

Section 508 Compliant Yes No

CSN Data Ingest
UCD TI #801A, Version 1.5
October 31, 2022
Page 1 of 18

UCD CSN Technical Information #801A

CSN Data Ingest

*Chemical Speciation Network
Air Quality Research Center
University of California, Davis*

*October 31, 2022
Version 1.5*

Prepared By:	<small>DocuSigned by:</small> <i>Alex Murrain</i> <small>4D6ECE5415824A8...</small>	Date: 11/15/2022
Reviewed By:	<small>DocuSigned by:</small> <i>Dominique Young</i> <small>BB55DBA34BAB407...</small>	Date: 11/15/2022
Approved By:	<small>DocuSigned by:</small> <i>Marcus Langston</i> <small>0A10CFCF79B0452...</small>	Date: 11/15/2022



DOCUMENT HISTORY

Revision	Release Date	Initials	Section/s Modified	Brief Description of Modifications
1.1	11/30/18	NJS	1,2,7,8,9,10	Rewording for clarity and updating name changes.
1.2	7/30/19	YN, KAG	1,8	Changed process for carbon and ion analysis pathways. Wording changes for clarity.
1.3	3/5/20	KAG	5-11	Wording changes for clarity.
1.4	3/31/21	DEY, AMM	8	Added steps for lab blank data and replicate ions analysis data. Added information on revised ions data.
1.5	10/31/22	DEY, AMM	1,2,3,8	Included HIPS. Added tables of null and validity codes. Added information on comments feature of data ingest. Added section on double filters.

TABLE OF CONTENTS

1. Purpose and Applicability.....	5
2. Summary of the Method	5
3. Definitions.....	5
4. Health and Safety Warnings	5
5. Cautions	5
6. Interferences.....	6
7. Personnel Qualifications	6
8. Procedural Steps.....	6
8.1 Filter Records, Sample Operational Data, Lab Blanks, Null and Validity Codes	6
8.2 Ion Analysis Results.....	11
8.3 Elemental, Carbon, and Filter Optical Absorption Analysis Results.....	13
8.3.1 Elemental Analysis	13
8.3.2 Carbon Analysis.....	14
8.3.3 Filter Optical Absorption Analysis	14
8.4 Mass Data.....	14
8.5 Ingesting Revised Files	15
8.6 Double Filters.....	17
9. Equipment and Supplies	17
10. Quality Assurance and Quality Control.....	18
11. References.....	18

LIST OF FIGURES

Figure 1. Filter data upload page from the UCD CSN Data Management website.....	7
Figure 2. Null code and validity code upload page.	9
Figure 3. Ion analysis results upload page.	13
Figure 4. Mass analysis results upload page.	15
Figure 5. Ions results QC Review page.	16

LIST OF TABLES

Table 1. Automated validity checks.....	8
Table 2. Automated validity checks performed.....	9
Table 3. Validity codes (informational qualifiers).....	10
Table 4. Null codes (terminal) available in CSN Database with descriptions.....	11
Table 5. Automated validity checks performed during the ions analysis results upload.....	13
Table 6. Automated validity checks performed during the mass analysis results upload.	15

1. PURPOSE AND APPLICABILITY

The subject of this technical information (TI) is handling electronic filter and laboratory records from samples collected in the Chemical Speciation Network (CSN). This document is intended to guide users on the receiving and validating of CSN filter and laboratory records and ingestion to the UCD CSN database. These include sample operational data, filter records, and gravimetric mass results from Wood PLC (Wood), ion analysis results from RTI International (RTI), and elemental, filter optical absorption, and carbon analysis results from the University of California, Davis (UCD).

2. SUMMARY OF THE METHOD

Filter records and gravimetric mass results from the Sample Handling Laboratory (Wood) and ion analysis results from RTI are received in data files, typically delivered as .csv files, and ingested into the UCD CSN database using the UCD CSN Data Management website. Elemental, filter optical absorption and carbon analysis results from UCD are automatically ingested.

