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EPA 500 Series Method Preparation of Sampling Kits

Access to this SOP shall be available within the laboratory for reference purposes; the official copy of this SOP resides on the official Georgia EPD website at https://epd.georgia.gov/about-us/epd-laboratory-operations. Printed copies of this SOP will contain a watermark indicating the copy is an uncontrolled copy.

1 Scope and Application

1.1 This SOP details how the sampling kits for the drinking water methods are organized, shipped, and/or picked up by various sample collectors. This SOP will also outline various procedures on how to prepare buffers and preservatives that will be used in the sample containers. The preservatives and buffers are used to reduce biological activity, reduce residual chlorine and to maintain the pH for sample extractions.

2 Definitions

2.1 Refer to Section 3 and Section 4 of the Georgia EPD Laboratory Quality Assurance Manual for Quality Control definitions.

3 Interferences

3.1 To reduce interference from the laboratory, sample containers used for all drinking water methodology requires sample containers to be pre-certified by the manufacturer.

4 Safety

4.1 Refer to Georgia EPD Laboratory Chemical Hygiene Plan, online revision.

5 Apparatus and Equipment

5.1 Sample containers:

5.1.1 Certified clear glass 40mL vials with Teflon-lined screw caps.
5.1.2 Certified amber glass 40mL vials with Teflon-lined screw caps.
5.1.3 Certified clear glass 60mL vials with Teflon-lined screw caps.
5.1.4 Certified amber glass 60mL vials with Teflon-lined screw caps.
5.1.5 Certified amber plastic 500mL bottles with plastic screw caps.
5.1.6 Certified amber glass 500mL bottles with Teflon-lined screw caps.
5.1.7 Certified amber glass 100mL bottles with Teflon-lined screw caps.
5.1.8 Certified and pre-preserved amber glass 1000mL bottles with Teflon-lined screw caps, ESS 1000-0150-QC or equivalent.
5.2 Shipping containers:
5.2.1 48 quart insulated cooler – Coleman or equivalent
5.2.2 28 quart insulated cooler – Coleman or equivalent
5.2.3 16 quart insulated cooler – Coleman or equivalent
5.2.4 9 quart insulated cooler – Coleman or equivalent
5.2.5 5 quart insulated cooler – Coleman or equivalent
5.3 Packaging materials:
5.3.1 Re-closable plastic bags 14” x 24”. Uline S-12294 or equivalent
5.3.2 Re-closable plastic bags, 6” x 9”, to protect paperwork. Uline S-2842
5.3.3 Open end bubble bags 7” x 9”. Uline S-8287 or equivalent
5.3.4 Open end bubble bags 6” x 9”. Uline S-10550 or equivalent
5.3.5 Heavy duty shipping tape, 2” and 3” rolls
5.3.6 5” x 5” x 2” – 12-hole, custom-made, foam sample holders, to protect THM and HAA sample containers during shipping.
5.3.7 Rubber bands.
5.4 Analytical equipment:
5.4.1 Balance: analytical, capable of weighing 0.0001g
5.4.2 Volumetric flasks, 500mL
5.4.3 Graduated cylinder
5.4.4 Beakers, 1000mL
5.4.5 Magnetic stirrer and stir bars
5.4.6 Premeasured sampling spoons, 0.1mL and 0.05mL
5.4.7 Micro Spoon and Spatula Sampling Set
5.5 Storage equipment:
5.5.1 Glass jars with Teflon lined caps for EPA method 551.1 preservative.

6 Reagents

6.1 Reagent Water – Purified water which does not contain any measurable quantities of target analytes or any compounds which interfere with the targets analytes. (Deionized, HPLC, Milli-Q water or equivalent. Milli-Q water has a resistivity of 18.2MΩ·cm @ 25°C, and a TOC of 50µg/L or less)
6.2 Sodium Thiosulfate – Reagent grade or equivalent
6.3 Sodium Sulfite, Na2SO3 – Reagent grade or equivalent
6.4 Potassium dihydrogen citrate. Added to EPA Method 531.2 samples to make the pH ~ 3.8. Biocide

6.5 8 – 10mL vials containing 5.0mL of 1:1 Hydrochloric acid. To be used in the field by the collector to inhibit biological activity for EPA methods 525.2 and 550.1. Thermo Scientific SVCH-5-1 or equivalent

