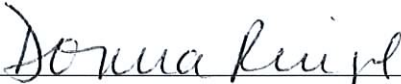

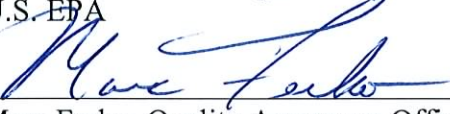
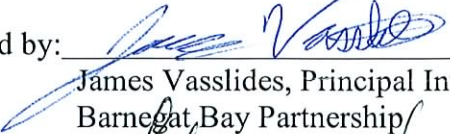
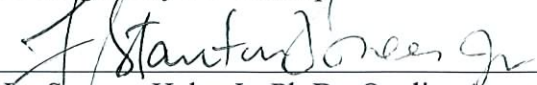


**State of the Bay Report  
Barnegat Bay Estuary  
Quality Assurance Project Plan**

**Barnegat Bay Partnership  
July 27, 2010**

Approved by: <u></u>	<u>12/22/10</u>
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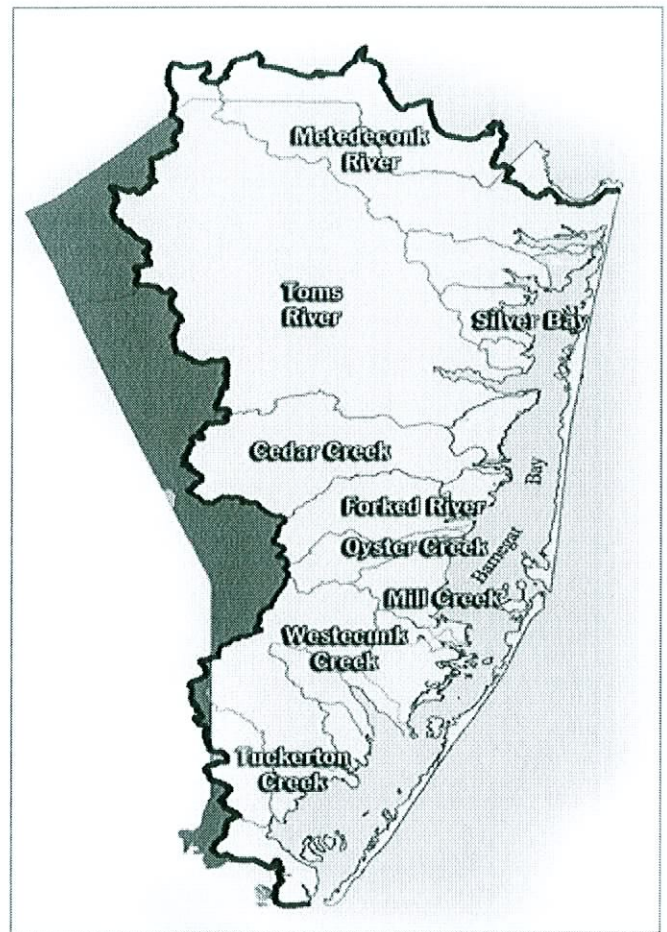
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## 1. Project Objectives, Organization, and Responsibilities

### 1.1. Purpose of Study and Background Information

The Barnegat Bay Partnership (BBP), authorized in 1995 as the Barnegat Bay Estuary Program by the U.S. Environmental Protection Agency, is one of 28 National Estuary Programs throughout the US. The BBP is a partnership of federal, state, county, municipal, academic, business, and private stakeholders in the Barnegat Bay watershed working together to help restore, maintain, protect, and enhance the natural resources of the Barnegat Bay estuary and its contributing watershed. The Barnegat Bay-Little Egg Harbor estuary ("Barnegat Bay") covers over 42 miles of shoreline from the Point Pleasant Canal to the north to Little Egg Harbor Inlet in the south and is composed of three shallow, micro-tidal bays: Barnegat Bay, Manahawkin Bay, and Little Egg Harbor. A nearly continuous barrier island complex runs along the eastern edge of Barnegat Bay, separating it from the Atlantic Ocean. Seawater enters the Barnegat Bay system through the Point Pleasant Canal via the Manasquan Inlet in the north and the Barnegat Inlet and Little Egg Inlet in the south.