3. DEFINITIONS

- **AQS:** EPA's Air Quality System database.
- **Chemical Speciation Network (CSN):** EPA's PM_{2.5} sampling network, with sites located principally in urban areas.
- **CSN database:** A SQL Server database that is the central warehouse of CSN preliminary and final data at UCD.
- **CSV:** a comma-separated value file that is the common format for delivery files.
- **Energy Dispersive X-Ray Fluorescence (EDXRF):** An analytical technique used to determine the concentration of elements.
- **Hybrid Integrating Plate and Sphere system (HIPS):** An analytical technique for filter optical absorption.
- **Ion Chromatography (IC):** An analytical technique used to determine the concentration of ions.
- **Thermal Optical Analysis (TOA):** An analytical technique used to determine the concentration of carbon.

4. HEALTH AND SAFETY WARNINGS

Not applicable.

5. CAUTIONS

Not applicable.

6. INTERFERENCES

Not applicable.

7. PERSONNEL QUALIFICATIONS

The UCD Air Quality Research Center (AQRC) Data & Reporting Group staff assigned to tasks described in this document have advanced training in database programming and database management.

8. PROCEDURAL STEPS

Four data ingest steps are required prior to data processing and validation.

1. Filter records, including sample operational data, lab blank records, null and validity codes, from Wood. (Section 8.1)
2. Ion routine analysis results and replicate analysis results from RTI (Section 8.2).
3. Elemental, carbon, and filter optical absorption analysis results from UCD (Section 8.3).
4. Mass analysis results from Wood (Section 8.4). Mass results are typically only available for specially designated sites.

These four steps are outlined below.

8.1 Filter Records, Sample Operational Data, Lab Blanks, Null and Validity Codes

Filter records are sent from Wood to UCD via email, typically on the same day as the shipment of corresponding physical filters. Filter records are delivered as four files:

1. FilterDataTransfer_[xxx].csv,
2. FilterDataNullFlags_[xxx].csv
3. FilterDataValidFlags_[xxx].csv,
4. LabBlanksDataTransfer_[xxx].csv

where [xxx] represents a number corresponding to the delivery batch. FilterDataTransfer contains a single record for each filter, including sample operational data (for example flow rate and ambient temperature). FilterDataNullFlags and FilterDataValidFlags include the null codes and validity codes, respectively. Null codes and validity codes are joined to corresponding filter data by the unique combination of SampleRequestID and ChannelID. LabBlanksDataTransfer contains a single record for each Lab Blank filter record sent with each shipment batch, with no sample operational data included. The files received from Wood are downloaded and stored on the UCD file server (U:\CSN\FromWood\To Be Imported).

Filter records (FilterDataTransfer_[xxx].csv and LabBlanksDataTransfer_[xxx].csv files from Wood) are ingested to the UCD CSN database through the UCD CSN Data

Electronic documents are official. Paper copies are for reference only.

Management website, one file at a time. Figure 1 shows a screenshot of the upload page. For each file, the analyst first loads in “test” mode (by having the “TestOnly” box checked as shown in Figure 1), which will perform import validation, but will not save any changes to the database. Filter records are subjected to the automated validity checks as shown in Table 1. The analyst will review the results of the validation and determine which, if any, records fail to upload due to validation errors. Once the analyst has reviewed the output messages in the “test” mode, the upload should be performed again with the “TestOnly” box unchecked to ingest the data into the database. If there are too many output messages and/or the analyst wants to review a reduced number of messages relating to specific columns, the analyst can run the ingest process in test mode and check various boxes in the “IgnoredColumns” section. When ready to upload to database, the analyst will select the relevant filter records data file, click the “TestOnly” box and enter a comment in the ‘ImportComments’ box to briefly describe the contents of the data file. After upload, the analyst will store the source files on the UCD file server (U:\CSN\FromWood\Imported) in a folder named “Batch_A[xxx]”, where [xxx] represents a number corresponding to the delivery batch.

Figure 1. Filter data upload page from the UCD CSN Data Management website.

