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NORTH CAROLINA
Environmental Quality

DAQ-05-001.5 Standard Operating Procedure (SOP)

Ambient Monitoring Section Database Manager Standard Operating Procedure

Version 0.0

NORTH CAROLINA
Department of Environmental Quality

1. Approval Sign Off-Sheet

I certify that I have read and approve of the contents of the Ambient Monitoring Database Manager Standard Operating Procedure with an effective date of March 5, 2021.

Director, Air Quality Division

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Signature: DocuSigned by: Michael Abraczinskas D5013FED0218423... Date: 3/2/2021

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Signature: DocuSigned by: Patrick Butler 4290A7E2D2A0429... Date: 3/2/2021

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Disclaimer: This document, and any revision hereto, is intended solely as a reference guide to assist individuals in the operation of the instrument, related to the North Carolina Division of Air Quality's Ambient Monitoring Program.

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Appendices

2.0 Scope/Application/Purpose

The Data Acquisition System (DAS) used by the Division of Air Quality (DAQ) Ambient Monitoring Section is Envista Air Resources Manager (Envista ARM), which is part of Envista environmental monitoring suite of software programs. All programs work in conjunction with a system database implemented in Microsoft Structured Query Language (SQL) Server or Oracle. There are four main software programs included in Envista, which are:

Envista Air Resources Manager – A data analysis and reporting program for supervisory control, management analysis and reporting of data from environmental, meteorological, and hydrological Envista ARMs.
Envista ARM Setup – A Windows client-server application used to create the required tables and other required database objects. Setup is the graphical user interface used to define the monitoring station network configurations including stations, monitors, communications etc. Setup is also used to create and populate additional database objects that support numerous optional Envista ARM applications.
CommCenter – A communication server for data collection from field data loggers and instruments as well as from other CommCenter instances. CommCenter connects to remote monitoring locations using various telephony media. It also supports Transmission Control Protocol (TCP)/Internet Protocol (IP) communications over a Local Area Network (LAN)/Wide Area Network (WAN) or Internet.
Envista DB Builder – Creation and build the Envista Database.

Envista ARM allows users to view, analyze, report, and distribute environmental quality data and information products across the full range of media. Envista runs under a variety of Windows versions. It provides comprehensive access to information that has been collected by the communication application (CommCenter) and stored in a SQL Server database. This database is housed in a workstation in the Electronics and Calibration Branch (ECB) Lab at 670 Maywood Avenue, Raleigh NC 27603. Additional Envista ARM information is found in the Envista ARM Manual on the DAQ SharePoint Documents page.

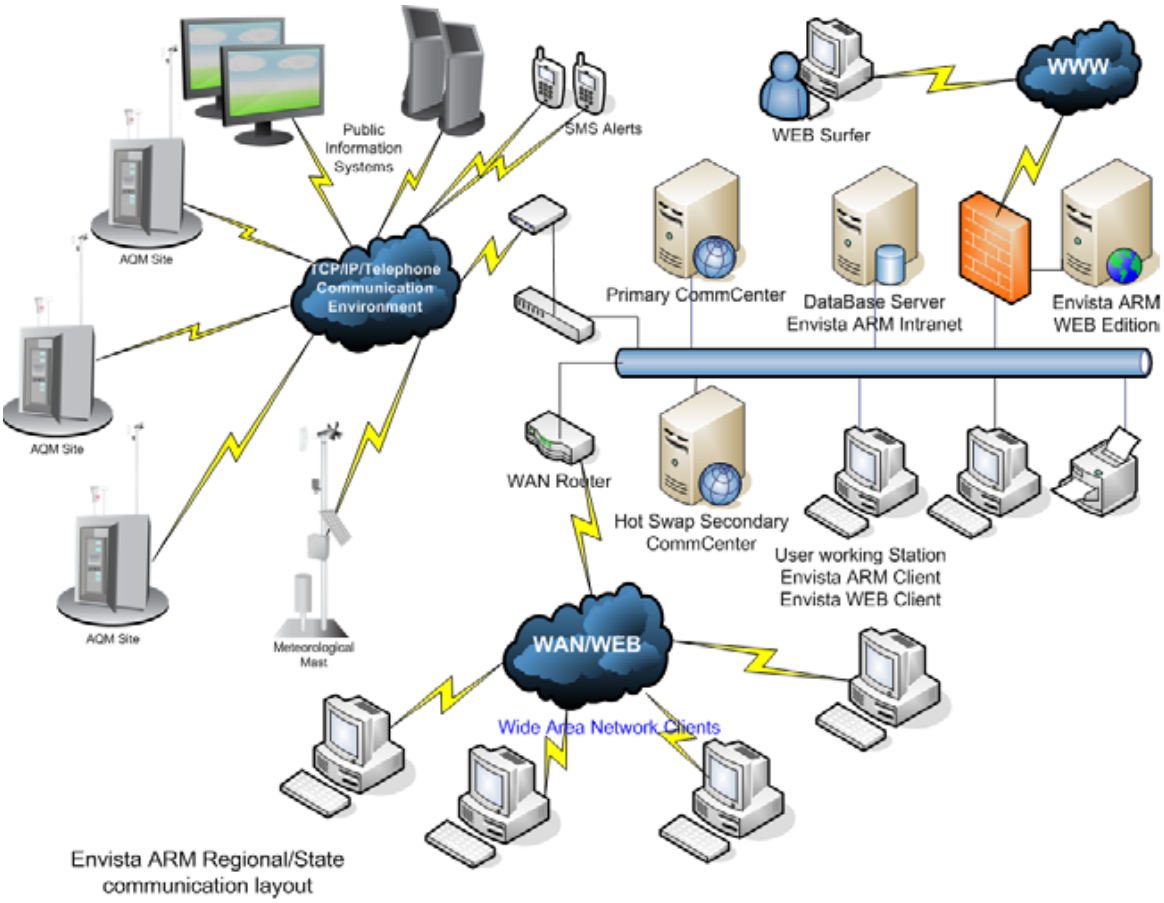
This section contains general information regarding Ambient Monitoring structure per the last completed EPA Technical Systems Audit as it pertains to the Database Manager.

3.0 Equipment

The typical system architecture utilizes a server for the database, an application server for CommCenter and public and intranet web sites, and workstations for other client program access. Envidas, a software used and managed by ECB and Ambient Monitoring field staff, is installed and used on workstations in DAQ's monitoring stations.

Many other arrangements are possible including operation on a single personal computer (PC), redundant CommCenter installation with failover, multiple CommCenter installations for load sharing, tiered data collection utilizing Regional CommCenter installations that collect data locally and then serve data to a single master CommCenter and database, and redundant databases with automated failover.

