MDH – Laboratories Administration
DIVISION OF ENVIRONMENTAL SCIENCES

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Chief, Division of Environmental Sciences	 Signature	05/18/2023 Date

REVISION RECORD

Revision	Date	Changes	Made By	Effective Date
9.3	11/15/2012	Global review and revision record implemented. Previous document 9.2	DEC & DEM Division Chiefs	11/15/2012
9.4	09/11/2013	Revised Org Chart of Microbiology; revised preservatives in tables on pp. 19 and 21	J. Razeq & P. Kassim	10/01/2013
9.5	01/25/2016	Updated contact information Administration Relocation	P. Kassim M. Saunders	04/01/2016
9.6	07/13/2017	Changed the title of the State and division. Updated chemistry and microbiology collection and preservation requirements. Update organizational charts.	M. Saunders	1/4/2018
9.7	06/26/2019	Updated organization chart, contact information and microbiology methods.	M. Molloy	07/01/2019
9.8	05/2023	Updated organization chart, contact information and methods	C. Stevenson	05/19/2023

PREFACE

The Laboratories Administration's mission is to promote, protect, and preserve the health and well-being of the people in Maryland by testing a wide variety of environmental samples and clinical specimens in cooperation with both public and private agencies at the local, state, and federal levels. This mission shall be accomplished with maximum public benefit at a minimum cost to the people of Maryland.

This Enviroguide enables this mission by listing both general sampling procedures and laboratory services available to local, county, and state public health and environmental officers and departments that are responsible for enforcement of regulations and standards and for ongoing surveillance of the environment and the food supply. The integrity of the sample and the quality of laboratory test data are significantly enhanced if one follows the instructions in the Enviroguide on sample requirements, preservation, and transport.

If you should have any suggestions to improve the usefulness of this Enviroguide, they will be gratefully received.

Robert A. Myers, Ph.D.
Director
Laboratories Administration

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

1.0 CONTACT INFORMATION

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2.0 MISSION STATEMENT

The mission of the Division of Environmental Sciences is to provide a wide array of chemical and microbiological testing and technical services in support of programs and policies essential to the environmental quality and public health of the citizens of the State of Maryland.

3.0 INTRODUCTION

The purpose of this guide is to familiarize users with the analytical capabilities of the Division of Environmental Sciences, and to facilitate the effective use of these services.

The ***Enviroguide*** is organized into three parts: **Part I** describes Environmental Chemistry; **Part II** describes Environmental Microbiology, and **Part III** shows the Tests Directory of both sections**.** Parts I and II give a brief description of each area and their respective laboratories, including tables of all the tests performed by each section. These tables provide information on the required containers, sample size/volume, preservation techniques, holding time, and prescribed analytical method for each test. Part III, Test Directory, contains the list of tests and the name of the laboratory that performs that test. If specific analyses are requested, the appropriate laboratories should be consulted in advance.

Phone numbers for all areas in the Division are included on the *Contact* pages. Users of the services are strongly encouraged to call the appropriate testing area for any additional information, and to visit the Laboratories Administration's web site in order to obtain detailed and timely information:

https://health.maryland.gov/laboratories/Pages/home.aspx

Finally, users are encouraged to consult this guide to help in planning prior to sampling. The proper collection, handling, and preservation of samples are critical to producing accurate and defensible data.

4.0 SAMPLING GUIDELINES

4.1 General Procedures

The Laboratories Administration analyzes samples to protect the environment and human health. It is therefore of great importance that all samples/specimens submitted for laboratory analysis are collected and preserved according to prescribed procedures. Failure to do so may result in rejection of the samples or in the invalidation of the test data. For information on established and prescribed procedures for collecting, preserving and transporting samples, consult the part of the *Enviroguide* that describes the particular test of interest. Field personnel are responsible for providing and preparing the appropriate sample containers, preservatives, and laboratory pure water for field and trip blanks for samples. Field personnel should not hesitate to consult the appropriate laboratories for information on sampling procedures for routine or non-routine analysis.

Information on each submitted sample should be entered directly into the MyLIMS portal https://starlims3.health.maryland.gov/starlims11.mdlabs.mylims/xfd.htm (preferable) or accompanied by a Laboratory Analysis Request Form with the following information completely filled out:

- Collector's name and phone number
- Source and location of sampling
- Bottle / Container number / sample ID #
- Date and time of collection
- Type of preservation used
- Test(s) required
- Description of sample, if applicable
- Other pertinent sample / specimen information
- Where test results should be sent

To gain access to MyLIMS, please complete and submit the Data User Agreement (page 6) to the relevant Section Supervisor.

4.2 Chain-of-Custody Samples

There are instances when the results of an analysis may be used in regulatory action and/or criminal/civil litigation. In such cases, the samples are considered physical evidence and special procedures must be strictly followed:

- The sample must be legally obtained.
- There must be a full description of how the sample was collected.
- A complete identification must be placed on the sample container and any shipping containers.
- Each sample must be securely sealed to prevent leakage, spills, or co-mingling of individual items.
- A Chain-of-Custody Record Form must accompany each sample or a batch of samples. The document will contain the name and signatures of all individuals handling the samples and the dates and time the samples were in their custody. Use the Division of Environmental Sciences' Chain-of-Custody Record Form for environmental chemistry samples and the Laboratories Administration's Chain-of-Custody Form for microbiology samples.
- When the samples are not under the direct control of any individual, they must be placed in a secured area.

State of Maryland
MDH - Laboratories Administration
DIVISION OF ENVIRONMENTAL SCIENCES
1770 Ashland Avenue
Baltimore, MD 21205

CHAIN OF CUSTODY RECORD

Collector: _____ **Sample Source:** _____ **Project:** _____

Agency & Address: _____

Phone No.: _____ **Fax No.:** _____

Program Supported: ☐ NPDES ☐ RCRA ☐ CERCLA ☐ SDWA ☐ CAA

☐ Biomonitoring
☐ Chemical Terrorism
☐ Other _____

Preservative Used						
	Tests Requested					

Lab No.	Sample Identification	Date	Time	Sample Matrix	No. of Containers						Remarks

I, the undersigned, hereby certify that the sample submitted in this case and listed above, while in my custody, remained and was delivered in essentially the same condition as when I received it, except that material or portion thereof consumed in the analytical process at the laboratory, and that I received and delivered it to the person indicated on the date and time stated.

Collected/Relinquished by: (1)	Date:	Time:	Received by:
Relinquished by: (2)	Date:	Time:	Received by:
Relinquished by: (3)	Date:	Time:	Received by:
Relinquished by: (4)	Date:	Time:	Received by:
Special Instructions (i.e., sample released to, storage condition, etc.):		Send Reports to:	

MDH No. 4507 Rev. 5/19

PRESS FIRMLY WHEN YOU WRITE - YOU ARE MAKING FOUR COPIES

MARYLAND DEPARTMENT OF HEALTH
Laboratories Administration
1770 Ashland Avenue
Baltimore, Maryland 21205
Robert A. Meyer, Ph.D., Director

CHAIN OF CUSTODY LOG

1. DELIVERING AGENCY	2. DATE COLLECTED	3. MBBT LAB NO.
4. COUNTY	7. COLLECTED BY	6. BT LAB NO.
7. SAMPLE DESCRIPTION (Quote pertinent labeling, firm name and address, pkg., etc.)		

I, the undersigned, hereby certify that the sample submitted in this case and listed above, while in my custody, remained and was delivered in essentially the same condition as when I received it, except that material or portion thereof consumed in the analytical process at the laboratory, and that I received and delivered it to the person indicated on the date and time stated.

8. SAMPLE ACKNOWLEDGEMENT Sample received from	Date/time	Sample received by	Date/Time	Remarks

9. SAMPLE RELEASED TO:

Name:_____ Date:_____ Time:_____

Address:_____

Received by:_____ Date:_____

Witnessed by:_____ Date:_____

10. SAMPLE STORAGE CONDITIONS

TEMPERATURE CONTROL °C

MDH 4281 11/17

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SAMPLE

Data User Agreement—Individual User
MDH Laboratories Administration

This data user agreement (Agreement) must be signed and submitted to the State of Maryland MDH-Laboratories Administration's Office of Information Management Services (OIMS) before a user ID and password are provided to a designated individual within an authorized entity for MyLIMS®/STARLIMS® system access. An entity whose representative has signed this Agreement shall ensure that the entity's designated MyLIMS®/STARLIMS® system user identified below will adhere to all pertinent Maryland and federal law including the Health Insurance Portability and Accountability Act (HIPAA) and the Health Information Technology for Economic and Clinical Health (HITECH) Act requirements, and the terms set forth in this Agreement.

