

**QUALITY MANAGEMENT PLAN**  
**FOR THE**  
**CHESAPEAKE BAY PROGRAM OFFICE**



**Chesapeake Bay Program**  
*A Watershed Partnership*

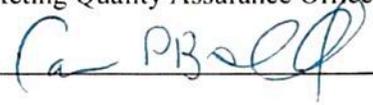
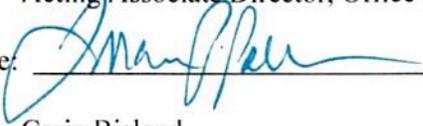
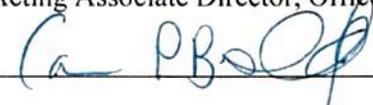
U. S. ENVIRONMENTAL PROTECTION AGENCY—REGION 3  
CHESAPEAKE BAY PROGRAM OFFICE  
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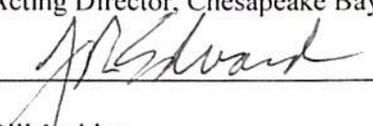
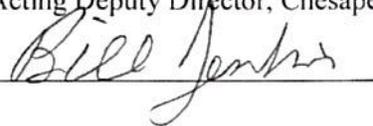


**CHESAPEAKE BAY PROGRAM OFFICE  
QUALITY ASSURANCE MANAGEMENT PLAN**

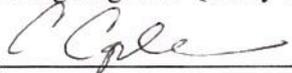
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## 1 MANAGEMENT AND ORGANIZATION

### 1.1 QUALITY ASSURANCE POLICY STATEMENT

#### 1.1.1 Introduction

The U. S. Environmental Protection Agency (EPA) initiated the Chesapeake Bay Program in 1977. Under Title I, Section 117 of the Clean Water Act (CWA), Congress directed EPA to establish a research program capable of defining historical water quality conditions in Chesapeake Bay, characterizing current baseline conditions and developing computation and data management tools that would be used in future management of the Bay's water quality and living resources. The research program results revealed numerous weaknesses in earlier data collection efforts on the Bay and observed that there was a lack of comparable data sets for portions of the Bay and its tidal tributaries.

In 1983, the first of a series of formal, voluntary agreements among state and federal jurisdictions was signed – a simple, one-page document pledging the partners to work together to restore the Chesapeake Bay. In 1987 a second Chesapeake Bay Agreement was signed. Signatories to this Agreement formed the [Chesapeake Executive Council](#), as directed by the 1987 Clean Water Act, to coordinate state and federal protection and restoration efforts. The Chesapeake Executive Council continues to develop new agreements and directives that prescribe specific goals, objectives and commitments for basin-wide restoration and protection actions. The [2014 Chesapeake Watershed Agreement](#) is the most recent agreement.

The mission of the Chesapeake Bay Program Office is clearly defined under the Clean Water Act in § 117(b)(2), which requires that the EPA Administrator maintain the Chesapeake Bay Program Office within EPA, to be a member of and support the Chesapeake Executive Council through the following functions:

- a. Implementing and coordinating science, research, modeling, support services, monitoring and data collection;
- b. Developing and making available, information pertaining to the environmental quality and living resources of the ecosystem;
- c. Assisting the signatories to the Chesapeake Bay Agreement in developing and implementing specific action plans to carry out their responsibilities;

- d. Coordinating EPA actions with State and Federal actions to improve the water quality and living resources in the Chesapeake Bay ecosystem; and
- e. Implementing outreach programs for public information, education and participation to foster stewardship of Bay resources.

Work to improve the water quality in the Chesapeake Bay watershed is focused on the reduction of nitrogen, phosphorus and sediment pollutants which are largely responsible for the Bay's water quality and habitat impairments. These pollutants come from many sources, including sewage treatment plants, city streets, development sites, agricultural operations, and deposition from the air onto the waters of the Chesapeake Bay and the lands of the watershed.

#### 1.1.2 Importance of Environmental Data

Many management decisions being made to accomplish the Chesapeake Bay restoration and protection ultimately require the use of environmental data produced by EPA and/or by the federal, state, local and academic partners. The collection, compilation, evaluation and reporting of environmental data are necessary to carry out the mandated Chesapeake Bay Program Office functions listed above. It is necessary that the origin and quality of the data used to make these decisions is of known and documented quality so that the most beneficial, cost-effective actions may be taken.

#### 1.1.3 Quality System Goals and Objectives

The Chesapeake Bay Program Office maintains a formal Quality Management System to ensure that all environmental data and related information products generated under its funding purview are of adequate quality to support immediate and future management decisions. The Quality System provides the necessary elements and procedures to plan, implement, document, and assess the quality of data and information products. Attachment 1 lists the major products and services covered by the Chesapeake Bay Program Office Quality System.

The Quality System ensures the integrity of the environmental data, i.e., the data must be scientifically valid, legally defensible, of known and documented quality and designed to meet data user requirements. The quality of the data is known when all components associated their derivation (methods, precision, bias, completeness, comparability, sensitivity, and representativeness) are documented. To achieve these objectives, quality assurance practices are incorporated into all phases of the environmental data collection, analysis and reporting activities, from the planning stages, through implementation, assessment and ultimately dissemination of data

products and services.

This Quality Management Plan satisfies Agency policy for environmental data collection set forth in [EPA Order CIO 2105.0](#) (formerly 5360.1), which requires that EPA programs establish and implement a Quality Management System. It defines and describes the quality assurance policies and responsibilities prescribed by the Chesapeake Bay Program Office to ensure that the results of technical work are of the type and quality needed for their intended use.

This document also describes the objectives, organization, policies and work processes designed to produce data of known quality that guide Project Officers and Grant Managers in the uniform application of requirements to all grants, contracts, cooperative and interagency agreements involving environmental data.

#### 1.1.4 Policy

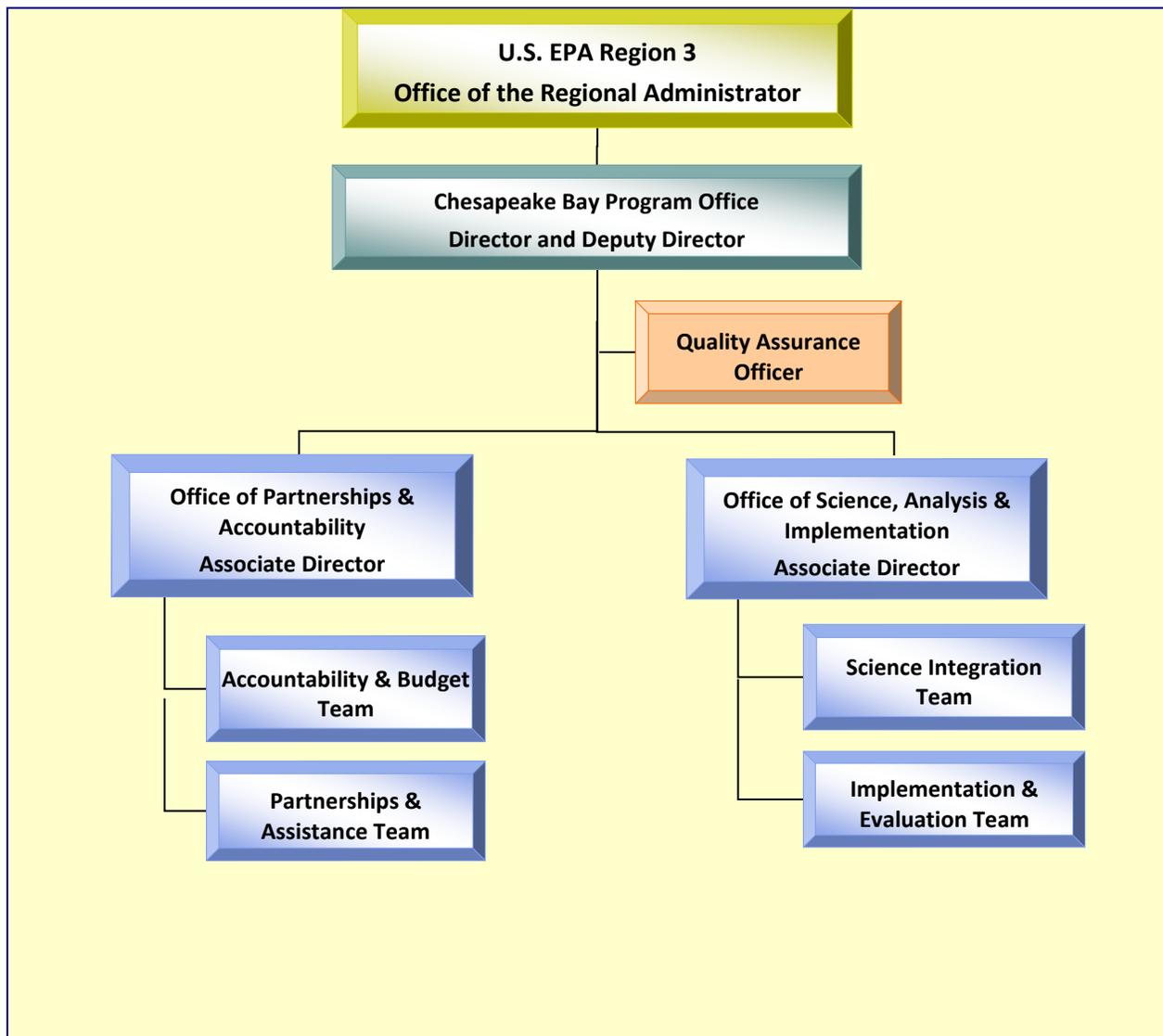
It is the policy of the Chesapeake Bay Program Office that the Quality System will be appropriate to assure that all environmental data acquired, and where possible, processed or used by the Chesapeake Bay Program Partnership, will be scientifically valid; of acceptable completeness, representativeness, and comparability; and of a known and documented quality. It is also the policy of the Chesapeake Bay Program Office that disseminated information will be presented in an accurate, clear, complete, and unbiased manner.

The quality of the data generated under the auspices of the Chesapeake Bay Program Partnership shall meet or exceed all State, Regional and National Program Office requirements. This policy shall be implemented by ensuring that for all environmental data related efforts, adequate quality assurance procedures will be employed throughout the entire environmental data collection process from study design through data access. The Chesapeake Bay Program Office will allocate sufficient funds to ensure that these policies are carried out.

