

Appendix H: Quality Assurance Project Plan

A Watershed Plan for the Hutchinson River-Westchester County-I (NY) - 70190

QUALITY ASSURANCE PROJECT PLAN

COMPLETED PLAN PREPARED BY:

Save the Sound

January 4, 2022


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Approval Signatures (required prior to project start):

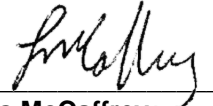

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Northeast Coastal

Date: _____
Elizabeth Wright, Project Officer
U.S. EPA Region 1

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TABLE OF CONTENTS

1	PROJECT MANAGEMENT	4
1.1	DISTRIBUTION LIST	4
1.2	PROJECT ORGANIZATION.....	5
1.3	PROJECT ABSTRACT	7
1.4	PROJECT OBJECTIVES AND APPROACH.....	7
1.5	DATA QUALITY OBJECTIVES	14
1.6	DOCUMENTATION AND RECORDS.....	21
2	DATA ACQUISITION	22
2.1	DATA COLLECTION & INFORMATION	22
2.2	DATA STORAGE, PRESERVATION AND HOLDING TIME	31
2.3	DATA CUSTODY AND DOCUMENTATION	32
3	ANALYTICAL REQUIREMENTS	32
3.1	CHEMISTRY ANALYSES	32
3.2	SAMPLE PREPARATION METHODS	32
4	QUALITY CONTROL REQUIREMENTS	33
4.1	QUALITY ASSURANCE OBJECTIVE (QAO) CRITERIA.....	33
4.2	MEASUREMENT PERFORMANCE CRITERIA	35
4.3	INTERNAL QUALITY CONTROL	36
4.4	FIELD QUALITY CONTROL.....	36
5	INSTRUMENTATION AND EQUIPMENT PREVENTIVE MAINTENANCE.....	36
5.1	DATA EQUIPMENT CLEANING PROCEDURES	36
5.2	ANALYTICAL INSTRUMENT AND EQUIPMENT TESTING PROCEDURES AND CORRECTIVE ACTIONS	37
5.3	INSTRUMENT CALIBRATIONS AND FREQUENCY.....	37
6	DATA MANAGEMENT	37
6.1	DATA ASSESSMENT PROCEDURES	37
6.2	DATA TO BE INCLUDED IN QA SUMMARY REPORTS	37
6.3	REPORTING FORMAT	39
7	DATA VALIDATION AND USABILITY	39
7.1	SELF-ASSESSMENT, DATA SYSTEM AUDITS	39
8	REFERENCES	39
9	APPENDICES.....	41
A)	PROJECT SITE MAP(S)	
B)	STANDARD OPERATING PROCEDURES	
C)	FIELD DATA SHEET	
D)	DATA INVENTORY	
E)	9E PLANNING PROCESS	
F)	POLLUTION LOAD MODEL SELECTIONS AND SETUP	
G)	QA SUMMARY REPORT	

1 PROJECT MANAGEMENT

1.1 DISTRIBUTION LIST

All personnel listed below will receive electronic copies of this Quality Assurance Project Plan (QAPP), and any approved revisions of this plan. Once approved, this QAPP will be available to any interested party by requesting a copy from the project management.

Table 1. Distribution List

<u>Title</u>	<u>Name</u>	<u>Organization</u>	<u>E-mail/Phone Number</u>	<u>Mail</u>	<u>Document Type</u>
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Consulting Engineer	TBD	TBD	TBD	TBD	Electronic
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1.2 PROJECT ORGANIZATION

The organizational chart, provided in Figure 1, includes the roles of the project personnel and identifies lines of authority and reporting between these individuals and organizations. Responsibilities of key personnel are as follows:

- **Project Lead** (Anthony Allen, Save the Sound): Oversees all aspects of project including fiscal management, project objectives, data uses, program changes, etc.
- **Project Manager** (Nicole Davis, Save the Sound): Manages all aspect of the project, including consultant oversight, secondary data collection and review, training volunteers and staff on streamwalks and site assessment techniques, and development of the watershed based plan. Coordinates with the steering committee and watershed stakeholders.
- **Project Specialist** (Katie Friedman, Save the Sound): Assists the Project Manager in secondary data review. Ensures all streamwalk and site assessment datasheets are properly filled out. Performs/oversees data entry and checks entries for accuracy against datasheets. Assists with stakeholder engagement.
- **QA Specialist** (Peter Linderoth, Save the Sound): Ensures the QAPP is being followed, conducts field audits in real-time and runs the Quality Assurance (QA) program.
- **Consulting Engineer** (TBD): Assists with technical aspects of the watershed plan development and watershed modeling.
- **Westchester County Staff** (Robert Doscher, Xiaobo Cui): Assists with secondary data collection, stakeholders and municipal outreach and coordination and technical review of draft documents. Also participates in the watershed steering committee.
- **Field Staff** (TBD, Save the Sound): Assists in streamwalks, site assessments, and data entry.
- **US EPA Project Officer** (Elizabeth Wright) – Oversees US EPA Cooperative Agreement compliance including processing recipient/subrecipient requests for QA/QC within EPA Regions.
- **US EPA QA Officer** (Esther Nelson): Reviews, comments on and approves QAPP.
- **US NFWF** (Lynn Dwyer, Erin Lewis): Programmatic and grant oversight and QAPP compliance.
- **NYSDEC QA Officer** (Lewis McCaffrey): Reviews, comments on and approves QAPP.
- **NYSDEC Environmental Specialist** (Michele Golden): Provides technical guidance, document review, assists with secondary data collection (NYSDEC data), and participates in the watershed steering committee.

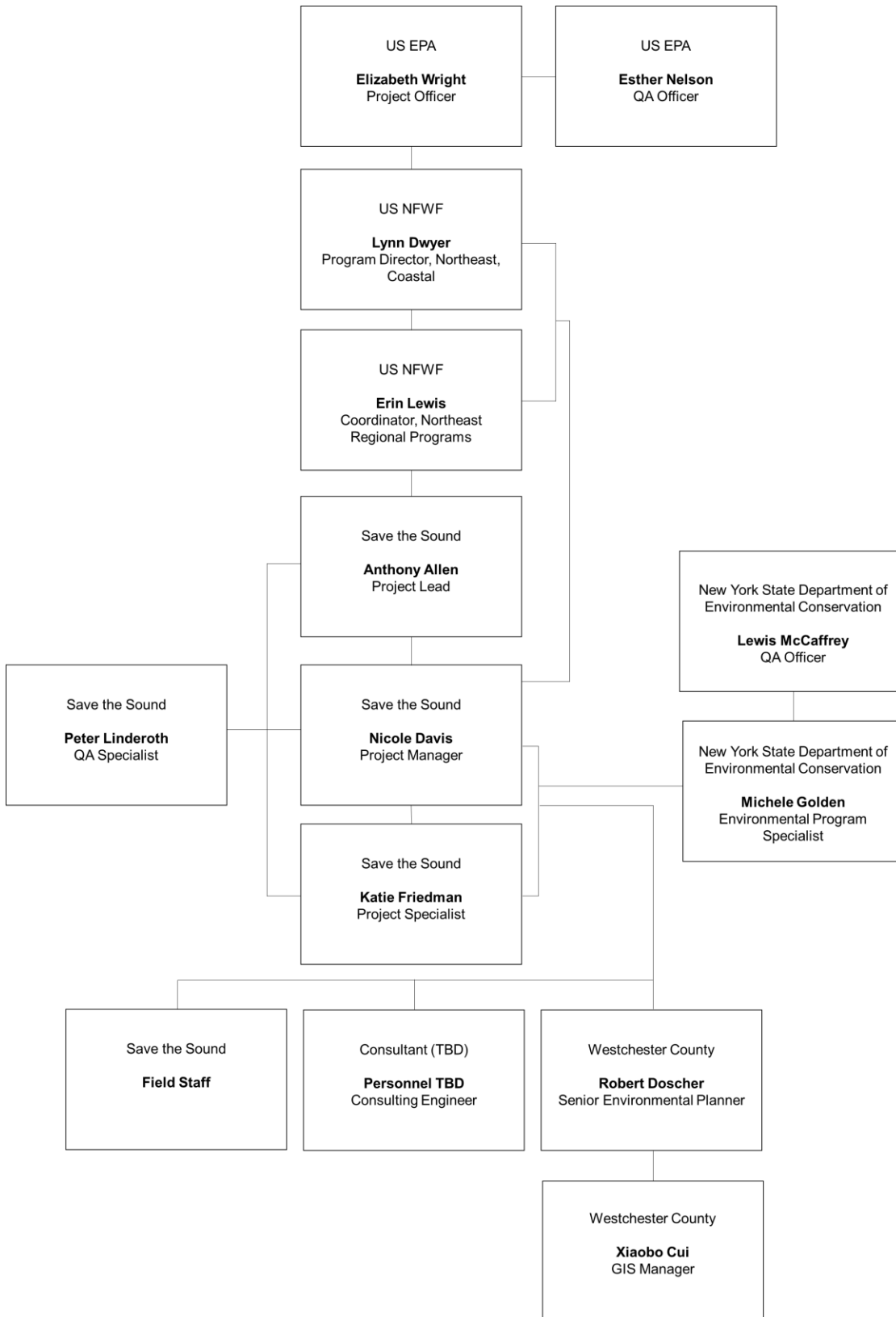


Figure 1. Organizational chart of project personnel.

1.3 PROJECT ABSTRACT

Save the Sound and Westchester County Department of Planning, working closely with local stakeholders, will develop a watershed plan for the 5,430-acre portion of the Hutchinson River in Westchester County, New York. The watershed plan will identify sources of nonpoint source pollution and implementable practices to improve water quality and watershed resilience. The ultimate goal, through future cleanup and restoration projects this plan generates, will be to remove the Hutchinson River and its tributaries from the “New York State Section 303(d) List of Impaired/TMDL Waters”.

Major activities will result in a watershed plan based on the “United States Environmental Protection Agency (US EPA) Nine Element (9e) Planning Process” (US EPA 2008) and will rely on existing data sources to identify sources of nonpoint source pollution, assess mitigation opportunities for nonpoint sources of pollution and flooding, engage and work with a Consulting Engineer to recommend future actions and implementable projects to achieve pollutant load reductions, provide flood mitigation and enhance resilience, and engage stakeholders, including representatives of municipalities in Westchester County.

Based on time and budget constraints this project will focus solely on the Westchester portion of the watershed (Appendix A). Additional funding will be sought to continue planning efforts and develop a watershed plan for the remainder of the watershed within New York City using the US EPA 9e Planning Process.

1.4 PROJECT OBJECTIVES AND APPROACH

Save the Sound and Westchester County Department of Planning will develop a watershed plan for the portion of the Hutchinson River Watershed in Westchester County using the US EPA 9e Planning Process that incorporates components to mitigate flooding and enhance resiliency. The project will: 1) identify the causes and sources of water quality impairments and the risks associated with flooding and propose management, restoration, and design recommendations to improve water quality in Long Island Sound and reduce flooding in the watershed; 2) identify implementable stormwater management, habitat restoration, and resiliency projects within the watershed that incorporate public recreation and access where feasible, prioritized using methodology established by a coalition of watershed stakeholders; and 3) engage and educate municipalities, key stakeholders in the watershed, and the public through volunteer opportunities, public meetings, and webinars. The Quality Assurance Project Plan (QAPP) for this project will be approved before work begins.

The Hutchinson River Watershed Plan will provide a blueprint for future restoration of the River by prioritizing activities to reduce impairments and improve water quality. The identification of nonpoint sources of pollution in the watershed will help target management measures and activities to areas where they will result in water quality improvements. Engaging a broad range of stakeholders and the general public will build capacity to protect the river, raise awareness of the problem, and increase opportunities for stewardship. The ultimate goal, through future cleanup and restoration projects this plan generates, will be to remove the Hutchinson River and its tributaries from the New York State Department of Environmental Conservation’s (NYSDEC) “Draft New York State 2018 Section 303(d) List of Impaired/TMDL Waters” (NYSDEC 2018).