The entity named below and all its designated users understand and agree that:

1. Use of the MyLIMS®/STARLIMS® system is limited to entities that are authorized covered health care providers that use the data from the Laboratories Administration for treatment purposes;
2. MyLIMS®/STARLIMS® system access and use is restricted to users designated by the entity authorized by the State of Maryland MDH-Laboratories Administration in this Agreement;
3. By signing onto and using the MyLIMS®/STARLIMS® system, a designated user expressly consents to the:
   a) Monitoring of all system activities; and
   b) Safeguarding of individual protected health information as required by Maryland law, HIPAA and the HITECH Act;
4. Unauthorized access or use of this system is prohibited and could be subject to both federal and State criminal and/or civil penalties;
5. All data including records, reports, e-mail, software, and other data generated by or residing within this system are the property of the State of Maryland and may only be used as authorized and directed by the State of Maryland MDH-Laboratories Administration or as permitted and required by law;
6. The authorized entity and each designated user will safeguard and protect the assigned user ID and password used to access the MyLIMS®/STARLIMS® system from misuse by unauthorized persons;
7. An entity and each designated MyLIMS®/STARLIMS® system user will report to the OIMS any:
   a) Misuse of the MyLIMS®/STARLIMS® system; and
   b) Breach in confidentiality associated with use of the MyLIMS®/STARLIMS® system;
8. A personal computer used to access the MyLIMS®/STARLIMS® system (e.g., for look-up or review of an individual's protected health information) is:
   a) Situated in a location away from public areas; and
   b) Positioned in a way that prevents viewing by unauthorized individuals; and
9. OIMS will unilaterally and automatically lock-out a designated user that:
   a) Is found misusing the MyLIMS®/STARLIMS® system; or
   b) Fails to report any:
      i) Misuse of the MyLIMS®/STARLIMS® system; or
      ii) Breach in confidentiality associated with use of the MyLIMS®/STARLIMS® system.

Name of Authorized Entity: _____

I affirm that I have the supervisory authority to designate the undersigned individual as a MyLIMS®/STARLIMS® System User:

Name of User's Supervisor (printed)	Title
Supervisor's Signature	Date

I affirm that as a MyLIMS®/STARLIMS® System User I agree to comply with the terms of this agreement:

Name of Designated User (printed)	Title
Signature	Date

5.0 PART I: ENVIRONMENTAL SCIENCES CHEMISTRY

5.1 Program Services

The Division of Environmental Sciences - Chemistry provides analytical data for environmental, human, and food product samples that are comprised of matrices such as drinking water, wastewater, sediments, soils, sludge, indoor air from worksites, ambient air, aquatic tissues, foods, dairy products, and human blood and urine. Tests are performed for trace metals, non-metallic inorganic compounds, Per- and Polyfluoroalkyl Substances (PFAS), volatile and semi-volatile organic compounds, asbestos, PCBs, pesticides, industrial solvents, radionuclides, poisons, and metabolites of chemical warfare agents. The laboratories serve as a resource for the Maryland Departments of the Environment (MDE), Health (MDH), Agriculture (MDA), and Natural Resources (DNR), counties and Local Health departments, MDH-Division of Milk Control, MDH-Office of Food Protection, Maryland Poison Center, and federal partners including the Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC), and Environmental Protection Agency (EPA).

5.1.1 *Operational Format* – page 9

5.1.2 *Accreditation / Certification*

The professional staff possesses a broad range of knowledge and experience in the performance of environmental chemical analyses in a variety of matrices. The laboratories involved in the analysis of drinking water are certified by the US-EPA for metals, volatile organics, pesticides, inorganics, and radiation. The Air Quality Laboratory is certified for particulate matter in ambient air and maintains NVLAP accreditation for the analysis of bulk asbestos in building materials. The Chemical Emergency Preparedness & Response Section is also accredited by CLIA for the analysis of trace metals, cyanide, volatile organic compounds, and metabolites of selected chemical warfare agents in human urine and blood. The Division is also ISO/IEC 17025:2017 accredited through A2LA (American Association for Laboratory Accreditation). Certificates (Biological: 3525.01, Chemical: 3525.02) and a complete list of the methods on our scope of accreditation is located on the MDH-Laboratories Administration website.

5.1.3 *Quality Assurance Program*

The Quality Assurance Program manages, coordinates, and monitors the division's quality assurance/quality control activities and laboratory safety protocols; serves as a liaison between federal and state regulatory agencies and the laboratory staff for advice on technical and QA/QC issues; promotes bi-directional communication with analysts and management; develops and implements data quality objectives, tracks the status of the various projects; and evaluates the overall analytical performance of the laboratory.

5.1.4 *Sample Management Area*

The Sample Management Area provides a centralized area that ensures all samples received have been collected, preserved, and transported as specified by standard procedures and regulations; performs sample log-in, registration, chain-of-custody, storage and distribution to the respective laboratories for chemical analysis; communicates with the laboratories about sample results and other pertinent information.

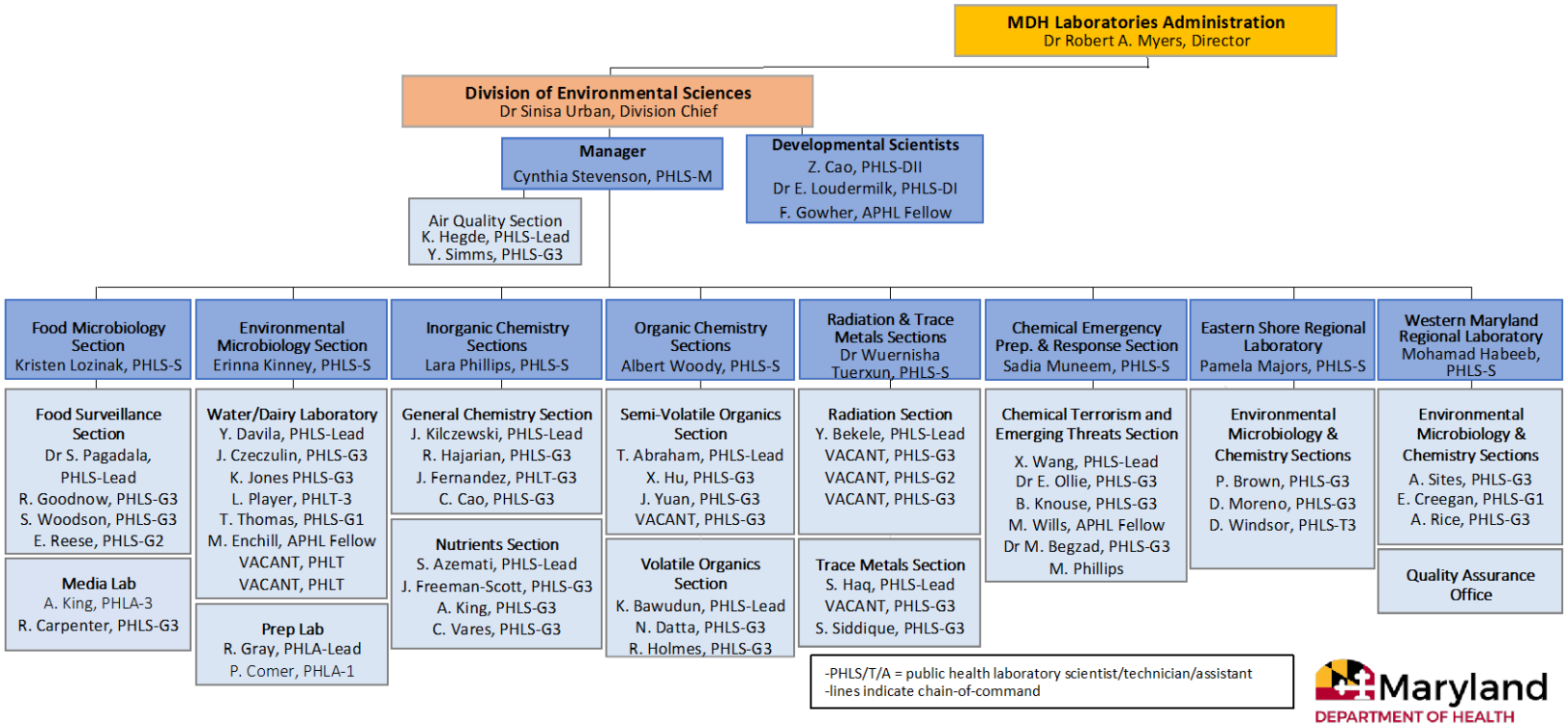
The normal turnaround time for sample analysis is 2 - 10 working days from receipt of the samples. Turnaround times, however, may vary depending on the type of test(s) requested, number of samples, and the regulatory criteria. In emergencies, rush/priority sample analysis can be performed upon client request with the consent of the Division Chief, Manager, and/or the appropriate Laboratory Supervisor.

