UCD CSN Technical Instruction #302B

Receiving and Inventorying of CSN Samples

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

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DOCUMENT HISTORY

Date Modified	Initials	Section/s Modified	Brief Description of Modifications
11/26/2018	MGN	all	Small editing changes; added pictures
06/17/2019	MGN	3	Update definitions
4/28/2020	LMK	all	Update images, rewording for clarity
5/21/2021	LMK	all	Small editing changes and added section for generating Teflon inventory trays

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1. PURPOSE AND APPLICABILITY

The subject of this technical instruction (TI) document is receiving and inventorying of samples collected for the Chemical Speciation Network (CSN). The scope is to ensure good laboratory practice of receiving samples by checking condition and amounts with the chain-of-custody forms, as well as inventorying and preparing samples for analysis.

2. SUMMARY OF THE METHOD

A Laboratory Technician in AQRC will receive shipments of CSN samples and perform integrity checks. Descriptive information will be entered for each batch of samples into the appropriate database using web application tools. Sample analysis queues will be generated and reviewed prior to analyses. Samples are stored in cold storage, unless undergoing analysis.

3. DEFINITIONS

Inventory: The list includes the number of samples received, type of filter (sample, lab blank, field blank etc.) as well as analysis order.

Chain-of-custody (COC) form: The form received with the samples including the itemized list, amount, sample type, ship date and name, as well as a field for receive date and name.

Analysis Request ID: WOOD PLC assigns a batch number to each shipment of filters, e.g. A0000001. Other names include Batch ID, and ContractorBatchNumber.

Filter Analysis ID: WOOD PLC assigns a barcode to each sample format F######, e.g. F000002. Other names include Barcode ID, and ContractorFilterAnalysisId.

Teflon filter ID#: Manufacturer serial number stamped on the outer membrane of a filter, eg220812072. Also known as manufacturer ID or manufacturer code.

SampleId (Id): The number assigned to the electronic record in CSN database.

XRF Application: The program contains the parameters for measuring a sample by XRF; specific to each instrument

XRF queue file: A list of electronic records associated with a Batch of CSN samples to be analyzed by XRF. Each record includes the following information; Barcode ID, SampleId and XRF Application, e.g. F000002, 325, CSNv1.1_Nanna.

CSN Data Management Site: User interface web application for the CSN database (*csn.aqrc.ucdavis.edu*).

Laboratory Technician: Authorized personnel responsible for processing of CSN samples; must receive prior approval from the Lab Manager. The lab tech shall have access to where the XRF instruments and refrigerators are located.

Wood: Short for WOOD PLC, is the Environmental Protection Agency (EPA) subcontractor for sampling handling including deployment of filters, sample processing, and electronic record delivery and shipping samples to University of California, Davis (UCD).

4.   HEALTH AND SAFETY WARNINGS

Not applicable.

5.   CAUTIONS

Not applicable.

6.   INTERFERENCES

Not applicable.

