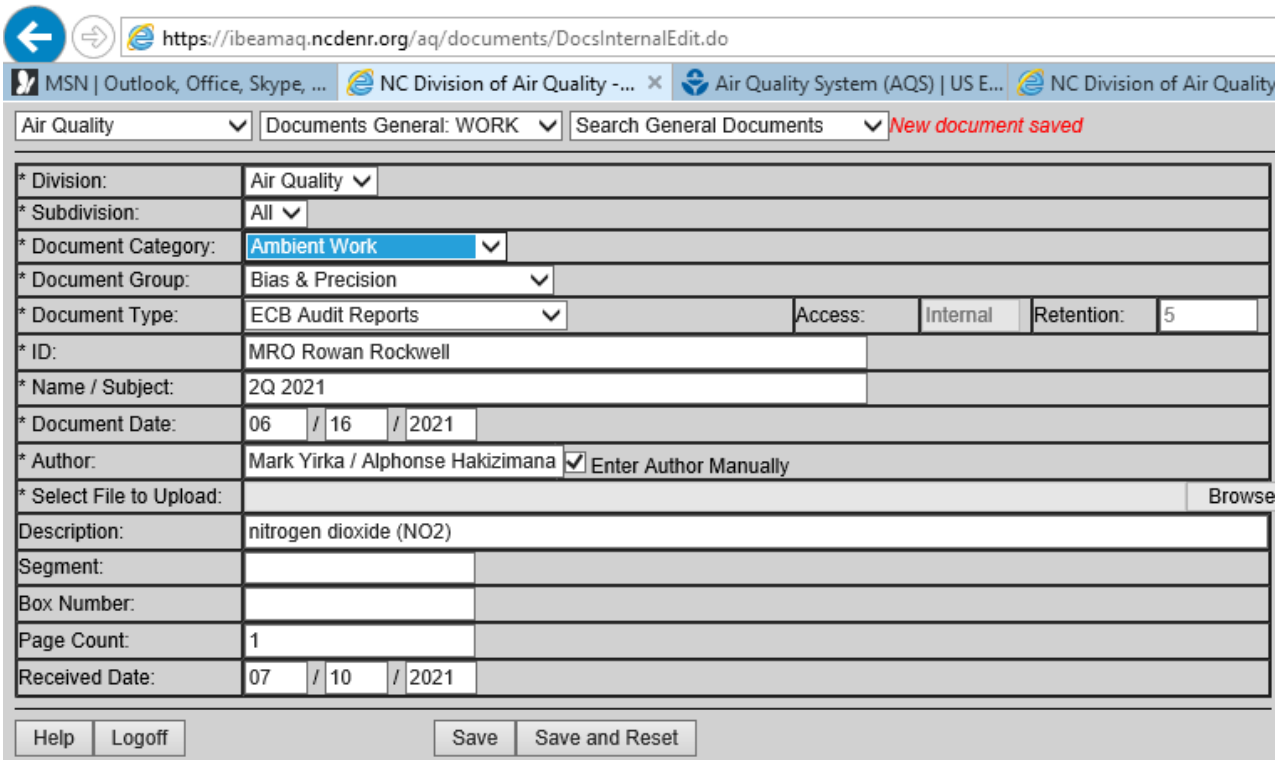


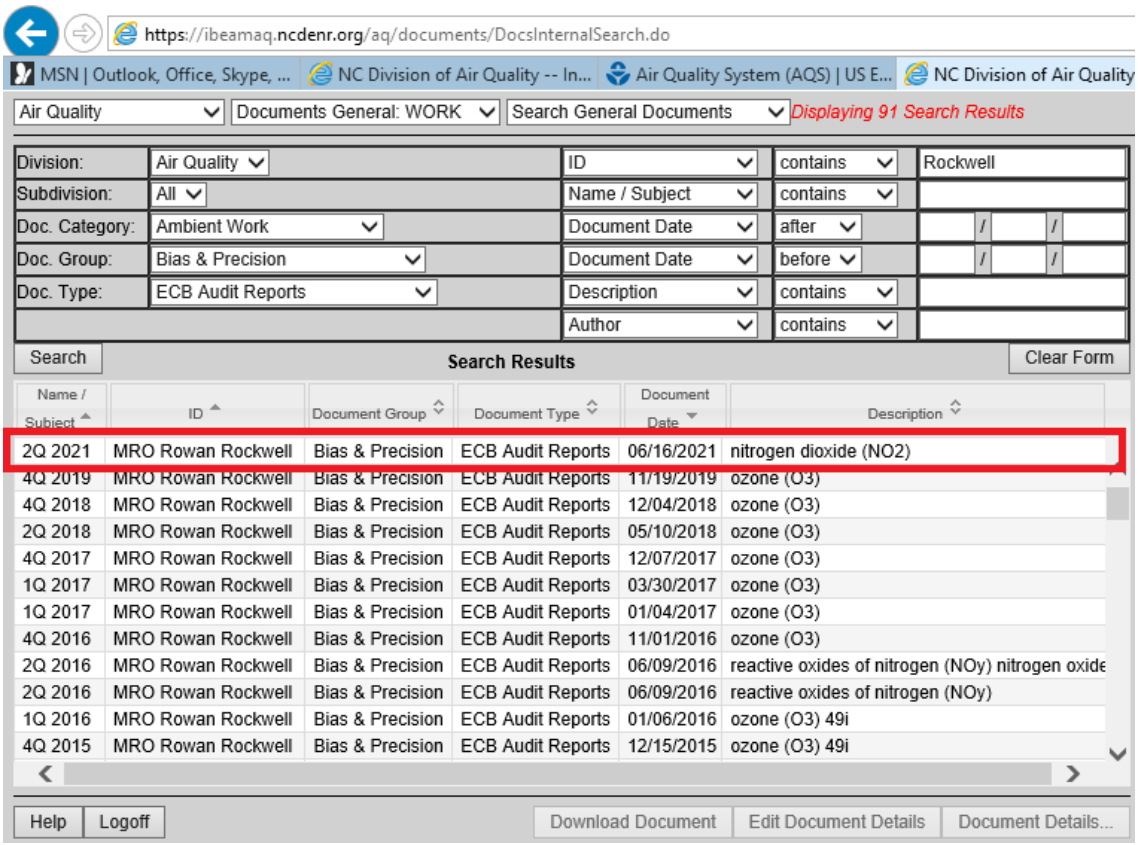
C.3 Uploading the Performance Evaluation Reporting Form to IBEAM

After the person reviewing, evaluating and signing the performance evaluation reporting form signs it, the person or a designee should upload it to IBEAM to document that the performance evaluation was evaluated, signed and uploaded to AQS. To upload the signed performance evaluation report, select the "Documents General: WORK" module and select "Add General WORK Document." From the dropdown lists, select Ambient Work" for the Document Category, "Bias & Precision" for the Document Group, and "ECB Audit Reports" for the Document Type. Type in the region (3 or 4 letter code), the county name and the site name for the ID and the quarter followed by "Q" and the four-digit year for the Name / Subject. Enter the assessment date for the document data and the names of the auditors for the author. Select the file to upload. In the description type the pollutant name followed by the acronym in parentheses. If desired, enter the number of pages and the received date. Then hit the Save button. The first screen shot below shows the filled in data fields before the document is uploaded to IBEAM and the second screen shot shows what the screen looks like after the file is uploaded. Once the file is uploaded, run a query as shown in the third screen

shot to confirm the file is in IBEAM and properly indexed. Because there are over 1,000 performance evaluation reports in IBEAM, you will want to include the site name in the "ID" in your search query.

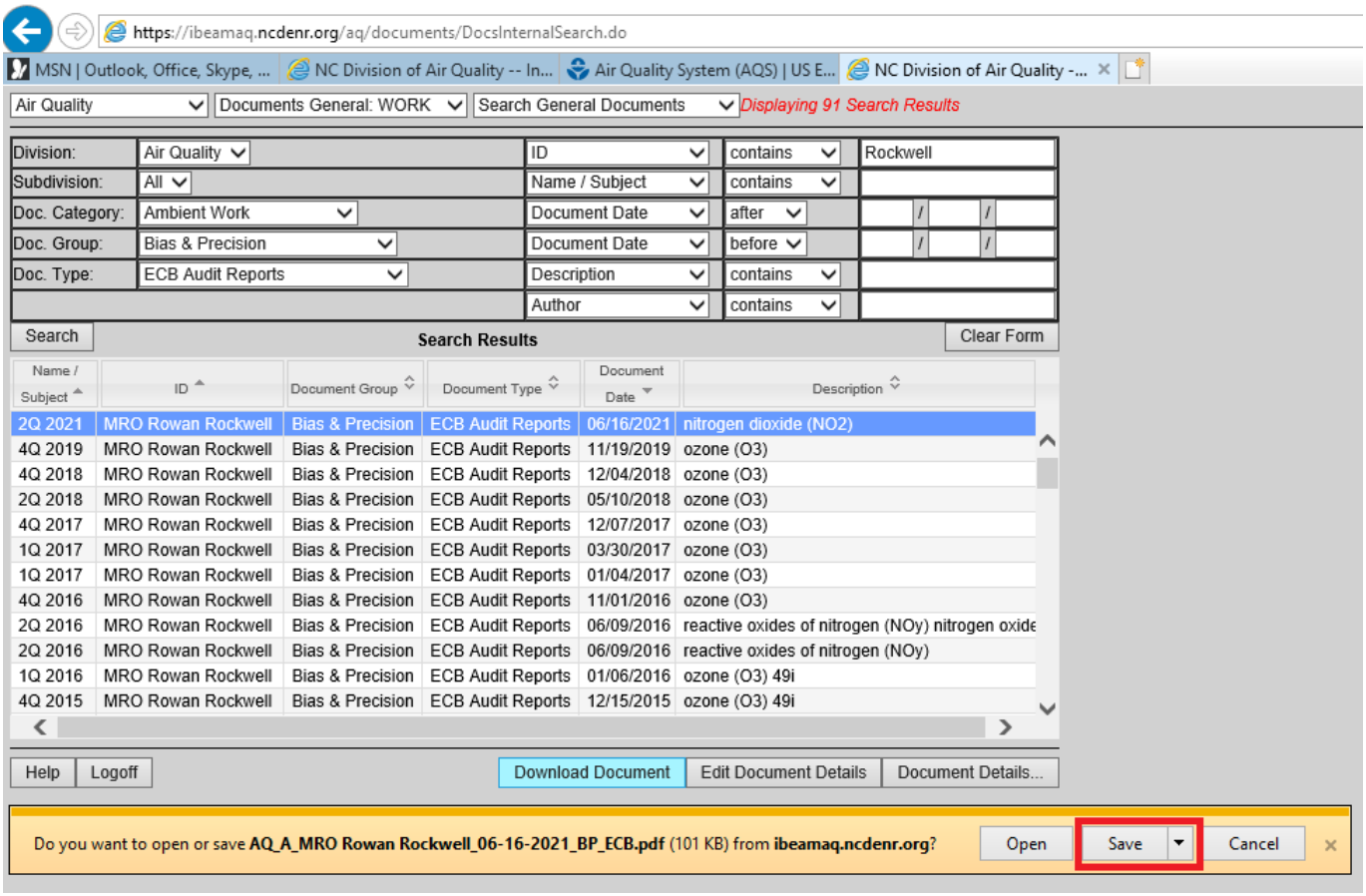






C.4 Sharing the Performance Evaluation Reporting Form with the Regional Supervisor and Coordinator

After the performance evaluation report is in IBEAM, you will want to download it and send it to the ABAQA staff or the regional supervisor, regional coordinator and RCO chemist listed at the top of the form. To download it run the same query used to confirm the document is in IBEAM, select the document by clicking on it and then click on “Download Document.” As shown below, a popup window will appear asking you whether you want to open the document or save it. Select “Save.” When the document has been saved, the popup window will tell you that the document has been saved and will give you the option to open the document. You may want to open the document to confirm it is the correct document (that is the document you desire to email).



Open your email, attach the document, address the email to the regional supervisor and coordinator (or ABAQA staff) and carbon copy the RCO chemist and the audit chemist. If the audit was not acceptable or was interesting for some reason, copy the chief, PPB supervisor and ECB supervisor. The body of the email should say something to the following:

Hi [name of supervisor] and [name of coordinator],

Attached please find the AQ-121 reports for the ECB performance audits completed at [name of site] and [name of site] on [date of audit]. Both evaluations [passed or failed]. The EPA requires the measured values to be within [7 for O_3, 10 for SO_2 and CO and 15 for NO_2] percent of the expected values. For both audits the measured values were within [enter results] percent of the expected values. [Keep up the good work. Your efforts ensure that the director can speak with great confidence when he says the state is attaining the [applicable pollutant] standard. Thank you for all the effort you invest to make this true.]

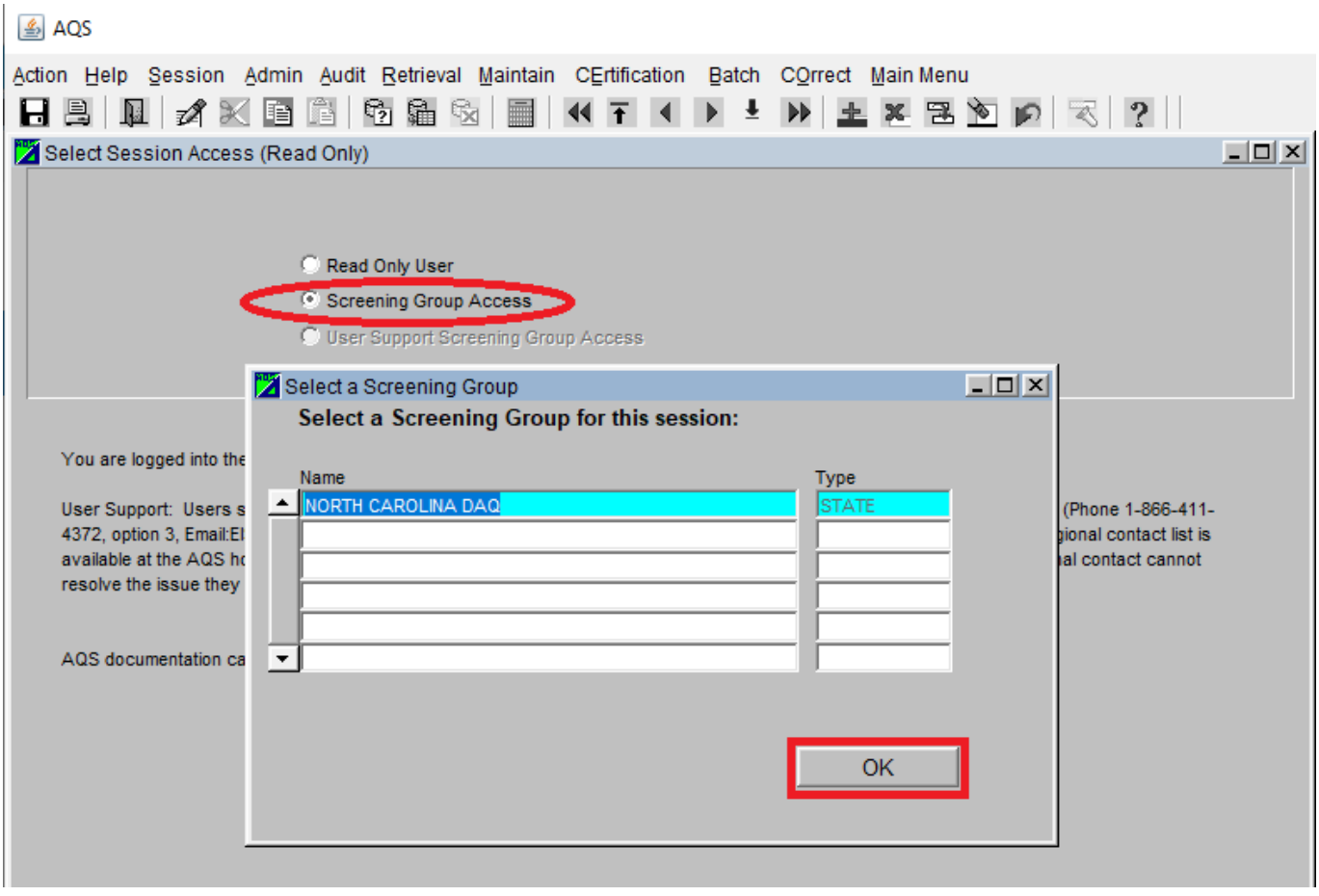
[Add closing such as with kind regards, sincerely, etc.]