6.6 Methanol – High purity, demonstrated to be free from analytes and interferences (HPLC grade or better)

6.7 Acetone – High purity, reagent grade, demonstrated to be free from analytes and interferences

6.8 Pentane – High purity, reagent grade, demonstrated to be free from analytes and interferences

6.9 Potassium Phosphate: reagent grade, monobasic

6.10 Sodium Phosphate: reagent grade, dibasic

6.11 Ammonium Chloride: reagent grade

6.12 Phosphate Buffer/Ammonium Chloride Preservative: To be used for EPA method 551.1

6.12.1 Prepare a dry homogenous mixture of 1% sodium phosphate/99% potassium phosphate, by weight. Example: Combine 6g of sodium phosphate and 594g of potassium phosphate for total weight of 600g into a large stainless steel bowl. Then add 3.6g of ammonium chloride to the 600g. (Note: the amount of ammonium chloride is 1.2g per every 200g of Phosphate buffer)

6.12.2 Completely cover mixture with methanol and stir. Pour off methanol and dispose of properly in the appropriate waste stream.

6.12.3 Next, completely cover the mixture with acetone and stir. Pour off acetone and dispose of properly in the appropriate waste stream.

6.12.4 Finally, completely cover the mixture with pentane and stir. Pour off pentane and dispose of properly in the appropriate waste stream.

6.12.5 Spread mixture onto clean aluminum foil under a hood to dry overnight. Break up any clumps using a metal spoon and transfer to glass jars with Teflon lined caps for storage until use in sample collection vials.

6.13 Ammonium Chloride: reagent grade

6.14 Ammonium Chloride Preservative Solution:

6.14.1 Dissolve 20g of reagent grade Ammonium chloride crystals in 500mL of reagent water. Concentration = 40mg/mL

7 Sample Collection

7.1 Refer to Section 5, table 5.5 of the Georgia EPD Laboratory Quality assurance Manual for sample container, sample preservation, and sample hold times.

8 Calibration

8.1 Not Applicable

9 Quality Control

9.1 QC procedures with this SOP can be found in the individual EPA 500 series methods and other documents listed in the reference section of this SOP. There are no Control limits or Reporting limits associated with this SOP.

10 Procedure

10.1.1 Drinking water samples for EPA Method 504.1 are collected in pre-certified 40mL clear glass vials with Teflon lined screw caps and preserved with 3mg of Sodium thiosulfate.

10.1.2 Drinking water samples for EPA Method 507 are collected in pre-certified 1000mL amber glass bottles (to shield from light) with Teflon lined screw caps and preserved with 80mg Sodium thiosulfate.

10.1.3 Drinking water samples for EPA Method 508 are collected in pre-certified 1000mL amber glass bottles (to shield from light) with Teflon lined screw caps and preserved with 80mg Sodium thiosulfate.

10.1.4 Drinking water samples for EPA Method 515.4 are collected in pre-certified 60mL amber glass bottles (to shield from light) with Teflon lined screw caps and preserved with 3mg Sodium sulfite.

10.1.5 Drinking water samples for EPA 525.2 semi-volatile organic compounds are collected in 1000mL amber glass bottles (to shield from light) with Teflon lined screw caps containing 50mg of sodium sulfite.

10.1.6 Drinking water samples for Method 531.2 are collected in pre-certified 40mL amber glass vials with a Teflon lined screw cap. 386mg of Potassium dihydrogen citrate is added to each sample vial in house to buffer the pH to approximately 3.8. Samples are then preserved in the field by the collector with 4mg of Sodium thiosulfate.

10.1.7 Drinking water samples for EPA Method 547 are collected in pre-certified 40mL clear glass vials with Teflon lined screw caps. Samples are preserved with 4mg of Sodium thiosulfate.

10.1.8 Drinking water samples for EPA Method 548.1 are collected in pre-certifed 500mL amber glass bottles (to shield from light) with Teflon lined screw caps. Samples are preserved with 40mg Sodium thiosulfate.