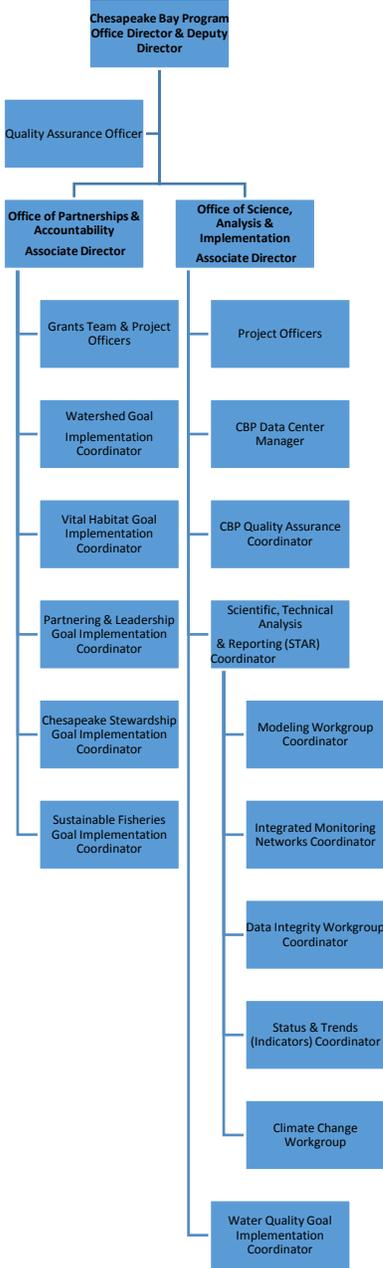
## 1.2 ORGANIZATIONAL CHARTS

The Chesapeake Bay Program Office is organizationally located under the Office of the Regional Administrator within EPA Region 3 (Figure 1).

**Figure 1: CHESAPEAKE BAY PROGRAM OFFICE ORGANIZATION CHART**



**Figure 2: CHESAPEAKE BAY PROGRAM OFFICE ORGANIZATION AND LINE AUTHORITY IN TERMS OF MANAGERS, PROJECT OFFICERS AND GOAL IMPLEMENTATION TEAM COORDINATORS**



## 1.3 RESPONSIBILITIES

### 1.3.1 Organization, Delegations and Responsibilities

The **Director of the Chesapeake Bay Program Office** has overall program management responsibilities for all restoration and protection activities including the acquisition of data of documented quality and management responsibilities for the development, implementation, and continued operation of the Chesapeake Bay Program Office Quality Assurance Program. Specific quality assurance management and implementation responsibilities are assigned to the Associate Director for Science, Analysis and Implementation, Project Officers, and Coordinators for the Chesapeake Bay Program Goal Implementation Teams, the Chesapeake Bay Program Quality Assurance Coordinator and the Chesapeake Bay Program Data Center Manager.

The authority and responsibility for managing the quality assurance activities within the Chesapeake Bay Program Office has been delegated to the **Associate Director of the Office of Science, Analysis and Implementation** as the **Chesapeake Bay Program Office Quality Assurance Officer**. The Chesapeake Bay Program Office Quality Assurance Officer has the overall responsibility for the development, implementation and continued oversight of the Chesapeake Bay Program Office Quality Assurance Program. The Chesapeake Bay Program Quality Assurance Officer reports directly to the Director of the Chesapeake Bay Program Office and serves as the quality assurance liaison with the Regional Office.

The following list describes the responsibilities of the Chesapeake Bay Program Office Quality Assurance Officer:

- Serves as the official Chesapeake Bay Program Office contact for all quality assurance and quality control matters of the Chesapeake Bay Program Office;
- Coordinates Chesapeake Bay Program Office quality assurance matters with the Regional Quality Assurance Manager to ensure that all methods, quality assurance policies are in accordance with National and Regional guidelines;
- Prepares the Chesapeake Bay Program Office Quality Management Plan;
- Oversees annual review and revision (if necessary) of the Chesapeake Bay Program Office Quality Management Plan;
- Oversees all quality assurance and quality control activities within the Chesapeake Bay Program Office;

- Identifies and delegates responsibility for responding to specific quality assurance and quality control needs and also ensures timely answers to requests for guidance or assistance.
- Ensures all required quality assurance management plans and quality assurance project plans are technically reviewed and approved prior to conducting environmental data operations under grants, contracts, cooperative agreements, and interagency agreements;
- Ensures that problems and deficiencies identified in technical audits and data analysis are resolved;
- Includes specifications in the annually updated Chesapeake Bay Program grant, cooperative and interagency agreement guidance for quality assurance requirements; and
- Establishes criteria for the acceptability of quality documentation in Chesapeake Bay Program quality assurance reports.

**Project Officers** have the overall responsibility for ensuring that the recipients of federal funds implement the quality assurance activities required by EPA as stated in the [U.S. EPA Chesapeake Bay Program Office Grant and Cooperative Agreement Guidance](#) (Grant Guidance) and documented with the individual assistance agreements. The Project Officers ensure all statements of work describe the intended use of environmental data to be collected so that specific guidance and criteria pertaining to the quality of the data can be given. Project Officers must obtain agreement from the Chesapeake Bay Program Office Quality Assurance Officer on all matters affecting quality assurance but are ultimately responsible for resolving problems and deficiencies identified in technical reviews, audits and data analysis.

**Chesapeake Bay Program Goal Implementation Team Coordinators** are responsible for ensuring that requirements of the Quality Assurance Program are identified during Goal Implementation Team meetings and in activities sponsored by the Teams. The Coordinators ensure that quality assurance is an integral part of each environmental data collection activity sponsored by the Goal Implementation Team. Coordination of quality assurance activities among numerous partner state and federal agencies, academic institutions, and organizations is accomplished through the Team and/or its workgroups.

The **Chesapeake Bay Program Quality Assurance Coordinator** is responsible for coordinating quality assurance efforts among and between the Chesapeake Bay Program partners as they relate to environmental data collection efforts supporting Bay restoration and protection programs. The Chesapeake Bay Program Quality Assurance Coordinator reviews federal assistance agreements prior to award to determine if the proposed work has quality assurance requirements. Each determination is documented in a quality assurance review form and provided to the Project Officer, who notifies the recipient of the requirements and files the review form in the assistance agreement records. This procedure is repeated for subsequent changes to the assistance agreement's work plan.

The Quality Assurance Coordinator performs a technical review of the required quality assurance documents and makes recommendations on the adequacy of the plans to achieve the project objectives to the Project Officers and the Quality Assurance Officer and, as necessary, coordinates the resolution of deficiencies. S/he tracks the projects with quality assurance requirements by title, preparer and dates received, reviewed and approved.

The Quality Assurance Coordinator monitors the performance of environmental laboratories through inter-laboratory quality assurance samples. S/he participates in the technical assessment of the coordinated split sample results and the blind audit sample results and prepares or reviews summary and individual laboratory performance reports.

The Quality Assurance Coordinator performs technical system audits—systematic on-site reviews of field and laboratory facilities, equipment, training, procedures, record-keeping, data validation, data management, and reporting aspects of the total quality assurance system to ensure that the approved quality assurance project plans, approved quality management plans, as well as approved sample handling and analytical procedures are in use. The Coordinator summarizes, substantiates and presents the audit findings to the Chesapeake Bay Program Office Quality Assurance Officer.

The roles and responsibilities of the Chesapeake Bay Program Office Quality Assurance Officer and the Chesapeake Bay Program Quality Assurance Coordinator are differentiated in *Attachment 2, Cross-walk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office*.

The **Chesapeake Bay Program Data Center Manager** has the program management responsibility for ensuring all the environmental data generated through the monitoring programs and projects funded directly by the EPA Chesapeake Bay Program Office or as matching funds have been subjected to an audit of data quality and will be documented as to known quality. This environmental data is considered public domain and will be made publicly available through the Chesapeake Center for Collaborative Computing (C4) as an asset of the Chesapeake Bay Program. Additional responsibilities include:

- Ensuring security, stability and availability of the EPA network for the Annapolis office;
- Coordinating the public dissemination of Chesapeake Bay data with the Chesapeake Center for Collaborative Computing (C4);
- Evaluating and implementing new technologies to address information technology needs; and
- Coordinating the implementation of the Chesapeake Bay Program target enterprise architecture.

### 1.3.2 Communications

There are many forms of communication for ensuring quality assurance is integral to environmental collection efforts. Chesapeake Bay Program Office managers—Director, Deputy Director and Associate Directors—review the Quality Management Plan and concur by signing the document. Project Officers are required to renew their Project Officer certifications every three years which includes the most recent requirements of the quality system. The Project Officers are briefed annually on changes to the Grant Guidance including changes to QA requirements, if applicable. These requirements are also communicated to grantees and assistance agreement holders via the annually updated Grant Guidance, which is described in Section 4 below.

Once a submitted Quality Assurance Project Plan is approved, grantee reports are submitted quarterly or semi-annually and include any updates regarding the Plan's status. Further quality assurance and quality control documentation is required with the submission of data such as quality control sample results and metadata for the data themselves. Progress reports should include any changes to the quality assurance program plan or standard operating procedures; status of completion of outstanding quality assurance plans; significant quality problems, accomplishments, and status of corrective actions.

The Project Officer shall notify the Chesapeake Bay Program Office Quality Assurance Officer immediately of any problem areas identified. Necessary changes

will be jointly outlined, and the Project Officer will institute the corrective actions. A follow-up review of the required changes will be made by the Chesapeake Bay Program Office Quality Assurance Officer and the Project Officer to verify that problems have been corrected.

The Chesapeake Bay Program Partnership's website is used to communicate [Quality Assurance Program](#) aspects to the public and to describe activities of the Chesapeake Bay Program Partnership's [Data Integrity Workgroup](#). These websites contain information pertaining to quality assurance policies, guidance documents, meeting materials, consensus standards, decisions, etc.

#### 1.4 RESOURCES FOR THE QUALITY ASSURANCE PROGRAM

Responsibilities for implementation of the Chesapeake Bay Program Office Quality Assurance Program are distributed across a wide array of Project Officers, Goal Implementation Team Coordinators, Workgroup Coordinators, the Data Center Manager and others beyond the Chesapeake Bay Program Office Quality Assurance Officer. Without a dedicated EPA FTE Chesapeake Bay Program Office Quality Assurance Officer position, the Associate Director of the Office of Science, Analysis and Implementation performs all the duties of the Chesapeake Bay Program Office Quality Assurance Officer. The Chesapeake Bay Program Office funds a full time Chesapeake Bay Program Quality Assurance Coordinator through an interagency agreement with the U.S. Geological Survey.

## 2 QUALITY SYSTEM AND DESCRIPTION

The goal of the Chesapeake Bay Program Office's Quality Management System is to ensure that each EPA-funded project involving the acquisition of new environmental data includes sufficient up-front planning for the development of well-defined project goals and data quality objectives. These objectives need to be supported by implementation of sufficient sampling design, collection, and analytical protocols such that the resultant data completely and accurately addresses the project's goals. The data must be of known and documented quality and have sufficient supporting documentation so that subsequent data users can evaluate if the data meets their data needs.