The primary planning document produced by BBP to guide its efforts is the Comprehensive Conservation and Management Plan (CCMP), which was signed by the governor of New Jersey and the EPA Region 2 Administrator in the spring of 2002 (Barnegat Bay National Estuary Program, 2002). The CCMP outlines a comprehensive strategy to achieve BBP's goal of establishing and maintaining a healthy and productive ecosystem with full beneficial uses. In the spring of 2008 the Barnegat Bay Partnership completed a 12-month collaborative effort resulting in a three-year Strategic Plan (2008-2011) identifying the key priority issues to focus on over the three-year time period (Barnegat Bay National Estuary Program, 2008).

In 1995 the Barnegat Bay Partnership convened a science and technical workshop to develop a Monitoring Program Plan (MPP) for the estuary. The MPP identifies a set of environmental parameters that could serve as indicators to measure the success of CCMP implementation. The MPP, completed in May 2003, includes recommendations to periodically assess and report on a

number of these environmental indicators to evaluate whether BBP's goals and objectives are being met (Barnegat Bay National Estuary Program, 2003).

The State of the Bay report will report on progress in the environmental health of the Barnegat Bay by presenting data on the status and trends for a series of environmental indicators. This report is intended for a general audience that may not be aware of, or initially interested in, environmental issues in the Barnegat Bay. Therefore, environmental data, which will be displayed primarily in charts and maps, will be accompanied by background information, discussion of any trends, current and past efforts by BBP and its partners to improve environmental conditions, pictures, resources for more information, and tips on how to get involved.

## **1.2. Project Objectives**

The main objectives of the State of the Bay report are to:

1. Report on the status and trends in several indicators of the environmental health of Barnegat Bay;
2. Serve as an education and outreach tool by presenting this information to a wide audience to:
  - a. Increase knowledge and appreciation, and foster stewardship, of the shared resources in the Barnegat Bay, and
  - b. Increase awareness and support of the BBP's work; and
3. Uncover new sources of environmental data

Secondary data will be presented to show whether the health of the bay is improving, deteriorating, or showing no trend over time, and thus whether or not the BBP's goals for the Barnegat Bay are being met.

## **1.3. Secondary Data Needed**

The secondary data needed are environmental data that are measured in the same manner periodically and serve as indicators of the bay's ecological health. These data shall cover the main primary causes of ecosystem impairments on which the Barnegat Bay Partnership's Strategic Plan focuses: water quality degradation within the ecosystem, especially eutrophication in the bay and stormwater and non-point source pollution in the watershed, water supply and flow issues, habitat loss and degradation, and fisheries decline. Specific indicators to be presented in the report will be selected from among a pool of approximately 9 primary and 20 secondary indicators that were recommended in the 2003 MPP (Barnegat Bay National Estuary Program, 2003), as well as other indicators used or considered by other National Estuary Programs.

Examples of environmental data sets that will be needed include measures of water quality

(concentrations of nitrogen and other nutrients, fecal coliform and other bacteria), extent of various habitats (*e.g.*, acreage of tidal wetlands, sea grass beds), and abundance of key species (*e.g.*, hard clams and other fish and crustaceans, great egret and other birds).

The full list of indicators of environmental health that will be considered can be found in the MPP (Barnegat Bay National Estuary Program, 2003). The first State of the Bay report for the Barnegat Bay was published in 2005 and was titled *Barnegat Bay National Estuary Program: 2005 State of the Bay Technical Report* (Barnegat Bay National Estuary Program, 2005). It included 6 indicators and will serve as a basis for the present edition. However, this second version will be targeted to the general public and will thus be written in a simpler language. As more information has been collected over the past five years and the Partnership has gained in technical expertise, we anticipate that additional indicators will be discussed.

