Appendix C

Grand Canal Public Health Evaluation Report

TASK 4:

PUBLIC HEALTH PROBLEM EVALUATION

GRAND CANAL, OAKDALE, NEW YORK

Submitted to:

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ACRONYMS AND ABBREVIATIONS

ABDL	Arthropod-Borne Disease Laboratory
BEHP	bis(2-Ethyl hexyl) phthalate
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degree Celsius
CDC	Center for Disease Control
CDPHE	Colorado Department of Public Health and Environment
cfu	colony forming unit
cis-1,2-DCE	cis-1,2-Dichloroethene
COPC	chemical of potential concern
CRR	Codes, Rules and Regulations
CSF	cancer slope factor
CSM	Conceptual Site Model
CWP	Center for Watershed Protection
DIN	dissolved inorganic nitrogen
DIP	dissolved inorganic phosphorus
DO	dissolved oxygen
EPC	exposure point concentration
GCSWA	Grand Canal Surface Water Assessment
HHRA	human health risk assessment
HI	hazard index
IARC	International Agency for Research on Cancer
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
mg/L	milligram per liter
MIR	minimum infection rate
ml	millimeter
N	nitrogen
NCCOS	National Center for Coastal Ocean Science
NTU	Nephelometric Turbidity Unit
NY DOH	New York Department of Health
OEHHA	Office of Environmental Health Hazard Assessment
OMWM	Open Marsh Water Management
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PHE	Public Health Evaluation
ppt	part per thousand

PSU	practical salinity units
RBC	risk-based concentration
RfD	reference dose
RSL	Regional Screening Level
SCDHS	Suffolk County Department of Health Services
SCDPW	Suffolk County Department of Public Works
STORET	Storage and Retrieval
STV	statistical threshold value
SVOC	semi-volatile organic compound
SWRMS	Storm Water Run-off Monitoring Study
TCE	trichloroethene
TEQ	toxicity equivalence
UCL	upper confidence limit
µg/L	microgram per liter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VI	vector index
VOC	volatile organic compound
WNV	West Nile Virus

1.0 INTRODUCTION

1.1 Purpose of Evaluation

Task 4 is the Public Health Evaluation (PHE) of the physical, chemical, and microbiological data collected from the Grand Canal and adjacent wetlands under Tasks 2 and 3 of Suffolk County Contract No. 525-5200-1180-00-00001. In addition, the PHE considers data (including vector data) provided by the Suffolk County Department of Health Services (SCDHS) and data readily available as a result of internet web searches. The primary objective of the PHE is to determine if such data indicates a potential for adverse human health impacts resulting from direct contact with surface waters and sediments, consumption of biota taken from the study area, and/or exposure to mosquitos (or other biological agents [e.g., bacteria]) within the Grand Canal study area, previously defined under Tasks 1, 2, and 3. Sections 2 through 4 present the data sources, methodology, and results for each facet of the PHE conducted, as follows:

- Section 2: Evaluation of Chemical Quality
- Section 3: Evaluation of Microbiological Quality
- Section 4: Evaluation of Potential For Vector-Borne Disease

Section 5 provides a summary and conclusions.

1.2 Study Area Location, Background, and Potential Human Receptors of Concern

The following overview of the Grand Canal study area (**Figure 1**) is based on information provided by Suffolk County and Cashin Associates in the following documents:

- The Grand Canal Environmental Assessment Final Report (SCDHS, 2005)
- The Draft Water Quality Monitoring Plan for Grand Canal, Oakdale, New York (Cashin Associates, 2015)

The Grand Canal is a shallow man-made waterway and tributary or branch of the Connetquot River located in Oakdale, New York, in the Town of Islip. The main channel of the Canal is approximately 8,000 feet in length and 20 feet wide and variable in terms of both width and depth. The canal system also includes a number of branch (“inner” finger) channels that extend into residential areas, providing access to the main channel. The Grand Canal is unique in that it has two interfaces that open into the Connetquot River. One opening is in the midsection of the tidal portion of the river, and the second opening is in the southern section of the tidal portion of the river. This creates a situation where the river flow may have an influence on the currents and tidal flow in the Canal. The Grand Canal is also integral to an extensive wetland system.

The Canal’s northern opening is surrounded by residential properties, and the southern opening is bordered on either side by commercial properties including a marina and restaurant. The land area surrounding the northern section of the main canal that runs east-west is residential. For the north-south section of the main

channel, the land to the west is a mixture of residential properties and tidal wetlands. The adjacent land area to the east is dominated by an extensive tidal and freshwater wetland complex known as the Pickman-Remmer Wetlands owned by the State of New York and managed by the New York State Department of Environmental Conservation. All of these wetlands depend on the Canal for tidal circulation. Additional relevant information describing the Grand Canal area and its history are provided in reports prepared by Cashin Associates under Tasks 1, 2, 3, and 5 of Suffolk County Contract No. 525-5200-1180-00-00001.

For a number of years, the Grand Canal has been the subject of complaints by area residents reportedly concerned about progressive shoaling and reduction in tidal flushing. Residential areas adjoin the Grand Canal, and residents use the Canal for recreational purposes (e.g., boating). Issues raised by residents include the potential for mosquito breeding, potential West Nile Virus (WNV) and other epizootic activity, possible contamination of Grand Canal surface waters and sediments, and general water quality deterioration. The following is an outline or overview (often referred to as a Conceptual Site Model [CSM]) of human exposure pathways and receptor issues to be addressed in this PHE:

- Several anthropogenic sources of contamination contribute to the organic chemical, nutrient, and microbiological load in surface waters of the Grand Canal. These include, but are not limited to:
    - Surface water run-off from adjoining residential, commercial, and recreational areas
    - Discharges from septic systems within the study area
    - Discharges from boats operating within the study area
- Residents (and other recreational users) that use the Canal for recreational purposes may be exposed to agents in surface waters and sediments while wading or swimming in the Canal, while launching boats to or extracting boats from the Canal, or while constructing or repairing structures along the Canal. Additionally, such receptors may also be exposed if they consume fish taken from the Canal if such chemicals have been transferred from surface water or sediment to the fish.
- Residents or receptors may contact chemicals/microbiological agents in surface water and sediment by both direct and indirect exposure pathways:
    - The direct contact exposure pathways are dermal contact and incidental ingestion, for example, while swimming in the Canal.
    - The indirect exposure pathway is occasional consumption of fish taken from the Canal.
- Residents and recreational users are potentially exposed to viral agents spread by mosquitos breeding in the Grand Canal area and adjoining wetlands.

1.3 Overview of the Previous Environmental Assessment

In January 2005, the SCDHS and Suffolk County Department of Public Works (SCDPW) published the Grand Canal Environmental Assessment Final Report that was based primarily on environmental data (e.g., microbiological, chemistry, vector) collected by the county in 2004. The SCDHS concluded that:

- Water quality in the Canal was significantly impacted by nutrient enrichment and potentially by pathogen contamination.
- Potential sources of contamination to the Canal included storm water run-off from fertilized lawns and roadways, area wildlife, and improperly functioning residential septic systems.
- Dredging of the Canal, in conjunction with a comprehensive Open Marsh Water Management (OMWM) strategy to provide greater water flows to the adjacent wetlands, could be a major step toward decreasing the need for annual larviciding. The Grand Canal area currently requires multiple larvicide events annually. However, any such dredging activity must be conducted in a manner to avoid creating any problems with changes in the current fish and wildlife habitat, and dredging spoils must be removed to prevent foul odors from impacting residents of the community.

In many respects, the PHE contained herein is a follow-up to the SCDHS/SCDPW assessment published in the 2005 report. The following sections briefly summarize the data presented in the January 2005 report and provide results of environmental sampling conducted by Cashin Associates in 2015. **Figure 2** depicts the 2004 SCDHS/SCDPW sampling locations and several 2015 Cashin Associates sampling locations. **Figure 2** also depicts two continuous monitoring locations used by SCDHS/SCDPW to collect water quality data (temperature, dissolved oxygen [DO], salinity, water displacement) every 15 minutes via Sonde meters for the Grand Canal Study Area in 2013 and 2014. **Figure 3** depicts additional 2015 Cashin Associates sampling locations.

2.0 EVALUATION OF CHEMICAL QUALITY

Section 2 provides the PHE of chemical surface water and sediment data available for the Grand Canal study area. Data sources are identified in Section 2.1, chemical data are presented and discussed in Section 2.2, and the results of the evaluation are provided in Section 2.3.

2.1 Data Sources

The PHE of chemical data available for the study area is based primarily on surface water data collected on July 15, August 11, August 27, and September 3, 2015, by Cashin Associates in accordance with the *Draft Water Quality Monitoring Plan* (Cashin Associates, 2015). The Plan has two components:

- *Grand Canal Surface Water Assessment (GCSWA):* This study was conducted to investigate water quality during four distinct tidal conditions. Surface water samples were collected at 11 locations depicted on **Figure 2** at low, mid-incoming, high, and mid-outgoing tides during the July 15 and August 27, 2015, sampling events. The sampling locations mirror those used by the

SCDHS/SCDPW in 2004, with the exception of Grand Canal location 3 (i.e., GC3). As discussed in the referenced planning document, water quality samples were not collected from location GC3 "due to its lack of utility in providing a unique representative location of the Canal based on its close proximity to other sampling locations."

- *Storm Water Run-off Monitoring Study (SWRMS):* This study was conducted to determine the contaminant load from storm water run-off to the Grand Canal. One surface water run-off sample was collected from each of six locations depicted on **Figure 3** (SW-1 through SW-6) during the August 11 and September 3, 2015, sampling events. Chemical data were not collected from the other locations depicted on **Figure 3**. The August 11, 2015, surface water run-off sampling (hereafter referred to as the "wet sampling" event) was conducted within the first 3 hours of a significant rainfall event (defined as a least 0.5 inch of precipitation). The September 3, 2015, surface water run-off sampling (hereafter referred to as the "dry sampling" event) was a baseline sampling event conducted following a period of dry weather (defined as no rain for at least 72 hours).

Surface water samples from these sampling events were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides, pesticides, and several nutrients [total nitrogen, total dissolved nitrogen, phosphorous (total and dissolved), and total inorganic nitrogen (dissolved)]. Analytical data for the samples are presented in **Attachment A.** Descriptive statistics for any target analyte detected at least once are presented in **Tables 2-1A and B, 2-2A and B, 2-3A and B, and 2-4A and B. Tables 2-1A, 2-2A, 2-3A, and 2-4A** present comparisons of maximum detected concentrations to screening levels defined in Section 2.2, and **Tables 2-1B, 2-2B, 2-3B, and 2-4B** present comparisons of maximum detected concentrations to water quality criteria defined in Section 2.2. The sample identifier for low, mid-incoming, high, and mid-outgoing tide samples are appended with an A, B, C, and D, respectively. Data for the following field parameters were also collected during the surface water monitoring events: temperature, salinity, DO, turbidity, and hydrogen sulfide. Field notes and general water quality readings for the 2015 surface water monitoring events are included in **Attachment A**.

Surface water quality data from the following additional sources are also considered in the PHE:

- Environmental Assessment Final Report (SCDHS, 2005). A formal analytical database was not available at the time this PHE was prepared. The data discussed herein were provided in summary tables presented in the January 2005 report.
- Continuous monitoring data (temperature, DO, salinity, water displacement readings every 15 minutes [Sonde data]) collected in 2013 and 2014 by SCDHS/SCDPW at two locations in the Grand Canal study area. The monitoring data are included as **Attachment B**. Summary descriptive statistics are presented in **Tables 2-5 and 2-6.**
- The United States Environmental Protection Agency (USEPA) Storage and Retrieval (STORET) data warehouse for regional data. **Tables 2-7 and 2-8** provide summary statistics for target

analytes detected in surface water samples collected from 2008 to 2014 in Suffolk County and the Southern Long Island Watershed, respectively. Stations were located at beach, ocean, lake, estuary, and river/stream settings and are not specific to the Grand Canal study area. However, the data (available for metals, a few VOCs, nutrients, and general water quality parameters) are useful as points of reference.

In addition, sediment data collected on December 21 and 22, 2015, by Cashin Associates from 10 stations within the Grand Canal was also evaluated. Sediment samples were analyzed for select VOCs [benzene, toluene, ethylbenzene, and xylenes (BTEX)], SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals. In addition, two sediment samples were analyzed for dioxins. Analytical data for these samples are presented in **Attachment A**. Descriptive statistics for any target analyte detected at least once are presented in **Table 2-9**. **Table 2-9** also presents a comparison of maximum detected concentrations to screening levels defined in Section 2.2. Surface water data for the following field parameters were also collected during the 2015 sediment monitoring event: temperature, salinity, dissolved oxygen, and turbidity, and are included in Attachment A.