All sampling must be consistently performed using accepted methodologies. Analysis of samples must be performed within a specific time frame after sampling and preservation in order to minimize the effect of biological or chemical processes on sample quality. This is to ensure that the analytical results are representative of the actual concentration of a contaminant at the time of sampling. Regulatory agencies such as the US-EPA have specified holding times allowed for each sample type and corresponding analytical parameters. See chart under each section.

The Laboratories Administration has a contracted courier service available to pick-up samples from designated local environmental health departments throughout the State. The courier delivers the samples to the Laboratories Administration Sample Receiving Area located at 1770 Ashland Avenue, Baltimore, MD 21205 on the First Floor Room 129 (Loading Dock Receiving, Mondays through Fridays between the hours of 8:00 a.m. to 6:00 p.m. During the working hours, Mondays through Fridays, submitters deliver samples to first floor loading dock receiving (Room 129) or directly to the laboratory. Upon arrival at the loading dock, submitters (or courier) sign in the “Courier Sign-in Sheet”. A laboratory staff member picks up and transports the coolers that are delivered to Room 139 Accessioning Lab, the samples are then logged in and distributed to their respective laboratories. For samples delivered after working hours, a laboratory staff member receives the samples from the first floor loading dock (Room 129) and delivers the coolers to the walk-in refrigerator in Room 143. Each morning a laboratory staff member picks up the coolers containing samples and transports them to Accessioning Lab located in Room 139 for processing. Upon completion of processing of the samples, the laboratory staff member notifies the respective laboratory to pick up the samples. All empty coolers are returned to the Empty Cooler Pick-up Room 141.

Samplers should follow the information regarding collection, preservation, and holding times for the specific samples being collected. This information is summarized under each laboratory.

OPERATIONAL FORMAT



5.2 ANALYTICAL SERVICES

5.2.1 *Air Quality Section*

The AIR QUALITY SECTION provides analytical and technical services in the evaluation of air quality in Maryland. This section performs analysis of the measurement of respirable dust on micro filters and the analysis of bulk asbestos in building materials and airborne particulates. *Test Chart on page 13.*

5.2.2 *Chemical Emergency Preparedness & Response Section*

The CHEMICAL EMERGENCY PREPAREDNESS & RESPONSE SECTION (CEPR) supports the State of Maryland's Chemical Terrorism Preparedness program by maintaining a state of readiness to respond immediately to a chemical terrorism incident. This Section has also been part of the Laboratory Response Network – Chemistry (LRN-C) of the CDC and DHS since its inception in 1999. It also supports the State's efforts to monitor the exposure of the citizens to certain toxic environmental contaminants in their communities. This Section analyzes human urine and blood specimens from people potentially exposed to different classes of toxic industrial compounds such as heavy metals and pyrethroid pesticides. The Section also performs the analysis of the metabolites of organophosphorus nerve agents and heavy metals in urine, and cyanide and volatile organic compounds in human blood. *Test Chart on page 15.*

5.2.3 PFAS & Contaminants of Emerging Concern Section

The PFAS & CONTAIMINANTS OF EMERGING CONCERN SECTION tests environmental samples including drinking, surface, ground, and waste waters, sediments, soils, landfill leachates, biosolids and fish, crab, and clam tissue for up to 40 different PFAS using EPA Methods 537.1, 533, and 1633 at parts-per-trillion (ppt) sensitivity. The Section also uses high-resolution mass spectrometry to identify novel PFAS and other Contaminants of Emerging Concern (CECs). *Test Chart on page 14.*

5.2.3 *Food Chemistry Section*

The FOOD CHEMISTRY SECTION analyzes food for compliance, surveillance, and evidence of adulteration. The Section works closely with FDA as a national food surveillance testing hub. The main focus of surveillance includes toxic metals (lead, mercury, cadmium, arsenic, and thallium) and the mycotoxin patulin.

Analysis of samples is performed mainly using automated microwave digestion, inductively coupled plasma mass spectrometry, liquid chromatography tandem mass spectrometry, high-resolution mass spectrometry, moisture analysis, pH analysis, and refractometry. *Test Chart on page 16.*

5.2.4 *General Chemistry Section*

The GENERAL CHEMISTRY SECTION provides analytical and technical services in the testing of samples for physical and aggregate properties, non-metallic inorganic compounds and organic aggregate constituents to help determine the suitability of drinking water for human consumption, effectiveness of wastewater treatment systems, and the quality of the Chesapeake Bay and its tributary waters. It also analyzes samples suspected of having toxic or hazardous effects. The testing is performed using a variety of wet chemistry instrumentation.

This section also measures the chlorophyll content of water collected from the Chesapeake Bay and its tributaries. The chlorophyll content of water is an important indication of the activity of algae and other organisms whose growth has harmful effects on water and wildlife. *Test Chart on page 17.*

5.2.5 *Trace Metals Section*

The TRACE METALS SECTION performs the analyses of trace metals in drinking water, wastewater, groundwater, aquatic tissues, hazardous wastes, soils, sediments, sludges, and leachates.

Analysis of multi-media samples is carried out using inductively coupled plasma spectrometry (ICP), inductively coupled plasma-mass spectrometry (ICP-MS), and cold vapor atomic absorption spectrophotometry (CVAA). *Test Chart on page 18.*

5.2.6 *Nutrients Section*

The NUTRIENTS SECTION provides analytical and technical services to determine the suitability of drinking water for human consumption and/or effectiveness of wastewater treatment systems. Nitrogen and phosphorus testing help to determine the quality of the Bay waters and support the evaluation of the effectiveness of the nutrient reduction strategies used in the Chesapeake Bay recovery efforts

The testing is performed using spectrophotometers and automated flow injection analyzers (FIA). *Test Chart on page 19.*

5.2.7 *Semi-Volatile Organics Section*

The SEMI-VOLATILE ORGANICS SECTION performs the analyses of pesticides, herbicides, carbamates, semi-volatile organic compounds and polychlorinated biphenyls (PCBs) in drinking water, wastewater, groundwater, aquatic tissues, hazardous wastes, soils, sediments, sludges, leachates, and in consumer products for possible tampering or adulteration. The Section also tests hand sanitizer for efficacy and toxic alcohols.

Analysis of multi-media samples is carried out using capillary column gas chromatographs equipped with electron capture detectors (GC/ECD), flame-ionization detectors (GC/FID), or mass spectrometers (GC/MS), and high performance liquid chromatographs (HPLC) equipped with fluorescence detectors. *Test Chart on page 20.*

5.2.8 *Radiation Section*

The RADIATION SECTION performs the analysis of radionuclides in drinking water, raw water, wastewater, groundwater, aquatic tissues, soils, sediments, milk, wipes, beverages, juice, grains and vegetation. The section also tests for radionuclides in foods for the FDA.

Analysis of samples is performed using gamma ray spectroscopy, alpha spectrometry, low background alpha / beta counting, and liquid scintillation spectrophotometry. *Test Chart on page 21.*

5.2.9 *Volatile Organics Section*

The VOLATILE ORGANICS SECTION performs the analyses of volatile and semi-volatile organic compounds in drinking water, wastewater, groundwater, hazardous wastes, soils, sediments, sludges, leachates, and in consumer products for possible tampering or adulteration. This laboratory also performs the analyses of disinfection by-products testing of total trihalomethanes (THMs) and halo-acetic acids (HAA6) in drinking water.

Analysis of multi-media samples is carried out using purge and trap introductory systems attached to capillary column (GC/MS) mass spectrometers and gas chromatographs equipped with dual electron capture detectors (GC/ECD). Test Chart page 22.

