SAMPLE HANDLING, TRACEABILITY & GOOD DOCUMENTATION PRACTICES

As per the North Carolina Department of Environmental Quality (NCDEQ)'s Quality Management Plan 2025, all environmental programs must conduct quality assurance activities to ensure that "all environmental data and information generated and processed are scientifically valid; of adequate quality and quantity for the intended use; of known precision, accuracy and bias; of acceptable completeness, representativeness, comparability, and usability; and where appropriate, legally defensible to support decision making".[1] Therefore, the Division of Waste Management (DWM) has developed this guidance for staff that collect and/or manage environmental samples.

Sample Handling

- *Preservation:* Prior to sample collection, check with the laboratory or project supervisor to ensure the proper sampling and preservation procedures are followed.
- *Container:* Follow laboratory/method specifications on the type of bottle to use for the analysis being performed. Avoid headspace whenever possible. Before placing sample in cooler, ensure the lid is secured in place to avoid leaks or iced water infiltration.
- *Temperature:* Place sample in the cooler as soon as possible and cover it with ice. The sample must be kept at ≤6°C (42.8°F) at ALL times.
    - A sample that is transported directly to the lab within several hours from the collection time can exceed 6°C upon arrival; however, the temperature must show a downward trend to be accepted by the lab.
- *Sample Retention:* <u>It is strongly encouraged for samples to be delivered to the laboratory or shipping courier on the same day they are collected.</u> If same-day delivery is not feasible, they must be securely stored and kept at or below 6°C, either on ice or under refrigeration. All samples must arrive at the laboratory within the holding time specified for the selected analytical method. For any samples stored overnight or longer, daily records of storage conditions are required. Please refer to the Sample Traceability section below for further details.
- *Chain of Custody:* Before preparing samples for shipment, verify that the sample IDs, collection dates, and times on each container match the corresponding entries in the laboratory chain of custody and field notes. Confirm that all required sections in the chain of custody are accurately completed, including the signature of the individual relinquishing the samples and the date and time of transfer.

- Make a copy, scan, or take a clear picture of the completed chain of custody for your records. Place the original form and applicable attachment inside a sealed Ziploc bag and affix it to the interior of the cooler lid prior to sealing the cooler for shipment.

- *Shipment:* Ensure all samples are fully covered in ice and the cooler is securely and properly packed. Wrap the cooler multiple times with packing tape to prevent the lid from opening during transit. If the laboratory provides a chain of custody seal, place it vertically across the cooler's opening and clearly mark the seal with your initials and the date. This procedure serves as a tamper-evident measure, indicating whether the cooler has been opened or compromised during transit.

Sample Traceability

- Properly documenting the origin, identity and handling history of a sample is an important part of the process that ensures analytical results are valid and accurately linked to the correct sample. Lack of traceability can result in inaccurate data, an increase in costs when resampling is needed and indicates a lack of transparency and accountability.

- To maintain sample traceability, both the chain of custody and field notes must capture all relevant information from the time of sample collection until the cooler is handed over to the laboratory or shipping courier. Staff handling samples must ensure all appropriate sections in the chain of custody are completed accurately and legibly. Please refer to the Good Documentation Practices section below for more information.

- When storing samples before shipment, ensure samples are placed in a secure location that safeguards against contamination and unauthorized access.

- While in storage, daily documentation of storage conditions is required. This information must be recorded in both the field notes and the chain of custody. If the chain of custody form does not include a designated comment section, use any available blank space on the form. Alternatively, attach a clearly labeled copy of the relevant field notes to the chain of custody before shipment. If a copy of the field notes is attached, make a note of the attachment in the chain of custody. Every entry must be initialed and dated by the person performing the entry. This practice ensures traceability and establishes a verifiable trail for quality assurance and compliance purposes.

- Storage conditions include both temperature readings and general observations:
  - *Temperature Readings:* Place a temperature bottle—filled with water to simulate the thermal properties of actual samples—alongside the collected samples. Take daily temperature readings from the bottle and document them in both the field notes and the chain of custody, ensuring each entry includes the date, time, initials and thermometer or meter ID used to measure the temperature. If the recorded

temperature exceeds 6°C, immediately inform the Project Manager. Do not proceed with sending samples to the laboratory without explicit instructions from both the Project Manager and the lab. Samples that exceed the required temperature threshold may be considered compromised and may need to be discarded.

- *Observations:* Note any actions taken to maintain the required temperature of ≤6°C, such as removing ice water or adding fresh ice to the cooler. Each action must be documented, initialed, and dated.