10.1.9 Drinking water samples for EPA Method 549.2 are collected in pre-certifed 500mL amber polyvinylchloride (PVC) bottles (to shield from light) with screw caps. Samples are preserved with 50mg Sodium thiosulfate.

10.1.10 Drinking water samples for EPA Method 550.1 are collected in pre-certified 1000mL amber glass bottles (to shield from light) with Teflon lined screw caps and preserved with 100mg Sodium thiosulfate.

10.1.11 Drinking water samples for EPA Method 551.1 are collected in pre-certified 60mL clear glass vials with Teflon-lined screw caps and preserved with 1g of phosphate buffer/ammonium chloride prior to shipping.

10.1.12 Drinking water samples for EPA Method 552.2 are collected in pre-certified 60mL amber glass vials with Teflon-lined screw caps and preserved with 150µL of 40mg/mL ammonium chloride solution prior to shipping.

10.2 Packaging and shipping sample coolers:

10.2.1 SOC coolers:

10.2.1.1 When it is time to pack a SOC cooler, the technician and/or scientist will receive a bottle order form and sample labels from a supervisor in charge of the SOC group. This will allow the technician and/or scientist to know the number of coolers to be picked up by the collector. (Note: As of the Effective Date of this SOP, there are only two collectors collecting samples for the SOC analyses.)

10.2.1.2 First obtain a 48 quart cooler to place the sample bottles in for collection.

10.2.1.3 Gather 12 – 7" x 9" open end bubble bags and then 1– 6" x 9" open end bubble bag. This number of bubble bags is for a traditional sample kit. For a sample kit that contains Quality Control bottles, obtain 16 – 7" x 9" open end bubble bags and the 1 – 6" x 9" open end bubble bag. There is one more type of sampling kit containing a travel blank for EPA 525.2 for which only one additional 7" x 9" open end bubble bag will be needed.

10.2.1.4 Each sample kit must have an SOC sampling form, EPA 504.1 travel blank sampling form and a chain of custody form. Sample kits containing the EPA 525.2 travel blank must have an EPA 525.2 travel blank sampling form along with the other forms.

10.2.1.5 The EPD uses a Microsoft Access data base to print the necessary sample labels. These are custom made in the data base by the IT manager at the EPD lab. As stated above, the supervisor in charge of the SOC group will have printed the necessary labels for each sample kit. The sample labels for each sample vial/bottle with have similar information on them. Each label will be slightly different due to the method listed on top of the label.

10.2.1.5.1 Example label: For example purposes only. (This label does not contain any customer information.)

SOC 504
System: Georgia EPD
WSID# 0000000 Sampling Pt: 301 Schedule ID: 631643
Facility: EPD Organic Lab
Sample Desc: Finished water tap
Sampling type: RSOC Schedule: QT

10.2.1.6 Once the technician and/or scientist have the labels for each sampling site, they will then obtain the following number of preserved vials/bottles for each analysis listed below:

EPA 504.1 – 3 clear 40mL vials with Teflon lined screw caps.
EPA 504.1 Trip Blank – 1 clear 40mL vial filled with laboratory reagent water.
EPA 507/508 – 4 amber glass 1000mL bottles with Teflon lined screw caps.
EPA 515.4 – 3 amber glass 60mL vials with Teflon lined screw caps.
EPA 525.2 – 2 amber glass 1000mL bottles with Teflon lined screw caps, ESS 1000-0150-QC or equivalent.
EPA 525.2 QC* – 2 amber glass 1000mL bottles with Teflon lined screw caps, ESS 1000-0150-QC or equivalent for selected QC sample(s).
EPA 525.2 Trip Blank – 2 amber glass 1000mL bottles with Teflon lined screw caps, ESS 1000-0150-QC or equivalent.
EPA 531.2 – 3 amber glass 40mL vials with Teflon lined screw caps.
EPA 547 – 3 clear 40mL vials with Teflon lined screw caps.

EPA 548.1 – 1 amber glass 500mL bottle with Teflon lined screw caps.
EPA 549.2 – 2 amber PVC 500mL bottle with PVC screw caps.
EPA 550.1 – 2 amber glass 1000mL bottles with Teflon lined screw caps.
EPA 550.1 QC* – 2 amber glass 1000mL bottles with Teflon lined screw caps for selected QC sample(s).
**Note: Not all coolers will have bottles for EPA 525.2 or EPA 550.1 QC samples. Only coolers containing selected QC samples will have the extra QC bottles. See Section 10.2.1.13.*

10.2.1.7 Once the technician and/or scientist obtain the above vials and bottles they will then place the appropriate label on each one of the sample vials or bottles.