Appendix D: Detailed Annual Data Certification Procedures

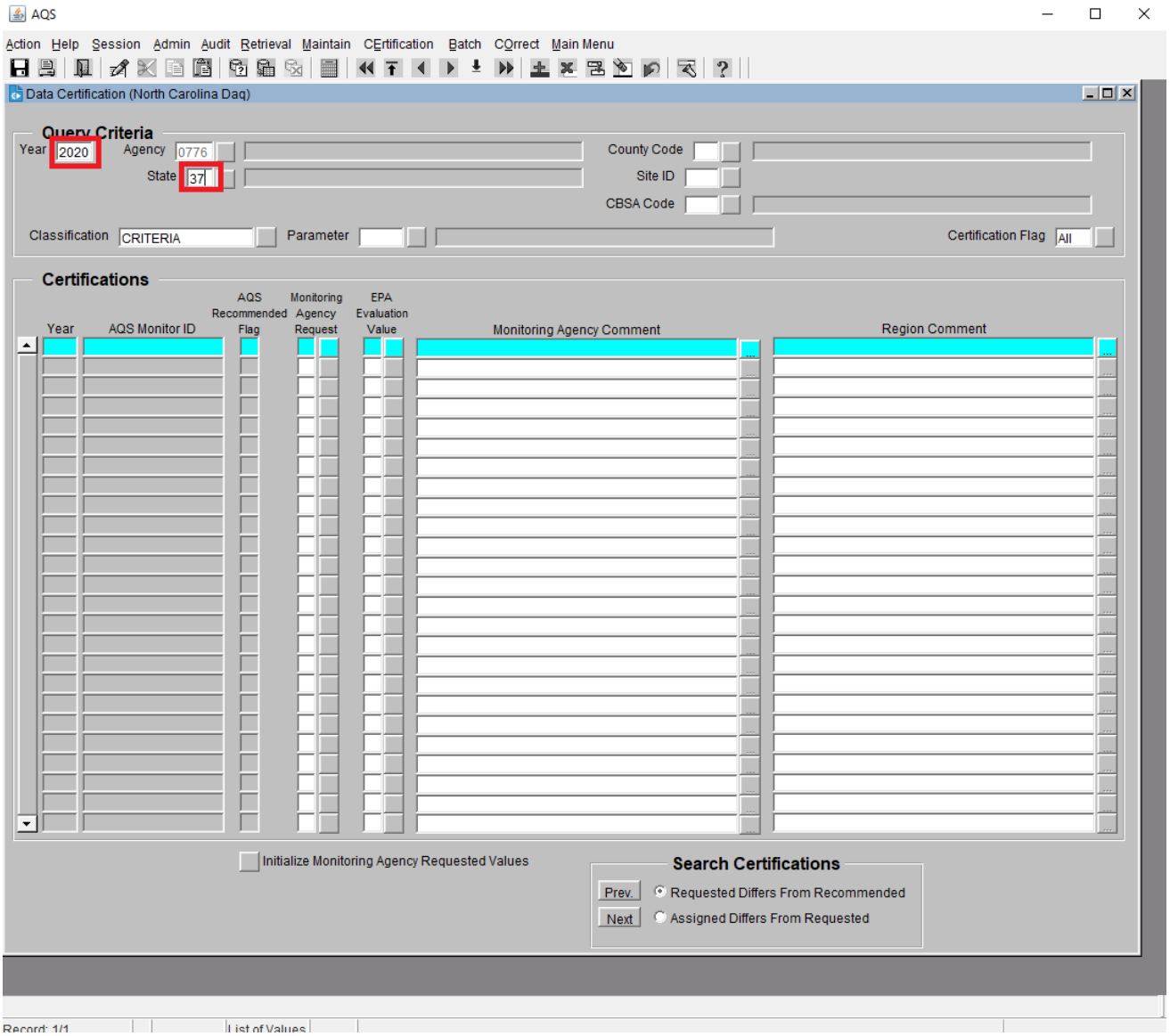
This appendix contains detailed procedures for generating the AMP600 and AMP450NC reports for the annual certification of the data. This appendix also contains instructions on archiving the annual data certification package in IBEAM.

D.1 Preparation of the AMP600 Report for Submittal to the EPA for the Annual Certification

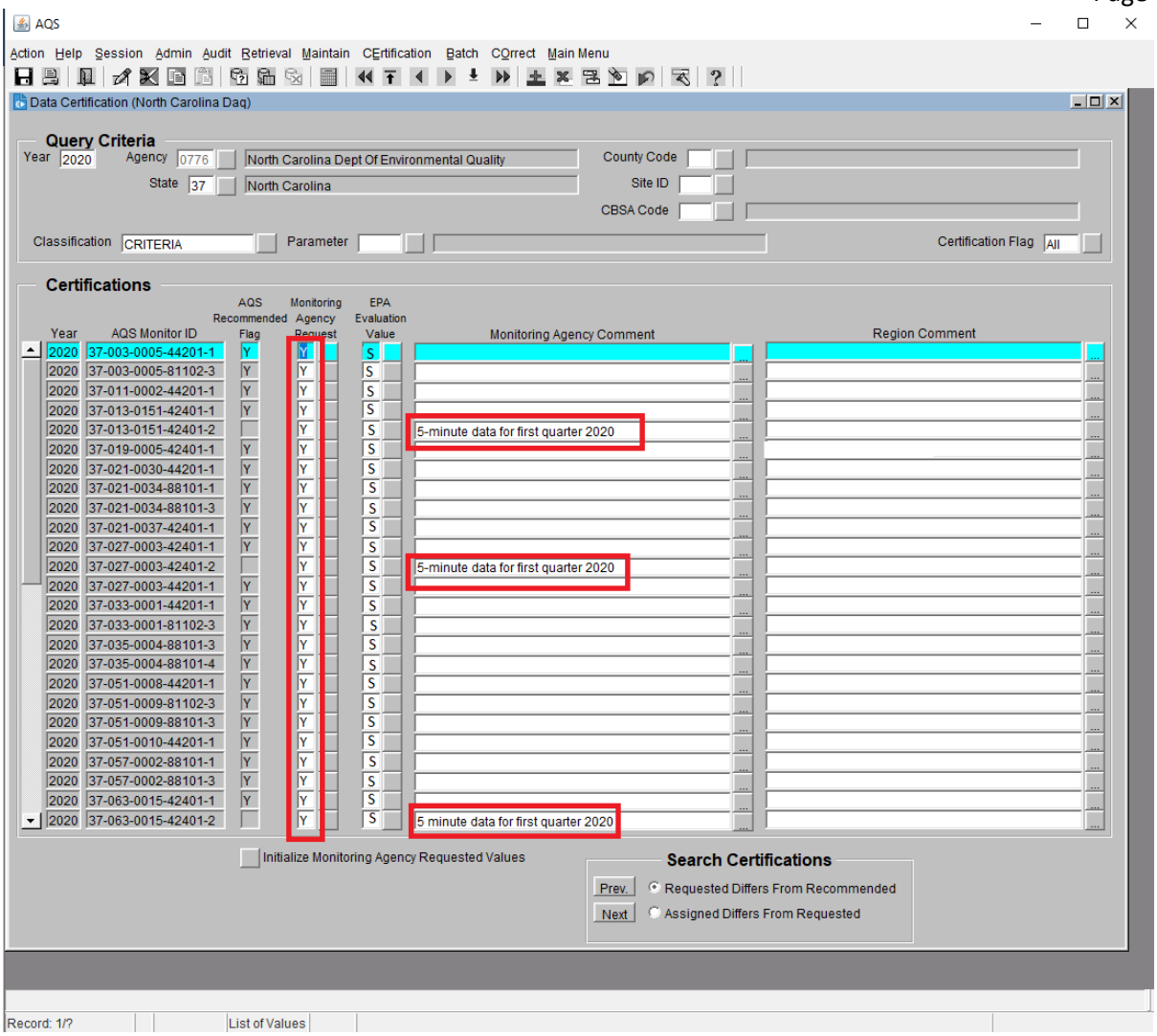
Preparing the AMP600 report for submittal to the EPA for annual data certification is a two-part process. First, after all the data corrections are made, someone who has "Screening Group Access" needs to log in to AQS by selecting the button next to "Screening Group Access," then selecting the "North Carolina DAQ" Screening Group and hitting the OK button as shown below.



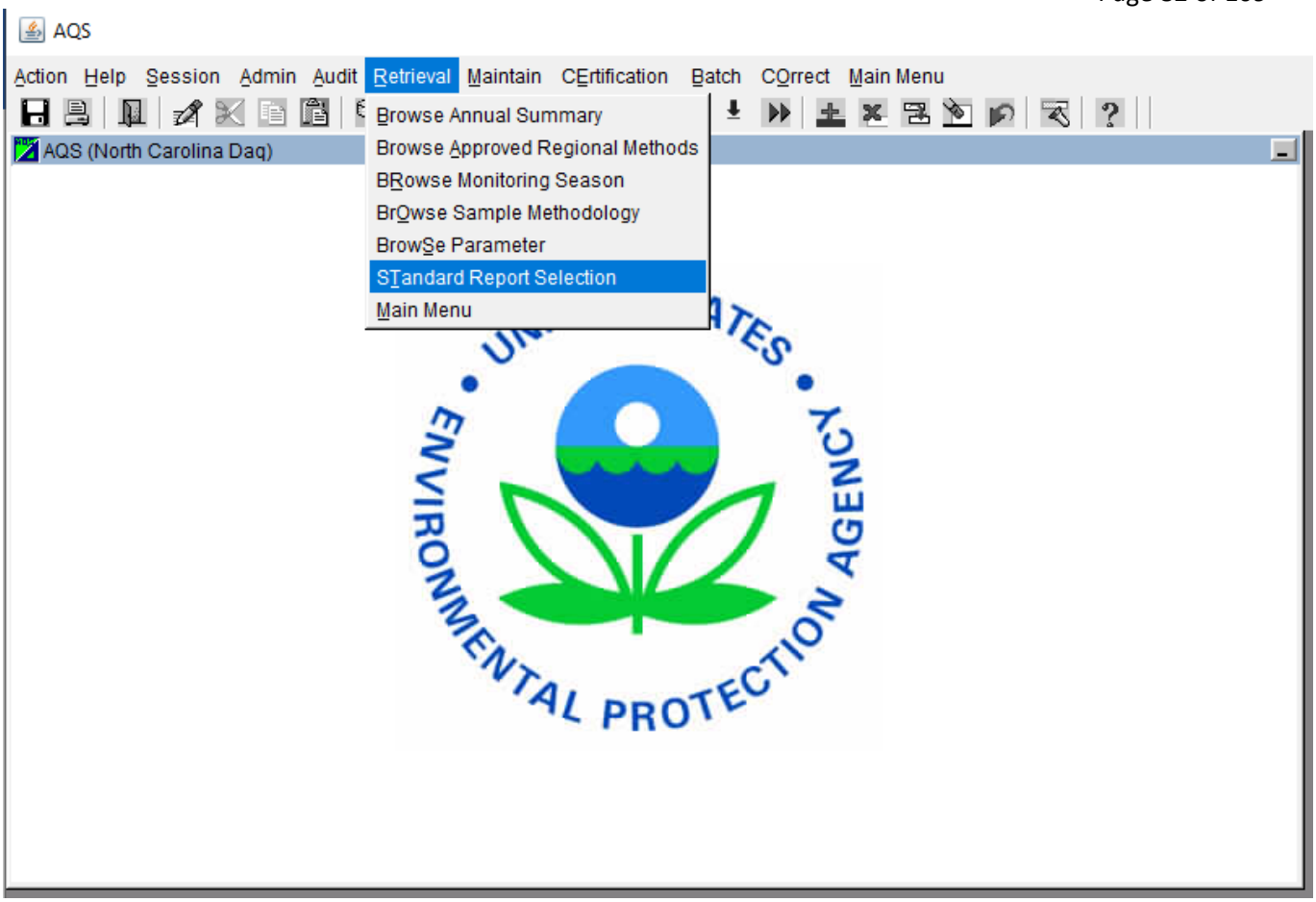
Once logged in to the North Carolina DAQ Screening Group, select "CErtification" from the menu on the top and type 37 in for the State code as shown below. If you are certifying all of the data, hit F8. If you are certifying a subset of the data, for example, O_3 data for an early certification, enter the parameter code, in this case "44201" and then hit F8.



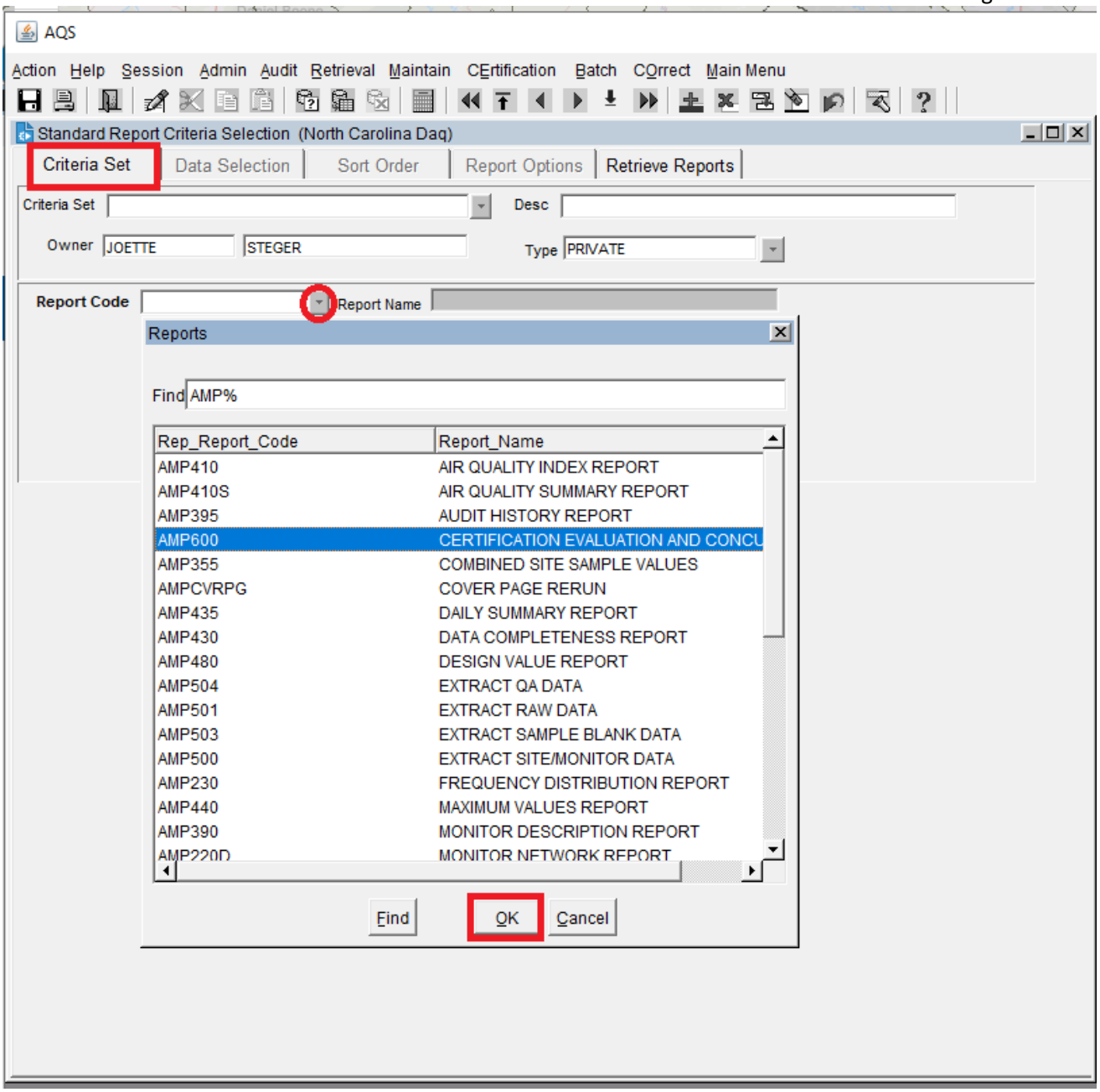
If the parameter code is left blank, all of the criteria pollutant monitors will appear in the screen. For those monitors you want to certify, place a "Y" in the "Monitoring Agency Request" box. If desired, add a comment to the "Monitoring Agency Comment" box. After all of the needed "Y"s and comments are added, hit the "F8" key again to save or commit your changes. An "S" signifying that the agency submitted the data to the EPA for certification will appear in the "EPA Evaluation Value" field for each monitor with a "Y" in the "Monitoring Agency Request" field as shown below. The agency is required to submit these data for certification and should follow through with the EPA to ensure the EPA changes the "S" flag to a "Y" flag for these monitors.



