

UCD CSN Technical Instruction #402A

Receiving and Inventorying of CSN Samples

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

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Prepared By: _____

Date: _____

Reviewed By: _____

Date: _____

Approved By: _____

Date: _____

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4/2/2020	XZ	9.4, 9.7	Added Sect.9.4; Modified Sect 9.7 to include check for data duplication.
4/30/2021	LMK	All	Update images, rewording for clarity and added procedure for generating tray.

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1. PURPOSE AND APPLICABILITY

The subject of this technical instruction document (TI) is receiving and inventorying of Quartz 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, and inventorying and preparing samples for carbon 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 tray lists 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.

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

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

Laboratory Technician: Authorized personnel responsible for processing CSN samples; must receive prior approval from the Lab Manager. The lab tech shall have access to the Carbon lab where the carbon analyzers 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.

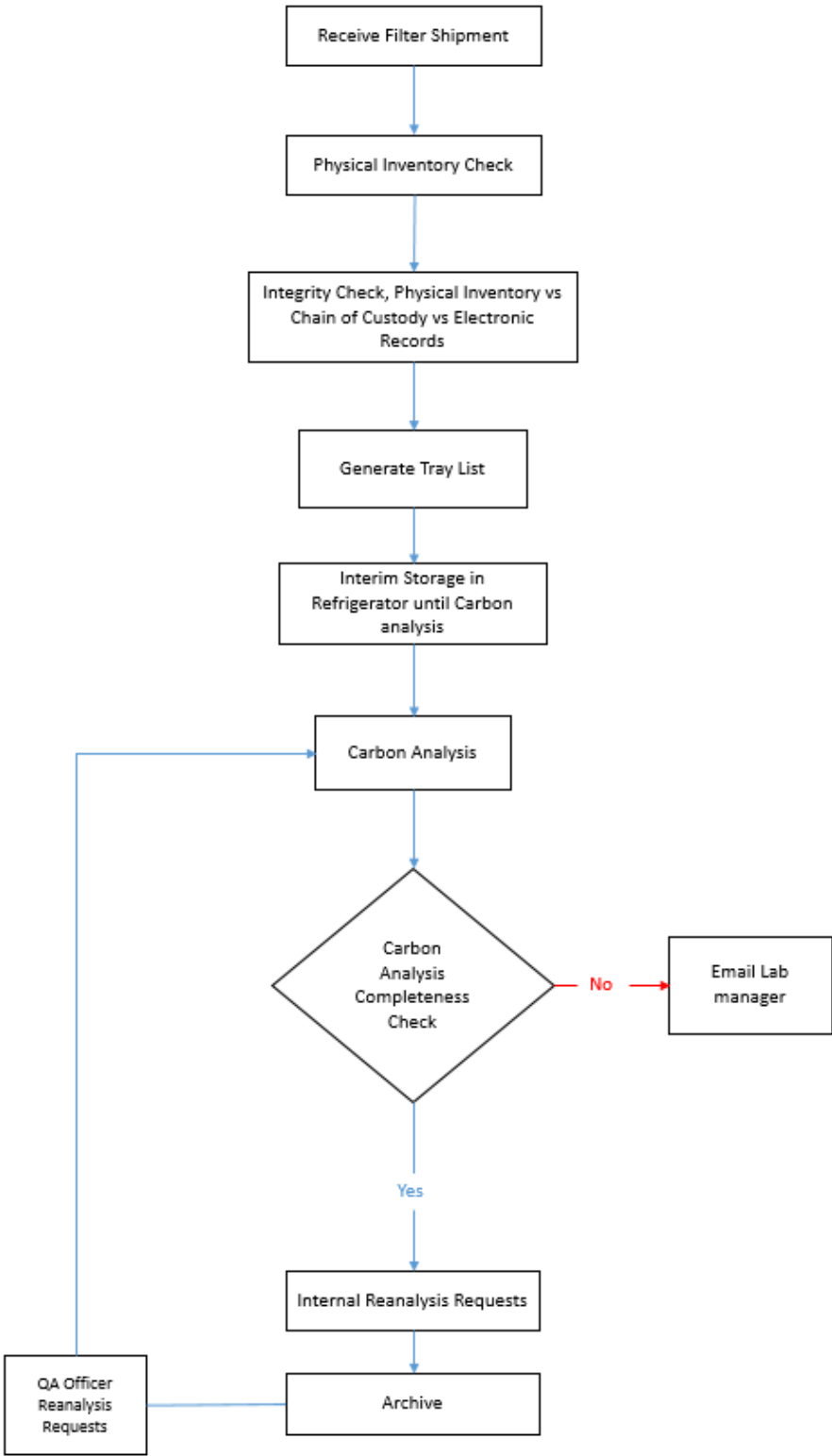
8. EQUIPMENT AND SUPPLIES

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.