### 2.1 DESCRIPTION

It is the policy of the Chesapeake Bay Program Office that:

- This Quality Management Plan is implemented as described herein and reviewed annually to ensure that it continues to accurately describe the organization and quality management policies of the Chesapeake Bay Program Office.

- Each agency receiving Chesapeake Bay Program Office grant or cooperative agreement funds for environmental data operations must maintain an approved Quality Management Plan or its equivalent that conforms to the document [EPA QA/R-2, Requirements for Quality Management Plans.](#)
- Each major project or program funded by the Chesapeake Bay Program Office which generates or uses environmental data will develop and implement a Quality Assurance Project Plan addressing the required major elements and will ensure that adequate resources (both monetary and staff) are provided to support the quality assurance effort. Quality Assurance Project Plans will specify the detailed procedures required to assure quality data and satisfy the requirements of the document [EPA QA/R5, Requirements for Quality Assurance Project Plans](#) and all applicable Chesapeake Bay Program objectives and protocols.
- Quality Assurance Project Plans must be jointly approved by the Chesapeake Bay Program Quality Assurance Officer and the Project Officer prior to environmental data collection. Special exemptions can only be requested and approved through the Chesapeake Bay Program Office Quality Assurance Officer.
- All environmental data generated for the Chesapeake Bay Program Partnership through direct Chesapeake Bay Program Office funding or matching funding will be of known and acceptable quality as defined in the data quality objectives. The data quality information developed for all environmental data will be documented and made electronically available along with the data itself through the Chesapeake Center for Collaborative Computing (C4).
- The intended use(s) of the data will be defined before the data collection or analysis effort begins, so that appropriate quality assurance measures may be applied to ensure a level of data quality commensurate with the monitoring objectives. The determination of this level of data quality shall also consider the prospective data needs of secondary users.
- Data quality objectives will be established to ensure the utility of the environmental data for its intended use and as guidance for preparation of Quality Assurance Project Plans. The intended data uses, level of quality, specific quality assurance activities, and data acceptance criteria needed to meet the data quality needs of these uses will be described in each environmental data collection activity's Quality Assurance Project Plan.
- Quality assurance activities will be designed in the most cost-effective fashion possible without compromising data quality objectives.

As the Chesapeake Bay Program partners continue to work to minimize the redundancy of

monitoring efforts in the Chesapeake Bay and across the surrounding watershed while maximizing the amount of quality environmental data made accessible through the expanding set of information network exchanges, the Chesapeake Bay Program partners need to use data generated through other Regional grants. Under the auspices of the Regional Quality Management Plan, Chesapeake Bay Program Office staff work through the appropriate Program Offices of Region 3 to inform them of the quality assurance requirements of the Chesapeake Bay Program for inclusion in their grant requirements as is appropriate.

## 2.2 PRINCIPAL COMPONENTS OF THE QUALITY SYSTEM

There are several base and enhanced components to the Chesapeake Bay Program Office Quality Management System to carry out these policies. The base program consists of the development and maintenance of Quality Management Plans, Data Quality Objectives, Quality Assurance Project Plans, and the Chesapeake Center for Collaborative Computing. Management and staff roles and responsibilities related to these components are described above on pages 6-10.

There are a number of additional components to the Quality System. The Chesapeake Bay Program's Data Integrity Workgroup advises the Chesapeake Bay Program's Integrated Monitoring Networks Workgroup on field and analytical methodology and quality assurance issues. The Data Integrity Workgroup is responsible for the Chesapeake Bay Program's Coordinated Split Sample Program and Blind Audit Program, which ensures that data from the different laboratories are comparable, and for the maintenance of program-wide Methods Manual. The Data Analysis Issues Tracking System (DAITS) is used to identify, investigate, resolve and document data anomalies that may affect the interpretation of the data. The Chesapeake Bay Program Office's Data Center Team is charged with developing data/information management and submission policies and guidelines.

### 2.2.1 Data Quality Objectives

Data quality objectives are statements of the quality of environmental data required to support Program decisions or actions. Prior to initiating or significantly changing long-term, multi-jurisdictional monitoring programs, the Chesapeake Bay Program Partnership establishes data quality objectives through a formally structured process where it is determined which environmental data are needed, what data quality is required and what is the appropriate balance between time, resources and data quality.

### 2.2.2 Quality Assurance Project Plans

All directly Chesapeake Bay Program Office funded and in-kind match projects

which involve the collection of new environmental data (activities that involve the measurement, monitoring or collection of physical, chemical, or biological data) are required to document all aspects of their project's sampling design, sample collection, analysis, quality control, and data management activities in a quality assurance project plan. Within the Chesapeake Bay Program Partnership, these projects include the collection of groundwater, surface water quality, sediment, atmospheric, living resource, and remotely sensed data as well as the collection of environmental data to assess the efficiency of implemented management practices or control technology upgrades.

A quality assurance project plan is a formal document describing the methods for collecting and assessing environmental data, quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. The plan also describes any limitations on the use of the data that will be generated.

The quality assurance project plan is submitted to the Project Officer along with the draft grant or assistance application or listed as a deliverable to be received at least 30 days prior to the initiation of each data collection or data compilation activity. Each of the extramural organizations' Quality Assurance Project Plan must be reviewed and approved by EPA prior to the initiation of each data collection or data compilation activity. The requirements for quality assurance project plans are defined in [QA/R-5: EPA Requirements for Quality Assurance Project Plans](#) (U.S. EPA 2001).

For ongoing environmental data collection programs, quality assurance project plans must be updated annually to document any procedural changes to field, sample handling and storage, laboratory analysis, quality control and data management activities. The funding recipient must notify the Project Officer prior to changing the number of samples collected, the number of sites, methodologies or parameters tested. If no changes are required to an existing quality assurance project plan, the funding recipient is required to provide written documentation (e.g., a letter, an email) to the Project Officer that a review was conducted, and no changes have occurred.

All efforts must be made to produce data that is comparable to data collected previously and currently by other Chesapeake Bay Program grant, cooperative agreement, contract, and interagency agreement recipients and partners. The funding recipient shall ensure the agencies, academic institutions, and/or consulting firms responsible for field sample collection and/or laboratory analysis of environmental samples collected using Chesapeake Bay Program funds or match funds will participate in the Chesapeake Bay Program Coordinated Split Sample and Blind

Audit Program.

### 2.2.3 Quality Management Plans

In accordance with 40 CFR 30.54 and 31.45, organizations conducting environmental programs funded by EPA that acquire, generate, compile, or use environmental data and technology are required to establish and implement a quality system. Recipients of ongoing contracts, grants or cooperative agreements shall describe their quality system in a written Quality Management Plan. Quality Management Plans must be prepared in accordance with [EPA QA/R-2: EPA Requirements for Quality Management Plans](#) and be submitted for review and approval to the U.S. EPA Region 3 Quality Assurance Manager. Prior to the initiation of environmental data collection and/or compilation activities, each of the extramural organization's Quality Management Plan must be reviewed and approved. The Chesapeake Bay Program Office Quality Assurance Officer may approve combined Quality Management and Quality Assurance Project Plans.

Quality Management Plans are not required from federal agencies outside of EPA; however, it is the policy of the Chesapeake Bay Program Office that all federal interagency agreements fulfill all Quality Assurance Project Plan requirements.

### 2.2.4 Standard Operating Procedures

Quality Assurance Project Plans submitted under grants and cooperative agreements may include Standard Operating Procedures (SOPs) to describe detailed sample collection and laboratory procedures. The SOPs are incorporated by reference and are submitted, reviewed and approved at the same time as the corresponding Quality Assurance Project Plan.

The Chesapeake Bay Program Office maintains internal SOPs for the management of monitoring data submitted to the Chesapeake Center for Collaborative Computing. Monitoring data are checked, compiled and uploaded into their respective databases according to data management SOPs. These SOPs are written by personnel performing the routine data management tasks and reflect actual data processing practices. Chesapeake Bay Program Office SOPs are prepared in document control format and are submitted to the Chesapeake Bay Program Office Quality Assurance Officer for approval and maintenance in a permanent file. Where applicable, the SOP is also kept in the grant file under which the data manager is funded. A listing of current SOPs follows.

Chesapeake Bay Program Data Management SOPs

- (1) *Standard Operating Procedures for Managing Water Quality Monitoring Data*, Chesapeake Bay Program, Revision 4, January 2011.
- (2) *Standard Operating Procedures for Managing Non-Point Source Data*, Chesapeake Bay Program, June 2002. Amended June 2009.
- (3) *Standard Operating Procedures for Managing Point Source Data* Chesapeake Bay Program, Revision 1, November 2006.
- (4) *Standard Operating Procedures for Conducting Geographic Information System (GIS) Projects*, Chesapeake Bay Program, December 2011.
- (5) *Standard Operating Procedures for Managing Living Resource Monitoring Data at the Chesapeake Bay Program*, Revision 3, June 2013.

#### 2.2.5 Chesapeake Center for Collaborative Computing (C4)

The Chesapeake Center for Collaborative Computing (C4) is the information system used by the Chesapeake Bay Program Partnership to collect, assemble, aggregate, provide quality assurance, and publicly disseminate Chesapeake Bay information. Implemented and managed through an EPA cooperative agreement, C4 is the authoritative source for Chesapeake Bay Program Partnership quality assured data. C4 supports, manages, and centralizes the flow of data to and from Chesapeake Bay Program partners including federal, state and local agencies; academic institutions; non-governmental organizations; private organizations; and advisory groups and commissions.

#### 2.2.6 Audits and Assessments

Technical assessments of long-term monitoring activities are conducted to confirm that grantee Quality Assurance Project Plans are being implemented. Each quarter, laboratory proficiency sample results are reviewed by the Chesapeake Bay Program Quality Assurance Coordinator and, if necessary, corrective actions are initiated. Proficiency sample results are summarized and reported annually to the major laboratories.

Independent assessments of quality control operations are periodically performed to ensure that grantees are meeting data quality objectives. The Chesapeake Bay Program Quality Assurance Coordinator conducts on-site technical audits periodically, or when unsatisfactory proficiency or quality control sample results are received. Further details are described in Section 9 below. For new monitoring programs, readiness reviews are done to assess grantee capability to carry out field, laboratory and/or data management activities.

Internal audits and self-assessments of grant files are routinely conducted by the Chesapeake Bay Program Office Grants Team to ensure that quality assurance requirements have been met and documented in the grant files.

### 2.2.7 Best Management Practices (BMP) Verification

Adopted by the Chesapeake Bay Program Partnership in October 2014, the [Chesapeake Bay Basinwide BMP Verification Framework](#) provides a structure by which Bay Program partners ensure BMPs, treatments, and technologies for reducing nitrogen, phosphorus, and/or sediment pollutant loads are implemented and operating correctly. Verification can be viewed as a life cycle process that includes initial inspection, follow-up checks, and evaluation of BMP performance.

