

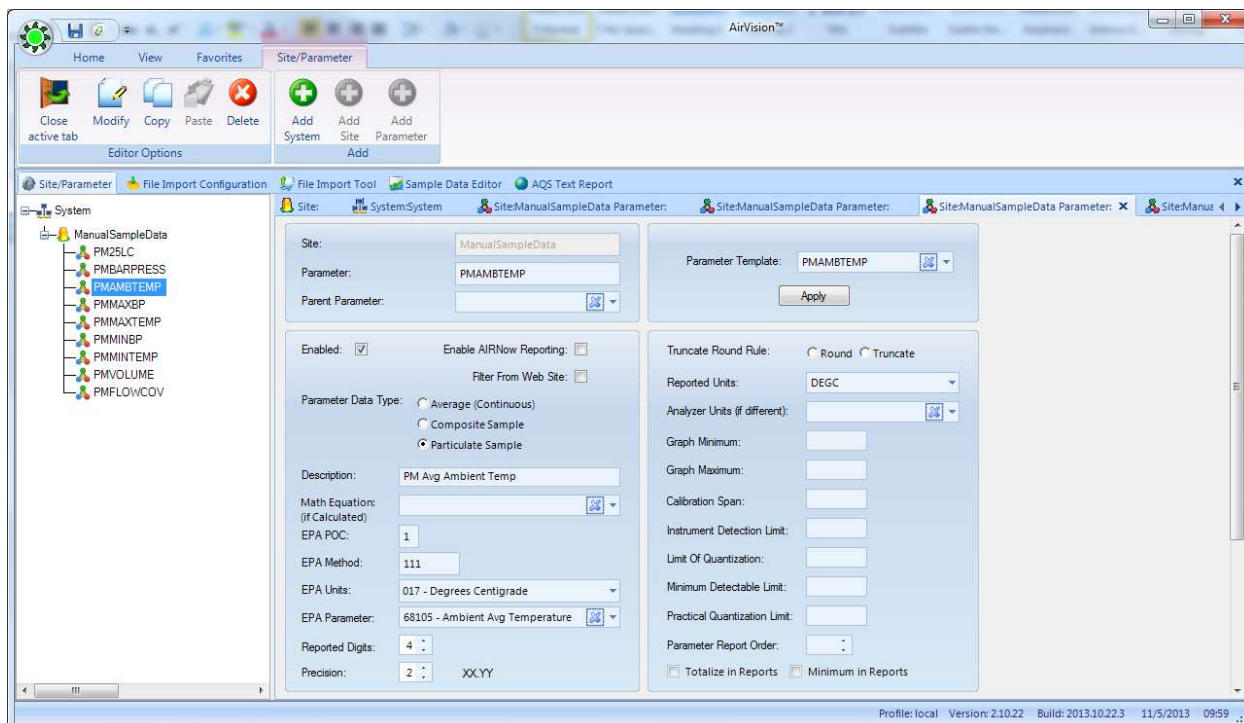
Methods for Sample Data Handling in AirVision

Manual filter/sample data can be handled in several different ways in AirVision, primarily depending on some of the options elected. These include:

1. Manual data entry of filter data through the Sample Data editor (base system)
2. Import of PM filter data files through File Import Tool, with follow-up editing for weights / lab data
3. Automatic polling of FRM samplers (using Direct Instrument Poll drivers) for Filter Data records, with follow-up editing for weights / lab data
4. Combining methods 2 or 3 with File Import Tool for final lab results.