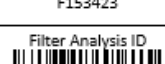
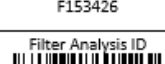
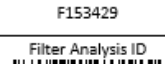
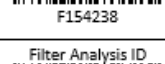
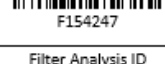


9.1. Receiving of Samples

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

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

Figure 2. Example of chain of custody form.

Analysis Request ID  A000054 — Batch ID		Intended Sample Date <input type="text" value="4/3/2019"/> — Sampling date	
		Set # <input type="text" value="4a"/> — Set number	
Barcode/Filter Analysis ID	Filter Type	Analysis Requested	Invalid?
Filter Analysis ID  F153411 — Barcode ID	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F153414	Quartz	Carbon — Analysis Request	<input type="checkbox"/>
Filter Analysis ID  F153417	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F153420	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F153423	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F153426	Quartz	Carbon Invalid sample	<input checked="" type="checkbox"/>
Filter Analysis ID  F153429	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F154238	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F154247	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F154250	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F154253	Quartz	Carbon	<input type="checkbox"/>
Filter Analysis ID  F154256	Quartz	Carbon	<input type="checkbox"/>

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. In addition, the laboratory technician verifies the BarcodeID prior to loading samples into the carbon analyzers. After completing inventory, the laboratory technician sends an email to the laboratory manager and QA officer with the results of the 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 sampling date and set numbers. The samples are labeled with a unique barcode sticker, which is also the Filter Analysis ID (e.g., F000002) on the Petri slide.

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\Quartz_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 (*) on the COC between the two records where the filter is located. On the bottom of the COC draw an asterisk and write the Filter Analysis ID, and write 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, see Figure 3. Print the form and place behind all the COCs for the specific batch. Save a copy of the form in the COC Quartz folder with the Batch number as the name of the file.

Figure 3. UC Davis Chain of Custody Form.


UC Davis Laboratory Chain of Custody Form
 Form to be used for samples received from Wood without a Chain of Custody Form

Received Name _____ Date/Time _____

Analysis Request ID _____



A0000036

Barcode/ Filter Analysis ID	Filter Type/ Manufacturer ID	Analysis Requested/ Intended Sample Date	Invalid? Set #
Filter Analysis ID  F080769	Teflon 220462458	XRF 10/4/2017	7Q

Report Integrity check information (Table 1) 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 different terminology is used in the database. To view the number of electronic records, log into the CSN Data Management Site and click on the link for the CSN Status site. From the menu on the left select the year and month for the Batch being received (this information is listed on the COC), then click on “Batch Review”. The total number for each filter type is listed. If this number does not match the physical count and/or the COC count check for filter without barcodes.

To check for filters without barcodes go back to the CSN Data Management Site and go to Batches. Select the corresponding batch number from the list and click on the “view record details” icon. Scroll down to the “Filters missing barcodes” list and check for any listed quartz filters. This number will be subtracted from the total listed on the CSN Status “Batch Review” total.

Table 1. Integrity check table.

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

To receive boxes, go to the CSN Data Management site (Figure 4) and update the following information for the batch: 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 4. CSN Data Management Site.

The screenshot shows a web form titled "Receive Box for Batch A0000007". The form contains several input fields and a text area:

- BoxReceivedDate:** A date-time field with the value "04/27/2016 9:57 AM" and a calendar icon.
- BoxReceivedBy:** A text field with the value "marigaby".
- BoxSampleCount:** A numeric field with the value "975" and a dropdown arrow.
- BoxFirstSampleDate:** A date-time field with the value "02/03/2016 12:00 AM" and a calendar icon.
- BoxLastSampleDate:** A date-time field with the value "02/27/2016 12:00 AM" and a calendar icon.
- Comments:** A large empty text area for entering notes.

