Appendix I

Grand Canal Ecological Health Assessment Report

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ECOLOGICAL HEALTH EVALUATION REPORT

Grand Canal
Suffolk County, Oakdale, New York

Prepared for:

Suffolk County Department of Health Services
Division of Environmental Quality

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Section 1. Introduction

In 2006, Suffolk County enacted a resolution (#1040-2006) to add Ecological Health and Marine Productivity as Acceptable Criterial for County Dredging Projects. This resolution enabled these factors to be used as a criterion for justification of county dredging projects as being in the public interest. A dredging project shall be deemed to be in the public interest if it supports, advances or improves environmental/ecological health and/or marine productivity, based upon a certification from the Suffolk County Department of Health Services, Office of Ecology, or the Suffolk County Department of Environment and Energy.

The document titled 'Environmental Dredging Factors Considered for Improving Environmental Quality, Ecological Health and Marine Productivity' (Appendix A) was used as a guide to perform an analysis and evaluation of the ecological health of the Grand Canal and adjacent wetlands. The document formulates a process for the evaluation of Environmental Dredging Factors for determining whether a proposed dredging project is necessary to increase flushing rates to protect or enhance marine ecology and productivity. Three main types of ecological dredging factors are outlined: water quality (e.g., dissolved oxygen, coliform, salinity); sediment management (e.g., modification of features to improve stream flow, removal of toxic sediments); habitat/living resources (e.g., elimination of harmful algal blooms, improving fish access).

This report, the 'Grand Canal Ecological Health Evaluation Report', describes the results of the analysis and evaluation of the ecological health of the Grand Canal and adjacent wetlands. It fulfills Task 5 of the Grand Canal Ecological and Public Health Assessment Statement of Work. The assessment was based on data collected by Cashin Associates (CA) from 2014 through 2016 as part of the overall Grand Canal Ecological and Public Health Assessment Project. Full details on the data collection and analysis, as well as a description of results, are provided in the overall 'Grand Canal Ecological and Public Health Assessment Report'. Here, key results are discussed and placed in context of the 'Environmental Dredging Factors Considered for Improving Environmental Quality, Ecological Health and Marine Productivity' in order to determine the

ecological health of the Grand Canal and adjacent wetlands, as well as to demonstrate if dredging will improve existing conditions.

This report also summarizes conclusions drawn from the microbial, chemical, and vector data collected within the Grand Canal in 2004 as part of the 'Grand Canal Environmental Assessment Report' (2005) published by Suffolk County Department of Health Services (SCDHS) and Suffolk County Department of Public Works (SCDPW). These data are used to show how conditions within the Grand Canal have changed within the last decade, and indicates that many of the observed impairments within the Grand Canal system are longstanding.

Section 2. Physical Characteristics of the Grand Canal

A hydrographic survey of the Grand Canal was conducted by CA to define physical characteristics of the canal system. This included a bathymetric survey to provide canal cross sections and profiles, characterization of bottom sediments, an assessment of stream flow and tidal flushing in the canal and adjacent wetlands, as well as identification of any potential restrictions to water flow and flushing.

2.1 Bathymetric Survey and Tidal Flushing/Flow Assessment

Detailed methods and results for the bathymetric survey performed in 2015 by CA can be found in the overall 'Grand Canal Ecological and Public Health Assessment Report'. The bathymetric survey indicated that the main section of the Grand Canal was found to vary in width from approximately 75-feet at it widest point (just south of the Shore Drive Bridge) to approximately 30-feet at is narrowest point (just east of the Idle Hour Boulevard Bridge). The main channel of the canal varies in depth from the deepest point of approximately five feet below mean low water (MLW) near the southern entrance to approximately two feet below MLW at its shallowest along the northern transect of the canal. These shallow areas lead to reduced navigability of the Grand Canal, as well as restricted tidal flow. In addition to the bathymetric survey, CA conducted a stream flow assessment and tidal flushing measurement (details provided in the 'Grand Canal Ecological and Public Health Assessment Report'). These analyses indicated restrictions to the Grand Canal's flow.

It can be concluded that sedimentation within the Grand Canal has resulted in reduced channel depths and reduced tidal flow into the canal. Qualitative observations by CA also indicated high levels of debris (e.g., limbs) throughout channels. These factors can have considerable impacts on navigation throughout the Grand Canal. The CA field team experienced situations in which navigation throughout the canal was difficult with a boat due to shallow depths and debris, particularly during low tides.

If dredging were conducted in the Grand Canal to create a five food MLW channel (where applicable), the navigational hazards of reduced channel depths and debris would be addressed.