CSN Management Site Home Analyses Import Admin Log off

Upload Filters Flags Mass Carbon Ions DART Contractor Flags FTIR

Upload Wood Filter data

Filename No file chosen

TestOnly Runs through the import process but doesn't save the changes to the database.

OverwriteExisting Default is to only add records that don't already exist.

LooseComparison Compares AvgFlowCv, SampleVolume, AvgFlow fields chopped to 2 decimal places.

IgnoredColumns FilterPurposeId FilterType Invalid IntendedUseDate SampleStartDate SampleEndDate
 SamplerId ChannelPosition AvgFlowCv SampleVolume AvgFlow AvgAmbTemp AvgBp
 AnalysisType ContractorFilterAnalysisId ContractorSampleEventId ContractorSetNumber
 ManufacturerNumber LotNumber Delivery Temperature

ImportComments

Table 1. Automated validity checks performed by the UCD CSN Data Management website during the filter data upload process.

Check	Action
Number of columns in header matches number of columns in row	Warning message
Any columns not found (or renamed)	Import aborted
Filter record matched more than one site or did not match any sites	Warning message
More than one batch found in the import	Warning message
Number/date columns fail to parse into number/date	Warning message
Existing records in the database; if multiple matches, generates message	Warning message
If matched existing record, checks for changed fields	Warning message
IntendedUseDate after SamplerStartDate	Warning message
SamplerStartDate more than a day after IntendedUseDate	Warning message
SamplerEndDate more than 25 hours after SamplerStartDate	Warning message
Calculated SamplerEventId does not match one in record	Warning message
SamplerEventId plus Channel position do not uniquely identify the record	Warning message
More than one LotNumber for PTFE filters in the import	Warning message
Flow and ambient parameters are out of specification	Warning message
Calculated sample volume is not within 10% of the reported sample volume	Warning message
FilterType column only consists of expected types (e.g. PTFE, nylon, quartz).	Warning message
File would change existing records but OverwriteExisting is not checked	Warning message
Filter SiteAnalysisPathId is changed when overwriting existing data	Warning message

Null codes (FilterDataNullFlags_[xxx].csv file from Wood) and validity codes (FilterDataValidFlags_[xxx].csv file from Wood) are uploaded through the data management website as shown in Figure 2. Filter records must be loaded prior to the null and validity codes. The following steps are followed for both files (FilterDataNullFlags_[xxx].csv and FilterDataValidFlags_[xxx].csv). Files should first be loaded in “test” mode, which will perform import validation, but will not save any changes to the database. Null codes and validity codes are subjected to the automated validity checks as shown in Table 2. The analyst will review the results from the automated checks and investigate and resolve records that failed to upload because of validation errors. Similar to the previous step, the ingest process should be performed again with the “TestOnly” box unchecked and a comment added in the ‘ImportComments’ box describing the data included in the file. After ingest, the analyst will store the source files on the file server (U:\CSN\FromWood\Imported). All currently available null codes and validity codes are listed in Table 3 and Table 4.

Figure 2. Null code and validity code upload page.

Table 2. Automated validity checks performed during the null code and validity code upload process.

Check	Action
Number of columns in header matches number of columns in row	Warning message
Any columns not found (or renamed)	Import aborted
Code record matched more than one filter or did not match any filters	Warning message
SetNumber or IntendedUseDate do not match the matched filter record	Warning message
Number/date columns fail to parse into number/date	Warning message
Code does not match existing AQS Code	Warning message
Codes apply to more than one batch	Warning message
More than one null code applied to filter (also create FilterComment); ranks codes and marks extra codes as duplicates	Warning message
The same code is applied to a filter more than once	Warning message
NullCode import tries to use any non-terminal codes; QualifierCode import tries to use any terminal codes	Warning message
Filter is not marked invalid but a null code is assigned to the filter	Warning message

Table 3. Validity codes (informational qualifiers) available in CSN Database with descriptions. Validity codes with “*” are only reported to DART and not to AQS.