The objective of this document is to identify the quality assurance components that are necessary to implement the project activities under the Watershed Plan for the Hutchinson River--Phase 1: Westchester County (NY). This objective will be achieved by using accepted methodology outlined in the US EPA’s “Handbook for Developing Watershed Plans to Restore and Protect Our Waters” (US EPA 2008) and NYSDEC “Nine Element (9e) Watershed Plan DEC Reviewer

Guidance” (NYSDEC 2019). The nine minimum elements to be included in watershed plans are (US EPA 2008; Appendix E):

- a. Identify causes and sources of pollution
- b. Estimate pollutant loading into the watershed and the expected load reductions
- c. Describe management measures that will achieve load reductions and targeted critical areas
- d. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan
- e. Develop an information/education component
- f. Develop a project schedule
- g. Describe the interim, measurable milestones
- h. Identify indicators to measure progress
- i. Develop a monitoring component

In addition to the methodology above, Save the Sound and Westchester County, working with a Consulting Engineer, will work with watershed stakeholders to compile and source all relevant existing data for the Hutchinson River Watershed, including but not limited to studies, reports, plans and GIS data. Field work and potential project site assessments will be conducted by trained staff using the Unified Stream Assessment, or comparable protocol (Kitchell & Schuler 2005). Save the Sound will also work with the Mount Vernon Boys and Girls Club to conduct qualitative streamwalk assessments following the Natural Resources Conservation Service’s (NRCS) Streamwalk program (Bobowick & Lerman 2005). Planning for flood resiliency will also be incorporated based on Federal Emergency Management Agency (FEMA) floodplain mapping and hydrologic analysis (US EPA 2008; FEMA 2001). This information will all be used to aid in the identification of sites that should be further investigated.

Components of this plan development will reflect previous watershed-planning efforts in neighboring watersheds of the Long Island Sound, such as the Bronx River Intermunicipal Watershed Management Plan, produced by Westchester County Department of Planning and partners in 2011, and Connecticut’s West River Watershed Plan (2015) and the Mill River Watershed Plan (2018) developed by Save the Sound and partners. Similar to these previous plans, the Hutchinson River Watershed Plan will include an existing conditions assessment through desktop analysis and subsequent field verifications, and inter-municipal stakeholder engagement. However, as described above, the Hutchinson River Watershed Plan will be strengthened by incorporating elements of flood mitigation and resiliency into the US EPA 9e Planning Process. The ultimate goal of this watershed plan is to develop projects and recommendations that will remove the River and its tributaries from the NYSDEC Draft 2018 Section 303(d) List of Impaired/TMDL Waters. This watershed plan will be developed concurrently with a management plan Westchester County is developing for the neighboring watersheds of Stephenson Brook, Burling Brook, Pine Brook and Larchmont Harbor, funded separately by the National Fish and Wildlife Foundation (NFWF).

Project Tasks:

Table 2. Project Tasks and Schedule

Task Number	Task Description	Date
Task 1		
Task 1	Hire Consultant: In order to achieve the goals of this project, Save the Sound will seek the assistance of a qualified engineering firm to assist in the development of a watershed plan and to help recommend and design implementation projects in the watershed. The specific responsibilities of the Consulting Engineer are outlined in Section 2 of this document.	January 2022
Task 2		
Task 2	Watershed Baseline Assessment: A baseline watershed assessment will be conducted to characterize the watershed and identify the major sources of bacteria, nutrients, and other impairments, addressing Elements a and b of the 9e process.	February 2022 – September 2022
2a	Gather Existing Data Reports and Information: Identification and review of existing plans, reports, studies, and geospatial data pertaining to the watershed, included but will not be limited to: reports, planning documents, studies, FEMA documents, flood and resiliency studies, monitoring data, and GIS data produced by municipal, county, State and federal agencies; and universities, non-governmental organizations (NGOs) and local stakeholders.	February 2022- August 2022
2b	Review and Synthesis of Existing Information: All existing data will be reviewed by the project team and entered into the data inventory included in Appendix D. A desktop analysis of suitable data will be conducted which will include compilation and review of existing data and reports related to water quality monitoring, streamflow, floodplain mapping, and the waterbody's long-term control plan. Data gaps will also be identified through this process.	
2c	Conduct Streamwalks: Visual stream assessments or "streamwalks" are a simplified assessment protocol to evaluate the condition of aquatic ecosystems associated with streams. A streamwalk is designed as an introductory, screening-level assessment method for people unfamiliar with stream assessments to help to evaluate the overall condition of the stream and adjacent land use and help to identify problem areas to inform the watershed plan. Number and location of streamwalk reaches will be identified in the Hutchinson River mainstem as part of this planning process.	July-August 2022
2d	Produce Watershed Baseline Assessment Report: Work completed in Task 2a, 2b and 2c will be incorporated into a watershed baseline assessment report, which will be used as the frame work in developing the watershed plan.	September 2022
Task 3		
Task 3	Stakeholder Engagement and Formation of a Watershed Steering Committee: Identification and engagement of potential watershed stakeholders, including local nonprofit organizations, businesses, large-property owners, schools, universities, community groups, watershed residents, and anyone else interested in the health of the Hutchinson River will be an integral part of the plan development and an ongoing effort during the planning process.	<i>Kick of meeting</i> March 2022 <i>Bimonthly Steering Committee meetings</i> March 2022 – July 2023

3a	Identification of Stakeholders: Identification of potential watershed stakeholders including local non- profit organizations, businesses, large-property owners, schools, universities, community groups, watershed residents, and anyone else interested in the health of the Hutchinson River.	February 2022 – March 2022
3b	Formation of Steering Committee: Stakeholders who wish to be more involved in guiding the development of the planning process will have the opportunity to participate in the plan’s Steering Committee, which will meet bimonthly throughout the project to review project deliverables in more detail. The Steering Committee is voluntary and will represent a cross section of stakeholder and ideally represent each of the major municipalities in the waters, the County, NYSDEC, other nongovernmental organizations, and special-interest groups.	April 2022
3c	Hold Public Stakeholder Events: A minimum of four public involvement events will be held to educate public stakeholders, identified during Task 3a, on the importance of local waterways and anthropogenic impacts on them, along with the challenges facing the watershed and potential opportunities to mitigate impairments and protect water quality.	March 2022 – August 2023
<i>3c(i)</i>	<i>Watershed Public Stakeholder Kick-Off Event</i>	<i>March 2022</i>
Task 4		
4a	Pollution Load Modeling: Utilizing the data collected as part of the watershed baseline assessment a pollution load model will be developed, for the Westchester County portion of the watershed, to characterize the amount or mass of a given pollutant delivered to river over a period of time, addressing Element b of the 9e process.	September - November 2022
<i>3c(ii)</i>	<i>Watershed Public Stakeholder Event</i>	November 2022
4b	Estimate Pollution Load Reduction: The pollution load model developed as part of Task 4a will be used to estimate the load reduction necessary to remove the river from the NYSDEC list of impaired waters. This model will focus on sources of nonpoint source pollution associated with stormwater runoff and the results from the pollutant load model will identify the relative contribution of nonpoint source pollution from various land uses, sources, and subwatersheds. This model will also be used to estimate the potential load reductions associated with any proposed project included in the watershed plan, addressing Element b of the 9e process.	December 2022 - April 2023
Task 5		
5	Identify Possible Management Recommendations: The results of the baseline assessment and pollution load model will be used to identify and assess opportunities for the nonpoint source management measures that will need to be implemented to achieve load reductions; including stormwater management, water quality improvement, flood reduction, habitat restoration, resiliency recreation, and public access throughout the watershed. A list of potential improvement opportunities will be generated and will be ground-truthed during field visits during Task 6, addressing Element c of the 9e process.	December 2022 – February 2023

Task 6		
6	Evaluate Options and Select Final Management Recommendations: Based on the findings of Task 5, feasibility of various management strategies will be evaluated. Identified improvement opportunities will be reviewed based on factors such as proximity to water quality impairments, flood risk, and intact ecological resources (i.e. open space, forest, riparian buffer etc.). Improvement opportunities will then be verified through targeted field visits to locations throughout the watershed during which observational measurements will be collected (Appendix C). Recommendations will encompass opportunities within the riparian corridors as well as upland areas, addressing Element c of the 9e process.	February 2023- April 2023
<i>3c(iii)</i>	<i>Watershed Public Stakeholder Event</i>	<i>April 2023</i>
Task 7		
7	Prioritize Management Recommendations and Identify Implementation Pathways: Feasible management recommendations will be prioritized according to several factors, such as subwatershed area treated, cost, feasibility, environmental benefits, public acceptance, and other key implementation factors, with emphasis placed on multi-benefit projects. The synergy and combined effects of management practice will also be considered. Specific ranking criteria will be developed in conjunction with the watershed Steering Committee, taking into account watershed goals identified by the group, addressing Element c of the 9e process.	April 2023 – May 2023
Task 8		
8	Produce Watershed Plan: The information gathered during the previous tasks will be compiled with additional recommendations into an US EPA 9e process that also addresses flooding and resiliency. The watershed plan also will include an implementation schedule, cost estimates for recommended projects, potential funding sources, criteria and milestones for implementation, along with a monitoring plan, incorporating Elements d-i of the 9e process. The draft watershed plan will be shared with the watershed stakeholders for their comments and feedback and presented in a public forum.	May 2023 – August 2023
<i>3c(iv)</i>	<i>Watershed Public Stakeholder Event</i>	<i>July 2023</i>
Task 9		
9	Plan Approval: The completed watershed plan will be submitted to the NYSDEC for approval in accordance with their “Nine Element Watershed Plan DEC Reviewer Guidance” (2019).	September 2023 - October 2023

Required meetings, data gathering, monitoring or measurements is expected to begin **January 15, 2022**, following the approval of the Quality Assurance Project Plan (QAPP). Table 3 lists the data or constituents that are required for this project, however additional sources may be identified as part of the planning process.