- Appendix A includes a checklist and a sample storage form that can serve as a guide for ensuring proper sample handling and traceability.

Good Documentation Practices

- Implementing good documentation practices ensures transparency, accountability, and protection during legal challenges. By maintaining clear, accurate, and timely records during a sampling event and sample handling, we create a verifiable trail that supports compliance with procedures and strengthens the credibility of our findings.
- Good documentation practices are enforced by law under the State of North Carolina's Laboratory Certification Rules (15A NCAC 02H .0805 (a)(7)(E) and 15A NCAC 02H .0805 (g)(1)). The rule states the following:
  - *"All analytical records, including original observations and information necessary to facilitate historical reconstruction of the calculated results, shall be maintained for five years.*
  - *All analytical data and records pertinent to each certified analysis shall be available for inspection upon request.*
  - *All analytical records shall be legible to all parties and safeguarded against unauthorized amendment, obliteration, erasures, overwriting and corruption.*
  - *Records that are stored only on electronic media shall be maintained throughout the five-year retention period and supported in the laboratory by all hardware and software necessary for data retrieval and review.*
  - *All documentation errors shall be corrected by drawing a single line through the error so that the original entry remains legible.*
  - *Entries shall not be obliterated by erasures or markings.*
  - *WiteOut®, correction tape, or similar products designed to obliterate documentation are not to be used; instead the correction shall be written adjacent to the error.*
  - *The correction shall be initialed by the responsible individual and the date of change documented.*

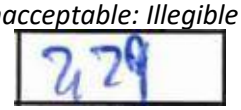
- *All manual data and log entries shall be written in indelible ink."*

- General guidelines to support good documentation practices for sample handling, field notes and the chain of custody include:
  - Label each sample clearly with the collection date and sampling location (e.g., 150-Bradley-20250803).
  - Data should be recorded in ways that cannot be altered.
    - Use **blue** or **black** indelible ink only
    - Do not use sharpies, gel pens or felt pens that could result in illegible record if smeared

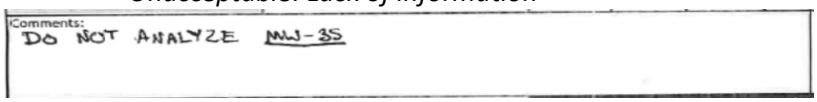
Unacceptable

  - Entries should be legible, clear, thorough, complete and well-organized.

Unacceptable: Illegible



Unacceptable: Lack of information

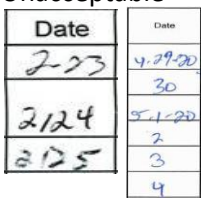


  - Use Month, Date and Year format when recording dates.

Acceptable

05JAN2021
JAN-05-2021
01/05/2021
01-05-2021
01-05-21
01/05/21
1-5-21
1/5/21

Unacceptable

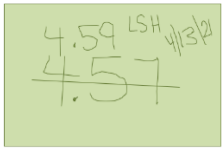


  - Ditto marks and squiggly lines are unacceptable.

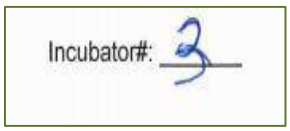
Date	Date	Date
4/13/2025	4/13/2025	4/13/2025
" "	~	|
" "	~	|

Unacceptable | Unacceptable | Acceptable

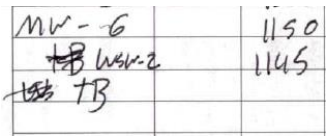
  - Error corrections need to be as clear as possible, so the intent is understood. Do not overwrite or obliterate records.



Acceptable



Unacceptable: Overwrite



Unacceptable: Obliteration

- It is recommended that empty spaces in the COC be accounted for by adding a cross line, initial and date.

- Use proper correction practices such as inclusion of footnotes and circled sequential numbers to keep the chain of custody organized. See screenshot example below .