The implementation, tracking, and reporting of BMPs has been at the center of the Chesapeake Bay Program Partnership's restoration efforts for almost three decades. In addition to nutrient and sediment load reductions, these practices can help reduce local flooding, protect sources of drinking water, ensure against the collapse of stream banks, and support local economies through the return of clean water and viable habitats suitable for recreational activities. Conversely, improperly installed or functioning BMPs do little to mitigate the effects that nutrient and sediment runoffs can have on local waterways. Verification will help the Partnership measure success, locate areas in which partners need to adapt, and ensure that these conservation and technological practices are doing the job of protecting lands, riparian habitats, and local streams.

In 2017, each jurisdiction was required to develop a BMP Verification Program Plan – also known as a Quality Assurance Project Plan or QAPP – for each pollutant source sector that has been reviewed and approved (at various levels of completion) by EPA by October 2018. In developing and assessing these QAPPs, jurisdictions and EPA followed five verification principles. The principles provide the common bar with which partners can judge the distinct components of the framework so that everything is aligned to hit the same mark in the end. The principles are specifically defined at

[https://www.chesapeakebay.net/what/programs/bmp\\_introduction\\_to\\_bmp\\_verificati](https://www.chesapeakebay.net/what/programs/bmp_introduction_to_bmp_verificati)

[on/bmp\\_verification\\_principles](#) and cover 1) practice reporting, 2) scientific rigor, 3) public confidence, 4) adaptive management, and 5) sector equity.

Jurisdictions were required to clean up their records of historic BMP implementation for the period 1985 – 2017 and submit data through the NEIEN (National Environmental Information Exchange Network) – as is done annually for modeled progress assessments. For the first time in the history of the Partnership, each BMP has an assigned date of implementation along with a Partnership-approved lifespan as the credit duration for that practice.

All reported practices will expire at the end of their assigned lifespan and be removed from current crediting for nutrient and sediment pollutant load reductions in the accountability system unless a jurisdiction reports a BMP as having been verified as still in place and fully functioning. If BMPs are not operating according to specifications, the responsible party's maintenance and compliance programs are to remediate the situation and report that practice for continued crediting. As agreed to by the Partnership in our *2014 Chesapeake Bay Basinwide BMP Verification Framework*, this is the insurance that protects private and public financial investments, habitats, and drinking water, and improves the quality of our streams and the estuary.

EPA expects that reported BMP data follow the assurances of quality defined in each jurisdiction's EPA-approved BMP Verification Program Plan. The BMPs are to follow the definitions of the practices and control technologies as recognized for Chesapeake Bay Program purposes.

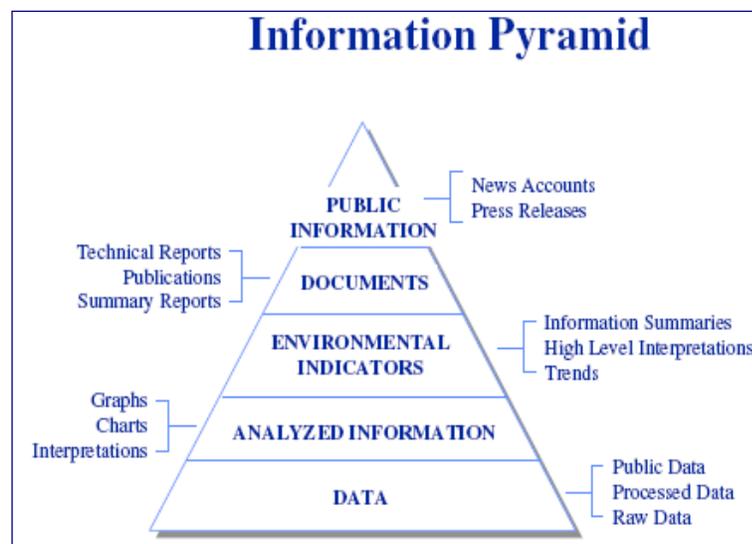
Starting with the 2018 progress year, EPA expects that BMPs reported as new or re-inspected implementation are accurate with respect to the amount of fully-functioning BMPs, their location, and the dates of implementation and verification. As stated in the 2018 Chesapeake Bay Program's Grant Guidance, BMP data reported through NEIEN are to be assured for quality, submitted no later than December 1, 2018, and cover the reporting period beginning July 1, 2017. BMPs reported through NEIEN (starting with the 2018 progress submission) that do not have and/or do not meet approved verification protocols will not be credited.

To ensure each jurisdiction has a robust operational BMP verification program, their QAPPs need to be updated when changes are made to their – or the Chesapeake Bay Program's – tracking mechanisms, the [Basin-wide BMP Verification Framework](#), or methods for implementation accounting. The draft plans are, in turn, reviewed by EPA. When specific verification program elements are found to be needing further attention, they need to be addressed by the specific source sector in the jurisdiction. This protocol ensures BMP Verification Program Plans are up-to-date and follow the

latest agreed-to principles established by the Partnership.

### 2.2.8 Pre-Dissemination Review of External Documents

The Chesapeake Bay Program Office ensures the quality of publicly-released data and information products at each level of the Chesapeake Bay Information Pyramid (shown below). The quality of the stored data, analyzed information and environmental indicators is well documented so that reports, websites and publications based on that information are credible and transparent. Attachment 4, Template for CBP Indicator Analysis and Methods Document, contains the pre-dissemination review requirements for environmental indicators.



## 2.3 PRODUCTS AND SERVICES SUPPORTED BY THE QUALITY SYSTEM

There are numerous environmental monitoring and modeling programs supported and/or influenced by the Chesapeake Bay Program Office Quality System. These programs are summarized below and listed in Attachment 1, Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System. Attachment 1 includes major publications and information products that rely on these quality-assured data sources.

### 2.3.1 Long-term Monitoring Programs

The Quality System supports major, long-term monitoring programs and networks that produce a substantial amount of environmental data which are compiled and maintained in centralized databases. The data are used for a variety of products and

services such as: calculating compliance with the jurisdictions' Chesapeake Bay water quality standards; supporting Clean Water Act §303 (d) listings, evaluating trends; estimating nutrient and sediment loadings; creating environmental indicators; calibrating environmental models; developing regulatory pollution budgets (e.g., TMDLs); and targeting expenditures of resources towards pollution sources and/or geographies for the most environmental benefit at the least cost. The major [monitoring programs](#) supported by the Chesapeake Bay Program Office and its Quality System are:

- Chesapeake Bay Mainstem & Tidal Tributary Water Quality Monitoring Program;
- [Chesapeake Bay Watershed Surface Water Quality and Stream Flow Monitoring Network](#);
- Chesapeake Bay Watershed Biological Monitoring Network;
- [Chesapeake Bay Shallow-Water Water Quality Monitoring Program](#);
- [Chesapeake Bay Benthic Invertebrate Monitoring Program](#); and
- [Chesapeake Bay Submerged Aquatic Vegetation Aerial Survey](#).

### 2.3.2 Modeling

The Quality System covers the environmental models and related decision-making support tools developed and used by the Chesapeake Bay Program Partnership. The quality and transparency of each model component is assured at various stages of development. Input data must be of known quality; model codes are tested and documented in permanent records; models are calibrated, and the output verified. All modeling activities, assumptions and management applications are subject to scientific, independent external peer reviews. Examples of Chesapeake Bay Program model protocols and assessments are contained in the following documents:

- [Chesapeake Bay Watershed Model Phase 6 Review](#) (STAC 2008);
- Chesapeake Bay Watershed Model Phase 6 [Scenario Builder Application](#);
- State Quality Assurance Project Plans for compiling and reporting nutrient and sediment source (BMP) data;
- [Review of the Phase 6 Watershed Model hydrologic calibration](#); and
- [Chesapeake Bay Estuary Model Calibration and Application to Water Quality Criteria](#).

Additional information about Chesapeake Bay Program modeling, publications and projects may be found on the [Chesapeake Bay Program Modeling Team](#) website.

### 2.3.3 Environmental Indicators and Information

Environmental indicators are used by Chesapeake Bay Program managers to summarize pollution sources, ecosystem conditions, and trends toward meeting specific restoration goals of the Watershed Agreement. Assessments using Bay health and restoration indicators are incorporated into scientific and management publications, websites and accountability tracking systems.

Chesapeake Bay Program Goal Implementation Teams and workgroups have the lead responsibility to create and update CBP indicators. The work is coordinated through the Chesapeake Bay Program Partnership's Status and Trends Workgroup, whose members ensure that Chesapeake Bay Program's indicators use the best available data and comparable analyses for each indicator.

Status and Trends Workgroup: Procedures for Updating, Adapting & Establishing New Indicators | June 2016:

[http://www.chesapeakebay.net/channel\\_files/24154/stw\\_indicator\\_process\\_final\\_06-16-2016.pdf](http://www.chesapeakebay.net/channel_files/24154/stw_indicator_process_final_06-16-2016.pdf)

The quality and sources of data for each indicator is reviewed, documented and approved. See Attachment 4, Chesapeake Bay Program Indicator Framework Indicator and Data Survey. All indicators are reviewed by Chesapeake Bay Program's Scientific, Technical, Analysis, and Reporting Team, the Chesapeake Bay Program Office's Communications Team and the Chesapeake Bay Program's Management Board prior to release on the website [Chesapeake Progress](#), and other Partnership publications such as the Bay Barometer.

## 3 PERSONNEL QUALIFICATION AND TRAINING

EPA and its other Chesapeake Bay Program partners have received training in the context of tasks and functions related to data quality for the Chesapeake Bay Program. In addition, they are required to draw upon their educational background, experience, professional symposia, and on-the-job training. Staff participates in technical workshops to share and expand their knowledge in their areas of expertise. Staff proficiency is demonstrated through workshop presentations, written reports, committee presentations and Chesapeake Bay Program publications. The Chesapeake Bay Program Quality Assurance Coordinator has completed the following EPA Quality Assurance Training Classes:

1. Orientation to Quality Assurance Management
2. Data Quality Objectives
3. Preparing Quality Assurance Project Plans

4. Reviewing Quality Assurance Project Plans
5. Sampling Design
6. Environmental Data Verification and Validation
7. Laboratory Quality Systems

Project Officers receive formal instruction from the Agency every three years to explain their legal assistance agreement oversight responsibilities. Project Officers who intend to approve Quality Assurance Project Plans must complete courses 1, 2, and 4 listed above and must be authorized to do so by the Chesapeake Bay Program Office Quality Assurance Officer, who will document the completion of the required training.