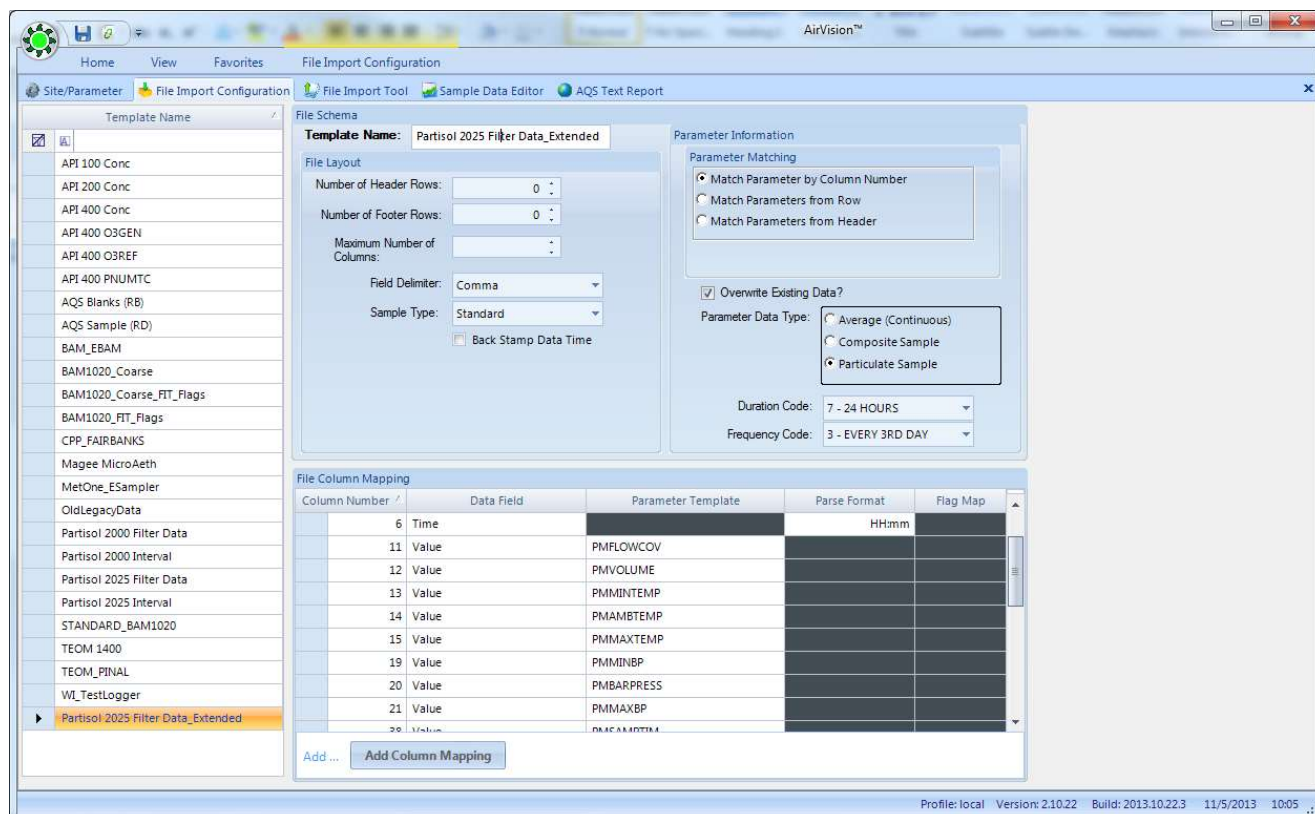
This section will focus on methods 2 and 3, as the other methods follow easily from a study of the setups of these methods.

First, we consider the Site/Parameter setup. In most cases, we want to report to AQS the PM concentration value itself, as well as average ambient temperature, barometric pressure, and volume. We may also want to report min/max temperature, min/max barometric pressure, and flow covariance. For this document, we will call this “Extended AQS Reporting.” We would set up site/parameter records for each entry we wish to report to AQS.



Note: if you do not report average flow/temp/pressure to AQS, they can still be imported using the File Import Tool, but a Parameter record does not need to be configured at this point. For this document, we will call this the “Basic AQS Reporting.”