Validity Code	Description	Validity Code	Description	Validity Code	Description
IA	African Dust	1	Deviation from a CFR/Critical Criteria Requirement	LJ	Identification Of Analyte Is Acceptable; Reported Value Is An Estimate
IB	Asian Dust	2	Operational Deviation	LK	Analyte Identified; Reported Value May Be Biased High
IC	Chem. Spills & Indust Accidents	3	Field Issue	LL	Analyte Identified; Reported Value May Be Biased Low
ID	Cleanup After a Major Disaster	4	Lab Issue	MD	Value less than MDL
IE	Demolition	5	Outlier	MS	Value reported is 1/2 MDL substituted.
IF	Fire - Canadian	6	QAPP Issue	MX	Matrix Effect
IG	Fire - Mexico/Central America	7	Below Lowest Calibration Level	ND	No Value Detected
IH	Fireworks	9	Negative value detected - zero reported	NS	Influenced by nearby source
II	High Pollen Count	A1*	Changed by Amec	QP	Pressure sensor questionable
IJ	High Winds	B1*	Changed by UCD	QT	Temperature sensor questionable
IK	Infrequent Large Gatherings	C1*	Highlighted data - attention required	QX	Does not meet QC criteria
IL	Other	CB	Values have been Blank Corrected	SQ	Values Between SQL and MDL
IM	Prescribed Fire	CC	Clean Canister Residue	SS	Value substituted from secondary monitor
IN	Seismic Activity	CL	Surrogate Recoveries Outside Control Limits	SX	Does Not Meet Siting Criteria
IO	Stratospheric Ozone Intrusion	D1*	Debris removed from filter	TB	Trip Blank Value Above Acceptable Limit
IP	Structural Fire	DI	Sample was diluted for analysis	TT	Transport Temperature is Out of Specs.
IQ	Terrorist Act	EH	Estimated; Exceeds Upper Range	V	Validated Value
IR	Unique Traffic Disruption	FB	Field Blank Value Above Acceptable Limit	VB	Value below normal; no reason to invalidate
IS	Volcanic Eruptions	FX	Filter Integrity Issue	W	Flow Rate Average out of Spec.
IT	Wildfire-U. S.	HT	Sample pick-up hold time exceeded	X	Filter Temperature Difference or Average out of Spec.
J	Construction	LB	Lab blank value above acceptable limit	Y	Elapsed Sample Time out of Spec.

Table 4. Null codes (terminal) available in CSN Database with descriptions.

Null Code	Description	Null Code	Description	Null Code	Description
AA	Sample Pressure out of Limits	AV	Power Failure	CS	Laboratory Calibration Standard
AB	Technician Unavailable	AW	Wildlife Damage	DA	Aberrant Data (Corrupt Files, Aberrant Chromatography, Spikes, Shifts)
AC	Construction/Repairs in Area	AX	Precision Check	DL	Detection Limit Analyses
AD	Shelter Storm Damage	AY	Q C Control Points (zero/span)	FI	Filter Inspection Flag
AE	Shelter Temperature Outside Limits	AZ	Q C Audit	MB	Method Blank (Analytical)
AF	Scheduled but not Collected	BA	Maintenance/Routine Repairs	MC	Module End Cap Missing
AG	Sample Time out of Limits	BB	Unable to Reach Site	SA	Storm Approaching
AH	Sample Flow Rate or CV out of Limits	BC	Multi-point Calibration	SC	Sampler Contamination
AI	Insufficient Data (cannot calculate)	BD	Auto Calibration	ST	Calibration Verification Standard
AJ	Filter Damage	BE	Building/Site Repair	SV	Sample Volume Out of Limits
AK	Filter Leak	BF	Precision/Zero/Span	TC	Component Check & Retention Time Standard
AL	Voided by Operator	BG	Missing ozone data not likely to exceed level of standard	TS	Holding Time Or Transport Temperature Is Out Of Specs.
AM	Miscellaneous Void	BH	Interference/co-elution/misidentification	XX	Experimental Data
AN	Machine Malfunction	BI	Lost or damaged in transit		
AO	Bad Weather	BJ	Operator Error		
AP	Vandalism	BK	Site computer/data logger down		
AQ	Collection Error	BL	QA Audit		
AR	Lab Error	BM	Accuracy check		
AS	Poor Quality Assurance Results	BN	Sample Value Exceeds Media Limit		
AT	Calibration	BR	Sample Value Below Acceptable Range		
AU	Monitoring Waived	CS	Laboratory Calibration Standard		

8.2 Ion Analysis Results

Ion analysis results are sent from RTI to UCD via email in .csv format.