Table 3. Information and Reports to be Collected

Information	Unit	Method
Primary Data Collection		
Channel Morphology (Type, Depth, Width)	Feet	Observation/Streamwalk
Substrate Composition (qualitative, check box)	%	Observation/Streamwalk
Water Conditions (qualitative, check box)	Type	Observation/Streamwalk
Aquatic Plants & Algae (qualitative, check box)	Presence/Absence	Observation/Streamwalk
Canopy Cover (qualitative, check box)	%	Observation/Streamwalk
Riparian Vegetation (qualitative, check box)	Low, moderate high	Observation/Streamwalk
Surrounding Land Use (qualitative, check box)	Type	Observation/Streamwalk
Degraded Buffer (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Erosion (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Fish Barrier (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Stormwater Outfalls (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Channel Modification (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Trash (if present)	Lat/Long, feet & observations	Observation/Streamwalk
Stakeholder Input and Oral Information	Survey & discussion summary	Public Meetings and Interviews
Potential Project Location and Problem Area Site Assessment	Lat/Long, measurements of area in square feet & observations	Observations/Site Assessments
Secondary/Existing Data	UNIT	SOURCE
Watershed and Subwatershed Boundaries	N/A	USGS/County/State
Land Use/Land Cover	Type%/Acres	County/Municipal/State GIS
Topography	Feet (elevation)	County/Municipal/State GIS
Impervious Cover	%/Acres	County/Municipal/State GIS

Hydrology	Feet/Miles	USGS/ County/Municipal/State GIS
Average Depth to Groundwater (over one-to-ten years based on available data)	Inches/Feet	NRCS/USGS
Stormwater and Sewer infrastructure	GIS	County/Municipal/State GIS
Hydrologic Soil Groups	Type%/Acres	NRCS
Ecological Resources (including environmentally sensitive areas as defined by State, Local, and/or Federal entities, eg. wetlands, endangered species habitat, etc.)	Type%/Acres	County/Municipal/State/ Federal/ Environmental Non-Governmental Organization
Stormwater Runoff Coefficients	EMC	literature values
Average Annual Precipitation	Inches	Northeast Regional Climate Center
Flood Hazards	GIS/Type	FEMA/County/Local
Fecal Indicator Bacteria (Fecal Coliform, <i>E. coli</i> or Enterococci)	CFU	NYSDEC/County/NYCD EP/Environmental Non- Governmental Organization
Total Nitrogen (TN)	mg/L	NYSDEC/County
Total Phosphorus (TP)	mg/L	NYSDEC/County
Total Suspended Solids (TSS)	mg/L	NYSDEC/County
Flow	ft ³ /s	USGS
Hazard Mitigation Mapping	GIS/Area	County/Municipal/FEMA
Number of Buildings (total drainage area)	Total Number	County/Municipal/US Census
Individuals Per Single Family Dwelling	Total Number	County/Municipal/US Census
Individuals Per Multi Family Dwelling	Total Number	County/Municipal/US Census
Individuals Per Commercial and Public Building	Total Number	County/Municipal/US Census
Conventional and Advanced Septic Systems	Total Number/%	County/Municipal/State
Street Sweeping	Occurrences	County/Municipal/State

Structural Stormwater Management Practices	Total Number/Volume	County/Municipal/State
Roadways	Feet/Miles	County/Municipal/State
Secondary/Existing Reports	UNIT	SOURCE
Previous Watershed Assessments	N/A	County/Municipal/State
Government Codes and Ordinances (related to land use, water and conservation)		County/Municipal/State
Open Space Plans		County/Municipal
Municipal Master Plans		Municipal
Hazard Mitigation Plans		County/Municipal/State
Coastal Resiliency Plans		County/Municipal/State
Transportation Corridor Plans		County/Municipal/State
Special District / Development Plans		County/Municipal
Water Company Studies and Reports		Utility Company
Relevant University Studies and Reports		Local Universities/Colleges
Sewer and Water District Reports		County/Municipal/local utilities

1.5 DATA QUALITY OBJECTIVES

Following the US EPA's 9e process and NYSDEC approval criteria will ensure the methodology used in plan development and the overarching goals and recommendations in the Hutchinson River Watershed Plan are consistent with the watershed plans developed for the other watersheds of Westchester County and the Borough of the Bronx (US EPA 2008; NYSDEC 2019). The 9e process was developed at the federal level to ensure efficiency and consistency in watershed planning nationwide. This methodology is the recommended approach by both US EPA and NYSDEC (US EPA 2008; NYSDEC 2019). Therefore, the data collection activities proposed for this project are the most appropriate to meet project objectives. Consistency both in format and content, will help ensure that the Hutchinson River Watershed Plan is an easy-to-use document for Westchester County and municipalities that span multiple watersheds, as well as for local stakeholder and Non-Governmental Organizations (NGOs).

The overall Data Quality Objectives (DQOs) for this project are completeness, representativeness, and comparability. It is important to note that developing a watershed plan relies heavily on both quantitative and qualitative information, on professional judgement and consensus from a large group of stakeholders. As such, it can be a subjective process and utilizing the US EPA's 9e process creates the structure to remain consistent with the overarching DQOs. All data for this project will be reviewed by the Project Manager or Project Specialist to ensure consistency and that data meet additional task specific DQOs specified below. Save the Sound, and specifically the Project Manager, have developed or been involved in the development of nine watershed plans following the 9e process. Recommendations from these 9e

plans have successfully been implemented in Connecticut and resulted in the successful removal of impaired water bodies from the Connecticut Integrated Water Quality Report, which is a List of Impaired/TMDL Waters for the state.

The following DQOs relate to each project task in chronological order, where appropriate, as follows. Please note that many of the tasks build upon one another or are ongoing throughout the plan development. Work flow has been adopted from the US EPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" (US EPA 2008; Appendix E):

Task 2. Watershed Baseline Assessment: A baseline watershed assessment will be conducted to characterize the watershed and identify the major sources of bacteria, nutrients, and other impairments.

Task 2a. Gather Existing Data Reports and Information:

The data collected for this project will include existing studies, plans and geospatial information, which will be evaluated to ensure the quality of the information meets the objectives of this project (also referred to as secondary source data). Whenever possible, existing data sets gathered will be peer-reviewed and/or widely used data from federal, state, county or local government agencies and publicly available data repositories. Data from universities, NGOs and other reputable sources will also be used if they meet the DQOs below.

Geospatial data will be used to represent on-the-ground watershed conditions in a geographic information system (GIS). Geospatial data will be obtained from numerous sources throughout the project and will meet the DQOs below. Data generated by State, County, Municipal governments and NGOs will be used in the watershed planning project. Preference will be given to data provided and previously reviewed for fitness by the Westchester County GIS Manager. If similar data exist from multiple sources priority will be given to the data recommended by the Westchester County GIS Manager or the most recent version of the data published, if the data source chosen is not the most recent version of the data, the reason for selection will be stated in the data inventory maintained for all secondary source data (Appendix D).

Potential existing data types, discussed in Table 3 and Section 2.1, will be evaluated and considered for inclusion in the project if the following are true:

- The information contained pertains directly to the geography of the Hutchinson River Watershed, or a portion of a political jurisdiction within the watershed;
- The information, goals or objectives contribute to or inform one of the 9 elements (appendix E) or provides information on the location, extent or severity of flooding or resiliency;
- It is the most recent version of the data (not superseded or revised), was created in the past 10 years and is still applicable, provides applicable historic context or informs one of the 9 elements (appendix E);
- The methodology for creation, collection and reporting meets DQOs included in this section, and criteria identified in Appendix D (i.e. has a valid QAPP, Standard Operating Procedures (SOPs), peer reviewed, etc.);
- Geospatial Data is consistent with the New York State (NYS) GIS Standards Work Group (now the Standards and Data Coordination Work Group) standards or able to be projected to the recommended Datum, based on their criteria downloaded 6/15/2021:

Datum Recommendations:

NAD-83 - Horizontal

NAVD-88 – Vertical

Coordinate Systems Recommendation:

For data at 1:10,000 scale and larger: State Plane, Meters or U.S. Survey Feet

For data at scales smaller than 1:10,000: UTM Zone 18, Meters

Task 2b. Review and Synthesis of Existing Information:

The Project Manager, Project Specialist or Consulting Engineer will review each identified dataset, report, plan or study for fitness based on the DQOs listed in Task 2a for each type of data. All data collected will be entered into the data inventory (Appendix D) and a copy will be retained as a digital file. If a dataset is determined not to meet the DQOs, a record of the dataset will be maintained with a note as to the reason the data are being excluded from the planning process.

Task 2c. Conduct Streamwalks:

Streamwalks are a screening level assessment and is an initial step in identifying the potential issues affecting the watershed. They also provide an opportunity to engage stakeholders and for community members to help inform the planning process. Streamwalk assessments are qualitative and rely on observations made by trained volunteers using the NRCS stream assessment protocol (Bobowick and Lerman 2005). The NRCS stream assessment protocol provides a framework for coordinating and conducting a streamwalk which produces comparable and replicable observations.

The watershed is expected to be divided into 12-25 streamwalk reaches, between 1,000 feet and 1.5 miles long based on convenient access points from a road, as recommended by Bobowick and Lerman (2005). Reaches will be defined by the Project Manager or Project Specialist using GIS, and local watershed and transportation data provided by Westchester County during Task 2. Given the limits of the budget and the screening level nature of the streamwalks all reaches may not be assessed.¹ The number of streamwalks conducted will be based on the number of volunteers participating and their interest in assessing a given reach. Reaches assessed will be selected by the volunteers based on their own personal preference and may not be representative of the entire watershed.

Data will be collected based on observations made in the field by trained volunteers using the same standardized data sheets for each reach assessed (Appendix C). Using a protocol that has successfully been employed by volunteers in multiple watersheds across Connecticut, requiring volunteers to complete a streamwalk training and the use of standardized data sheets will ensure data is collected in a consistent manner. Streamwalk trainings will be conducted by the Project Manager, see Section 1.6, for additional information. Additionally, volunteers will be asked to take pictures using their own personal devices or camera. The following photos will be taken during a streamwalk:

- Photo taken from downstream (beginning of reach) facing upstream.
- Photo taken from upstream (end of reach) facing downstream.
- Photos of each Areas of Concern (defined in Section 2.1) observed within the full reach.

Photos will be reviewed by the Project Specialist to verify observed in-stream conditions. Photographs too blurry or submitted without reference to the streamreach assessed will not be used.

Parameters to be assessed using estimates and observations include:

- Channel Morphology (Estimate Type, Depth, Width)
- Substrate Composition (qualitative, check box)
- Water conditions (qualitative, check box)
- Water conditions (qualitative, check box)
- Aquatic Plants & Algae (qualitative, check box)
- Riparian vegetation (qualitative, check box)

¹ Disclaimer: Streamwalks are used to enhance understanding of on-the-ground conditions in the watershed but are not required as part of the US EPA 9-Element Planning Process. Watershed management recommendations can still be made based on existing data. However, for every reach that is assessed through a streamwalk, our understanding of existing conditions is enhanced. If no reaches are assessed, site-specific information critical to the development of the watershed plan will be gained during Task 6.

- Surrounding Land Use (qualitative, check box)
- *Area of Concern*: Degraded Buffer (if present) (qualitative, approximate location or lat/long, estimate of length and width)
- *Area of Concern*: Erosion (if present) (qualitative, approximate location or lat/long, estimate of length and height)
- *Area of Concern*: Fish Barrier (if present) (qualitative, approximate location or lat/long, estimate of length and height, material)
- *Area of Concern*: Stormwater Outfalls (if present) (qualitative, approximate size and location)
- *Area of Concern*: Channel Modification (if present) (qualitative, approximate location or lat/long, estimate of length and description)
- *Area of Concern*: Trash (if present) (qualitative, approximate location or lat/long, description of trash)

Data will be compiled and reviewed by the Project Specialist or the Consulting Engineer. Data will be assessed for use based on the criteria below, and data must meet all listed criteria to be included:

- Stream assessments were conducted with trained staff or one person who demonstrated the ability to accurately conduct an assessment during the provided training;
- The entire reach was assessed or reason for not assessing the entire reach was made clear (i.e. pond, impassible due to downed trees, etc.);
- All survey sheets were completed and returned;
- Areas of concern worksheets were completed when appropriate and returned;
- Name of assessor(s) and date of assessment was recorded on the data sheets;
- Photographs were included as part of the assessment;

In reaches where streamwalks have been conducted, the data collected will be used to inform Task 5, but will not be the sole source used to identify potential recommendations.

Task 3. Stakeholder Engagement and Formation of a Watershed Steering Committee:

Public stakeholder events will be held throughout the planning process with the Watershed Steering Committee and other interested members of the public. The goal of these events is to use a qualitative method of engaging stakeholders and to solicit information and feedback at critical points in the planning process (Table 2). An agenda and stakeholder questions will be developed and circulated at least one week prior to each event. Questions or surveys will be developed by the project team prior to each meeting to help facilitate discussions and identify additional data or information that should be considered, similar to the structure used in the development of the Mill River Watershed Plan (Fuss & O'Neill 2018). Additional information on the timing, objectives and structure for these events are discussed in Sections 1.4, 2.1, and Table 2. Data Quality Objectives will be met by:

- Developing a consistent list of guiding questions that frame and provide a foundation for stakeholder discussion at each Steering Committee meeting and stakeholder event;
- Holding at least 8 Steering Committee meeting during the planning process with at least one member from each of the watershed municipalities in attendance;
- Developing meeting notes that summarize the conversations at each watershed Steering Committee meeting and capture insights and responses to questions raised during discussions.