2.2 Chemical Data for the Grand Canal Study Area

The data sources identified in Section 2.1 provide information regarding the general water quality and nutrient profile for the Grand Canal study area and data regarding the nature and extent of chemicals in the surface waters and sediment of the Canal. The data are summarized and compared to the following USEPA and State of New York screening levels developed assuming that human receptors are exposed to the surface waters and sediment of the Canal while engaged in recreational activities along the Canal:

- ***Regional Screening Levels (RSLs) developed by USEPA for tap water and residential soil.*** The USEPA tap-water RSLs (2016) are developed assuming a water source is used as a domestic water supply (i.e., used for drinking/bathing on a daily basis). The USEPA residential soil RSLs (2016) are developed assuming residential exposure to soils. For chemicals considered to be known or potential carcinogens, these screening levels represent the one-in-one million cancer risk level (i.e., a human receptor has one-in-one million excess chance of developing cancer if exposed to a chemical at a concentration equal to the RSL). For chemicals capable of producing adverse non-cancer effects (e.g., kidney toxicity), these screening levels represent, conservatively, a concentration that is an order of magnitude *less than* the exposure concentrations below which adverse effects are not expected to occur. Adverse non-cancer effects are not anticipated when the hazard index (HI) is equal to or less than 1. The RSL for a chemical with non-cancer effects is set at an HI of 0.1 to account for the potential cumulative effect of multiple chemicals impacting the same target organ. The USEPA tap water RSLs (developed as detailed in **Attachment C**) are included as useful points of reference *only* because the Grand Canal is not currently used as a domestic water supply, and it is very unlikely that it would be developed as a domestic water supply source in the future. In addition, receptors are less frequently exposed to sediment than to soil,

and the USEPA residential RSLs are based on exposure to soils. Consequently, chemical levels exceeding the tap water and residential soil RSLs do not necessarily present unacceptable levels of risk resulting from exposure to surface waters and sediments of the Grand Canal. The RSLs are however frequently used as screening levels for chemical of potential concern (COPC) selection in human health risk assessments (HHRAs).

- ***Recreational Screening Levels (Direct Contact and Fish Ingestion) calculated using the USEPA RSL calculator.*** Project-specific screening levels were developed assuming lifelong exposure to surface water and sediment (incidental ingestion of a small amount of surface water/sediment and dermal contact with surface water and sediment) while swimming in the Grand Canal or ingestion of fish taken from the Grand Canal. The screening levels are set at the one-in-one million cancer risk level (i.e., the $1x10^{-6}$ cancer risk level) and non-cancer HI of 0.1 and are based on the most current toxicity information published by USEPA in the RSL calculator (USEPA, 2016. The direct contact values conservatively assume that child and adult receptors are swimming 100 and 50 days per year, respectively. The fish ingestion screening levels assume that an adult consumes 12 meals per year of fish caught within the Canal. Note that fish sampling was not conducted as part of this assessment. Instead, surface water and sediment concentrations were compared to screening levels developed assuming a portion of the contaminants in surface water and sediment are retained in fish contacting those media. The specific exposure assumptions and calculations for the screening levels are presented in **Attachment D** and summarized in **Table 2-10.** All screening levels have been validated using the USEPA RSL calculator. Note that, only 10 percent of arsenic obtained from sediment is assumed to be present as inorganic arsenic (the more toxic form of arsenic) in fish (ATSDR, 2007). Therefore, the arsenic screening level developed for fish ingestion was multiplied by 10 to account for the percent inorganic arsenic in fish. Literature sources indicate that this value is conservative as inorganic arsenic levels in fish are likely less than 3 percent (Peshut, et al., 2008; Pétursdóttir, 2010). The development of screening levels for the fish ingestion pathway are discussed in more detail in Attachment D.
- ***New York State Criteria.*** New York Water Quality Standards are available for taste-, color- and odor-producing, toxic, and other deleterious substances [6 Codes, Rules and Regulations (CRR)-NY 703.5] and are health-, aquatic-, wildlife-, aesthetic-, or recreation-based values. In addition, ambient water quality standards and guidance values (New York State, 1998) are available for chemicals without standards in 6 CRR-NY 703.5 including a value of 20 microgram per liter (µg/L) for phosphorus for recreational exposure to freshwater water. Criteria for nutrients are also presented in the Nutrient Standards Plan (New York State, 2011). The value for phosphorus is applicable to ponds, lakes, and reservoirs and is based on aesthetic effects for primary and secondary contact recreation (New York State, 1998). Concentrations of phosphorus greater than 20 µg/L increase the potential for algae blooms, including algal blooms that could

generate cyanotoxins that are harmful to humans if contacted or ingested. These three New York guidance documents are included in **Attachment C**.

2.2.1 Summary of Organic Chemical Data for Surface Water

2.2.1.1 Organic Chemical Results for the Grand Canal Locations

VOCs and SVOCs were detected in surface water samples collected from 11 locations within the Grand Canal study area on July 15 and August 27, 2015. A total of 88 samples were collected at locations depicted on **Figure 2.** Summary statistics, including frequencies of detection, for these two sampling events are presented in **Tables 2-1A and B and 2-2A and B**. Of the chemicals detected, most were noted in less than 5 percent of the samples collected and most at maximum concentrations less than 1 µg/L. The following chemicals, detected in more than 5 percent of the samples (three or more samples in either sampling event), are discussed in detail in the following narrative:

- Acrolein
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- bis(2-Ethyl hexyl) phthalate (BEHP)
- Ethylbenzene
- Toluene
- Benzene
- Fluoranthene
- Xylenes
- 1,2,4-Trimethylbenzene

BEHP was the only chemical of those listed above to exceed recreational screening levels developed for this PHE (see **Tables 2-1A and 2-2A**). Many detections also exceed the water quality criteria presented in **Tables 2-1B and 2-2B**. The maximum detected concentration exceeds the recreational screening level calculated assuming direct contact exposure with surface water (i.e., assuming the receptor is swimming in the Canal) *and* assuming consumption of fish from the Canal. However, BEHP concentrations only exceed the screening value based on consumption of fish from the Canal (estimated from surface water concentrations). BEHP was detected in approximately one-half of the samples collected in July and August 2015. It is a common laboratory contaminant and is also frequently found in environmental samples because of the widespread use (and disposal) of plastics in our modern society. Two other chemicals (n-nitroso-di-n-propylamine and 2,6-dinitrotoluene, not listed above) were also detected at concentrations exceeding recreational screening levels and water quality criteria. However, each chemical was detected in only one of 88 surface water samples collected in 2015. Neither chemical was detected in samples collected in 2004 (see **Table 3 of Attachment E).**

Acrolein, detected at maximum concentrations slightly exceeding water quality criteria, and toluene were the most frequently detected VOCs in the July and August 2015 surface water samples. Acrolein, detected in 7 of 44 July samples and in 23 of 44 August samples, is formed during the combustion of gasoline and oil. Toluene is a component of gasoline. All of the BTEX compounds were found in six or more of the 88

samples analyzed and are common indicators of fuel-related contamination. Toluene was the most frequently detected BTEX compound (identified in five July samples and 15 August samples), whereas other BTEX components were detected in no more than three July 2015 samples and five August 2015 samples. The BTEX detections reported for the 2015 sampling events are comparable to those reported for the surface water samples collected in 2004 (see **Table 3 of Attachment E).**

1,2,4-Trimethylbenzene was detected in three of the August 2015 samples. Trimethylbenzene compounds were also detected in two July 2015 samples and two surface water samples collected in 2004 (see **Table 3 of Attachment E)**. Trimethylbenzene is a component of gasoline and is released from vehicles, municipal waste treatment plants, and coal-fired power stations (OEHHA, 2001). cis-1,2-DCE, detected in eight August 2015 samples, is used as a solvent and is a biodegradation product of chlorinated organic chemicals such as trichloroethene (TCE). Trimethylbenzene compounds and chlorinated organic chemicals (TCE, tetrachlorothene, 1,2-dichloroethene, cis-1,2-DCE) were detected sporadically in surface water samples collected in 2004 and 2015. The maximum detected concentrations do not exceed 2 µg/L and suggest low-level, occasional releases to the Canal.

Fluoranthene, a polycyclic aromatic hydrocarbon (PAH), was detected in four August 2015 samples and two July 2015 samples. It was the only PAH detected in more than 5 percent of the samples analyzed; although a few other PAHs were detected sporadically in both July and August 2015 samples and in surface water samples collected in 2004 (see **Table 3 of Attachment E)**. PAHs are present in vehicle emissions and found in products such as coal tar-based pavement. The acrolein, BTEX, trimethylbenzene, and PAH detections reported for the 2015 and/or 2004 samples are likely associated with combustion sources and the widespread use of fuels within the Grand Canal study area (e.g., surface water run-off from roads, boat exhausts, etc.).

Field notes for the July and August 2015 sampling events (**Attachment A**) indicate that an oily sheen was observed in the water at Stations 2, 9, and 10 during the July sampling event and at Stations 2, 9, and 10 during the August sampling event. These observations may explain some of the BTEX and PAH detections discussed above. One or more PAHs were detected at Stations 4, 9, and 11 during the July 2015 sampling event and at Stations 2, 4, 7, and 10 during the August sampling event. Concentrations of individual PAHs were all less than 0.15 µg/L. Detected concentrations of two or more BTEX components (toluene, in particular) were reported at Stations 6 and 8 during the July 2015 sampling event and at Stations 10, 11, and 12 during the August 2015 sampling event.

2.2.1.2 Organic Data for the Surface Water Run-off Monitoring Study

Summary statistics for surface water run-off samples collected from six locations (**Figure 3**) during the August (wet sampling) and September (dry sampling) events are presented in **Tables 2-3A and 2-4A,** respectively. Analytical data for these samples is provided in **Attachment A**.

The SWRMS samples were collected to evaluate contaminant loading to the Canal as a consequence of surface water run-off. Several VOCs and SVOCs were detected in the samples. The chemical profile and concentrations are generally similar to those noted in the Grand Canal samples discussed above. With the exception of BEHP and acrolein (among the most frequently detected compounds reported if considering the data for both events), maximum concentrations reported did not exceed 5 µg/L. BEHP and acrolein concentrations for the dry sampling event generally exceed those for the wet sampling event, suggesting a possible dilution of loading concentrations as a consequence of the precipitation event. BTEX, PAH, and 1,2,4-trimethylbenzene detections are indicative of contributions from one or more anthropogenic sources of contamination (e.g., fuel-related or combustion sources, surface water run-off from asphalt-paved areas, etc.) Three organic chemicals (tert-butyl alcohol, chloromethane, and carbon disulfide) were detected in the SWRMS samples but not in the Grand Canal samples.

BEHP was the only chemical detected in SWRMS samples at concentrations exceeding recreational screening levels developed for the project. The BEHP recreational screening level was calculated assuming that a receptor was exposed via the fish ingestion pathway (the screening level was estimated from surface water concentrations).

2.2.2 Summary of 2015 Nutrient Data

Surface water samples from the four 2015 sampling events were also analyzed for nutrients indicative of water quality [total nitrogen, total dissolved nitrogen, phosphorous (total and dissolved), and total inorganic nitrogen (dissolved)]. **Tables 2-1A and B, 2-2A and B, 2-3A and B, and 2-4A and B** include summary statistics for the nutrient data, which are provided in detail in **Attachment A**. Total and dissolved nitrogen and phosphorus data for the July and August Grand Canal sampling events are also depicted on **Figures 4 through 11**. The following items summarize the data collected and compare detected concentrations to available criteria and benchmarks established for water quality (e.g., to mitigate the potential for harmful algal blooms, reduced water transparency, decreased levels of oxygen, and production of foul odors):

- Total nitrogen was detected in most of the surface water samples collected; concentrations ranged from 1,300 to 4,700 µg/L. Most of the detected concentrations (and the laboratory reporting limit of 1,200 µg/L) exceed one or more available federal or state water quality criteria or recommendation. For example, total nitrogen criteria for Florida estuaries range from 170 to

1,870 µg/L, with values for rivers and streams ranging from 670 to 1,870 µg/L (USEPA, 2015). Total nitrogen criteria for Massachusetts estuaries range for 380 to 552 µg/L (USEPA, 2015). As summarized in **Tables 2-1A and 2-2A**, mean and median dissolved nitrogen concentrations are less than mean and total nitrogen concentrations, suggesting that most of the nitrogen is present in the dissolved form. Total and dissolved nitrogen concentrations reported for samples collected in the 2004 sampling event conducted by the county are less than those reported for the 2015 sampling event (see Table 2 of **Attachment E**).