7.   PERSONNEL QUALIFICATIONS, DUTIES, AND TRAINING

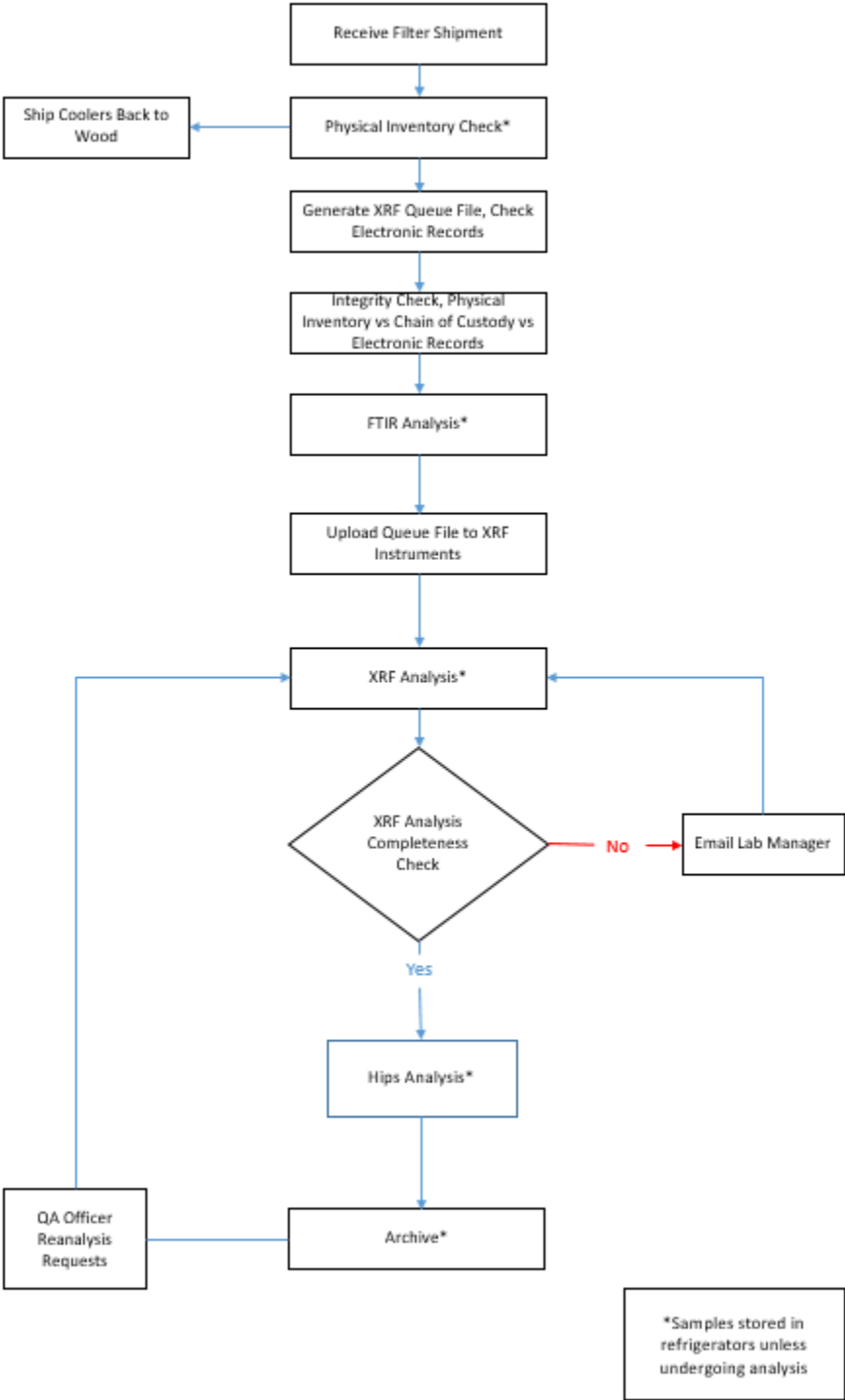Only trained lab personnel designated by the Laboratory Manager may receive and inventory CSN samples.

8.   EQUIPMENT AND SUPPLIES

Not applicable.

9.   PROCEDURAL STEPS

The flowchart of sample receiving and inventorying shown in Figure 1.

Figure 1. The flowchart of sample receiving to archiving.

```
                          ┌──────────────────────────┐
                          │  Receive Filter Shipment │
                          └──────────────────────────┘
                                        │
┌──────────────────────┐    ┌──────────────────────────┐
│ Ship Coolers Back to │◄───│  Physical Inventory Check* │
│        Wood          │    └──────────────────────────┘
└──────────────────────┘                │
                          ┌──────────────────────────┐
                          │ Generate XRF Queue File, Check │
                          │     Electronic Records    │
                          └──────────────────────────┘
                                        │
                          ┌──────────────────────────┐
                          │  Integrity Check, Physical │
                          │ Inventory vs Chain of Custody vs │
                          │    Electronic Records     │
                          └──────────────────────────┘
                                        │
                          ┌──────────────────────────┐
                          │      FTIR Analysis*       │
                          └──────────────────────────┘
                                        │
                          ┌──────────────────────────┐
                          │ Upload Queue File to XRF  │
                          │       Instruments         │
                          └──────────────────────────┘
                                        │
                          ┌──────────────────────────┐
                          │      XRF Analysis*        │
                          └──────────────────────────┘
                                        │
                          ◇──────────────────────────◇
                          │       XRF Analysis        │      No      ┌──────────────────┐
                          │   Completeness Check      │─────────────►│ Email Lab Manager│
                          ◇──────────────────────────◇              └──────────────────┘
                                        │ Yes
                          ┌──────────────────────────┐
                          │      Hips Analysis*       │
                          └──────────────────────────┘
                                        │
┌──────────────────────┐    ┌──────────────────────────┐
│     QA Officer       │◄───│        Archive*          │
│    Reanalysis        │    └──────────────────────────┘
│     Requests         │
└──────────────────────┘

                          ┌──────────────────────────┐
                          │  *Samples stored in       │
                          │  refrigerators unless     │
                          │  undergoing analysis      │
                          └──────────────────────────┘
```