Qualitative and anecdotal data collected during stakeholder meetings and conversations will be evaluated by the Project Manager or Project Specialist for consideration for use if:

- The information contained pertains directly to the geography of the Hutchinson River Watershed, or a portion of a political jurisdiction within the watershed;
- The information directly contributes to or informs one of the 9 elements (Appendix E) or provides information on the location, extent or severity of flooding and resiliency;

- The information can be corroborated and is consistent with other information/observations or data for the Hutchinson River Watershed or similar geographic areas of the Northeastern United States;
- Contact information for the source of the information is provided for follow up, if necessary.

Meeting documentation will be retained with the project records and anecdotal information will be maintained as part of the data inventory (Appendix D).

Task 4. Pollution Load Modeling:

Utilizing the data collected as part of the watershed baseline assessment (Task 2), a screening-level pollution load model will be developed, for the Westchester County portion of the watershed. The primary purpose of the model is to evaluate source(s) categories of nutrients generated from various land uses within each subwatershed and acquire information as to the relative contribution from each source. The Watershed Treatment Model (WTM) was chosen for a pollution load model based on its focus on sources of non-point source pollution associated with stormwater runoff and its successful use in the development of 9e plans for similar sized watersheds in Connecticut. The WTM is a screening-level model that is used to estimate the loading of pollutants to a waterbody based on land use and other activities within a watershed. Based on user-specified inputs describing characteristics of the watershed, the WTM estimates pollutant loads from various land uses and activities, as well as load reductions associated with structural and non-structural management measures. The WTM provides annual loading estimates for fecal indicator bacteria (bacteria), total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) and can be distinguished as stormwater or non-stormwater. These distinctions are also important in relation to water quantity are important and for evaluating the effectiveness of best management practices related to hydrologic impacts.

All model input and parameterization (calibration) and corroboration (validation and simulation) of data will be of a known and documented quality and meet the DQOs for existing data above (see DQOs for Task 2). The ultimate quality test for the model is whether the output sufficiently represents the natural system that is being simulated. For this model, no water quality data will be used for calibration or validation. The data to be used will consist of data previously collected by county, state, and federal agencies or other reputable organizations. The selection process and model set up will be documented in Appendix F. As data review and collection is a major component of this project, Appendix F will be completed by the Consulting Engineer and reviewed by the Project Manger following the completion of the Task 2.

Per NYSDEC guidance (2020): "The overall DQOs for data analysis and modeling is to analyze, model and accurately report data collected and analyzed by approved data sources. For data analysis and modeling the DQOs are qualitative and quantitative statements that:

- Clarify the intended use of data;
- Define the type of data needed to support a decision;
- Identify the conditions of collecting the data.

The DQOs for input data for the model are

- Data quality for key model inputs (e.g., land use, meteorological, hydrological or chemistry) will be representative to support specification of the model.
- Data quality for model will be representative to provide a robust test of model performance.

The DQOs for model output (e.g., predictions, simulations) include both qualitative and quantitative perspectives.

- Output will be consistent with well accepted watershed paradigms (Singh, and Jain 2002);
- Output will be consistent with mass balance constraints;
- Patterns of output in time and space will be consistent with the biogeochemical features of riverine systems;

- Appropriate responses of models to reasonable variations;
- Performance, according to metrics widely reported in similar modeling initiatives, is consistent with levels reported for other similar efforts.”

The DQOs for the WTM can be further refined to define performance criteria that limit decision-based errors and address the data validity and reliability of the modeling effort in the context of completeness, representativeness, and comparability:

For the WTM, completeness is a measure of the amount of valid input data obtained during a process. The target completeness for models will be 100 percent (i.e. all acceptable sources used in the model). A list of required and supplemental data needed to run the model are included in Appendix D. Available data may be limited or only available from a single source. The actual completeness may vary depending on the availability of existing data for the Hutchinson River Watershed and may be outside of the control of the project team or the scope and budget of this project. As collection and review of existing data sources is major component of this project, this will be addressed as part of Task 2. For this project, only data sources meeting the DQOs references in Task 2 will be used and data that is excluded from use from the WTM will be noted.

Representativeness is a measure of how closely the input or parameterization (calibration) data will reflect the physical characteristics of the watershed over time. The use of data sets developed using a QAPP, standardized monitoring plan design, or the use of Standard Operating Procedures (SOPs) for soils identification, land cover mapping, and acquisition of weather data are crucial to ensuring representative data quality. All applicable model input or parameterization data sources will meet the DQOs identified in Task 2.

Comparability is the confidence with which one data set can be compared to another. Data comparability from external sources is very much tied to the individual project methodology and time at which it was collected. For the purpose of this project, comparability will be maintained by using consistent units, appropriate temporal (10 years) and spatial scales (within the Hutchinson River Watershed), and reproducible methods. Unit conversions, datum transformations, and grid re-projections may be required to make data for modeling comparable and will be made according to the recommendations of the New York State GIS Standards and Data Coordination Work Group (2021). Any necessary data transformations will be noted in Appendix D. Data that, has been significantly changed, or will potentially diminish the modeling results or are not comparable will be excluded from use in the WTM. The decision will be made using best professional judgment by the Consulting Engineer or Project Manager, as necessary. Comparability between other model indicators will be evaluated on a case-by-case basis. Where ever possible data of a particular type will be obtained from a single source, reducing potential issues of comparability.

Pollution load modeling assumptions, inputs, outputs and results will be reviewed by the Project Manager, Westchester County, and included in a technical memorandum approved by the watershed stakeholder Steering Committee and made available as part of the draft and final watershed plan.

Tasks 5-7. Identify Possible Management Recommendations; Evaluate Options and Select Final Management Recommendations; Prioritize Management Recommendations and Identify Implementation Pathways:

This set of tasks will focus on improvement opportunities and recommendations to address water quality concerns, flooding and resiliency, and will be based on information gathered during Task 2 and Task 4. Due to project budget and time constraints, potential project locations will focus on publicly owned land, Right-of-Way (ROW) and privately-owned properties where permission has already been granted. DQOs for this set of tasks will employ standard methods for identifying, evaluating and selecting management recommendations.

Site assessments, conducted as part of Task 6, will include targeted site observations of watershed conditions relying on professional judgement by experienced project staff and will be conducted by the Consulting Engineer, Project Manager, Project Specialist and Save the Sound field staff, all of whom have experience with or will be trained in the methodologies described in the Center for Watershed Protection (CWP) Urban Subwatershed Restoration Manual Series (Kitchell and Schueler 2005). Site assessments and field observations, as opposed to streamwalks, are to verify the improvement opportunities identified through targeted field visits to locations throughout the watershed. As with all field work, DQOs include accuracy, precision, completeness, representativeness, and comparability. This will be achieved through collaborative consensus where site assessments will be conducted by teams of at least two (2) and not more than 5, the staff performing these assessments will individually conduct a visual assessment of the site using the appropriate data sheets and then come together to compare and discuss their findings and the potential problems and solutions at each site; consistent with the methodologies described in the CWP “Urban Subwatershed Restoration Manual Series” (Kitchell and Schueler 2005). Field data sheets for visual assessments that are proposed as part of this project are provided in Appendix C. As needed measurements will be made using a standard tape measure in inches and feet. Based on project budget and time constraints, it is expected that 60 improvement opportunities will be assessed. If more than 60 potential sites are identified, two sites will be selected by each municipality and the remaining 50 will be chosen at random from the subwatersheds that have the highest pollution load contribution, as determined during Task 4.

The Consulting Engineer will then evaluate each opportunity identified in Task 6 for feasibility and cost effectiveness, impact on water quality, and potential for flood mitigation (based on existing conditions, published data, and professional judgement). Based on the outcome of this evaluation, the potential improvement opportunities will be reviewed and vetted by the Steering Committee and the Consulting Engineer will develop up to eight (8) concept plans. These will be preliminary designs that help visualize improvement recommendations, such as a rain garden installation or riparian buffer restoration, at specific locations within the watershed to highlight priority projects in the watershed plan. Concept plans will utilize standard methods for creating design schematics and potential concepts and locations will be reviewed by the Project Manager to ensure that concept designs consist of a representative suite of projects and include information that is transferable to other potential project locations. The number of concept plans to be included is based on project budget and time constraints.

Task 8. Produce Watershed Plan:

Information generated during the previous tasks will be used to develop a watershed plan using the standard methods established by the US EPA 9e process and meet the approval criteria developed by the NYSDEC (2019). Elements for the 9e process not associated with the previous tasks will be developed by the Consulting Engineer using standard methods and best professional judgement; and will be reviewed by the Project Manager and vetted by the Steering Committee. The DQOs for the watershed plan are to ensure the best available input data were used for each task and that all recommendations are consistent with the overall project objectives.

Table 4. Quality Assurance Objectives for Primary Data Measurements¹

Parameter	Source	Method	Units	Sensitivity	Precision	Accuracy	Completeness
GPS Coordinates	Save the Sound and Volunteers	Smart phone or GPS handheld unit	Decimal degrees (Dec. deg.)	1.02 m	for reference point, within 10 m (=0.0001 dec. deg.)	± 7.8 m	100%

Parameter	Source	Method	Units	Sensitivity	Precision	Accuracy	Completeness
			Datum specific on field data sheet				
Field Photographs	Save the Sound and Volunteers	Camera or smart phone	N/A	N/A	N/A	N/A	100%
Field Measurements	Save the Sound and Volunteers	Tape measure	Feet (ft)	0.5 ft	Field Replicate 100%	± 0.5 ft	100%
Channel Morphology (Type, Depth, Width)	Save the Sound and Volunteers	Tape measure	Feet (ft)	0.5 ft	Field Replicate 100%	± 0.5 ft	100%
Substrate Composition (qualitative, check box)	Save the Sound and Volunteers	Observation	%	10%	Field Replicate 80%	± 10%	100%
Water Conditions (qualitative, check box)	Save the Sound and Volunteers	Observation	Type	N/A	Field Replicate 100%	N/A	100%
Aquatic Plants & Algae (qualitative, check box)	Save the Sound and Volunteers	Observation	Presence/Absence	N/A	Field Replicate 100%	N/A	100%
Canopy Cover (qualitative, check box)	Save the Sound and Volunteers	Observation	%	10%	Field Replicate 80%	± 10%	100%
Riparian Vegetation (qualitative, check box)	Save the Sound and Volunteers	Observation	Low, moderate high	N/A	Field Replicate 80%	N/A	100%
Surrounding Land Use (qualitative, check box)	Save the Sound and Volunteers	Observation	Type	N/A	Field Replicate 80%	N/A	100%

1. To be identified and records maintained during the process

1.6 DOCUMENTATION AND RECORDS

Specialized training is not required for Save the Sound, Westchester County and the Consulting Engineer staff to successfully complete this project. Save the Sound's Project Manager has more than 13 years' experience facilitating and developing watershed plans, including the Mill River Watershed Plan for south central Connecticut. All personnel involved in this project will receive instructions on stakeholder engagement, reviewing secondary source data, data collection, documentation and storage procedures for digital records and hard copies prior to collecting or reviewing information, by the Project Manager and Project Specialist. All information will be stored in a central location accessible by the project team and all data received will be documented using the data inventory in Appendix D.