At the bottom of the form, there are two buttons: a blue "Save" button with a checkmark icon and a "Back" button with a circular arrow icon.

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 webapp, check with developers and/or AQRC IT.

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

1. The *Filters* submenu (Figure 5) is helpful when reviewing and selecting specific records for a given batch.

Figure 5. Filter results.

Filter Results

Filter Type: Quartz

Batch: A0000076

Site: All

IntendedUseDate: Start: [] End: []

Filter Purpose: All

Invalid: Not Set

Null Code: All

Qualifier Code: All

Comments: []

SampleEventId: []

Set: []

ManufacturerNumber: []

Lot: []

Max Results: 100

Include Analysis Flags:

[Filter] [Close]

- 2. The *Filter Details* submenu (Figure 6) 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 6. Filter details.

Filter Details

Filter Barcode/Id: [] Go

Id: 6959

ContractorFilterAnalysisId: F007456

ContractorBatchNumber: A0000008

Sampler: 30-049-0004: Seiben Flats, MT (id: 133)

IntendedUseDate: 1/31/2016 12:00:00 AM

SampleStartDate: 1/31/2016 12:00:00 AM

SampleEndDate: 2/1/2016 12:00:00 AM

FilterPurpose: SA - Sample (id: 1)

AqsNullCodeId: [Edit AQS Null Code](#)

Invalid: False

QualifierCodes: [Edit Qualifier Codes](#)

FilterType: Teflon

ChannelPosition: 5

SampleVolume: 9.67 m³

AvgFlow: 6.72 LPM

AvgFlowCv: 0.01

AvgAmbTemp: -3.50 °C

AvgBp: 658.00 mm Hg

AnalysisType: XRF

ContractorSampleEventId: Q0672016013101

ContractorSetNumber: 6q

ManufacturerNumber: T6645775

LotNumber: MTLCY2015

Comments: [Edit Comments](#)

[Edit](#) [Back to List](#)

- 3. The *Batches* submenu (Figure 7) includes a list of all shipments received and the corresponding electronic records.

Figure 7. Batch list.

Batches						
ContractorBatchNumber	BoxReceivedDate	BoxSampleCount	BoxFirstSampleDate	BoxLastSampleDate	BoxReceivedBy	Comments
A0000001	12/16/2015 8:38:43 PM	346	11/20/2015 12:00:00 AM	12/21/2015 12:00:00 AM	marigaby	Initial import of data received
A0000002	1/28/2016 9:51:00 AM	2409	11/20/2015 12:00:00 AM	12/14/2015 12:00:00 AM	marigaby	

- The Batch Details submenu (Figure 8) is accessed via the Batches submenu and provides a view of the details for the batch including Teflon count (it does not list quartz count), invalid count, list of samples without barcodes and Box received.

Figure 8. Batch details.

Batch Details

Receive Box Generate XRF Queue Back to List Inventory information from COC and integrity check. Enter during Box Receiving