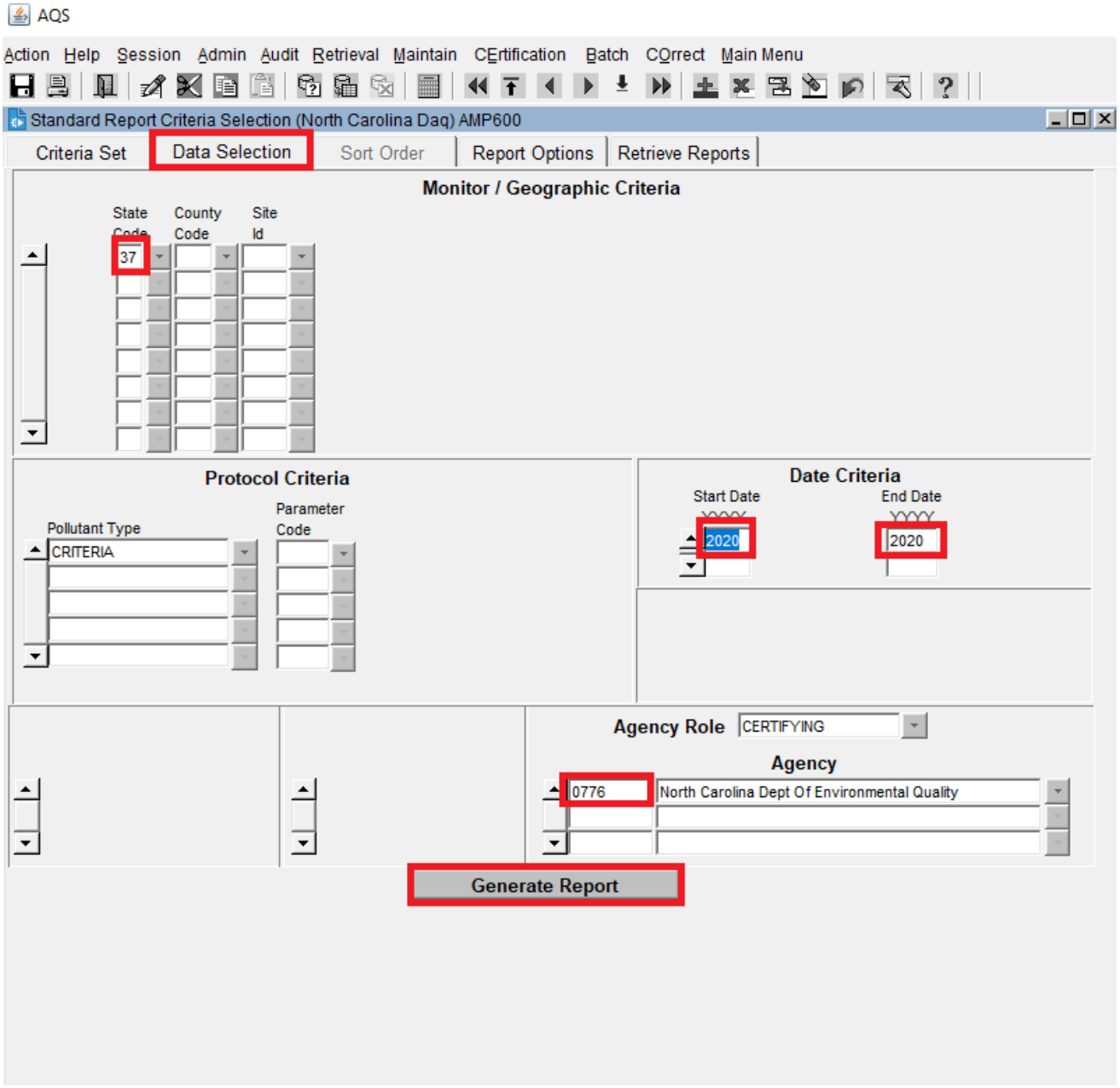
The second part of the process to prepare the AMP600 report for submittal to the EPA for the annual data certification, involves generating the report. To generate the report, first log into AQS. Next select "Retrieval" from the menu going across the top of the screen as shown below. Then select "Standard Report Selection" from the dropdown menu as shown below.



Next on the “Criteria Set” page, which should be the default page that opens initially, click on the button by “Report Code” to open the dropdown list of available reports. Select Rep_Report_Code “AMP600” with the Report_Name “Certification Evaluation and Concurrence” and click the “OK” button at the bottom of the page as shown below. Reports are listed alphabetically by Report_Name.



Next, select the "Data Selection" page. For the "Monitor / Geographic Criteria" type in "37" for the State Code. You can also click on the button for a dropdown list of state codes. If you are not certifying all of the monitors in the state, but only a subset, you can enter the County Code and Site Id codes for the specific monitors you want to certify. The "Protocol Criteria" type defaults to "CRITERIA" and does not need to be changed unless you are only certifying a subset of data. For example, if you are doing an early certification for O_3, you would want to add the parameter code "44201" for O_3. For the "Date Criteria" enter the four-digit year for the year you want to certify for both the "Start Date" and "End Date." For "Agency" type in "0776" which is the agency code for DEQ. Then hit the "Generate Report" button as shown below.



A report will be produced summarizing the quality of the data for the year. The second page of the report containing a summary of the monitors evaluated with the monitoring agency representative's signature is shown below. The date on the report must be within one or at most two days of the date when the annual certification letter is submitted to the EPA. If the annual certification letter is submitted more than two days after the report is generated, rerun the report following the previous steps. After the report is finalized, the chief should sign and date the report as shown below.

Apr. 29, 2021

Data Evaluation and Concurrence Report Summary

Certification Year: 2020
Certifying Agency (CA): North Carolina Dept Of Environmental Quality (0776)

Pollutants in Report:

Parameter Name	Code	Monitors Evaluated	Monitors Recommended for Concurrence by AQS	Monitors NOT Recommended for Concurrence by AQS
Carbon monoxide	42101	2	2	0
Nitrogen dioxide (NO2)	42602	4	4	0
Ozone	44201	28	28	0
PM10 Total 0-10um STP	81102	10	10	0
PM2.5 - Local Conditions	88101	22	21	1
Sulfur dioxide	42401	10	10	0

PQAOs in Report:

PQAO Name	PQAO Code	TSA Date
North Carolina Dept Of Environmental Quality	0776	03/11/19

Summary of 'N' flags for all pollutants:

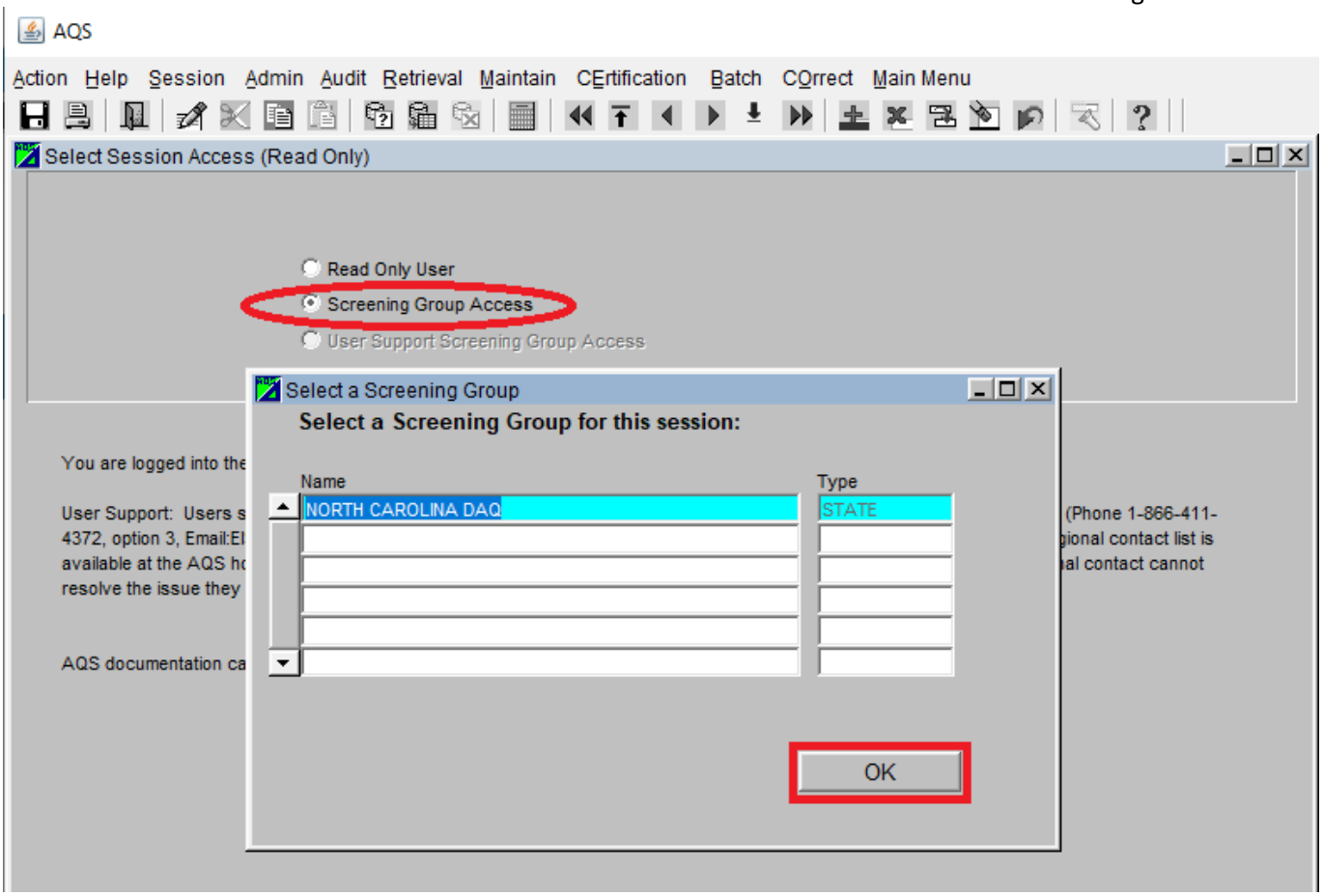
PQAO	Parameter Code	AQS Site-ID	POC	AQS Recommended Flag	Cert. Agency Recommended Flag	Reason for AQS Recommendation
0776	88101	37-183-0014	1	N	Y	Annual Summary completeness < 70%.

Signature of Monitoring Organization Representative: Patrick Butler 4-30-2021

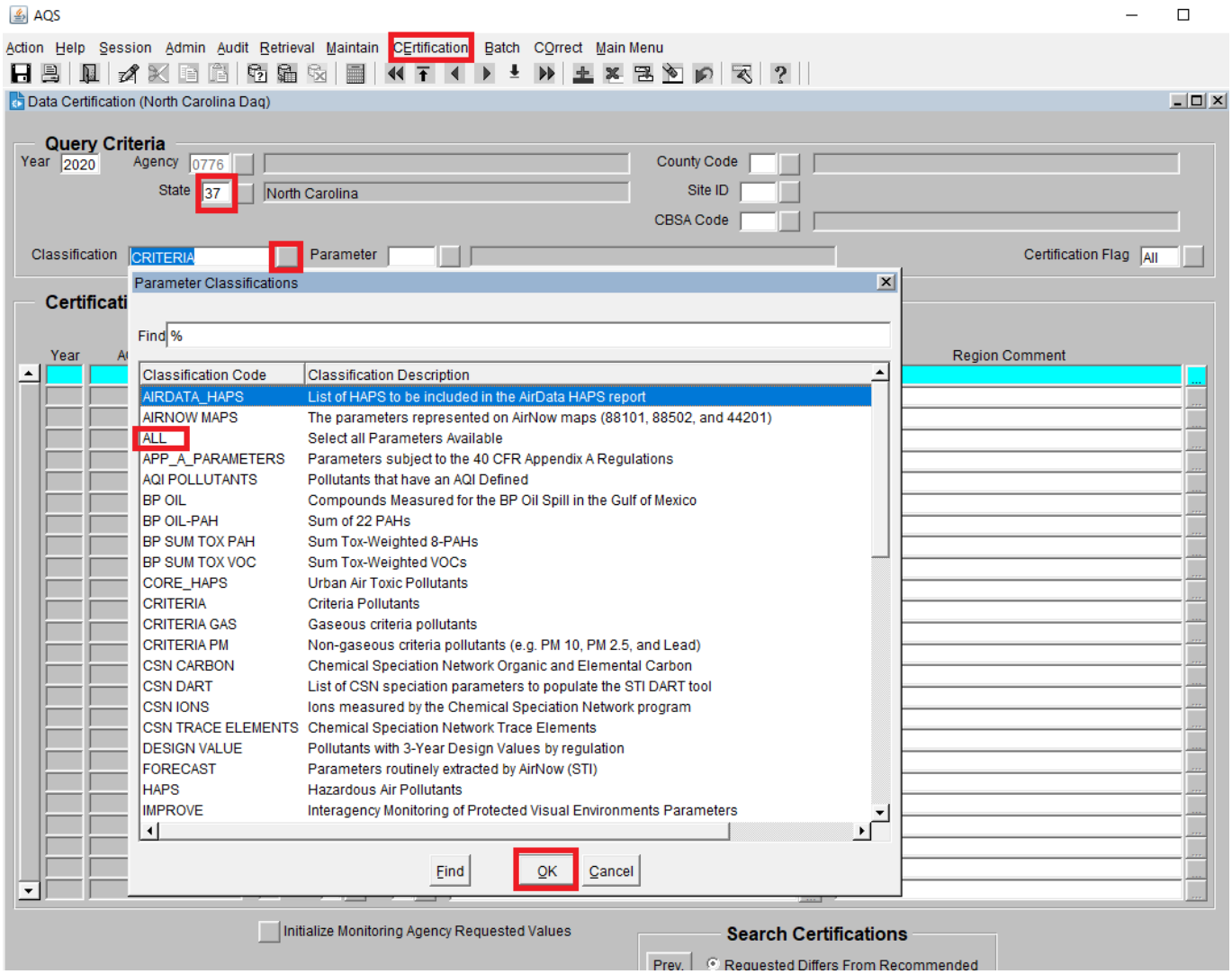
Page 1 of 1

D.2 Preparation of the AMP450NC Report for Submittal to the EPA for the Annual Certification

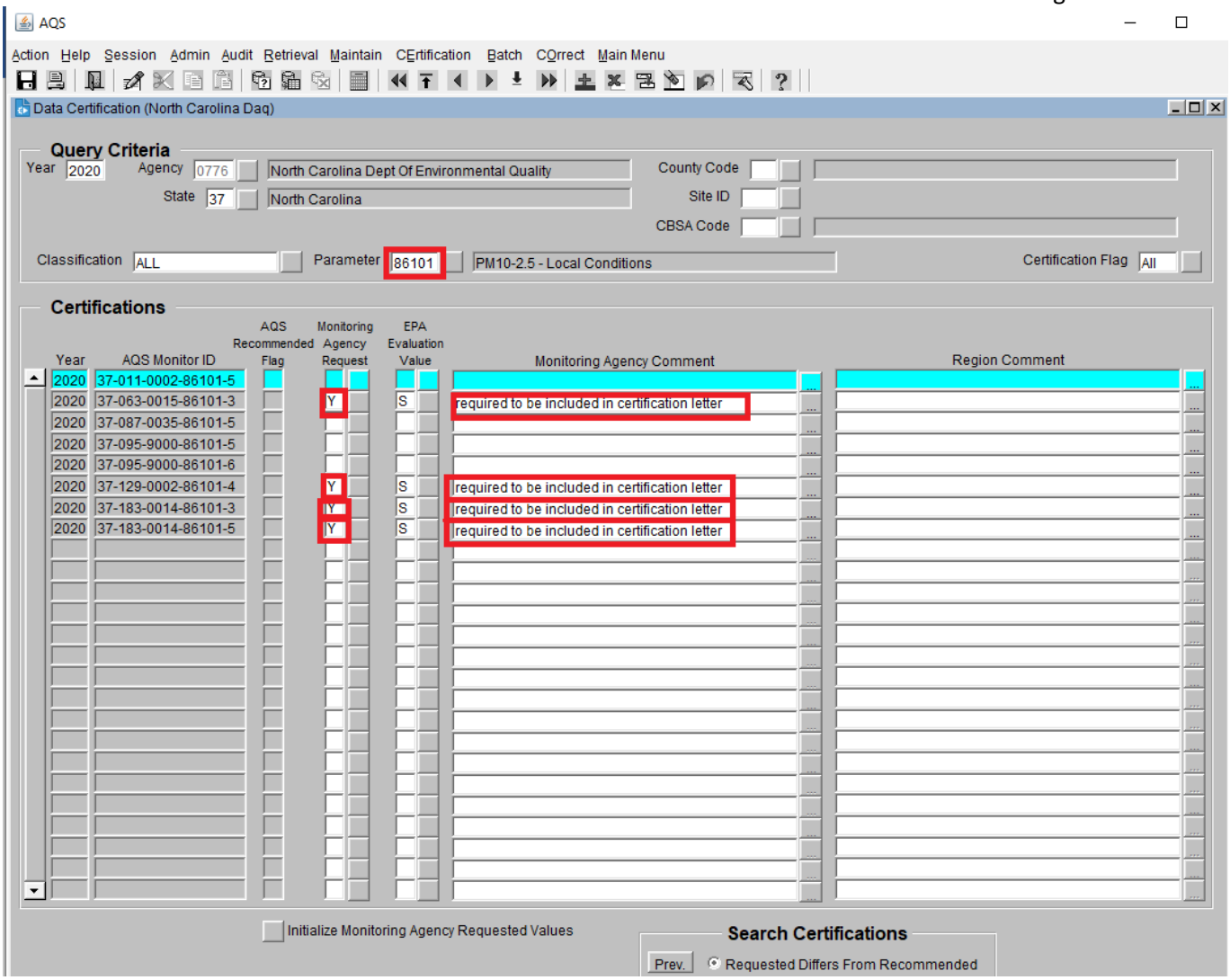
Preparing the AMP450NC report for submittal to the EPA for annual data certification is a two-part process. First, after all of the data corrections are made, someone who has “Screening Group Access” needs to log in to AQS by selecting the button next to “Screening Group Access,” then selecting the “North Carolina DAQ” Screening Group and hitting the OK button as shown below.