One streamwalk training will be held, for any volunteer interested in participating, by Save the Sound staff, prior to streamwalks being conducted. If possible, based on Westchester County Health Department recommendations, an in-person train will be held. If in-person training is not advisable the virtual training and field training video, developed by Save the Sound in 2020, will be used. The project manager, Nicole Davis, or another equally qualified member of the project team, who have experience conducting stream assessments and training volunteers to use the NRCS protocol, will conduct streamwalk trainings. Nicole has conducted streamwalk assessments and trained students and volunteers utilizing the US EPA Rapid Bioassessment protocol in Virginia and the NRCS stream assessment protocol developed for Connecticut in both the Mill and Farm River Watersheds as part of their respective watershed plan development. At least one person from each group of volunteers assessing a reach of stream will be required to have attended the full volunteer training or be accompanied by Save the Sound staff familiar with the NRCS stream assessment protocol. A training log for all volunteers attending the streamwalk training will be maintained with the project records. Standard operating procedures will be provided to all volunteers (Appendix B).

Save the Sound Staff and the Consulting Engineer, following the CWP “Urban Subwatershed Restoration Manual Series” (Kitchell and Schueler 2005), will conduct site assessments and field observations. The Project Manager will train field staff not familiar with the methodologies described in the CWP “Urban Subwatershed Restoration Manual Series” (Kitchell and Schueler 2005). The Project Manager will review the information guidance with all inexperienced staff, who will conduct one visual assessments under the guidance of the Project Manager and then conduct at least three visual assessments, which will be reviewed by the Project Manager.

All records generated by this project will be stored on Save the Sound’s server and cloud-based storage network, OneDrive, and at Save the Sound’s New Haven office. All records will be backed up on Save the Sound’s internal server. Copies of this QAPP will be distributed to all parties involved with the project, including signatories and field personnel. Any future changes or amendments to the QAPP will be held and distributed in the same fashion. Copies of previous versions of the QAPP will be clearly marked as “superseded by revision #” so as not to create confusion.

The records of all project information and data used to complete the activities of the project will be retained for at least seven years from the date of sampling, measurement, report, or application.

2 DATA ACQUISITION

2.1 DATA COLLECTION & INFORMATION

Task 1. Hire a Consultant:

To achieve the goals of this project, Save the Sound will seek the assistance of a qualified engineering firm to assist in the development of a watershed plan and to help recommend and design implementation projects in the watershed following the approach established in US EPA’s 9e planning process. The selected Consulting Engineer will be required to uphold the standards for data collection and use outlined in this QAPP approved by US EPA. Consultant responsibilities resulting in data collection will include:

- Development and maintenance of a geodatabase containing all existing data and reports;
- Development of a pollution load model and identification of the causes of impairment and pollutant sources;
- Identification of opportunities for stormwater management, water quality and resiliency improvements, and habitat restoration opportunities. Methods to incorporate recreation,

and public access throughout the watershed will be included into recommendations where practical;

- For the watershed, as well as each subwatershed (identified during Task 2 based on existing subwatershed data), the consultant will develop specific management recommendations that address the causes and sources of pollution and will refine the overarching goals identified by stakeholders into corresponding implementable objectives and actions (See Task 3 for additional information);
- The consultant will work with project team and watershed stakeholders to develop a Watershed Management Plan for the Westchester County portion of the watershed. The Plan will include the watershed characterization, watershed management goals, watershed management objectives, and proposed implementation measures to achieve the goals. The consultant will complete additional components as required by the US EPA 9e process (US EPA 2008; NYSDEC 2019), such as identifying a schedule for implementation, developing the monitoring component, and identifying funding and technical resources to implement the plan.

Task 2. Watershed Baseline Assessment:

Task 2a. Gathering Existing Data, Reports, and Information:

This project will rely on existing data as well as input from watershed stakeholders. Collection and review of existing data, plans, reports and observations will be ongoing from the date of QAPP approval through Task 9. Existing data for the project will be acquired, whenever possible, from established sources as noted in Section 1.5. During this initial phase, information will be collected based on existing federal, state, county, municipal, and university generated reports, studies, and data as well as NGO, community, and stakeholder information. These data will be collected and reviewed by Save the Sound staff and the Consulting Engineer. Information relevant to the geography of the Hutchinson River Watershed will be assessed based on the criteria outlined in Section 1.5 of this document and documented using the data inventory included in Appendix D. Table 3 includes a preliminary list of expected data and reports to be collected (Section 1.4, Appendix D).

A data inventory will be created and maintained by the Save the Sound Project Manager for all datasets and existing studies throughout the planning process following the methodology discussed in “US EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters” (2008). Data will be reviewed by Save the Sound and the Consulting Engineer, based on the DQOs identified in Section 1.5. The data inventory will be maintained using the data inventory included in Appendix D and serve as a record of all existing data collected. Information will be entered into the inventory upon receipt of the documented and updated directly following the review of each document. Any data not used or excluded from the plan will also be maintained in the data inventory, with notation as to why the data was not used.

At minimum the data inventory (Appendix D) will include:

- Type of data (e.g., monitored, geographic)
- Source of data (agency)
- Quality of data (QA/QC documentation, QAPP)
- Representativeness of data (number of samples)
- Spatial coverage (location of data collection)
- Temporal coverage (period of record)
- Data gaps
- Location (file path or physical storage location)
- Geospatial data: Datum realization and year adopted

Data inventories for tabular datasets, reports, and anecdotal information and GIS data will be maintained using the appropriate table included in Appendix D. In addition, a geodatabase will also be developed and maintained by the Consulting Engineer. The geodatabase will contain all

geospatial data utilized and information generated for this project (e.g. land use maps). All data will be projected according to the New York State “Datum and Coordinate System Standards” compiled by the Standards Work Group into the same datum, North American Datum 1983; New York State Plane East Zone or the projection recommended by the Westchester County GIS manager if different. This projection will also be used for any maps produced for the watershed plan.

Task 2b. Review and Synthesis of Existing Information:

The consulting engineer will conduct a GIS desktop analysis to characterize the existing Hutchinson River Watershed conditions. GIS data management and mapping will be overseen by the selected Consulting Engineer who will ensure that all data meet the standards established in this QAPP and that GIS work completed is accurate and appropriately presented (US EPA 2003; Appendix D). Details on how data will be assessed for fitness are included above and in Section 1.5.

The desktop analysis will include compilation and review of existing data and reports related to water quality monitoring, streamflow, floodplain mapping, and the waterbody’s long-term control plan. Through available GIS data related to topography, hydrologic units, and storm sewer drainage, subwatersheds will be delineated for the Westchester County portion of the Hutchinson River Watershed. These subwatersheds will serve as planning units for the remainder of the project, and they will be characterized based on land use and land cover, impervious cover, open space, geology and soils, ecological resources, and existing infrastructure. The desktop analysis will serve as the basis for identifying the causes for impairment and pollutant sources.

Data gaps – informational, temporal, and spatial – will be identified under Task 2b by following Section 6.2.1 of the US EPA 9e Handbook (US EPA 2008). Based on known available data, it is anticipated that sufficient data exists to meet the objectives of this project. If data gaps are encountered, alternative data will be sought. If no suitable alternative data are available based on the DQOs, the project team will work with Westchester County, US EPA, NFWF, and NYSDEC to determine the best method to develop a watershed plan that identifies additional data needed to complete the 9e process.

Summary figures and maps showing the key data elements for each subwatershed will be prepared and presented to the Steering Committee for review. Data gathering and analysis will be an ongoing, iterative process. Data examined in this phase will continue to be used in subsequent activities, such as modeling pollution loading, identifying and evaluating management measures, and tracking implementation efforts (US EPA 2008).

Task 2c. Streamwalk Assessments:

Visual stream assessments or “streamwalks” are a simplified assessment protocol designed as an introductory, screening-level assessment method that can be conducted by people unfamiliar with riverine systems. They help to evaluate the overall condition of the stream channel, riparian buffer, and floodplain based on point-in-time observations and a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment using a standardized data sheet. Visual stream assessments also help to identify potential problem areas and provide a basis for further detailed field investigation and potential restoration opportunities.

Save the Sound will partner with the Mount Vernon Boys & Girls Club to conduct streamwalks of the Hutchinson River following NRCS protocols for performing visual stream assessments in Connecticut (Bobowick and Lerman 2005). As the state of Connecticut and Westchester County are both part of the same physiographic province (Appalachian Highland, New England Province, New England Upland Section, 9b) this protocol is appropriate for the geographic extent of this project (Fenneman 1946). This NRCS streamwalk protocol has been used by Save the Sound

and volunteers in New Haven County's West River (2014), Mill River (2018), and Farm River (2020).

Trainings will be held by Save the Sound staff in person, or utilizing the virtual training and field training video, developed in 2020, if required by the pandemic. Streamwalk trainings will be conducted by the Project Manager or another member of Save the Sound's Ecological Restoration Team who has experience conducting stream assessments and training volunteers to use the NRCS protocol. Participants will be provided links to the streamwalk guidebook and all necessary maps and data sheets to complete the assessment.

Groups of two or more volunteers will then conduct assessments with Save the Sound staff (Task 2c of Task 2: Watershed Baseline Assessment, Section 1.5). Data will be collected following the procedures established in the "Streamwalk Guide Book" (Bobowick & Lerman 2005) and utilizing the "CT-NRCS Stream Segment Survey Sheet" (Appendix C). Streamwalks will be conducted under baseline conditions. A single assessment typically takes between two to four hours to conduct. Streamwalks will be conducted once per reach, starting downstream and moving upstream. Multiple streamwalks can be completed concurrently as volunteer time and staffing allow. Volunteer coordination will be conducted by the Project Specialist. The following materials and equipment required to conduct a streamwalk will be provided to volunteers by Save the Sound:

- Maps (GIS subwatershed maps, street maps)
- Waders
- Tape measure
- Digital camera
- GPS unit (commercial grade)
- Pencils, notebook, clipboard
- Spray paint
- Clippers
- Data Sheets
- Photo Inventory
- Notification Letter

The number of streamwalk reaches and locations will be determined during the project following the NRCS protocol (Bobowick and Lerman 2005), based on the following general criteria:

- At least one convenient access point from a road;
- Located between major road crossings or near a transition between significant land use change, based on existing transportation and land use data;
- Relatively homogeneous land use;
- At a confluence of two streams separate reaches will be defined;
- Reasonably accessible (check for private property); and
- Reaches will be >1000 feet and < 1.5 miles
- One reach will be selected as a reference in a subwatershed without documented water quality issues. The reference reach will be selected by the Project Manager and Project Specialist based on a stream segment that is not included on the Draft New York State 2018 Section 303(d) List of Impaired/TMDL Waters (NYSDEC 2018).

A NRCS "Reach Level Assessment" form will be completed for each reach. In addition, separate "Area of Concern" forms will be completed for problems if observed in each reach (one form will be completed for each instance observed) (Appendix C). According to NRCS, "Areas of concern are sections of stream where the physical characteristics of the stream are indicative of conditions adverse to aquatic life and human uses" (Bobowick and Lerman 2005) These may include areas of erosion, fish barriers, stormwater outfalls, sections of modified channel, degraded buffer, trash/debris, and/or water conditions.

Streamwalk volunteers will be asked to take pictures using their own personal devices or camera. The following photos will be taken during a stream assessment:

- Photo taken from downstream (beginning of reach) facing upstream.
- Photo taken from upstream (end of reach) facing downstream.
- Photos of each Areas of Concern (defined above) observed within the full reach.

Photos will be reviewed by the Project Specialist to verify observed in-stream conditions to inform the watershed baseline assessment.

