



## **APPENDIX D**

---

# Open Marsh Water Management Project Monitoring Requirements



*Suffolk County Vector Control & Wetlands  
Management Long Term Plan &  
Environmental Impact Statement*

**TASK 4: OPEN MARSH WATER  
MANAGEMENT PROJECT MONITORING  
REQUIREMENTS**



*Prepared for:*

Suffolk County Department of Public Works  
Suffolk County Department of Health Services  
Suffolk County, New York

*Prepared by:*

**CASHIN ASSOCIATES, P.C.**  
1200 Veterans Memorial Highway, Hauppauge, NY

**May 2005**

**SUFFOLK COUNTY VECTOR CONTROL AND WETLANDS MANAGEMENT  
LONG - TERM PLAN AND ENVIRONMENTAL IMPACT STATEMENT**

**PROJECT SPONSOR**

**Steve Levy**  
**Suffolk County Executive**



**Department of Public Works**

Charles J. Bartha, P.E.  
*Commissioner*  
Richard LaValle, P.E.  
*Chief Deputy Commissioner*  
Leslie A. Mitchel  
*Deputy Commissioner*

**Department of Health Services**

Brian L. Harper, M.D., M.P.H.  
*Commissioner*  
Vito Minei, P.E.  
*Director, Division of Environmental Quality*

**PROJECT MANAGEMENT**

Project Manager: Walter Dawydiak, P.E., J.D.  
Chief Engineer, Division of Environmental Quality, Suffolk County Department of Health Services

**Suffolk County Department of Public  
Works, Division of Vector Control**

Dominick V. Ninivaggi  
*Superintendent*  
Tom Iwanejko  
*Entomologist*  
Mary E. Dempsey  
*Biologist*

**Suffolk County Department of  
Health Services, Office of Ecology**

Martin Trent  
*Acting Chief*  
Kim Shaw  
*Bureau Supervisor*  
Robert M. Waters  
*Bureau Supervisor*  
Laura Bavaro  
*Senior Environmental Analyst*  
Phil DeBlasi  
*Environmental Analyst*  
Jeanine Schlosser  
*Principal Clerk*

## **SUFFOLK COUNTY LONG TERM PLAN CONSULTANT TEAM**

<b>Cashin Associates, P.C.</b>	<b>Hauppauge, NY</b>
<b>Subconsultants</b>	
Cameron Engineering, L.L.P.	Syosset, NY
Integral Consulting	Annapolis, MD
Bowne Management Systems, Inc.	Mineola, NY
Kamazima Lwiza, PhD	Stony Brook University, Stony Brook, NY
Ducks Unlimited	Stony Brook, NY
Steven Goodbred, PhD & Laboratory	Stony Brook University, Stony Brook, NY
RTP Environmental	Westbury, NY
Sinnreich, Safar & Kosakoff	Central Islip, NY
Bruce Brownawell, PhD & Laboratory	Stony Brook University, Stony Brook, NY
Anne McElroy, PhD & Laboratory	Stony Brook University, Stony Brook, NY
Andrew Spielman, PhD	Harvard School of Public Health, Boston, MA
Richard Pollack, PhD	Harvard School of Public Health, Boston, MA
Masahiko Hachiya, PhD	Harvard School of Public Health, Boston, MA
Wayne Crans, PhD	Rutgers University, New Brunswick, NJ
Susan Teitelbaum, PhD	Mount Sinai School of Medicine, NY
Zawicki Vector Management Consultants	Freehold, NJ
Michael Bottini, Turtle Researcher	East Hampton, NY
Robert Turner, PhD & Laboratory	Southampton College, NY
Christopher Gobler, PhD & Laboratory	Southampton College, NY
Jerome Goddard, PhD	Mississippi Department of Health, Jackson, MS
Sergio Sanudo, PhD & Laboratory	Stony Brook University, Stony Brook, NY
Robert Cerrato, PhD	Stony Brook University, Stony Brook, NY
Suffolk County Department of Health Services, Division of Environmental Quality	Hauppauge, NY

### **Abbreviations and Acronyms**

OMWM	Open Marsh Water Management
DMCAC	Delaware Mosquito Control Advisory Committee
MCA	Mosquito Control Agency
NYSDEC	New York State Department of Environmental Conservation
USACOE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey

## **OMWM Monitoring Requirements**

The following information was compiled through telephone interviews and e-mail contacts with appropriate State officials.