The typical data acquisition system architecture and data flow is shown below:

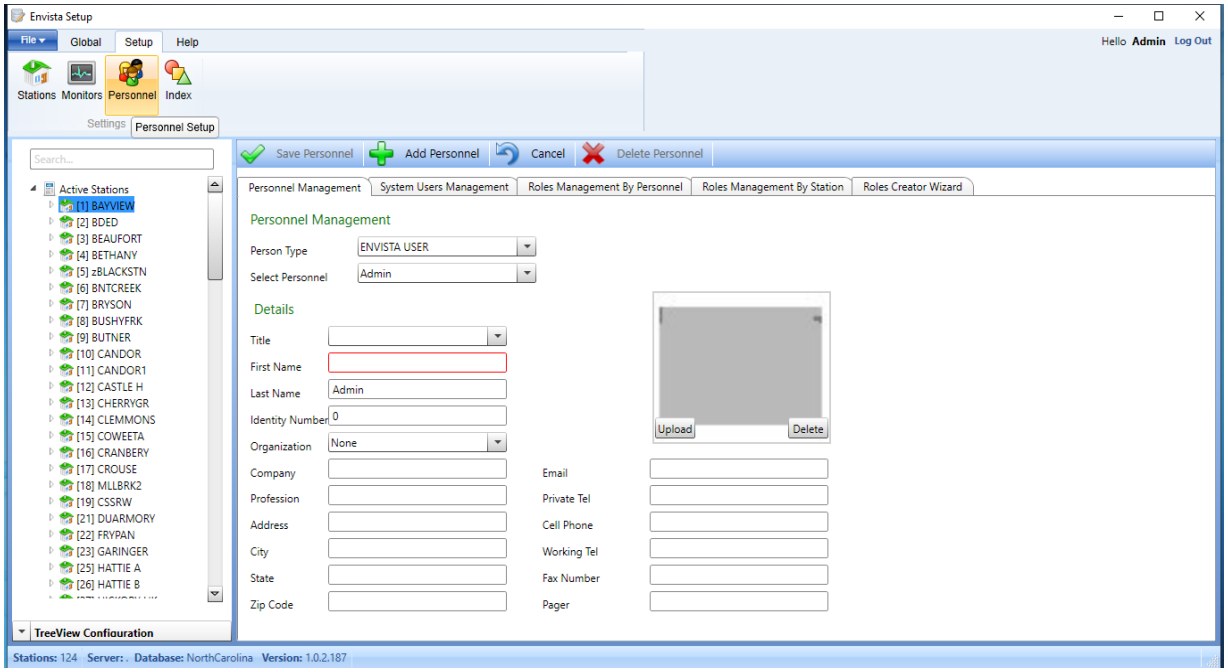


4.0 DAS Set-up

Envista ARM Setup is the graphical user interface used to define the monitoring station network configurations including stations, monitors, communications etc. Setup is also used to create and populate additional database objects that support numerous optional Envista ARM applications. Additionally, DAQ staff are added to Envista ARM Setup in order to access DAQ's Ambient Monitoring data via Envista ARM. Consult Setup Manual for full setup instructions.

4.1 Users

In Envista ARM Setup, the Personnel field will appear after selecting the Setup tab from the main menu. This allows the Database Manager to create personnel profiles, add permitted users, and match users' roles related to the stations, data, and alerts in the system. When all information is entered, click Save Personnel.

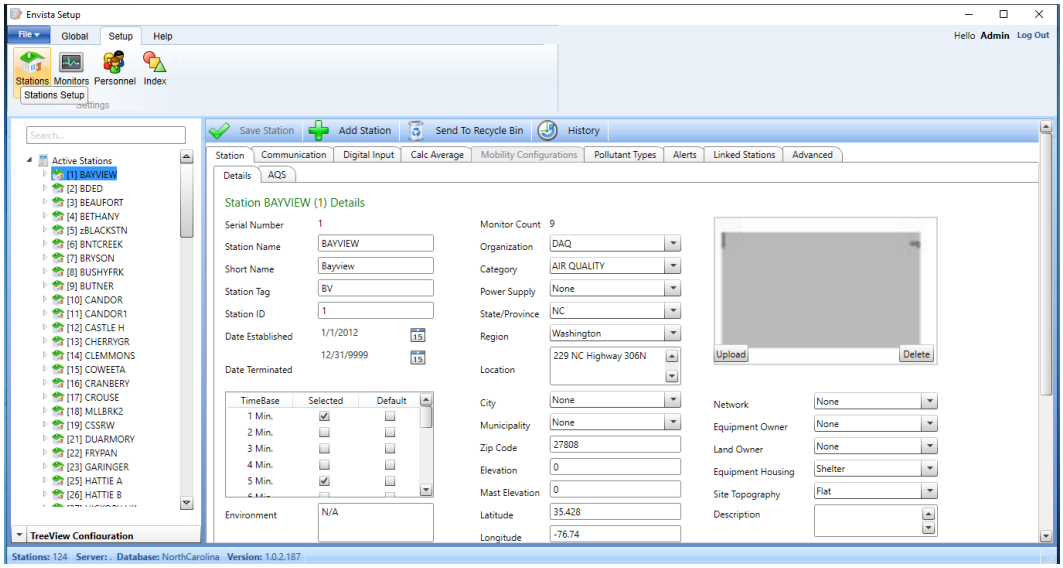


Personnel subtabs include:

- Personnel Management – Add personnel or edit their profile, including name, phones, address, E-mail and more.
- System Users Management – Give users general authorizations related to the Envista ARM program.
- Roles Management by User – Create personnel roles for editing and receiving alerts.
- Roles Management by Station – Create personnel roles for editing and receiving alerts for the current station.
- Roles Creator Wizard – Create personnel roles for editing and receiving alerts for selected stations.

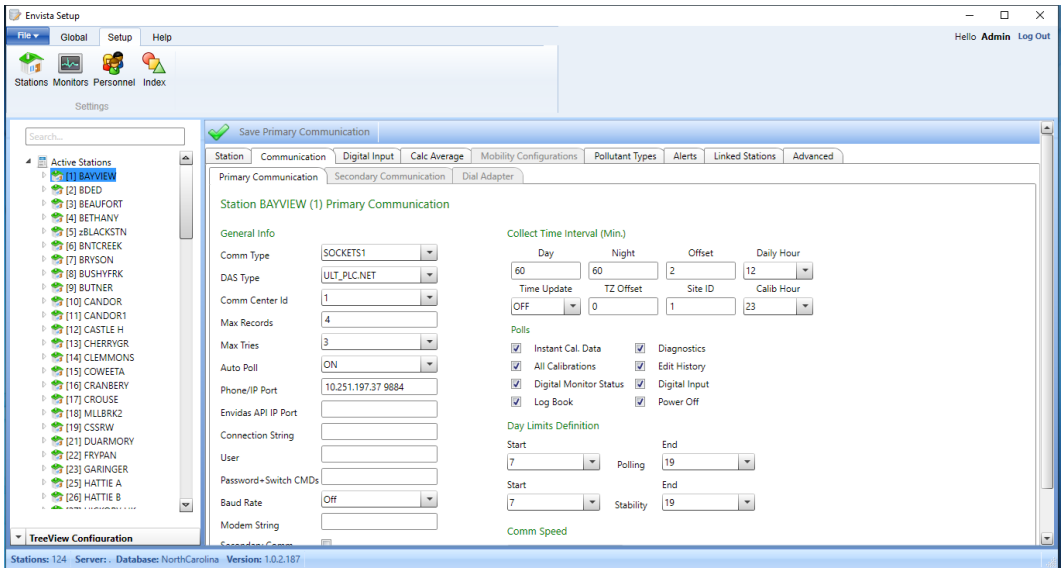
4.2 Stations

In Envista ARM Setup, select the Stations tab from the main menu to get to a station configuration screen. From here the Database Manager can add or edit a station so that it can be accessible in Envista ARM.



When all information is entered, click Save Station. Main station subtabs include:

- Station Details – Add stations including general parameters like location, time base(s), categories and more.
- AQS – Add EPA's Air Quality System (AQS) metadata to a station for data exports.
- Communication – Select a station's DAS and Communications Type and change primary communication's parameters. These are determined by ECB and are subject to change when replacing communication equipment at a station.