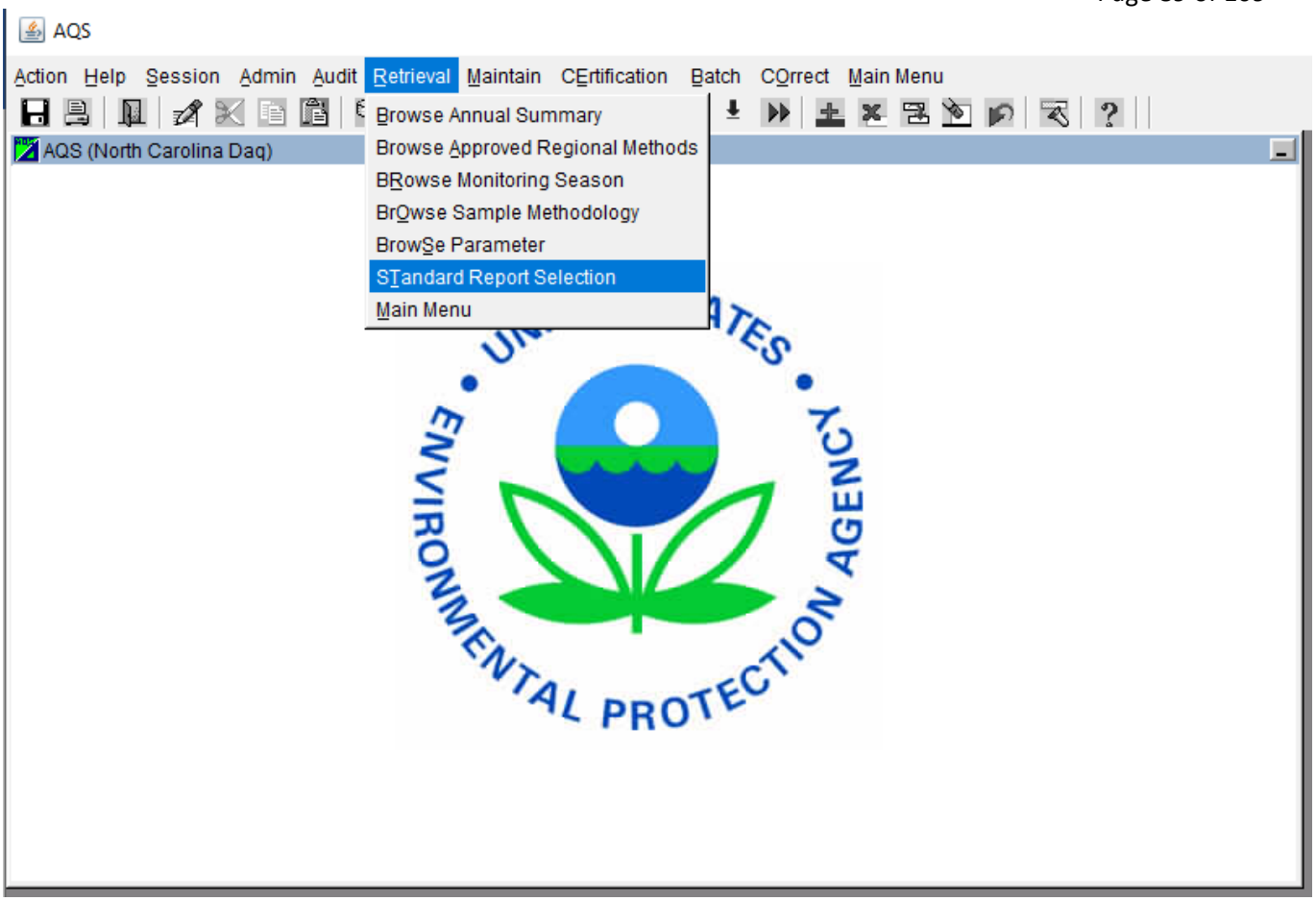
Once logged in to the North Carolina DAQ Screening Group, select "CErtification" from the menu on the top, type 37 in for the State code, click on the Classification drop down menu, select "ALL" and then hit the "OK" button as shown below.



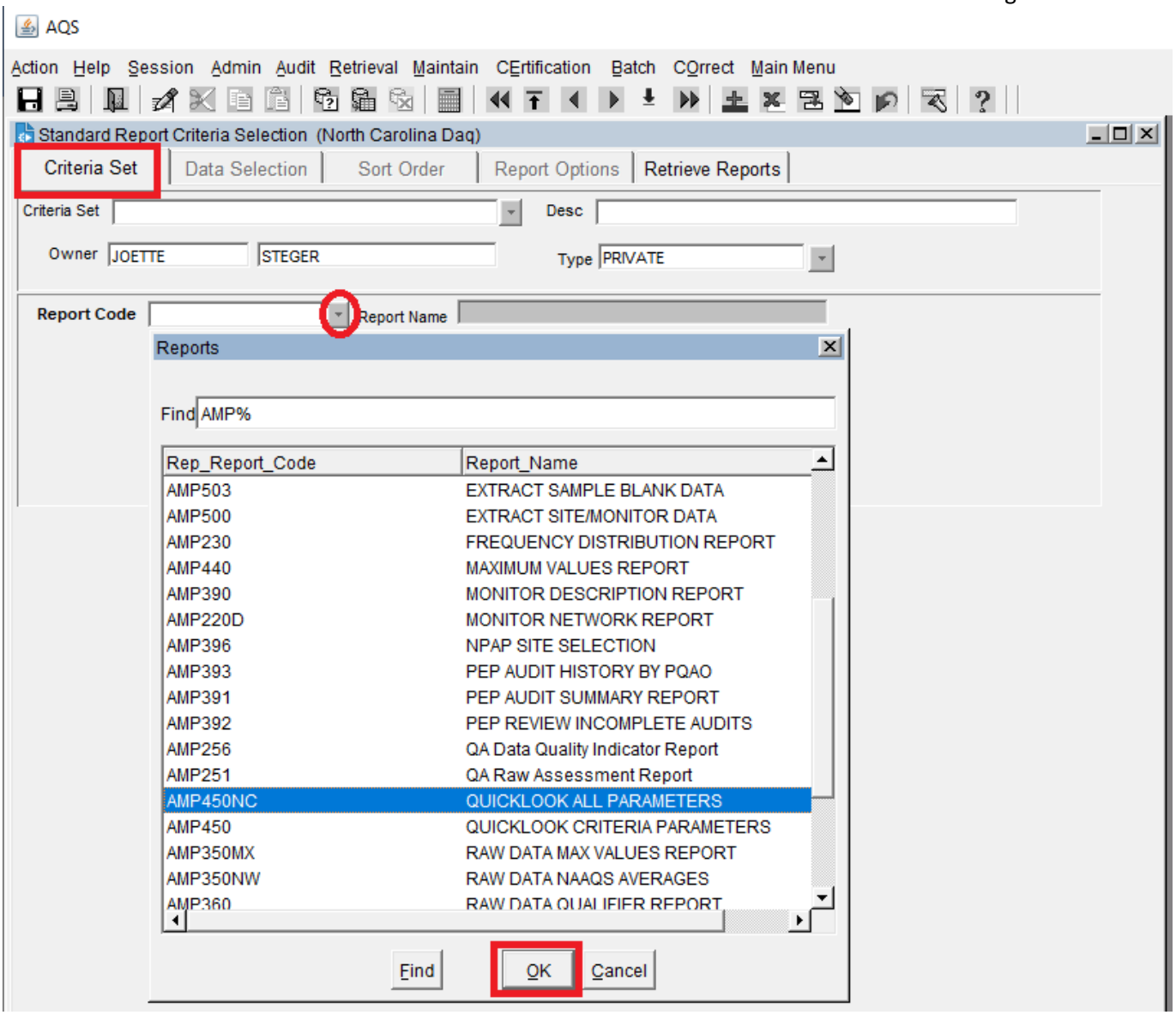
Type “86101” in the Parameter code box and hit the “F8” key. All of the $PM_{10-2.5}$ monitors will appear in the screen. For those monitors you want to certify, place a “Y” in the “Monitoring Agency Request” box. If desired, add a comment to the “Monitoring Agency Comment” box. After all of the needed “Y”s and comments are added, hit the “F8” key again to save or commit your changes. An “S” signifying that the agency submitted the data to the EPA for certification will appear in the “EPA Evaluation Value” field for each monitor with a “Y” in the “Monitoring Agency Request” field as shown below. The agency is required to submit these data for certification but the EPA will not ever change the “S” flag to a “Y” flag for these monitors. However, it is good to add the “Y” flag so that AQS will show that the data were submitted for certification. Repeat the process for the hourly 5-minute maximum SO2 monitors by typing “42406” in the Parameter code box and hitting the “F8” key. If you are certifying 5-minute data, type “42401” in the Parameter code box and hit the “F8” key. Add the “Y” to the “Monitoring Agency Request” box for the 5-minute monitors, usually signified by a POC of 2 or 3.



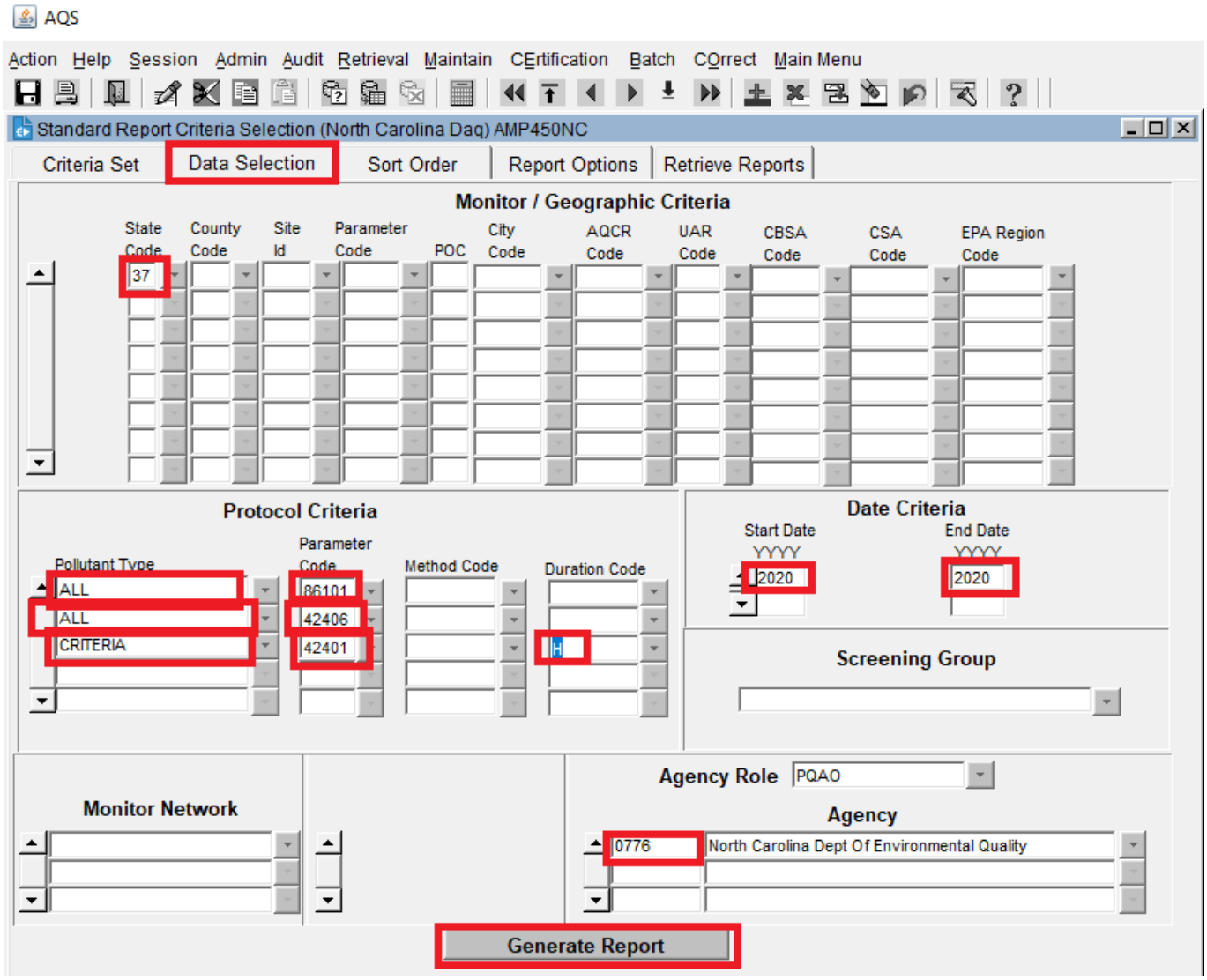
The second part of the process to prepare the AMP450NC report for submittal to the EPA for the annual data certification, involves generating the report. To generate the report, first log into AQS. Next select "Retrieval" from the menu going across the top of the screen as shown below. Then select "Standard Report Selection" from the dropdown menu as shown below.



Next on the "Criteria Set" page, which should be the default page that opens initially, click on the button by "Report Code" to open the dropdown list of available reports. Select Rep_Report_Code "AMP450NC" with the Report_Name "QUICKLOOK ALL PARAMETERS" and click the "OK" button at the bottom of the page as shown below. Reports are listed alphabetically by Report_Name.



Next, select the "Data Selection" page. For the "Monitor / Geographic Criteria" type in "37" for the State Code. You can also click on the button for a dropdown list of state codes. For "Protocol Criteria" type, use the dropdown list to select "ALL" for the Pollutant Type. Then type in "86101" for the Parameter Code. This is the parameter code for coarse particulate matter as measured by particles with aerodynamic diameters of 10 microns or less (PM_{10}) minus fine particles ($PM_{2.5}$). In the next box down, use the dropdown list again to select "ALL" for the Pollutant Type. Then type in "42406" for the Parameter Code. This is the parameter code for the 5-minute hourly maximum block average value for SO_2. If you have 5-minute SO_2 data to certify, use the dropdown list again to select "CRITERIA" for the Pollutant Type. Then type in "42401" for the Parameter Code. This is the parameter code for SO_2. In the "Duration Code" column use the dropdown list to select "H" for 5-minute data. For the "Date Criteria" enter the four-digit year for the year you want to certify for both the "Start Date" and "End Date." For "Agency" type in "0776" which is the agency code for the DEQ. Then hit the "Generate Report" button as shown below.