However, dredging and deepening of inner portions of the canal, without widening or deepening of its connections to the Connetquot River or adjacent wetlands, will not improve flushing rates for the canal. In fact, deepening of the canal without increasing water in flow could result in greater volumes of stagnant water in the canal.

Section 3. Sediment Sampling Plan for Physical Parameters and Contaminants

Sediment sampling was conducted in the Grand Canal to determine if sediment quality was impacting the ecological health and marine productivity of the Grand Canal and adjacent wetlands. The Sediment Sampling Plan for the Grand Canal was approved by the NYSDEC. The Plan incorporated the information needs and sampling requirements of the NYSDEC's Division of Marine Habitat Protection and Division of Solid and Hazardous Material and was was developed based on the NYSDEC TOGS 5.1.9 ('In-Water and Riparian Management of Sediment and Dredge Material') and NYSDEC Remedial Program Soil Cleanup Objectives. The Sediment Sampling Plan was also based on findings from bathymetric data collection performed by CA as part of Task 3 of this project. Details on the sediment sampling plan and methodology can be found in the overall 'Grand Canal Ecological and Public Health Assessment Report'.

A total of ten sample sites were selected throughout the canal for sediment core sampling. Samples were collected from the Grand Canal by CA environmental personnel in 2015 in accordance with the approved Sediment Sampling Plan (methodological details provided in the overall 'Grand Canal Ecological and Public Health Assessment Report'). At each of the ten sites, three different segment samples were collected using the coring instrument. The three segment samples from each location were as follows: one sample of the material to be dredged (top layer of sediment); one sample of zero to six inches below the dredge depth; and one sample from six to 12 inches below the dredge depth. So, in total, 30 sediment samples for subsequent laboratory analysis were collected. In the event that the grain size and Total Organic Carbon (TOC) analyses determined that the composition of any of the sediment sample was at least 90 percent sand or larger, and less than one-half percent TOC, no further testing was required. All samples falling below the threshold were tested for priority pollutant parameters, as identified by NYSDEC. If the priority pollutant analysis from the dredge material and the first six inches below dredge depth revealed priority pollutant constituents above NYSDEC recommended limits, the archived samples were to be analyzed.

3.1 Sediment- Physical Parameters

Changes in canal sediments can affect the ecological health of a waterway in several ways, such as through the mechanical covering of immobile organisms and increased turbidity. The grain size distribution analysis for the sediment samples indicated that all of the samples were found to consist of at least 90% sand or larger material (less than 10% of the material passes through the No. 200 sieve).

3.2 Sediment- Contaminants

According to the NYSDEC protocol, two of the sediment samples met the required less than 0.5% of TOC requirement. Based on these results, 18 samples did not meet the minimum TOC requirement and therefore needed to be tested for contaminant parameters. Analysis of the sediments for priority pollutants, PAHs, metals, pesticides, and dioxin were performed on these samples to characterize the Grand Canal sediments in terms of potential contaminants.

The results of the sediment chemistry were compared to the NYSDEC's *Sediment Quality Thresholds for In-Water/Riparian Placement* guidelines and the following classifications:

- Class A – No Appreciable Contamination (No Toxicity Aquatic Life);
- Class B – Moderate Contamination (Chronic Toxicity to Aquatic Life); and
- Class C – High Contamination (Acute Toxicity to Aquatic Life).

The sum of DDT and its constituents (DDE and DDD) were detected in the dredge material at eight sites. The dredge sediment at one site (Site GC 1) met Class B criteria and sediment from seven sites (Sites GC 2 through GC 8) met or exceeded Class C criteria. The concentrations of this constituent in the sediment below the dredge material is lower than the dredge material but still in Class B and Class C criteria. No DDT, DDE or DDE were detected in two of the sampled sites (Sites GC 9 and GC 10).

Several metals were also detected in the dredge material and sediment below the dredge material. The metals met Class A and Class B criteria. Specific metals detected were: copper, arsenic, chromium, lead, nickel, zinc, and mercury. Copper, arsenic and chromium were most likely introduced into the sediment by the chromated copper arsenate (CCA) wood material used to construct bulk heading. Lead, zinc and mercury were most likely introduced into the sediment from boating activities.

The sediment analyses indicated that much of the sediment sampled within the Grand Canal showed DDT constituents and metal levels greater than levels that are shown to provide chronic or acute toxicity to aquatic life.

Dredging would result in the removal of contaminated sediments; however, the removal would not result in improved conditions unless the sources of contamination are controlled (e.g., storm water, sanitary waste, etc.). There are multiple sources of contamination associated with existing anthropogenic land uses that will continue to affect the canal unless long-term abatement measures are taken.

Section 4. Water Sample Analysis for Physical Parameters and Contaminants

4.1 Water- Physical Parameters

Physical water parameters of temperature, salinity, dissolved oxygen, and turbidity were taken at multiple sample locations during surface sampling event in the Grand Canal. Readings were taken by CA environmental personnel in 2015.