Electronic documents are official. Paper copies are for reference only.

The ions data are delivered in two .csv files named after the batch of data that is being delivered with the replicate (RTI termed 'duplicate') analysis results file name ending with “_DUP”:

1. _XXXXXXXX.csv
2. XXXXXXXX_DUP.csv

The Xs represent the batch number; for example, A0000053 for batch 53. All .csv analysis records are ingested to the database through the UCD CSN Data Management website, one file at a time. Figure 3 shows a screenshot of the IonsData upload page. For each file, the analyst first loads in “test” mode (by having the “TestOnly” box checked as shown in Figure 3), which will perform import validation, but will not save any changes to the database. Records are subjected to the automated validity checks as shown in Table 5. There will be records in the routine ions data file with the internal ‘RS’ flag, designating these results as having reanalysis results kept at RTI and not included in the data file sent to UCD. All the records in the replicate analysis results file should have the internal ‘RP’ flag applied to designate these results as replicates. The analyst will review the results from the automated checks and investigate and resolve records that failed to upload because of validation errors. The ingest process should be performed again with the “TestOnly” box unchecked and comments added in the ‘ImportComments’ box describing the data in the file. After upload, the analyst will store the source files on the file server (U:\CSN\FromRTI\Imported).

Figure 3. Ion analysis results upload page.

Table 5. Automated validity checks performed during the ions analysis results upload.

Check	Action
Number of columns in header matches number of columns in row	Warning message
Any columns not found (or renamed)	Import aborted
Number/date columns fail to parse into number/date	Warning message
Flag does not match existing AQS Code or extra codes (i.e. RS/RP)	Warning message
Existing records in the database; if multiple matches, generates message	Warning message
If matched existing record, checks for changed fields	Warning message
Record identifier did not match any filters	Warning message

8.3 Elemental, Carbon, and Filter Optical Absorption Analysis Results

Elemental, carbon, and filter optical absorption analyses are performed at the AQRC.

8.3.1 Elemental Analysis

Results files created by the PANalytical EDXRF software are automatically ingested on a schedule by a software service. The results files are transmitted to a directory on a shared drive on the network (U:\XRF Transmission). A Windows Service (internally named

Electronic documents are official. Paper copies are for reference only.

XRF Data Transfer) is installed on a server and monitors the transmission directory checking it every hour for any files created. The results files are standard text files with the extension *.qan*. The file names are the EDXRF analysis dates and times in the format YYYYMMDDHHMMSS.qan. The results files and contents are parsed by the service and ingested into tables in the UCD CSN database.

8.3.2 Carbon Analysis

The software application used to run the carbon analyzer automatically stores data acquired during an analysis in a comma-delimited text format for later computation, display, and printing. The text file containing raw carbon data is automatically ingested into the UCD CSN database by a software service. Upon ingestion, the areal densities of organic carbon (OC; transmittance and/or reflectance), elemental carbon (EC; transmittance and/or reflectance), and total carbon (TC), as well as carbon fractions OC1, OC2, OC3, OC4, EC1, EC2, EC3, and pyrolyzed carbon (OP; Pyrol C; transmittance and/or reflectance) (in $\mu\text{g C}/\text{cm}^2$) are automatically calculated and stored.

8.3.3 Filter Optical Absorption Analysis

Filter optical absorption analysis is performed on the Hybrid Integrating Plate/Sphere (HIPS) system. The HIPS instrument generates results which are then verified by the operator to be complete and then written to the database. The data are then available on the UCD CSN database.