Because environmental data tend to fluctuate widely, it is often the case that trends can only be detected upon evaluating long time-series of data. Thus, new data which have been added to existing datasets since the publication of our previous *State of the Bay* report should not be presented and assessed in isolation but within the context of all available historical data. Therefore, this edition of the *State of the Bay* will present a new overall trends report which will include (for all indicators covered) data already presented in the 2005 report and the newly available data. However, if a more complete or otherwise superior dataset is uncovered, it will be preferred. This may result in (presumably slightly) different results than those presented in the 2005 edition. Even if the same dataset is used, the inclusion of new data may change the conclusions drawn previously (*e.g.*, a formerly inconclusive trend could now be clearly defined). Regardless of the dataset used, all trends will be explained and compared to our previous findings. In particular, any changes resulting from the inclusion of a different dataset will be noted in the report.

Broad spatial coverage within the entire bay would be preferred as it would allow a more representative depiction of conditions, but even data from a few or a single location would be useful, as long as data are collected in a consistent manner (*e.g.*, same sites, or same sampling design). In order to show temporal trends of the various indicators, datasets should ideally include recent measures (a few years old at most), go back in time for as long as available, and be relatively frequent (see Section 3.1 Quality Requirements).

Data of the best quality available will be preferred. However, data with deficiencies or gaps will not necessarily be excluded: these data could still be valuable to illustrate the state of knowledge and uncertainties in bay conditions, and make the case for better or additional monitoring programs.

#### **1.4. Planned Approach**

Assessing trends in various environmental indicators is the only project objective that involves data analysis. The goal is to determine whether the value of a given environmental parameter (*e.g.*, dissolved oxygen, areal coverage of seagrass) has increased, decreased, remained the same over time, or showed no consistent trend. In most cases, the data which will be used in this

project have been collected for similar purposes as ours, and studied in detail and assessed for trends by the data generator and/or other scientists and experts involved in the subject (*e.g.*, data on fecal coliform levels collected by OCHD has been examined at length by this agency and other parties). This project will rely on these available results and conclusions whenever possible.

For indicators where such previous analysis is not readily available, we will consult with scientists and other knowledgeable individuals (including those in our review team) as needed, to determine if there is a consensus position within the scientific community about trends. If there is no generally agreed interpretation of the data, we will work with these and other individuals to determine whether any trends are apparent. This process may require visual inspection of the time series and possibly trend tests (*e.g.*, regression analysis, and Mann-Kendall-based tests, provided that sufficient data are available to apply such statistical tools). It is anticipated that for some indicators, a trend may be apparent, but data will not be sufficient to conclusively establish a trend. In those cases, the apparent trend may be mentioned, but the uncertainties and need for additional data will be noted. It is also expected that in some cases determining whether the data show a trend, or are otherwise “telling a story” may not be straightforward and may require a careful analysis of different datasets and professional judgment. We will rely for these interpretations on scientists and experts who have been studying these issues at length.

In all cases, the report will be subject to a review process (described in Section 1.5) to ensure that the contents are scientifically sound and reflect the most current views within the scientific community.

### **1.5. Project Organization and Responsibilities**

The BBP Principal Investigator is responsible for carrying out nearly every aspect of this project, including data gathering and analyses, quality assurance, writing of the report and reviewing and editing sections that are provided by contributors. The BBP Principal Investigator will solicit guidance from a variety of scientists and experts to ensure the accuracy of the final report. More details are provided in the following list of project participants and their responsibilities.

o **Principal Investigator:** James Vasslides, Program Scientist, BBP

- Responsible for overseeing implementation of the project work plan, reviewing drafts of the report, managing the project budget, issuing contracts and agreements for any needed professional services, and processing invoices.
- Responsible for implementing the project work plan with assistance from the Science and Technical Advisory Committee (STAC), other BBP partners, data providers, and team of reviewers. Specific responsibilities include:
  - Collecting existing environmental data for Barnegat Bay Program indicators, including collecting and compiling data, assuring State of the Estuary QAPP secondary data quality, performing data analyses where necessary and appropriate, creating maps and charts, providing the data, maps and charts to the graphic designer, and working with the web developer to prepare a version of the report for the web site.

- Reporting, writing, substantive editing and copy editing, assigning articles, managing the review process, obtaining photographs and images, providing ideas to the graphic designer for layout and design, and managing outside contractors, including a printer, and possibly illustrator and photographer.

o **Project Quality Assurance Officer:** Dr. L. Stanton Hales Jr, Director, Barnegat Bay Partnership

- Responsible for reviewing drafts of the report and approving the final report prior to printing.