Adequate dissolved oxygen levels (DO) are necessary for the growth and reproduction of aquatic organisms. Adequate DO also is essential for the natural decomposition of organic wastes. A majority of the DO readings from the Grand Canal taken by CA in 2015 were found to be less than the minimum allowable DO level of 4.8 mg/L stipulated in New York Water Quality Standards for saline surface waters class (adverse impacts on aquatic organisms will begin to occur at levels below this level); there were several samples where DO readings were less than 2 mg/L. For saltwater, USEPA (2000) recommends a minimum DO level of 2.3 mg/l as a limit for continuous 24-hour exposure to protect juvenile and adult aquatic life.

During the tidal cycle sampling which occurred in July and August 2015, the average DO varied from a low 1.62 mg/l during the low tide to a high of 5.12 mg/l during the mid-outgoing tide. The lowest average DO readings occurred during the low tide during both sampling events. The average DO readings during the low and incoming off low tidal cycles indicated that the canal was experiencing a state of hypoxia (DO less than three mg/l). DO levels were generally slightly greater in the high tide and mid-outgoing tide samples versus samples collected at low tide or mid-incoming tide. During the storm water runoff surface water sampling which occurred in August and September 2015, DO readings during the dry sampling event ranged from 1.06 to 2.36 mg/L; during the wet sampling event they ranged from 2.33 to 4.21 mg/L. During the dry event it appeared that the DO readings (average of 1.84 mg/l) indicated that the canal was experiencing a state of hypoxia (DO less than three mg/l). The DO during the wet event appeared to have increased as a result of the colder storm water input and had an average DO of 3.35 mg/l. The low DO levels in the Grand Canal have the potential to impact the development

and health of aquatic organisms as they are below the New York State Water Quality Standards for saline surface waters threshold (4.8 mg/L) which indicates levels where adverse impacts on aquatic organisms will occur. Some of the readings also fell below USEPA's (2000) recommendation of a minimum DO level of 2.3 mg/l as a limit for continuous 24-hour exposure to protect saltwater juvenile and adult aquatic life.

Low DO levels were also documented in the 2005 Grand Canal report, although generally DO levels were lower in 2015. In samples taken in 2004, 29.5% of surface measurements were below 5.0 mg/L, and over 65% of bottom measurements were less than 5.0mg/L. These results indicate that DO levels have been impaired in the Grand Canal for over a decade.

Based on the water quality data collected by CA in 2015, water temperature, salinity, and DO levels were found to be somewhat related to tidal fluctuations. Generally, higher water temperatures, salinity and DO levels were observed at high-tide and mid-outgoing tide conditions versus low-tide and mid-incoming tide conditions. However, the variations in readings over time and across the stations did not indicate considerable tidal flushing in the Grand Canal.

4.2 Water- Contaminants

Surface water samples collected by CA from the Grand Canal in 2015 were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, several nutrients (total and dissolved nitrogen, total and dissolved phosphorus, and dissolved total inorganic nitrogen), and three bacterial indicators (enterococci, total coliform, and fecal).

The results from the bacterial indicator testing indicated that that bacterial contamination is a significant issue throughout the Grand Canal, as elevated coliform levels were frequently observed. In many cases, exceedances were orders of magnitude above the recommended standard values. The bacterial analysis for the surface water samples indicated that bacterial levels frequently exceeded the standard values for all indicators in all months. The New York water quality standards for coliforms (6 CRR-NY 703.4) state that:

- For Total Coliforms (measured as number per 100 millimeters [ml]) "the monthly median value and more than 20 percent of the samples from a minimum of five examinations, shall not exceed 2,400 and 5,000, respectively."
- For Fecal Coliforms (measured as number per 100 ml) "the monthly geometric mean from a minimum of five examinations shall not exceed 200."

Additionally, USEPA's 2012 Recreational Water Quality Criteria recommend that:

- Enterococci should not exceed a geometric sample mean of 30-35 colony forming units (cfu)/100 ml or a statistical threshold value (STV; a value that should not be exceed by more than 10% of samples) of 110-130 cfu/100 ml. The range of values represent two recommendations based on differing acceptable illness rates from recreational activities in contaminated waters.

Fecal coliform levels in the Grand Canal ranged from 130-16,000 colonies/100ml. Total coliform levels ranged from 130-16,000 colonies/100ml. Enterococci levels ranged from 10-13,000 colonies/100ml. The fecal coliform and total coliform results for samples collected in 2015 exceeded those reported for samples reported in the 2005 Grand Canal report. In 2005, Coliform levels found in the Grand Canal were found to be consistently elevated, with total coliform averages ranging from 290 to 5,713 organisms/100 mL and fecal coliform averages ranging from 130 to 967 organisms/100 mL. In the 2005 report, the authors concluded that these levels would make the waters of Grand Canal unsuitable for bathing or shell fishing.