## **4 FINANCIAL ASSISTANCE**

### **4.1 COMPETITIVE FUNDING PROCESS FOR GRANTS AND COOPERATIVE AGREEMENTS**

Most of the environmental monitoring data acquired and used by the Chesapeake Bay Program Office are derived from approved grants and cooperative agreements. Interagency agreements may fund environmental data operations; however, these agreements are not competitively awarded. Contracts are very seldom used for environmental data acquisition.

Guidance for grant and cooperative agreement applications is developed as a collaborative effort among management, technical experts, and project officers in the Chesapeake Bay Program Office, with input from the jurisdictional Chesapeake Bay Program partners. The [\*U.S. EPA Chesapeake Bay Program Grant and Cooperative Agreement Guidance\*](#) (Grant Guidance) cites the quality assurance requirements for EPA grants and cooperative agreements that are mandated in 40 CFR Part 30.54 for universities and non-profits and Part 31.45 for states, tribal and local governments. The guidance states that recipients of grants and cooperative agreements that fund environmental data operations shall submit a Quality Management Plan and a Quality Assurance Project Plan prepared in accordance to the specifications in [\*EPA Requirements for Quality Management Plans, EPA QA/R-2\*](#) and [\*EPA Requirements for Quality Assurance Project Plans, QA/R-5\*](#).

The Grant Guidance is reviewed, updated and distributed annually to existing and potential future recipients of Chesapeake Bay Program Office funding. The guidance is also made available through the Chesapeake Bay Program Partnership's website. Requirements for quality assurance and data deliverables are communicated to grant and cooperative agreement recipients through Requests for Proposals, the Grant Guidance, during workplan reviews, and in the final award terms and conditions.

The Chesapeake Bay Program Partnership may use data which are generated under the

auspices of other EPA, federal, state, local, and non-governmental organization funding mechanisms. For data beyond the direct control or influence of the decision makers and users within the Chesapeake Bay Program Office, Chesapeake Bay Program Office staff actively works with Region 3 programs and with other funding partners to develop consistent guidance materials and Quality Assurance Project Plans.

#### 4.2 REVIEW AND APPROVAL OF RESPONSES TO REQUEST FOR PROPOSAL ANNOUNCEMENTS

The Chesapeake Bay Program Office has a system in place to review and approve proposals for grants and cooperative agreements. The process is initiated through extensive advertisement of a Request for Proposals (RFP) through website postings, hard copy and e-mail mailings using a RFP mailing list. Once proposals are received, they are initially screened by the Chesapeake Bay Program Office administrative team for deadline requirements, necessary applicant designations (e.g. nonprofit status), and other requirements specified by the RFP. After initial screening, eligible proposals are sent to a panel of three to five reviewers who rate each proposal on a predetermined set of criteria which is addressed within the RFP. Each reviewer is required to sign a conflict of interest form prior to initiating any proposal review. The ratings for each proposal and the review team's recommendations are sent to the Chesapeake Bay Program Office Director for a final selection of the grant or cooperative agreement recipient(s).

#### 4.3 REVIEW AND APPROVAL OF GRANT AND COOPERATIVE AGREEMENT APPLICATIONS / AWARDS

Following the selection of the recipient(s) and proposal to be funded, the applicant(s) is required to submit a formal grant/cooperative agreement application. The application then goes through extensive administrative and technical reviews. Once the final award document is signed, work can begin on the project, however, the recipient must have an approved Quality Management Plan and Quality Assurance Project Plan in hand before environmental data collection or compilation work begins.

Post-award oversight by the Chesapeake Bay Program Office is mandated through the Chesapeake Bay Program Office Post-Award Monitoring Plan for Grants and Cooperative Agreements. This document describes in detail the duties of the Project Officer and supporting Chesapeake Bay Program Office Grants Management Team such as:

- Comprehensive tracking of administrative and technical elements of assistance agreements;
- Communication between recipients and the Grants and Audit Management Branch;
- Documentation of files;
- Monitoring of a recipient's compliance with the Statement of Work, Assistance

- Agreement Terms and Conditions and Budget Expenditures;
- On-site, six-month, and closeout requirements;
- Certification of the receipt of final deliverables; and
- Attendance at periodic Project Officer meetings and scheduled training.

The Post-Award Monitoring Plan also addresses:

- Functions of the Chesapeake Bay Program Office Grant Special Task Team; and
- Duties of the Designated Liaison with Grants and Audit Management Branch.

The Chesapeake Bay Program Office Grants Team provides training to and periodically audits the Project Officers' office grant/cooperative agreement/interagency agreement files to ensure that they contain the required information.

#### 4.4 REVIEW AND APPROVAL OF QUALITY ASSURANCE PROJECT PLANS

All environmental data collection and analysis efforts funded by the Chesapeake Bay Program Office, including Interagency Agreements, shall have an associated Quality Assurance Project Plan approved by the Chesapeake Bay Program Office Quality Assurance Officer and the respective Project Officer. Specifically, the Quality Assurance Project Plan shall ensure that:

- The level of data quality needed will be determined and stated before the data collection effort begins; and
- All environmental data generated and processed will reflect the quality and integrity established by the Quality Assurance Project Plan.

The Quality Assurance Project Plan documents the technical and quality control aspects of the project such as data quality objectives, sampling design, sample collection, analytical methods, quality-control limits and data management. In developing this plan, all efforts must be made to produce data that is comparable to data collected previously and currently by other Chesapeake Bay Program grant recipients and partners. All Quality Assurance Project Plans shall adhere to QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (U.S. EPA 2001). Where possible, document control format as exhibited in this document should be utilized.

For all new environmental data related projects, a draft quality assurance project plan for EPA review and approval is requested 30-60 days prior to the initiation of each data collection or data compilation activity. The originating Project Officer shall notify the Chesapeake Bay Program Office Quality Assurance Officer and the respective Goal Implementation Team Coordinator regarding the processing of the grant, interagency or

formalized agreements during the planning phase. The Project Officer has responsibility for his/her project and is the official contact with the funding recipient. However, the Project Officer must obtain concurrence from the Chesapeake Bay Program Office Quality Assurance Officer on all matters affecting quality assurance.

Quality Assurance Project Plans shall be reviewed and approved prior to initiating environmental data operations, in the context of the project's objective(s) and data quality objectives. The Chesapeake Bay Program Office Quality Assurance Officer and Project Officer shall review and evaluate the use of these Plans during the environmental monitoring and assess the quality of the data generated and processed for Chesapeake Bay Program. Upon completion of the environmental data collection activities, the Project Officer shall also assess the actual performance of the planned activity and subsequent results according to the criteria described in the Quality Assurance Project Plans. Distribution lists of personnel who need to receive quality assurance reports and information are to be maintained as part of the Document Control System.

The Chesapeake Bay Program Office Quality Assurance Officer shall notify the Project Officer immediately of any problem areas identified in the review of the Quality Assurance Project Plan. Necessary changes will be jointly determined, and the Project Officer will outline the corrective actions. A follow-up review of the required changes will be made by the Chesapeake Bay Program Office Quality Assurance Officer and Project Officer to verify that problems have been corrected. Project Officers shall review, comment on, and concur with the draft project report prior to the release of the final report.

If no changes are required to an existing quality assurance project plan, the grant/cooperative agreement/interagency agreement recipient is required to provide written documentation (e.g., a letter, email) to the Project Officer stating that a review was conducted, and no changes have occurred. The Chesapeake Bay Program Office Quality Assurance Officer and Project Officer must find the current Quality Assurance Project Plans for these activities acceptable prior to the approval of the grant, cooperative agreement or interagency agreement.

The Chesapeake Bay Program Office Quality Assurance Officer maintains electronic files of Quality Assurance Project Plans and Standard Operating Plans for all environmental data collections programs funded by the Chesapeake Bay Program Office and makes these documents directly accessible to data users through the Chesapeake Bay Program Partnership's web site.

## 5 DOCUMENTATION AND RECORDS

### 5.1 DOCUMENTATION

Every data set served by Chesapeake Bay Program Office-funded data generators is accompanied by a related file documenting the source of the data, the contact for additional information, the sponsoring and collecting organizations, the reasons for collecting the data, published documents or reports associated with the data, and other items. Documentation on database files is essential for drawing meaningful interpretations of the data contained in the database. In addition, database management is dependent upon structured, easy-to-use documentation. See the “Data Downloads” section of the Chesapeake Bay Program Data Hub at <https://www.chesapeakebay.net/what/data> for a description of each monitoring program’s data. The Chesapeake Bay Program Data Center Manager ensures that these tasks are performed (See section 1.3.1).

Technical guidance and other quality-related documents are prepared by Workgroup members, peer reviewed and approved by the Scientific, Technical Analysis and Reporting Team, the Goal Implementation Team and/or Management Board. Once approved, guidance documents are given an EPA Document Control Number and filed electronically for future printings and revisions. The Chesapeake Bay Program Office Administration Team is responsible for document control of all EPA and official Chesapeake Bay Program Partnership publications and reports. A listing of publications is maintained, and hard copies kept on hand in a publication “library” at the Chesapeake Bay Program Office. For guidance documents, only the most recent versions are available for distribution. Documents and publications are also available to the public on the Chesapeake Bay Program Partnership’s website (<https://www.chesapeakebay.net>).

Documentation of data sources for publications available from the Chesapeake Bay Program Partnership’s website is achieved by requiring data sets, reports and publications to have associated metadata. For database documentation, database managers are responsible for documenting and discontinuing the use of obsolete and superseded procedures. Data management standard operating procedures (SOPs) are reviewed annually to ensure that procedural changes have been incorporated.

### 5.2 RECORDS

The Chesapeake Bay Program Office has adopted records management controls that are consistent with the [U.S. EPA Records Management Manual \(2160\)](#), i.e., records are classified, retained and disposed according to the specifications in this Manual. Chesapeake Bay Program Office staff also must comply with the Project Officer’s Manual requirements which states “Record retention requirements apply to all supporting documentation, including documentation of significant actions and decisions, cost records, scope of work,

correspondence, applications, pre-award reviews, quality assurance plans (i.e. QAPP, QMP), and funding decisions.”

The Chesapeake Bay Program Office keeps official records in-house for at least one year after the closeout of the agreement and then sends the records to the Federal Records Center where they are destroyed when they are ten years old. The retention time has been extended from seven to ten years in accordance with 31 U.S.C. 3731, the statute of limitations on civil false claims cases. If litigation, claim, negotiation, audit, or other action involving the records was started before the end of the retention period, the records must be kept until either the completion of the action and resolution of all issues which arise from it, or until the end of the established retention period, whichever is later.

The Chesapeake Bay Program Office Grants Team Leader and Project Officers are required to take the annual on-line records management training and are familiar with records retention and management requirements. When needed, the Grants Team Leader coordinates with the Records Liaison Officer in the Philadelphia Regional Office (Region 3) to answer any questions staff may have pertaining to records management. Quality assurance documents, data reports and interpretive reports submitted for grants and assistance agreements are placed in the corresponding files. Closed agreements are inventoried and disposed of or transferred to the National Archives in accordance with EPA's [policy and guidance](#) and federal [statutes and regulations](#).