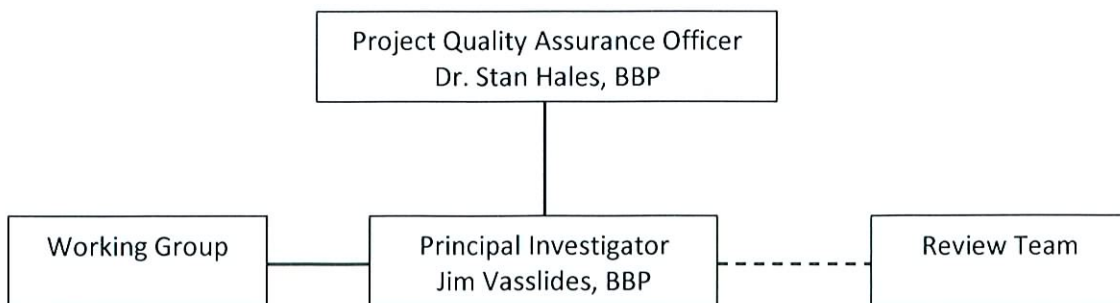
o **State of the Bay Report Working Group:** Dr. Ron Baker, US Geological Survey – New Jersey Water Science Center; Robert Connell, NJDEP – Bureau of Marine Water Monitoring; Thomas Belton, NJDEP – Office of Science and Research; Scott Haag, Center for Remote Sensing and Spatial Analysis, Rutgers University; Dr. Michael Kennish, Institute of Marine and Coastal Science, Rutgers University; Robert Karl, Brick Municipal Utilities Authority; and Martha Maxwell-Doyle, Barnegat Bay Partnership

- Responsible for providing general guidance and advice on all scientific and technical aspects of the report, including: selecting an adequate set of indicators for the report, reviewing this Quality Assurance Project Plan and providing guidance as needed in its implementation, suggesting possible sources of data, reviewing the report, and suggesting individuals for the review team.

o **Review Team:** A team of reviewers will be assembled and subsets of the team will be asked to review different sections of the report according to their expertise. The team may include scientists conducting research in and around the Barnegat Bay, scientists within the organizations providing the environmental data, STAC members, Barnegat Bay Program staff and partners, and other knowledgeable individuals. A list of review team members will be available and kept as part of the project files once the individuals have been identified and agreed to participate in the process.

- Responsible for ensuring the scientific soundness of the report, including adequate data interpretation and accurate background information.

**Organizational Chart.** Connecting lines represent the proper lines of communication between individuals. Dotted lines represent general guidance and feedback





## 1.6. Project Schedule

The tentative schedule for the project is provided in the following table.

	<b>Task</b>	<b>Start Date</b>	<b>End Date</b>
QAPP	QAPP preparation	19-April-10	31-July-10
	Define contents/Select reviewers	19-April -10	14-May-10
Report contents	Write sections	30-June-10	03-Sep-10
	Conduct review	03-Sep-10	24-Sep-10
Report graphics	Obtain pictures	18-Jun-10	17-Sep-10
	Create charts & maps	11-May-10	27-Sep-10
Layout	Work with designer	03-Sep-10	15-Oct-10
	Produce 1st draft layout	24-Sep-10	8-Oct-10
	Review 1st draft layout	08-Oct-10	12-Oct-10
	Produce 2nd draft layout	12-Oct-10	22-Oct-10
	Review & approve 2nd draft layout	15-Nov-10	19-Nov-10
Report Printing	Printing	19-Nov-10	10-Dec-10
Report Distribution	Create distribution lists & labels	01-Oct-10	31-Oct-10
	Mail out report	11-Dec-10	31-Dec-10

## 2. Sources of Secondary Data

### 2.1. Data Sources

This project will rely entirely on existing data, which will be obtained primarily from agencies, institutions and companies already conducting monitoring programs such as New Jersey Department of Environmental Protection's Bureau of Marine Water Monitoring and Rutgers University. Data sources include published reports and, most frequently, databases. Databases can typically be downloaded in their entirety, or queried for specific subsets of data, either by the user (BBP) or by the data generators/managers via a formal or informal data request.