- Total phosphorus was detected in most surface water samples collected; concentrations ranged from 50 to 597 µg/L. All detected concentrations (and the laboratory reporting limit of 50 µg/L) exceed the New York State water quality criterion for recreational use of freshwaters of 20 µg/L (New York State, 2011). This criterion was developed for lakes and ponds and therefore is not strictly applicable to the Grand Canal. As an additional point of reference, the State of New Jersey has developed a total phosphorus criterion of 100 µg/L for non-tidal freshwater streams (USEPA, 2015). The State of Wisconsin also generally uses total phosphorus criteria of 100 and 75 µg/L for rivers and streams, respectively (USEPA, 2015). The total phosphorus results depicted on **Figures 8 and 9** indicate that concentrations for most high and mid-outgoing tidal samples exceed 100 µg/L; most concentrations for low and mid-incoming tidal samples do not. The data summarized in **Tables 2-1A and 2-2A** suggest that most phosphorus is present in the dissolved form. The total and dissolved phosphorus concentrations reported for samples collected during the 2004 sampling event conducted by the county are less than those reported for the 2015 sampling event.
- Total dissolved inorganic nitrogen (DIN) was detected infrequently in the July 2015 Grand Canal samples (three detections, 1.2 to 1.6 milligrams per liter [mg/L], in samples GC-11B, GC-12A, GC-12B) and was not detected in any surface water samples collected in August or September 2015. However, the laboratory reporting limit for the 2015 surface water samples, 1.05 mg/L, was elevated compared to the reporting limits for the county's 2004 sampling event. Total DIN was detected in the 2004 samples and levels were greatest at Stations 9 through 12. As a point of reference for the 2004 sampling event, total DIN levels in adjacent areas of Great South Bay averaged less than 0.05 mg/L (SCDHS, 2005). Total DIN is the nutrient most responsible for eutrophication in open estuarine and marine waters, whereas dissolved inorganic phosphorus (DIP), not a target analyte for the 2015 sampling events, is more likely to promote algal growth in tidal-fresh waters. DIP was not detected in samples collected in the county's 2004 sampling event. Total DIN detections and reporting limits exceed the following benchmarks published by the USEPA (2008).

Area: Northeast, Southeast, Gulf Coast	Benchmarks for Nutrients Indicating Water Quality		
	Good	Fair	Poor
DIN	< 0.1 mg/L	0.1 to 0.5 mg/L	> 0.5 mg/L
DIP	< 0.01 mg/L	0.01 to 0.05 mg/L	> 0.05 mg/L
DO	> 5 mg/L	2 to 5 mg/L	< 2 mg/L

Based on a comparison of average reported concentrations, the Grand Canal study area concentrations of total nitrogen and total phosphorous are generally greater than regional data reported for nitrogen and phosphorous (**Tables 2-7 and 2-8**):

- Regional phosphorous concentrations ranged from 3.6 to 2050 µg/L (with average concentrations of 50 µg/L for Suffolk County data and 70 µg/L for the Southern Long Island Watershed). Average total phosphorous concentrations for the study area data, presented in **Tables 2-1A through 2-4A**, exceed these average regional concentrations.
- Regional nitrogen concentrations ranged from 92 to 750 µg/L (average of 210 µg/L) for Suffolk County and 12 to 280,000 µg/L (average of 970 µg/L) for the Southern Long Island Watershed. Average total nitrogen concentrations for study area data exceed the regional average concentrations.
- Nitrogen data in the STORET database (accessed October 6, 2015; summarized in **Tables 2-7 and 2-8**), in addition to total nitrogen, are also reported as ammonia-nitrogen as nitrogen (N), inorganic nitrogen (nitrate and nitrite) as N, and Kjeldahl nitrogen. Some of these values are greater than the regional nitrogen values summarized above, indicating that nutrient concentrations may be elevated in the Grand Canal

2.2.3 Summary of Water Quality Measurements

2.2.3.1 General Water Quality Data for the 2015 July and August Tidal Sampling Events

Tables A-1 through A-4 in Attachment A-1 summarize the field notes and water quality monitoring data collected during the 2015 sampling events. **Figures 12 through 19** depict temperature, salinity, dissolved oxygen, and turbidity measurements collected at 11 stations monitored throughout the tidal cycle (low, mid-incoming, high, and mid-outgoing) for the two sampling events, July 15, 2015, and August 27, 2015, respectively. The following items summarize data collected and trends observed:

- Temperature (**Figures 12 and 16**): With a few exceptions, water temperature readings collected during high tide and mid-outgoing tide conditions generally exceed those reported for low tide and mid-incoming conditions. Water temperature readings were more variable and the temperature range was larger for samples collected during the August event compared to samples collected during the July event.

- Salinity (**Figures 14 and 18**): Salinity readings were more variable across monitoring stations in July than in August. Most salinity readings in July were between 16 and 20 practical salinity units (PSU) whereas most August readings were between 20 and 22 PSU. Readings at GC-01 and GC-12, located closest to the Connetquot River, were generally more variable than those reported for other stations and likely reflect tidal influences. The salinity readings reported indicate that surface waters of the Grand Canal are brackish.
- DO (**Figures 13 and 17**): DO readings were generally similar for both sampling events, except that July readings were more variable, and readings reported for Stations 2, 4, and 5 during the July sampling event exceed those reported for other July-event stations and all August-event readings. Most DO readings are less than the minimum allowable DO level of 4.8 mg/L stipulated in New York Water Quality Standards for saline surface waters Classes SA, SB, and SC (6 CRR-NY 703.3). With some exceptions, DO levels were generally slightly greater in high tide and mid-outgoing tide samples than in samples collected at low tide or mid-incoming tide.
- Turbidity (**Figures 15 and 19**): Turbidity levels were generally between 5 and 15 Nephelometric Turbidity Units (NTU) at most locations, with notable exceptions at Stations 4 and 7 during the August sampling event.

Based on water quality data collected as part of the tidal study, water temperature, salinity, and DO levels are somewhat related to tidal fluctuations. In general, higher water temperatures, salinities, and DO levels occur at high-tide and mid-outgoing tide conditions versus low-tide and mid-incoming tide conditions. However, with a few exceptions, the variations in readings over time and across the stations do not suggest that significant tidal flushing is occurring throughout the study area. Also, most DO levels were less than the minimum New York criterion of 4.8 mg/L, and several DO readings collected during the monitoring events 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 (the value would be approximately 2 mg/L for a 12 hour exposure). Therefore, the low DO levels in the Grand Canal have the potential to impact the development and health of aquatic organisms.

2.2.3.2 General Water Quality Data for 2015 Wet and Dry Sampling Events

Tables A-3 and A-4 in Attachment A-1 summarize field notes and water quality monitoring data collected for the August 2015 wet and September 2015 dry sampling events. The following items summarize data collected and trends observed:

- Temperature: Temperature differences between the sampling events could not be evaluated because temperature readings were not available for the August 2015 sampling event.
- Salinity: Salinity was higher during the dry sampling event (20.78 to 24.07 PSU) compared to the wet sampling event (16.24 to 19.68 PSU).
- DO: DO readings were generally lower during the dry sampling event (1.06 to 2.36 mg/L) compared to the wet sampling event (2.33 to 4.21 mg/L).

- Turbidity: Turbidity levels were generally lower during the dry sampling event (5.1 to 8 NTU) compared to the wet sampling event (6.9 to 20.2 NTU).

The reduced salinity and increased DO and turbidity values in the August event were likely due to rainfall and storm water run-off. The introduction of freshwater from rainfall and run-off reduced salinity values within the Grand Canal. The turbidity would have increased with the additional water movement from rainfall and storm water run-off. Freshwater in rainfall is high in DO and likely contributed to the increased DO measurements during the wet sampling event.

2.2.3.3 General Water Quality Data for the 2015 December Sediment Sampling Event

Table A-5 in Attachment A-1 summarizes water quality monitoring data collected for the December sediment sampling event. The following items summarize data collected and trends observed:

- Temperature: Water temperature readings were between 7.7 and 9.8 degrees Celsius (ºC) for the two sampling days.
- Salinity: Salinity readings generally increased with depth. Salinity readings reported for surface samples from Stations 6 to 10 (0.8 to 1.8 PSU) were generally low because it was raining heavily on that sampling day. However, the bottom depth salinity readings were similar across the stations monitored. Only a surface salinity reading is available for Station 6 due to the shallow water depth at that location.
- DO: DO readings were generally similar across the stations monitored, except that a DO reading of less than 1 mg/L was reported for Station 1. DO readings between 2.3 and 4.1 mg/L were reported for the remaining stations.
- Turbidity: Turbidity levels were between 0.2 and 15.6 NTU.

2.2.3.4 General Water Quality Data for the 2013 and 2014 Continuous Monitoring Events

The continuous monitoring data collected at 15-minute intervals by the county using Sonde meters at Locations A and B (**Figure 2**) in 2013 and 2014 are provided in **Attachment B** in tabular and graphic formats. **Attachment B** plots show relationships, if present, between tidal fluctuation (as measured by water displacement) and water quality parameters (i.e., salinity, temperature, DO) and between the water quality parameters. **Attachment B** plots and descriptive statistics (for sample count, temperature, DO, and salinity) for data collected at 2-week intervals across the monitoring events (presented in **Table 2-5** and depicted on **Figures 20 through 22**) were evaluated to determine if the data indicate temporal or seasonal trends in DO, temperature, or salinity. **Table 2-6** provides summary statistics for DO compared to State of New York and USEPA Water Quality Standards and benchmarks. The 4.8 mg/L benchmark is the New York ambient water quality standard, and the 2.3 mg/L benchmark is the USEPA minimum value based on aquatic life. The following items summarize data collected and trends observed:

- Based on displacement data at Locations A and B (**Attachment B**), similar daily patterns for water quality parameters were noted at both locations with a 1-foot tidal influence at Location B and a 1.5-foot tidal influence at Location A.
- Some readings appear anomalous and/or likely indicate occasional meter malfunctions. For example, although average DO values presented in **Table 2-5** are generally similar to the 4.8 mg/L criterion, DO reported for several samples is greater than 10 mg/L. Based on water temperature (approximately 17 to 29 °C) and salinity (approximately 15 to 25 parts per thousand [ppt]), DO levels at 100-percent air saturation should be less than 10 mg/L (Kemker, 2013). It is possible for oxygen to be supersaturated but not at the levels recorded (i.e., greater than15 ppt) and not usually in tidal/brackish waters.
- Salinity levels do fluctuate from day to day but, as expected, tend to be greatest during high tide and lowest during low tide. **Figure 23** shows daily salinity fluctuation for a 5-day period in 2014. These observations are in general agreement with those of the 2015 tidal studies. Salinity readings at Location B tend to be somewhat less than those at Location A, and readings collected in the spring tend to be somewhat lower than those collected in the heat of summer.
- Temperature readings also demonstrate daily fluctuations with the tidal cycle (**Figure 24**), and as expected, mean readings in the spring are less than mean readings in the summer.
- Daily DO values range from fully saturated with oxygen (8 to 9 mg/L) to nearly anoxic (less than 2 mg/L). The DO levels appear to correlate with time of day and less so with tidal fluctuations. Maximum DO levels occur in mid-afternoon and lowest levels occur in early morning. **Figure 25** shows this daily DO fluctuation using data for a 5-day period in 2014. Maximum readings are near the second high tide of the day, and the lowest readings are generally near the first high tide of the day. The most likely reason for this is that in the evening, aquatic plants consume oxygen from the water rather than releasing it, as they do through photosynthesis during the daylight hours. Daily water temperature readings follow a similar pattern.

2.2.4 Sediment Chemical Data for the Grand Canal Study Area

2.2.4.1 Organic Chemical Results for Sediment

4,4'-DDT and its breakdown products 4,4'-DDD and 4,4'-DDE and one PCB mixture (Aroclor-1254) were detected in sediment samples collected from 10 locations within the Grand Canal study area on December 21 and 22, 2015. A total of 20 samples were collected from locations depicted on **Figure 2**. In addition, several dioxins/furans were detected in the two sediment samples analyzed for dioxins/furans. Summary statistics, including frequencies of detection, for this sampling event are presented in **Table 2-9**.