Surface water samples collected in 2015 were analyzed for several nutrients (total and dissolved nitrogen, total and dissolved phosphorus, and dissolved total inorganic nitrogen). Nutrients are essential for life in marine environments. However, nutrient enrichment can have adverse effects on aquatic species due to its promotion of algal blooms, reduced water transparency, and decreased DO levels. Results indicated significant nutrient enrichment in the Grand Canal as evidenced by high nitrogen and phosphorus levels. Total nitrogen was detected in most of the

surface water samples with concentrations ranging from 1300 to 4700 µg/L. Total phosphorus was also detected in most surface water samples collected with the concentrations ranging from 50 to 329 µg/L. Based on a comparison of average reported concentrations, the Grand Canal study area concentrations of total nitrogen and total phosphorous were generally greater than regional data reported for nitrogen and phosphorous. The total and dissolved nitrogen and phosphorus concentrations reported for samples collected in the 2015 event were found to be greater than those reported for the 2015 sampling event. This suggests that nutrient enrichment has worsened over the past decade.

Nutrients are regulated in New York State Waters (NYSDEC 2015) by a narrative water quality standard rather than a numeric standard. A narrative standard lays out a descriptive condition that needs to be met. The narrative standard for phosphorus and nitrogen is: *None in amounts that result in the growths of algae, weeds and slimes that will impair the waters for their best usages*. It can be concluded that nutrient levels in the Grand Canal are exceeding these levels, as evidenced by the presence of algal growth, low DO levels, and levels of nutrients higher than in the surrounding region.

It can be concluded that water quality in the Grand Canal is impacting the ecological health and marine productivity, and that generally water quality has worsened over the past decade.

Section 5. Habitat/Living Resources

5.1 Wetland Health

The 'Grand Canal Wetland Assessment Report' documented baseline conditions for hydrology, vegetation, soils and avian species with the Grand Canal, and assessed the current health of the wetland system. The assessment found that habitats and wetland living resources were severely impaired.

Wetland communities within the Grand Canal were delineated based on the dominant plant species present, resulting in four major community types: intertidal marsh; high marsh/pool/panne; high marsh/marsh elder; and common reed. Common reed, an aggressive invasive wetland plant, was found at levels of 50% or greater in 70.2% of all Grand Canal wetland habitats surveyed. The east marsh complex was nearly entirely dominated by a robust tall growth form of common reed which completely surrounded the few remaining remnant pockets of high marsh/pool/panne habitat. Common reed occupied over 50% of the northwest marsh. The high presence of common reed and its high density growth occurs to the detriment of native marsh species, and is known to inhibit wildlife maneuverability.

The 'Grand Canal Wetland Assessment Report' concluded that the wetlands in the Grand Canal are considered highly stressed. Notable stressors which were found to contribute to the overall poor condition of Grand Canal marshes included several related to significant reductions in tidal flow into marshes from the Grand Canal:

- Alterations, particularly a 900 ft. earthen berm which forms a partial barrier between the northwest marsh and its primary source of tidal flow (i.e., Grand Canal), and a 3,800 ft. berm which forms a nearly complete barrier between the northwest marsh, and its sole source of tidal flow.
- Four undersized culverts within the earthen berm are the only direct sources of tidal flow from the Grand Canal into the east marsh. One low lying breach area on the south end of the berm allows periodic tidal input.

- Stagnant areas of the canal and marshes

The 'Grand Canal Wetland Assessment Report' proposed several recommendations to address the declining state of wetlands in the Grand Canal, including dredging the canal to increase tidal flow in the cannel and removing portions of the man-made berm along the west perimeter of the east marsh complex to allow for increased tidal flow throughout the marsh. If actions were taken to increase tidal flow into the Grand Canal system and adjacent wetlands, such as through removal of the berm, some of the identified stressors of the Grand Canal system would be reduced, ultimately enabling improvement in the ecological health of the Grand Canal system. Particularly, increased flow would result in reduced habitats dominated by the invasive common reed. This would enable native species to return and thrive, yielding increased vegetative diversity, and would assist in promoting wildlife maneuverability throughout the wetland system. In Sunken Meadow State Park, a storm resulted in the natural opening of restricted wetland system. Prior to the opening, the marsh was characterized by a high prevalence of common reed, particularly *Phragmites australis.* After the opening, *Phragmites australis* communities were considerably reduced, and native marsh vegetation returned.