<p>ContractorBatchNumber A0000040</p> <p>BoxReceivedDate 4/4/2018 9:45:00 AM</p> <p>BoxSampleCount 1252</p> <p>First IntendedUseDate 2/1/2018 12:00:00 AM</p> <p>Last IntendedUseDate 2/28/2018 12:00:00 AM</p> <p>BoxReceivedBy marigaby</p> <hr/> <p>First SampleStartDate 2/1/2018 12:00:00 AM</p> <p>Last SampleStartDate 2/28/2018 12:00:00 AM</p> <p>Filter Count 3758 (Blanks: 430)</p> <p>Invalid Count 126 (3 %)</p> <p>Teflon Count 1252 (Blanks: 143)</p> <p>Invalid Teflon Count 37 (2 %)</p> <p style="text-align: center;">Data from electronic records</p>	<p>Comments: =</p> <p>Imports (9)</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Date</th> <th>Records Added / Updated</th> </tr> </thead> <tbody> <tr><td>Filter</td><td>4/4/2018</td><td>3758 / 0</td></tr> <tr><td>Flags</td><td>4/4/2018</td><td>533 / 0</td></tr> <tr><td>NullCodes</td><td>4/4/2018</td><td>0 / 129</td></tr> <tr><td>Filter</td><td>4/5/2018</td><td>0 / 2</td></tr> <tr><td>Filter</td><td>4/12/2018</td><td>0 / 2</td></tr> <tr><td>Mass</td><td>4/13/2018</td><td>13 / 0</td></tr> <tr><td>Filter</td><td>4/13/2018</td><td>0 / 2</td></tr> <tr><td>NullCodes</td><td>4/13/2018</td><td>0 / 1</td></tr> <tr><td>Filter</td><td>4/16/2018</td><td>0 / 2</td></tr> </tbody> </table>	Type	Date	Records Added / Updated	Filter	4/4/2018	3758 / 0	Flags	4/4/2018	533 / 0	NullCodes	4/4/2018	0 / 129	Filter	4/5/2018	0 / 2	Filter	4/12/2018	0 / 2	Mass	4/13/2018	13 / 0	Filter	4/13/2018	0 / 2	NullCodes	4/13/2018	0 / 1	Filter	4/16/2018	0 / 2
Type	Date	Records Added / Updated																													
Filter	4/4/2018	3758 / 0																													
Flags	4/4/2018	533 / 0																													
NullCodes	4/4/2018	0 / 129																													
Filter	4/5/2018	0 / 2																													
Filter	4/12/2018	0 / 2																													
Mass	4/13/2018	13 / 0																													
Filter	4/13/2018	0 / 2																													
NullCodes	4/13/2018	0 / 1																													
Filter	4/16/2018	0 / 2																													

Sets (18) IntendedUseDates (10) Filters missing Barcodes (0)

- The Lab Blanks submenu (Figure 9) can view and generate the electronic records for the laboratory blanks.

Figure 9. Lab Blanks.

Lab Blanks + Add Lab Blank													
Batch	Sampler	FilterPurpose	AqsNullCode	FilterType	Invalid	IntendedUseDate	SampleVolume	AnalysisType	ContractorFilterAnalysisId	ContractorSampleEventId	ContractorSetNumber	ManufacturerNumber	LotNumber
	LB			Teflon	False			XRF	T6571484			T6571484	MTLCY2015

- The Sites submenu has a list of all CSN sites.
- The Archive submenu is used for archiving Batches of quartz samples as detailed in *UCD CSN SOP #901 Long-Term Archiving of Filters*.
- The Special Studies submenu has a list of current special studies being conducted.

9.4. Generate Quartz Filter 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.crocker.ucdavis> and select “Archive”
2. The archive tab will default to Teflon, click on Quartz (Figure 10) to see 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 10. Quartz Archive.

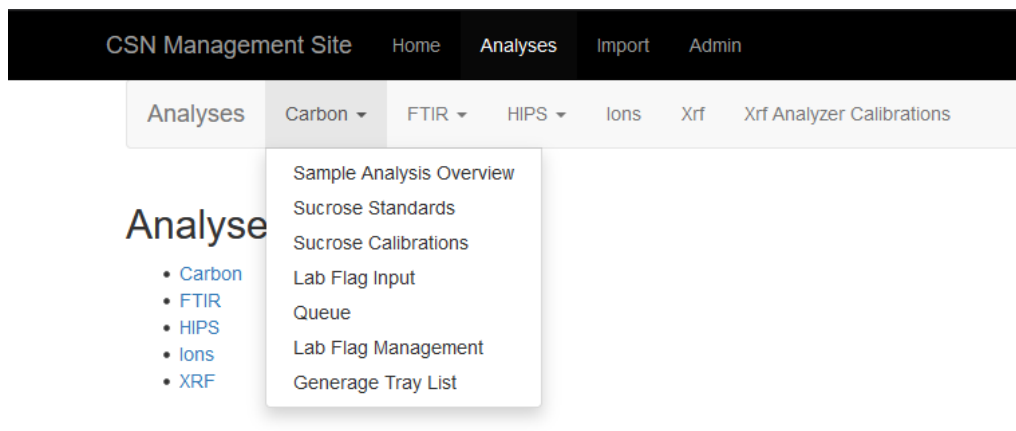
Year	Box Number	BoxLabel	StorageTrays	Created	ArchivedDate	
2021	34	Quartz CSN Box 34	11	4/7/2021 1:12:07 PM		Details
2021	33	Quartz CSN Box 33	20	3/10/2021 2:22:25 PM		Details
2021	32	Quartz CSN Box 32	20	2/10/2021 2:39:22 PM		Details
2021	31	Quartz CSN Box 31	20	2/10/2021 2:18:26 PM		Details
2021	30	Quartz CSN Box 30	20	1/14/2021 8:33:51 AM	4/13/2021	Details
2020	29	Quartz CSN Box 29	20	12/16/2020 2:35:58 PM	4/13/2021	Details
2020	28	Quartz CSN Box 28	20	11/5/2020 1:13:08 PM	2/25/2021	Details