10.2.1.8 When packing the 40 or 60 mL vials the technician and/or scientist will then wrap a rubber band around the three vials associated with the specific EPA method. Example: *For EPA 504.1 there is 3 clear 40mL sample vials and one 504.1 40mL travel blank. The technician and/or scientist will take these 4 vials and wrap a rubber band around them and then place them in a 7" x 9" open end bubble bag.*

10.2.1.9 Once all the 40mL and 60mL sample vials are wrapped together by method and placed into open end bubble bags, the technician and/or scientist will place them to the side.

10.2.1.10 The technician and/or scientist will place the remaining 1000mL sample bottles in a 7" x 9" open end bubble bag.

10.2.1.11 For the EPA 548.1 sample bottle, the technician and/or scientist will place that 500mL amber glass bottle into a 6" x 9" open end bubble bag.

10.2.1.12 The technician and/or scientist may now place the 1000mL sample bottles into the 48 quart cooler. It is recommended to place the 1000mL bottles up against the sides of the interior of the cooler and leave room in the middle of the cooler to place the remaining 500mL bottles and vials.

10.2.1.13 Note: If a sample site has been designated by the technician and/or scientist to be a Quality Control site then the technician and/or scientist must add 2 more EPA 525.2 1000mL sample bottles to the kit. They must also add 2 more EPA 550.1 1000mL bottles to the kit. Additionally if a sampling site has been designated to receive an EPA 525.2 1000mL Travel Blank then the technician and/or scientist will add the necessary travel blank bottle and paperwork associated with it to the sample kit.

10.2.1.14 Finally, the technician and/or scientist will fill out the SOC sampling form and 504.1 travel blank sampling form (and the 525.2 travel blank sampling form if needed) with all the necessary information of the sampling site. They will then added a chain of custody form to the stack of forms and fold them in half. They will then place these forms in a 6" x 9" re-closable plastic bag and seal it closed and then place it in the cooler with the samples.

10.2.1.15 After these steps have been completed, the sampling kit is ready to be given to the collector.

10.2.2 EPA 551.1 (Trihalomethanes, THM's) and 552.2 (Haloacetic acids, HAA's) coolers:

10.2.2.1 When packing a THM and HAA (disinfection byproduct) cooler, the technician and/or scientist will receive a list of system IDs and the number of sampling sites associated with each system ID. The technician and/or scientist will also receive sample labels from a supervisor in charge of the disinfection byproduct group. This will assist the technician and/or scientist to know the number of coolers to prepare and ship out.

10.2.2.2 Depending on the population size of the system this will determine the size of the cooler to be shipped out. Example: If a system ID has 1 sampling point, the technician and/or scientist will use a 5 quart cooler to place the 4 sample vials into the cooler to be shipped out. Another example: If a system ID has 12 sampling sites then the technician and/or scientist would have to pack 48 sample vials, therefore this location ID would have to utilize 2 – 28 quart coolers.

10.2.2.3 The technician and/or scientist will then obtain the necessary disinfection byproduct sampling form and chain of custody form.

10.2.2.4 As stated above, the supervisor over the disinfection byproduct group will have given to the technician and/or scientist the sample labels and a list of system IDs to be shipped out. Every sample vial will receive a label. The EPD uses a Microsoft Access data base to print the necessary sample labels. These are custom made in the data base by the IT manager at the EPD lab. The sample labels for each sample vial with have the same information on them.

10.2.2.5 Example label: For example purposes only. (This label does not contain any customer information.)

Stage 2 DBP Sampling Schedule 1Q2017
WSID# 0000000 Entry point 501
System: Georgia EPD
Entry Desc: Distribution system
Sampling point: Finished Drinking Water Tap
Bottle Bar Code Bottle # 629072

10.2.2.6 After receiving the sample labels, the technician and/or scientist may begin to pack the cooler.

10.2.2.7 The technician and/or scientist will obtain a 5" x 5" x 2" – 12-hole, custom-made, foam sample holder. They will place 2 clear glass 60mL vials with Teflon lined screw caps into the foam holder for the THM samples. Then they will repeat this process by placing 2 amber glass 60mL vials with Teflon lined screw caps in the foam holder for the HAA samples. The technician and/or scientist will then place the foam holder with the vials into a 14" x 24" re-closable, plastic bag. This will then be place into the appropriate sized cooler.