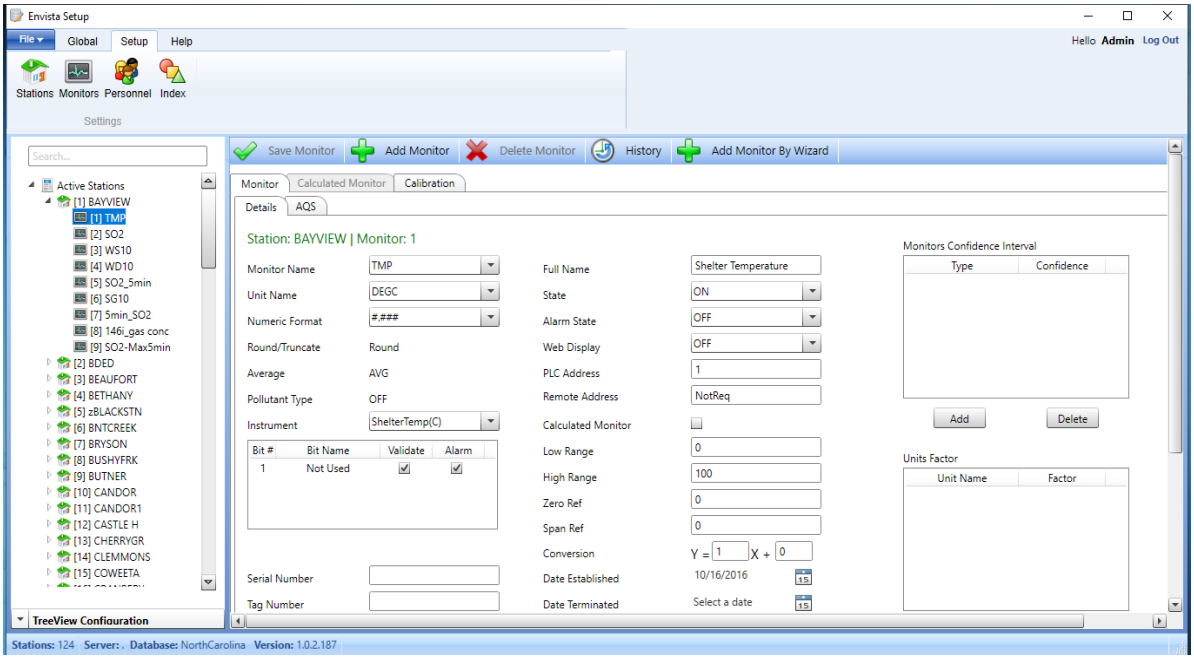


4.3 Monitors

The Monitors tab allows the Database Manager to add monitors to the station or edit a monitor's entered information. Monitor metadata are already entered into the Setup software.

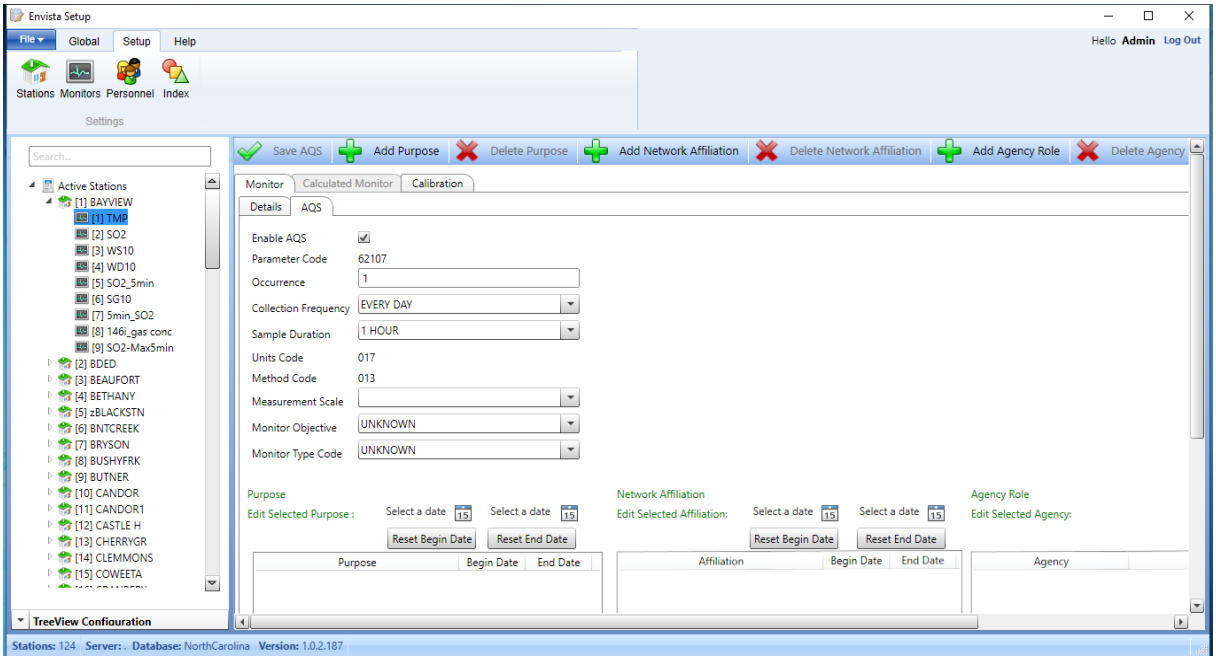
4.3.1 Details subtab

A variety of information can be entered into a Monitor's Detail tab, but the minimum needed to accept data from the Station's Envidas and to be acceptable in AQS is Monitor Name, Unit Name, and Instrument. Additionally, the State of the Monitor must be set to ON (otherwise data will be null) and the Programmable Logic Controller (PLC) Address must match the corresponding Monitor address set in Envidas. This is determined by ECB and is subject to change when replacing communication equipment at a station.



4.3.2 AQS subtab

In the AQS tab, check the Enable AQS box if the data from this Monitor is to be sent to AQS. A variety of information can be entered into a Monitor's AQS tab, but the minimum needed to be accepted by AQS is Parameter Code, Occurrence, Collection Frequency, Sample Duration, Unit Code, and Method Code. AQS metadata are already entered into the Setup software, and the specific information needed per Monitor can be provided by Raleigh Central Office (RCO) Chemists or the Projects and Procedure Branch (PPB) supervisor.



5.0 Data & Data Management

Ambient Monitoring data are initially collected at a DAQ monitoring station after ECB completes a Monitor setup and an installation of Envidas on a station workstation computer. When communication is established between the Monitor and Envidas, data are polled from the Monitor into the Envidas software. Via the CommCenter software, data are polled from Envidas in Envista on an automated hourly basis and can also be manually polled on demand. From there, real time data are exported to public display websites, edited as needed, validated by RCO Chemists, and sent to AQS.

5.1 Data Handling

The Database Manager ensures automated hourly polling of data and metadata from all sites and monitors via the Envista ARM suite of monitoring software and ensures all received data are complete, non-corrupt and backed up. Any handling of data is for the purpose of completeness, not quality.

5.2 Software Documentation

Software versions are stored on the DAQ Ambient Monitoring SharePoint webpage for reference and accessibility. DAQ Department of Information Technology (DIT) and ECB also have various copies of software for elevated installation purposes. See Appendix A of this SOP.

5.3 Data Validation and Correction

The Database Manager does not validate or correct data as per DAQ's three tier data review process of Operators (DAQ regional staff), Preliminary Editors (DAQ regional ambient monitoring coordinators), and Final Editors (DAQ RCO Chemists). The only manipulation of the database would come in the form of a data import upon request of DAQ Ambient Monitoring staff.