Date Began	Time Began	Date End	Time End
4 /12/21	10:15am	~~4 /14/21~~ LSC 4/13/21 4/13/21	10:15am

Sampling Site Description	Falls Lake Boat Ramp

Container: X 4L (1 gal) PE cubitainer ☐Other (describe)_____ # of containers 1
Chlorinated: ☐ Yes X No Collected on Ice or in Refrigerated Sampler: X Yes ☐ No Shipped on Ice: X Yes ☐ No
Method of Shipment: Courier X Bus ☐ Staff ☐ Other (explain):_____
Date/time of transfer to shipper or courier box: ~~4/14/21~~ 4/13/21 / 11:00am

Comments: Lake was flooded at time of collection LSC 4/13/21

X "Split" sample, splitting lab name: ~~Dubia Analytical, Inc.~~ NC Environmental, LLC LSC 4/13/21 (1)

Did DWQ staff perform the split? Yes If **NO**, then did DWQ staff witness the split? N/A

**** Pack sample with sufficient ice to maintain temperature of 0.0 to 6.0°C until delivery to ATU Lab*****

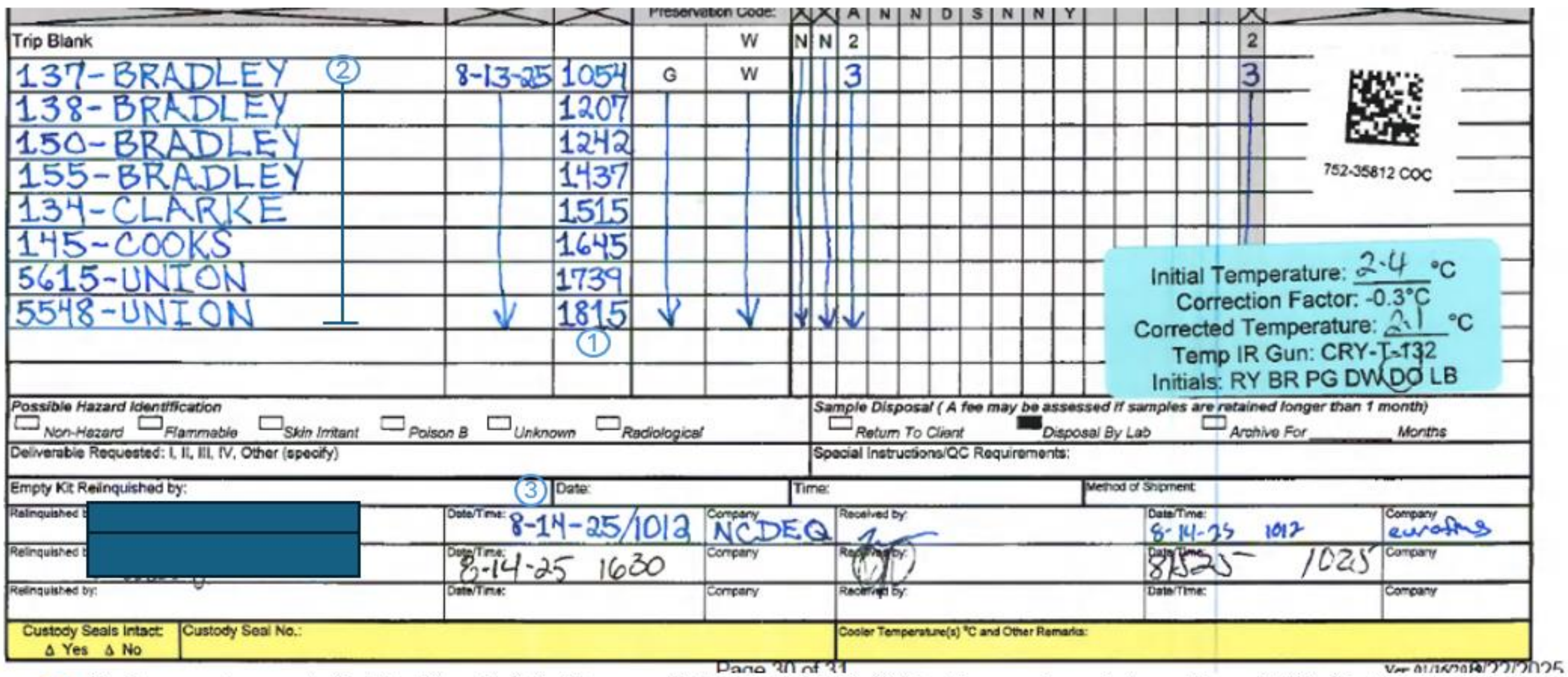
Collector(s) Signature: *L. S. Clark* Date: 4 / 13 / 2021

Additional sample handler records:

Relinquished by:	*L. S. Clark*	Received by:	State Courier	Date:	4/13/21	Time:	11:15 am
Relinquished by:		Received by:		Date:		Time:	
Relinquished by:		Received by:		Date:		Time:	
Relinquished by:		Received by:		Date:		Time:	

(1) Lab performing the test changed. Confirmed this after record was submitted. LSC 4/13/21

- Circled sequential numbers can also be used to provide the information needed to supplement the chain of custody when samples are stored overnight. See screenshot example below.