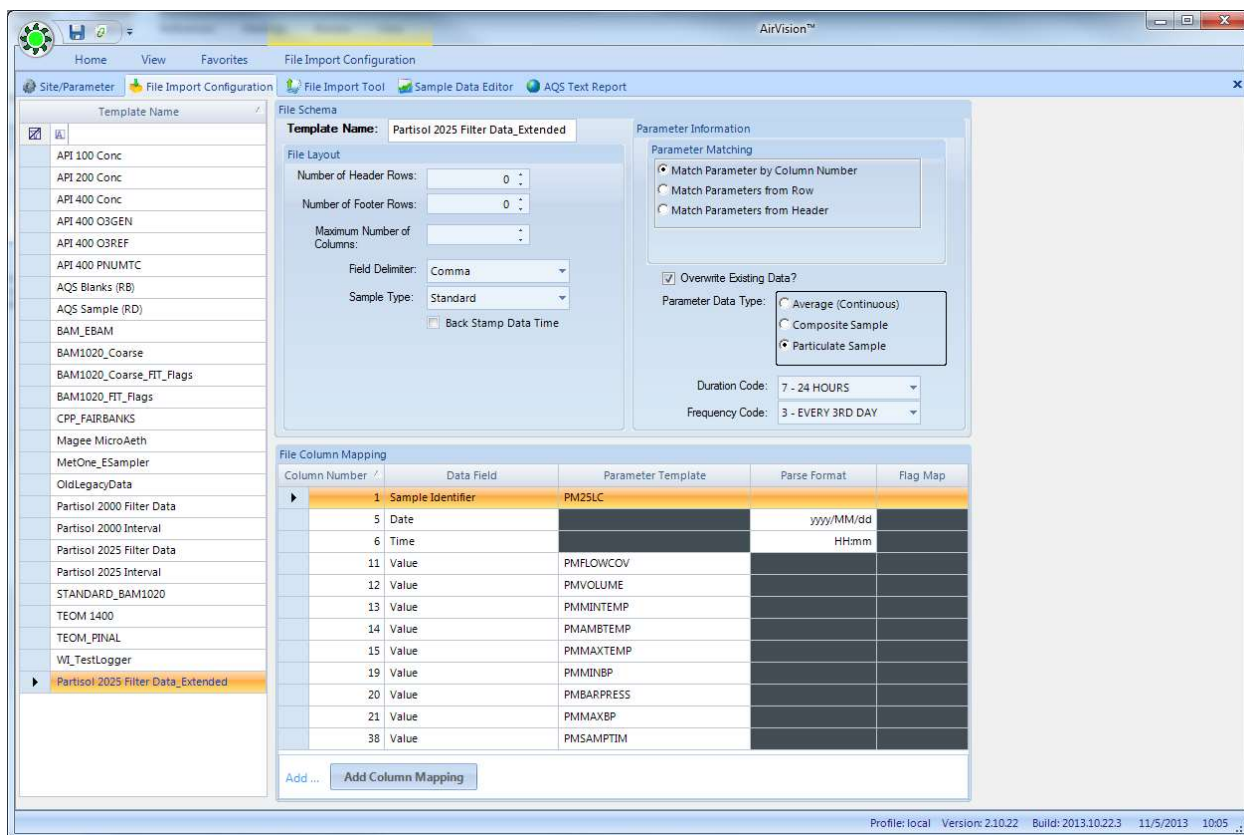
Next, we consider the File Import Template we will use for either manual file import, or connected to the Direct Instrument Poll of our FRM sampler. If we want to use the Basic AQS Reporting method, we can use the default Partisol templates already packaged in the system. These map the pressure, temperature, and flow fields to sub-records inside the PM sample record:



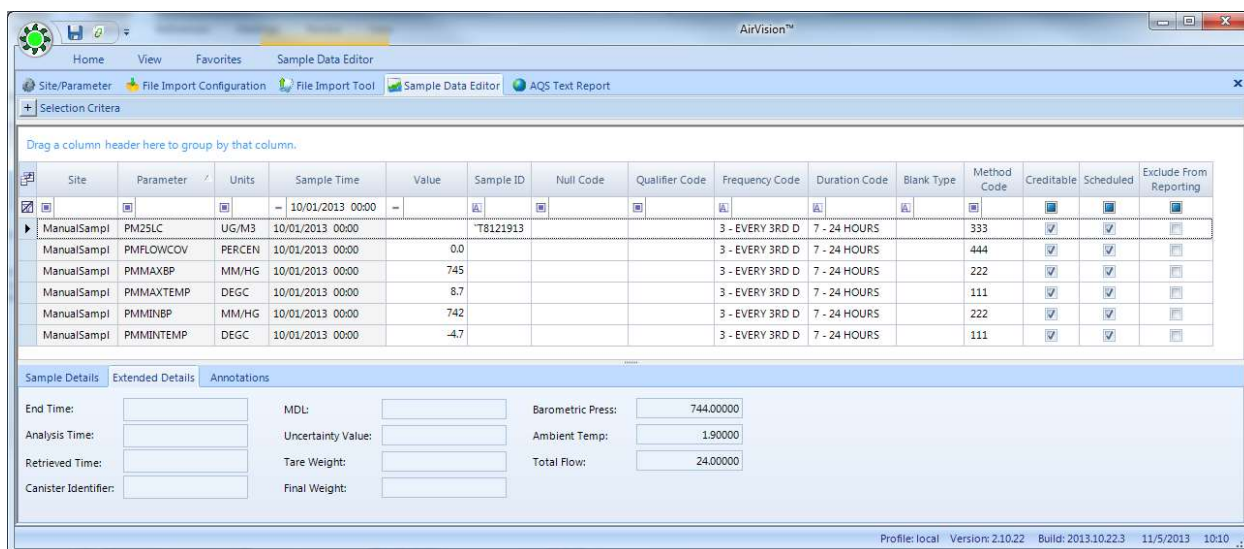
Note: If you want to report PM10 instead of PM25, you can use the “Copy” function on the ribbon to create a duplicate parameter template and change the parameter template from PM25 to PM10.

Note that the flow, temperature, and pressure are data fields **within** the PM25LC sample record. They are not stored separately as parameter records, and thus in this method, AQS records cannot be generated independently for those measurements.