Task 3. Stakeholder Engagement and Formation of a Watershed Steering Committee:

Task 3a. Identification of Stakeholders:

Identification of potential watershed stakeholders, including local nonprofit organizations, businesses, large-property owners, schools, universities, community groups, watershed residents, and anyone else interested in the health of the Hutchinson River will be an integral part of the plan development and an ongoing effort during the planning process. Local stakeholder knowledge and engagement is necessary to have a collaborative process that will increase stewardship and awareness of water quality, flooding and resilience across the Hutchinson River Watershed. The "US EPA Handbook for Developing Watershed Plans to Restore and Protect our Waters" (2008) identifies local knowledge as "critical to accurately identifying and characterizing sources" and to ensuring a complete picture of the unique characteristics of the watershed (pages 5-32). Stakeholder involvement adds more detailed information to watershed planning given that stakeholders are most aware of existing issues, and is an on-going component throughout the planning process. Building off Save the Sound and Westchester County's existing network of partners in the watershed, Save the Sound, Westchester County and the Consulting Engineer will reach out directly to watershed municipalities and the groups previously identified to make them aware of the initiation of the watershed planning process and to invite them to a project kick-off meeting. Meeting information will be shared broadly through emails, social media and local news sources to encourage widespread and diverse participation. As part of this initial meeting the team will help to identify and develop a list of additional groups and individuals that should be involved in the plan development.

Task 3b. Form Steering Committee:

From this group of stakeholders, a watershed Steering Committee will be formed that will help shape the watershed plan and its recommendations. At minimum the Steering Committee will be comprised of representatives from each watershed municipality, NYSDEC, New York City (NYC) Parks, Westchester County and Soil and Water Conservation District representatives, as well as any interested stakeholder. The Steering Committee will meet bimonthly to help guide the plan development, provide input and review all materials and draft documents developed by the consulting engineer.

Task 3c. Hold Public Stakeholder Events:

A minimum of four public stakeholder events will be held to educate the public on the importance of our local waterways and the impacts that we have on them as well as the challenges facing the watershed and potential opportunities to mitigate impairments and protect water quality. These forums will also provide stakeholders with opportunities to shape the planning process by providing feedback on goals and priorities in the watershed, to share information, knowledge and recommendations, and to guide projects included in the final plan. Public-involvement events will be incorporated into meetings of the watershed Steering Committee at the completion of major tasks during the planning process. This will help to ensure that evaluations and their related assumptions build upon the best available information. These meetings will take place at the beginning of the planning process (Task 3c(i)), after the watershed baseline assessment and initial pollution load model is developed (Task 3c(ii)), during the investigation of watershed improvement opportunities (Task 3c(iii)), and at the completion of the draft watershed plan (Task 3c(iv)).

Stakeholders will be invited to the public events through email, social media, press releases, and coordination with local municipalities. All individuals who reside, work, recreate or have an interest in the Hutchinson River Watershed will be invited to participate. The “group” will be self-selecting based on time and interest of those individuals who decide to participate.

For each meeting, at minimum, two staff will be present to facilitate and take detailed notes. Prior to the meeting, the roles and responsibilities of each staff person present will be identified (i.e. lead meeting, facilitate discussion, take notes, prepare meeting summary). Meeting attendees will be asked to sign in with their names and contact information and introduce themselves and their affiliation. This information will be used to ensure attendees represent a cross section of the watershed communities and that we can follow up with meeting attendees as needed. Following each meeting, a meeting summary will be circulated to all attendees to review for accuracy. Information about all outreach efforts; meeting agendas, summaries, and attendee lists; volunteers; and publicity will be documented in a public involvement summary included as an appendix to the final watershed plan.

Meetings will be approximately 1.5 to 2 hours long, although the actual time may vary based on stakeholder discussion and the proposed meeting objectives. A meeting notice, including an agenda, will be sent out in advance to all identified stakeholders, and recipients will be asked to RSVP.

To ensure consistency:

- Questions will be established prior to all meetings and included in the meeting agenda, which will be shared with stakeholders via email at least 48 hours prior to the meeting;
- Stakeholders will be informed any information provided as part of this project will be public;
- Summary of responses and discussions will be circulated via email to attendees prior to the following public stakeholder meeting;
- All meeting summaries will be developed by the Project Specialist and approved by the Project Manager, and will be included in a public involvement summary;
- All responses to questions prepared for the meeting will be retained as part of the project records;
- Original or photographs of public-information data gathering will be retained as part of the project records;
- Stakeholders unable to attend will have the opportunity to provide written responses via email to the Project Specialist and Project Manager up to two weeks after the meeting that will be included in the meeting summary;
- If meetings are held virtually, the meeting will be recorded and made available.

The first public stakeholder meeting (Task 3c(i)) will be used to kick-off the planning process by identifying existing and needed sources of data and begin to establish stakeholder goals and priorities. Attendees will be asked at minimum these 5 questions:

- What is important in the watershed?
- What are your top concerns/issues/priorities regarding the watershed?
- What do you want to see in the plan?
- What information is available?
- Is there anyone else who should participate?

Watershed planning goals will be based on stakeholder input and priorities for how the watershed is currently used and how stakeholders would like to be able to utilize areas in the watershed in the future. Based on this feedback, individual priorities will be categorized into overarching goals used to guide the watershed plan.

If more than 10 attendees are present the group will be divided, randomly, for smaller group discussions, then come back together. Answers to each question and group discussions will be recorded by a staff person appointed by Save the Sound or the selected Consulting Engineer. At least one member of the project team will be present to take notes and document the discussion for each group. Responses will be compiled and used to develop and prioritize plan goals and objectives.

Subsequent public meetings will follow a similar format. The second public stakeholder meeting (Task 3c(ii)) will give watershed stakeholders the opportunity to provide feedback on the baseline assessment, and will help identify watershed restoration goals, which will be used to shape the watershed plan. The third meeting (Task 3c(iii)) will be used to refine planning goals and objectives, review and provide feedback on the pollution load model and begin to identify potential project locations. The fourth meeting (Task 3c(iv)) will be used as public information session to familiarize stakeholders with the draft watershed plan and provide an opportunity to for public comment on the document.

The form of meetings and other opportunities for stakeholder involvement will be determined and evaluated throughout the planning process. Although in-person meetings have been the preferred approach, it may be necessary to use other options for public engagement, such as virtual meetings, on-line StoryMaps, field walks, etc. to ensure the safety of all involved due to the coronavirus pandemic. During this time the project team will consult and follow the guidance and protocols developed by the New York State Department of Health and the Westchester County Department of Health prior to scheduling or hosting stakeholder engagement. The form of the meeting will be decided two weeks ahead of time and if a virtual format is selected, all participants will be provided options to participate via internet and phone. If in-person meetings are feasible, meeting notices will be distributed throughout the watershed with at least 1 meeting held in proximity to the upper watershed and 1 meeting held in the southern area of Westchester County. Meeting information, links, agenda, summaries and draft documents will be posted in a central online location (e.g. the Save the Sound website).

Task 4. Pollution Load Modeling:

Utilizing the data collected as part of the watershed baseline assessment, a pollution load model will be developed for the Westchester County portion of the watershed. Pollutant loads characterize the amount or mass of a given pollutant delivered to a water body over a period of time. Estimation of pollutant loads from a watershed therefore provides insight into the relative contributions of pollutants from different land uses and land use practices within a watershed and is a key element of the US EPA 9e process.

Task 4a. Pollution Load Modeling:

Save the Sound and the engineering consultant will develop a pollution load model using the Watershed Treatment Model (WTM). The WTM, developed by the Center for Watershed Protection, is a spreadsheet-based model used to calculate annual pollutant loads (total phosphorus, total nitrogen, total suspended sediment, and fecal coliform) and runoff volumes as well as estimate benefits from a wide range of stormwater runoff and pollutant removal practices (Caraco 2013). Model selection and setup will be document using the table included in Appendix F. As data review and collection is a major component of this project, Appendix F will be completed by the Consulting Engineer and reviewed by the Project Manger following the completion of the Task 2.

This model will focus on sources of nonpoint source pollution associated with stormwater runoff and the results from the pollution load model will identify the relative contribution of nonpoint source pollution from various land uses, sources, and subwatersheds. The model will be set up to focus on primary sources of runoff pollution loads, which will be calculated based on existing county and municipal level land use data. The specific data to be used in the WTM will be based on quality of available data as determined during the watershed baseline assessment and the methods outlined in Section 1.5, previously in Section 2 of this document and Appendix D.

Depending on the quality and types of available data, the team may also incorporate secondary model sources, which are associated with specific activities or other sources that are not tied specifically to a particular land use (e.g. septic systems, potential illicit connections, etc.). Secondary model sources will be used only if they are available and meet fitness of use standards identified as DQOs in Section 1.5. The pollution load model will rely on existing local, state, federal, and county-level data (Appendix D). The pollution load model will provide estimates of the annual pollutant loads from each of the subwatersheds and the relative contribution from various land uses, primary sources, and where data exists, secondary sources. This task will form the basis for estimating the load reductions as part of Element b of the 9e process. A brief technical memorandum summarizing the assumptions and inputs to the pollutant load model will be prepared. A draft technical memo and results of the pollution-load model will be reviewed by stakeholders and comments will be incorporated into the final memo.

Task 4b. Estimate Pollution Load Reduction:

The pollution load model developed for the Hutchinson River Watershed will also be used to estimate the load reduction necessary to remove the River from the NYSDEC list of impaired waters. This model will focus on sources of nonpoint source pollution associated with stormwater runoff and the results from the pollution load model will identify the relative contribution of nonpoint source pollution from various land uses, sources, and subwatersheds. Water quantity will be modeled to develop a pre- and post-implementation hydrologic model for the watershed, which will be used to estimate peak flow reductions necessary to address flood hazards. The model will also be used to evaluate load reductions associated with the suite of watershed improvement opportunities identified later in the planning process, and aid in prioritization of plan recommendations and projects.

Task 5. Identify Possible Management recommendations:

Using the outcomes from Tasks 2 through 4, properties (including publicly owned, Rights-of-Way, and privately-owned properties where permission has already been granted) located within subwatersheds contributing to the pollutant load will be identified using GIS for potential improvement opportunities. This desktop analysis through GIS will allow the project team to view the watershed at a high-level extent efficiently and identify areas that will require more fine grain analysis during Task 6. Data used in Task 4 is listed in Table 3 within Section 1.4 and Appendix D, and will include property maps, impervious cover and open space layers, streamwalk areas of concern, pollution load outputs, sewer and stormwater infrastructure, transportation corridors, and other relevant data identified during Task 2. A list of potential properties to assess for improvement opportunities will be generated and used by field staff to conduct site assessments in Task 6.

Task 6. Evaluate Options and Select Final Management Recommendations:

The Consulting Engineer and Save the Sound will conduct a total of 60 site assessments, following methods described in the Center for CWP “Urban Subwatershed Restoration Manual Series” (Kitchell and Schueler 2005). These will occur throughout the project area, with emphasis on the target areas identified during Task 5. Site assessments will encompass opportunities within the riparian corridors as well as upland areas, such as:

- Stormwater best management practices, including rain gardens, bioswales, permeable pavement, and stormwater wetlands;
- Stream restoration initiatives, including barrier removals, bank stabilizations, riparian plantings, living shorelines, and floodplain reconnections; and
- Habitat enhancement efforts including reforestations, native plantings, and wetland restorations.

Specific site assessment activities may include but are not limited to the following:

- Evaluation of physical riparian, in-stream and floodplain conditions and opportunities for restoration or other improvements using the Unified Stream Assessment or comparable protocol (Kitchell & Schueler 2005);
- Evaluation of upland stormwater retrofit opportunities in the public right-of-way, on public properties such as schools, parks, and government complexes, and on properties with large impervious areas, such as institutional campuses and parking lots; and
- Assessment of existing ecological resources, such as wetlands, forests, and large pervious areas, focused on identifying opportunities for habitat enhancement, restoration, or improved recreational opportunities.

Each site assessment will be documented using the protocol field sheets (Appendix C). Based on data collected through the site assessments, the Consulting Engineer will develop an inventory of physical improvement opportunities throughout the watershed. Opportunities will be categorized based on type of project (e.g., stream restoration, stormwater retrofit, etc.). The inventory of watershed improvement opportunities will be evaluated using the pollution load model, discussed above, to calculate the water quality and runoff reduction potential of each project.