			Preservation Code:				A N D S N N Y		
Trip Blank				W	N	N	2	2	
137-BRADLEY ②	8-13-25	1054	G	W			3	3	
138-BRADLEY		1207							
150-BRADLEY		1242							
155-BRADLEY		1437							752-35812 COC
134-CLARKE		1515							
145-COOKS		1645							
5615-UNION		1739							
5548-UNION		1815							
		①							

Initial Temperature: 2.4 °C
Correction Factor: -0.3°C
Corrected Temperature: 2.1 °C
Temp IR Gun: CRY-T-132
Initials: RY BR PG DW DO LB

Possible Hazard Identification: Non-Hazard, Flammable, Skin Irritant, Poison B, Unknown, Radiological
Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): Return To Client, Disposal By Lab, Archive For ___ Months
Deliverable Requested: I, II, III, IV, Other (specify)
Special Instructions/QC Requirements:

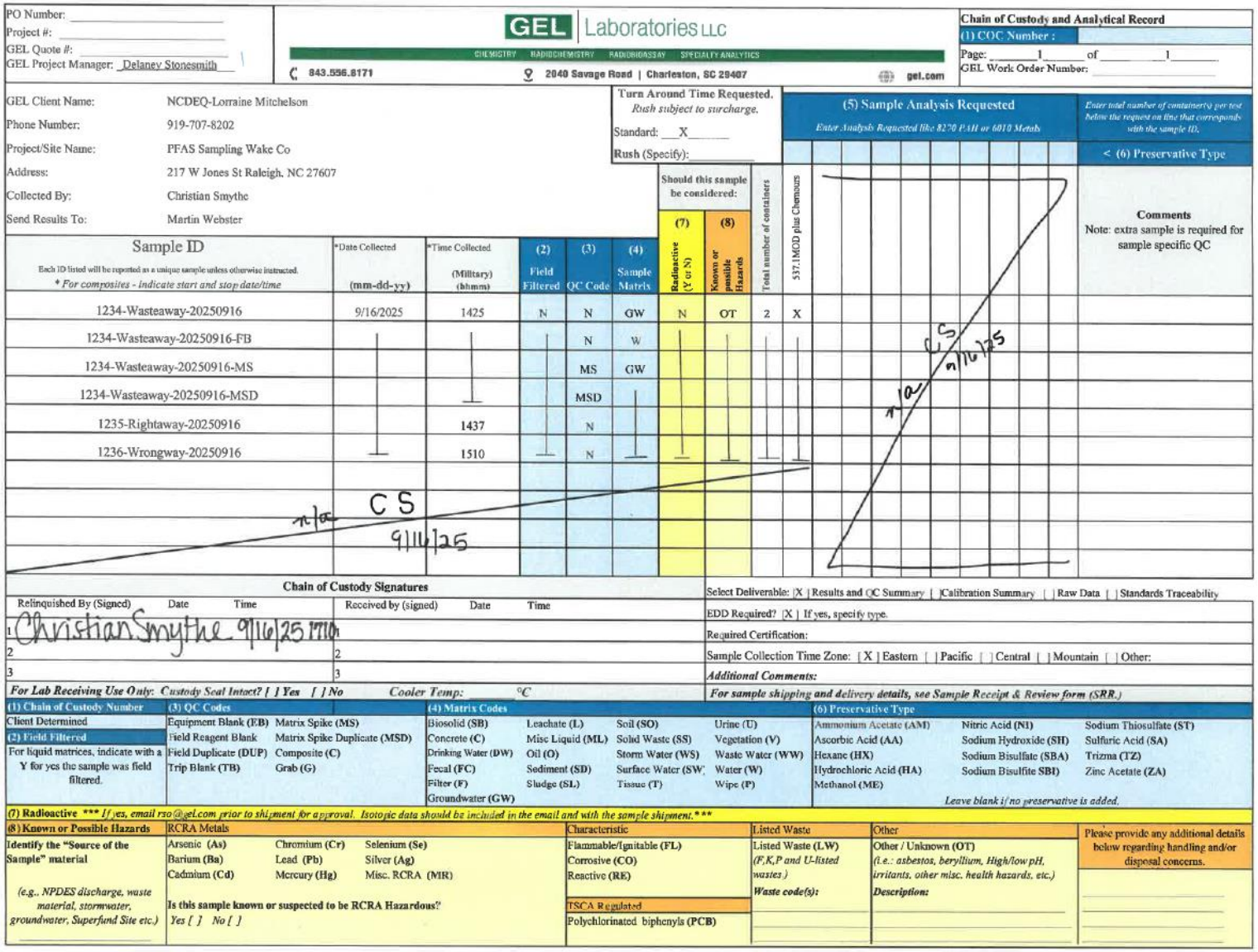
Empty Kit Relinquished by:	③ Date:		Time:		Method of Shipment
Relinquished by: [redacted]	Date/Time: 8-14-25/1012	Company: NCDEQ	Received by:	Date/Time: 8-14-25 1012	Company: eurofins
Relinquished by:	Date/Time: 8-14-25 1630	Company	Received by:	Date/Time: 8/15/25 1025	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