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, B#T# and click create
7. Repeat these steps until all filters on the COC have been assigned to a tray.

9.5. Generate Carbon Analysis Tray List

Carbon analysis utilizes a generated inventory list referred to as a Tray List for analyzing routine samples. Tray Lists are generated per batch prior to beginning analysis of any given batch. Tray Lists are generated via the CSN webapp following generating electronic trays.

1. Go to the CSN webapp and login, <https://csn.aqrc.ucdavis.edu/>
2. Click on Analyses and select Carbon from the dropdown
3. Click on the down-arrow next to Carbon and select “Generate Tray List”



- The analyzer names will auto-populate, leave them in this order unless instructed to change it:

GenerateTrayList

Analyzer	Analyzer	Analyzer	Analyzer	Analyzer	Analyzer
beta	alpha	gamma	delta	zeta	theta
Tray	Tray	Tray	Tray	Tray	Tray
Last Replicate Filter Number					
Last Filter Number					
Update		Cancel			

Copy to Clipboard

- Starting with the first analyzer listed, from the dropdown options (if available) select the desired Batch number and Tray number. The Batch number and Tray number can be typed into the “Tray” field. Each Batch will begin with Tray 1. The Batch number for each tray will remain the same for all trays generated within a Batch. When generating the first group of tray lists (Trays 1-6) the “Last Replicate Filter Number” and “Last Filter Number” will remain blank.
- After filling in the Batch and Tray numbers for each analyzer, click “Update” and then click “Copy to Clipboard”.
- Paste this information into an excel file on the u-drive located here, "U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Inventory\PrintTemplate.xlsx". Create a folder for the batch, name the folder as the Batch ##. Save the file as B#T1-6 within the generated folder.
- Repeat steps 5-7 until all trays within a batch are assigned, the last replicate filter number and last filter number fields will be filled in for the remaining trays. Update the Generate Tray List to Trays 7-12, and input the last replicate filter number and the last filter number from the previous list (e.g., for Tray 7-12, the last replicate filter number is 290, and the last filter number is 300).
- Save and print all Tray Lists.

9.6. Storage

CSN network samples are stored between 0 and 4 °C. Refrigerators are available for CSN sample storage, located in the lab. Archive samples for long-term storage after carbon analysis. Refer to *UCD CSN SOP #901: Long-Term Archiving of Filters*.

9.7. 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.

9.8. Carbon Analysis Completeness

When Carbon analysis of a batch is completed, notify the Lab supervisor. The Lab supervisor will check data completeness and duplication. Any discrepancies will be resolved prior to data delivery.

To check Analysis completeness, go to the website:

<https://shiny.aqrc.ucdavis.edu/csnStatus/>. On the left-hand side of the page select “*Analysis Completeness*”, then select the appropriate Year and Month. Review the list “*Filters Not Yet Analyzed by TOR*”. If any samples are on the list review the comments, verify samples were received. Notify the Laboratory Manager of any discrepancies.

To check data duplication, go to U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\CSN QC\R and run the script “qCarbon_Monthly_QC.R” in R. The dataframe “duplicate” contains any FilterID with more than 1 valid records. Resolve the issue by keeping only one record as valid. Duplicate samples from each batch are also listed on the right top corner of the QCarbonQCTools website at <https://shiny.aqrc.ucdavis.edu/qCarbonTouchScreen/>.

10. QUALITY ASSURANCE AND QUALTY CONTROL

Not applicable.

11. REFERENCES

Not applicable.