Task 7. Prioritize Management Recommendations and Identify Implementation Pathways:

The results of the baseline assessment, pollution load model, stakeholder input, and site assessments will be used to identify and assess opportunities for the nonpoint source management measures that will need to be implemented to achieve load reductions, including stormwater management, water quality improvement, flood reduction, habitat restoration, resiliency recreation, and public access throughout the watershed. This will serve to identify critical watershed areas and evaluate management measures. After identifying opportunities for watershed restoration, stakeholders will prioritize identified opportunities during a public meeting (Task 3c(iii)) based on several criteria outlined in Section 10.3.7 of the US EPA “Handbook for Developing Watershed Plans to Restore and Protect Our Waters” (2008), such as subwatershed area treated, cost, feasibility, environmental benefits, public acceptance, and other key implementation factors, with emphasis placed on multi-benefit projects. Following Section 10.3.8 of the US EPA 9e Handbook, these criteria will be ranked and weighted by the Consulting Engineer in conjunction with the watershed Steering Committee, taking into account watershed goals identified by the group and objectives outlined in this document. Prioritizing projects through such a ranking system is consistent with past watershed planning efforts, described in Section 1.4. All decisions will be made through collaborate consensus, where options will be discussed by the group to address any potential conflicts of opinion. Concept designs will be developed for up to eight (8) of the highest ranking projects (based on budget and timing constraints). Potential project locations assessed and deemed feasible for the field team that are not further developed as concept designs will be included in the watershed plan as additional recommendations to pursue.

Task 8. Produce Watershed Plan:

The information gathered during all previous tasks will be compiled into a US EPA 9e Watershed Plan that also addresses flooding and resiliency. Additional recommendations will be developed by the Consulting Engineer in conjunction with the watershed Steering Committee related to capacity building, education and outreach, general stormwater best management practices, habitat restoration, and monitoring. The plan will highlight how each recommendation will address the causes of impairment and sources of pollution and help meet the target parameters established. Additional components will be developed and incorporated into the draft watershed plan, including: identifying a schedule for implementation that emphasizes the importance of multi-benefit projects during implementation of the plan, developing the monitoring component, and identifying funding and technical resources to implement the plan. The draft watershed plan will be shared with the watershed stakeholders for their comments and feedback and presented in a public forum. The draft watershed plan will be made available for review and comment for at least 30 days, revisions to the plan will be made based on

feedback received and all comments received will be responded to and included in the plans public involvement summary. A celebration event will also be held once the watershed plan is finalized.

Task 9. Plan Approval:

The completed watershed plan will be submitted to the NYSDEC for approval in accordance with their "Nine Element Watershed Plan DEC Reviewer Guidance" (2019).

2.2 Data Storage, Preservation and Holding Time

DATA SHEET IDENTIFICATION

All site assessments and streamwalk assessments will be collected using the appropriate standard data sheets (Appendix C). All site assessments and streamwalk data sheets will be identified with a unique site ID and with the following information:

- Site ID
- Location and latitude and longitude in decimal degrees
- Date
- Time
- Initials of data collector

See Sections 1.5 and 2.1 for additional details.

FIELD OBSERVATIONS AND MEASUREMENTS

Field observations and associated measurements will be collected using standardized forms and protocols outlined in Sections 1.5, 2.1, and included in Appendix C. To ensure consistency, unless otherwise noted, all streamwalk observations will be made from downstream looking upstream. Site assessments will be made facing north. When necessary, measurements will be made using a standard tape measure as inches or feet.

QC field and site assessments

For site assessments and streamwalks conducted in the field, all data sheets will be reviewed by the Project Specialist or Project Manager for accuracy. A streamwalk control reach will be identified in the Hutchinson River and will be assessed by the Project Specialist or Project Manager (see Section 2.1 for additional details). The Save the Sound QA Specialist will also conduct a streamwalk field audit in real-time to ensure the QAPP is being followed by staff and volunteers.

DECONTAMINATION PROCEDURES

Not applicable.

FIELD DOCUMENTATION

The Project Manager will be responsible for ensuring that the all site assessments and streamwalks adhere to proper custody and documentation procedures. If an assessment is deemed to have not adhered to proper custody and documentation procedures it will be disqualified.

All field activities, including site assessments and streamwalks, will be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation using the associated field data sheets (Appendix C). The primary field sampler will be responsible for ensuring that the field team adheres to proper custody and documentation

procedures and utilizes the correct field sheet. The primary field assessor will be responsible for ensuring all data sheets are completed. For streamwalks, the primary sampler will be Save the Sound staff or a volunteer who completed the streamwalk training. For all site assessments, the Consulting Engineer shall identify a primary field sampler each site assessment. Hard copy of data sheets will be retained according to procedures discussed Section 6 and photographs will be documented as outlined in Section 2.1 and retained with electronic files as discussed in Section 6.

2.3 DATA CUSTODY AND DOCUMENTATION

The Project Manager will be responsible for ensuring that the data collection team adheres to proper custody and documentation procedures.

DATA CUSTODY AND DOCUMENTATION PROCEDURES

Site assessment and streamwalk data sheets, preliminary and final reports, and electronic media reports will be kept for review by the Save the Sound. Save the Sound will retain original hard copies of data sheets for at least 7 years. Original copies of field sheets will be scanned and saved as digital copies by Save the Sound project staff within one month of data collection and saved on Save the Sound's S Drive for at least 7 years with a plan to keep records for duration of the project and beyond. Any Quality Assurance Project Plan(s) or Standard Operating Procedure(s) accompanying these data will be kept in the project file on the S-Drive. The S-Drive is backed up weekly. Data from the scanned data sheets will be entered into an excel spreadsheet by the Project Specialist saved on the S-Drive and retained for at least 7 years. At the beginning of the project, a file sharing site will be established between the Consulting Engineer and Save the Sound for the project.

A file sharing site will also be established between Save the Sound and volunteers conducting streamwalks. Photographs will be uploaded by volunteers to this file sharing site and will be named with the following naming convention: YYYY-MM-DD-SITEID-#. Each photograph must be documented on its corresponding data sheet using the same naming convention. Once photographs are uploaded, Save the Sound's Project Manager and Project Specialist will review for completeness by cross-checking the data sheets and will upload the photographs both to the S-drive for long-term storage and to the separate file sharing site established between the Consulting Engineer and Save the Sound.

Secondary source data acquired and reviewed during this project will be recorded, using the corresponding data inventory included in Appendix D. Data sources used for the pollution load model will be determined by the Consulting Engineering using the data inventory described in Sections 1.5 and 2.1 and Appendix D.

3 ANALYTICAL REQUIREMENTS

3.1 CHEMISTRY ANALYSES

N/A – no chemical analysis will be conducted.

3.2 SAMPLE PREPARATION METHODS

N/A – no samples will be collected. All data collected will be based on field observations.

4 QUALITY CONTROL REQUIREMENTS

The types of quality control assessments required for this project are discussed below.

4.1 QUALITY ASSURANCE OBJECTIVE (QAO) CRITERIA

The QAOs define a tolerable level of potential decision error for data collected on a project. They help to define the data quality objectives and clarify the project objectives further. The QAOs are then used as comparison criteria during data quality review by the group that is responsible for collecting data to determine if the minimum requirements have been met and the data may be used as planned. With the development of the watershed plan largely being an iterative process, much of the data reviewed and collective will be qualitative the main QAO for this project will be to ensure the information collected and used informs one of the 9 elements and supports the 9e process established in the EPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" (2008).

Data collected that do not meet QAOs will be disqualified. To ensure overall project objectives are not jeopardized, at least 80% of all collected data will need to meet QAOs. If less than 80% of all data collected meet QAOs, data may be included with an identifier that explains any discrepancies when compared against QAOs and a justification for why the data are still valuable to the project. If data critical to meeting project objectives are not available or suitable, these data limitations will be reported to NFWF, US EPA, and NYSDEC, and identified as future data needs in the resulting watershed plan.

Task 2. Watershed Baseline Assessment:

The data collected for this project will include existing studies, plans and geospatial information, which will be evaluated to ensure the quality of the information meets the objectives of this project (also referred to as secondary source data). The Project Manager and Project Specialist will be responsible for collecting data and to determine if the DQOs have been meet, based on the following requirements:

- Data/report/information pertains to the Hutchinson River Watershed, or a portion of a political jurisdiction within the watershed;
- Data was collected in the past 10 years, provides applicable historic context or informs one of the 9 elements (appendix E);
- Is the most current version of the data/report;
- The methodology for creation, collection and reporting meets DQOs in Section 1.5, and criteria identified in Appendix D (i.e. has a valid QAPP, SOPs, peer reviewed, etc.);
- The data/report/information contribute to or inform one of the 9 elements or our understanding of flooding and resiliency;
- Information is consistent with other information and observations and can be corroborated;
- Geospatial Data: consistent with the New York State (NYS) GIS Standards Work Group (now the Standards and Data Coordination Work Group) standards;
- Geospatial data provides complete coverage of the watershed or applicable political jurisdiction;

Task 2c. Conduct Streamwalks:

Streamwalk data will also be compiled and reviewed by the Project Specialist or the consulting engineer. Data will be assessed for use based on the criteria below, data must meet all listed criteria to be included.

- The entire reach was assessed or reason for not assessing the entire reach was made clear (i.e. pond, impassible due to downed trees, etc.);
- Stream surveys conducted with trained staff or one person who demonstrated the ability to accurately conduct an assessment during the provided training;
- All survey sheets were completed and returned;
- Areas of concern worksheets were completed when appropriate and returned;
- Name of Assessor(s) and date of assessment is on the data sheets, and at least one member of the team completed the streamwalk training;
- Photographs were included as part of the assessment as described in Sections 1.5 and 2.1.

Task 3. Stakeholder Engagement and Formation of a Watershed Steering Committee:

Quality assurance objectives are that each municipality located within the Westchester County portion of the watershed appoints a representative to the watershed Steering Committee; that for 75% of all project meetings there is at least one representative from each of the municipalities and the county are present; and that 80% of the municipalities are represented at each public stakeholder event. This will help assure that discussions and decisions are representative of the watershed. Another QAO is that meeting summaries are accurate and thorough. Additional information on meeting structure and how information will be documented to are discussed in Sections 1.5 and 2.1.

Task 4. Pollutant Load Modeling: Data quality is important in the development of the pollution load model. For this project, model data will consist of data previously collected by a reliable source and reviewed during Task 2 and all input data will meet data quality acceptance criteria discussed in Section 1.5. Model Drivers are expected to be provided by state, federal and county sources or the reputable data source reviewed by the GIS manager. Expected sources of data for the WTM are listed in Table 3 and Appendices D and F. Based on the nature of the WTM, model validation will consist of professional judgment of the consulting engineer in comparison of modeled values with typical pollutant loading for similar land use in Westchester County and the northeastern United States. Additional information on model structure and parameters are discussed in Sections 1.5 and 2.1.

Calibration, or model parameterization, is defined as the process of adjusting model parameters within defensible ranges (determined following the US EPA's 2009 Guidance on the Development, Evaluation, and Application of Environmental Models) until the resulting predictions give the best possible fit to the observed data. The acceptance criteria for model parameterization (calibration) define the procedures whereby the difference between the predicted and observed values of the model are within an acceptable range or are optimized. This can occur either qualitatively or quantitatively and documented accordingly (US EPA 2009). Often calibration is the only method to ensure that model predictions correlate with values observed in the field or within ranges documented in scientific studies. Parameterization uses observed data in a systematic search for parameters that yield an acceptable fit of computed results. This search is performed to find a reasonable best estimate that will yield the minimum value of an objective function, or variable that is critical in an application. In this modeling project, that variable is pollution loading.