AIR QUALITY LABORATORY

TEST / MATRIX	CONTAINER	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
PM_{10}	Teflon filter	4 L air	4 °C	30 days*	EPA 454/R-98-005
$PM_{2.5}$	Teflon filter	24 L air	4 °C	30 days*	EPA 454/R-98-005
Asbestos (bulk)	Screw cap plastic or glass vials	3 - 4 sq.in. floor tiles or 1 $in.^3$ loose-fill insulation	na	na	App. E to Sub. E of 40 CFR Part 763 & EPA/600/R-93/116
Particle Identification	Screw cap plastic or glass vials	1 in^3	na	na	na

na = not applicable

***** From pre-sampling weight to final exposed weight. Exposed filters unrefrigerated are stable for 10 days

PFAS SECTION

TEST / MATRIX	CONTAINER*	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Drinking Water					
‣ per & polyfluoroalkyl substances (PFAS)	*HDPE bottle with screw cap	250 mL (3 FS & 2 FBs)	Trizma, 5g/L Preserve field blanks as samples	14 days@ 0-10 °C	EPA 537.1
‣ per & polyfluoroalkyl substances (PFAS)	* HDPE bottle with screw cap	250 mL (3 FS & 2 FBs)	Amm.acetate 1g/L Preserve field blanks as samples	28 days@ 0-10 °C,	EPA 533
Aqueous (Ground/Surface/Wastewater/Leachate)					
‣ per & polyfluoroalkyl substances (PFAS)	**HDPE bottle with screw cap	500 mL (3 FS & 2 FBs)	No preservation required	7 days @ 0-6°C 90 days @ -20°C stored in dark	Draft EPA 1633
Solid (soil/Bio solid/sediment)					
‣ per & polyfluoroalkyl substances (PFAS)	HDPE bottle (wide mouth)	250 g (2 FS & 2 FBs)	No preservation required	90 days @ -20°C stored in dark	Draft EPA 1633
Tissue (fish/crab/chicken etc.)					
‣ per & polyfluoroalkyl substances (PFAS)	HDPE bottle (wide mouth)	250 g (2 FS & 2 FBs)	No preservation required	90 days @ -20°C stored in dark	Draft EPA 1633

*Scientific Specialties part #334008 or Fisher Scientific part # 02-896-2D
**Fisher Scientific part # 03-313-2E

CHEMICAL EMERGENCY PREAPAREDNESS & RESPONSE SECTION

TEST / MATRIX	CONTAINER*	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Human Urine					
‣ Metabolites of pyrethroid pesticides	Sterile specimen cup	100 mL	-20 °C, 6 hrs after collection	na	CDC, etc.
‣ Toxic metals panel	Sterile specimen cup	100 mL	-20 °C, 6 hrs after collection	na	CDC
‣ Abrine / Ricinine	Sterile specimen cup	100 mL	-20 °C, 6 hrs after collection	na	CDC
‣ Tetramine	Sterile specimen cup	100 mL	-20 °C, 6 hrs after collection	na	CDC
‣ Metabolites of Organophosphate nerve agents	Sterile specimen cup	100 mL	-20 °C, 6 hrs after collection	na	CDC
Whole Blood/Serum					
‣ Cyanide	Purple capped vacutainer w/EDTA	4 mL	4 °C, 6 hrs after collection	na	CDC
‣ Volatile Organic Compounds	Grey top vacutainer w/pot oxalate & sodium flouride	4 mL	4- °C, 6 hrs after collection	na	CDC
‣ Metabolites of Organophosphate nerve agents	Purple capped vacutainer w/EDTA	4 mL	4 °C, 6 hrs after collection	na	CDC
‣ Toxic metals panel	Purple capped vacutainer w/EDTA	4 mL	4 °C, 6 hrs after collection	na	CDC

FOOD CHEMISTRY SECTION

TEST / MATRIX	CONTAINER	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Refractive index	P / G / C	> 40 mL	4 °C	Expiry Date	AOAC
Brix %, sugar	P / G / C	100 mL/100g	4 °C	Expiry Date	AOAC 932.1
Fat, %	P / G / C	100 mL/100g	4 °C	Expiry Date	AOAC 991.36
Moisture content	P / G / C	100 mL/100g	4 °C	Expiry Date	AOAC 985.14
Toxic organics	P / G / C	500 mL/100g	4 °C	Expiry Date	AOAC
Toxic metals (Ar,Cd,Pb,Hg,Tl)	P / G / C	500 mL/100g	4 °C	Expiry Date	FDA EAM 4.7
Salt, %	P / G / C	500 mL/100g	4 °C	Expiry Date	AOAC 935.43
Water activity	P / G / C	100 mL/100g	4 °C	Expiry Date	AOAC
Patulin in apple juice/cider	P / G / C	100 mL	4C	Expiry Date	FDA SOP-000066
Toxins/Poison Screening	P/G/C	50 mL/50 g	4C	Expiry Date	FERN CHE.0008
Arsenic speciation in Rice/Juice	P/G/C	50 mL/50 g	4C	Expiry Date	FDA EAM 4.11/10

P = Plastic; G = Glass; C = Cans; na = not applicable

GENERAL CHEMISTRY SECTION

Test	Container	Sample Size	Preservation	Holding Time	Method
Alkalinity	Plastic	500 mL	4 °C	14 days	SM 2320 B
Bioch. oxygen demand	Plastic	1000 mL	4 °C	48 hours	SM 5210 B
Carbon					
‣ Total organic	Plastic	500 mL	4 °C, HCl/H_2SO_4 pH < 2	28 days	SM 5310 B
Chloride	Plastic	500 mL	None	28 days	SM 4500 Cl E
Chlorophyll	Filter	na	- 20 °C, lt. protect.	28 days	EPA 10200 H
Conductance, specific	Plastic	500 ml	4 °C	28 days	SM 2510 B
Corrosivity	Glass	8 oz	4 °C	ASAP	EPA 846/9040-C
Cyanide					
‣ Free	Dark Plastic	500 mL	4 °C, NaOH, pH >12*	14 days	SM 4500 CN F
Fluoride	Plastic	1L	None	28 days	SM 4500-FC
Ignitability	Glass	8 oz	4 °C	14 days	EPA 846/1020
MBAS (detergents)	Plastic	500 mL	4 °C	48 hours	EPA 425.1
Oil and Grease	Glass, Teflon cap	1 L	4 °C, H_2SO_4, pH <2	28 days	EPA 1664A
pH	Glass	8 oz	4 °C	Immediately	EPA 150.1
‣ Dissolved	Plastic	500 mL	4 °C	7 days	SM 2540 C
‣ Total suspended	Plastic	500 mL	4 °C	7 days	SM 2540 D
‣ Total	Plastic	500 mL	4 °C	7 days	SM 2540 B
‣ Volatile	Plastic	500 mL	4 °C	7 days	SM 2540 E
Sulfate	Plastic	500 mL	4 °C	28 days	EPA 375.2
Turbidity	Plastic	500 mL	4 °C	48 hours	EPA 180.1

na = not applicable. * Ascorbic acid (if chlorine present), lead acetate (if sulfide present)

TRACE METALS LABORATORY

TEST / MATRIX	CONTAINER	SAMPLE SIZE	PRESERVATION TIME	HOLDING	METHOD
Aluminum	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Antimony	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Arsenic	Plastic	1 L	HNO_3, pH <2	6 month	EPA 200.7 / 200.8
Barium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Beryllium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Cadmium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Calcium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7
Chromium, hexavalent	Plastic	300 mL	4 °C, no acid	48 hours	USGS I-1230-85
Chromium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Cobalt	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Copper	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Iron	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7
Lead	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Magnesium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7
Manganese	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Mercury	Plastic	1 L	HNO_3, pH <2	28 days	EPA 245.1
Mercury	Plastic	1 L	HNO_3, pH <2	28 days	EPA Method 200.8
Molybdenum	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Nickel	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Potassium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7
Selenium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Silver	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Sodium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7
Thallium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7/200.8
Uranium	Plastic	1 L	HNO_3, pH <2	6 months	EPA Method 200.8
Vanadium	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Zinc	Plastic	1 L	HNO_3, pH <2	6 months	EPA 200.7 / 200.8
Soils/Sediments	Glass	50 g	4 °C	na	SW-846 / 3051A

L=liter; mL=milliliter; HNO_3=conc. nitric acid (Ultra pure); na = not applicable