A report will be produced that looks like the report below. The date on the report must be within one or at most two days of the date when the annual certification letter is submitted to the EPA. If the annual certification letter is submitted more than two days after the report is generated, rerun the report following the previous steps.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM

QUICKLOOK ALL PARAMETERS

Apr. 29, 2021

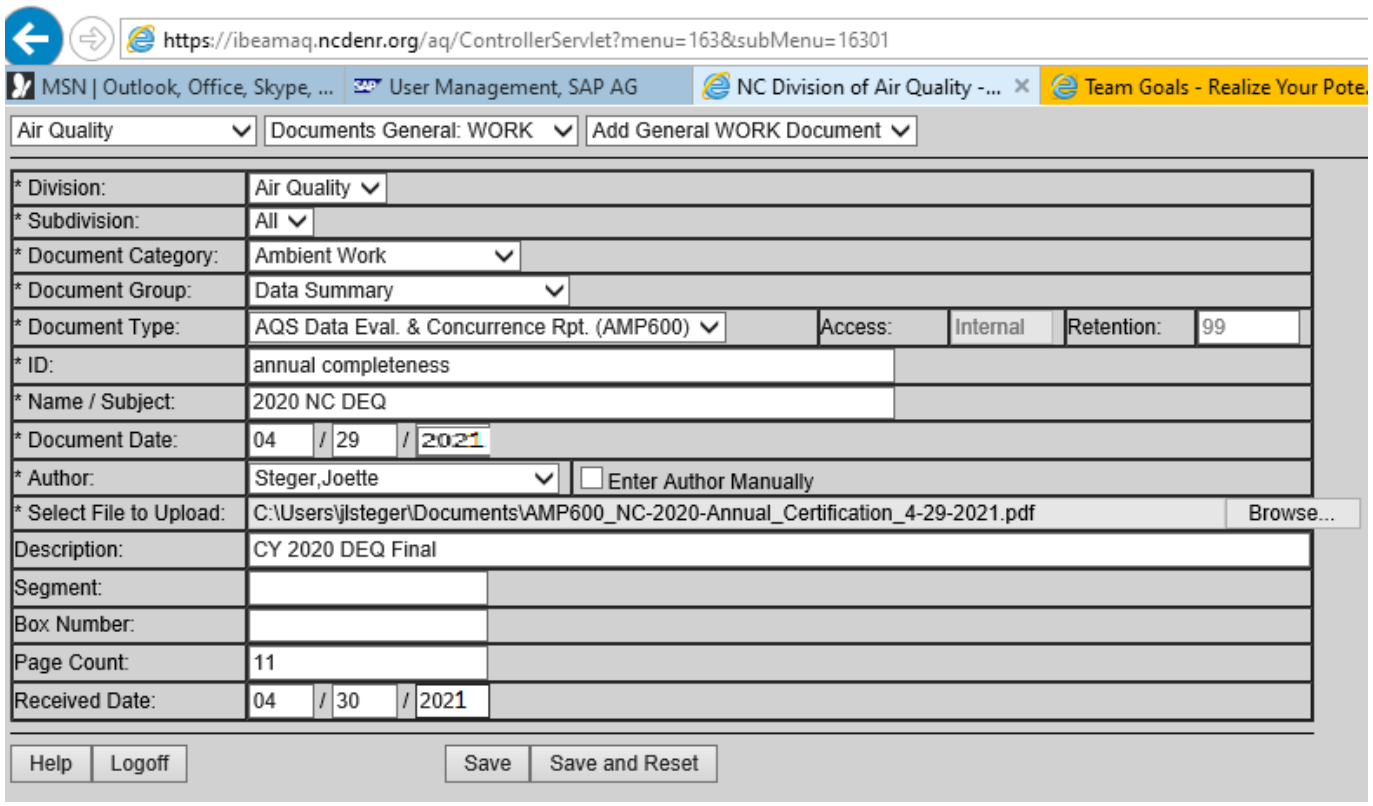
Parameter	Unit	POC	PQAO	Year	Meth	# Obs	1st Max Value	2nd Max Value	3rd Max Value	4th Max Value	Arith. Mean	Duration	Cert& Eval	EDT
Site ID: 37-013-0151 City: Bath	County: Beaufort						Address: 229 NC Hwy 306N							
42401 Sulfur dioxide	Parts per billion	2	0776	2020	060	24944	50.0	47.1	39.7	39.4	.41*	5 MINUTE	S	5
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	060	6031	39.4	27.4	24.4	22.6	.42	1 HOUR	S	0
Site ID: 37-019-0005 City: Southport	County: Brunswick						Address: 5538 Rob Gandy Blvd SE, Southport NC 28461							
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	560	7847	142.8	137.4	133.2	128.9	2.19	1 HOUR	S	0
Site ID: 37-021-0037 City: Royal Pines	County: Buncombe						Address: Crestwood Drive Air Monitor							
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	560	4103	8.9	1.6	1.4	1.4	.21	1 HOUR	S	0
Site ID: 37-027-0003 City: Lenoir	County: Caldwell						Address: 291 NUWAY CIRCLE							
42401 Sulfur dioxide	Parts per billion	2	0776	2020	060	24949	2.6	2.4	2.3	2.3	-.37*	5 MINUTE	S	5
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	060	1397	.5	.4	.4	.4	-.33*	1 HOUR	S	0
Site ID: 37-063-0015 City: Durham	County: Durham						Address: 801 STADIUM DRIVE							
42401 Sulfur dioxide	Parts per billion	2	0776	2020	060	24911	6.6	5.3	4.3	4.2	.08*	5 MINUTE	S	5
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	060	6211	4.7	3.7	3.6	3.1	.29	1 HOUR	S	0
86101 PM10-2.5 - Local Conditions	Micrograms/cubic meter (LC)	3	0776	2020	185	8206	195.0	91.0	71.0	57.0	3.37	1 HOUR	S	0
Site ID: 37-087-0013 City: West Canton	County: Haywood						Address: 104 Pace St							
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	060	8305	108.6	66.2	56.9	56.2	1.72	1 HOUR	S	0
Site ID: 37-117-0001 City: Jamesville	County: Martin						Address: 1210 Hayes Street							
42401 Sulfur dioxide	Parts per billion	2	0776	2020	060	25073	2.7	2.6	2.5	2.5	-.06*	5 MINUTE	S	5
Site ID: 37-129-0002 City: Castle Hayne	County: New Hanover						Address: 6028 HOLLY SHELTER RD							
86101 PM10-2.5 - Local Conditions	Micrograms/cubic meter (LC)	4	0776	2020	240	1545	29.8	28.8	28.6	28.1	6.04	1 HOUR	S	0
Site ID: 37-145-0004 City: Not in a city	County: Person						Address: 921 Shore Road, Semora, NC 27343							
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	560	8295	221.1	195.2	182.9	173.3	2.07	1 HOUR	S	0
Site ID: 37-157-0099 City: Not in a city	County: Rockingham						Address: 6371 NC 65 @ BETHANY SCHOOL							
42406 SO2 max 5-min avg	Parts per billion	1	0776	2020	060	6275	9.1	8.2	7.7	7.3	.44	1 HOUR	S	0

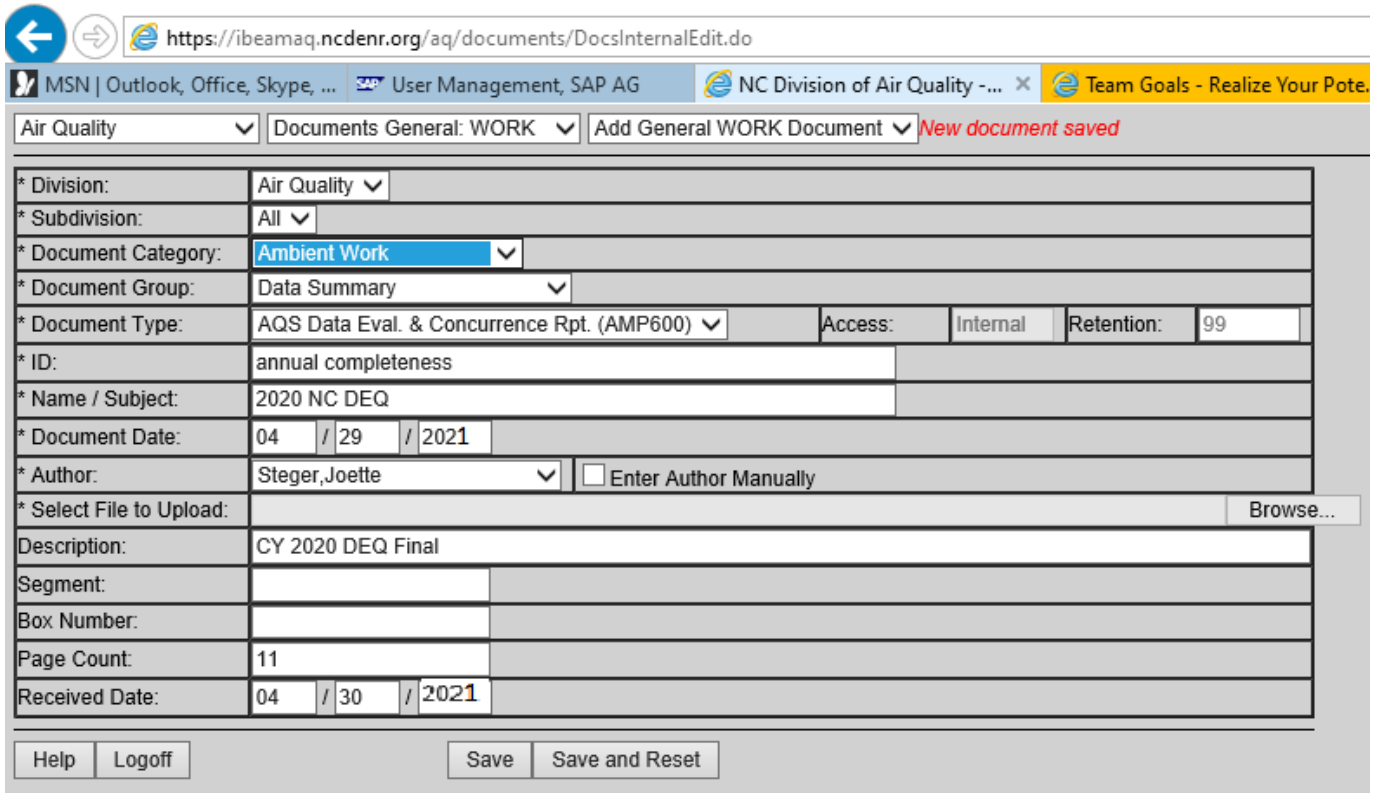
Note: The * indicates that the mean does not satisfy summary criteria.

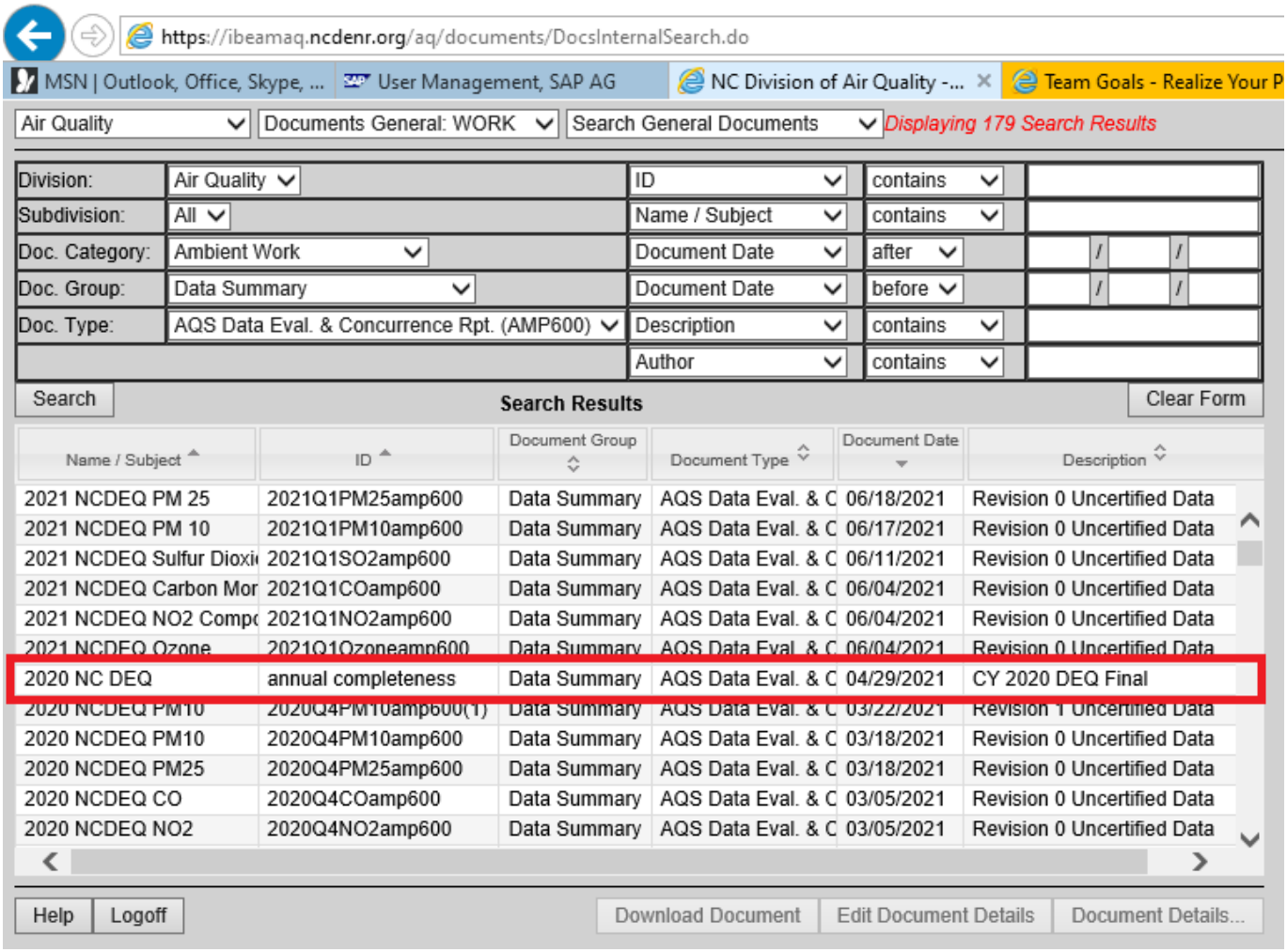
Page 2 of 6

D.3 Archiving the Annual Certification Submittal in IBEAM

After the chief submits the annual certification, the certification letter and AMP reports should be archived in IBEAM to document that the annual certification was completed. To upload the AMP600 report, select the "Documents General: WORK" module and select "Add General WORK Document." From the dropdown lists, select Ambient Work" for the Document Category, "Data Summary" for the Document Group, and "AQS Data Eval. & Concurrence Rpt. (AMP600)" for the Document Type. Type in "annual completeness" for the ID and the year and "NC DEQ" for the Name / Subject. Enter the date on the document. If you are not the author, select the author on the dropdown menu or manually enter the author if the author is not a DAQ employee. Select the file to upload. In the description type "CY" followed by the year followed by "DEQ Final." If desired, enter the number of pages and the received date. Then hit the Save button. The first screen shot below shows the filled in data fields before the document is uploaded to IBEAM and the second screen shot shows what the screen looks like after the file is uploaded. Once the file is uploaded, run a query as shown in the third screen shot to confirm the file is in IBEAM and properly indexed.