5.2 Mosquito Breeding

The 2005 Grand Canal report found that routine monitoring of mosquito larval surveillance conducted by the SCDPW Division of Vector Control indicated that mosquitoes were not breeding within the Grand Canal. However, several major breeding locations were identified within freshwater and tidal wetlands adjacent to the Canal. The 2005 report notes that breeding potential in these areas may be exacerbated by the berm bordering the Grand Canal which causes water accumulation on the marsh surface and ideal mosquito breeding grounds. It was concluded that restoration work, including dredging, be conducted to restore proper hydrology to the wetlands adjacent to the Grand Canal to reduce mosquito breeding. As restoration efforts and dredging have not been conducted in the Grand Canal since the 2005 report, it still can be concluded that dredging efforts may serve to reduce mosquito breeding in the wetlands adjacent to the Grand Canal.

Section 6. Dredging Project Application

Once a final decision has been made regarding actions at the Grand Canal, a Dredging Project Application will be submitted if dredging is a selected action. This application summarizes the results of the investigation for the Grand Canal into the Environmental Dredging Factors.

Section 7. Discussion

This ecological health assessment was based on sediment, water quality data, and wetland/living resource analyses conducted from 2014 through 2016 for the Grand Canal and adjacent wetlands. These results were also compared to findings from data collected from the Grand Canal in 2014 to determine how conditions have changed over the past decade. It can be concluded that the canal system is severely impaired in terms of water quality, sediments, and habitat/living resources, and dredging may be used to alleviate these conditions.

Table 1 lists the environmental dredging factors that will be improved by actions taken within the Grand Canal. Actions in the Grand Canal (e.g., berm removal) is expected to be environmentally beneficial, resulting in:

- Increased tidal flushing
- Increased levels of dissolved oxygen in the water column
- Improved water quality
- Reduced abundance of invasive common reed and increased native vegetation
- Reduced bacterial and nutrient retention times, resulting in lower observed levels
- Increased navigability
- Removal of toxic sediments
- Increased fish access and reduced stagnant waters in wetlands

Table 1. Key environmental factors that can be improved through actions.

Category	Impaired Factor	Predicted Improvement by Actions
Water Quality	High levels of Coliform	Although increasing water flow into the canal and surrounding wetlands will help to improve the overall water quality, action must be taken to eliminate the sources of the coliform input such as treatment of stormwater runoff and residential septic system improvements.
	Low levels of dissolved oxygen	Increasing tidal flow (oxygenated water) into the canal and surrounding wetlands will help to increase the overall dissolved oxygen level in the canal. However, action should be taken to reduce nutrient input into the canal system which is most likely the source that initiates the biological reaction that results in the decrease dissolved oxygen levels in the canal system.
	Nutrient (nitrogen and phosphorus) enrichment	Although increasing water flow into the canal and surrounding wetlands will help to improve the overall water quality. Action must be taken to eliminate the sources of the nutrient enrichment, such as treatment of stormwater runoff and residential septic system improvements.
Sediment Management	Sedimentation resulting in reduced channel depth.	Although, some of the sedimentation may be a result of material entering the system through the southern and northern canal entrances. The majority of sedimentation appears to be the result of failing bulkheads and erosion to the berms separating the canal from the adjacent wetlands. Even if dredging was to be considered in order to deepen the canal, without addressing the issues of failing bulkheads and berm erosion, the canal will continue to experience sediment deposition.
	Sediment contaminations	Analysis of the sediment appears to indicate elevated levels of pesticides and metals. The sources of these containments reflect contributions from a wide variety of anthropogenic sources, including routine pesticide use, emissions from common combustion sources, CCA treated lumber for bulkheads and recreational boating activities. Although, removing of the fine contaminated sediment within the canal may improve the benthic community diversity, difficulty in remediating and controlling the re-suspension of this material into the water column may increase human health concerns. In addition to removal issues, the transport and deposition of this material will also need to be evaluated.
Habitat/Living Resources	Highly stressed wetlands	Increasing tidal flow into the surrounding wetlands will help to improve the overall habitat and increase the diversity of flora and fauna within the wetland system. Removal of the berms surrounding the wetlands adjacent to the canal will increase the movement of tidal driven water flow into and out of the existing wetland. In addition, allowing for flood waters to move onto a larger area will help remediate flooding issues for the residents surrounding the canal.
	Mosquito Breeding	Integrated Marsh Management (IMM) has been proven to be an effective way to reduce mosquito breeding. By incorporating IMM practices in the surrounding wetlands may result in the reduction of mosquito breeding and reduced chemical treatment to the surrounding wetlands.