The low-level pesticide (less than 0.7 mg/kg), PCB (less than 0.2 mg/kg), and dioxin/furan (less than 5 ng/kg) detections in the sediment samples reflect contributions from a wide variety of anthropogenic sources (e.g., historical routine pesticide use, emissions from common combustion sources, etc.). Several

dioxins/furans were detected in the two sediment samples analyzed for those chemicals. The toxicity equivalence (TEQ) concentrations of 2,3,7,8-TCDD, calculated based on the reported results for the individual congeners, are within background soil ranges reported in the literature (USEPA, 1994). One PCB, Aroclor-1254, was detected in the sediment samples. Concentrations of DDT and related breakdown products, 2,3,7,8-TCDD TEQ, and Aroclor-1254 exceeded the recreational screening level calculated assuming direct contact exposure with sediment (i.e., assuming the receptor is swimming/wading in the Canal) and consumption of fish from the Canal (estimated from sediment concentrations). However, Aroclor-1254 was only detected in one of 20 samples at a concentration of 0.171 mg/kg and 4,4'-DDT was only detected in 2 of 20 samples. None of the organic chemicals exceeded the recreational screening level based on direct contact exposure only.

2.2.4.2 Inorganic Chemical Results for Sediment

Seven metals were detected in all sediment samples. Concentrations of arsenic, chromium (evaluated as hexavalent chromium), copper, nickel, mercury, and zinc exceeded recreational screening levels calculated assuming direct contact exposure with sediment (i.e., assuming the receptor is swimming/wading in the Canal) and consumption of fish from the Canal (estimated from sediment concentrations). Concentrations of copper, nickel, mercury, and zinc exceed the recreational screening level based on an HQ of 0.1, but do not exceed based on an HI of 1. The detected arsenic concentrations (1.86 to 22.9 mg/kg) are within the range of sediment concentrations reported by the National Center for Coastal Ocean Science (NCCOS) for sediments in areas in the general vicinity of the Hudson River (**Table 2-11**). Arsenic concentrations of 20 mg/kg are not uncommon in that data set. Also, it should be noted that chromium concentrations (5.39 to 55.6 mg/kg) would not exceed screening criteria if it was assumed to be present as trivalent chromium. Toxicity criteria are available for different forms of chromium (trivalent and hexavalent), and the hexavalent form is considered to be more toxic. However, the sediments are likely to be anoxic, and therefore, hexavalent chromium is unlikely to be present in study area sediment at significant concentrations (relative to total chromium concentrations) unless a recent source/release(s) contributed to the sediment concentrations. As noted above for organic data, metals concentrations in sediments likely reflect contributions from a wide variety anthropogenic sources (e.g., septic system discharge, emissions from combustion sources, discharges from boats, surface water run-off from adjoining properties, etc.) that have contributed (over the long term) to the sediment profile. As points of reference, data extracted from the United States Geological Survey (USGS) and STORET data sources listed in **Tables 2-12 and 2-13** indicate that total chromium concentrations range from 2 to 88 mg/kg based on samples collected from sediments collected across the general region.

2.3 Human Health Risk Methodology and Results

Section 2.3 presents the methodology for and results of the HHRA conducted for chemical concentrations detected in surface water and sediment samples collected from the Grand Canal study area in 2015. The assessment is based on standard USEPA risk assessment methodology and project-specific risk-based

screening levels. These levels were developed (as detailed in Section 2.2 and in **Attachment D**) based on the CSM considerations discussed in Section 1. However, it should be noted that site-specific data are not currently available regarding the frequency at which residents may contact the surface water and sediment of the Canal or consume fish taken from the Canal. Risk estimates presented herein assume that child and adult recreational receptors are swimming/wading in the Grand Canal 100 and 50 days per year, respectively, and an adult is consuming fish taken from the Canal 12 days per year over the course of a lifetime. In addition, fish sampling was not conducted for this assessment. Risk estimates based on fish ingestion were calculated by comparing chemical concentrations in surface waters and sediments to risk-based concentrations (RBCs) developed assuming a portion of the contaminants are retained in fish contacting those media. However, considerable uncertainty is associated with estimating fish tissue concentrations from surface water and sediment concentrations. For example, the method used to estimate fish tissue concentrations assumes that fish taken by recreational fishermen are routinely in contact with the sediments (i.e., are likely to be bottom dwelling species), and that bioaccumulation occurs from contaminated sediments to fish. However, this assumption may significantly overestimate risk if species typically taken by recreational fishermen do not routinely contact the sediments. The estimated fish tissue concentrations also assume that the fish within the study area have a home range limited to the surface water and sediment sampling area. In reality, fish may swim to other nearby waterways. Therefore, there is uncertainty in predicting chemical concentrations in fish tissue from chemical concentrations in surface water and sediment. The uncertainty associated with estimating fish tissue concentrations needs to be considered when interpreting the overall conclusions because a few metals were identified as primary risk drivers for recreational users exposed via the fish ingestion exposure pathway.

The estimates are based on the current toxicity information published by USEPA. The HHRA was conducted as follows:

- Step 1: COPCs were selected
- Step 2: Exposure point concentrations (EPCs) were calculated for the COPCs
- Step 3: Cancer and non-cancer risk estimates were developed using the “sum of ratios” approach for calculating risk (Section 5.15.2 of the USEPA RSL Table User’s Guide [USEPA, 2016])

Step 1: Selection of COPCs

All analytical data evaluated in the HHRA are presented in **Attachment A** and summarized in **Tables 2-1A** through **2-4A** for surface water and **Table 2-5** for sediment. The following chemicals were detected in surface water at maximum concentrations exceeding the project-specific risk-based screening levels presented in **Tables 2-1A** through **2-4A**:

- July 2015 Grand Canal Sampling Event: BEHP and n-nitroso-di-n-propylamine
- August 2015 Grand Canal Sampling Event: BEHP and 2,6-dinitrotoluene
- August 2015 SWRMS Wet Sampling Event: BEHP
- September 2015 SWRMS Dry Sampling Event: BEHP

As indicated in Section 2.2, the screening levels represent the $1x10^{-6}$ cancer risk level or a HI of 0.1. N-nitroso-di-n-propylamine and 2,6-dinitrotoluene were eliminated as COPCs in surface water because they were each detected in only one of the 88 surface water samples collected in 2015. BEHP was the only chemical selected as a COPC for surface water and further evaluated in the HHRA.

4,4'-DDT and its breakdown products (4,4'-DDD and 4,4'-DDE), 2,3,7,8-TCDD TEQ, Aroclor-1254, and several metals were detected in sediment at maximum concentrations exceeding the project-specific risk-based screening levels presented in **Table 2-9**: However, Aroclor-1254 was eliminated as a COPC in sediment because it was detected in only one of 20 sediment samples. DDT and related breakdown products, 2,3,7,8-TCDD TEQ, and metals were selected as COPCs for sediment and further evaluated in the HHRA.

Toxicity criteria (cancer slope factors [CSFs] and reference doses [RfDs]) are available in USEPA's Integrated Risk Information System (IRIS) and are indicators of the strength or potency of BEHP, arsenic, and chromium in terms of producing adverse cancer or non-cancer effects. The IRIS print-outs for BEHP, arsenic, and chromium are provided in **Attachment F**. Toxicity criteria and the exposure assumptions discussed above for the recreational user are the basis of the aforementioned project-specific screening levels.

Step 2: Calculation of EPCs

The EPC is the concentration to which a receptor is exposed. Per USEPA guidance, the 95 -percent upper confidence limit (UCL) on the arithmetic mean is generally recommended as the EPC for data sets evaluated in HHRAs. EPCs were calculated following USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (2002) and using USEPA's ProUCL Version 5.0 (2013). Conservatively, an evaluation using the maximum concentrations of these chemicals as the EPCs is also included in **Attachment F**. However, given the size of the July and August Grand Canal surface water data sets (44 surface water samples each event) and the December Grand Canal sediment data set (20 sediment samples), risk management decisions for the Grand Canal data sets should be based on the 95-percent UCLs as the EPCs. ProUCL outputs are presented in **Attachment F**. The EPCs are presented in **Table 2-14** for surface water and **Table 2-15** for sediment.

Step 3: Calculation of Cancer and Non-cancer Risk Estimates

Cancer and non-cancer risk estimates for BEHP in surface water and for DDT and related breakdown products, 2,3,7,8-TCDD TEQ, and metals in sediment were calculated using RBCs for the direct contact while swimming/wading and fish ingestion exposures (estimated from surface water and sediment concentrations), EPCs, and a simple risk-ratio equation. RBCs used represent HIs of 1 (i.e., the concentration not expected to result in adverse effects) for non-carcinogens and $1x10^{-6}$ (i.e., a one-in-one million probability) cancer risk levels for carcinogens. The RBCs *are the same as* the project-specific screening levels referenced above except that the non-cancer-based RBC values represent HIs of 1 (not HIs of 0.1 as is used in the development of the screening levels). The RBCs, all associated receptor exposure assumptions, and the toxicity criteria used to develop the RBCs are presented in **Attachment D**. Risk estimates were developed using the following equation, which calculates an HI or incremental lifetime cancer risk (ILCR) for a particular chemical based on the EPC and RBC for that same chemical:

$$\text{HI or ILCR} = \frac{\text{EPC x Target HI of 1 or Target ILCR of 1E - 06}}{\text{Risk - based Concentrat ion for Receptor}}$$

This simple risk-ratio approach is possible because all equations used to estimate exposure and risk are linear equations. Therefore, if the RBC is the concentration associated with a one-in-one million excess probability of developing cancer (or, alternatively, a HI of 1), one may simply scale off that known relationship to predict risks for other concentrations detected or predicted in an environmental medium. This approach is presented in Section 5.15.2 of the USEPA's RSL User Guide.

Cancer and non-cancer risk estimates were compared to the following USEPA risk management benchmarks (i.e., acceptable risk levels):

- ***A target-organ-specific HI of 1.*** Adverse non-cancer effects are not anticipated when the HI is equal to or less than 1. This is the non-cancer risk management benchmark typically used by USEPA to evaluate environmental contamination.

- ***USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$*** (*a one-in-one million to one-in-10,000 chance of developing cancer).* This is the cancer risk management range typically used by USEPA to evaluate environmental contamination.

Risk estimates developed for BEHP concentrations in the four surface water data sets collected in 2015 are presented in **Table 2-14** and summarized below in **Table 2-16**:

Table 2-16

Summary of Non-Cancer Hazard Indices and Cancer Risk Estimates for Surface Water

Data Set	Exposure	EPC = 95-Percent UCL on the Arithmetic Mean	
		Hazard Index	Cancer Risk Estimate
Grand Canal Sampling Events			
July 2015 Grand Canal Samples	Direct Contact	0.003	8E-08
	Fish Ingestion	0.1	1E-05
	Combined(1)	0.1	1E-05
August 2015 Grand Canal Samples	Direct Contact	0.0004	1E-08
	Fish Ingestion	0.02	2E-06
	Combined(1)	0.02	2E-06
Sampling of Discharge to Grand Canal (not the Canal)			
August 2015 Wet Sampling Event (SWRMS samples)	Direct Contact	0.0008	2E-08
	Fish Ingestion	0.04	4E-06
	Combined(1)	0.04	4E-06
September 2015 Dry Sampling Event (SWRMS samples)(2)	Direct Contact	0.02	5E-07
	Fish Ingestion	0.7	7E-05
	Combined(1)	0.7	8E-05

1 Exposure occurs by both direct contact with surface water and fish ingestion exposure pathways.
2 Based on maximum concentration; UCL exceeds maximum detected concentration.

It should be noted that each of the surface water data sets was evaluated separately to estimate cancer risks based on a lifetime exposure to each data set EPC. None of the cancer risk estimates exceed the USEPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$ (i.e., a one-in-10,000 to one-in-one million probability of developing cancer). However, all of the cancer risk estimates for the fish ingestion exposure pathway and the combined direct contact and fish ingestion exposure scenario exceed $1x10^{-6}$ (the conservative end of the USEPA cancer risk management range). In contrast, none of the risk estimates for the direct contact exposure pathways exceed $1x10^{-6}$.

Non-cancer risks were considered to not be a concern because none of the HIs exceed the benchmark of 1. It should be noted that the August and September 2015 SWRMS data sets represent surface water run-off flowing into the Grand Canal, not the concentrations in the Canal. The July and August 2015 Grand Canal data sets are likely more representative of surface water quality in the Canal.