## **6 COMPUTING INFRASTRUCTURE**

Chesapeake Bay Program Office funded data served through the Chesapeake Center for Collaborative Computing are managed through provisioned hardware and software resources. This infrastructure uses industry standard guidelines and policies to ensure the efficient collection, storage and dissemination of Chesapeake Bay Program Partnership data. These data and processing requirements are used as the basis for determining the required infrastructure to be provisioned.

### **6.1 APPLICATION DEVELOPMENT PROTOCOL**

The Data Center uses an industry-standard Agile application development process. Projects within the portfolio are managed in three-week sprints using an iterative design practice. Solutions evolve through collaboration between self-organizing, cross-functional teams utilizing the appropriate practices for their context. The workflow is monitored through daily scrum briefings.

CBP's Data Center utilizes four planning groups to manage application development and deployment. These include: Release Planning Board, Deployment Management Board, Sprint Management Board, and the Infrastructure Management Board. These groups plan all

phases of each project's lifecycle from project planning to operations and maintenance.

## 6.2 DATA AND INFORMATION STANDARDS

The Chesapeake Bay Program Partnership has adopted data and information standards to improve coordination, compatibility, standardization, and access to data. Grantees, cooperators, contractors, and data servers are required to submit deliverables in electronic format. Electronic deliverables include reports, graphics, spreadsheets, imagery, data files, audio, and digital video products. All data and information, whether funded directly or indirectly by EPA, is considered public information and will be made available through the Chesapeake Bay Program's website. Standards for submitting data and information are documented in [Chesapeake Bay Program Guidance for Data Management \(November 2006\)](#). The document describes the policies and guidelines for:

- Data, Information and Document Delivery
- Deliverable Serving vs. Submission
- Locational Data
- Map Coordinate Datum
- Map Coordinate Projection
- Metadata
- Common Station Names
- Common Data Dictionary
- Common Database Design
- Calendar Date
- Common Method Codes
- Data Reporting
- ITIS Biological Nomenclature

Specific guidelines for descriptive information, i.e., metadata, are documented in *Chesapeake Information Systems Metadata Reporting Guidelines* (September 1998) and available on the internet at <http://archive.chesapeakebay.net/cims/metasep.pdf>.

Chesapeake Bay database managers process data deliverables and identify deviations from reporting requirements. Database managers will contact the data generator directly to resolve minor errors; however, they consult with the appropriate Project Officer to resolve major reporting errors or omissions.

## 7 PLANNING FOR DATA ACQUISITIONS

The planning process for monitoring begins with program-wide objectives and priorities which are documented in a comprehensive monitoring strategy. In 2008, the Chesapeake Bay Program's

Scientific and Technical Advisory Committee, in conjunction with Chesapeake Bay Program's Management Board, developed a process for evaluating the objectives and priorities for water quality monitoring programs. The full report is available on the Scientific and Technical Advisory Committee's website at: <http://www.chesapeake.org/stac/Pubs/STACReviewPrioritiesFinal3-09.pdf>.

The monitoring objectives and priorities for 2010 and beyond are conveyed from the Chesapeake Bay Management Board to the [Scientific, Technical Analysis and Reporting Team](#) who recommends strategies and coordinates actions approved by the Management Board to accomplish management objectives.

Technical specifications for monitoring and data analysis are established by Chesapeake Bay Program's workgroups, which consist of staff from EPA, state and federal agencies, academic institutions and non-profit organizations. For long-term projects, the Chesapeake Bay Program workgroups agree upon common objectives, designs, parameters, methods and quality assurance practices to ensure the consistency and comparability of data from multiple agencies and investigators.

Data from outside sources (i.e., secondary data) may be utilized following peer review and evaluation through the respective Chesapeake Bay Program workgroup. Hydrological, meteorological and agricultural data from USGS, NOAA and USDA are considered acceptable. Point-source and non-point source data generated by state and county agencies must have approved Quality Assurance Project Plans. Acceptance criteria for these secondary data sets are documented in the SOPs for point-source and non-point source data management.

Processes for the development and approval of Quality Management Plans and Quality Assurance Project Plans are described in Sections 2.2 and 4.4 above. Requirements for these plans are communicated to grantees and cooperative agreement holders via the Chesapeake Bay Program Office's annual grant guidance.

## **8 IMPLEMENTATION OF WORK PROCESSES**

Work processes are monitored through a collaborative effort between the appropriate Chesapeake Bay Program Goal Implementation Team, Workgroup, and the Project Officer. Proposed projects are evaluated and approved through the Goal Implementation Teams and the Chesapeake Bay Program Management Board. Activities and outputs of the projects are presented to the respective Goal Implementation Team and Workgroup that actually use the information. Each of the projects is overseen by a Project Officer who is responsible for initiating the project, reviewing the progress reports, receiving applicable data and reports. Project Officers work in conjunction with the Goal Implementation Team and/or Workgroup to ensure that the project proceeds in the correct direction and generates the appropriate data and documents, in-line with the desired outcome. If a Project

Officer, Goal Implementation Team, Workgroup or grantee decides to make changes to a project, the Project Officer documents the changes to the grant file and amends the grant if necessary.

Implementation of data collection operations is continually monitored. Monitoring data are submitted within 3-6 months of collection and pre-processed through automated data checks within 30 days. Annual data analysis and assessments provide further validation of the completeness of the data sets and the accuracy of the database.

## **9 ASSESSMENT AND RESPONSE**

### **9.1 DATA QUALITY ASSESSMENTS**

All routine water quality monitoring data generated through the Chesapeake Bay Program are submitted on a regular basis. For example, the State of Maryland and the Commonwealth of Virginia and their respective contractors are subjected to an Audit of Data Quality (ADQ). Before the Project Officer signs off on any particular data set submitted, monitoring data are run through a series of automated computer verification programs, called the Data Upload and Evaluation Tool (DUET). DUET permits data submitters to upload both regular data submission and special submissions to add or replace data already in the water quality database. After the data set is uploaded, it is placed in a processing queue. During processing, a text report is created listing each of the over 180 quality assurance checks and the records that fail each check. These reports are reviewed and approved by the Chesapeake Bay Program Water Quality Data Manager before a data set is imported to the Chesapeake Environmental Data Repository (CEDR) and made available to the public.

### **9.2 TECHNICAL SYSTEMS AUDITS**

Technical systems audits, which focus on the actual quality control in environmental measurement data collection systems, are performed at each laboratory and field data collection center involved in the generation of data funded by the Chesapeake Bay Program Office. Technical systems audits are performed by the Chesapeake Bay Program Quality Assurance Coordinator who is experienced in water quality chemistry, data collection technology and quality control procedures. The audit addresses an examination of calibration records, sampling and measurement procedures, general laboratory conditions, support systems, equipment and facilities, maintenance and repair records, control charts, etc. Technical systems audits reports are submitted by the Chesapeake Bay Program Quality Assurance Coordinator to the Director of the audited laboratory and/or field operation with copies to the appropriate State Project Manager as well as to the respective Chesapeake Bay Program Goal Implementation Team/Workgroup Coordinator and Project Officer.

Reports of corrective action are to be submitted by each facility to the Chesapeake Bay Program Quality Assurance Coordinator within 45 days of receipt of the Technical systems audit report. Items not corrected will be brought to the attention of the funding recipient, Grants Manager, the Project Officer, the respective Chesapeake Bay Program Goal Implementation Team/Workgroup Coordinator and the Chesapeake Bay Program Office Quality Assurance Officer. The Project Officer has the authority to suspend or stop work in progress upon detection and identification of a situation affecting the quality of the results. In those cases, the Chesapeake Bay Program Office Director and Region 3 Grants and Audit Management Branch Chief are notified.

### 9.3 PERFORMANCE EVALUATIONS

On a semi-annual basis, blind audit samples are distributed to the laboratories participating in the Chesapeake Bay Mainstem, Tidal Tributary and Watershed Water Quality Monitoring Networks. An effort is made to adjust blind audit sample instructions to allow the analysis of concentration ranges appropriate to the respective monitoring program's ambient monitoring levels. Ampoules are prepared with deionized water as diluents since only a select set of laboratories analyze saline samples. For particulate parameters, suspended matter is collected on glass fiber filters.

Results are returned by the laboratories to the Chesapeake Bay Program Quality Assurance Coordinator for comparison with the current statistical estimates of the 95% and 99% confidence intervals. Audit sample performance is used along with independent technical systems audits to evaluate each laboratory's capability to accurately analyze the parameters of interest.

### 9.4 PEER REVIEW

The performance and comparability of water quality monitoring methods is an ongoing activity of the Chesapeake Bay Program's Data Integrity Workgroup. This workgroup provides a technical peer review of data collection and reporting activities to ensure consistency. This group evaluates blind audit and coordinated split sample results and identifies procedural differences and recommends corrective actions to ensure inter-laboratory agreement. If corrective actions would affect the interpretation of subsequent data analyses, statistical analyses may be necessary to estimate the associated bias. All significant findings are reported to the appropriate Chesapeake Bay Program Goal Implementation Team/Workgroup, documented in the Data Integrity Workgroup's meeting summaries, and in the Chesapeake Bay Program's Data Analysis Issues Tracking System.

Modeling work done within the Chesapeake Bay Program Office is peer reviewed by the [Chesapeake Bay Program Modeling Team](#) every three months at in-depth, model review

meetings hosted by the Chesapeake Bay Program's Modeling Workgroup. As discussed in Section 2.3.3 above, all Chesapeake Bay Program modeling activities, assumptions and related management applications are subject to scientific, independent external peer reviews. The [Chesapeake Bay Program Scientific and Technical Advisory Committee](#) organizes these *external* reviews of Chesapeake Bay Program Modeling Team products as well as peer reviews of other monitoring and research activities.

## 9.5 MANAGEMENT ASSESSMENTS

As part of the annual Quality Management Plan review process, Chesapeake Bay Program Office senior managers will review and assess the adequacy of the quality system to meet the needs of the Chesapeake Bay Program Office and the larger Chesapeake Bay Program Partnership. The Chesapeake Bay Program Office prepares a Quality Assurance Annual Report and Workplan (QAARWP) each year to be incorporated into the Region 3 QAARWP. Accomplishments and significant changes to the Chesapeake Bay Program Quality System are included in the QAARWP.

Every three years EPA Office of Environmental Information (OEI) Quality Staff conduct a routine, independent Quality Systems Assessment of the Chesapeake Bay Program Office as part of the larger review of Region 3's Quality System. This involves a review the components of the Chesapeake Bay Program Office Quality System to ensure that the Quality Management Plan is being implemented. The assessment and reported findings are done in conjunction with the OEI assessments of all Region 3 programs.