### ***Connecticut***

In 1985, Connecticut began replacing the standard practice of maintaining the existing mosquito ditch network throughout its tidal marsh system with a variety of OMWM techniques. Presently, there are no formal requirements for monitoring OMWM projects in the state of Connecticut.

Prior to implementation, data are collected in order to determine what type of OMWM to install at a candidate salt marsh. These data consist of general water quality parameters (dissolved oxygen, temperature, salinity, and pH), marsh inundation measurements, vegetation analysis, and marsh monitoring through photo stations. Vegetation studies are performed in early fall, when seeds have formed. Water quality parameters are collected during higher water levels over a month: once at full moon, and once at new moon. Photo documentation at select photo stations is done three times a year, during the spring, mid-summer and fall. Marsh float tubes are used to measure marsh inundation during full and new moon phases. Fish sampling is performed once, in early fall. No post construction monitoring is required.

Source: Paul Capotosto, Connecticut Department of Environmental Protection, pers. comm., March 2005

### ***New Jersey***

The New Jersey Mosquito Extermination Commission has been implementing OMWM at salt marshes for approximately 30 years. The Commission believes that the effectiveness of OMWM has been amply demonstrated. Therefore, no pre- or post-project biological, physical or chemical monitoring is required. Earlier monitoring efforts had shown that the kinds of OMWM installed in New Jersey allow for fish presence on the marsh, sustained marsh vegetation patterns, and reductions in mosquito breeding. OMWM

installations are monitored only through anecdotal observations, performed on a casual basis. If unwanted changes in vegetation are noticed, more precise measurements can be made to locate the cause of the change, although techniques to accomplish this are not specified or even required.

Source: Richard Candeletti, Ocean County, Mosquito Extermination Commission, pers. comm., April 2005

### ***Delaware***

All OMWM wetland alterations in Delaware are performed under regulatory oversight by the Delaware Mosquito Control Advisory Committee (DMCAC). The DMCAC consists of four federal agencies (US Army Corps of Engineers [USACOE], US Environmental Protection Agency, US Fish and Wildlife Service [USFWS] and National Marine Fisheries Service), three Delaware Natural Resources and Environmental Conservation agencies (Division of Fish and Wildlife, Wetlands and Subaqueous Lands Section and the Delaware Coastal Management Program), and the State Historic Preservation Office.

In the early 1980s, Delaware performed a detailed five-year environmental assessment of OMWM impacts to salt marshes. Many of the current permit requirements are based upon this assessment. Permitting agencies have not required continued monitoring. If an agency develops concerns regarding OMWM in general, or for a particular project, previous projects are used to demonstrate the resource benefits associated with OMWM.

Currently, Delaware performs OMWM under a five-year blanket permit issued by the USACOE and the State Wetland program. Under this permit, advanced notification of all OMWM projects is required by the DMCAC prior to any OMWM installation. A detailed map is provided to each agency before any marsh alterations can commence. All agencies are encouraged to attend an on-site pre-construction site visit to address any specific concerns.

It is not required to collect or submit any pre- or post-project biological sampling data to any agency in the DMCAC. However, prior to implementing OMWM at a federal refuge, it is necessary to determine if the proposed marsh alterations could affect historic

properties that are included in the National Register of Historic Places, or properties that meet the criteria for the National Register, in accordance with Section 106 of the National Historic Preservation Act of 1966. If it is thought that the marsh alterations could affect historical properties, a State Historic Preservation Officer/Tribal Historic Preservation Officer is required to be involved during the OMWM process. Areas of marsh alterations must be carefully monitored and examined for the presence of any Indian artifacts that, if found, are required to be submitted to the state.