NUTRIENTS SECTION

TEST / MATRIX	CONTAINER	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Chemical oxygen demand	Plastic	500 mL	4 °C, H_2SO_4 pH <2	28 days	EPA 410.4
Hardness	Plastic	500 mL	H_2SO_4 or HNO_3 pH <2	6 months	EPA 130.1
Nitrogen					
‣ Ammonia	Plastic	1 L	4 °C, H_2SO_4, pH <2	28 days	EPA 350.1
‣ Nitrate + Nitrite	Plastic	1 L	H_2SO_4, pH <2	28 days	EPA 353.2
‣ Nitrite	Plastic	1 L	4 °C	48 hours	EPA 353.2
‣ Total Kjeldahl	Plastic	1 L	4 °C, H_2SO_4, pH <2	28 days	EPA 351.2
Phosphorus					
‣ Ortho	Plastic	1L	4 °C	48 hours	EPA 365.1
‣ Total	Plastic	1L	4 °C, H_2SO_4, pH <2	28 days	EPA 365.4

na = not applicable

SEMI-VOLATILE ORGANICS SECTION

TEST / MATRIX	CONTAINER*	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Drinking Water					
‣ EDB & DBCP	Glass vial (no headspace)	40 mL	4 °C, sodium thiosulfate	14 days	EPA 504.1
‣ Chlorinated pesticides & PCBs	Glass amber bottle	1 L	4 °C, sodium thiosulfate	7 days	EPA 508
‣ Chlorinated acids Herbicides	Glass amber bottle	60 mL	4 °C, sodium thiosulfate	14 days	EPA 515.3
‣ Semi-volatile pesticides	Glass amber bottle	1 L	4 °C, sodium sulfite pH <2 (with 6N HCl)	14 days	EPA 525.2
‣ Carbamate pesticides	Glass amber bottle	60 mL	4 °C, potassium dihydrogen citrate & sodium thiosulfate pH <4. Mix samples in the field for 1 min.	28 days	EPA 531.2
‣ Haloacetic acids	Glass amber bottle	60 mL	4 °C, 6 mg NH_4Cl	14 days	EPA 552.2
Wastewater					
‣ Chlorinated pesticides & PCBs	Glass amber bottle	1 L	4 °C, sodium thiosulfate	7 days	EPA 608
Hazardous Wastes					
‣ Chlorinated pesticides & PCBs	Glass amber bottle	1 L	4 °C, sodium thiosulfate	7 days	EPA 8081
	Glass jar (soil)	8 oz	4 °C	14 days	EPA 8081

***** Glass vials must have PTFE-lined septum caps; glass bottles must have PTFE-lined caps

RADIATION SECTION

TEST / MATRIX	CONTAINER	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Gross alpha & beta (air)	Pump head	50 m^3	na	6 months	EPA 900.0
Gross alpha & beta (water, diss)	Plastic	1 L	HNO_3, pH <2	6 months	EPA 900.0
Gross alpha & beta (water, susp)	Plastic	1 L	na	72 hours	EPA 900.0
Gross alpha & beta (wipes)	Coin envelope	100 cm^2	na	variable*	EPA 900.0
Gamma isotope (air particle)	Pump head	50 m^3	na	6 months	HASL
Gamma isotope (fruit, juices, beverages, etc.)	Plastic/glass	4 L	na	na	HASL
Gamma isotope (water)	Plastic	4 L	HNO_3, pH <2	3 months	HASL
Gamma isotope (milk)	Plastic	4 L	4 °C, formaldehyde	3 months	HASL
Gamma isotope (oyster)	Polybag	100 cm^3	Freeze	2 weeks	HASL
Gamma isotope (sediment/sand)	Polybag/plastic bag	4000 cm^3/4L	Freeze	months	HASL
Gamma isotope (soil)	Polybag	1000 cm^3	na	variable*	HASL
Gamma isotope (wipes)	Coin envelope	100 cm^2	na	variable*	HASL
Gamma isotope (vegetation)	Polybag	4000 cm^3	4 °C	2 weeks	HASL
I-131 (charcoal filter)	Pump head	50 cm^3	na	8 days	
Strontium 90 & 89 (water)	Plastic	4 L	HNO_3, pH <2	6 months	EPA 905.0
Strontium 90 & 89 (milk)	Plastic	4 L	4 °C, formaldehyde	6 months	AOAC/EPA 905.0
Tritium (water)	Plastic	1 L	na	6 months	EPA 906.0
Radon 222 (water)	Boro glass vial	15 mL	4 °C	3 days	EPA 913.0
Liquid scint. (wipes)	Coin envelope	100 cm^2	na	variable*	EPA 906.0
Radium 226 (water)	Plastic	4 L	HNO_3, pH <2	6 months	EPA 903.1
Radium 228 (water)	Plastic	4 L	HNO_3, pH <2	6 months	EPA 904.0

na = not applicable
Variable* = the maximum holding time as determined by isotope and sensitivity desired

VOLATILE ORGANICS SECTION

TEST / MATRIX	CONTAINER*	SAMPLE SIZE	PRESERVATION	HOLDING TIME	METHOD
Drinking Water					
‣ Volatile organics	Glass vial No air bubbles or sediments	40 mL	4 °C, 1:1 HCl, pH <2 ascorbic acid Preserve trip & field blanks as samples	14 days	EPA 524.2
‣ Trihalomethanes	Glass vial No air bubbles or sediments	40 mL	4 °C, 1:1 HCl, pH <2 ascorbic acid or sodium thiosulfate Preserve trip & field blanks as samples	14 days	EPA 524.2
Wastewater					
‣ Volatile organics	Glass vial	40 mL	4 °C, 1:1 HCl, pH <2 ascorbic acid	14 days	EPA 624
‣ Base Neutral / Acid extractable organics (semi-volatile organics)	Glass amber bottle	1 L	4 °C	7 days	EPA 625
Hazardous Wastes					
‣ Volatile organics	Glass vial	40 mL	4 ° C, 1:1 HCl, pH <2 ascorbic acid	14 days	EPA 8260
	Glass jar (soils)	8 oz	4 °C	14 days	EPA 8260
‣ Base Neutral / Acid extractable organics (semi-volatile organics)	Glass amber bottle	1 L	4 °C	7 days	EPA 8270
	Glass jar (soils)	8 oz	4 °C	14 days	EPA 8270

***** Glass vials must have PTFE-lined septum caps; glass bottles must have PTFE-lined caps

6.0 PART II: ENVIRONMENTAL SCIENCES MICROBIOLOGY

6.1 PROGRAM SERVICES

The Division of Environmental Sciences Microbiology area analyzes samples originating from diverse environmental sources. At Central Laboratory, Microbiological testing is divided into two main sections – *Environmental Microbiology (Water/Dairy/ Shellfish), and Food Microbiology.*

The two Regional Laboratories - *Eastern Shore Regional Laboratory (ESRL)* and *Western Maryland Regional Laboratory* (WMRL) - all perform water microbiology analysis. The WMRL also analyzes dairy samples and the ESRL performs analysis of shellfish growing water samples.

6.1.1 *Organizational Chart* - see *Page 8*

6.1.2 *Quality Assurance*

Quality Assurance is a set of operating principles to ensure production of data of known and defensible quality. To accomplish these goals, each laboratory has a written Quality Control plan that outlines the procedures to be followed in sample collection, transport, and analysis. Corrective action procedures, which are a part of the Quality Assurance Plan, are instituted to address possible deviations.

6.1.3 *Sample Management*

At Central Laboratory, food and water samples should be delivered to the loading dock. Dairy product samples are to be transported to the Accessioning Lab, located in Room 139, for processing. For further information, contact the individual laboratory.

For sample management procedures at the regional laboratories, contact the specific laboratory.

- Eastern Shore (410)219-9005 / (410)749-1174
- Western Maryland (301)777-2115/ 2116

6.1.4 *Sampling Procedures*

For sample collection protocols please refer to the specific methods or contact the appropriate laboratory.

6.2 ANALYTICAL SERVICES

The Environmental Sciences Microbiology Program responds to client requests for laboratory support in the areas of environmental and consumer products compliance monitoring. The functions of the program are performed in three testing units at the Central Laboratory and integrated into the functions of two regional laboratories.

These functions summarize the mission of the Laboratories Administration: to provide accurate and reliable data that can be used to support the public health goals of the State's monitoring agencies.

6.2.1 *Environmental Microbiology (Water & Dairy)*

The ENVIRONMENTAL MICROBIOLOGY SECTION is focused on:

(1) Water Microbiology: analytical testing of public and private drinking waters, sewages, streams, dairy waters, and recreational waters that include natural bathing areas (beaches), swimming pools, and spas, for organisms indicative of fecal contamination and bacterial densities. This laboratory is certified by the U.S. Environmental Protection Agency (EPA) for the analysis of drinking waters.

(2) Shellfish Microbiology: analytical testing of shellfish suspected of being associated with potential food borne illness. The Shellfish laboratory performs testing of shellfish growing waters and shellstock in support of the State's monitoring and enforcement activities.

(3) Dairy Section: analytical testing of a variety of dairy products to determine compliance with State and Federal laws and regulations. The Dairy laboratory performs microbiological tests such as HPC (total microbial counts), coliform counts, and listeria identification. Additional microbiological tests performed in this laboratory include inhibitor testing (antibiotic concentration) and somatic cell counts. The Dairy Section is also a regulatory laboratory that analyzes milk and milk products to ensure complete pasteurization and to monitor quality standard by physical and chemical methods. The testing is in accordance with Pasteurized Milk Ordnance (PMO) compiled by U.S. FDA Milk Program which the State of Maryland has adopted. This document provides for the safe handling of milk to prevent the transmission of disease and prevents the mislabeling and adulteration of milk products. This laboratory is certified by the U.S. Food and Drug Administration (FDA).