9.1. Receiving of Samples

The CSN samples are shipped in coolers from Wood to UC Davis with accompanied COC forms (Figure 2). Upon receipt, the laboratory technician will sign, and write down the date and time on the COC. The COC includes the following information for each sample: Filter Analysis ID, intended sample date, analysis requested, Teflon filter ID#, set #, and status flag.

The laboratory technician unpacks the boxes in the lab and inventories the filters.

Figure 2. Example of chain of custody form.

9.2. Inventorying

The purpose of inventorying is to verify if the physical filter count is equal to the number of samples listed on the COCs and the number of electronic records received from Wood. In addition, the laboratory technician verifies the BarcodeID and manufacturer number prior to loading samples into the XRF instruments. After completing inventory, the laboratory technician sends an email to the laboratory manager and QA officer with results of this integrity check, including any discrepancies.

The samples are organized and shipped by Wood, where each shipment is assigned a batch number. Each batch contains multiple boxes of Petri trays. Each Petri box can hold two Petri trays, while each tray contains 50 Petri slides. The samples are organized in numerical order based on the COC. The boxes and each Petri tray are labeled with the sampling date and set numbers. The samples are also labeled with a unique barcode sticker, which is also the Filter Analysis ID (e.g., F000002) on the Petri slide.

Using the COC as a guide, check the 1st, 25th, 26th, and 50th sample of each Petri tray. This ensures the samples in the Petri tray are in the same order as on the COC. Prior to analysis, each filter analysis ID (e.g., F000002) and the unique manufacturer serial number (e.g., 220812072) will be verified with the COC.

Using a black or red pen the following notations will be made directly on the COC forms. At the top of each page with a red pen write the tray information in the following format T# (e.g. T1). If a page contains samples for two trays, write both tray numbers in the following format T#/T# (e.g. T1/T2). Use a red pen, to mark the COC with a small dash (-) before the first sample of each tray to designate the start of the tray. The tray number is also written in red pen next to this mark. Use a black pen to mark the COC with a small dash (-) after the 25th sample of each tray. If less than 50 samples are received in a Petri tray or Ziploc bag, continue with the sample procedure by checking the first and last filters in the tray or bag. Note the number of filters received and the number of filter records on the COC.

In addition, a barcode label is placed on each tray in the format B#T# (e.g., B7T1). The file for generating barcode labels is located here:

"U:\IMPROVE_Lab\XRF_Epsilon5\CSN\Labels\Inventory\Teflon_CSN Tray labels.xlsx"

To update this file, change the Batch Number on the "Tray List" worksheet (only update the tray numbers if needed). Next click on the "Tray Stickers" worksheet and go to add-ins and click "TBarCode Panel" opening the TbarCode Office submenu. Click "select all barcodes", refresh all barcodes and then print.

For samples received without COC documentation, leave the sample in the tray. Draw an asterisk (*) between the two records where the filter is located. On the bottom of the COC draw an asterisk and record the Filter Analysis ID, the Manufacturer number, and the comment "Sample missing from COC, refer to appendix for further sample information." Initial and date the comment. Open the UCD COC file, located at U:\IMPROVE_Lab\XRF_Epsilon5\CSN\Forms\COC.xlsx, and enter the requested

information in the worksheet "Enter Data." The UC Davis Laboratory Chain of Custody Form will then be generated, shown in Figure 3. Print the form and place it behind all the COCs for the specific batch. Save a copy of the form in the Teflon folder with the Batch number as the name of the file.

Figure 3. UC Davis Chain of Custody Form.

Report the integrity check information (Figure 4) and discrepancies to the Laboratory Manager and QA officer via email. The "Filter Count" field is the number of samples received within a Batch. The "COC" field refers to the number of samples included in the COC forms. The "Electronic Records" field refers to the number of records in the database for the specific Batch. Note that different terminology is used in the database. To view the number of electronic records, log into the CSN Data Management site web application and go to Batches, select the corresponding batch number from the list and click the "view batch details" icon. In Batch Details, locate the Teflon Count. The Teflon Count is the number of electronic records for the Batch. Record the number of records in Figure 4.