8.4 Mass Data

Filter masses for specific sites (typically specially designated sites) are determined at Wood and the results are sent to UCD via email as *MassTransfer_[xxx].csv* files, where [xxx] represents a number corresponding to the delivery batch. Mass analysis data is ingested to the UCD CSN database through the UCD CSN Data Management website. Figure 4 shows a screenshot of the upload page. The data analyst will first load in "test" mode (by having the "TestOnly" box checked as shown in Figure 4). The analyst will review the results from the automated checks, as shown in Table 6, and investigate and resolve records that failed to upload because of validation errors. The ingest process should be performed with the "TestOnly" box unchecked and comments added in the 'ImportComments' box describing the data in the file. After upload, the analyst will store the source files on the file server (U:/CSN/FromWood/Imported/Mass).

Figure 4. Mass analysis results upload page.

Table 6. Automated validity checks performed during the mass analysis results upload.

Check	Action
Number of columns in header matches number of columns in row	Warning message
Any columns not found (or renamed)	Import aborted
Mass record matched more than one filter or did not match any filters	Warning message
SetNumber or IntendedUseDate do not match the matched filter record	Warning message
Number/date columns fail to parse into number/date	Warning message
Checks for out of spec Weight Types	Warning message
Records from more than one batch	Warning message
More than one valid (Analysis QC code = 1) mass record per filter	Warning message
File MDL does not match the MDL of the most recent mass records	Warning message
More than one MDL found in file	Warning message

8.5 Ingesting Revised Files

In the event that data corrections are made by Wood or RTI, new files will be provided for re-ingestion. The new files will be uploaded using the same processes described above. The ingest processing will identify any changed records in the case of the filter data files.

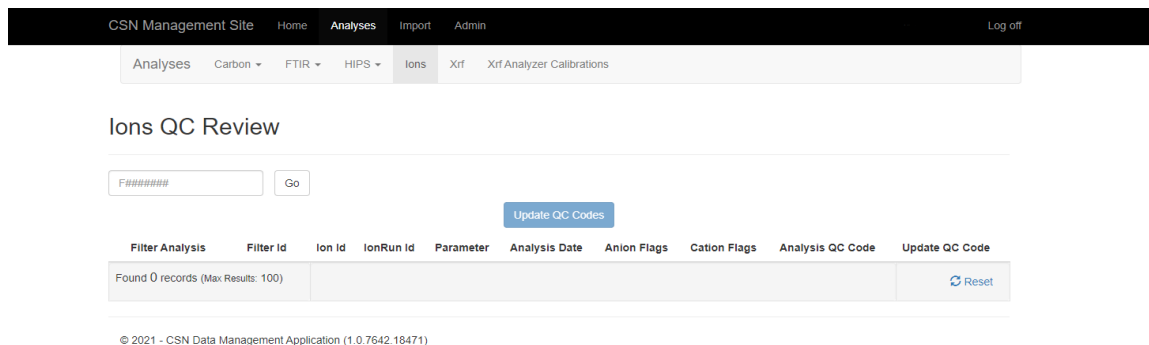
For revised filter data files from Wood, the analyst will first run the ingest process in “test” mode (by having the “TestOnly” box checked; see Figure 1) and to confirm what changes will be made, the analyst needs to also have the “OverwriteExisting” box checked. The analyst will scrutinize the changed records to ensure that they are correct

Electronic documents are official. Paper copies are for reference only.

before re-running the process in “overwrite” mode only (by having the “TestOnly” box unchecked and the “OverwriteExisting” box checked) and adding comments in the ‘ImportComments’ box describing the data in the file. Only changed records will be overwritten. After upload, the analyst will store the source files on the UCD file server (U:\CSN\FromWood\Imported) in a folder named “Batch_A[xxx]”, where [xxx] represents a number corresponding to the delivery batch.