Source: Chet Stachecki, Delaware Mosquito Control, pers. comm., April 2005  
Chris Lesser, Delaware Natural Resources and Environmental Conservation, pers. comm., April 2005

### ***National Wildlife Refuges***

National Wildlife Refuges require Mosquito Control Agencies (MCAs) to collect quantifying data that are used to support the thesis that the proposed OMWM will effectively restore hydrology, significantly enhance fish and wildlife functions, and control salt marsh mosquito production. In 1998, USFWS issued its “Guidance for Meeting US Fish and Wildlife Service Trust Resource Needs When Conducting Coastal Marsh Management for Mosquito Control on Region 5 National Wildlife Refuges.”

In Region 5, if an OMWM is to be installed, a paired ditched marsh and control marsh are selected. They are to be sampled for one year prior to implementing any OMWM alterations. In the second year, OMWM is performed on the ditched marsh and sampling proceeds. USFWS sample parameters and sampling frequency are listed in Table 1.

National Wildlife Refuges require a minimum of two years post OMWM monitoring, with repeat monitoring several years thereafter once the marsh has adjusted to the alterations. If an OMWM system fails, the MCA is responsible for rectifying any problems for up to five years after completion of the project.



Table 1. USFWS OMWM Sampling Protocols

Sample Parameter	Sampling Frequency
Vegetation	Once at the end of the growing season
Water table level measurements	10-14 day intervals during the growing season
Soil salinity	10-14 day intervals during the growing season
Mosquito larval sampling	4-5 days after a tide has flooded the marsh surface
Nekton sampling in ponds	A minimum of twice during the summer
Nekton sampling in ditches/creeks	At 10 locations, twice in early summer and once in later summer-early fall
Water quality measurements	Taken during nekton sampling
Bird surveys	Performed during both the breeding and non-breeding seasons, five times for each season

Sources: Jan Taylor, US Fish and Wildlife Service, pers. comm. April 2005.

James-Pirri, M., Roman, C., and Erwin, R., April 2002. *Field Methods Manual: US Fish and Wildlife Service (Region 5) Salt Marsh Study*. US Fish and Wildlife Service.

Taylor, J., 1998. *Guidance for Meeting US Fish and Wildlife Service Trust Resource Needs When Conducting Coastal Marsh Management for Mosquito Control on Region 5 National Wildlife Refuges*.

US Fish and Wildlife Service, 1999. *Concerns and Issues about Mosquito Control on National Wildlife Refuges in the Northeast*. National Wildlife Refuge, 27 pp.

***Monitoring at the Suffolk County Vector Control and Wetlands Management Long-Term Plan OMWM Project (Wertheim National Wildlife Refuge, Shirley, NY)***

Wertheim National Wildlife Refuge is comprised of approximately 2,550 acres located on the south shore of Long Island at the mouth of the Carmans River. In conjunction with USFWS, the Long-Term Plan project team proposed to conduct an OMWM demonstration project in approximately 80 acres of the salt marshes along the east bank of the Carmans River, near its confluence with the Great South Bay, in 2003. The project

locations consisted of two distinct areas, called Area 1 and Area 2, with two similarly-sized control areas, called Area 3 and Area 4.

A joint USFWS-US Geological Survey (USGS) appraisal of OMWM in the north-east US had used an area of the Refuge, located between Area 3 and Area 4, as a study site. Therefore, the USFWS/USGS monitoring protocols (see above) formed the basis of the proposed monitoring approach. New York State Department of Environmental Conservation (NYSDEC) does not have defined monitoring protocols for marsh alterations. NYSDEC requested that the Long-Term Plan team propose a protocol that would be appropriate to measure any significant change in the marsh, and be able to determine if the change was due to the project or some other cause (such as natural variability). NYSDEC also stated its concerns regarding potential impacts to sedimentation rates, invertebrate populations, fish species, and birds. NYSDEC also, at a later date, specified a need for photo documentation.

Therefore, an adapted USFWS-USGS approach was created. 88 stations (48 in Areas 1 and 2 and 40 in Areas 3 and 4) were identified on the marsh surface, and 10 stations were set in ditches in each area (“fish stations”). Four Carmans River water quality monitoring stations (one associated with each Area), and two water quality monitoring stations in navigable sections of the major creeks were also established.