Figure 4. Integrity check table.

COC	Physical Count	Electronic Records
# of samples listed	# of samples received	# of records in the file

To receive boxes, go to the CSN Data Management site (Figure 5), and update the following information for the batch: BoxReceivedDate, BoxSampleCount, BoxFirstSampleDate and BoxLastSampleDate. Refer to Section 3.3, CSN Data Management Site for instructions. Note: Teflon and Quartz filters are received in the system at the same time.

Figure 5. CSN Data Management Site.

9.3. CSN Data Management Site

CSN Data Management Site is the user interface to the electronic data associated with CSN for all sample types (Quartz, Nylon, and Teflon). The electronic files are provided by Wood in a PDF. The electronic data is ingested into the CSN database by the UC Davis QA officer. The URL for the CSN Data Management Site (CSN webapp) is *https://csn.aqrc.ucdavis.edu/*. A valid UC Davis ID and password are required. For access to the CSN web app, check with developers and/or AQRC IT.

The CSN webapp has four main menus: Home, Analyses, Import and Admin. The Home menu has eight submenus:

1. The *Filters* submenu (Figure 6) is helpful when reviewing and selecting specific records for a given batch.

Figure 6. Filter results.

2. The *Filter Details* submenu (Figure 7) is helpful when searching for detailed information for a given filter. Qualifier codes and comments are added in this view. It is possible to search records by Filter Barcode or Filter ID.

Figure 7. Filter details.

3. The *Batches* submenu (Figure 8) includes a list of all shipments received and the corresponding electronic records.

Figure 8. Batch list.

4. The Batch Details submenu (Figure 9) is accessed via the Batches submenu and provides a view of the details for the batch including Teflon count, invalid count, list of samples without barcodes, Box received, and XRF queue file generation.

Figure 9. Batch details.

5. The *Lab Blanks* submenu (Figure 10) can view and generate the electronic records for the laboratory blanks.

Figure 10. Lab Blanks.

6. The Sites submenu has a list of all CSN sites.
7. The Archive submenu is used for archiving Batches of Teflon samples as detailed in *UCD CSN SOP #901 Long-Term Archiving of Filters.* Additionally, generating text files for delivering CSN filters to FTIR is listed under the archive submenu.
8. The Special Studies submenu has a list of current special studies being conducted.

9.4.   Generate Teflon Inventory Trays

Electronic trays must be generated via the CSN webapp upon receiving a shipment of filters. The CSN batch will need to be archived in order to generate the electronic trays. The physical copy of the COC will be utilized to generate trays. Refer to *UCD CSN Technical Information #901   Long-Term Archiving of Filters* for more information on generating and editing filter archive.

1. Login to the CSN webapp at https://csn.aqrc.ucdavis.edu/ and select "Archive"
2. The archive tab will default to Teflon and displays a list of "Filter Archive Boxes". The most recent box will be at the top of the list. Check the number of trays in the "Storage Trays" column, if less than 20, trays will be added to this box.

Figure 11. Teflon Archive.

3. Click on "Details" for the box to add a new tray.
4. Click on "Add Tray" at the bottom of the screen and type in the Barcode ID for the first filter in the tray. If this is the first tray being generated for a batch, it will be the first filter listed on the COC, click select.
5. The first 50 filters will populate in the same order as the COC, verify the filter order matches the COC.
6. Type in the Tray Label in the following format, CSN Batch# Tray# and click create
7. Repeat these steps until all filters on the COC have been assigned to a tray.

9.5.   Delivering Filters to FTIR

CSN filters are delivered to FTIR following inventory (before XRF analysis). Prior to delivery to FTIR the CSN batch will need to be archived in order to generate the

necessary text files. Refer to *UCD CSN SOP #901 Long-term Archiving of Filters* for step-by-step procedure on generating archive boxes and trays.