In addition, BEHP concentrations in the Grand Canal are generally within the concentration range (less than 0.1 to 10 µg/L) reported in the scientific literature for other surface water data sets (IARC, 2012). BEHP concentrations in the 2015 Grand Canal surface water samples ranged from 0.54 to 101 µg/L. Mean concentrations were 6.6 µg/L in July and 2.3 µg/L in August 2015. Median concentrations were 3.6 µg/L in July and 0.62 µg/L in August 2015. Concentrations exceeded 10 µg/L in 3 of 44 samples from July (15.1, 28.1, and 101 µg/L) and in 2 of 44 samples from August (11.6 and 11.9 µg/L).

Based on data from the National Stormwater Quality Database, the national median detected BEHP concentration in storm water was 9.5 µg/L (CWP, 2004). In general, BEHP concentrations were greater (around 100 µg/L) when water basins are located near industrial plants (IARC, 2012). An evaluation of national data found BEHP in 24 percent of surface water supplies at a median concentration of 10 µg/L based on data from the USEPA STORET database (Staples et al., 1985). A comparison of the Grand Canal data set to USEPA STORET data for the area could not be conducted because a review of the USEPA STORET database (2008 to 2014) indicated that phthalate data was not available for Suffolk County or the Southern Long Island Watershed (STORET database accessed October 6, 2015). However, based on comparison to national data, the BEHP concentrations in the Grand Canal appear to be comparable to BEHP concentrations reported for other surface water resources. Therefore, risks from fish consumption (based on Grand Canal surface water concentrations) are expected to be similar to those predicted based on surface water concentrations detected nationally.

Risk estimates developed for COPCs in the sediment data set collected in 2015 with chromium concentrations assumed present as hexavalent and, then, as trivalent chromium are presented in **Table 2-15** and summarized below in **Table 2-17**:

Table 2-17

Summary of Non-Cancer Hazard Indices and Cancer Risk Estimates for Sediment

Data Set	Exposure	EPC = 95-Percent UCL on the Arithmetic Mean	
		Hazard Index(1)	Cancer Risk Estimate(1)
Grand Canal Sediment Samples	Direct Contact	0.09/0.08	2E-05/3E-06
	Fish Ingestion	3/2(3)	3E-04/7E-05
	Combined(2)	3/2(3)	3E-04/7E-05

1 The first risk estimate presented assumes chromium is present as hexavalent chromium. The second risk estimate presented assumes chromium is present as trivalent chromium.
2 Assumes both direct contact and fish ingestion exposures.
3 Hazard index for individual target organs are less than or equal to 1.

Cancer risk estimates do not exceed the USEPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$ (i.e., a one-in-10,000 to one-in-one million probability of developing cancer) when evaluating chromium as trivalent chromium. However, cancer risk estimates for the direct contact and combined direct contact and fish ingestion exposure pathways do exceed $1x\text{-}10^{-4}$ (i.e., a one-in-10,000 probability of developing cancer) when it is assumed that chromium is present as hexavalent chromium. Regional data presented in Tables 2-11 to 13 was reviewed for sediment COPCs. Data was only available for the inorganics selected as COPCs. As discussed above in Section 2.2.4.2, arsenic and chromium concentrations detected in study area sediments, which are the main risk drivers, are within the ranges of concentrations reported for sediments within the region (as are the other inorganic COPCs), and it is unlikely that chromium is present as hexavalent chromium.

Non-cancer risks were considered to not be a concern because none of the target organ HIs exceed the benchmark of 1.

3.0 EVALUATION OF MICROBIOLOGICAL QUALITY

This section provides the PHE of the bacteriological data collected for the Grand Canal study area. The data sources and sampling locations are those described for the evaluation of chemical quality (Section 2), except that the locations in the following table were sampled in 2015 for bacteriological quality (**Figure 2**) but were not sampled and analyzed for VOCs, SVOCs, herbicides, or pesticides in 2015,

Table 3-1

2015 Bacteriological Quality Sample Locations Not Analyzed for Chemical Parameters

Sampling Location Identifier	Description
WL-1	Sample collected from the north-south mosquito ditch depicted on Figure 2.
WL-2	Sample collected at the three-way intersection of the mosquito ditches depicted on Figure 2.
GC-South	Sample collected from the Connetquot River west of the southern entrance to the Grand Canal.
GC-North	Sample collected from the Connetquot River north of the northern entrance to the Grand Canal.
WL-Ref1	Reference location sample collected from the center of the canal depicted on Figure 2, near the southwestern corner of a golf course.
WL-Ref2	Reference location sample collected from a culvert discharging from a wetland area east of the canal depicted on Figure 2.

All of the water samples collected during the following four sampling events conducted by Cashin Associates in 2015 were analyzed for the presence of three bacterial indicators (*Enterococci,* Total Coliform, and Fecal Coliforms):

- The July 15, 2015, GCSWA Tidal Cycle Sampling Event (four samples at each of 11 locations; low tide, mid-incoming tide, high tide, mid-outgoing tide).
- The August 27, 2015, GCSWA Tidal Cycle Sampling Event (two samples at each of 11 locations; high tide and mid-outgoing tide).
- The September 3, 2015, SWRMS Dry Sampling Event (samples from the six locations described in **Table 3-1** and surface water run-off samples from locations SW-1 through SW-6, **Figure 2**).
- The August 11, 2015, SWRMS Wet Sampling Event (surface water run-off samples from locations SW-1 through SW-6, **Figure 2**).

Analytical results for all four sampling events are presented in **Tables 3-2 through 3-5** and depicted on **Figures 26 to 28**. Data for each type of indicator bacteria are compared to state and nationally recommended standard values to evaluate whether exceedances of bacterial standards were likely to occur. It should be noted that compliance is typically determined using results for multiple samples taken throughout a month. Consequently, because only one to two samples were collected per month during the sampling events, the water quality standard values are used here as benchmarks for comparison only.

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 to 35 colony forming units (cfu) per 100 ml or a statistical threshold value (STV; a value that should not be exceed by more than 10 percent of samples) of 110 to 130 cfu per 100 ml. The ranges of values represent two recommendations based on differing acceptable illness rates from recreational activities in contaminated waters.

The analyses indicate that results for the locations sampled frequently exceeded the standard values for all indicators in all months. In many cases, exceedances were orders of magnitude greater than the recommended standard values (**Figures 26 through 28**). The following items summarize the results:

- **Fecal Coliforms:** With the exception of the results for location SW-3, data reported for all sampling locations, including the reference locations, exceed the value of 200 colonies per 100 ml (**Figure 26**). Data ranged from 130 to 16,000 colonies per 100 ml. The data displayed on **Figure 26** indicate that results for samples collected from the Grand Canal during the tidal studies tend to be greater than those reported for other locations. However, the perceived difference may

be a function, in part, of the significant difference in the sizes of the data sets evaluated. The interpretation of the fecal coliform data set for the July 15, 2015, sampling event is complicated by the fact that the analytical laboratory reported most results as ">1600 cfu/100 ml."

- **Total Coliforms:** August samples often exceeded 2,400 and frequently 5,000 colonies per 100 ml (**Figure 27**). Data ranged from 130 to 16,000 colonies per 100 ml. The data displayed on **Figure 27** indicate that results for samples collected from the Grand Canal during the tidal studies tend to be greater than those reported for other locations. The data for most of the Canal locations exceed the benchmarks presented, whereas data for most of the other locations do not. However, again, the perceived difference may be a function, in part, of the significant difference in the sizes of the data sets evaluated. The data reported for GC-North and GC-South (the Connequot River locations) and WL-Ref-2 do not exceed the benchmarks presented. The interpretation of the total coliforms data for the July 15, 2015, sampling event is complicated by the fact that the analytical laboratory reported most results as ">1600 cfu/100 ml."
- **Enterococci:** The majority of samples exceeded 35 and 130 colonies per 100 ml (**Figure 28**). Data ranged from 10 to 13,000 colonies per 100ml. The data reported for GC-North and GC-South (the Connequot River locations) do not exceed the benchmarks presented; however, the results for the reference stations do exceed the benchmarks. The interpretation of the Enterococci data for the July 15, 2015, sampling event is complicated by the fact that the analytical laboratory reported most results as ">2419.6 cfu/100 ml."
- The data plotted on **Figures 26, 27, and 28** for the dry and wet sampling events do not suggest a significant difference (i.e., dry versus wet conditions) in the bacteriological loading in surface water run-off to the Canal.
- Field sampling notes (**Attachment A**) indicate that the smell of sewage was present at some locations.
- The fecal coliforms and total coliforms results for samples collected from the Grand Canal during the 2015 tidal studies exceed those reported for samples collected by the county in 2004 (see Table 2 of **Attachment E**).

These results suggest that bacterial contamination is a significant issue throughout the Grand Canal. Although the data for the Connequet River locations (GC North and GC South) are limited, the results for the Canal are significantly greater than those reported for the river. However, results for the reference locations also indicate that the issue is not unique to the Canal area. Additional follow-up investigations would be necessary to determine, more definitely, the potential sources of contamination. The sewage odor observed during field sampling could be indicative of failing septic systems. Other potential sources may include fecal contamination from waterfowl or run-off from non-point sources. In terms of bacteriological quality, neither the Grand Canal nor the reference area surface waters are likely to be safe for recreational uses involving direct contact with those waters.

4.0 EVALUATION OF POTENTIAL FOR VECTOR-BORNE DISEASE

This section provides the PHE of the WNV data collected for the Grand Canal study area by the SCDHS Arthropod-Borne Disease Laboratory (ABDL) in 2013 and 2014. Section 4.1 discusses the depth and quality of the available data sets, Section 4.2 presents the methodology for the WNV risk assessment, and Section 4.3 provides the results of the HHRA conducted based on the available data sets.

4.1 Depth and Quality of 2013 and 2014 WNV Surveillance Data

In 2013 and 2014, the SCDHS-ABDL collected mosquitoes on a weekly basis using Center for Disease Control (CDC) light and CDC gravid traps during the peak WNV season (August through October) at two trap sites near the Grand Canal (**Figure 29**). The Byron Lake site is located 0.79 mile east of the Canal, and the Fernwood site 0.28 mile east of the Canal. In 2014, mosquitoes were also collected in June and July. *Culex spp.* mosquito pools were tested for WNV. A pool represents a group of mosquitoes (from 10 to 60) from one trap or site that is tested as one sample for WNV. In 2013, *Culex spp.* mosquitoes were separated into *Culex salinarius* and *Culex pipiens/restuans* pools, but in 2014 they were processed as *Cx. pipiens/restuans/salinarius* pools.

The WNV surveillance data for all Suffolk County trap sites for the years 2013 and 2014 were compared to data from the years 2000 to 2012. In addition, the WNV surveillance data for the Byron Lake and Fernwood sites were compared to all other Suffolk County sites for the years 2013 and 2014. The results of the evaluation are provided in the following narrative.

For all of Suffolk County, the extent of mosquito collecting and testing activities as well as the number of WNV positive pools and the minimum infection rate (MIR) values for 2013 and 2014 were relatively high compared to the years 2000 to 2012. The largest and second largest number of *Culex spp.* mosquitoes were collected during 2013 and 2014, respectively (**Table 4-1**). The number of *Culex spp.* pools tested, number of *Culex spp.* mosquitoes tested, number of positive pools, and MIR values were ranked for the years 2000 to 2014 (**Table 4-2**). The number of *Culex spp.* pools tested in the years 2013 and 2014 were in the top 10 for the years 2000 to 2014; the number of Culex *spp*. mosquitoes tested, number of positive pools, and MIR values for 2013 and 2014 were all in the top five for the years 2000 to 2014.