To do so, we would use the Extended AQS Reporting method, and choose one of the new “Extended” file import templates:



Here, you can see in this case, each field is matched to the parameter template to direct imported data into the individual parameter. Once we have imported the data or polled the instrument to get the data in, we can open the Sample Data Editor and see the results.



In this example, we have used the Basic mode template. You see that the pressure, temp, and flow are not available as individual records, but exist in the Extended Details of the PM25 record, and are available to the Sample Data calculator (but not to AQS reporting).

If we use the Extended template, our records would look like this:

Site	Parameter	Units	Sample Time	Value	Sample ID	Null Code	Qualifier Code	Frequency Code	Duration Code	Blank Type	Method Code	Creditable	Scheduled	Exclude From Reporting
ManualSampl	PM25SLC	UG/M3	11/01/2013 00:00		T8121913			3 - EVERY 3RD D	7 - 24 HOURS		333	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMAMBTMP	DEGC	11/01/2013 00:00	1.90				3 - EVERY 3RD D	7 - 24 HOURS		111	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMBARPRESS	MM/HG	11/01/2013 00:00	744.00				3 - EVERY 3RD D	7 - 24 HOURS		222	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMFLOWCOV	PERCEN	11/01/2013 00:00	0.0				3 - EVERY 3RD D	7 - 24 HOURS		444	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMMAXBP	MM/HG	11/01/2013 00:00	745				3 - EVERY 3RD D	7 - 24 HOURS		222	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMMAXTEMP	DEGC	11/01/2013 00:00	8.7				3 - EVERY 3RD D	7 - 24 HOURS		111	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMMINBP	MM/HG	11/01/2013 00:00	742				3 - EVERY 3RD D	7 - 24 HOURS		222	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMMINTEMP	DEGC	11/01/2013 00:00	-4.7				3 - EVERY 3RD D	7 - 24 HOURS		111	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ManualSampl	PMVOLUME	M3	11/01/2013 00:00	24				3 - EVERY 3RD D	7 - 24 HOURS		444	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Sample Details Extended Details Annotations

End Time: MDL: Barometric Press:

Analysis Time: Uncertainty Value: Ambient Temp:

Retrieved Time: Tare Weight: Total Flow:

Canister Identifier: Final Weight:

Profile: local Version: 2.10.22 Build: 2013.10.22.3 11/5/2013 10:09

Here, the flow, pressure, temp data are all available for AQS reporting, but not stored as fields within the PM25 record. But that's OK, we can still access that data when using the Calculator.

The Sample Calculator

The calculator allow the editor to determine PM concentration from volume, temperature, pressure, and tare/final weight data manually entered into the editor (users with the File Import Tool have the option, of course, to directly import the concentration data).

Sample Details Extended Details Annotations

Site: ManualSampleData Units: UG/M3 Frequency Code: 3 - EVERY 3RD DAY Creditable Sample: ☒

Parameter: PM25LC Sample: T8121913 Duration Code: 7 - 24 HOURS Scheduled Sample: ☒

Sample Time: 11/01/2013 00:00 Method Code: 333 Blank Filter Type: Exclude From Reporting: ☐

Sample Value: Null Code:

Qualifier Code:

Profile: local Version: 2.10.22 Build: 2013.10.22.3 11/5/2013 10:13

When you click the calculator button, a popup screen will appear for data entry:

Here, all data can be manually entered, and “Calculate Sample” used to calculate the concentration. If using the Basic method, the flow, pressure, and temperature will already be populated from the meta data in the main PM data record.

For the Extended method, flow/pressure/temperature data can be filled using the “Populate from Site Samples/Averages” button. The algorithm AirVision uses to fill these records are as follows:

1. Try to find sample data records with the same date/time from parameters with the parameter templates PMVOLUME, PMBARPRESS, and PMAMBTMP.
2. If these do not exist, try to find hourly data records for that day with parameter templates ??, ??, ??, and create 24-hour totals/averages from those parameters.

Once the flow, pressure, temperature, and tare/final weights have been entered, the “Calculate Sample” button will calculate the concentration value. “OK” will save the result.

Importing Filter Lab Data

Obviously, if dealing with a lot of filter weight data, it is not necessarily viable to depend on manual entry for all of these. Most gravimetric lab data is kept in spreadsheets or can be generated to spreadsheets in LIMS software. So, we can use the File Import Tool to *merge* the above sampler data with weights, and then calculate the results in AirVision.