10.2.2.8 The technician and/or scientist will then place one of the labels on the disinfection byproduct sampling form. They will take the chain of custody form and the sampling form and fold them half and place it into a 6" x 9" re-closable, plastic bag. Once the technician and/or scientist has placed the paperwork into the cooler, it is ready to be shipped out.

10.2.2.9 The EPD uses a UPS shipping program to create the labels for the coolers. The barcode on the sample labels can be used to pull up the system ID and the correct shipping address. Once the label has been created, it then can be placed on the cooler.

10.2.2.10 The technician and/or scientist will then take the heavy duty 3" shipping tape and wrap it around the cooler for protection as well as placing some shipping tape on the sides of the UPS label to make sure that the label does not come off in the shipping process.

10.2.2.11 The coolers are then given to UPS.

10.2.2.12 The instructions above for packing a THM/HAA cooler are only for a system ID with one sampling site. Many of the systems in Georgia have 2 or more sampling sites, therefore the technician and/or scientist will have to increase the number of samples being shipped out. Example: If system ID 000000 had 2 sampling sites the technician and/or scientist would ship out a total of 8 sample vials. It would still be 2 THM and 2 HAA vials for sampling site #1 and 2 THM and 2 HAA vials for sampling site #2. This will continue all the way up to 12 sampling points per 1 system ID.

10.2.2.13 Over the course of a year, at random, the lab will pull an additional 2 samples (2 THM and 2 HAA vials) for every system location. This will fulfill the laboratory requirement to provide a matrix sample for every drinking water source. The supervisor in charge of the disinfection byproduct group will coordinate with the technician and/or scientist packing the cooler to which random sampling points will receive the additional matrix sample.

11 Calculations

11.1 1% sodium phosphate / 99% potassium phosphate, by weight

Total weight in grams * 0.01= 1% sodium phosphate by weight in grams

11.2 Example

Total weight = 1200g

1200g * 0.01 = 12g of sodium phosphate

Remaining weight would constitute 1188g of potassium phosphate.

12 Waste Management

12.1 See GA EPD Laboratory SOP-EPD Laboratory Waste Management Standard Operating procedures, online revision.

13 References

13.1 EPA/600/4-88-039 - EPA Method 504.1, Revision 1.1, 1995, EPA Method 507, Revision 2.1, 1995, EPA Method 508, Revision 3.1, 1995, EPA Method 515.4, Revision 1.0, 2000, 525.2, Revision 2.0, 1995, 531.2, Revision 1.0, 2001, EPA Method 547, 1990, EPA Method 548.1, Revision 1.0, 1992, EPA Method 549.2, Revision 1.0, 1997, EPA Method 550.1, 1990, EPA Method 551.1 Revision 1.0, 1995, EPA Method 552.2 Revision 1.0, 1995

13.2 GA EPD Laboratory SOP –EPD - SOP 1-002, online revision, EPD - SOP 1-019, online revision, EPD - SOP 1-020, online revision, EPD - SOP 1-050, online revision, EPD - SOP 1-050, online revision, EPD - SOP 1-022, online revision, EPD - SOP 1-023, online revision, EPD - SOP 1-026, online revision, EPD - SOP 1-024, online revision, EPD - SOP 1-025, online revision, EPD - SOP 1-027, online revision, EPD - SOP 1-008, online revision.

13.3 GA EPD Laboratory SOP- EPD Laboratory Waste Management SOP, SOP 6-015, online revision.

13.4 Manual for the Certification of Laboratories Analyzing Drinking Water, EPA/815-R-05-004, January 2005

14 Reporting Limits (RLs), Precision and Accuracy Criteria, and Quality Control Approach

14.1 Not Applicable

15 Associated LabWorks Test Codes

15.1 Not Applicable