Some of the data sources that have already been identified include USEPA's Regional Environmental Monitoring and Assessment Program (REMAP), NJDEP's marine water quality data, BBP's water quality database, as well as all sources used in the *2005 State of the Bay Technical Report* (Barnegat Bay National Estuary Program, 2005). Additional potential data sources are listed in the Appendix A of the Monitoring Program Plan (Barnegat Bay National Estuary Program, 2003).

This project is exploratory in nature and one of its objectives is precisely to uncover new data sources that may be used to track progress in the environmental health of the Barnegat Bay. Therefore, it is possible that additional data sources will be identified during the course of the project, as we interact more closely with scientists and experts. In addition, not all data obtained will necessarily be used, even if of adequate quality. Because of size constraints, the printed report can only include a handful of indicators that will be selected upon obtaining and evaluating the data, based not only on their quality but also on the relevance and expected ability to engage the intended audience. The first task of the Work Group will be to review the data sources available and decide on the specific indicators to be included based on data availability and quality, ease of conveying a clear and relevant message to the public, and indicators included in similar reports that are also targeted to the general public. This process will be documented in Working Group meeting minutes that will be kept as part of the project files.

All data sources will be fully referenced, including links to databases, and any documentation of data quality.

## **2.2. Data Generators**

Data generators are, generally speaking, the agencies, research institutions, and other organizations that collect (or have collected) suitable (in terms of type of data being relevant to BBP's goals, covering an adequate geographic and temporal scale, and being of adequate quality) environmental data.

The Science and Technical Advisory Committee to the Barnegat Bay Partnership held a series of workshops in 2001 and 2002 to obtain input in developing the Program's Monitoring Program Plan. A diverse group of scientists, managers, and others attended these workshops and identified a suite of approximately 30 indicators that could be used to monitor environmental improvement within BBP's geographic area of concern, along with regional monitoring programs which could provide appropriate data for each of the indicators.

Specific data generators will be selected from this pool of previously identified possible sources. In addition, it is possible that data providers, scientists and researchers contacted in the preparation of this report may be able to point to other suitable monitoring programs unbeknownst to us, that we will, in turn, pursue and evaluate for relevance and adequacy.

## **2.3. Hierarchy of Data Sources**

In general, data from ongoing environmental monitoring programs going as far back in time as possible; carried out by trusted agencies, universities, or research institutions; and with known and adequate quality control and quality assurance procedures will be preferred. If these conditions are not met, less desirable data may be gathered if they can provide at least partial indication of the health of the Estuary. Any limitations and gaps in data included in the report will be fully disclosed, and it will be noted that the data should be used with caution. For example, for certain indicators, available data may only cover a limited window in time but still be crucial to complement and put in perspective other available data. Even if data are not of the

best quality, they may represent the best available knowledge of the system and may not only provide a glimpse into current conditions, but also point to the need for improved data collection efforts.

## **2.4. Rationale for Selecting Data Sources**

Given the specificity of this project's data needs (*i.e.*, various types of environmental monitoring data collected from the Barnegat Bay, covering several years), in many cases there may be a single data source available. If more than one data source is available, all will be evaluated and the highest quality, most complete (in terms of spatial and temporal coverage) data source will be used.

## **2.5. List of Sources of Secondary Data**

The sources of all secondary data presented will be identified in any report or other project deliverables. Size constraints may make it impossible to include a full list of sources. In this case, the report, and any other materials produced will provide a link to our website where the full references will be listed, including references to data quality. The references shall include, but not be limited to, the following: (1) The groups who were responsible for the data collection process and the time frame for the data collected, including any special training they had and if they were a volunteer group; (2) data qualifiers such as a notation of the laboratories used in the analysis of samples (*i.e.*, same laboratories throughout a project or group of laboratories), the analytical methods used throughout the data collection process, and any changes in detection levels which might have occurred with a change in methods; (3) a notation indicating if the data collection process was planned and had an approved QAPP; and (4) a note indicating if any review/ audit was performed during the data collection process, and if so the results of the review/audit.