The construction of the OMWM in Area 1 (completed, March, 2005) and Area 2 (proposed for fall, 2005) will result in the loss of the ditches that contain 15 of the 20 fish stations. Relocated stations will be used to replace these losses. Three surface water stations will be established in each area (one in a small pond, one in a large pond, and one in an isolated pond). In Area 1, in addition to the three remaining fish stations and the three surface water stations, five additional stations will be established in the newly constructed streams. In Area 2, in addition to the remaining two stations and the three surface water stations, four additional stations will be selected in either new streams or remnant ditches.

Permanent photo stations were also established, using either transect points or fish stations, with clear fields of view that allowed for panoramic views across the

surrounding marsh. Where possible, photo stations were located at the original fish stations, or at transect points.

50 m radius bird survey points were established throughout the four Areas in 2004. The survey points were placed 25 m from any edge (unsuitable or non-marsh habitat) and point centers were 150 m apart.

In effort to monitor freshwater inputs and locate the freshwater interface, monitoring wells were installed near Areas 1 and 4. Two single shallow (12-foot) wells and a cluster of three wells (depths of 12 feet, 150 feet and 180 feet) were installed along the upland perimeter of Area 1. Four 12-foot wells, two 150-foot wells, and one 175-foot well were installed along the upland perimeter of Area 4.

Monitoring has been characterized into three concentrations: Biological, physical, and chemical characteristics. The following lists the general monitoring approaches adopted for the project:

### **Biological Monitoring**

- Mosquito Breeding Concentration Areas (one week intervals throughout each breeding season, across all four Areas)
- Mosquito Dip Transects (every 15-20 m along each transect, monthly)
- Vegetation Quadrats (88 transect stations, annually)
- Nekton Sampling (40 fish stations, three times a year)
- Invertebrates (26 transect stations, 28 fish stations [both water column and benthic], annually)
- Vegetation Biomass (44 transect stations, surface biomass, 22 transect stations, surface and root biomass, annually)
- Overall Marsh Composition (pre-project)

- Bird Observations (bird stations, three times a year)
- Photo Stations (annually)

### **Physical Parameter Monitoring**

- Ditch Qualities (43 ditches, pre-project)
- Sedimentation Rates (marker horizons) (88 transect stations, one-third tested each year)
- Salt Marsh Water Table Height (88 transect stations, approximately every two weeks, April-October)
- Water Table Heights (Ground Water Monitoring Wells, continuous record)
- Marsh Inundation (Areas 1 and 2, pre-project)

### **Chemical Parameter Monitoring**

- Water Quality Monitoring in Ditches (40 fish stations, monthly)
- Ditch Salinity Survey (43 ditches, pre-construction; ditches and creeks, post-construction)
- Water Table/Pore Water Salinity (88 transect stations, approximately every two weeks, April-October)
- Nutrient Sampling (12 fish stations, quarterly)
- Carmans River Water Quality (6 stations, three times a year)
- Estuarine Water Quality (three stations, three rounds, pre-construction)

NYSDEC originally requested three years of pre-project monitoring data, because of concerns that large interannual variability for many variables would obscure impacts

associated with the project. NYSDEC accepted the approximately one and a half years of pre-project monitoring, as the Long-Term Plan team was persuasive regarding its ability to use sophisticated statistical analyses to address some of these issues, along with the availability of more than three years of key monitoring data from the USFWS-USGS project.

However, as a permit condition, NYSDEC is requesting that monitoring continue for 10 years. It is unlikely that it will be possible to continue to monitor the site at the current intensity, as annual consultant costs associated with monitoring are in excess of \$100,000, and the County and USFWS have provide much in-kind assistance. The monitoring plan submitted with the permit application called for re-evaluations of monitoring parameters and frequencies after the completion of construction, within the first two to three years. NYSDEC did not comment on that portion of the monitoring plan.

Sources: Cashin Associates, 2004. *Wertheim National Wildlife Refuge Open Marsh Water Management Project Monitoring Protocols*. New York State Department of Environmental Conservation Permit Application. US Fish and Wildlife Service Long Island Complex, Shirley, NY. 20 pp.

James-Pirri, M., Roman, C., and Erwin, R., April 2002. *Field Methods Manual: US Fish and Wildlife Service (Region 5) Salt Marsh Study*. US Fish and Wildlife Service.