Table 4-1

Summary Data for Mosquito Surveillance Activities from All Suffolk County Mosquito Trap Sites from 2000 to 2014

Year	Total *Culex spp.* Mosquitoes Collected	Total *Culex spp.* Mosquitoes Tested	Total *Culex spp.* Pools Tested	Total *Culex spp.* Positive Pools	MIR[(1)]
2000	96,244	90,968	2,415	121	1.330
2001	115,953	54,731	1,911	68	1.242
2002	ND	ND	ND	ND	ND

Year	Total *Culex spp.* Mosquitoes Collected	Total *Culex spp.* Mosquitoes Tested	Total *Culex spp.* Pools Tested	Total *Culex spp.* Positive Pools	MIR(1)
2003	105,895	49,845	1,884	40	0.80
2004	63,670	28,066	952	8	0.29
2005	59,517	46,633	2,054	16	0.34
2006	76,304	49,634	1,480	57	1.15
2007	51,678	29,570	918	12	0.41
2008	47,772	47,491	1,526	41	0.86
2009	75,271	48,538	1,465	17	0.35
2010	118,457	65,571	2,323	292	4.45
2011	139,167	69,562	1,801	81	1.16
2012	102,455	55,347	1,438	210	3.79
2013	233,190	59,259	1,515	177	2.99
2014	185,376	62,591	1,476	186	2.97

1 Minimum infection rate equals number of positive pools per total specimens tested multiplied by 1,000.
No data.

Table 4-2

Ranking of Mosquito Surveillance Activities from All Suffolk County Mosquito Trap Sites for 2013 and 2014 Compared to All Years from 2000 to 2014

Surveillance and Testing Activity	2013	2014
Total *Culex spp.* mosquitoes collected	1	2
Total *Culex spp.* mosquitoes tested	5	4
Total *Culex spp.* mosquito pools tested	10	8
Total *Culex spp.* positive pools	4	3
MIR(1)	3	4

1 Minimum infection rate equals number of positive pools per total specimens tested multiplied by 1,000.

The 2013 and 2014 mosquito collecting and testing activities for the Byron Lake and Fernwood trap sites are reported in **Table 4-3**. The collection and testing activities at these two sites compared to other sites in Suffolk County is relatively high. In 2013 the number of *Culex spp*. mosquitoes collected and the number of mosquitoes and pools tested ranked in the top 10 of 45 trap sites (**Table 4-4**). In 2014 they ranked in the top 25 of 42 trap sites (**Table 4-4**). Note that the rankings for the 2013 season are based on data collected from August 5 to October 23 whereas the rankings for 2014 are based on data collected from June 3 to October 2. Because 75 percent of the WNV positive pools for all Suffolk County trap sites in 2014 occurred during the August 4 to October 2 surveillance period, and only 25 percent during the June 3 to August 1 period, the lack of 2013 data from June and July should not bias the surveillance data for the Byron Lake and Fernwood trap sites.

Table 4-3

Summary Data for Mosquito Surveillance Activities at the Byron Lake and Fernwood Trap Sites in 2013 and 2014

Trap Site	2013		2014	
	Byron Lake	Fernwood	Byron Lake	Fernwood
Number of trap nights	11	11	36	36
Total *Culex spp*. mosquitoes collected	594	585	2246	1179
Light trap	534	437	672	244
Gravid trap	60	148	672	244
Total *Culex spp*. mosquitoes tested for WNV	594	585	1610	1021
Cx. pipiens/restuans	505	510	ND(1)	ND(1)
Cx. salinarius	89	75	ND(1)	ND(1)
Total *Culex spp.* pools tested for WNV	16	14	31	25
Cx. pipiens/restuans	13	11	ND(1)	ND(1)
Cx. salinarius	3	3	ND(1)	ND(1)
Number of positive pools	1	1	0	0

1 No data. In 2014, *Cx. salinarius* were not separated from *Cx. pipiens/restuans* mosquitoes, and they were processed together.

Table 4-4

Ranking of Mosquito Surveillance Activities at the Byron Lake and Fernwood Sites Compared to All 45 Suffolk County Sites in 2013 and 42 Sites in 2014 that had Mosquito Pools Testing Positive for WNV

Trap Site	2013		2014	
	Byron Lake	Fernwood	Byron Lake	Fernwood
Total *Culex spp.* mosquitoes collected	9	8	16	23
Total *Culex spp.* mosquitoes tested for WNV	9	10	17	25
Total *Culex spp.* pools tested for WNV	6	9	21	25

Rankings for 2013 based on August 5 through October 23 sampling season.
Rankings for 2014 based on June 3 through October 2 sampling season.

In 2013, there was only one WNV positive pool for the Byron Lakes and one for the Fernwood trap sites (**Table 4-3**), placing them in the bottom one-half of all 55 Suffolk County sites. In 2014, there were no WNV positive pools for the Byron Lakes and Fernwood trap sites, placing them in the bottom one-third of all 51 Suffolk County sites (**Table 4-5**). Furthermore, because none of the mosquito pools in 2014 for the Byron Lake and Fernwood trap sites tested positive for WNV, the testing of *Cx. pipiens/restuans/salinarius* together, rather than testing *Cx. pipiens/salinarius* and *Cx. salinarius* separately as in 2013 (**Table 4-3**), would not have biased the surveillance data for 2014.

Table 4-5

The Number of Mosquito Surveillance Sites in Suffolk County During 2013 and 2014 Matched with the Number of WNV Positive Pooled Samples from the Sites

	2013		2014	
	Number of Trap Sites	Number of WNV Positive Pools	Number of Trap Sites	Number of WNV Positive Pools
	1	19	1	20
	1	14	1	18
	1	13	1	17
	2	11	1	15
	1	10	1	12
	1	8	1	11
	1	7	1	10
	3	6	1	9
	1	5	1	7
	6	4	2	6
	4	3	5	4
	7	2	5	3
	12(1)	1	6	2
	14	0	8	1
			16(1)	0
Totals	**55**	**178**	**51**	**186**

1 The Byron Lake and Fernwood sites are included these categories.

4.2 WNV Risk Assessment Methodology

Risk Model

Relative human risk of WNV in the Grand Canal area was estimated using the risk model outlined by Kilpatrick et al. (2005). This risk model uses abundance, fraction of blood meals taken from mammals, vector competence, and MIR to determine WNV risk to humans by mosquito species. Kilpatrick et al. (2005) employed the following model using Suffolk and Rockland County data (New York) from a 1999 outbreak:

$$\textbf{WNV Risk} = A \times F_m \times MIR \times C_v$$

Where:

A is the relative abundance of the species,

F_m is the fraction of blood meals taken from mammals,

MIR is the minimum infection rate or WNV infection prevalence, and

C_v is the vector competence (the percentage of WNV-infected mosquitoes that will transmit WNV in in a subsequent bite) (Kilpatrick et al., 2005).

The species-specific values for vector competence and blood meal fraction are taken from Kilpatrick et al. (2005). Abundance and MIR were calculated using 2013 and 2014 vector data for the Byron Lake and Fernwood trap sites in the Grand Canal area of Suffolk County (see **Attachment G).** Abundance was calculated by combining data for both gravid and light trap sample data at the Byron Lake and Fernwood locations. MIR was calculated for *Culex spp.* using the following formula: MIR = 1,000 × (pools testing positive for WNV/total number of mosquitoes tested) (Kilpatrick et al., 2005). MIRs were calculated for all sampling locations in Suffolk County and compared to the Byron Lake and Fernwood locations.

The values for vector competence were taken from Kilpatrick et al. (2005). The literature indicates that mosquitoes can carry WNV but not transmit the virus when the virus is not present in the salivary glands at the time of feeding (Kilpatrick et al., 2005). Vector competence varies by species but is similar for *Cx. pipiens/restuans* and *Cx. salinarius*. The values for fraction of blood meals taken from mammals were identical to those used by Kilpatrick et al. (2005). Kilpatrick et al. (2005) calculated the fraction of *Cx. pipiens/restuans*' and *Cx. salinarius*' "blood meals that came from mammals as a relative estimate of the probability that the species would feed on humans" based on information available in the literature (Apperson et al., 2002; Apperson et al., 2004).

Because the 2014 data from the Byron Lake and Fernwood locations are not separated for *Cx. pipiens/restuans* and *Cx. salinarius*, it was assumed that the abundance of the species for the 2014 data was the same as for the 2013 data. This enabled estimation of risk separately for *Cx. pipiens/restuans* and *Cx. salinarius* for 2014.

Vector Index

Vector index (VI) is defined by the CDC as "an estimate of the abundance of infected mosquitoes in an area and incorporates information describing the vector species that are present in the area, relative abundance of those species, and the WNV infection rate in each species into a single index" (CDC, 2013). The CDC also indicates predictive ability of the VI as surges in VI reflect increases in risk of WNV disease among humans (CDC, 2013). The VI has been effective in establishing human risk of WNV in Colorado (Bolling et al., 2009; Barker et al., 2009). Bolling et al. (2009) report that VI data were strongly associated with weekly WNV cases 1 to 2 weeks later. Kilpatrick and Pape (2013) report that VI "should theoretically provide a quantitative measure of the risk of human WNV infection." The equation for VI is defined by the CDC (2013) as follows:

$$\textbf{VI} = \textbf{Average Density} \times \textbf{Estimated Infection Rate}$$

Where:

Average density is defined as the average number of mosquitoes collected per trap night and

Estimated infection rate is the proportion of the mosquito population that tests positive for WNV.

The available sampling data for the Byron Lake and Fernwood locations provided sufficient information to calculate VIs for 2013 and 2014 for all *Culex* species combined. Calculations are provided in **Attachment G**.

WNV Cases

Human WNV case data for Suffolk County covering the 2001 to 2014 time period were evaluated. Information including date of onset, town, zip code, and township are described.

4.3 WNV Risk Assessment Results

Risk (as defined by Kilpatrick et al., 2005) is an estimate of the relative number of WNV-infectious bites on humans by each mosquito species. Because it was not possible to calculate the risk estimates for all mosquito species sampled at the Byron Lake and Fernwood locations, percent risk (as calculated in Kilpatrick et al., 2005) could not be estimated. However, the data in **Table 4-6** do provide relative estimates of WNV risk in the Grand Canal area. In 2013, risk of WNV was greater to humans near the Byron Lake sampling location compared to the Fernwood location. Risk was greater in both locations from *Cx. pipiens/restuans* mosquitoes compared to *Cx. salinarius* mosquitoes. The risk of WNV in 2014 at both sampling locations is estimated to be 0 for both *Cx. salinarius* and *Cx. pipiens/restuans* because the MIRs are calculated to be 0. Across all sampling locations in Suffolk County, the MIRs for 2013 and 2014 were 3.71 and 3.42, respectively. The highest MIR calculated in 2013 was 20 (New Highway, Commack) and the lowest was 0 (several sampling locations). In 2014, the highest MIR calculated was 11.02 (June Avenue, Northport) and the lowest was 0 (several sampling locations including Fernwood and Byron Lake). The MIRs for Byron Lake and Fernwood were much lower than the MIRs calculated for all sampling locations for both 2013 and 2014, indicating that the infection rate is lower in the Grand Canal area.

Table 4-6

WNV Risk for 2013 and 2014 Based on the Grand Canal Area of Suffolk County

Year	Location	Species	Relative Abundance (A)[(1)]	WNV MIR (P)	Vector Competence (C_v)	Fraction Mammal (F_m)	WNV Risk
2013	Byron Lake	*Culex salinarius*	5.945	1.69	0.36	0.67	2.42
		Culex pipiens/restuans	33.734	1.69	0.38	0.19	4.12
	Fernwood	*Culex salinarius*	4.183	1.71	0.36	0.67	1.73
		Culex pipiens/restuans	29.225	1.71	0.38	0.19	3.61
2014	Byron Lake	*Culex salinarius*	5.945	0	0.36	0.67	0
		Culex pipiens/restuans	33.734	0	0.38	0.19	0
	Fernwood	*Culex salinarius*	4.183	0	0.36	0.67	0
		Culex pipiens/restuans	29.225	0	0.38	0.19	0

1 In 2014, samples of *Culex salinarius and Culex pipiens/restuans* were not separated. Therefore, the relative abundance data for 2013 was used for risk calculations for 2014.

Vector Index

According to the Colorado Department of Public Health and Environment (CDPHE) (2014), a VI of 0.50 suggests "some risk of local WNV activity," and a VI of 0.75 indicates that WNV risk to humans is on the rise, and prevention efforts should begin (CDPHE, 2014). When the VI increases to greater than 0.75, local transmission of WNV is likely occurring, and an epidemic may be starting (CDPHE, 2014). The VI calculated for all *Culex* species in the Grand Canal area are very low for both 2013 and 2014 and are significantly less than the value of 0.50 that indicates risk of WNV activity (**Table 4-7**). Additionally, the VI decreased from 2013 to 2014, indicating a reduction in WNV risk to humans from *Culex* species.