5.4 Data Processing

The Database Manager does not process data as per DAQ's three tier data review process of Operators (DAQ regional staff), Preliminary Editors (DAQ regional ambient monitoring coordinators), and Final Editors (DAQ RCO Chemists). The only manipulation of the database would come in the form of a data import upon request of DAQ Ambient Monitoring staff.

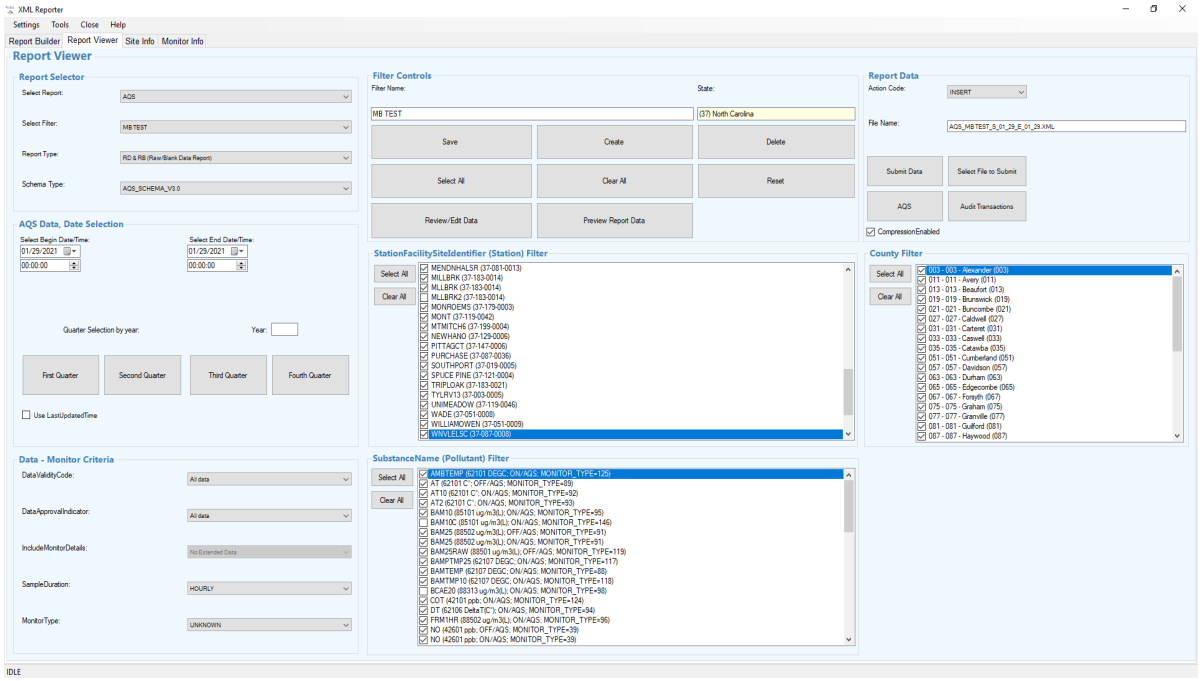
5.5 Reports

Envista ARM comes with a full range of reports to display the data as desired by the Database Manager and all Envista ARM users. To produce tabular and graphic reports for measurements choose "Reports" from the main menu. Reports can present information for selected monitors in a station or a group of monitors from multiple stations. They can present results for the monitors in the averaging periods in which the data are stored or in block averages built from the stored values, as well. The full list of reports is in the Envista ARM Manual on the DAQ SharePoint Documents page, but the main reports used by the Database Manager are:

- Station: Standard tabular and graphical reports for Station values. Several report intervals are supported. Values reported may be filtered.
- Multi-Station: The same as "Station Report", but for more than one station.
- Edit History Data: Reports on the edits that have been made to raw station data values and/or status.
- Validation: Report of intentioned validating of station as configured in Validation Date application from Edit menu.
- Raw VS Edited: Compare between the raw data and edited data for selected monitor.