## 10 QUALITY IMPROVEMENT

All Chesapeake Bay Program Office staff are responsible for quality improvement within their areas. Chesapeake Bay Program Office senior managers communicate critical activities of the Chesapeake Bay Program at office-wide staff meetings and solicit input for improvements. The Associate Director for Science, Analysis and Implementation is responsible for the overall quality improvement program, the function of which is to identify the cause and consequence of a problem and suggest actions to prevent its recurrence. Chesapeake Bay Program Office senior managers and team leaders also use the Goal Implementation Teams and Workgroups to continually identify, plan, implement and evaluate the quality and effectiveness of the work of the Chesapeake Bay Program Partnership.

## 11 REFERENCES

### DOCUMENTS

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URL:[http://archive.chesapeakebay.net/pubs/subcommittee/msc/ntwqwg/Nontidal\\_Monitoring\\_Report.pdf](http://archive.chesapeakebay.net/pubs/subcommittee/msc/ntwqwg/Nontidal_Monitoring_Report.pdf)
2. Lane, Mark. 2004. *CIMS Data Upload and Quality Assurance Tool: Data User's Guide*. Prepared by Veridyne, Inc. for the U.S. EPA Region III Chesapeake Bay Program Office URL: <http://archive.chesapeakebay.net/pubs/DUQATUsersGuide.pdf>
3. U.S. EPA. August 1996. *Recommended Guidelines for Sampling and Analysis in the Chesapeake Bay Monitoring Program*. Chesapeake Bay Program, CBP/TRS 148/96; EPA 903-R-96-006. URL:  
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4. Chesapeake Bay Program. May 2017 (CBP/TRS-319-17). *Chesapeake Bay Program Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs*. Prepared by the Chesapeake Bay Program Data Integrity Workgroup.  
URL:<https://www.chesapeakebay.net/documents/CBPMethodsManualMay2017.pdf>
5. U.S. Environmental Protection Agency (EPA). May 2000. EPA Order CIO 2105.0 - *Policy and Program Requirements for the Mandatory Agency-wide Quality System*. URL: [https://www.epa.gov/sites/production/files/2015-09/documents/cio\\_2105-p-01-0.pdf](https://www.epa.gov/sites/production/files/2015-09/documents/cio_2105-p-01-0.pdf)
6. U.S EPA. March 2001. *EPA Requirements for Quality Management Plans (QA/R-2)* EPA/240/B-01/002. URL: <https://www.epa.gov/quality/epa-qar-2-epa-requirements-quality-management-plans> .
7. U.S. EPA. March 2001. *EPA Requirements for Quality Assurance Project Plans (QA/R-5)* EPA/240/B-01/003. URL: <https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans>
8. U.S. EPA Records Management Manual (2160)  
URL:<http://www.epa.gov/records/policy/manual/index.htm>

9. U.S. EPA Project Officer Manual, 6<sup>th</sup> edition. November, 2005.  
URL: <https://www.epa.gov/sites/production/files/2017-07/documents/fifra-po-manual.pdf>

## WEBSITES

1. Chesapeake Executive Council  
URL: [http://www.chesapeakebay.net/groups/group/chesapeake\\_executive\\_council](http://www.chesapeakebay.net/groups/group/chesapeake_executive_council)
2. Chesapeake Bay Program Quality Assurance Program  
URL:  
[https://www.chesapeakebay.net/what/programs/chesapeake\\_bay\\_quality\\_assurance\\_program](https://www.chesapeakebay.net/what/programs/chesapeake_bay_quality_assurance_program)
3. Chesapeake Bay Program Office Grant Guidance for 2017 URLs:  
<https://www.epa.gov/restoration-chesapeake-bay/chesapeake-bay-program-grant-guidance>
4. Chesapeake Bay Program Data Integrity Workgroup URL:[Data Integrity Workgroup \(formerly AMQAW\) - Chesapeake Bay Program](http://www.chesapeakebay.net/dataandtools.aspx?menuItem=14872)
5. Chesapeake Bay Program Modeling Workgroup - Publications and Current Projects  
[http://www.chesapeakebay.net/groups/group/modeling\\_team](http://www.chesapeakebay.net/groups/group/modeling_team)
6. Submerged Aquatic Vegetation in Chesapeake Bay  
URL:<http://web.vims.edu/bio/sav/index.html>
7. Chesapeake Bay Program Data Hub  
URL: <http://www.chesapeakebay.net/dataandtools.aspx?menuItem=14872>
8. Chesapeake Bay Program Water Quality Database  
URL:[http://www.chesapeakebay.net/data\\_waterquality.aspx](http://www.chesapeakebay.net/data_waterquality.aspx)
9. Chesapeake Bay Program Integrated Monitoring Networks Workgroup - URL:  
[http://www.chesapeakebay.net/groups/group/tidal\\_monitoring\\_and\\_analysis\\_workgroup](http://www.chesapeakebay.net/groups/group/tidal_monitoring_and_analysis_workgroup)
10. Data Analysis Issues Tracking System (DAITS)  
URL:[http://archive.chesapeakebay.net/pubs/DAITS\\_9\\_21\\_10.pdf](http://archive.chesapeakebay.net/pubs/DAITS_9_21_10.pdf)
11. Chesapeake Bay Program Status and Trends Team – Current Projects and Information  
URL:[http://www.chesapeakebay.net/groups/group/indicators\\_workgroup](http://www.chesapeakebay.net/groups/group/indicators_workgroup)

12. [Chesapeake Bay Program's Scientific and Technical Advisory Committee](#)

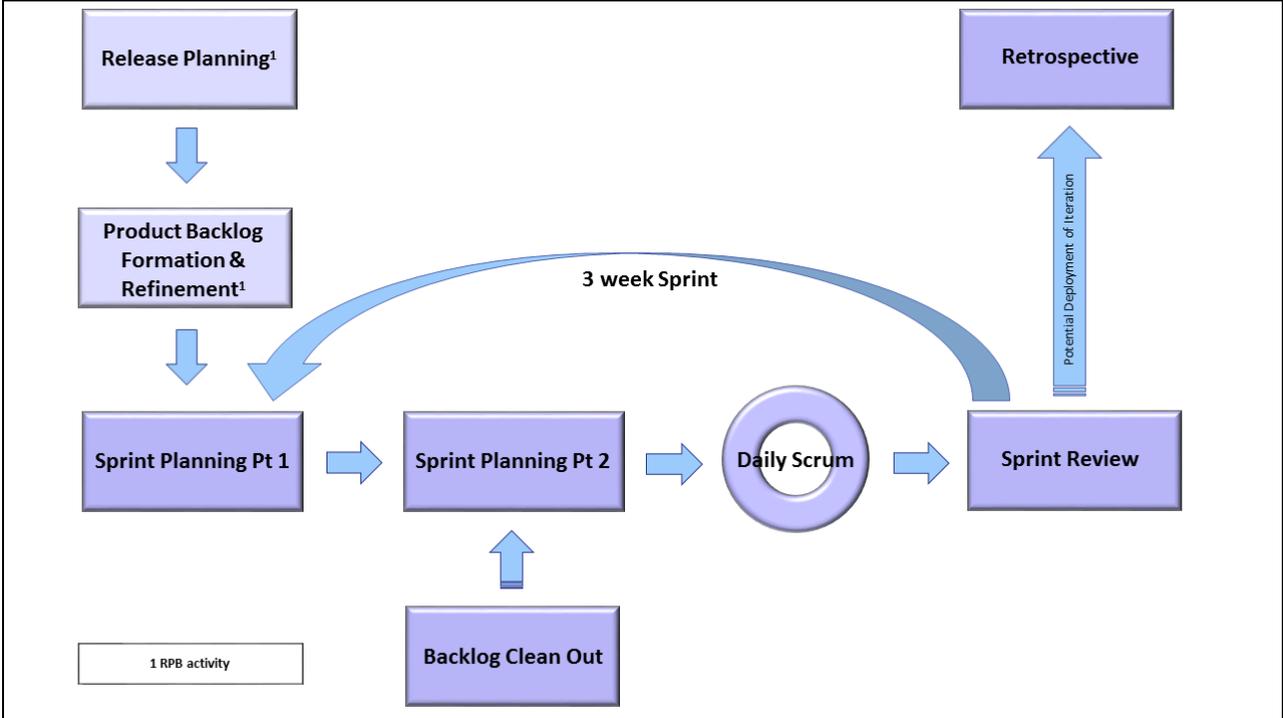
<b>Attachment 1</b>	
<b>Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System</b>	
<b>Category</b>	<b>Products / Services</b>
<b>Assessments</b>	
Data Quality	<ul style="list-style-type: none"> <li>• Data Upload and Evaluation Tool (automated verification of data)</li> <li>• Technical System Audits</li> <li>• Laboratory Performance Testing and Evaluation</li> <li>• QAPP Review and Approval</li> </ul>
Scientific	<ul style="list-style-type: none"> <li>• <a href="#">Chesapeake Bay Health and Restoration Indicators</a></li> <li>• <a href="#">Resource Lands Assessment</a></li> <li>• Chesapeake Bay Water Quality Standards Assessments</li> </ul>
Management	<ul style="list-style-type: none"> <li>• <a href="#">Best Management Practice Verification Process</a></li> <li>• <a href="#">Annual Health and Restoration Assessment of the Chesapeake Bay Watershed</a></li> <li>• CBPO QA Annual Report &amp; Work Plan (QAARWP)</li> <li>• National Academy of Sciences Independent Evaluator</li> </ul>
<b>Data</b>	
Environmental	<ul style="list-style-type: none"> <li>• <a href="#">Chesapeake Bay Data Hub Downloads</a> (Water Quality, Living Resources)</li> <li>• Watershed Model Scenario Databases (Point and Nonpoint Source BMP data)</li> <li>• Land Cover and GIS Data</li> </ul>
Indicators	<ul style="list-style-type: none"> <li>• <a href="#">Chesapeake Bay Program Health and Restoration Indicators</a></li> </ul>
Administrative	<ul style="list-style-type: none"> <li>• CBPO Grants Tracking System (CATS)</li> </ul>
<b>Grants / Contracts / Interagency Agreements</b>	
Administrative	<ul style="list-style-type: none"> <li>• Review and Approval of Responses to Solicitations</li> <li>• <a href="#">U.S. EPA Chesapeake Bay Program Office Grant Guidance</a></li> <li>• QA Review and Documentation</li> </ul>
<b>Policy and Guidance Documents</b>	
Programmatic	<ul style="list-style-type: none"> <li>• CBPO Quality Management Plan</li> <li>• <i>Methods and QA for Chesapeake Bay Water Quality Monitoring Programs</i></li> <li>• <a href="#">Chesapeake Bay Program Guidance for Data Management (11/2006)</a></li> <li>• <a href="#">Guidance for Revising QAPPs for BMP Tracking, Verification &amp; Reporting</a></li> <li>• <a href="#">Metadata Reporting Guidelines (9/1998)</a></li> <li>• <a href="#">Guide to Using Chesapeake Bay Program Water Quality Monitoring Data (2/2012)</a></li> <li>• CBPO Data Management SOPs</li> </ul>