Section 8. Summary and Conclusion

It can be concluded that the Grand Canal has experienced impaired environmental quality due to inadequate stream flow and tidal flushing. This is evidenced by the poor water quality observed within the canal system, particularly the low levels of dissolved oxygen, high levels of bacterial contaminants (coliforms), and high nutrient enrichment. Water quality in the canal has been significantly impacted by nutrient enrichment which can adversely affect marine productivity, and dissolved oxygen readings were frequently found below levels necessary for healthy aquatic life. These impairments in water quality have been documented for over a decade in the Grand Canal system as evidenced in the 2005 report on the Grand Canal. Although the 2005 report concluded that water quality in the Grand Canal was impaired, generally conditions have been observed to have worsened over the past decade. Furthermore, the inadequate flow and flushing within the Grand Canal has been listed as a major contributor to the highly stressed condition of the marshes surrounding the Grant Canal. A major characteristic of these stressed marshes is the abundance of invasive species, particularly the common reed. In addition to poor water quality, sediments sampled from multiple locations throughout the Grand Canal were found to be acutely and chronically toxic to aquatic life. Therefore, these toxic sediments are impairing the ecological quality of the Grand Canal.

Bathymetric surveys of the Grand Canal indicated reduced channel depths throughout the canal system, which act to reduce tidal flushing and also impede navigation. Observations documented during the current Grand Canal study also indicted an abundance of debris within the canal. IMM measures in the canal would provide long-term water quality and habitat improvements. These measures can include creation of additional channels and areas of open water, removal of invasive species, and grading modifications to provide water flow. These actions can serve as a means to increase tidal flushing into the canal system. This flushing will facilitate fish access and reduce stagnant waters in wetlands, both of which may reduce mosquito breeding near the Grand Canal. Increased tidal flushing should also help to reduce the retention time of bacteria and nutrients within the canal, resulting in lower observed coliform and nutrient levels, as well as improve impaired water quality parameters, such as DO. Increased tidal flushing can also serve to improve the health of the wetlands near the Grand Canal by: reducing common reed populations;

increasing native vegetation; increasing vegetative diversity; and improving wildlife maneuverability throughout marshes adjacent to the Grand Canal. Lastly, dredging the Grand Canal can increase canal navigability by deepening channels and removing debris, but dredging will not ultimately increase tidal flow or address sources of contamination to the canal system.

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Appendix A.

Environmental and Ecological Criteria for County Dredging Projects

Environmental Dredging Factors Considered for Improving Environmental Quality, Ecological Health and Marine Productivity

Section III, Attachment 9

Background
The County of Suffolk enacted Resolution Number 1040-2006 a Local Law to Add Ecological Health and Marine Productivity as Acceptable Criteria for County Dredging Projects (Local Law No. 50-2006, Added 09-19-2006) which amended the Suffolk County Administrative Code and added an eleventh criterion that could be utilized to justify county dredging projects as being "in the public interest." This added criterion provides that the Suffolk County

Department of Health Services Office of Ecology (OE) (or Department of Environment and Energy [DEE]) shall evaluate such Environmental Factors to determine and certify whether a proposed dredging project is needed to improve the ecological health or marine productivity. If certified, the application and supporting documentation will be forwarded to the County's Dredging Project Screening Committee for consideration of the proposed project as being "in the public interest."

§ A8-5. Criteria for County Dredging Projects.

B. A dredging project shall be deemed to be in the public interest if it supports advances or enhances the following types of uses, activities and/or facilities:

(11) improves environmental/ecological health and/or marine productivity, based upon a certification from the Suffolk County Department of Health Services, Office of Ecology, or the Suffolk County Department of Environment and Energy. Such determination shall consider factors including, but not limited to, flow rates, contaminant levels, nitrogen levels, phosphorus levels, coliform levels, algal growth rates, salinity levels, pH levels, dissolved oxygen, water temperature, oxygen levels and other such considerations that may jeopardize the health of the marine ecology or productivity

This document formulates a process for evaluation of Environmental Dredging Factors for determining whether a proposed dredging project is necessary to increase flushing rates to protect or enhance marine ecology and productivity. This document also outlines the information and data the applicant may submit to support obtaining certification under these criteria. It is incumbent upon the applicant to sufficiently document that environmental/ecological health and/or marine productivity will be improved by the proposed dredge project to the satisfaction of the Office of Ecology (or Dept. of Environment and Energy).

This certification does not imply the Dredging Project Screening Committee will approve nor the County of Suffolk will fund the proposed project; that required permits from other agencies including the New York State Department of Environmental Conservation and the United States Army Corps of Engineers will be granted; or that the information and data submitted by the applicant are sufficient for any other departmental and agency purposes.