## **3. Quality of Secondary Data**

### **3.1. Quality Requirements**

Data should meet the following quality requirements. However, given the paucity of environmental data within our study area for some indicators, it is likely that some datasets will not meet one or more requirements. These data may still be valuable for our purposes and, if used, any shortcomings will be noted.

- Data were generated by a reliable source. Although the identity of the data generator does not guarantee data quality, it provides a simple screening criterion when multiple data sources are available. The following are indicators of data source reliability.
  - o Data generator is generally trusted and respected (federal, state, and local agencies, or research institutions; examples include, but are not limited to, U.S. EPA, NOAA, USGS, NJDEP, Rutgers University, Monmouth University, Montclair State University).
  - o Data are published in peer-reviewed articles or publications.

- Data have been collected for purposes similar to ours; *i.e.*, to assess the status and trends in a particular environmental indicator.
- Monitoring Program has a QAPP or similar plan documenting quality assurance and quality control procedures to ensure data accuracy, precision, representativeness, and comparability.
- Data have been widely used and/or trusted by scientists and professionals in the subject.
- Completeness
  - o Spatial coverage
    - Dataset provides good coverage of the geographic area of interest (*e.g.*, as many of the main bays and tributaries in the Estuary as possible are represented) and the same sites are included in each sampling effort.
  - o Temporal coverage
    - Enough historical data are available (the farther back in time, the better) to allow assessing any trends in the various environmental indicators.
    - Adequate sampling frequency. In general, the more frequent the sampling, the better. In general, yearly (or even less frequent) data may be adequate to assess long-term trends. More frequent data may allow showing short-term changes; while this is not the main goal of the report, it may provide an interesting piece of information and may help clarify or illustrate certain concepts (*e.g.*, how seasonal conditions affect algal growth and, consequently, chlorophyll and dissolved oxygen concentrations).
    - Data are more or less evenly distributed throughout the sampling period. In other words, there are no major periods where no data were collected. Evenly spaced sampling intervals are desirable but not strictly necessary.
- Monitoring program is ongoing. This is not strictly required, but highly desirable as the availability of future data would facilitate the preparation of upcoming reports on the State of the bay

### **3.2. Data Review and Evaluation**

The quality of the secondary data will be based on data quality requirements defined in Section 3.1 of this document. In determining data quality, the completeness of the dataset will be assessed first, by inspecting data description (usually metadata) or the dataset itself (whichever is more easily available). If completeness is deemed adequate, other quality requirements will be assessed by inspecting the QAPP, other QA/QC documentation, metadata, and/or other information obtained from data providers. This will be accomplished by the Principal Investigator through the use of a modified Region 2 Data Usability Assessment Checklist. The completed checklist will be maintained with the dataset per the records management standards (Section 4.4).

### 3.3. Disclaimers

All project deliverables will inform of the existence of this QAPP. As stated previously, any limitations in data quality will be fully disclosed. If a decision is made to use data of unknown quality, this will be indicated in a disclaimer that will be added to any project deliverable. The disclaimer will read: “These data are of unknown quality and presented here for illustrative purposes only. No inferences regarding the environmental health of the Barnegat Bay should be made based on these data until their quality can be determined.”

## 4. Data Reporting, Data Reduction, Data Validation, and Records Management

### 4.1. Data Reduction

In general, data will be manipulated as little as possible. Data reduction may be required to graphically display the information in a condensed, more easily understandable format and, in some cases, to establish or show specific data trends or characteristics.

The following are some examples of anticipated or possible data reduction procedures (provided that adequate data are available):

- For most indicators, the presence or absence of a trend over time will be shown by means of an x-y chart. It is anticipated that all available data will be plotted. However, for indicators for which there are large numbers of data points (*e.g.*, sea level, water quality parameters), it will be considered whether plotting monthly or yearly average values provides a clearer depiction of trends.
- Indicators that involve counts or otherwise depend on the level of effort will be normalized and reported per unit effort whenever possible. For example, fish landings will be divided by the number of fishing trips or other form of effort.
- Data units may need to be changed for report consistency and/or to allow comparisons across data sources
- Certain datasets may be reduced and presented as percentages (*e.g.*, percentage of time a beach was closed during the swimming season, or percentage of water open to shellfish harvesting)
- Some data reduction may also be needed to display data in map form (maps will normally be intended to summarize some of the available information). Possible data reductions include the following.
  - o Average values for a given water quality parameter (*e.g.*, fecal coliform cell concentrations) across sampling locations within a sub-region of the Estuary (*e.g.*, Manahawkin bay) at a given date.
  - o Data may be reduced to show whether or not they comply with a given benchmark. For example, concentrations of toxic compounds in sediments may

be compared to the effects range-median (ER-M) and data displayed as above or below this benchmark.