1. Log-in to the CSN web app at https://csn.crocker.ucdavis.edu and select Archive
2. The archive tab will default to Teflon, if it does not then click Teflon (Figure 11)
3. Select the box containing trays that will be delivered to FTIR by clicking on Details, in most cases this will be the box most recently created.
4. From the tray list find the first tray based on the tray label, format CSN Batch ## Tray # (e.g. Batch 63 Tray 1), click details.
5. This opens a detailed filter inventory list, click FT-IR and save the file as a .txt to the following folder U:\FTIR Tray Files from Lab\CSN. The file will auto-save with the following name CSN_SampleList_YYYY_Batch_##_Tray_##.txt
6. Repeat step 5 for all trays within a given CSN batch.
7. Open the txt files and print each document.
8. Fold and place the sheets inside the zippered plastic bags for each tray.
9. Trays are now ready for FTIR to pick up and will be placed on shelves in the designated refrigerator. An email is sent by the XRF laboratory technician to FTIR regarding trays available for analysis. The XRF laboratory technician will log the trays available for FTIR analysis on a log sheet attached to the refrigerator. FTIR laboratory personnel will sign-out the trays on the provided log sheet. The FTIR group will send an email once CSN trays are ready for pickup and will place the trays back in the designated refrigerator and sign the trays back in. The XRF laboratory technician will sign for any trays removed from the refrigerator following FTIR analysis. Trays are then moved to the designated refrigerator in the XRF laboratory. Log sheets are available here "U:\IMPROVE_Lab\XRF_Epsilon5\CSN\Forms\CSN Batch sign in_out sheet.xlsx"

9.6.   XRF Queue Generation

XRF queue files include the BarcodeId, SampleId, and Application information. The sample changer software uses the data within the queue file to link the Filter Analysis Barcode with the Sample identity and the application. The queue file includes all samples regardless of status and may include lab blanks. For additional information regarding generation and uploading queue files to the Epsilon 5 instruments, refer to *UCD CSN TI #302C: Sample Changes for 8-Position Trays*.

9.7.   XRF Inventory

Sample information is verified at XRF stations upon loading by scanning directly into the sample changer software for the Epsilon 5 instruments. The laboratory technician will verify individual sample receipt by comparing Filter Analysis Barcode ID with the COC. Record the instrument name, tray and position number for the first and last samples in the XRF tray (Figure 12).

Figure 12. COC with XRF assigned Instrument Name, Tray and Position number.

9.8. Laboratory Blanks

Wood will provide a box of 50 filters every time the Teflon lot changes. The Lab Manager will inform the laboratory technician when to prepare the lab blanks for analysis.

Lab blanks have a manufacturer code (manufacturer serial number), which is also used as the Teflon filter ID, format ########. Generate a barcode sticker for each filter using the Teflon filter ID. Prepare a subset (typically16 laboratory blanks) to be analyzed by XRF. Refer to *UCD CSN TI #302C: Sample Changes for 8-Position Trays* for further details.

9.9. Quartz filters

Quartz filters are received from Wood in the same shipment as Teflon filters. Shipments are accompanied by a COC specific to filter type. The inventory procedure for quartz filters is described in *UCD CSN TI402A Receiving and Inventorying*.

Samples can be stored as per section 9.9 and archived as per *UCD CSN SOP #901 Long-Term Archiving of Filters*.

9.10. Storage

CSN samples are stored below 4°C. Refrigerators are available for CSN sample storage in the laboratory. Archive samples for long-term storage after XRF analysis. Refer to *UCD CSN SOP #901: Long-Term Archiving of Filters.*

9.11. Cooler Return

The laboratory technician will prepare and ship the ice packs/coolers back to Wood, using the provided UPS return labels. If labels are not provided, contact Wood for shipping account information.

9.12. XRF Analysis Completeness

When XRF analysis of a batch is completed verify completeness by comparing the number of results generated to the Teflon count received. Check XRF data and verify each sample has a valid XRF result, also check for duplicates. If there are any discrepancies notify the Lab manager.

To check Analysis completeness, go to the website https://shiny.aqrc.ucdavis.edu/csnStatus/. On the left side of the page, select *Analysis Completeness*, then select the appropriate Year and Month. Review the list *Filters Not Yet Analyzed by XRF*. If any samples are on the list, review the comments and verify the samples were received. Notify the Laboratory Manager of any discrepancies.

To check for duplicates analyses, go to the CSN web app (https://csn.aqrc.ucdavis.edu/). Click on "Analyses" and then XRF. From the Batch dropdown select the corresponding batch number and then check the "Has Multiple Analyses" box, then click go. This will display any duplicate analyses for this batch. Only one valid result is allowed for any given sample. Duplicate results should be resolved before data is delivered.

10.   QUALITY ASSURANCE AND QUALTY CONTROL

Not applicable.

11.   REFERENCES

Not applicable.