To upload the AMP450NC report, select the "Documents General: WORK" module and select "Add General WORK Document." From the dropdown lists, select Ambient Work" for the Document Category, "Data Summary" for the Document Group, and "AQS Quick Look/Noncrit. Pollut. (AMP450NC)" for the Document Type. Type in "annual completeness" for the ID and the year and "NC DEQ" and the pollutants included in the report for the Name / Subject. Enter the date on the document. If you are not the author, select the author on the dropdown menu or manually enter the author if the author is not a DAQ employee. Select the file to upload. In the description type "CY" followed by the year followed by "DEQ Final." If desired, enter the number of pages and the received date. Then hit the Save button. The first screen shot below shows the filled in data fields before the document is uploaded to IBEAM and the second screen shot shows what the screen looks like after the file is uploaded. Once the file is uploaded, run a query as shown in the third screen shot to confirm the file is in IBEAM and properly indexed.

https://ibeamaq.ncdenr.org/aq/ControllerServlet?menu=163&subMenu=16301

MSN | Outlook, Office, Skype, ... | User Management, SAP AG | NC Division of Air Quality -... | Team Goals - Realize Your Pote

Air Quality | Documents General: WORK | Add General WORK Document

* Division:	Air Quality
* Subdivision:	All
* Document Category:	Ambient Work
* Document Group:	Data Summary
* Document Type:	AQS Quick Look/Noncrit. Pollut. (AMP450NC) — Access: Internal — Retention: 99
* ID:	annual completeness
* Name / Subject:	2020 NC DEQ PM10-2.5, SO2 5-min Max, SO2 5 min data
* Document Date:	04 / 29 / 2021
* Author:	Steger,Joette — Enter Author Manually
* Select File to Upload:	C:\Users\jlsteger\Documents\AMP450NC_NC-2020-Annual_Certification_4-29-2021.pdf — Browse...
Description:	CY 2020 DEQ Final
Segment:	
Box Number:	
Page Count:	7
Received Date:	04 / 29 / 2021

Help | Logoff | Save | Save and Reset

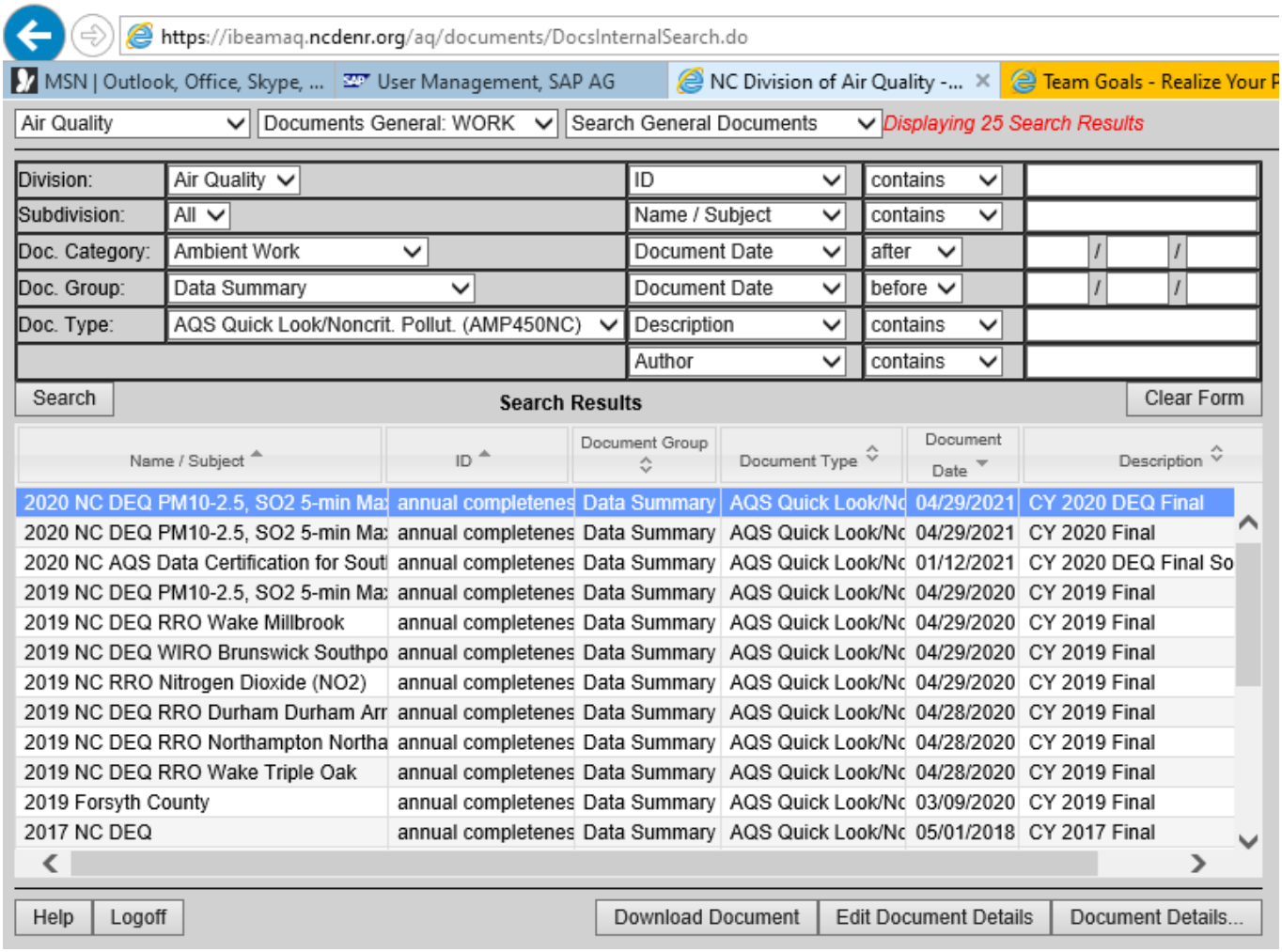
https://ibeamaq.ncdenr.org/aq/documents/DocsInternalEdit.do

MSN | Outlook, Office, Skype, ... | User Management, SAP AG | NC Division of Air Quality -... | Team Goals - Realize Your Pote

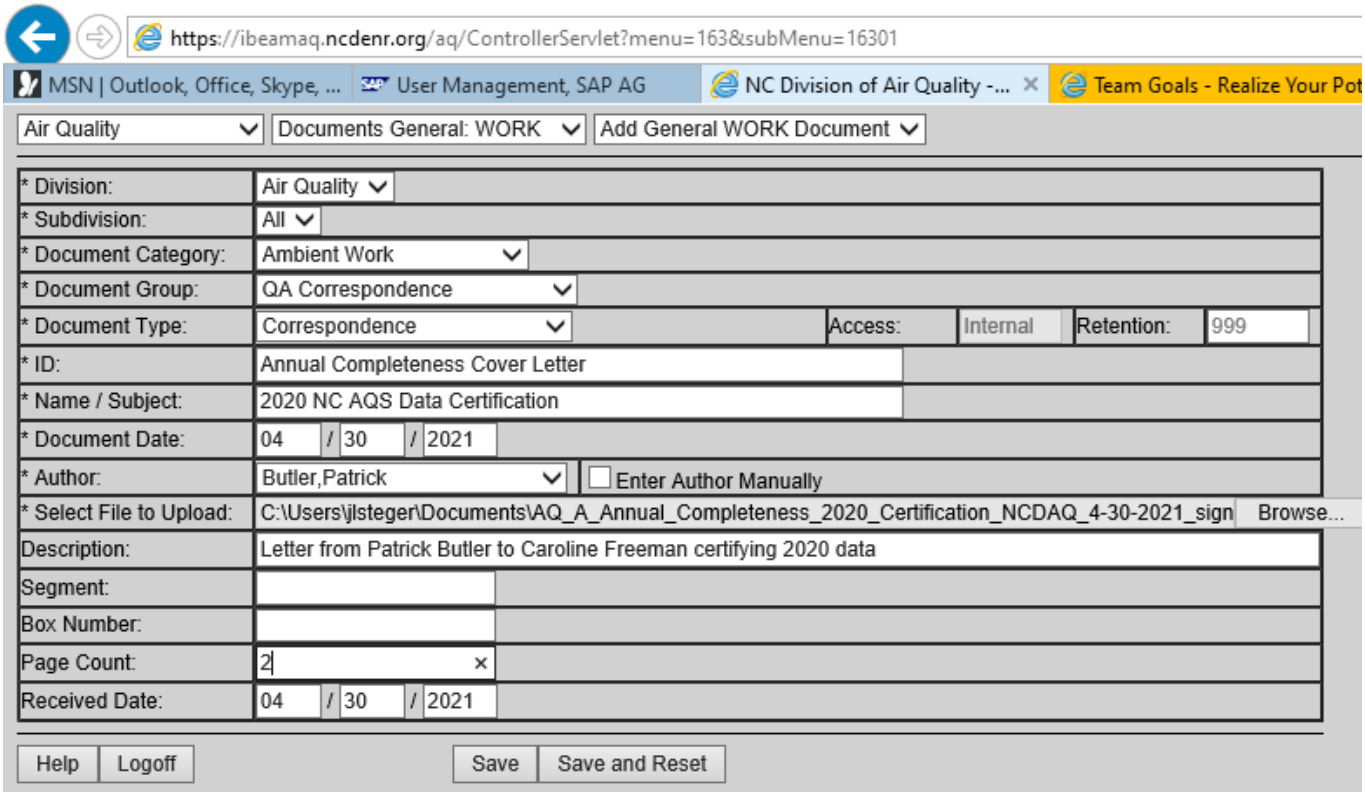
Air Quality | Documents General: WORK | Add General WORK Document — *New document saved*

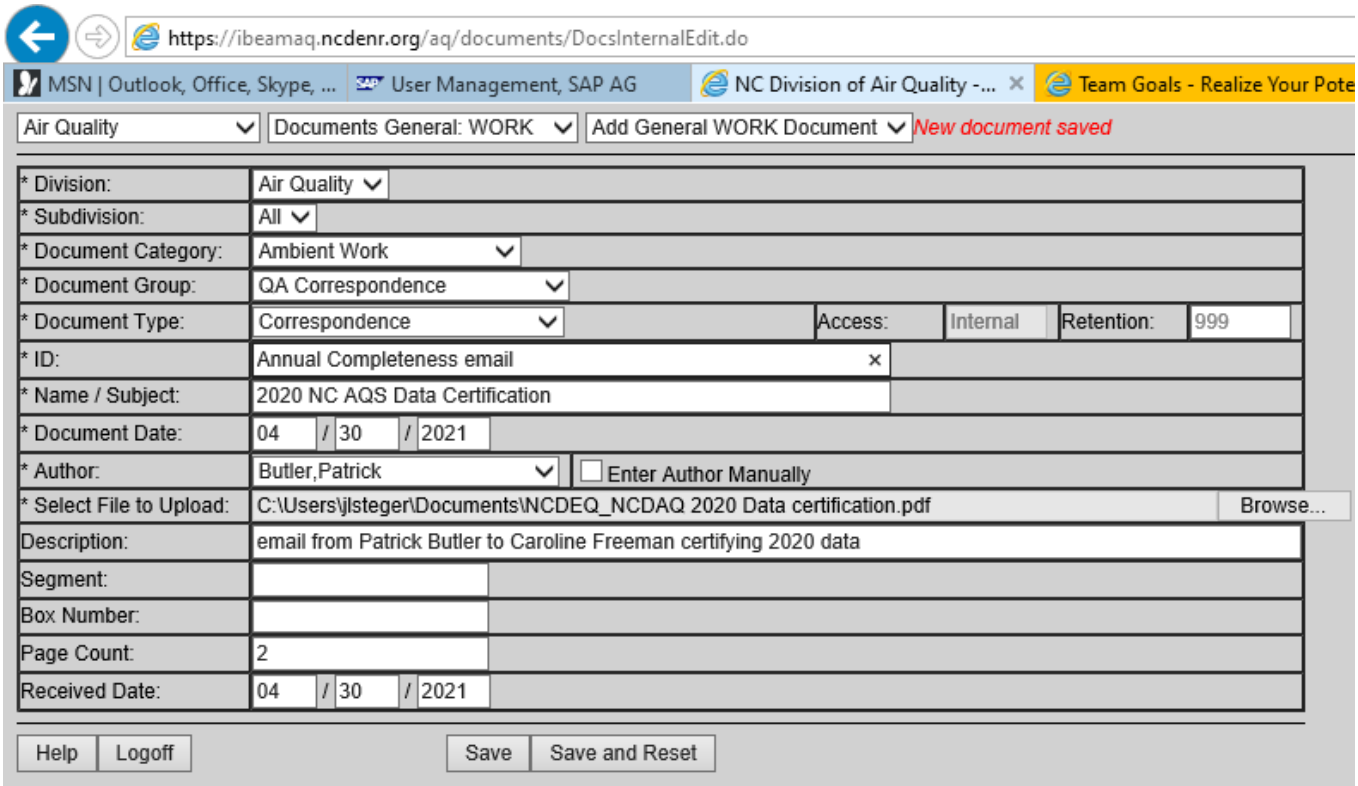
* Division:	Air Quality
* Subdivision:	All
* Document Category:	Ambient Work
* Document Group:	Data Summary
* Document Type:	AQS Quick Look/Noncrit. Pollut. (AMP450NC) — Access: Internal — Retention: 99
* ID:	annual completeness
* Name / Subject:	2020 NC DEQ PM10-2.5, SO2 5-min Max, SO2 5 min data
* Document Date:	04 / 29 / 2021
* Author:	Steger,Joette — Enter Author Manually
* Select File to Upload:	Browse...
Description:	CY 2020 DEQ Final
Segment:	
Box Number:	
Page Count:	7
Received Date:	04 / 29 / 2021

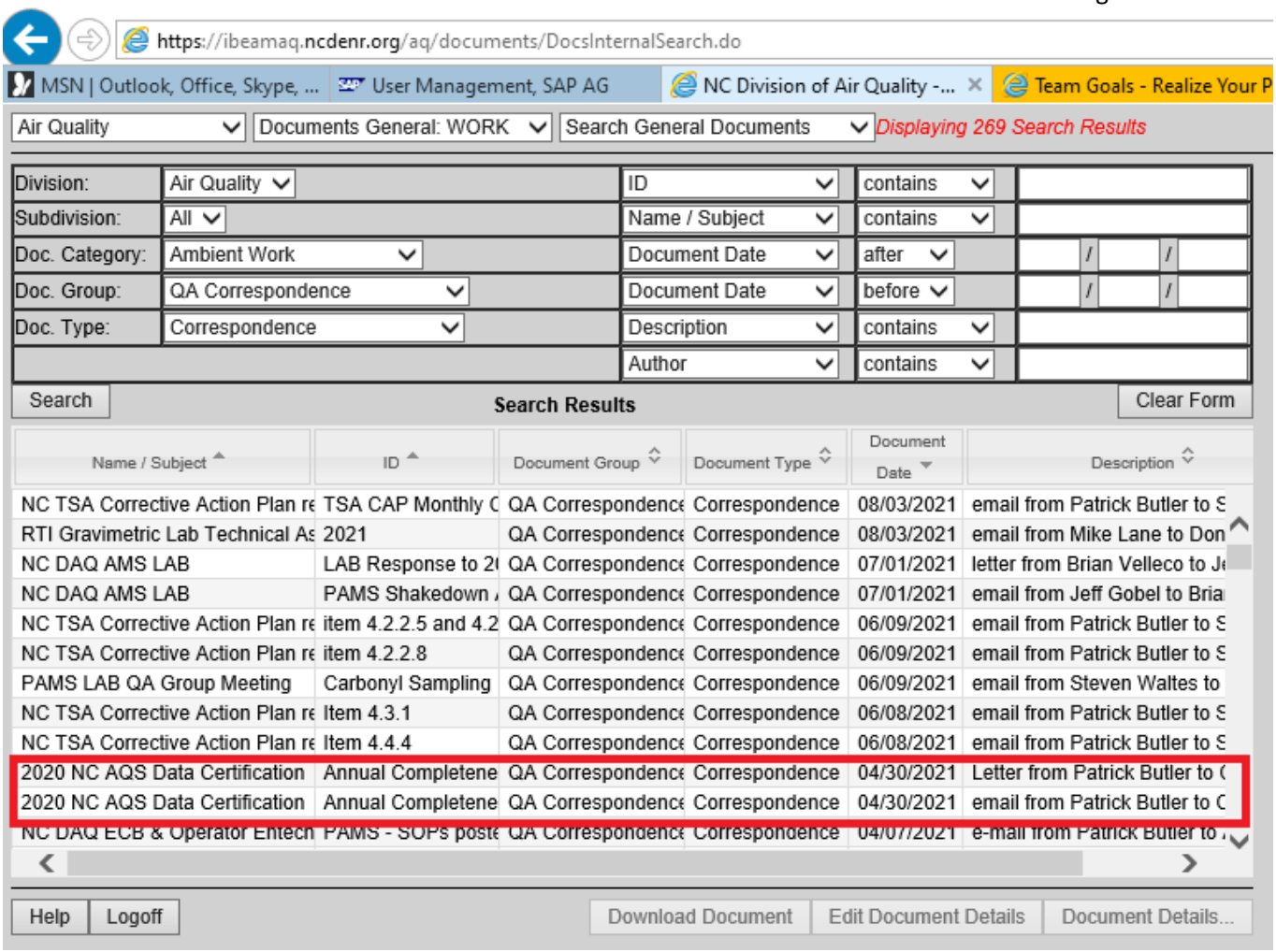
Help | Logoff | Save | Save and Reset



To upload the certification letter and email, select the “Documents General: WORK” module and select “Add General WORK Document.” From the dropdown lists, select Ambient Work” for the Document Category, “QA Correspondence” for the Document Group, and “Correspondence” for the Document Type. Type in “annual completeness cover letter” for the ID and the year and “NC AQS Data Certification” for the Name / Subject. Enter the date on the document. Enter the chief, or whoever signed the letter as the author by selecting the person’s name from the dropdown menu. Select the file to upload. In the description, type “Letter from” followed by whoever signed the letter followed by “to” and then whoever the letter is addressed to followed by “certifying” followed by the year followed by “data.” If desired, enter the number of pages and the received date. Then hit the Save button. The first screen shot below shows the filled in data fields before the document is uploaded to IBEAM. Next, upload the email by selecting the saved email as the file to upload and changing “Cover Letter” to “email” in the ID and “Letter” to “email” in the description. After making those changes, hit the Save button. The second screen shot shows what the screen looks like after the cover letter file is uploaded and the changes are made to the form to upload the email. Once the files are uploaded, run a query as shown in the third screen shot to confirm the files are in IBEAM and properly indexed.