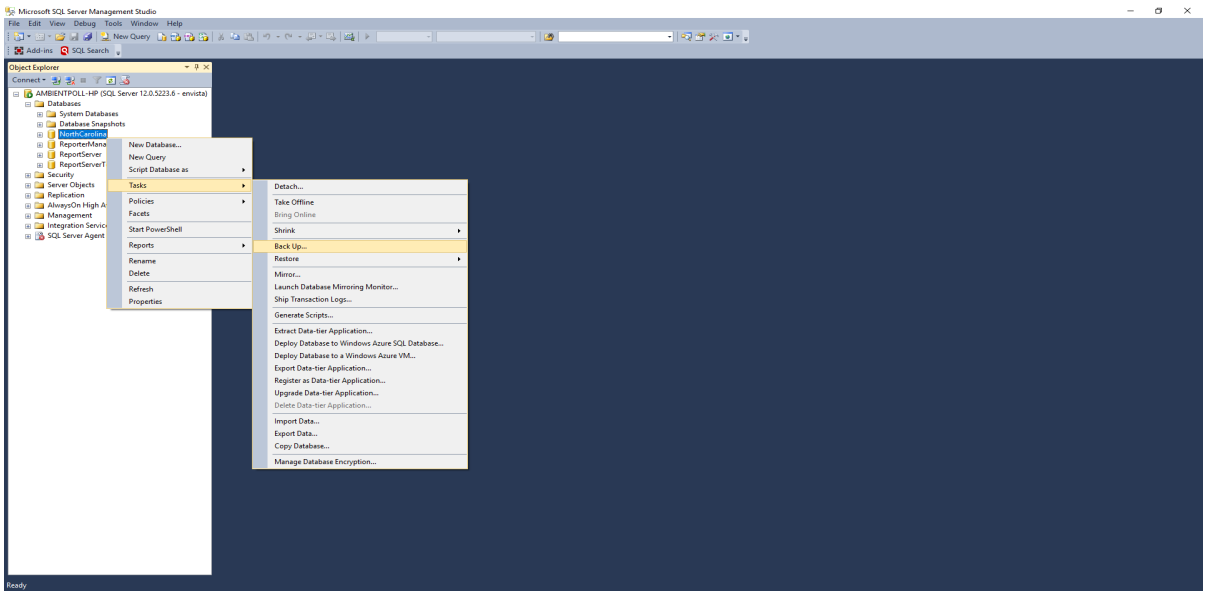
5.6 Data Submission

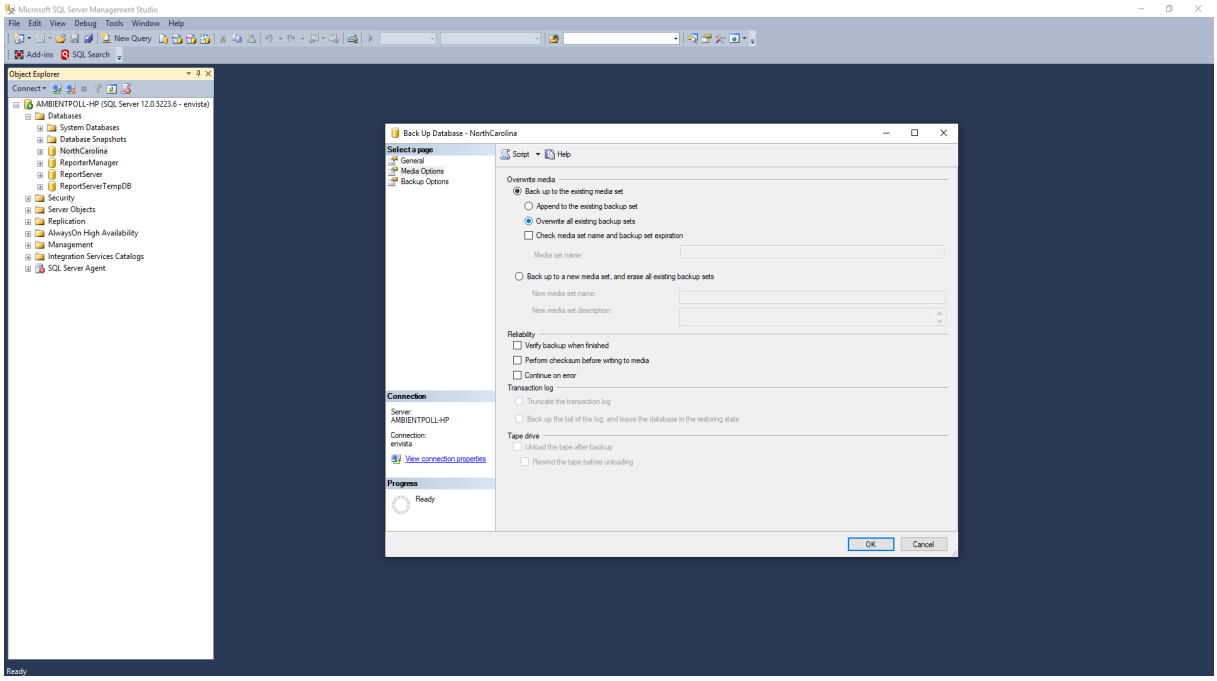
When the RCO Chemists have completed their editing and validation of data, they contact the Database Manager with the scope of data that are ready to be sent to AQS (this data can also be seen in the Envista ARM Validation report). XML Reporter is a software included in the Envista ARM suite which references the database and allows for data submission to AQS in an extensible markup language (XML) file format. Once data has been submitted, the results of the export can be reviewed in AQS. See Appendix B of this SOP.



5.7 Database back up procedures

The Microsoft SQL Server database is backed up to the workstation and the DAQ Ambient Monitoring SharepPoint webpage on a weekly basis. The Database Manager must log into the SQL Management Studio software on the workstation and perform the backup manually. After logging into the software, expand Databases to reveal the NorthCarolina database. Right click the icon and scroll to Tasks and then select Back Up. In the window that opens, click Media Options and select Overwrite all existing backup sets. A Back Up file will begin to save to DATADRIVE1 (E: Drive) of the workstation.





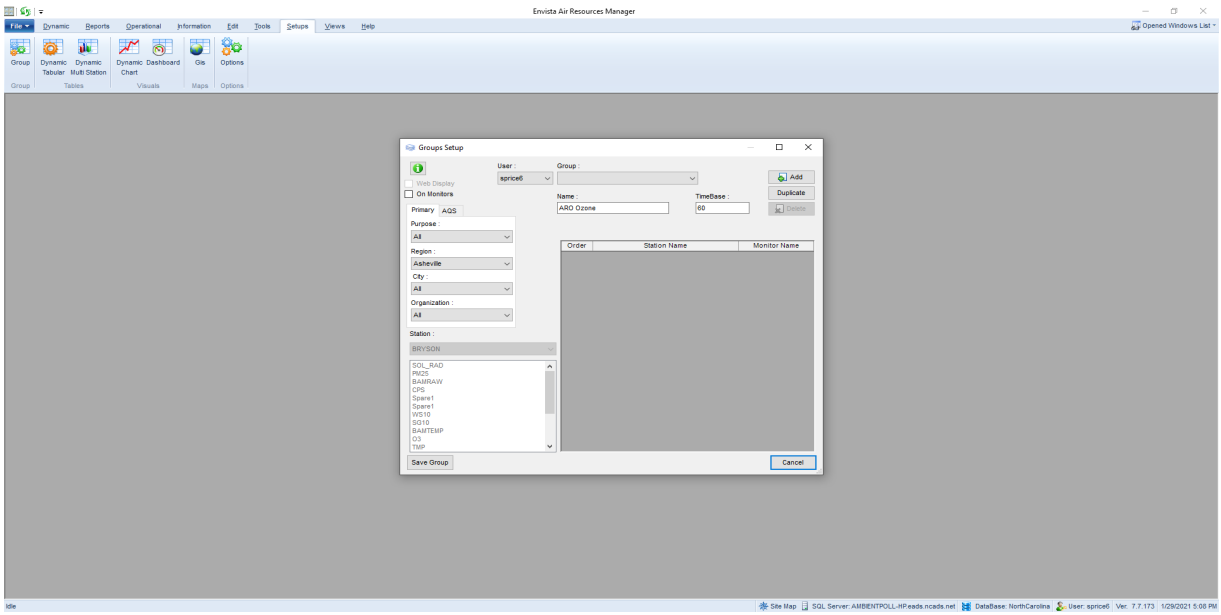
6.0 Internal Reporting

6.1 Reports

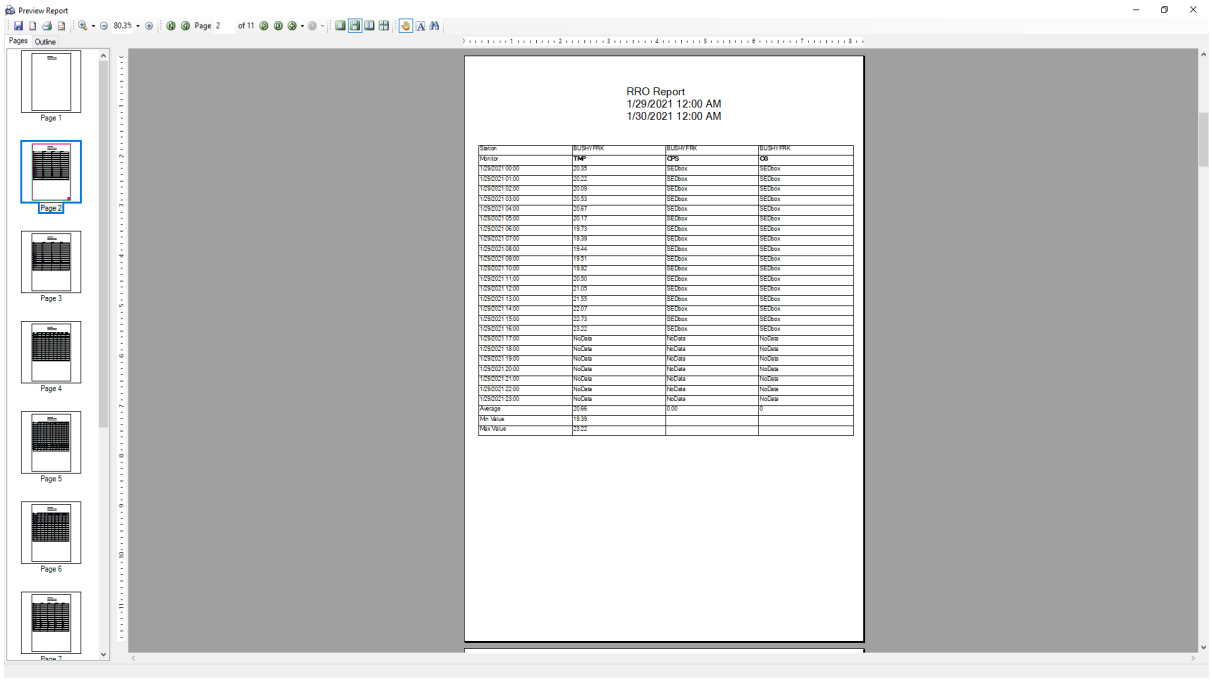
Please see Section 5.5 of this SOP for more information on reports found in Envista ARM.