6.2.2 *Food Microbiology Section*

The FOOD MICROBIOLOGY SECTION analyzes food and environmental samples suspected of being associated with potential foodborne illness. The Section performs testing for outbreak investigations with State programs and FDA, and large-scale (>1,000 samples per year) surveillance testing for FDA. Pathogens analyzed within the Food Microbiology Section include Aerobic Plate Count, Total Coliforms, Fecal Coliforms, *Escherichia coli*, *Staphylococcus aureus*, *Salmonella*, *Listeria monocytogenes*, *Bacillus cereus*, *Escherichia coli O157:H7* and *non-O157 STEC, Campylobacter spp, Cronobacter spp, Cyclsopora cayetensis, Clostridium perfringens,* and *Staphylococcal Enterotoxin,* and *Vibrio spp..* The Food Microbiology Section is certified by the U.S. Food and Drug Administration (FDA). The Food Microbiology Section is accredited under ISO17025:2017 (A2LA Certificate 3525.01).

Sample Test	Analytical Test	Sample Size	Sample Container Specifications	Turnaround Time	Transport Conditions	Holding Time
Wastewater effluents	Fecal coliforms	100 mL	Sterile 250 mL 8 oz. bottle containing 0.8 mL of a combination of sodium thiosulfate & EDTA	24 hrs	Water Samples should be transported in coolers containing crushed ice filled no higher than the shoulders of the water containers in order to hold the temperature of the samples between 1.0 °C to 10 °C from the time of collection to the time of examination. Use of "Cool-Pack" alone without ice is not sufficient to maintain the required temperature. Water containers should be protected with barriers so as to be transported in upright positions and not be submerged in ice or slush.	6 hrs.
Stream samples	Fecal coliforms; *Escherichia coli*; Enterococci, Pseudomonas	100 mL	Sterile 150 mL 4 oz. bottle containing 0.1 mL of a 10% sodium thiosulfate solution.	24 hrs		6 hrs.
Swimming pool and/or man-made tanks	Total coliforms; *Escherichia coli,* Heterotrophic plate count (HPC), Simplate, Pseudomonas	150 mL		24-48 hrs		6 hrs.
Bathing beach areas, quarries and other natural bathing areas	Fecal coliforms; *Escherichia coli*; Enterococci, Pseudomonas	100 mL		24 hrs		6 hrs.
Private & other public drinking waters	Total Coliforms & *Escherichia coli*	105 mL		24 hrs		30 hrs.
Public drinking water	Total coliforms; Heterotrophic plate count (HPC), Simplate	105 mL		48 hrs		30 hrs. 8 hrs. (HPC)
Potable and Non-Potable Water Systems	Legionella	1L	In sterile container	12 days		72 hrs (or Refrigeration)
Bottled water	Total & Fecal coliforms; *Escherichia coli*; Standard plate count, Simplate, Pseudomonas,	100 mL	In original, unopened container	72 hrs	Un-iced.	N/A

FOOD MICROBIOLOGY

The condition of food and environmental samples received for examination at the lab is of primary importance. If the samples are not properly collected, are mishandled during transport to the lab, or are not representative of the sampled lot, then there is an increased likelihood that laboratory results will be meaningless. In general, for all food and environmental samples submitted to the Food Microbiology Laboratory, unless otherwise noted, the following may be assumed for all methods:

- If possible, collect and send food samples in the original packaging or container.
- For environmental swab or sponge collection, only use those swabs and sponges provided by the Food Microbiology Laboratory or the MD Rapid Response Team. Swabs are provided pre-moistened with D/E Neutralizing Broth or Letheen Broth.
- All food/environmental samples must be submitted under chain of custody (including chain of custody seals, tamper-proof tape, and appropriate paperwork) unless prior arrangements are made with the Food Microbiology Laboratory.
- Sterile/aseptic technique is required for handling/packaging of food/environmental samples.
- Food and environmental samples must be individually bagged in sterile, leak-proof containers. Do not use felt pen on plastic for identification markings because the ink might penetrate the container.
- Samples should be submitted microbiologically unchanged from the time of sampling. Refrigerated/perishable foods should be held under refrigeration immediately after collection and during transport. Frozen food samples should be maintained frozen after collection and during transport. Non-perishable/ambient foods can be kept at ambient temperatures during collection and during transport. Environmental swabs/sponges should be kept refrigerated after collection and during transport. Water samples should be transported in coolers containing between 2.0 °C to 5 °C.
- Use insulated containers (Styrofoam ice chests, coolers) and prefrozen icepacks and/or Insul-Ice to maintain sample temperature. Fill dead space inside coolers so that food/environmental samples do not move.
- Water samples should be transported in coolers containing crushed ice filled no higher than the shoulders of the water containers in order to hold the temperature of the samples between 2.0 °C to 5 °C.

METHOD	MATRIX	METHOD	SAMPLE SIZE	HOLDING TIME	TURNAROUND TIME
Aerobic Plate Count	Food	BAM Chapter 3	**Amount:** • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample.	36 hours (unless otherwise noted)	3-5 days
Bacillus cereus	Food	BAM Chapter 14	**Amount:** • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample.	96 hours (or store at -20˚C until analyzed)	5-7 days
Campylobacter	Food	BAM Chapter 7	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample • *Shellfish*: 12-15 animals. Samples less than 12 animals may be tested if necessary but results may not be representative of the sample.	36 hours	7-10 days
	Water	ISO 17995	**Amount**: • *Water:* 1-2L; minimum of 200 mL. Samples less than 200 mL may be tested if necessary but results may not be representative of the sample. Sample bottles should be filled to the rim (avoid air spaces in	30 hours	7-10 days

METHOD	MATRIX	METHOD	SAMPLE SIZE	HOLDING TIME	TURNAROUND TIME
			the container to ensure *Campylobacter* survival). A temperature control should also be collected		
Clostridium perfringens	Food	BAM Chapter 16	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 25g. Samples less than 25g may be tested if necessary but results may not be representative of the sample	36 hours	7-10 days
Coliforms (Total and Fecal)	Food	BAM Chapter 4	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample	36 hours	3-5 days
Cronobacter spp	Food	ISO 29964	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	7-10 days
	Environmental Swabs		**Amount**: • 1 sponge/swab per sample	24 hours	5-10 days
Cyclospora cayetensis	Food	BAM Chapter 19B	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	5-7 days
E. coli (generic)	Food	BAM Chapter 4	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 50g. Samples less than 50g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	5-7 days
E. coli O157:H7/non-O157 STEC	Food	BAM Chapter 4A	**Amount**: • *Food*: 100-200g (3.5– 7.05 oz); minimum of 25g. Samples less than 25g may be tested if necessary but results may not be representative of the sample • *Leafy Produce*: 300-400g (10.5 – 14.1 oz); minimum of 200g. Samples less than 200g may be tested if necessary but results may not be representative of the sample. • *Cilantro/Parsley***:** 100-200g (3.5– 7.05 oz); minimum of 25g. Samples less than 25g may be tested if necessary but results may not be representative of the sample • *Juice, Milk, Other Turbid Beverage Samples***:** 300-400g (10.5 – 14.1 oz); minimum of 200g. Samples less than 200g may be tested if necessary but results may not be representative of the sample. • *Bottled Water*: 200-300g (7.05-10.5 oz); minimum of 125g. Samples less than 125g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	5-10 days

METHOD	MATRIX	METHOD	SAMPLE SIZE	HOLDING TIME	TURNAROUND TIME
E. coli O157:H7	Environmental Swabs	AOAC OMA 2000.14	**Amount**: • 1 sponge/swab per sample	24 hours	5-10 days
L. monocytogenes	Food	BAM Chapter 10	**Amount**: • *Food*: 200-400g (7.05 – 14.1 oz); minimum of 100g. Samples less than 100g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	7-10 days
	Environmental Swabs	AOAC OMA 2016.07; AOAC OMA 2016.08	**Amount**: • 1 sponge/swab per sample	24 hours	5-10 days
Salmonella spp	Food	BAM Chapter 5	**Amount**: • *Food*: 200-400g (7.05 – 14.1 oz); minimum of 25g. Samples less than 25g may be tested if necessary but results may not be representative of the sample	36 hours (unless otherwise noted)	5-10 days
	Environmental Swabs	AOAC OMA 2016.01	**Amount**: • 1 sponge/swab per sample	24 hours	5-10 days
	Water	SM9260B	**Amount**: • 100 mL per sample. Samples less than 100 mL may be tested if necessary but results may not be representative of the sample	2-31 hours	5-10 days
Vibrio spp	Food	BAM Chapter 9	**Amount**: • *Food*: 200-400g (7.05 – 14.1 oz); minimum of 100g. Samples less than 100g may be tested if necessary but results may not be representative of the sample • *Shellfish*: *Shellfish*: 12-15 animals. Samples less than 12 animals may be tested if necessary but results may not be representative of the sample.	36 hours (unless otherwise noted)	5-10 days