Table 4-7

WNV Vector Indices for 2013 and 2014 in the Grand Canal Area of Suffolk County

Year	Total Trap Nights	Total Culex Collected	Total Culex ÷ Trap Nights	Proportion Infected	Vector Index
2013	22	1179	22÷1179 = 53.59	0.0017	53.59×0.0017 = 0.09
2014	72	3425	72÷3425 = 47.57	0.00	47.57×0.00 = 0.00

WNV Cases

The Grand Canal area is located in the Town of Oakdale, New York, in the Township of Islip. According to Suffolk County data, there was only one case of WNV in Oakdale during the years of 2001 to 2014; the date of onset was August 28, 2012. In comparison, there were 15 WNV cases in other towns in the Township of Islip (including six in the town of Bayshore) over the 2001 to 2014 time period. There were 88 WNV cases reported for Suffolk County during this time frame. Because only one case of WNV was

reported during this entire 14-year period in the Grand Canal area and no cases were reported in 2013 and 2014, the risk of WNV in this area is considered low.

In summary, the large amount of surveillance data collected for the Byron Lake and Fernwood trap sites as well as that for Suffolk County is more than adequate for evaluating the WNV risk in the Grand Canal area. The data calculated by the risk model and the VIs indicate that the risk of WNV to humans decreased from 2013 to 2014 in the Grand Canal area. The WNV risk to humans was greater in the Byron Lake area compared to the Fernwood area and greater for *Cx. pipiens/restuans* than for *Cx. salinarius* because *Cx. pipiens/restuans* species were more abundant. VI has been shown to be a good predictor for human risk of WNV. The VIs calculated for 2013 and 2014 in the Grand Canal area were very low (0.09 and 0, respectively). There were no WNV cases identified in the Grand Canal area during the 2013 to 2014 time frame. When the risk and VI data are taken together with the case data, it appears that the risk of WNV in the Grand Canal area is very low. Nevertheless, as a public health measure, weekly calculations of VI for the Grand Canal area and Suffolk County as a whole could be performed. If the VI is increasing or goes above a certain threshold, emergency spraying may be recommended.

The CDC (2013) suggests the following community-level actions to mitigate WNV risk:

1) **Community protection measures**
   a) Encourage the community to report dead birds and nuisance mosquitoes
   b) Inform the community about sources of mosquitoes, including standing water and trash
   c) Encourage the concept that health departments and mosquito control requires community assistance
2) **Communicate with the community regarding mosquito control**
   a) Communicate to the public the importance of adult mosquito control using insecticides; provide information regarding the insecticide schedule
   b) Inform the community about surveillance measures
3) **Engage and educate the community**
   a) Understand how targeted audiences communicate with each other and government officials
   b) Identify key audiences and best methods for communication
   c) Translate technical and scientific information into lay terms
   d) Create a partnership with the media and ensure at least one staff member has media training and can serve as a spokesperson
   e) Use social media outlets such as Twitter and Facebook to communicate with the community

5.0 SUMMARY AND CONCLUSIONS

A PHE was conducted based on physical, chemical, microbiological, and vector (mosquito) data collected from the Grand Canal and adjacent wetlands. Most data were collected between 2013 and 2015 either by Suffolk County (mosquito surveillance data) or by Cashin Associates, PC, under contract to the county

(microbiological data or surface water quality data). In many respects, results of this evaluation are in agreement with the findings presented in the 2005 Grand Canal Environmental Assessment Final Report (SCDHS, 2005). Water quality in the Canal has been significantly impacted by nutrient enrichment (nitrogen and phosphorus levels exceed recommended benchmarks). DO readings are frequently less than levels necessary for healthy aquatic life. In terms of bacteriological quality, neither the Grand Canal nor the reference area surface waters (east of the Grand Canal Study area) are likely to be safe for recreational uses involving direct contact with those waters. Additionally, the quality of the fish inhabiting the Grand Canal may be compromised (e.g., for purposes of human consumption) by the microbiological contamination. It should be noted that the bacterial levels in the Canal significantly exceed those reported for the reference area locations.

As noted in the 2005 Grand Canal Environmental Assessment Final Report, sources of contamination to the Canal likely include storm water run-off from fertilized lawns and roadways, area wildlife, and residential septic systems. Evidence of a malfunctioning septic system was noted by the environmental sampling teams collecting surface water samples in 2015. (Although suspected septic odors were noted by the field team, no direct evidence or observation of failing septic systems was observed during the field work.) Dredging the Canal, in conjunction with a comprehensive OMWM strategy, may provide greater water flows to (flushing of) the Canal and adjacent wetlands. However, the ability of any such program to improve water quality may be somewhat limited if the aforementioned contaminant sources are not addressed as well.

In contrast, based on chemical monitoring for standard-list volatile and semi-volatile organic chemicals and pesticides, the chemical profile of the surface water and sediment of the Grand Canal indicates concentration of contaminants generally consistent with other surface water bodies in the general vicinity of Southern Long Island and typical of local anthropogenic sources (e.g., surface water run-off and septic system sources). Based on the PHE, direct contact with surface water and sediment was not determined to be a concern for non-cancer effects. Estimated fish concentrations that could result from contaminants in surface water and sediment were also not a concern for non-cancer effects if fish from the Canal were consumed (based on an estimate of 12 meals per year)

Cancer risk estimates for direct contact with actual surface water within the Canal (not discharges to the canal) and sediment ranged from 1×10^{-8} to 3×10^{-6} (taking into consideration the most likely metal species found in sediments). This risk range does not exceed USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. Potential cancer risks estimated based on consumption of fish from the Canal and using fish tissue concentrations estimated from surface water and sediment concentrations, range from 2×10^{-6} to 7×10^{-5}. These estimates take into consideration the metals species most likely to be found in sediments. The resulting cancer risk estimates are within the USEPA target risk range.

This PHE indicates that consumption of fish from the Canal represents the greatest source of potential risk to residents along the Grand Canal. The analysis conducted also indicates that sediment was the source of contaminants that posed the greatest risk from fish consumption. It should be noted that for this analysis, fish tissue concentrations were estimated based on surface water and sediment concentrations as opposed to actual fish tissue sampling. In addition, there is a New York State fish consumption advisory in place for the Long Island South Shore, which recommends that consumption be limited to up to one meal per month for high-risk populations (women under 50 and children under 15) for American eel, bluefish (greater than 20 inches), striped bass, and weakfish (less than 25 inches) (NY DOH, 2015). The New York State fish advisory also recommends that weakfish (greater than 25 inches) and crab/lobster tomalley should not be consumed (NY DOH). A review of the mosquito surveillance data reported for the past 2 years indicates that it is more than adequate for calculating WNV disease risk for the Grand Canal area. The results of the risk assessment of such data indicates the risk of WNV in the Grand Canal area is very low.

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TABLES

TABLE 2-1A

SUMMARY OF DETECTED RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE JULY 15, 2015 TIDAL SURFACE WATER SAMPLING EVENT (COMPARISON TO SCREENING LEVELS)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Recreational Screening Value[4]	Recreational and Fish Ingestion Screening Value[4]	USEPA RSL Tapwater[4, 5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organics																	
95-63-6	1,2,4-Trimethylbenzene	ug/L	2/44	0.130	0.750	0.100	0.147	0.5	1	GC-6A	0.2-0.2	1	NA	NA	1.5 N	No	BSL
108-67-8	1,3,5-Trimethylbenzene	ug/L	1/44	0.10	0.30	0.10	0.030	0.3 J	0.3 J	GC-6A	0.2-0.2	0.3	28 N	23 N	12 N	No	BSL
107-02-8	Acrolein	ug/L	7/44	0.64	3.51	0.10	1.46	2 J	7.5	GC-4C	0.2-0.2	7.5	12 N	12 N	**0.0042 N**	No	BSL
71-43-2	Benzene	ug/L	3/44	0.125	0.473	0.100	0.097	0.4 J	0.57	GC-6A	0.2-0.2	0.57	8.7 C	7.3 C	**0.46 C**	No	BSL
100-41-4	Ethyl Benzene	ug/L	2/44	0.116	0.445	0.100	0.078	0.31 J	0.58	GC-6A	0.2-0.2	0.58	15 C	11 C	1.5 C	No	BSL
95-47-6	o-Xylene	ug/L	3/44	0.136	0.623	0.100	0.164	0.23 J	1.1	GC-6A	0.2-0.2	1.1	730 N	610 N	19 N	No	BSL
179601-23-1	p- m- Xylenes	ug/L	2/44	0.314	1.650	0.250	0.318	1.1	2.2	GC-6A	0.5-0.5	2.2	660 N	560 N	19 N	No	BSL
108-88-3	Toluene	ug/L	5/44	0.225	1.200	0.100	0.477	0.37 J	2.9	GC-6A	0.2-0.2	2.9	410 N	360 N	110 N	No	BSL
79-01-6	Trichloroethylene	ug/L	2/44	0.109	0.29	0.100	0.043	0.22 J	0.36 J	GC-12A	0.2-0.2	0.36	7.3 C	6 C	**0.28 N**	No	BSL
1330-20-7	Xylenes, Total	ug/L	3/44	0.405	1.840	0.300	0.477	0.72 J	3.2	GC-6A	0.6-0.6	3.2	690 N	590 N	19 N	No	BSL
Semi-Volatiles																	
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	23/44	6.63	10.9	3.60	15.3	0.589	101	GC-7B	0.5-8.28	101	200 C	**1.2 C**	**5.6 C**	**Yes**	ASL
206-44-0	Fluoranthene	ug/L	2/44	0.0299	0.105	0.026	0.017	0.0865	0.123	GC-4C	0.05-0.0571	0.123	1100 N	35 N	80 N	No	BSL
91-20-3	Naphthalene	ug/L	2/44	0.0288	0.0805	0.026	0.012	0.0686	0.0923	GC-4C	0.05-0.0571	0.0923	69 N	57 N	0.17 C	No	BSL
621-64-7	**N-nitroso-di-n-propylamine**	ug/L	1/44	1.38	4.32	1.28	0.456	4.32 J	4.32 J	GC-11D	2.5-2.86	4.32	**0.21 C**	**0.18 C**	**0.011 C**	**Yes**	ASL
85-01-8	Phenanthrene	ug/L	2/44	0.0297	0.102	0.026	0.017	0.0778	0.126	GC-9A	0.05-0.0571	0.126	NA	NA	NA	No	NTX
129-00-0	Pyrene	ug/L	2/44	0.0280	0.0632	0.026	0.008	0.0615	0.0649	GC-11A	0.05-0.0571	0.0649	19 N	13 N	12 N	No	BSL
Miscellaneous																	
--	Total Nitrogen	ug/L	43/44	2098	2133	2100	658	1300	4700	GC-2A	1200-1200	4700	NA	NA	NA	No	NTX
--	Nitrogen, Total-Dissolved	ug/L	33/44	1389	1652	1300	723	1300	3700	GC-12B	1200-1200	3700	NA	NA	NA	No	NTX
--	Phosphorous, Dissolved As P	ug/L	24/44	49	69	56	24.4	53	100	GC-11D	50-50	100	NA	NA	NA	No	NTX
--	Phosphorous, Total As P	ug/L	36/44	98	114	83	69.2	50	329	GC-7C	50-50	329	NA	NA	NA	No	NTX
--	Total Inorganic Nitrogen, Dissolved	ug/L	3/44	585	1400	525	227.2	1200	1600	GC-12B	1050-1050	1600	NA	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Recreational screening levels and fish ingestion values were calculated with USEPA's Regional Screening Level Calculator. Tap water RSLs are from the May 2016 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. The noncarcinogenic values (denoted with a "N" flag) correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1E-06 (carcinogens denoted with a "C" flag).
5 - Presented for informational purposes. Grand Canal is not a drinking water source.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the recreational screening level or recreational and fish ingestion screening level. Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

GC-1A	GC-8B	GC-5D
GC-2A	GC-9B	GC-6D
GC-4A	GC-10B	GC-7D
GC-5A	GC-1C	GC-8D
GC-6A	GC-2C	GC-9D
GC-7A	GC-4C	GC-10D
GC-8A	GC-5C	GC-11A
GC-9A	GC-6C	GC-11B
GC-10A	GC-7C	GC-11C
GC-1B	GC-8C	GC-11D
GC-2B	GC-9C	GC-12A
GC-4B	GC-10C	GC-12B
GC-5B	GC-1D	GC-12C
GC-6B	GC-2D	GC-12D
GC-7B	GC-4D	

Definitions:
C Carcinogen
COPC Chemical Of Potential Concern
J Estimated value
N Noncarcinogen
NA Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL Above Screening Level.