Each time a model is calibrated, it is potentially altered. Therefore, all calibrations will be documented, including the approaches taken (e.g. qualitative versus quantitative) along with the acceptance criteria. For this project, calibration will consist of use of engineering professional judgment, by the Consulting Engineer, in the comparison of modeled values with typical pollution loading models for similar land use in Westchester County. As such, no formal acceptance criteria are proposed for the modeling elements of the study. All adjustments made to model

parameters will be properly documented in the pollution load modeling technical report, describing how the calibration was conducted and tested for acceptance.

Model corroboration, or validation, is defined as the comparison of modeled results with independently derived numerical observations from the simulated environment. Model corroboration is an extension of the calibration process. Its purpose is to assure that the calibrated model properly assesses the range of variables and conditions that are expected within the simulated environment; or a comparison of modeled pollutant loads and load reductions to observed loads and load reductions. For this project, validation will be based on the professional judgment of the Consulting Engineer in the comparison of modeled values with typical pollutant loading for similar land use in Westchester County and the north eastern United States. As such, no formal acceptance criteria are proposed for the modeling elements of the study.

Tasks 5-7. Identify Possible Management Recommendations; Evaluate Options and Select Final Management Recommendations; Prioritize Management Recommendations and Identify Implementation Pathways:

Development of plan recommendations and improvement opportunities will be developed through an iterative process and will rely heavily on existing data, pollution load model outputs, stakeholder feedback, and professional judgement. As such, the QAOs for these tasks are that data used in the plan development meet the DQOs outlined in Section 1.5 and that the final plan recommendations meet industry standards for planning, design and engineering related to nonpoint source reduction, flooding and resiliency. As discussed in Section 2.1, the project team and Steering Committee members will collaborate throughout the planning process, review draft materials, and provide feedback at key points throughout the plan development. Using the process established in EPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" (2008) will provide the framework for achieving these QAOs.

Task 8. Produce Watershed Plan:

QAOs for this task are that data used in the plan development meet the DQOs outlined in Section 1.5 and that the final plan recommendations meets industry standards for planning, address each of the elements established US EPA 9e process, and meet the approval criteria developed by the NYSDEC (2019).

4.2 MEASUREMENT PERFORMANCE CRITERIA

The overall QAO for this project is to develop and implement procedures for watershed planning, pollution load modeling, field and site assessments, secondary source data, and reporting that will provide results that are scientifically defensible. Specific procedures for watershed planning, pollution load modeling, field and site assessments, secondary source data and reporting and corrective action are described in the other Sections 1.4, 1.5 and 2 of this document.

As an additional quality assurance check on the validity of the WTM results, the modeled pollutant yields will be compared with those of the U.S. Geological Survey (USGS) "Spatially Referenced Regressions On Watershed Attributes Model" (SPARROW) for TN and TP for the overall Hutchinson River Watershed (Moore, Johnston, Robinson, & Deacon, 2004). This comparison will be done to ensure the model accurately represents real-world conditions.

4.2.1 Field Precision

Precision of GPS points collected in the field will be evaluated through the use of a reference station at a previously set point for each stream reach that is recorded by the person that collected data for that day. All stream reach reference points will be named and stored in the project files. The Project Lead, Project Manager, Project Specialist, and QA Specialist will all have direct access to these points. Data sheets will have a line for entering the reference point name and corresponding GPS coordinates collected in the field. Notification of a completed data sheet will be sent to the Project Manager for filing in the project folder and subsequent notification to the QA Specialist for reviewing precision. Reference Table 4. in this document for precision objectives of GPS coordinates. GPS coordinates outside of the ± 7.8 meters listed in the table will be flagged for further evaluation.

4.2.2 Field Accuracy

Accuracy of GPS points will be maintained through the use of a reference station at a previously set point for each stream reach that is recorded by the person that collected data for that day. That reference point will be named and maintained in the project files. All stream reach reference points will be named and stored in the project files. The Project Lead, Project Manager, Project Specialist, and QA Specialist will all have direct access to these points. Data sheets for both site assessments and streamwalks will have a line for entering the reference point name and corresponding GPS coordinates collected in the field. Notification of a completed data sheet will be sent to the Project Manager for filing in the project folder and subsequent notification to the QA Specialist for reviewing precision. Reference Table 4 in this document for accuracy range of GPS coordinates. GPS coordinates outside of the ± 7.8 meters listed in the table will be flagged for further evaluation. Additional information is provided in Sections 1.5 and 2.1

4.3 INTERNAL QUALITY CONTROL

Internal QC is achieved through review of all studies, reports, field observations and other products of the watershed planning process by multiple trained staff, including the Consulting Engineering, Westchester County, and Save the Sound; and will ultimately be reviewed by the Project Manager. The internal QC components of the review and assessment program will ensure that the data of known quality are produced and documented.

Peer review of the WTM developed by the Consulting Engineer will be conducted by consultant staff not involved in the model development and the Project Manager to ensure that the model is technically adequate, properly documented and meets established quality requirements through the review of assumptions, calculations, extrapolations, methodology, and acceptance criteria.

4.4 FIELD QUALITY CONTROL

FIELD REPLICATES

Not applicable to this project.

5 INSTRUMENTATION AND EQUIPMENT PREVENTIVE MAINTENANCE

5.1 DATA EQUIPMENT CLEANING PROCEDURES

Equipment used for data collection that comes in contact with water in the field must be cleaned with freshwater and maintained in accordance with proper field practices. This includes waders, boots, and tape-measurers. The Project Specialist will be responsible for equipment maintenance.

5.2 ANALYTICAL INSTRUMENT AND EQUIPMENT TESTING PROCEDURES AND CORRECTIVE ACTIONS

Not applicable to this project.

5.3 INSTRUMENT CALIBRATIONS AND FREQUENCY

GPS equipment will be calibrated following Standard Operating Procedures described in Appendix B.

6 DATA MANAGEMENT

6.1 DATA ASSESSMENT PROCEDURES

Data must be consistently assessed and documented to determine whether project QAOs have been met, quantitatively assess data quality, and identify potential limitations on data use. Assessment and compliance with quality control procedures will be undertaken during the data collection phase of the project primarily by the QA Specialist after data are provided by the Project Manager. Data that fail to meet DQOs will be disqualified and limitations on use of data will be recorded in the data inventory. The Project Manager and Project Specialist will determine if project objectives have been met by comparing the final watershed plan against the NYSDEC “Nine Element (9e) Watershed Plan DEC Reviewer Guidance” and ensuring all criteria are met (NYSDEC 2019). If data critical to meeting project objectives do not meet DQOs, these data limitations will be reported to NFWF, US EPA, and NYSDEC, and identified as future data needs in the resulting watershed plan.

Field data sheets will be checked in the field by the Project Manager once per assessment, and originals given to the Project Manager or Consulting Engineer. They will identify any unusual or noteworthy results or observations, or if assessments were unable to be completed. If data are missing, inadequate, or a data sheet appears incomplete, such data will be marked as unacceptable in the data inventory and will not be entered into the electronic data base and/or otherwise used for project analysis, reporting or other purpose.

Data from the scanned data sheets will be entered into an excel spreadsheet by the Project Specialist. The data entered into the excel spreadsheet will be reviewed against the corresponding original data sheets by the QA Specialist. After data entry or data transfer procedures are completed for each assessment, data will be inspected by the Save the Sound QA Specialist for data transcription errors, and corrected as appropriate. After the final QA checks for errors are completed, precision and accuracy objectives are reviewed, the data will be added to the final database.

6.2 DATA TO BE INCLUDED IN QA SUMMARY REPORTS

During the project, NFWF may require periodic reporting, as noted below in Table 5.

At project completion, and upon request, the field team will provide copies of field data sheets and QA summary reports to NFWF. At a minimum, information must be provided for each data type to NFWF staff according to the QA Summary Report template, included as Attachment D.

Table 5. Summary of the types of data to be reported and the method in which that information will be delivered to recipients.

Data	Data Description	Reporting Method	Frequency	Responsible	Recipient
Secondary reports	Existing plans, reports, and studies reviewed during the planning process	Spreadsheet, and/or raw data, reports, electronically	Annually	Project Manager	NFWF
Secondary monitoring data	Raw data on project effectiveness, ambient water quality in priority watershed, stormwater flow, project conclusion data, etc.	Raw data, reports, and/or spreadsheets, electronically on CD or via e-mail.	At NFWF request during the closeout procedure	Project Manager	NFWF
Geospatial data	Google polygon maps, ESRI shapefiles and/or geodatabase features, latitude/longitude info, watershed segment	Spreadsheet	Annually	Project Manager	NFWF
Watershed treatment model	Inputs, outputs, assumptions data used	Spreadsheet	Annually	Project Manager and Consultant	NFWF, Watershed Steering Committee
Site assessments	On the ground observations for selected sites requiring further investigation, may include Best Management Practice (BMP) recommendation	Original assessment sheets	At NFWF request during the closeout procedure	Project Manager	NFWF
Streamwalk assessment	Instream observation of existing conditions and areas of concern for specific stream reaches	Spreadsheet (original data sheets upon request)	At NFWF Request during the closeout procedure	Project Manager	NFWF
Stakeholder engagement	Public involvement summary documenting all meetings held, outreach and volunteer events, comments received on draft documents, and other relevant information shared during the planning process	Spreadsheet and compilation of summary materials	At NFWF request during the closeout procedure	Project Manager	NFWF
Watershed Baseline Assessment Report	Document summarizing findings from Task 2: Watershed Baseline Assessment.	PDF and/or Microsoft Word Document	Once after report completion	Project Manager, Consultant	NFWF, Watershed Steering Committee

Watershed Management Plan	Document detailing watershed management recommendations based on findings from Tasks 2-7.	PDF and/or Microsoft Word Document	Once after plan completion	Project Manager, Consultant	NFWF, Watershed Steering Committee, NYSDEC
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6.3 REPORTING FORMAT

All results meeting data quality objectives and results having satisfactory explanations for deviations from objectives will be reported in the QA Summary Report. The final results will include the results of all field quality control actions. Results will be reported to NFWF at project completion as noted in Section 6.2 above. Reports may be submitted electronically along with the final programmatic report.

7 DATA VALIDATION AND USABILITY

7.1 Self-Assessment, Data System Audits

Periodic self-assessments and/or data system audits are implemented based on the nature and scope of project-specific data collection activities. For data users, these technical audits and assessments provide project personnel with a tool to determine whether data collection activities are being or have been implemented as planned. They also provide the basis for taking action to correct any deficiencies that are discovered. For QAPP Categories 1-2, NFWF may request periodic self-assessments or a data system audit. For QAPP Categories 3-4, NFWF requires the implementation of one of these tools. The decision is made by the Project Manager and based on the frequency of project-specific data activities.

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9 Appendices

- A) Project Site Map(s)**
 - a. HUTCHINSON RIVER SUBWATERSHEDS (TO BE OBTAINED AS PART OF THIS PROJECT)
 - b. STREAMWALK REACHES (TO BE OBTAINED AS PART OF THIS PROJECT)

- B) Standard Operating Procedures**
 - a. SAVE THE SOUND'S COVID-19 FIELD WORK SAFETY PROCEDURES
 - b. GPS
 - c. STREAMWALK ASSESSMENT

- C) Field Data Sheet**
 - a. UNIFIED STREAM ASSESSMENT FIELD SHEETS
 - b. NRCS STREAM ASSESSMENT FIELD SHEETS

- D) Data Inventory**
 - a. SECONDARY DATA REVIEW CRITERIA
 - b. SECONDARY DATA RECORDS
 - i. TABULAR
 - ii. REPORTS
 - iii. ANECDOTAL
 - iv. GIS
 - c. WATERSHED TREATMENT MODEL DATA
 - d. STREAMWALK ASSESSMENT

- E) 9e Planning Process**

- F) Pollution Load Model Selections and Setup**

- G) QA Summary Report**