6.2 Responsibilities

In addition to standard Envista ARM reports, Envista ARM users can create custom Group reports or request the Database Manager create one for all Envista ARM users to access.



The Database Manager can also create reports with Report Designer software which references the Envista ARM database. These reports are generated outside of Envista ARM and are sent to DAQ staff via an email portable document file (PDF) attachment. The very same report is also available on demand in Envista ARM using the Report Designer View feature.

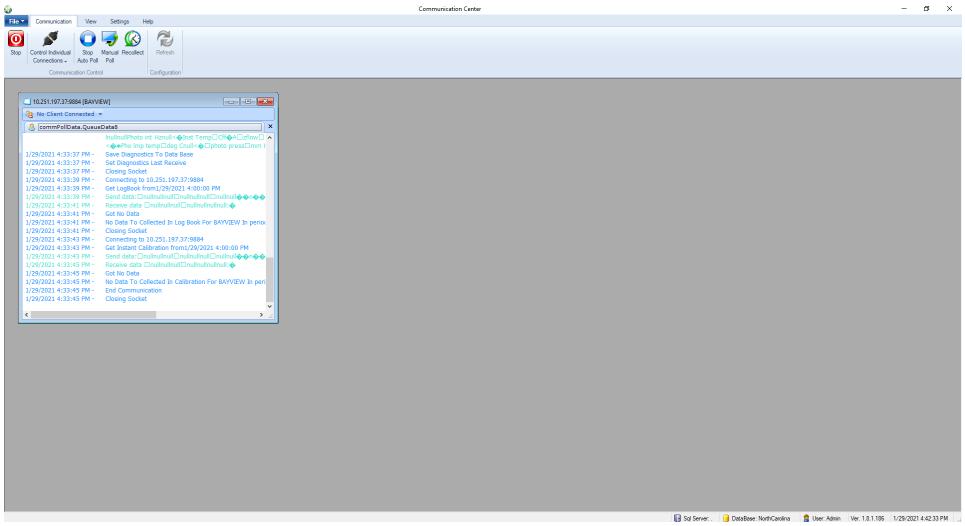


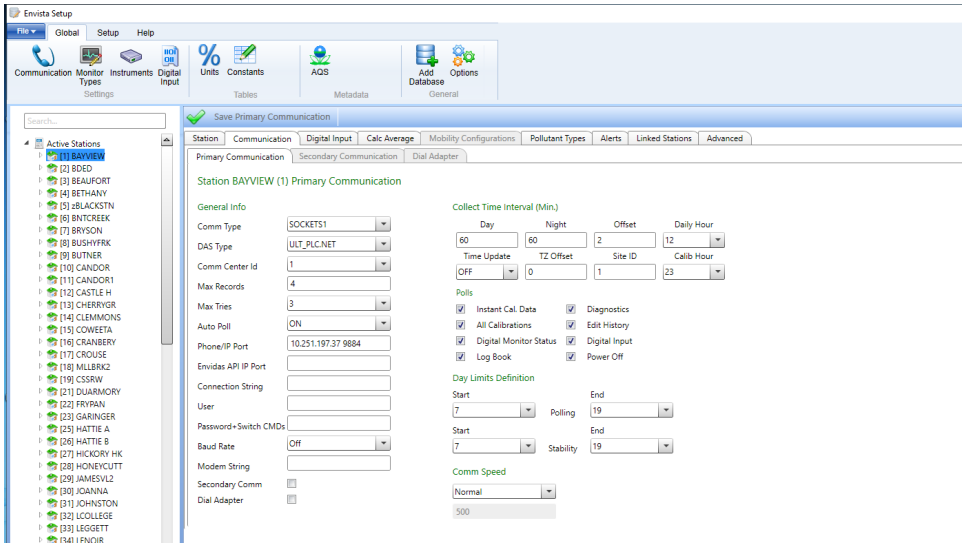
7.0 DAS Scheduled Events

Envista ARM and its accompanying polling/file transfer protocol (FTP) software are programmed to run and collect data continuously and automatically per their settings. The main automated processes occur on an hourly basis but can be configured to larger or smaller periods of time.

7.1 Site polling

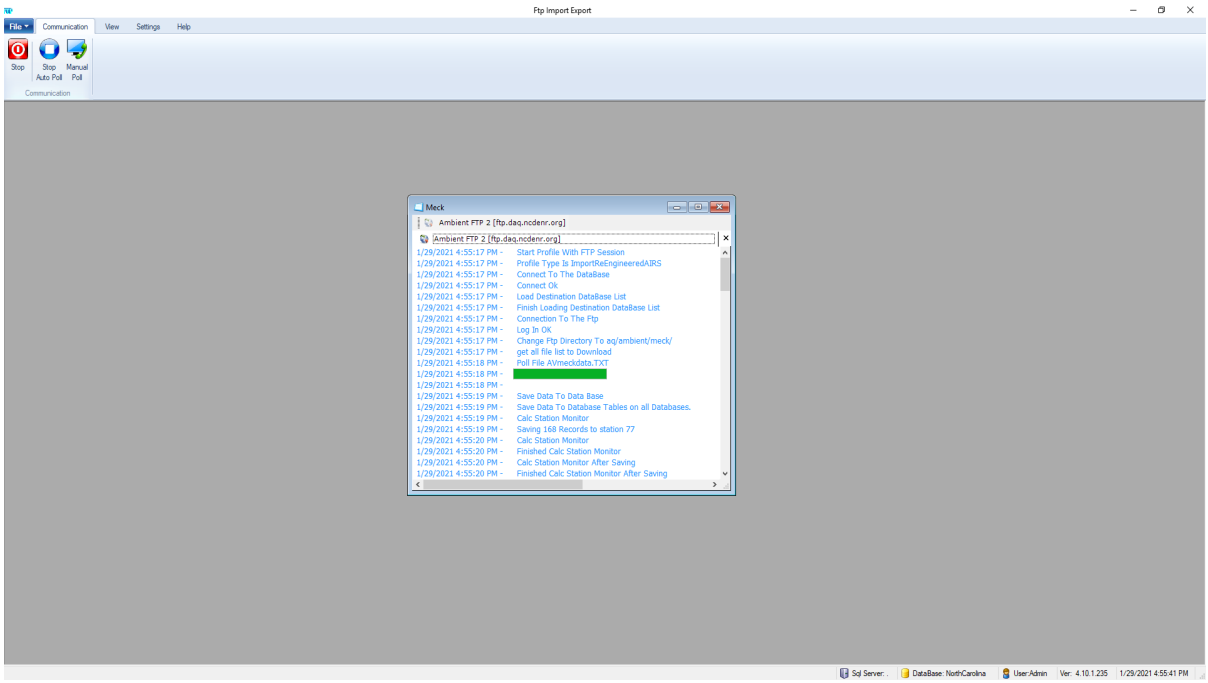
The CommCenter software acts as the communication bridge between the Envidas software at DAQ Ambient Monitoring Stations and Envista ARM. Data collected in Envidas is requested via CommCenter and stored in the 670 Maywood Avenue workstation's SQL database for Envista ARM reference. CommCenter runs as a Service on the workstation and would need to be restarted for any change in the settings to take effect. The settings that dictate how a Station functions in CommCenter are found in Envista ARM Setup.





7.2 FTP of data from external sources

The Import Export FTP software acts as the communication bridge between Envista ARM and external data sources/receptacles which lack access to the State network. Data provided on external FTP websites is requested via Import Export FTP and stored in the 670 Maywood Avenue workstation's SQL database for Envista ARM reference. Import Export FTP runs as a Service on the workstation and would need to be restarted for any change in the settings to take effect. FTP credentials need to be entered into an FTP profile's settings to gain access to secure FTP websites.