***** Additional time may be required

DAIRY

Sample Type	Analytical Test	Sample Size	Sample Container Specifications	Turn around Time	Transport Conditions	Maximum Allowable Holding Time
Temperature Control		100 mL	Container similar to samples in size and product type.	none	Transport under same conditions as samples.	none
Raw milk	Petrifilm Aerobic Count, Inhibitory substances, DMSCC(as appropriate)	50 mL	Must be in sterile container, at least 50 mL volume	5 days	Transport in coolers containing crushed ice filled to the shoulder of container. Each cooler accompanied by a temperature control	48 hrs
Pasteurized milk and cream	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count, Inhibitory substances; Phosphatase	100 mL	Must be in a sterile, unopened, container with appropriate sample size.	5 days		60 hrs
Pasteurized flavored milk and cream	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count,	100 mL		5 days		60 hrs
Ultra-pasteurized products	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count, Inhibitory substances;	100 mL		5 days		60 hrs
Cultured products	Petrifilm Coliform Count, High Sensitivity Coliform	100 mL		5 days		60 hrs
Acidophilus milk	Petrifilm Coliform Count, High Sensitivity Coliform; Inhibitory substances;	100 mL	Must be in a sterile, unopened, container with appropriate sample size.	5 days	Must be transported in cooler containing crushed ice. Avoid complete submersion of container. Must be accompanied by temperature control.	60 hrs
Frozen desserts	Petrifilm Aerobic Count, High Sensitivity Coliform Count	100 g		5 days	Must be transported in cooler chest accompanied by dry ice. Temperature control not necessary.	60 hrs
Frozen dessert mixes or soft-serves	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count	100 g	Must be in a sterile, unopened, container with appropriate sample size.	5 days	Must be transported in coolers with crushed ice and accompanied by temperature control. May not be frozen.	60 hrs.
Powdered Milk	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count	100 g	Submitted in Division of Milk Control approved plastic bags.	5 days	Room temperature	60 hrs
Soft frozen desserts	Petrifilm Aerobic Count, Petrifilm Coliform Count, High Sensitivity Coliform Count Phosphates	100 mL/g	Original container or sterile container	5 days	Must be transported in cooler with crushed ice and accompanied by temperature control. May not be frozen	60 hrs
Empty containers	Residual bacterial count & residual coliform count	NA	NA	5 days	Room temperature.	48 hrs*

Under ideal conditions, analysis of the samples should begin within 24 hours and, in most cases, no later than 48 hours after original collection

7.0 PART III: TEST DIRECTORY

7.1 Abbreviations

Laboratory/Section	Abbreviation
AIR QUALITY SECTION	AQS
CHEMICAL EMERGENCY PREPAREDNESS & RESPONSE SECTION	CEPR
DAIRY MICROBIOLOGY SECTION	DM
DAIRY CHEMISTRY	DC
FOOD CHEMISTRY SECTION	FCS
FOOD MICROBIOLOGY SECTIONv	FM
GENERAL CHEMISTRY SECTION	GCS
TRACE METALS SECTION	TML
NUTRIENTS SECTION	NS
SEMI-VOLATILE ORGANICS SECTION	SVOS
RADIATION SECTION	RS
VOLATILE ORGANICS SECTION	VOS
WATER MICROBIOLOGY SECTION	WM
PFAS AND CEC SECTION	PFAS

7.2 Index

Bromobenzene	VOS
Bromochloroacetic acid	VOS
Bromochloromethane	VOS
Bromodichloromethane	VOS
Bromoform	VOS
Bromomethane	VOS
4-Bromophenylether	VOS
Butachlor	SVOS
2-Butanone (MEK)	VOS
n-Butylbenzene	VOS
sec-Butylbenzene	VOS
tert-Butylbenzene	VOS
Butylbenzyl phthalate	VOS
2,4,6-*sec*-Butyl-dinitrophenol	VOS

C

Cadmium	TML, CEPR
Caffeine	FCS
Calcium	TML
Campylobacter identification	FM
Canned foods	FM, FCS
Carbon, total organic	GCS
Carbon tetrachloride	VOS
Cesium	CEPR
Chemical oxygen demand (COD)	NS
Chemical terrorism (CT)	CEPR
Chemical warfare agent (CWA)	CEPR
Chlordane	SVOS, VOS
Chloride	GCS
Chlorinated hydrocarbons	VOS, SVOS
Chloroacetic acid	VOS
Chlorobenzene	VOS
Chloroethane	VOS
2-Chloroethyl vinyl ether	VOS
Chlorophyll	GCS
Chloroform	VOS
Chloromethane	VOS
4-Chloro-3-methylphenol	VOS
2-Chloronaphthalene	VOS
2-Chlorophenol	VOS
4-Chlorophenyl phenyl ether	VOS
0rtho-Chlorotoluene	VOS
para-Chlorotoluene	VOS
Chlorpyrifos (dursban)	SVOS
Chromium	TML
Chrysene	VOS, SVOS
Citric acid	FCS
Clostridum botulinum (toxin assay)	FM
Clostridium perfringens (identification)	FM
Clostridium perfringens (count)	FM
Cobalt	TML, CEPR
Coliform count (pasteurized milk)	DM
Coliform, total & fecal, MPN (drinking water)	WM

Coliform, total & fecal, MPN (food)	FM
Coliform, total & fecal MF (water sewage)	WM
Coliform, total & fecal, ONPG-MUG (water recreational)	WM
Coliform, total & fecal, ONPG-MUG (water, stream)	WM
Coliform, total & fecal, P-A (water, farm/dairy)	WM
Coliform, total & fecal, P-A (water, other)	WM
Color	GCS
Commercial sterility (canned foods)	FM
Conductivity	GCS
Copper	TML
Corn (canned)	FCS
Corrosivity / pH	GCS
Crabs (decomposition)	FCS
Crabmeat (decomposition)	FCS
Cyanide, amenable to chlorination	GCS
Cyanide, blood	CEPR
Cyanide, total	GCS
Cyclosarin (GF)	CEPR

D

Dalapon	SVOS
2,4-DB	SVOS
DDD	SVOS, VOS
DDE	SVOS, VOS
4,4′-DDE	CEPR, VOS
4,4′-DDT	CEPR, VOS
delta-BHC	VOS
DDT	SVOS
2,4-DDT	CEPR, VOS
Diazinon	SVOS
Dibenzo (a,h) anthracene	SVOS, VOS
Dibromoacetic acid	VOS
Dibromochloromethane	VOS
1,2-Dibromo-3-chloropropane	VOS
1,2-Dibromoethane (EDB)	VOS
Dibromomethane	VOS
Dicamba	SVOS
Dichloroacetic acid	VOS
1,2-Dichlorobenzene	VOS
1,3-Dichlorobenzene	VOS
1,4-Dichlorobenzene	VOS
Dichlorofluoromethane	VOS
1,2-Dichloroethane	VOS
cis-1,2-Dichloroethene	VOS
trans-1,2-Dichloroethane	VOS
1,1-Dichloroethylene	VOS
trans-1,2-Dichloroethylene	VOS
Dichlorofluoromethane	VOS
1,1-Dichloroethene	VOS
2,4-Dichlorophenol	VOS
2,6-Dichlorophenol	VOS
1,1-Dichloropropene	VOS
Diphenylamine	VOS

Di-methylaminoazobenzene	VOS
1,2-Dichloropropane	VOS
1,3-Dichloropropane	VOS
2,2-Dichloropropane	VOS
cis-1,3-Dichloropropene	VOS
trans-1,3-Dichloropropene	VOS
Dichlorodifluoromethane	VOS
Dieldrin	SVOS, CEPR
Diethyl dithiophosphate (DEDTP)	CEPR
Diethyl phosphate (DEP)	CEPR
Diethyl phthalate	VOS
Diethyl thiophosphate (DETP)	CEPR
Difluoromethane	VOS
7,12-Dimethylbenz(a)anthracene	VOS
Dimethyl dithiophosphate (DMDTP)	CEPR
2-4-Dimethyphenol	VOS
Dimethyl phosphate (DMP)	CEPR
Dimethyl phthalate	VOS
Dimethyl thiophosphate (DMTP)	CEPR
Di-n-butyl phthalate	VOS
Di-n-octyl phthalate	VOS
2,4-Dinitrophenol	VOS
2,4-Dinitrotoluene	VOS
2,6-Dinitrotoluene	VOS
4,6-Dinitro-2-methylphenol	VOS
1,3 Dinitrobenzene	VOS
Dinoseb	SVOS
1,2-Diphenyl hydrazine	VOS
Diphenyl nitrosamine	VOS
Di-isopropyl ether (DIPE)	VOS
Drinking water (private, public supplies)	VOS, GCS, NS, SVOS, RS, TML