#### **4.2. Data Validation**

The reporting of accurate project data will generally be ensured by carefully conducting and clearly expressing data reduction (if and when needed) and visual inspection of data before including in final report. Specifically, we will follow the following validation process.

- A copy of every original dataset obtained from each data source will be saved as a read-only, protected file in the event the integrity of the working datasets is compromised.
- Working data will be stored in spreadsheet format and will include all relevant raw data, which will be locked for editing.
- Data manipulation will be minimized to decrease the chances of inadvertently introducing errors. If any data reduction or manipulation is needed, it will be calculated starting from the raw, protected dataset. All formulas, along with units and conversion factors, will be shown in the spreadsheet; in addition, the formulas will be visible in each cell containing the reduced values. The formulas used will be checked by the BBP Quality Assurance Officer, as will 10 percent of the calculations. If errors are encountered the percentage to be checked will increase to 25.
- Prior to inclusion in the final report, raw and/or reduced data will be displayed in graphic form and inspected to detect any anomalous value. Most environmental indicators to be displayed have been measured in the past and values are expected to fluctuate between “generally accepted values.” If apparently anomalous values are detected, any data reduction will be verified. If the seeming anomaly is present in the original dataset, the data generator will be contacted for clarification and/or the issue will be discussed with the STAC and other appropriate parties. Any decision to eliminate “anomalous values” will be documented in the working data spreadsheets which will be kept as part of the project files and will be noted in the list of sources of secondary data (Section 2.5).
- In rare occasions, a dataset may only be available in hard copy format. In these cases, data will be manually entered into a spreadsheet. To ensure an error-free copy, summary statistics will be checked if possible, and 10 percent of the data will be spot-checked by the BBP Quality Assurance Officer. If errors are encountered the percentage to be checked will increase to 25.

#### **4.3. Deliverables**

The deliverable of this project will be a report. A special edition of BBP’s newsletter will be produced based on summary findings of the final report. Both the report and the summary will be available in hard copy and online.

#### **4.4. Records Management**

The following project-related documents and records will be kept by the Barnegat Bay Program office for as long as possible and for a minimum of three years from the date of the final Financial Status Report to EPA, as stipulated by 40 CFR § 31.42:

- Original files and materials (either electronic or in print) obtained from the data providers, including datasets, data quality information, reports, and other relevant information pertaining the data and data interpretation;
- Working data spreadsheets which will document any data reduction, anomalous data removal, and other issues;
- Draft and final versions of the report;
- Minutes from any meetings held in relation with the preparation of the report, including Working Group meetings;
- List of report reviewers and their written comments;
- Files exchanged with graphic designer, printer, and other contractors; and
- Other relevant documents and materials.

#### **5. References**

Barnegat Bay National Estuary Program. 2002. Final Comprehensive Conservation and Management Plan. May 2002. <http://bbp.ocean.edu/pages/129.asp>

Barnegat Bay National Estuary Program. 2003. Monitoring Program Plan. May 2003. <http://bbp.ocean.edu/Reports/BBNEP%20Monitoring%20Plan%20-%202005.pdf>

Barnegat Bay National Estuary Program. 2005. 2005 State of the Bay Technical Report. August 2005. [http://bbp.ocean.edu/Reports/2005-state\\_of\\_bay\\_tech.pdf](http://bbp.ocean.edu/Reports/2005-state_of_bay_tech.pdf)

Barnegat Bay National Estuary Program. 2008. Strategic Plan 2008-2001. May 2008. <http://bbp.ocean.edu/pages/131.asp>