Environmental Dredging Factors

Environmental Dredging Factors are classified into three broad categories:

1. Water Quality – e.g., surface and bottom dissolved oxygen, temperature, nitrogen hydrogen sulfide, phosphorous, coliform, enterococcus, pH, salinity, other pollutants, etc.;

2. Sediment Management – to modify sedimentary features, thereby improving stream flow or tidal flushing rates of harbors or embayments with respect to current, circulation, salinity, etc.; and remove toxic/noxious/eutrophic sediments; and

3. Habitat/Living Resources – e.g., to improve environmental/ecological health and/or marine productivity, to improve tidal flushing or light penetration, eliminate harmful algal blooms, contaminated or potentially hazardous sediments, improve shellfish/finfish productivity, spawning, and/or fish access.

The applicant must affirmatively demonstrate, using accepted scientific methodology (data, models, status/trend studies, etc.) that an impairment or violation exists for sediment, water quality, and/or habitat/living resources, and that dredging will result in alleviating the impairment (i.e., attainment of objective standard). Such analysis must be based on numeric criteria, including, but not necessarily limited to: NYS standard for Dissolved Oxygen (or other ambient water quality standard), Estuary Plan nitrogen guidelines, estuary program eelgrass habitat criteria, shellfish sanitation bacteriological standards, sediment toxicity criteria (EPA, DEC, literature studies, etc.). Habitat/living resources impairments and mitigation must similarly be demonstrated using quantitative metrics (e.g., estuary program guidelines or generally accepted, published scientific indices), and accepted scientific methodology.

Dredging may be proposed to increase tidal flushing to meet NYS dissolved oxygen standards. As an example New York State Environmental Conservation Law §703.3 Water quality standards for dissolved oxygen (DO) state:

Chronic: Shall not be less than a daily average of 4.8 mg/L;
Acute: Shall not be less than 3.0 mg/L at any time.

Waters listed on the NYSDEC Atlantic/Long Island Sound Basin Priority Waterbodies List and ECL Part 41.3, Sanitary Condition of Shellfish Lands in Suffolk County, may also be considered where dredging is proposed to alleviate stressing factors.

The burden of proof is on the applicant to demonstrate both of the following:

1. A high likelihood of success of dredging as a mitigation measure to achieve the desired objective (based on data, models, studies, etc.). For example, a hydrodynamic model can be used to calculate dilution of nitrogen and other contaminants. Mere anecdotal or observational conclusions that dredging will improve water or sediment quality are not sufficient.
2. 2. Significant environmental improvement, i.e., mitigation of a measurable impairment to a significant resource, with meaningful environmental health benefits. Town/municipality must sponsor each application, and is responsible for all data, analyses, and/or studies.

A review fee, to be determined by the Commissioner of the Department of Public Works may be required for independent consultant review and analysis of the application, or the applicant may apply to and obtain necessary permits from the NYSDEC.

The applicant shall complete and submit the County's application contained herein as part of this document (Dredging Needs Application in the Public Interest to Improve Ecological Health and/or Marine Productivity). The information obtained to complete this checklist shall be considered in review of the Environmental Dredging Factors and may include any supporting observations, measurements, analyses and findings relating to the physical and chemical qualities of the water body and sediments in the areas of proposed dredging. Photographs may be taken of physical conditions such as impediments to flow, and included as an attachment(s). Other measurements such as tidal gauge and/or flow information, depth measurements, modeling data, historical data, and other hydrographic information may be provided as supporting records to be evaluated by the OE (or DEE) in the decision to of whether the proposed dredging project will improve environmental/ecological health and/or marine productivity.

Certification by the OE (or DEE) that dredging to remove sediments from a waterbody supports, advances or enhances the environmental quality and productivity of the water body shall be forwarded to the Committee in consideration of whether the project is in the public interest. The Legislative Intent behind adding environmental criteria factors to the Committee's decision making process, relating to a Dredging Project's benefit to the public interest, is the finding that dredging may, at times, be necessary to increase flushing rates in order to protect marine ecology and productivity.

Dredging projects in the public interest to improve the environmental quality of a water body shall be completed in water bodies including, but not necessarily limited to:

I. Those demonstrated to have impaired environmental quality due to inadequate stream flow and/or tidal flushing resulting in an excessive accumulation of sediments and/or impaired water quality within the water body;
II. Those shown to have a history of detrimental affects to the environmental quality caused by existing and/or former activities within the water body, or in the surrounding areas, impacting the water body; and
III. Those where a significant restriction or reduction of the flushing rates is causing detrimental changes in environmental conditions, impairing the water body's marine ecology and productivity.