E

E. coli Count, MPN (shellfish)	FM
E. coli O157:H7 Identification	FM
Endosulfan I	VOS
Endosulfan II	VOS
Endosulfan sulfate	VOS
Endrin	SVOS, VOS
Endrin aldehyde	VOS
Endrin ketone	VOS
Enterobacteriaceae identification (canned food)	FM
Ethion	SVOS
Ethylbenzene	VOS
Ethylene dibromide (EDB)	SVOS
Ethyl-*tert*-butyl-ether (ETBE)	VOS
Extractable organics	VOS
Extraneous material (food)	FCS

F

Fat, (percent)	FCS
Filth (food)	FCS
Finfish (heavy metals)	TML

Fluoranthene	VOS, SVOS
Fluorene	VOS
Fluorescein dye	GCS
Fluoride	GCS
Fly ash	AQS
Food quality, adulteration	FCS
Foreign material (food)	FCS
Forensic drugs	CEPR
Formaldehyde	RS
Fourier transform infrared spectrometer (FTIR)	CEPR

G

Gamma emitting isotopes	RS
Gasoline	VOS
Glass (foods)	FCS
Gravimetric	FCS

H

Haloacetic acids	VOS
Hardness	NS
Heavy metals	TML
Heptachlor	SVOS, VOS
Heptachlor epoxide	SVOS, VOS, CEPR
Herbicides, chlorinated acids	SVOS
Hexachlorobenzene (HCB)	SVOS, CEPR, VOS
Hexachlorobutadiene	VOS
Hexachlorocyclopentadiene	SVOS, VOS
Hexachloroethane	VOS
2-Hexanone	VOS
Hexachloropropylene	VOS
Hydrocarbons (chlorinated)	VOS, SVOS

I

Identification	GCS, CEPR
Ignitability	GCS, AQS
Indeno (1,2,3-ed) pyrene	VOS, SVOS
Infant botulism (anaerobe culture)	FM
Inhibitory substances	DM
Inhibitory substances (powdered milk)	DM
Iodine-131 (air)	RS
Insect identification	FCS
Isophorone	VOS
Isopropylbenzene	VOS
para-Isopropyltoluene	VOS
Iron	TML

J

K

Kjeldahl, total nitrogen (TKN)	NS

L

Lead	TML, CEPR

Lindane (gamma BHC)	SVOS, VOS, CEPR
Liquid scintillation (wipes)	RS
Listeria identification (foods, environmental)	FM

M

Maggots (foods)	FCS
Malathion	SVOS
Manganese	TML
Magnesium	TML
Methylene blue active substances (MBAS)	GCS
2-Methylphenol	VOS
3-Methylphenol	VOS
4-Methylphenol	VOS
Methapyrilene	VOS
Meat (speciation of uncooked meat)	FCS
Mercury	TML
Mercury (fish)	TML, FCS
Metals, dissolved	TML
Metals, total	TML, FCS
Methoxychlor	SVOS
Methyl parathion	SVOS
4-Methyl-2-pentanone (MIBK)	VOS
Methyl-*tert*-butyl ether (MTBE)	VOS
Methylene chloride	VOS
Methylene diphenyl isocyanate	RS
Metolachlor	SVOS
Metribuzin	SVOS
Mirex	CEPR
Moisture (percent)	DC
Molybdenum	TML, CEPR
Monobromoacetic acid	VOS
Monochloroacetic acid	VOS

N

Naphthalene	VOS, SVOS
Nerve agent (metabolites)	CEPR
Nickel	TML
Nitrobenzene	VOS
Nitrogen, ammonia	NS
Nitrogen, nitrate-nitrite	NS
Nitrogen, nitrite	NS
Nitrogen, total kjeldahl	NS
Nitrophenol	VOS
4-Nitrophenol	VOS
4-Nitroquinoline-N-oxide	VOS
trans-Nonachlor	CEPR

O

Oil & grease	GCS
Organic chemical (stream sample)	VOS
Organochlorine pesticides	CEPR
Organoleptic analysis (food)	FCS
Organophosphate pesticides (metabolites)	CEPR

Organophosphorus nerve agent (metabolites)	CEPR
Oxalic acid	FCS
Oxamyl (vydate)	SVOS
Oxychlordane	CEPR
Oyster	FCS, TML, FM

P

pH	GCS
$PM_{2.5}$	AQS
PM_{10}	AQS
Particulates (industrial pollution)	AQS
Pentachlorobenzene	VOS
Pentachloronitrobenzene	VOS
Pentachlorophenol	SVOS, VOS
Per- and Polyfluoroalkyl Substances	PFAS
Percent fat	FCS
Pesticides	SVOS, VOS
Pesticides (food)	FCS, SVOS
Phenacetin	VOS
Phenantherene	VOS
Phenols	VOS
Phenolics, total recoverable	GCS
3-Phenoxybenzoic acid (3PBA)	CEPR
4-Fluoro-3-phenoxybenzoic acid (4F3PBA)	CEPR
Photon emitters	RS
Phosphatase (alkaline)	DC
Phosphatase (microbial)	DC
Phosphatase (reactivated)	DC
Phosphorous, ortho	NS
Phosphorous, total	NS
Phosphorus, total dissolved	NS
Physical condition (food)	FCS
Picloram	SVOS
Platinum	CEPR
Polychlorinated biphenyl (PCB)	SVOS
Polynuclear aromatic hydrocarbons (PAH)	VOS, SVOS
Potassium	TML
Presumptive blood test	FCS
Priority pollutants	VOS, SVOS
Propachlor	SVOS
n-Propylbenzene	VOS
Purgeable aromatics	VOS
Purgeable halocarbons	VOS
Pyrethroid pesticides	CEPR

Q

Quartz (filters)	AQS

R

Radiological tests	RS
Radium	RS
Radon (water)	RS
Residual bacterial count	DM

Residual bacterial count (molded containers)	DC
Russian VX (SVX)	CEPR

S

Salt (percent in meCEPR)	FCS
Sarin (GB)	CEPR
Sediment	GCS
Selenium	TML, CEPR
Semi-volatile organic compounds	VOS
Silver	TML
Silvex (2,4,5-TP)	SVOS
Simazine	SVOS
Shellfish	FCS
Sodium	TML
Solids, settleable	GCS
Solids, total	GCS
Solids, total dissolved	GCS
Solids, total suspended	GCS
Soman (GD)	CEPR
Somatic cell counts (dairy products)	DM
Speciation of uncooked meat	FCS
Standard plate count	WM, FM, DM
Staphylococcus count	FM
Strontium (milk, water)	RS
Styrene	VOS
Succinic acid	FCS
Sulfate	GCS

T

Tartaric acid	FCS
2,4,5-TP (silvex)	SVOS
tert-amyl-methyl-ether (TAME)	VOS
tert-butyl alcohol (TBA)	VOS
1,2,4,5 Tetrachlorobenzene	VOS
1,1,1,2-Tetrachloroethane	VOS
1,1,2,2-Tetrachloroethane	VOS
Tetrachloroethene	VOS
2,3,4,6-Tetrachlorophenol	VOS
Thallium	TML, CEPR
Thermometer calibrations	FCS
Toluene	VOS
Total petroleum hydrocarbons	GCS
Total suspended particulates	AQS
Toxaphene	VOS, SVOS
1,2,3-Trichlorobenzene	VOS
1,2,4-Trichlorobenzene	VOS
1,1,1-Trichloroethane	VOS
1,1,2-Trichloroethane	VOS
Trichloroethene	VOS
Trichlorofluroomethane	VOS
2,4,6-Trichlorophenol	VOS
1,2,3-Trichloropropane	VOS
Trihalomethanes, total	VOS

1,2,4-Trimethybenzene	VOS
1,3,5-Trimethylbenzene	VOS
Tritium (water)	RS
Tungsten	CEPR
Turbidity	GCS
U	
Uranium	TML, CEPR
V	
Vanadium	TML
Vibrio cholera identification	FM
Vibrio parahaemolyticus count	FM
Vinyl chloride	VOS
Volatile organic compounds	VOS
Volume	FCS
VX	CEPR
W	
Water	VOS, SVOS, GCS, RS, NS, TML, WM
X	
ortho-Xylene	VOS
meta-Xylene	VOS
para-Xylene	VOS
Total xylenes	VOS
Y	
Yersinia identification	FM
Z	
Zinc	TML