<b>Attachment 1 (cont'd.) Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System</b>	
<b>Category</b>	<b>Products / Services</b>
<b>Information Management and Technologies</b>	
Programmatic	<ul style="list-style-type: none"> <li>• Chesapeake Center for Collaborative Computing (C4)</li> <li>• Chesapeake Bay Program Website (<a href="http://www.chesapeakebay.net">www.chesapeakebay.net</a>)</li> <li>• <a href="#">ChesapeakeStat</a></li> <li>• <a href="#">Chesapeake Action Plan</a> (re-named to Bay Tracking and Accountability System)</li> </ul>
<b>Modeling and Other Decision-Support Tools</b>	
Scientific	<ul style="list-style-type: none"> <li>• <a href="#">Chesapeake Bay Phase 6 Watershed Model</a></li> <li>• <a href="#">Chesapeake Bay Water Quality and Sediment Transport Model</a></li> <li>• Chesapeake Bay Land Change Model</li> <li>• Chesapeake Bay Water Quality Criteria Assessment Tool</li> <li>• <a href="#">Resource Lands Assessment</a></li> <li>• GIS Analysis and Mapping <a href="http://www.chesapeakebay.net/content/publications/cbp_33365.pdf">http://www.chesapeakebay.net/content/publications/cbp_33365.pdf</a>)</li> </ul>
<b>Reports</b>	
Progress, Performance and Characterization Reports	<ul style="list-style-type: none"> <li>• <a href="#">Restoration and Protection Efforts</a> (online summaries)</li> <li>• <a href="#">Bay Barometer 2014-2015, Health and Restoration in the Chesapeake Bay Watershed</a></li> </ul>
<b>Research (includes Peer Review)</b>	
Scientific Review	<ul style="list-style-type: none"> <li>• <a href="#">Scientific and Technical Advisory Committee (STAC) reviews and recommendations</a></li> </ul>

<b>Attachment 2: Crosswalk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office</b>		
<b>EPA Chesapeake Bay Program Office Quality Assurance Officer</b>	<b>Federal Chesapeake Bay Program Quality Assurance Coordinator</b>	<b>EPA/Federal Chesapeake Bay Program Project Officers</b>
Drafts, approves and signs all quality assurance policies and the EPA Chesapeake Bay Program Office's QMP.	Reviews EPA CBP Office QMP annually, revise if necessary and report to Region 3. Prepare and submit CBP Annual QA Report.	Provide technical input on draft policy and management-oriented quality assurance documents.
Reviews technical comments and recommendations; provides final EPA approval of and signs all quality assurance project plans.	Reviews federal assistance agreements and determines quality requirements; reviews quality assurance project plans; prepares technical comments and makes recommendations on the adequacy of the plans to achieve the project objectives; coordinates the resolution of deficiencies with project officers.	Review draft quality assurance project plans; formally transmit technical comments to assistance agreement recipients; ensure recipients respond to all technical comments; sign approved quality assurance project plans.
Approves on-site audit plans and priorities for technical assessments; reviews technical assessment findings; determines necessary response actions; assigns responsibility for follow up to response actions.	Conducts on-site technical assessments of field, laboratory and data handling operations; prepares technical comments and recommends necessary response actions in accordance with established technical assessment procedures.	Formally transmit technical on-site field, laboratory, data and information management audit comments to assistance agreement recipients; ensure that recipients respond to all technical comments received.
Approves plans and procedures for implementing the split sampling program; reviews split sample assessment findings; determines response and corrective actions; assigns responsibility for follow up to response actions.	Coordinates the multi-laboratory tidal and nontidal coordinated split sample programs; responsible for analysis and interpretation of the results; monitors individual laboratory performance; prepares recommendations for corrective actions or quality improvement.	Formally transmit any technical issues and/or requests for response to results from the coordinated split sample programs to assistance agreement recipients; ensure that recipients respond to all technical comments received.

<b>Attachment 2 (cont'd): Crosswalk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office</b>		
<b>EPA Chesapeake Bay Program Office Quality Assurance Officer</b>	<b>Federal Chesapeake Bay Program Quality Assurance Coordinator</b>	<b>EPA/Federal Chesapeake Bay Program Project Officers</b>
Approves plans and procedures for implementing the water quality laboratory blind reference material audit program; reviews recommendations from blind reference audits; assigns responsibility for follow up to response actions.	Coordinates the blind reference material audit program; ensure adequacy of program to assess laboratory performance; monitors individual laboratory performance, prepares recommendations for corrective actions and quality improvement resulting from blind reference material program.	Formally transmit any technical issues and/or requests for response to results from the blind reference audit program to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments received.
Reviews recommendations from the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup; determines necessary response actions; assigns responsibility for follow up to response actions.	Works through the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup to identify data quality problems associated with field sampling techniques and analytical methods and develops recommendations.	Formally transmit any technical issues and/or requests for response to issues raised by the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments received.
Reviews recommendations from the Chesapeake Bay Program Office Data Center staff; determines necessary response actions; assigns responsibility for follow up to response actions.	Works with the Chesapeake Bay Program Data Managers to document methods and quality control data; ensures that data reporting requirements are documented in quality assurance project plans; support data managers on documentation decisions.	Formally transmit any technical issues and/or requests for response to issues raised by the Chesapeake Bay Program Office Data Center staff to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments.
Reviews recommendations from the Goal Implementation Teams and Workgroups; determines necessary response actions; assigns responsibility for follow up to response actions.	Works with the Chesapeake Bay Program's Goal Implementation Teams and Workgroups to identify quality assurance related issues identified during the analysis and interpretation of environmental data.	Formally transmit any technical issues and/or requests for response to issues raised by the Goal Implementation Teams to assistance agreement recipients; ensure that recipients respond to all technical comments.

**Attachment 3: Agile Planning Flowchart for Application Development**



**Attachment 4. Template for CBP Indicator Analysis and Methods Document** (Revision 1,  
9/9/2015)

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**Chesapeake Bay Program | Indicator Analysis and Methods Document**  
*[Insert Indicator Title Here] | Updated [Insert Date Here]*

Indicator Title:

Relevant Outcome(s):

Relevant Goal(s):

Location within Framework (i.e., Influencing Factor, Output or Performance):

**A. Data Set and Source**

- (1) Describe the data set. What parameters are measured? What parameters are obtained by calculation? For what purpose(s) are the data used?
- (2) List the source(s) of the data set, the custodian of the source data, and the relevant contact at the Chesapeake Bay Program.
  - Source:
  - Custodian:
  - Chesapeake Bay Program Contact (name, email address, phone number):
- (3) Please provide a link to the location of the data set. Are metadata, data-dictionaries and embedded definitions included?

**B. Temporal Considerations**

- (4) Data collection date(s):
- (5) Planned update frequency (e.g., annual, biannual, etc.):
  - Source Data:
  - Indicator:
- (6) Date (month and year) next data set is expected to be available for reporting:

**C. Spatial Considerations**

- (7) What is the ideal level of spatial aggregation (e.g., watershed-wide, river basin, state, county, hydrologic unit code)?
- (8) Is there geographic (GIS) data associated with this data set? If so, indicate its format (e.g., point, line polygon).
- (9) Are there geographic areas that are missing data? If so, list the areas.
- (10) Please submit any appropriate examples of how this information has been mapped or otherwise portrayed geographically in the past.

#### **D. Communicating the Data**

- (11) What is the goal, target, threshold or expected outcome for this indicator? How was it established?
- (12) What is the current status in relation to the goal, target, threshold or expected outcome?
- (13) Has a new goal, target, threshold or expected outcome been established since the last reporting period? Why?
- (14) Has the methodology of data collection or analysis changed since the last reporting period? How? Why?
- (15) What is the long-term data trend (since the start of data collection)?
- (16) What change(s) does the most recent data show compared to the last reporting period? To what do you attribute the change? Is this actual cause or educated speculation?
- (17) What is the key story told by this indicator?

#### **E. Adaptive Management**

- (18) What factors influence progress toward the goal, target, threshold or expected outcome?
- (19) What are the current gaps in existing management efforts?
- (20) What are the current overlaps in existing management efforts?
- (21) According to the management strategy written for the outcome associated with this indicator, how will we (a) assess our performance in making progress toward the goal, target, threshold or expected outcome, and (b) ensure the adaptive management of our work?

## **F. Analysis and Interpretation**

*Please provide appropriate references and location(s) of documentation if hard to find.*

- (22) What method is used to transform raw data into the information presented in this indicator?  
Please cite methods and/or modeling programs.
- (23) Is the method used to transform raw data into the information presented in this indicator accepted as scientifically sound? If not, what are its limitations?
- (24) How well does the indicator represent the environmental condition being assessed?
- (25) Are there established reference points, thresholds, ranges or values for this indicator that unambiguously reflect the desired state of the environment?
- (26) How far can the data be extrapolated? Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

## **G. Quality**

*Please provide appropriate references and location(s) of documentation if hard to find.*

- (27) Were the data collected and processed according to a U.S. Environmental Protection Agency-approved Quality Assurance Project Plan? If so, please provide a link to the QAPP and indicate when the plan was last reviewed and approved. **If not, please complete questions 29-31.**
- (28) *If applicable:* Are the sampling, analytical and data processing procedures accepted as scientifically and technically valid?
- (29) *If applicable:* What documentation describes the sampling and analytical procedures used?
- (30) *If applicable:* To what extent are procedures for quality assurance and quality control of the data documented and accessible?
- (31) Are descriptions of the study design clear, complete and sufficient to enable the study to be reproduced?
- (32) Were the sampling, analytical and data processing procedures performed consistently throughout the data record?
- (33) If data sets from two or more sources have been merged, are the sampling designs, methods and results comparable? If not, what are the limitations?

- (34) Are levels of uncertainty available for the indicator and/or the underlying data set? If so, do the uncertainty and variability impact the conclusions drawn from the data or the utility of the indicator?
- (35) For chemical data reporting: How are data below the MDL reported (i.e., reported as 0, censored, or as < MDL)? If parameter substitutions are made (e.g., using orthophosphate instead of total phosphorus), how are data normalized? How does this impact the indicator?
- (36) Are there noteworthy limitations or gaps in the data record?

**H. Additional Information (*Optional*)**

- (37) Please provide any further information you believe is necessary to aid in communication and prevent any potential misrepresentation of this indicator.