To do this, we select a particular Import Type in the File Import Template Editor: *SampleIDKey*. This selection tells the File Import tool that the incoming template will have a SampleID in the file, and to look for an existing matching record (that will have the date, time, parameter). So the incoming file could contain nothing more than tare weight and final weight (but could contain other meta data like null codes, qualifier codes, etc). Example:

The screenshot displays the 'File Import Configuration' window in the AirVision software. The window is divided into several sections for configuring the import process.

Template Name: Partisol DC Lab Test

File Layout:

- Number of Header Lines: 0
- Number of Footer Lines: 0
- Minimum Number of Columns: 0
- Field Delimiter: Comma
- Sample Type: SampleIDKey

Parameter Information:

- Match Parameter by Column Number (selected)
- Match Parameters from Row
- Match Parameters from Header

Data Type:

- Average / Continuous
- Logbook
- Sample / Non-Continuous (selected)
- Annotation
- Calibration

Duration Code: 7 - 24 HOURS

Frequency Code: 3 - EVERY 3RD DAY

Blank Type:

Existing Data:

- Do Not Modify Existing Data
- Update Field Values (selected)
- Reset Record And Overwrite

File Column Mapping:

Column Number	Data Field	Parameter Template	Parse Format	Flag Map
1	Sample Identifier	PM25LC		
2	Tare Weight	PM25LC		
3	Final Weight	PM25LC		

Buttons: Add ... Add Column Mapping

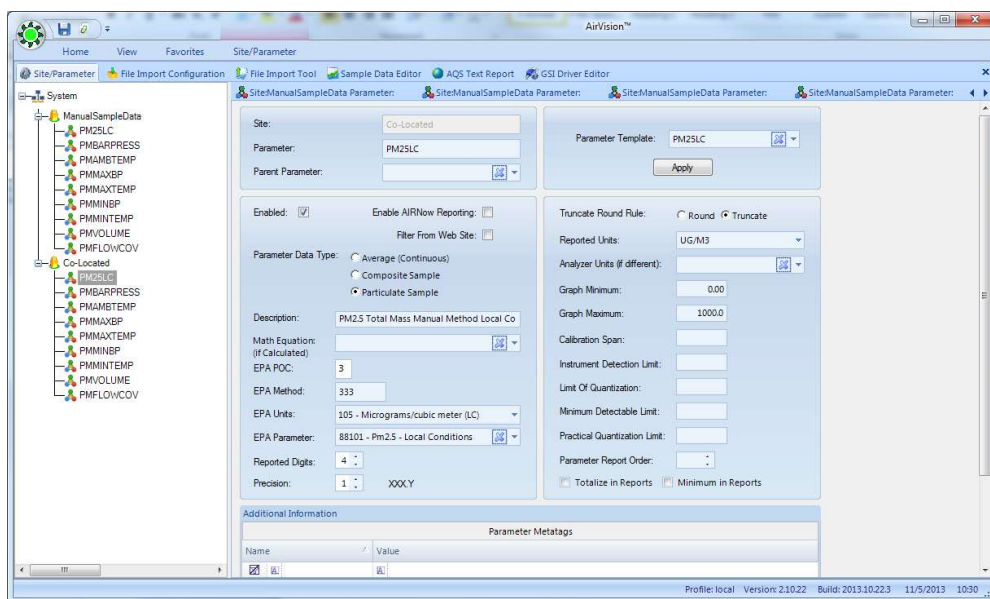
Status Bar: Starting File Import Configuration... User: Admin Profile: LAPTOP-15A681RS Version: 4.6.222 Build: 2023.07.10.1 9/13/2023 08:36

Co-Located Samplers

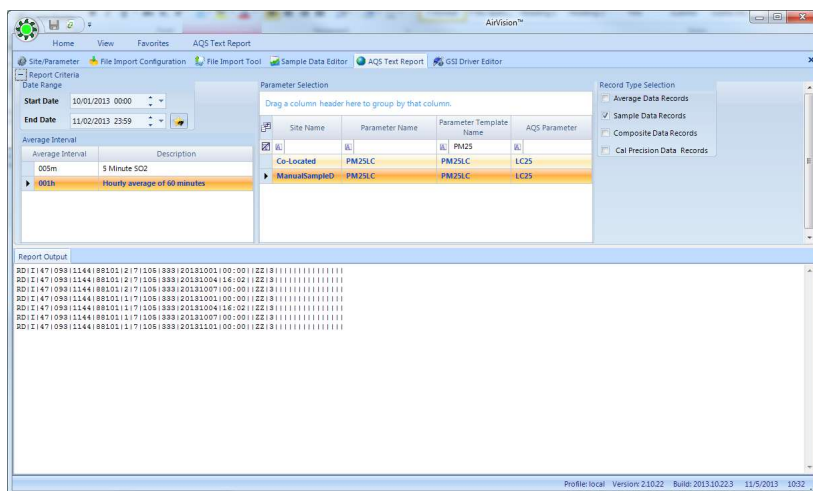
In the Basic mode, it would be easy to copy a File Import Template and create alternate templates and alternate Parameter Templates (e.g., PM25LC_2, PMAMBTTEMP_2, etc).