A. Physical Characteristics of the Water Body

The applicant shall complete a bathymetric survey and may conduct stream flow and/or tidal flushing measurements. The bathymetric survey shall be completed to determine the stream/water body cross section and profile. Results from this investigation shall be used to identify whether or not there are restrictions to the water body's flow and/or tidal flushing, due to bottom features including, but not limited to, fluviomarine and anthropogenic features such as sediment bars, shoals, reefs, deep spots, jetties, groins, point-source discharge features, etc. This information shall be part of the hydrographic evaluation of the water body's physical characteristics and flushing rates, which will be combined with any water column and sediment testing conducted by the applicant to become part of the overall decision making process.

B. Sediment Sampling Plan

Where sediment quality is perceived as impacting the ecological health or marine productivity of a waterbody, the applicant shall follow the procedures and decision-making criteria contained in the attached the NYSDEC, Region 1, Office of Marine Habitat Protection, "Developing Sediment Sampling Plans for Proposed Dredging Projects in Region 1."

In situ sediments to be dredged often require sampling according to the Sediment Sampling Plan approved by the NYSDEC as per DEC's technical operation guidance (TOG's) on In-Water and Riparian Management of Sediment and Dredged material and or the attached document used by NYSDEC Region 1 for development of sediment sampling plans. The web site for the TOG's is http://www.dec.ny.gov/docs/water_pdf/togs519.pdf and the attached quick reference guidance on sediment testing.

Identifying sediment quality aids on identifying disposal options both for beneficial re-use or disposal facilities . This information will dictate how and when dredging is done and have significant implications regarding dredge window restrictions, operational restrictions and cost implications that weigh into moving a dredge project forward.

C. Sediment Sample Analysis for Physical Parameters and Chemical Contaminants

Sediment sampling may include procedures for identifying and characterizing sediment physical characteristics based on grain size, grain size distribution, mineralogy, layering, and possible sediment sources. Based on the sediment's physical characteristics, sediment samples collected may be further evaluated for physical and chemical parameters of concern, e.g., heavy metals, pesticides/herbicides.

If sediment samples are collected, they shall be analyzed for chemical contaminants according to the analytical methods and recommended method detection limits defined in the NYSDEC's guidance documents. The results of this set of sample analyses will provide evidence that sediments in the water body possess chemical contaminants at concentrations exceeding applicable Action Levels (USEPA, ACOE, NYSDEC, SCDHS), which may be affecting the water body's overall environmental quality. The removal of these sediments via dredging may be necessary, not only to possibly increase flushing rates, but also to reduce levels of chemical contamination in the water body, improving overall environmental quality.

The collection and analysis for additional chemical parameters may be conducted if other contaminants are suspected to be present in the sediments, based on knowledge of the existing and/or historical uses of the water body and/or lands surrounding it. The collection and analysis of sediment samples for these other contaminants shall be on a case by case basis in consultation with the County, New York State Department of Environmental Conservation, Army Corp of Engineers, and following state and/or federal guidelines.

D. Water Sample Analysis for Chemical Contaminants and Physical Parameters

Where water quality is perceived as impacting the ecological health or marine productivity of a waterbody, the applicant may collect and analyze samples from the water column to determine the environmental conditions (e.g., surface and bottom dissolved oxygen levels within the water column). This assessment is designed to determine whether dredging may be appropriate for the improvement of the water body's environmental quality. The applicant shall describe its reasoning for selecting the timing, tide, number, type(s) and locations of samples collected. The water quality samples shall be evaluated according to appropriate criteria (USEPA, ACOE, NYSDEC, SCDHS).

The collection and analysis of water samples for additional chemical parameters (e.g., nutrients, metals) may be necessary if other contaminants are suspected to be present in the water column or in the sediment pore waters, based on knowledge of the existing and/or historical uses of the water body and/or lands surrounding it. The need for further sampling and evaluation of other contaminants shall be determined on a case by case basis in consultation with the County, and also following New York State and/or federal guidelines.

E. Dredging Project Application

The decision by the OE (or DEE) whether or not to certify an application for a proposed dredging project shall be based on the submitted documentation relating to the Environmental Dredging Factors and the potential for the project to improve the health of the marine ecology or productivity. The attached application shall be completed by the applicant summarizing the results of the investigation of the Environmental Dredging Factors relating to the target water body.

It is incumbent upon the applicant to sufficiently characterize and document the Environmental Dredging Factors that will be improved by completing the proposed dredging project. If the OE (or DEE) determines that the information submitted by the applicant is not sufficient to support a certification decision, they may request additional information from the applicant. Upon certification, the application together with supporting documentation shall be forwarded to the Committee for the consideration. As stated previously, certification of an application does not guarantee Committee approval, or County funding for the project (if applicable). Also, additional approvals and permitting may be required by the NYSDEC and the US Army Corps of Engineers; as well as any other applicable requirements by government agencies, prior to proceeding with a proposed County Dredging Project.