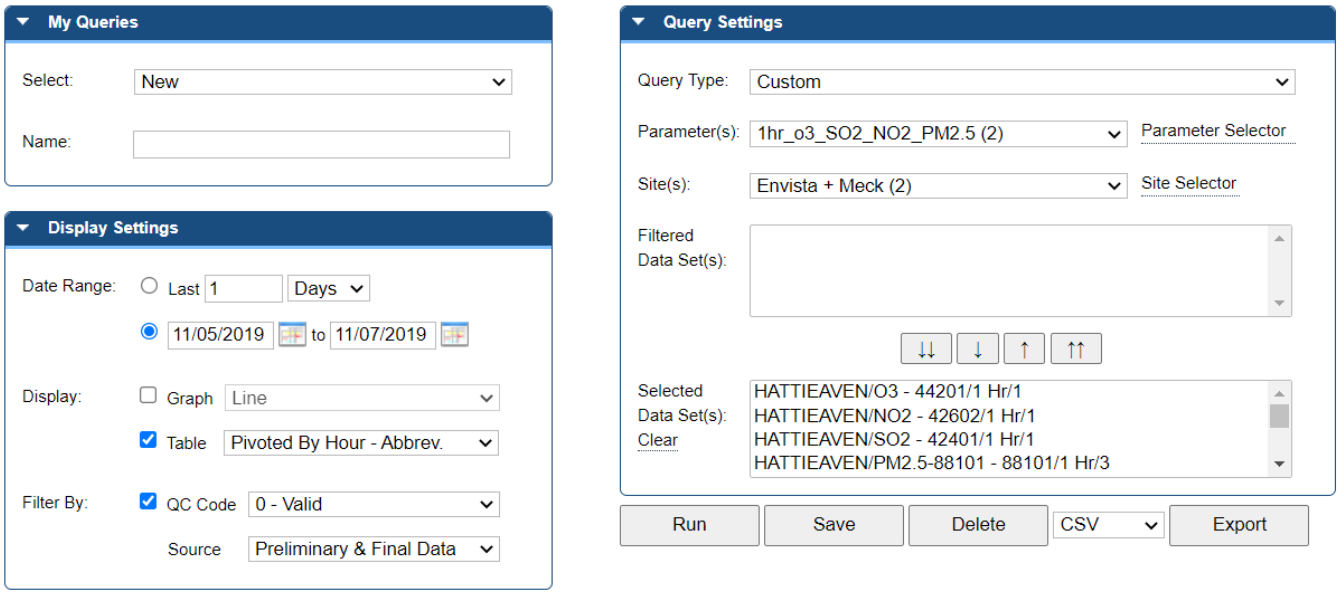


Appendix E: Generating the Statistician's Daily Reports

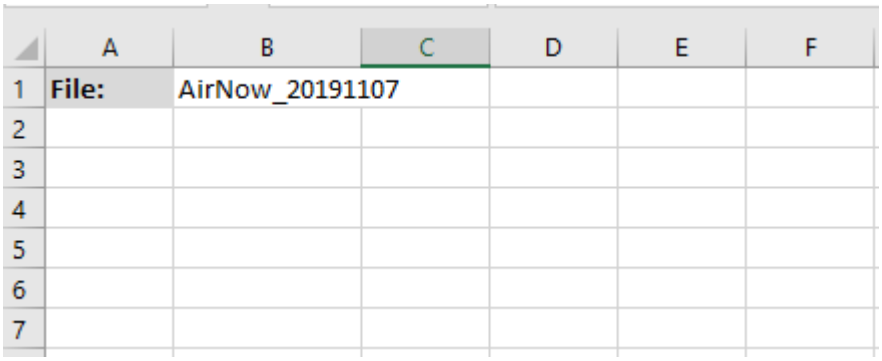
To use these instructions, template files will have to be obtained from the RCO statistician.

Obtaining Site Hourly Data outside of NC PQAO Sites

1. Go to airnowtech.org and log in.
2. Along the header of the site, click **Data**
3. In the box labeled **Display Settings**, select the circle beside **Date Range** and pick a date range from the present day to 1 day before the last report. Check the box by **QC Code** and leave the dropdown box as '0 – Valid'.
    - For example, if the present day is November 07, 2019 and the last report made was the 6th, you would pick a date range of 11/05/2019 to 11/07/2019.
4. In the box labeled **Query Settings**, leave the **Query Type** set as 'Custom', select 'O3_SO2_NO2_1h' for the **Parameter**, and select 'Envista + Meck' for the **Sites**. For both the Parameters and Sites selection there may be a version number in parentheses. Click the box with **two arrows pointing down**. Below is how the screen should appear.



5. Leave the dropdown box beside the **Export** button as 'CSV', and then click the **Export** button.
6. Open the file and click the **Save As** command under the **File** menu. Save the file in a location that contains the file 'AirNow_ENVISTA'. Save the file under the format of 'AirNow_XXXYYZZ' where X is the current year, Y is the current month, and Z is the current day.
    - For example, the CSV generated on November 07, 2019 will be saved as AirNow_20191107.
7. Close the browser with airnowtech.org
8. Open the file 'AirNow_ENVISTA'. In the Cell B1 beside **File**, type in the name of the file that was saved in step 6. See Below:

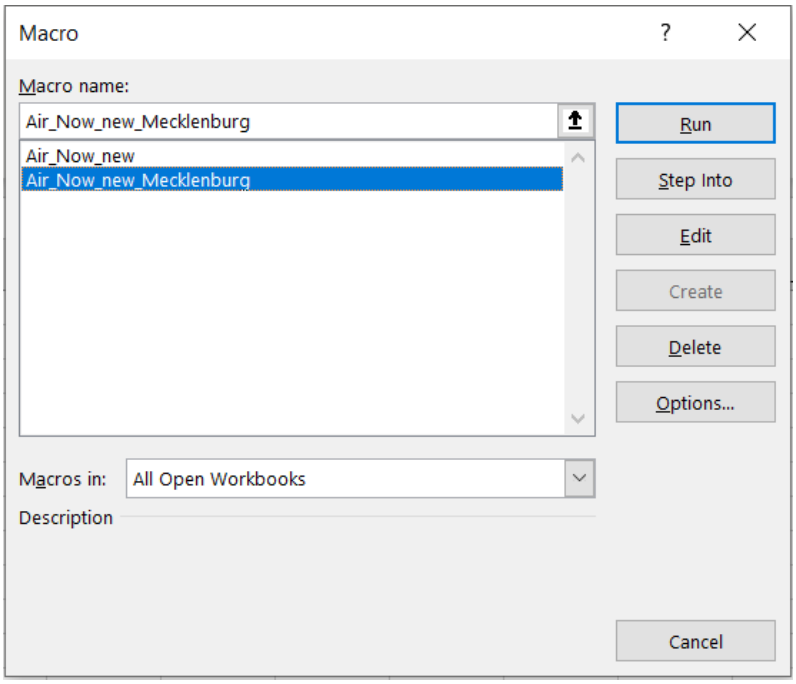


	A	B	C	D	E	F
1	**File:**	AirNow_20191107				
2						
3						
4						
5						
6						
7						

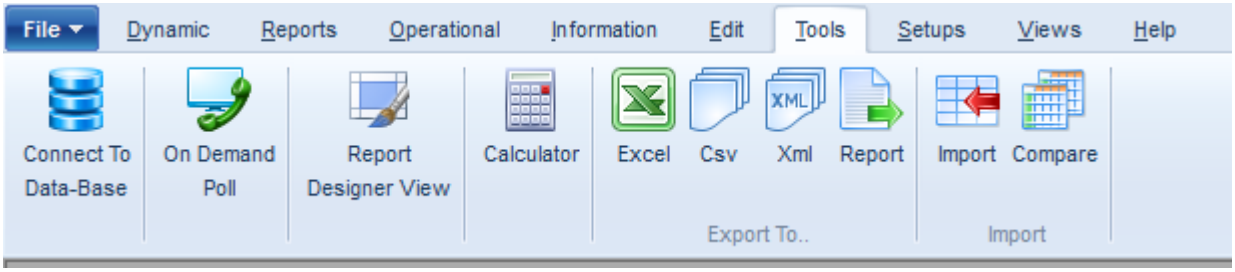
9. Open the Macro menu and run the Macro named 'Air_Now_new_Mecklenburg'. This will produce a dat file.

Note: To open the Macro menu, you will need to have the 'View Macro' shortcut added to Excel's ribbon, enabled the developer tab, or press Alt+F8.

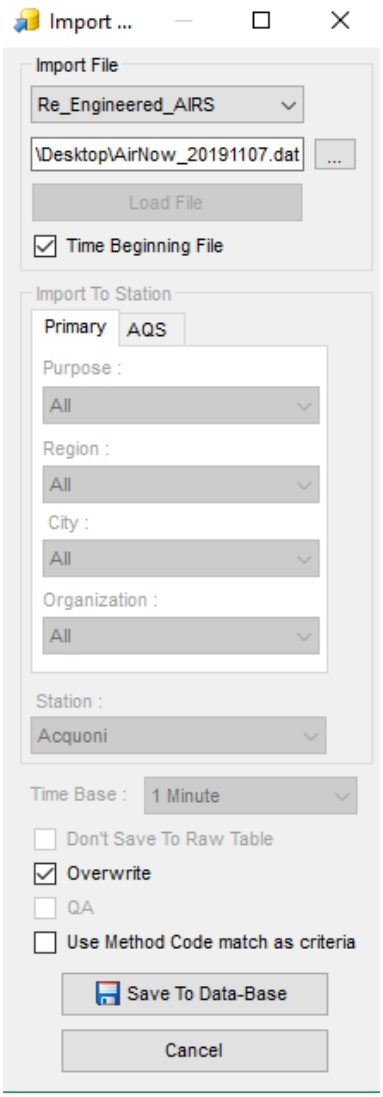
10. Close the 'AirNow_ENVISTA' file.



11. Open Envista. Under the Tools tab, select Import.



12. In the Import window, select 'Re_engineered_AIRS' in the top dropdown box, click the button with **…** , select the dat file generated in step 8, check the box beside **Overwrite** and click the button **Save To Data-Base**. The window should look like the image below.



13. On completion of the upload, a window will pop up stating the number of records uploaded, the number of valid imported records, the number of invalid import records, and the number of blocked validation dates. If the number of records uploaded do not equal the number of valid imported records, start over from air now and reupload.

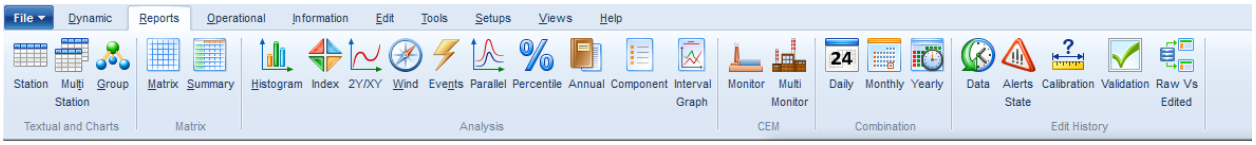
- If after reupload the number of records uploaded do not equal the number of valid imported records, examine the dat file for errors in delimiter code. If there was a change at the site, the macro may have to be edited to account for it or the database manager may have to make an adjustment in Envista.

- Alternatively, each time Envista encounters invalid import records, the program will produce a record. Examine this record for mistakes in delimiter code. If there was a change at the

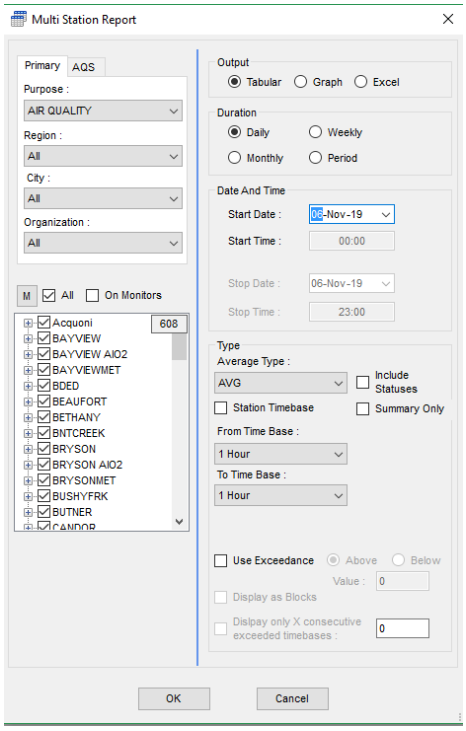
site, the macro may have to be edited to account for it or the database manager may have to make an adjustment in Envista.

Generating Reports

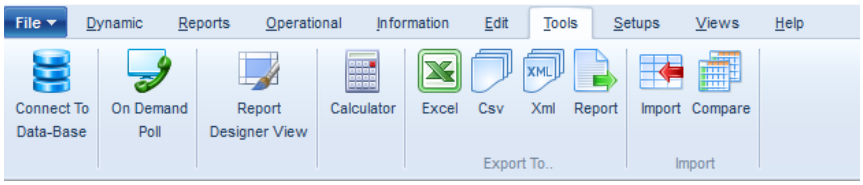
1. In Envista under the **Reports** tab, select the **Multi Station** button.



2. Select 'AIR QUALITY' in the **Purpose** drop down box and then check the box by 'All'. Leave the **Output** as 'Tabular' and the **Duration** as 'Daily'. Select the day of interest and select '1 Hour' for the **From Time Base** dropdown box. The window should appear similarly to the image below.



3. Under the **Tools** tab, select the **Csv** button.

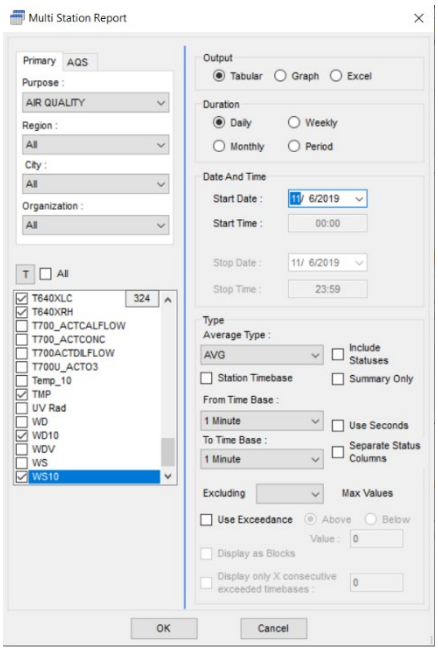


4. Save the file in the folder containing the excel file named 'ENVISTA'. The file should be named 'E_daily_summary_XXXYYZZ' where X is the year, Y is the current month, and Z is the day after the day of interest. Repeat steps 1 through 4 for each day of interest.