For revised Ions data files from RTI, the analyst will first run the ingest process in “test” mode (see Figure 3) and scrutinize the added records to ensure that they are correct before re-running the process (by having the “TestOnly” box unchecked) and adding comments in the ‘ImportComments’ box describing the data in the file. After upload, the analyst will store the source files on the file server (U:\CSN\FromRTI\Imported). No records will be overwritten, only added to the database. Each record in the revised file should have the internal ‘RS’ flag present, to designate as reanalysis results, and only the species requiring updating will have different values. The analyst will then use the Ions QC Review tool in the UCD CSN Data Management website to edit the Analysis QC Codes. Figure 5 shows a screenshot of the Ions Analysis QC Review page. Filtering by Filter Id, the Analysis QC Codes for each Ion will be updated so the confirmed valid reanalysis results are reported (by setting the analysis QC Code = 1) and the original results be invalidated (by setting the analysis QC Code = 0). For results which do not require changes, reanalysis results will have the same values as the original results, and the ‘RS’ flag present. These reanalysis results records will be stored in the CSN Database with the Reanalysis AnalysisQcCode (by setting the analysis QC Code = 2).

Figure 5. Ions results QC Review page.



For revised mass data files from Wood, the analyst will first run the ingest process in “test” mode (by having the “TestOnly” box checked; see Figure 4) and scrutinize the added records to ensure that they are correct before re-running the process (by having the “TestOnly” box unchecked) and adding comments in the ‘ImportComments’ box describing the data in the file. After upload, the analyst will store the source files on the file server (U:/CSN/FromWood/Imported/Mass). No records will be overwritten, only added to the database. The AnalysisQcCode of the original mass record will need to be updated according to the reason why the revised mass record is needed (e.g. Sample Volume was updated and concentrations were updated at Wood; original mass record

given QC Code “0” for invalid). The analysis QC Code can be updated in the CSN Database.

8.6 Double Filters

In the event two filters have been stuck together during sampling, whether discovered at Wood or the Analytical laboratory, the two filters will be stored in two separate petri slides, each with a distinct Filter Analysis ID (barcode). A filter record will need to be created for the secondary filter in the CSN database using a unique barcode. This must be done prior to inventory by the UCD Lab or analysis, depending when in the process the double filter is discovered.

The SQL query for creating a double filter record is stored on the UCD file server (U:\CSN\QA\SQL Queries), titled “DoubleFilter”. The SQL query contains an explanation of the necessary steps which include checking there are no existing records for the ‘bottom’ or double filter, and ways to identify all the necessary filter information to be entered for the double filter record. If the filters involved are PTFE filters, each filter will have a unique ManufacturerNumber; the ManufacturerNumber for the double filter record to be created should therefore not already exist in the database. The following fields from the filter.Filters table in the database should match between the record for the ‘top’ or primary filter and the record for the ‘bottom’ or double filter which is to be created: AqsNullCodeId, FilterType, Invalid, IntendedUseDate, SampleStartDate, SampleEndDate, SamplerId, ChannelPosition, SampleVolume, AvgFlow, AvgFlowCv, AvgAmbTemp, AvgBp, AnalysisType, ContractorSetNumber, LotNumber, AnalysisBatchId, DeliveryTemperature, FilterTypeId, SiteAnalysisPathId.

The analyst will need to apply the ‘4 – Lab Issue’ qualifier to both filter records and a comment explaining the situation. The comment should include pertinent information such as a second filter was loaded in the sampler and which filter record relates to the physical filter with the most sample deposit (the ‘top’ filter) and which record relates to the physical filter termed the double filter, likely with little-to-no deposit (the ‘bottom’ filter). The analyst is to notify the analytical laboratory once record is created so analysis can be performed and the results saved in the database. If the double filter was identified at the analytical lab, the analyst is to notify Wood with the newly created filter record information.

9. EQUIPMENT AND SUPPLIES

The hardware and software used for CSN data ingest are described in the associated *UCD CSN SOP #801: Processing & Validating Raw Data*.

10. **QUALITY ASSURANCE AND QUALITY CONTROL**

Software bugs and data management issues are tracked through JIRA tracking software. All users have access to the internal UCD JIRA website and can submit, track, and comment on issue reports.

11. **REFERENCES**

Not applicable.