① Cooler was dropped off at the Tilery Building for overnight storage inside fridge. Temperature at drop off was 15°C with downtrend from 25°C. Cooler is full of ice. GHR, 8-13-25 at 1930.

② Sample IDs should include 20250813 to properly follow good documentation practices (e.g., 137-Bradley-220250813). FR, 8-14-2025, 0945

③ Temperature in cooler was 3.4°C at 0945. Samples were still covered on ice with some ice water present. Emptied water, verified samples for leaks and replenished iced. Prepared cooler for shipping and dropped off at FedEx. FR, 8-14-2025, 1012

- The following screenshot provides an example of the applicability of the guidance described above.



PO Number:
Project #:
GEL Quote #:
GEL Project Manager: Delaney Stonesmith

GEL Laboratories LLC
CHEMISTRY RADIOCHEMISTRY RADIOBIOASSAY SPECIALTY ANALYTICS
843.556.8171 | 2040 Savage Road | Charleston, SC 29407 | gel.com

Chain of Custody and Analytical Record
(1) COC Number :
Page: 1 of 1
GEL Work Order Number:

GEL Client Name:	NCDEQ-Lorraine Mitchelson
Phone Number:	919-707-8202
Project/Site Name:	PFAS Sampling Wake Co
Address:	217 W Jones St Raleigh, NC 27607
Collected By:	Christian Smythe
Send Results To:	Martin Webster

Turn Around Time Requested. *Rush subject to surcharge.*
Standard: X
Rush (Specify):

(5) Sample Analysis Requested — *Enter Analysis Requested like 8270 PAH or 6010 Metals*
Enter total number of container(s) per test below the request on line that corresponds with the sample ID.
< (6) Preservative Type

Sample ID (Each ID listed will be reported as a unique sample unless otherwise instructed. * For composites - indicate start and stop date/time)	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	(2) Field Filtered	(3) QC Code	(4) Sample Matrix	Should this sample be considered: (7) Radioactive (Y or N)	(8) Known or possible Hazards	Total number of containers	537.1MOD plus Chemours
1234-Wasteaway-20250916	9/16/2025	1425	N	N	GW	N	OT	2	X
1234-Wasteaway-20250916-FB				N	W				
1234-Wasteaway-20250916-MS				MS	GW				
1234-Wasteaway-20250916-MSD				MSD					
1235-Rightaway-20250916		1437		N					
1236-Wrongway-20250916		1510		N					

n/a C S 9/16/25

Comments
Note: extra sample is required for sample specific QC

n/a C S 9/16/25

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	Christian Smythe	9/16/25	1710			
2						
3						

Select Deliverable: [X] Results and QC Summary [ ] Calibration Summary [ ] Raw Data [ ] Standards Traceability
EDD Required? [X] If yes, specify type.
Required Certification:
Sample Collection Time Zone: [X] Eastern [ ] Pacific [ ] Central [ ] Mountain [ ] Other:
Additional Comments:
For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

For Lab Receiving Use Only: Custody Seal Intact? [ ] Yes [ ] No Cooler Temp: °C

(1) Chain of Custody Number
Client Determined

(2) Field Filtered
For liquid matrices, indicate with a Y for yes the sample was field filtered.