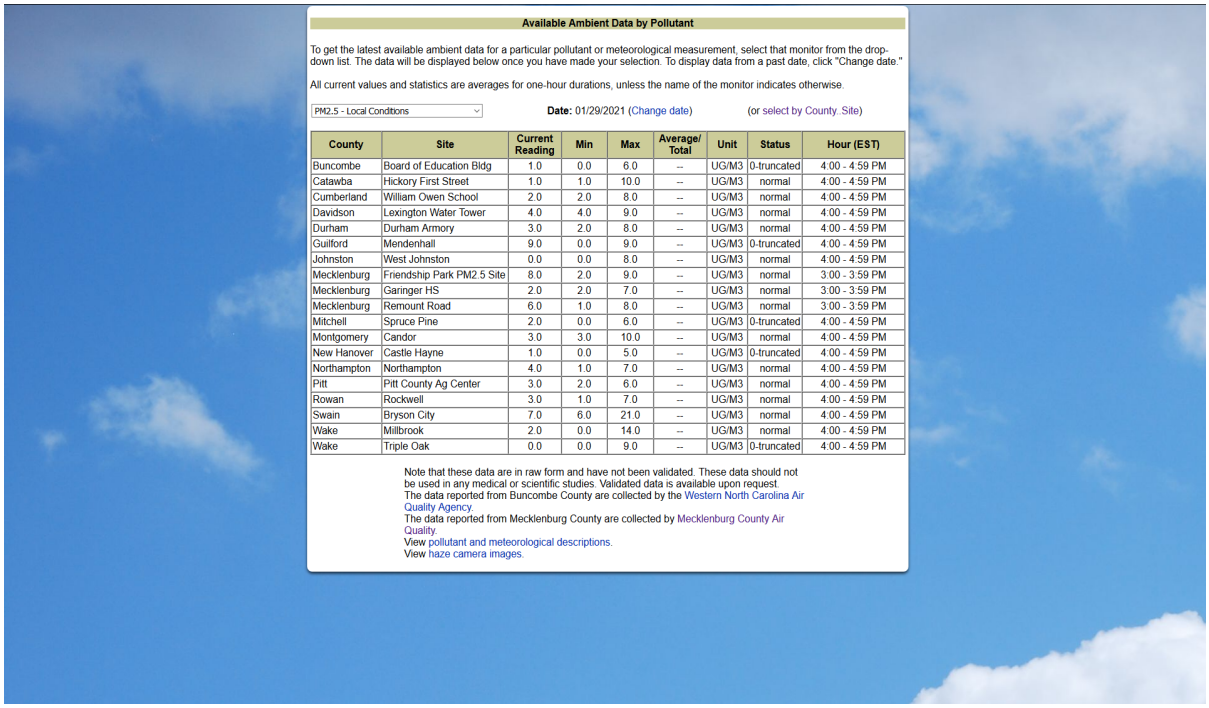
8.0 Routine Maintenance Envista

For back-up and archival procedures of the SQL database see Section 5.7 of this SOP.

9.0 External Reporting

9.1 DAQ Ambient Monitoring Website

The DAQ Ambient Monitoring Website displays raw hourly data sent to the Internet-Based Enterprise Application Management (IBEAM) database every hour via the Import Export FTP software. The data are not validated, but after an RCO Chemist has validated a month of hourly values the Database Manager runs a manual FTP export to IBEAM to update data that has since been edited. Also, RCO Chemists can request that the Database Manager export data to IBEAM to remove a value from the Website after it has been nulled.



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.

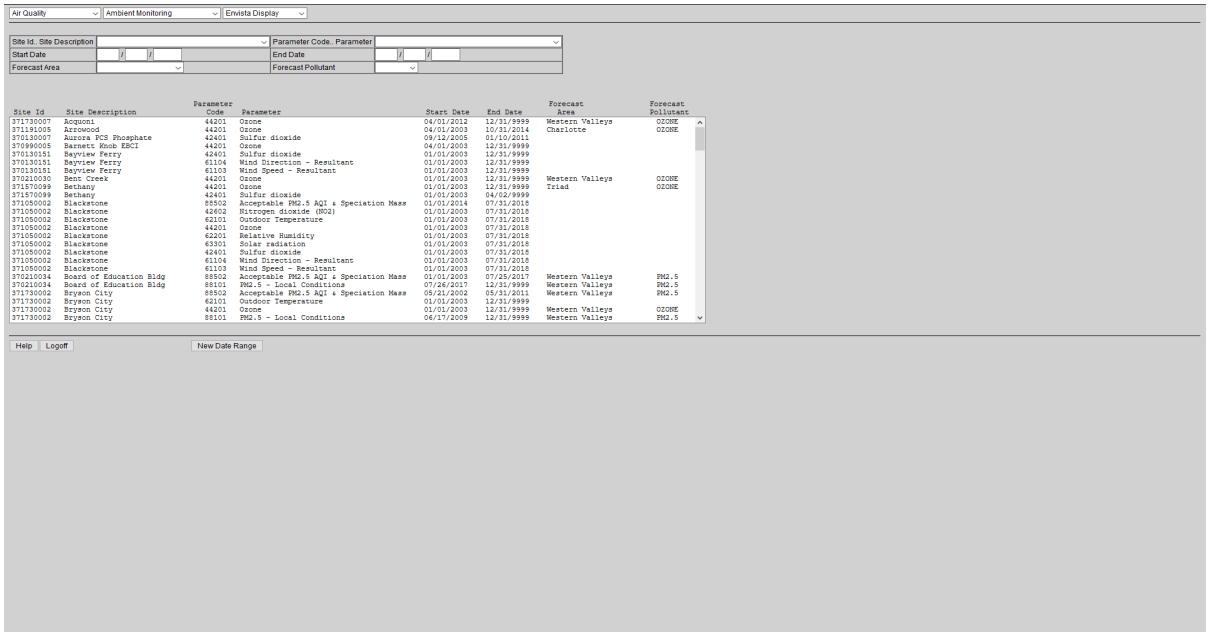
PM2.5 - Local Conditions **Date:** 01/29/2021 (Change date) (or select by County, Site)

County	Site	Current Reading	Min	Max	Average/ Total	Unit	Status	Hour (EST)
Buncombe	Board of Education Bldg	1.0	0.0	6.0	--	UG/M3	0-truncated	4:00 - 4:59 PM
Catawba	Hickory First Street	1.0	1.0	10.0	--	UG/M3	normal	4:00 - 4:59 PM
Cumberland	William Owen School	2.0	2.0	8.0	--	UG/M3	normal	4:00 - 4:59 PM
Davidson	Lexington Water Tower	4.0	4.0	9.0	--	UG/M3	normal	4:00 - 4:59 PM
Durham	Durham Armory	3.0	2.0	8.0	--	UG/M3	normal	4:00 - 4:59 PM
Guilford	Mendenhall	9.0	0.0	9.0	--	UG/M3	0-truncated	4:00 - 4:59 PM
Johnston	West Johnston	0.0	0.0	8.0	--	UG/M3	normal	4:00 - 4:59 PM
Mecklenburg	Friendship Park PM2.5 Site	8.0	2.0	9.0	--	UG/M3	normal	3:00 - 3:59 PM
Mecklenburg	Garinger HS	2.0	2.0	7.0	--	UG/M3	normal	3:00 - 3:59 PM
Mecklenburg	Remount Road	6.0	1.0	8.0	--	UG/M3	normal	3:00 - 3:59 PM
Mitchell	Spruce Pine	2.0	0.0	6.0	--	UG/M3	0-truncated	4:00 - 4:59 PM
Montgomery	Candor	3.0	3.0	10.0	--	UG/M3	normal	4:00 - 4:59 PM
New Hanover	Castle Hayne	1.0	0.0	5.0	--	UG/M3	0-truncated	4:00 - 4:59 PM
Northampton	Northampton	4.0	1.0	7.0	--	UG/M3	normal	4:00 - 4:59 PM
Pitt	Pitt County Ag Center	3.0	2.0	6.0	--	UG/M3	normal	4:00 - 4:59 PM
Rowan	Rockwell	3.0	1.0	7.0	--	UG/M3	normal	4:00 - 4:59 PM
Swain	Bryson City	7.0	6.0	21.0	--	UG/M3	normal	4:00 - 4:59 PM
Wake	Millbrook	2.0	0.0	14.0	--	UG/M3	normal	4:00 - 4:59 PM
Wake	Triple Oak	0.0	0.0	9.0	--	UG/M3	0-truncated	4:00 - 4:59 PM