Because the calculator has some elements hard-coded to particular parameter templates, using the Extended mode can be problematic for co-located samplers configured at the same site.

For this reason, it may be easier for the user to configure a secondary “pseudo site” to represent a co-located sampler. The co-located site can have the same site/county code, and a similar list of parameters (and use the standard parameter templates). In this case, the only difference would be the Site Name, and the POC settings in the parameters. Example:



In this case, the parameter just appears in AQS as the same site, with a different POC code:

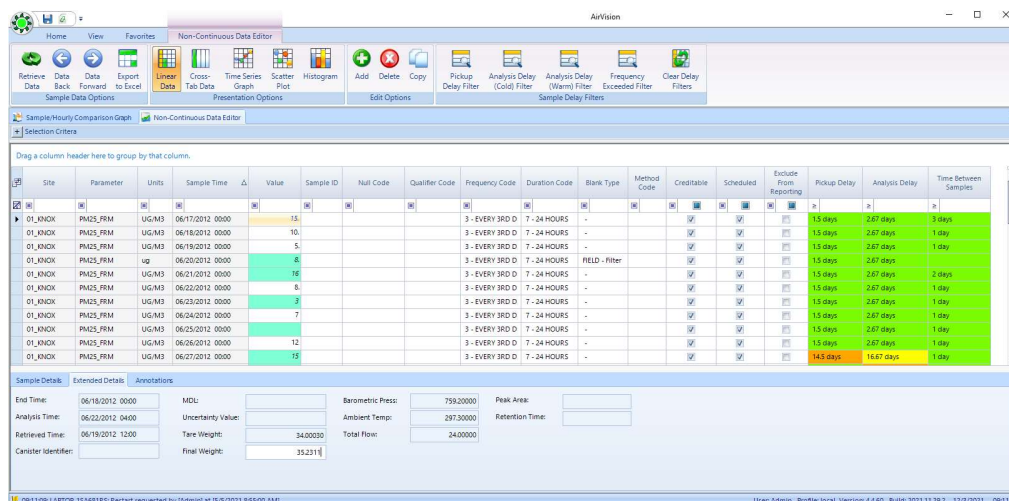


Options for Managing Filter-based PM Meta Data

AiVision offers two main approaches for handling the meta data (sampler volume, pressures, temps, etc) associated with filter-based samplers:

- Store the data as meta data as part of a single Sample record
- Store the data as additional parameters in AirVision

There are pros and cons to each, so let's review the approaches. Looking at the sample data editor, we can see that a single PM record can have meta data as part of the sample record:

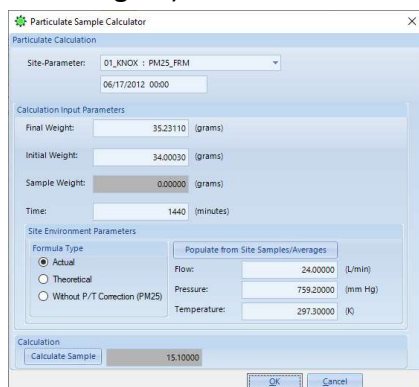


Site	Parameter	Units	Sample Time	Value	Sample ID	Null Code	Qualifier Code	Frequency Code	Duration Code	Blank Type	Method Code	Creditable	Scheduled	Exclude From Reporting	Pickup Delay	Analysis Delay	Time Between Samples
01_KNOK	PM25_FRM	UG/M3	06/17/2012 0000	15				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	3 days
01_KNOK	PM25_FRM	UG/M3	06/18/2012 0000	10				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/19/2012 0000	5				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	ug	06/20/2012 0000	4				3 - EVERY 3RD D	7 - 24 HOURS	FIELD - Filter					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/21/2012 0000	16				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	2 days
01_KNOK	PM25_FRM	UG/M3	06/22/2012 0000	8				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/23/2012 0000	7				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/24/2012 0000	7				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/25/2012 0000	12				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/26/2012 0000	12				3 - EVERY 3RD D	7 - 24 HOURS	-					15 days	2.67 days	1 day
01_KNOK	PM25_FRM	UG/M3	06/27/2012 0000	13				3 - EVERY 3RD D	7 - 24 HOURS	-					14.5 days	16.67 days	1 day