(3) QC Codes
Equipment Blank (EB), Field Reagent Blank, Field Duplicate (DUP), Trip Blank (TB), Matrix Spike (MS), Matrix Spike Duplicate (MSD), Composite (C), Grab (G)

(4) Matrix Codes
Biosolid (SB), Concrete (C), Drinking Water (DW), Fecal (FC), Filter (F), Groundwater (GW), Leachate (L), Misc Liquid (ML), Oil (O), Sediment (SD), Sludge (SL), Solid Waste (SS), Storm Water (WS), Surface Water (SW), Tissue (T), Urine (U), Vegetation (V), Waste Water (WW), Water (W), Wipe (P)

(6) Preservative Type
Ammonium Acetate (AM), Ascorbic Acid (AA), Hexane (HX), Hydrochloric Acid (HA), Methanol (ME), Nitric Acid (NI), Sodium Hydroxide (SH), Sodium Bisulfate (SBA), Sodium Bisulfite SBI), Sodium Thiosulfate (ST), Sulfuric Acid (SA), Trizma (TZ), Zinc Acetate (ZA)
Leave blank if no preservative is added.

(7) Radioactive *** If yes, email rso@gel.com prior to shipment for approval. Isotopic data should be included in the email and with the sample shipment.***

(8) Known or Possible Hazards
Identify the "Source of the Sample" material (e.g., NPDES discharge, waste material, stormwater, groundwater, Superfund Site etc.)

RCRA Metals
Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), Selenium (Se), Silver (Ag), Misc. RCRA (MIR)
Is this sample known or suspected to be RCRA Hazardous?
Yes [ ] No [ ]

Characteristic
Flammable/Ignitable (FL), Corrosive (CO), Reactive (RE)

TSCA Regulated
Polychlorinated biphenyls (PCB)

Listed Waste
Listed Waste (LW) *(F,K,P and U-listed wastes)*
Waste code(s):

Other
Other / Unknown (OT) *(i.e.: asbestos, beryllium, High/low pH, irritants, other misc. health hazards, etc.)*
Description:

Please provide any additional details below regarding handling and/or disposal concerns.

- *Retention and Disposal of Documentation:* Proper handling, storage, and disposal of documentation related to all Division activities is essential to maintaining good documentation practices. Materials such as field notes, equipment calibration logs, chain of custody forms, and laboratory reports must be scanned and/or uploaded to Laserfiche.
    - The retention and destruction of field-related documents must adhere to the specific guidelines outlined in each Section's or Program's Quality Assurance Project Plan (QAPP). Staff should consult their respective QAPPs to ensure full compliance with documentation standards.

References:

1. North Carolina Department of Environmental Quality (NC DEQ). 2025. Quality Management Plan (Applicable April 2025-April 2030). [Accessed on 2025 September]. Available from: https://edocs.deq.nc.gov/AirQuality/DocView.aspx?id=555477&dbid=0&repo=AirQuality&cr=1

2. 15A NCAC 02H .0800 (2019). Laboratory Certification. [Accessed 2025 September]. Available from: https://files.nc.gov/ncdeq/Water%20Quality/Chemistry%20Lab/Certification/Rules%20and%20Regulations/subchapter-h-rules-0800.pdf

Appendix A:

Checklist for Compliance with DWM's Guidance on Sample Handling, Traceability & Good Documentation Practices

Sample Handling & Traceability

☐ Sample labels include location and date of collection (e.g., 150-Bradley-20250813)
☐ Sample containers have the correct preservative and headspace is limited
☐ Sample lids are secured and leak-proof
☐ Samples are fully covered by ice and properly secured and packed

Chain of Custody (COC) & Field Documentation

☐ Field notes include all relevant sample collection information such as:
    ☐ temperature
    ☐ environmental conditions (sunny, raining, windy, etc.)
☐ Sample label matches label on the sample bottle
☐ Date and time of collection match label on the sample bottle
☐ Number of containers listed matches label on the sample bottle
☐ Name(s) of collector(s)
☐ All fields in the chain of custody are accurately completed and clearly legible
☐ Analytical method to be used is clearly marked
☐ If samples are stored overnight, holding conditions are documented
☐ All notes and corrections are initialed and dated
☐ COC references attached field notes, if applicable
☐ COC is properly signed, date and time provided in both relinquished and receiving sections
☐ Chain of custody and attachments (if applicable) are affixed to the cooler lid
☐ COC tape is initialed and dated after sealing the cooler (if applicable)

Supplementary Form for Sample Storage Documentation

Sampling Event Name:	
Sampling Event Location:	
Sampling Event Dates:	
Sample Storage Location:	

Date	Time	Temperature & Thermometer/Meter ID	Notes	Signature