Note that these data are in raw form and have not been validated. These data should not be used in any medical or scientific studies. Validated data is available upon request.
The data reported from Buncombe County are collected by the Western North Carolina Air Quality Agency.
The data reported from Mecklenburg County are collected by Mecklenburg County Air Quality.
View pollutant and meteorological descriptions.
View haze camera images.

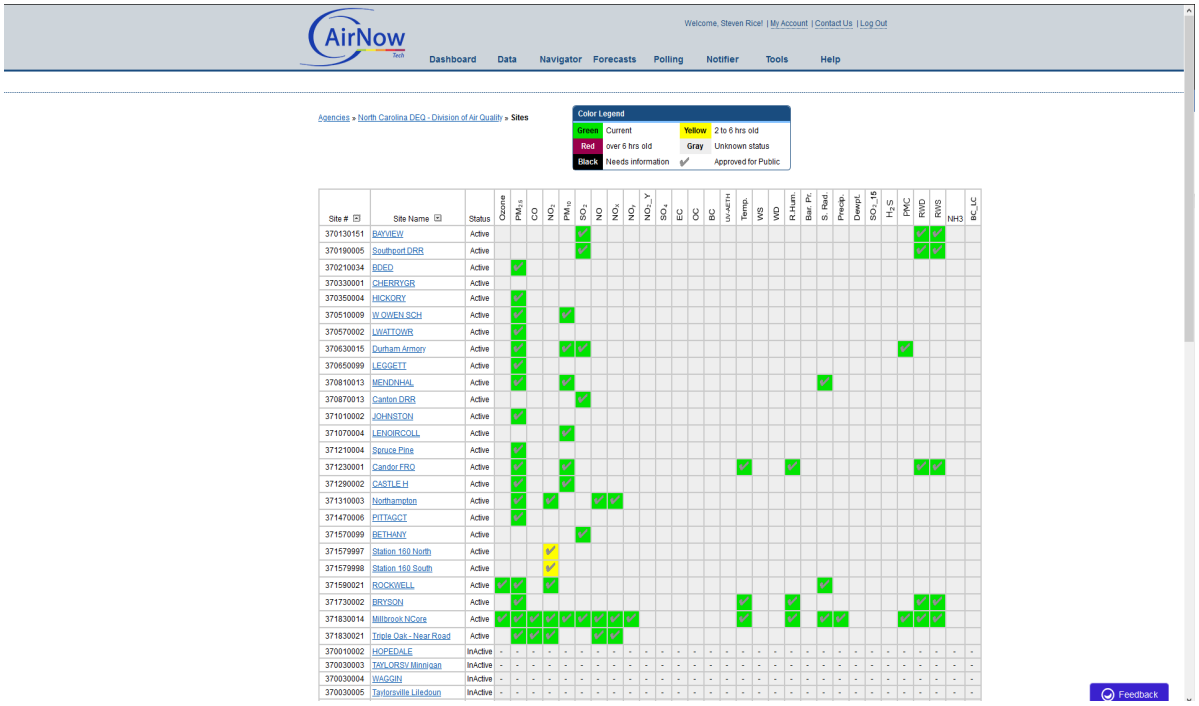
9.2 IBEAM

Data are automatically sent to the IBEAM database every hour via the Import Export FTP software to be displayed on the DAQ Ambient Monitoring Website or be accessible to DAQ staff who are not Envista ARM users. A Monitor's metadata must match between IBEAM and the Import Export FTP software in order to be displayed. The Database Manager can add Stations, Monitors, date ranges, and other information into the Ambient Monitoring Display settings in IBEAM.



9.3 AirNow

The Database Manager is to have an AirNow-Tech account to export Ambient Monitoring data via the Import Export FTP software to AirNow-Tech for public display. AirNow-Tech searches AQS for updated data values so sending edited data is only required for immediate display updates.



9.0 Revision History

This SOP is a new SOP and does not yet have any revision history.

10.0 References

1. Envista ARM Revision 1.1.14
2. Envista Setup WPF Version 8 -Revision 1.0.43

11.0 Appendices

Appendix A Software Documentation (from 2019 Technical Systems Audit)
Appendix B Data Submission (from 2019 Technical Systems Audit)

Appendix A Software Documentation (from 2019 Technical Systems Audit)

Question	Yes	No	Comment
Does your agency use an AQS Manual?	☒	☐	
Does your agency use an AirNow Manual? If yes, list the title of the manual used including the version number and date published.	☒	☐	AirNow-I AQCSV Format Specifications Document Version 3.0, STI-915100-3492 01/2015
Does the agency have information on the reporting of precision and accuracy data available?	☒	☐	
What software is used to prepare air monitoring data for release into the AQS and AirNow databases? Include the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.	☐	☐	Envista Air Resource Manager (ver 7.7.160). DR DAS and Envitech are the software developers.
What is the recovery capability in the event of a significant computer problem (i.e., how much time and data would be lost)?	☐	☐	A computer solution will be in place within three business days. Data being stored on the site's monitors would be imported into the database. Potentially no data loss.
Has your agency tested the data processing software to ensure its performance of the intended function are consistent with the *QA Handbook Volume II, Section 14.0*?	☒	☐	
Does your agency document software tests? **If yes, provide the documentation.**	☐	☒	

Appendix B Data Submission (from 2019 Technical Systems Audit)

Question	Yes	No	Comment
How often are data submitted to AQS?			Monthly
How often are data submitted to AirNow?			Hourly
Briefly comment on difficulties the agency may have encountered in coding and submitting data following the AQS guidelines.			No significant difficulties to comment on.
Does the agency retain a hard copy printout of submitted data from AQS?	☐	☒	
Are records kept by the agency for at least three years in an orderly, accessible form? If yes, does this include:	☒	☐	
• Raw data	☒	☐	
• Calculations	☒	☐	
• QC data	☒	☐	
• Reports: list which reports are used	☒	☐	
Has your agency submitted data (along with the appropriate calibration equations used) to the processing center?	☒	☐	
Are concentrations of PM_{10} corrected to EPA standard temperature and pressure conditions (i.e., 298 K, 760 mm Hg) before input to AQS?	☒	☐	
Are concentrations of $PM_{2.5}$ and Pb reported to AQS under actual (volumetric) conditions?	☒	☐	
Are audits on data reduction procedures performed on a routine basis? If yes, at what frequency?	☐	☒	
Are precision and accuracy data checked each time they are calculated, recorded, or transcribed to ensure that incorrect values are not submitted to EPA?	☒	☐	