Sample Details
End Time: 06/18/2012 0000
Analysis Time: 06/22/2012 0400
Retrieved Time: 06/19/2012 1200
Candidate Identifier:
MDL:
Uncertainty Value:
Tare Weight: 34.00030
Final Weight: 35.2311
Barometric Press: 759.20000
Ambient Temp: 297.30000
Total Flow: 24.00000
Peak Area:
Retention Time:

Note, however, that only the *average* pressure and temperature are stored, max and min values are not available as meta data- those must always be stored as additional parameters if the user wants to keep that data for other reports, graphing, etc. Note also that this approach assumes press/temp/flow kept only as the 24-hour sampler values, and not as hourly data potentially acquired via a data logger connected to the sampler.

When the user runs the calculator to get the final concentration, the calculator can draw from the meta data, or the user can request the data be queried from other parameters (“Populate from Site Averages”):



Particulate Sample Calculator

Particulate Calculation

Site-Parameter: 01_KNOK : PM25_FRM

Calculation Input Parameters

Final Weight: 35.23110 (grams)

Initial Weight: 34.00030 (grams)

Sample Weight: 0.00000 (grams)

Time: 1440 (minutes)

Site Environment Parameters

Formula Type: ☒ Actual ☐ Theoretical ☐ Without P/T Correction (PM25)

Populate from Site Samples/Averages:

Flow: 24.00000 (L/min)

Pressure: 759.20000 (mm Hg)

Temperature: 297.30000 (K)

Calculation

Calculate Sample: 15.10000

OK Cancel

If the populate button is used, the system will seek either a sample record of the same time, or 24 x 1-hour averages from the same day, identifying the parameters using the parameter templates PMVOLUME, PMBARPRESS, and PMAMBTMP.

This creates a problem if you want to have two co-located samplers at the same site, as one site cannot have two instances of the same parameter templates (for volume, press, temp). So, for a co-located site, we must either create a second site (e.g., NORTH_COL) and put all the parameters for the second sampler in that site, or forgo the parameter approach, and only keep the values in the meta data of the single PM parameter.

Also, note that the 'batch calculate' function in the Sample Data Editor (drag-select, left-click, "Recalculate Sample" can't do the "Populate" step, forcing the user to manually populate each record and calculate. However, this shortcoming can be worked around by having the File Import Template 'double-import' the average pressure and temperature (and flow) parameters, both as a parameter at the site, and in the meta data part of the record:

The screenshot shows the 'File Import Configuration' window in the AirVision software. The 'Template Name' is 'Partisol 2025 Filter Data_2Ximport'. The 'File Layout' section shows 'Number of Header Lines' as 0, 'Number of Footer Lines' as 0, and 'Minimum Number of Columns' as 1. The 'Field Delimiter' is set to 'Comma' and 'Sample Type' is 'Standard'. The 'Parameter Information' section shows 'Match Parameter by Column Number' selected. The 'Data Type' section shows 'Sample / Non-Continuous' selected. The 'Duration Code' is '7 - 24 HOURS' and 'Frequency Code' is '3 - EVERY 3RD DAY'. The 'Blank Type' is empty. The 'File Column Mapping' table is shown below, with columns for Column Number, Data Field, Parameter Template, Parse Format, and Flag Map. The table contains 19 rows of data, with some rows highlighted by red boxes.

Column Number	Data Field	Parameter Template	Parse Format	Flag Map
1	Sample Identifier	PM2SLC		
5	Date		yyyy/MM/dd	
6	Time		HHmm	
11	Value	PMFLOWCOV		
12	Sample Total Flow	PM2SLC		
12	Value	PMVOLUME		
13	Value	PMMINTEMP		
14	Value	PMAMBTMP		
14	Sample Ambient Temp	PM2SLC		
15	Value	PMMAXTEMP		
19	Value	PMMINBP		
20	Value	PMBARPRESS		
20	Sample Barometric Press	PM2SLC		
21	Value	PMMAXBP		
38	Value	PMSAMPTIM		

So, the pros and cons of the two approaches can be summarized as follows:

	Store as Parameter	Store as Meta Data
Using reports and charts for average, min, max press, temp, flow	Yes	Not available
Using average press/temp in calculations	Yes, but 'fill' button must be used OR File Import template can be set to 'double-import'	Yes, can 'batch' calculate
Store min/max pressure, temp	Yes	No
Co-Located data in same site	No, must be separate site	Yes