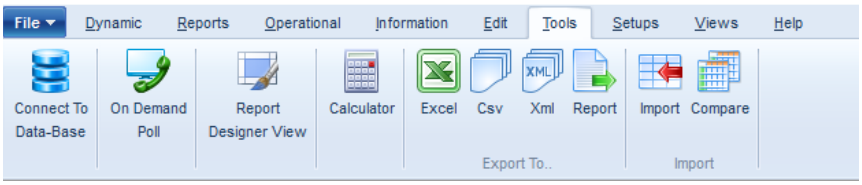
- For example, if you are saving this file for November 6th, 2019 the file would be named E_daily_summary_20191107.

5. Under the **Reports** tab, select the **Multi Station** button.
6. Leave 'AIR QUALITY' in the **Purpose** drop down box and then uncheck the box by 'All'. Click on the box with the 'M' to turn it into a 'T'. Then check the box by the following parameters:
    - AT
    - AT10
    - CO
    - Compass
    - COT
    - COT_Bkg
    - NO
    - NO2
    - NO2 CAPS
    - NO2T
    - NOT
    - NOX
    - NOY
    - NOYT
    - O3
    - RH
    - RH10
    - SO2
    - SO2T
    - SOL_RAD
    - T640X
    - T640X10
    - T640XAP
    - T640XAT
    - T640XCRS
    - T640XLC
    - T640XRH
    - TMP
    - WD10
    - WS10

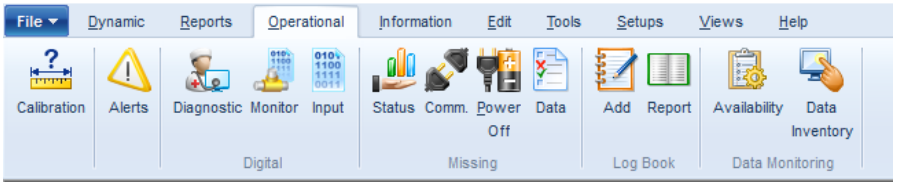
Leave the **Output** as 'Tabular' and the **Duration** as 'Daily'. Select the day of interest and select '1 Minute' for the **From Time Base** dropdown box. The window should appear similarly to the image below.



7. Under the **Tools** tab, select the **Csv** button.

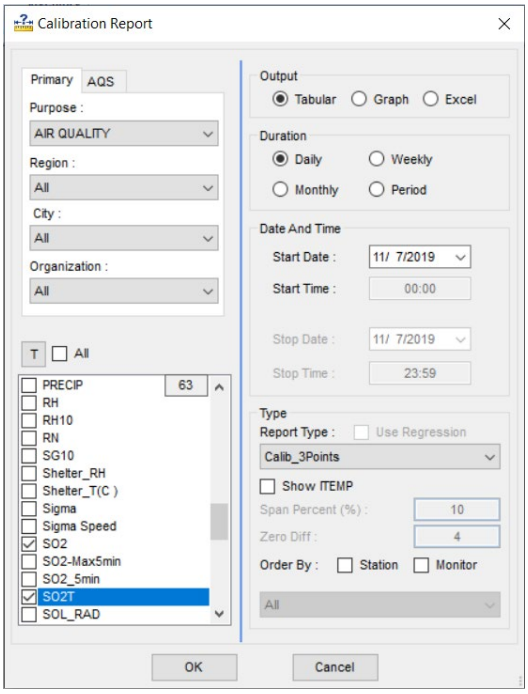


8. Save the file in the folder containing the excel file named ‘ENVISTA’. The file should be named ‘E_1min_summary_XXXYYZZ’ where X is the year, Y is the current month, and Z is the day after the day of interest. Repeat steps 5 through 8 for each day of interest.
    - For example, it you are saving this file on November 6th, 2019 the file would be named E_daily_summary_20191107.
9. Under the **Operation** tab, Select the **Calibration** button.

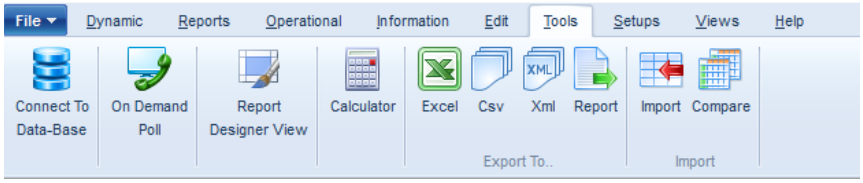


10. In the **Calibration Report** menu, select ‘AIR QUALITY’ in the **Purpose** drop down box and click on the box that contains an ‘M’ to Turn it to a ‘T’. Select the following parameters:
    - O3
    - SO2
    - SO2T

    Leave the **Output** as ‘Tabular’ and the **Duration** as ‘Daily’. Select the day of interest, and change **Report Type** to ‘Calib_3Points’. The window should appear similarly to the image below.



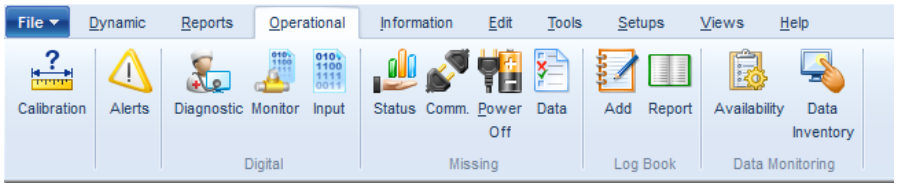
11. Under the **Tools** tab, select the **Csv** button.



12. Save the file in the folder containing the excel file named 'ENVISTA'. The file should be named 'E_CalibrationReport_XXXYYZZ' where X is the year, Y is the current month, and Z is the day of interest.
    - For example, it you are saving this file on November 7th, 2019 the file would be named E_CalibrationReport_20191107.

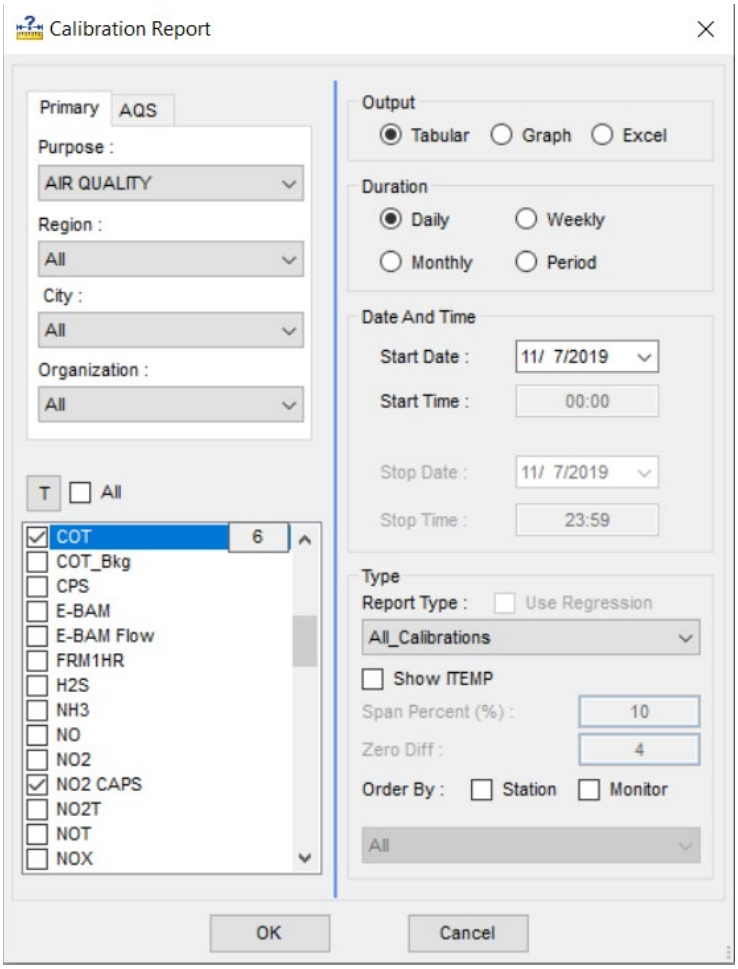
Note: Steps 9 through 12 will have to be repeated for each day of interest.

13. Under the **Operation** tab, Select the **Calibration** button.

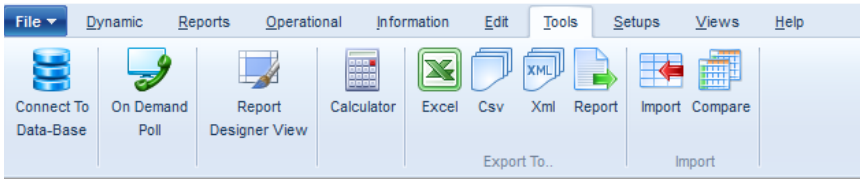


14. In the **Calibration Report** menu, select 'AIR QUALITY' in the **Purpose** drop down box and leave the box that contains an 'T'. Deselect any previously selected parameters. Then select the following parameters:
    - COT
    - NO2 CAPS

15. Leave the **Output** as 'Tabular' and the **Duration** as 'Daily'. Select the day of interest, and change **Report Type** to 'All_Calibrations'. The window should appear similarly to the image below.



16. Under the **Tools** tab, select the **Csv** button.

17. 

18. Save the file in the folder containing the excel file named 'ENVISTA'. The file should be named 'Cal_COT_NO2_XXXYYZZ' where X is the year, Y is the current month, and Z is the day of interest.
    - For example, it you are saving this file on November 7th, 2019 the file would be named Cal_COT_NO2_20191107.

Note: Steps 13 through 18 will have to be repeated for each day of interest.

19. Close Envista.
20. Open the excel file 'ENVISTA'.

Note: The folder location containing the excel file 'ENVISTA' will also need the following excel files: E_O3_calibration(days), E_O3_calibration(sites), E_SO2_calibration(days), E_SO2_calibration(sites), E_NO2_calibration, and E_COT_calibration.

21. On **E_excel** worksheet, change the date to one day after the date of interest, open the Macro menu, and run the **E_excel** macro. This will create an excel sheet named 'Envista YY ZZ, XXXX' where X is the year, Y is the current month, and Z is the day after the day of interest. Repeat this step for each report you need.

Note: In the event that a new site is added to Envista, the site will have to be added for it do show up correctly in the daily report. On the **E_excel** worksheet, add the site name as it appears in Envista in column B at the bottom of the sites listed and in column A beside that entry add the abbreviation for what region that site belongs to.

22. On the **O3_cal** worksheet, change the date to the date of interest. Then in an internet browser go to the North Carolina Air Quality Forecast Center (https://xapps.ncdenr.org/aq/ForecastCenterEnvista) and copy the corresponding Ozone AQI into the O3_cal worksheet.
23. Open the Macro menu and run the **O3_cal** macro. This macro adds data to the 'E_O3_calibration(days)' and 'E_O3_calibration(sites)' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
24. On the **O3_TMP_cal** worksheet, change the date to one day after the date of interest, open the Macro menu, and run the **O3_TMP_cal** macro. This macro adds data to the 'E_O3_calibration(days)' and 'E_O3_calibration(sites)' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
25. On the **SO2_cal** worksheet, change the date to the date of interest, open the Macro menu, and run the **SO2_cal** macro. This macro adds data to the 'E_SO2_calibration(days)' and 'E_SO2_calibration(sites)' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
26. On the **SO2_TMP_cal** worksheet, change the date to one day after the date of interest, open the Macro menu, and run the **SO2_TMP_cal** macro. This macro adds data to the 'E_SO2_calibration(days)' and 'E_SO2_calibration(sites)' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
27. On the **COT_NO2_cal** worksheet, change the date to the date of interest, open the Macro menu, and run the **COT_NO2_cal** macro. This macro adds data to the 'E_NO2_calibration' and 'E_COT_calibration' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
28. On the **COT_NO2_TMP** worksheet, change the date to one day after the date of interest, open the Macro menu, and run the **COT_TMP** macro. Then run the **NO2_TMP** macro. These macros add data to the 'E_NO2_calibration' and 'E_COT_calibration' excel files. If those files for the correct month are not located in the folder with the 'ENVISTA' excel file, the macro will produce an error message. Repeat this for each day of interest.
29. Close the excel file 'ENVISTA'.
30. Open the excel file 'Pictures_1_min'.

31. In the 'Pictures_1_min' file, change the date to one day after the date of interest. Repeat this for each day of interest.
32. Close the excel file 'Pictures_1_min'.

Sending Reports

1. Open E_O3_calibration(days), E_O3_calibration(sites), E_SO2_calibration(days), E_SO2_calibration(sites), E_NO2_calibration, and E_COT_calibration. Note any failures, missing data, and temperature exceedance for the day(s) of interest.

   Note: any event that is a known issue does not have to reported.

2. Open the Envista report for each day of interest. Look for missing data, outliers, and exceedances. Determine if any of the outliers are significant and remove the outlier flag from any that are not. Highlight and Note any exceedances. Save and close those files when finished.
3. Place a copy of E_O3_calibration(days), E_O3_calibration(sites), E_SO2_calibration(days), E_SO2_calibration(sites), the 1min summary excel file for the day of interest and the Envista excel file for the day of interest on the P drive at \\wv1dnfp01.eads.ncads.net\AQGroup\Ambient\PUB\RegOffices.NC\Monthly Airs Output\INBOX\Envista in the folder with the appropriate year.
4. Send one email to the following email addresses: 'DENR.DAQ.AMBIENT-MONITORING.REGIONALOFFICES@lists.ncmail.net', 'Kelly.Grass@mecklenburgcountync.gov', 'Suzanne.Hollenbeck@mecklenburgcountync.gov'. Attach the E_O3_calibration(days), E_O3_calibration(sites), E_SO2_calibration(days), E_SO2_calibration(sites), and the Envista excel file for the day of interest. Add any notes from step 1 and step 2 to the email.
5. Send a second email to the mailing lists 'DEQ.AQ.Ambient-Monitoring.PPB.CO@ncdenr.gov' and 'DEQ.AQ.Ambient.ECB.GS.Group@ncdenr.gov' and Carbon Copy the Ambient Air Monitoring chief as well as the Database Manager. Include any notes from step 1 and step 2 and the link to the location on the P drive.

Appendix F: List of Acronyms

ABAQA – Asheville-Buncombe Air Quality Agency
AQS - Air Quality System (EPA's Air database)
ARM – Air Resources Manager
CFR – Code of Federal Regulations
Chief – Ambient Monitoring Section chief
CPU – central processing unit
CTS – certified transfer standard
DAQ - North Carolina Division of Air Quality
°C – degrees Celsius
DEQ – North Carolina Department of Environmental Quality
DIT – Department of Information Technology
DQO - Data quality objective
ECB – Electronics and Calibration Branch
e-log – electronic logbook
EPA – United States Environmental Protection Agency
hPa – hectopascals (equivalent to millibars)
IBEAM – Internet-Based Enterprise Application Management
≤ - less than or equal to
m/s – meters per second
MQO – Measurement quality objective
NA – not applicable
NAAQS - National ambient air quality standards
NCore- National Ambient Air Monitoring Strategy - National Core Monitoring
NO – nitric oxide
NO_2 – nitrogen dioxide
NO2T – the measured difference from the NOyT and NOT channels, DAQ does not report NO2T to AQS
NOT – trace-level nitric oxide
NO_x – oxides of nitrogen
NO_y – reactive oxides of nitrogen
NO_yT – trace-level reactive oxides of nitrogen
NPAP – National Performance Audit Program
O_3 - ozone
PEP – Performance evaluation program
pm – post meridiem
PM – Particulate matter
$PM_{2.5}$ – Particles with an average aerodynamic diameter of 2.5 microns or less, also known as fine particles
PM_{10} – Particles with an average aerodynamic diameter of 10 microns or less
PM_{10c} or $PM_{10-2.5}$ – Coarse particles defined as particles with an average aerodynamic diameter of 10 microns or less (PM_{10}) but greater than 2.5 microns ($PM_{2.5}$) generally measured by subtracting $PM_{2.5}$ measured at local conditions from PM_{10} measured at local conditions.
POC – Parameter Occurrence Code
ppb – parts per billion
% - percent
± - plus or minus
PPB – Projects and Procedures Branch
ppm – parts per million
PQAO – Primary quality assurance organization
PZS – precision-zero-span
QA – Quality assurance
QA/QC - Quality assurance/quality control
QAPP - Quality assurance project plan
QC – Quality control
R^2 – coefficient of determination
RCO – Raleigh Central Office
RH – relative Humidity
SLAMS - state and local air monitoring station
SO_2 – sulfur dioxide
SOP - standard operating procedure
SPM – Special purpose monitor
TMP – shelter temperature