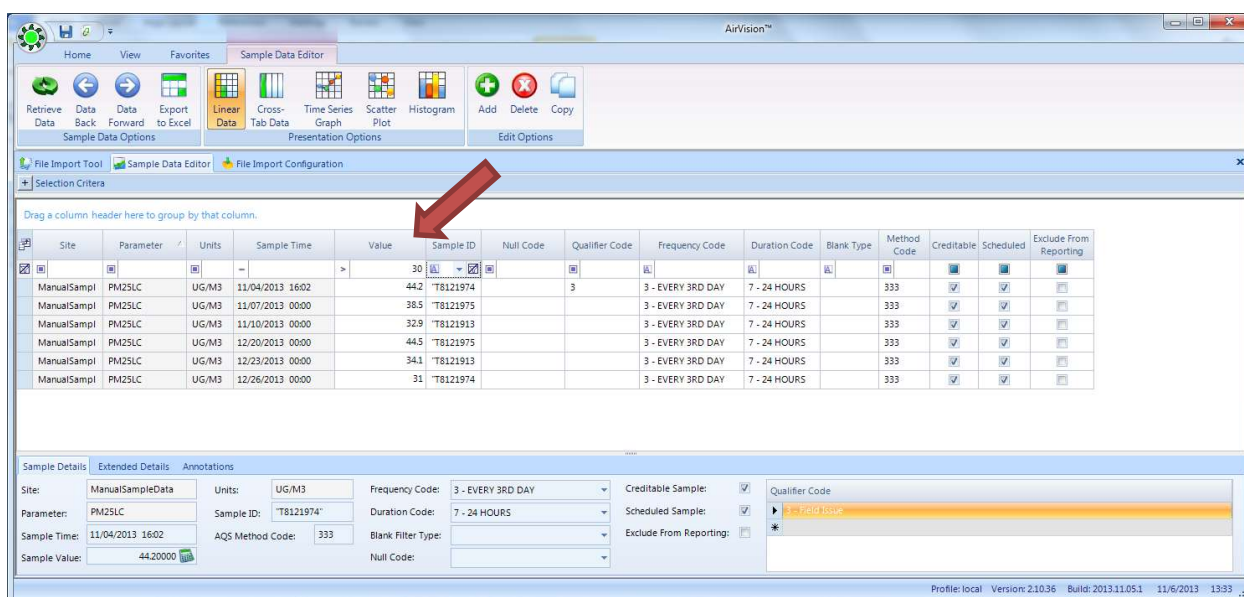
So, in short, the general recommendation is to store as parameters and use the 'double import' approach, unless the customer has a particular objection to co-located samplers being represented as secondary sites in AirVision.

Enhancements To The Sample Data Editor (Version 2.10)

The following enhancements were made to the Sample Data Editor:

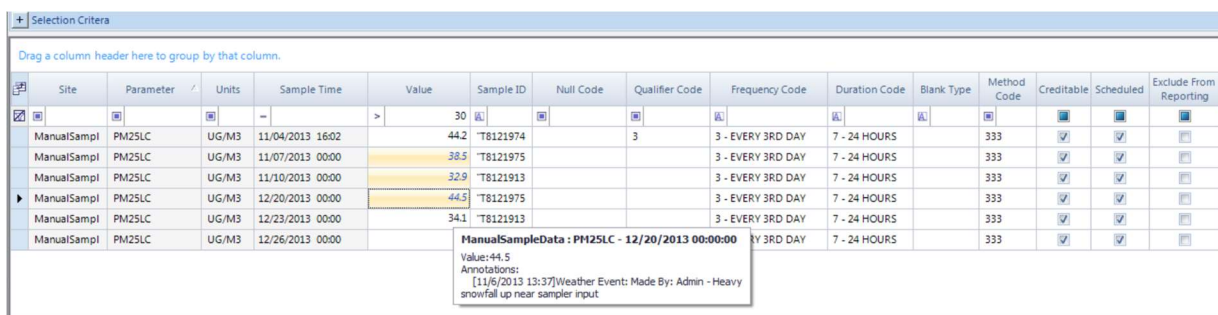
- Additional fields were added to the meta data of the records, and to the File Import Tool:
 - Tare/Final Weight
 - End Time
 - Analysis Time
 - Cannister ID
 - MDL, Uncertainty Values

Note that the Sample Data Editor supports sorting and filtering on these fields in the Linear Mode:



Thus, the user can easily search for PMFLOW under a certain value, flow covariance over a certain limit, etc, or just filter the samples based on Blank Type or Null Code.

The editor also supports selection of data points and the ability to add annotations to the data, much like the Average Data Editor, including italic marking of data points, and mouse-hover over to see the annotations:



The Sample Data Editor also provides right-click options on selected data points for several functions like the Average Data Editor, including a Batch Edit function.