For elimination as a COPC:
BSL Below COPC Screening Level
NTX No toxicity criteria

TABLE 2-1B

SUMMARY OF DETECTED RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE JULY 15, 2015 TIDAL SURFACE WATER SAMPLING EVENT (COMPARISON TO WATER QUALITY CRITERIA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	National Water Quality Criteria - Human Health, Consumption of Organism[4]	NY Water Quality Standards 6 NYCRR part 703[5]	NY Ambient Water Quality Standards[6]
Volatile Organics															
95-63-6	1,2,4-Trimethylbenzene	ug/L	2/44	0.130	0.750	0.100	0.147	0.5	1	GC-6A	0.2-0.2	1	NA	NA	19 s
108-67-8	1,3,5-Trimethylbenzene	ug/L	1/44	0.10	0.30	0.10	0.030	0.3 J	0.3 J	GC-6A	0.2-0.2	0.3	NA	NA	5 f
107-02-8	**Acrolein**	ug/L	7/44	0.64	3.51	0.10	1.46	2 J	7.5	GC-4C	0.2-0.2	7.5	400	**5 g**	**5 f**
71-43-2	Benzene	ug/L	3/44	0.125	0.473	0.100	0.097	0.4 J	0.57	GC-6A	0.2-0.2	0.57	16	10 s	10 s
100-41-4	Ethyl Benzene	ug/L	2/44	0.116	0.445	0.100	0.078	0.31 J	0.58	GC-6A	0.2-0.2	0.58	130	5 f	4.5 s
95-47-6	o-Xylene	ug/L	3/44	0.136	0.623	0.100	0.164	0.23 J	1.1	GC-6A	0.2-0.2	1.1	NA	5 f	19 s
179601-23-1	p- m- Xylenes	ug/L	2/44	0.314	1.650	0.250	0.318	1.1	2.2	GC-6A	0.5-0.5	2.2	NA	5 f	19 s
108-88-3	Toluene	ug/L	5/44	0.225	1.200	0.100	0.477	0.37 J	2.9	GC-6A	0.2-0.2	2.9	520	6000 s	92 s
79-01-6	Trichloroethylene	ug/L	2/44	0.109	0.29	0.100	0.043	0.22 J	0.36 J	GC-12A	0.2-0.2	0.36	7	40 s	40 s
1330-20-7	Xylenes, Total	ug/L	3/44	0.405	1.840	0.300	0.477	0.72 J	3.2	GC-6A	0.6-0.6	3.2	NA	5 f	19 s
Semi-Volatiles															
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	23/44	6.63	10.9	3.60	15.3	0.589	101	GC-7B	0.5-8.28	101	**0.37**	**5 f**	**0.6 f**
206-44-0	Fluoranthene	ug/L	2/44	0.0299	0.105	0.026	0.017	0.0865	0.123	GC-4C	0.05-0.0571	0.123	20	NA	50 f
91-20-3	Naphthalene	ug/L	2/44	0.0288	0.0805	0.026	0.012	0.0686	0.0923	GC-4C	0.05-0.0571	0.0923	NA	10 f	16 s
621-64-7	**N-nitroso-di-n-propylamine**	ug/L	1/44	1.38	4.32	1.28	0.456	4.32 J	4.32 J	GC-11D	2.5-2.86	4.32	**0.51**	NA	NA
85-01-8	Phenanthrene	ug/L	2/44	0.0297	0.102	0.026	0.017	0.0778	0.126	GC-9A	0.05-0.0571	0.126	NA	NA	1.5 s
129-00-0	Pyrene	ug/L	2/44	0.0280	0.0632	0.026	0.008	0.0615	0.0649	GC-11A	0.05-0.0571	0.0649	30	NA	4.6 f
Miscellaneous															
--	Total Nitrogen	ug/L	43/44	2098	2133	2100	658	1300	4700	GC-2A	1200-1200	4700	NA	NA	NA
--	Nitrogen, Total-Dissolved	ug/L	33/44	1389	1652	1300	723	1300	3700	GC-12B	1200-1200	3700	NA	NA	NA
--	Phosphorous, Dissolved As P	ug/L	24/44	49	69	56	24.4	53	100	GC-11D	50-50	100	NA	NA	NA
--	**Phosphorous, Total As P**	ug/L	36/44	98	114	83	69.2	50	329	GC-7C	50-50	329	NA	NA	**20 f**
--	Total Inorganic Nitrogen, Dissolved	ug/L	3/44	585	1400	525	227.2	1200	1600	GC-12B	1050-1050	1600	NA	NA	NA

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - USEPA National Recommend Water Quality Criteria (USEPA, 2015). Protective of fish consumption.
5 - New York Water Quality Standards, 6 NYCRR Part 703. Accessed September 30, 2015. Saline values presented if available.
6 - New York Division of Water Technical and Operational Guidance. Compilation of ambient water quality guidance values where there are no standards. Saline values presented if available.

Definitions:
J Estimated value
NA Not Applicable/Not Available
g groundwater
f freshwater
s saline

Shaded criterion and chemical name indicates that the maximum detected concentration exceeds one or more screening criteria.

Associated Samples

GC-1A	GC-8B	GC-5D
GC-2A	GC-9B	GC-6D
GC-4A	GC-10B	GC-7D
GC-5A	GC-1C	GC-8D
GC-6A	GC-2C	GC-9D
GC-7A	GC-4C	GC-10D
GC-8A	GC-5C	GC-11A
GC-9A	GC-6C	GC-11B
GC-10A	GC-7C	GC-11C
GC-1B	GC-8C	GC-11D
GC-2B	GC-9C	GC-12A
GC-4B	GC-10C	GC-12B
GC-5B	GC-1D	GC-12C
GC-6B	GC-2D	GC-12D
GC-7B	GC-4D	

TABLE 2-2A

SUMMARY OF DETECTED RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE AUGUST 27, 2015 TIDAL SURFACE WATER SAMPLING EVENT (COMPARISON TO SCREENING LEVELS)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Recreational Screening Value[4]	Recreational and Fish Ingestion Screening Value[4]	USEPA RSL Tapwater[4, 5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organics																	
95-63-6	1,2,4-Trimethylbenzene	ug/L	3/44	0.119	0.380	0.100	0.073	0.31 J	0.46 J	GC-11C	0.2-0.2	0.46	NA	NA	1.5 N	No	BSL
78-93-3	2-Butanone	ug/L	1/44	0.11	0.33	0.10	0.035	0.33 J	0.33 J	GC-7D	0.2-0.2	0.33	14,000 N	13000 N	560 N	No	BSL
107-02-8	Acrolein	ug/L	23/44	2.26	4.22	2.15	2.35	2.1	7.8	GC-7D	0.2-0.8	7.8	12 N	12 N	**0.0042 N**	No	BSL
71-43-2	Benzene	ug/L	3/44	0.121	0.407	0.100	0.080	0.32 J	0.47 J	GC-11C	0.2-0.2	0.47	8.7 C	7.3 C	**0.46 C**	No	BSL
156-59-2	cis-1,2-Dichloroethylene	ug/L	8/44	0.170	0.483	0.100	0.171	0.27 J	0.91	GC-10B	0.2-0.2	0.91	21 N	19 N	3.6 N	No	BSL
100-41-4	Ethyl Benzene	ug/L	5/44	0.126	0.326	0.100	0.077	0.25 J	0.46 J	GC-11C	0.2-0.2	0.46	15 C	11 C	1.5 C	No	BSL
95-47-6	o-Xylene	ug/L	4/44	0.125	0.370	0.100	0.084	0.24 J	0.49 J	GC-11C	0.2-0.2	0.49	730 N	610 N	19 N	No	BSL
179601-23-1	p- m- Xylenes	ug/L	5/44	0.319	0.860	0.250	0.207	0.69 J	1.2	GC-11C	0.5-0.5	1.2	660 N	560 N	19 N	No	BSL
108-88-3	Toluene	ug/L	15/44	0.367	0.88	0.100	0.579	0.21 J	2.7	GC-11C	0.2-0.2	2.7	410 N	360 N	110 N	No	BSL
1330-20-7	Xylenes, Total	ug/L	5/44	0.397	1.156	0.300	0.300	0.69 J	1.7	GC-11C	0.6-0.6	1.7	690 N	590 N	19 N	No	BSL
Semi-Volatiles																	
606-20-2	**2,6-Dinitrotoluene**	ug/L	1/44	1.62	16.0	1.28	2.2	16	16	GC-12D	2.5-2.78	16	**0.69 C**	**0.49 C**	**0.049 C**	**Yes**	ASL
83-32-9	Acenaphthene	ug/L	1/44	0.0265	0.062	0.026	0.005	0.0615	0.0615	GC-4A	0.05-0.0556	0.0615	110 N	86 N	53 N	No	BSL
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	27/44	1.5215	2.3171	0.619	2.580	0.54 J	11.9 J	GC-7D	0.5-0.556	11.9	200 C	**1.2 C**	**5.6 C**	**Yes**	ASL
206-44-0	Fluoranthene	ug/L	4/44	0.03	0.08	0.03	0.017	0.0718	0.1	GC-10A	0.05-0.0556	0.1	1100 N	35 N	80 N	No	BSL
86-73-7	Fluorene	ug/L	1/44	0.0267	0.072	0.026	0.007	0.0718	0.0718	GC-4B	0.05-0.0556	0.0718	57 N	42 N	29 N	No	BSL
129-00-0	Pyrene	ug/L	2/44	0.0300	0.1220	0.026	0.021	0.1	0.144	GC-2C	0.05-0.0556	0.144	19 N	13 N	12 N	No	BSL
Miscellaneous																	
--	Total Nitrogen	ug/L	42/44	1936	2000	1850	619	1400	4600	GC-7B	1200-1200	4600	NA	NA	NA	No	NTX
--	Nitrogen, Total-Dissolved	ug/L	42/44	1777	1833	1800	395	1300	2900	GC-4D	1200-1200	2900	NA	NA	NA	No	NTX
--	Phosphorous, Dissolved As P	ug/L	36/44	143	169	128	94.9	87	432	GC-12C	50-50	432	NA	NA	NA	No	NTX
--	Phosphorous, Total As P	ug/L	35/44	113	135	114	70.5	53	301	GC-12C	50-50	301	NA	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Recreational screening levels and fish ingestion values were calculated with USEPA's Regional Screening Level Calculator. Tap water RSLs are from the May 2016 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. The noncarcinogenic values (denoted with a "N" flag) correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1E-06 (carcinogens denoted with a "C" flag).
5 - Presented for informational purposes. Grand Canal is not a drinking water source.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the recreational screening level or recreational and fish ingestion screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples

GC-1A	GC-8B	GC-5D
GC-2A	GC-9B	GC-6D
GC-4A	GC-10B	GC-7D
GC-5A	GC-1C	GC-8D
GC-6A	GC-2C	GC-9D
GC-7A	GC-4C	GC-10D
GC-8A	GC-5C	GC-11A
GC-9A	GC-6C	GC-11B
GC-10A	GC-7C	GC-11C
GC-1B	GC-8C	GC-11D
GC-2B	GC-9C	GC-12A
GC-4B	GC-10C	GC-12B
GC-5B	GC-1D	GC-12C
GC-6B	GC-2D	GC-12D
GC-7B	GC-4D	

Definitions:
C Carcinogen
COPC Chemical Of Potential Concern
J Estimated value
N Noncarcinogen
NA Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL Above Screening Level.

For elimination as a COPC:
BSL Below COPC Screening Level
NTX No toxicity criteria

TABLE 2-2B

SUMMARY OF DETECTED RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE AUGUST 27, 2015 TIDAL SURFACE WATER SAMPLING EVENT (COMPARISON TO WATER QUALITY CRITERIA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	National Water Quality Criteria - Human Health, Consumption of Organism[4]	NY Water Quality Standards 6 NYCRR part 703[5]	NY Ambient Water Quality Standards[6]
Volatile Organics															
95-63-6	1,2,4-Trimethylbenzene	ug/L	3/44	0.119	0.380	0.100	0.073	0.31 J	0.46 J	GC-11C	0.2-0.2	0.46	NA	NA	19 s
78-93-3	2-Butanone	ug/L	1/44	0.11	0.33	0.10	0.035	0.33 J	0.33 J	GC-7D	0.2-0.2	0.33	NA	NA	50 f
107-02-8	**Acrolein**	ug/L	23/44	2.26	4.22	2.15	2.35	2.1	7.8	GC-7D	0.2-0.8	7.8	400	**5 g**	**5 f**
71-43-2	Benzene	ug/L	3/44	0.121	0.407	0.100	0.080	0.32 J	0.47 J	GC-11C	0.2-0.2	0.47	16-58	10 s	10 s
156-59-2	cis-1,2-Dichloroethylene	ug/L	8/44	0.170	0.483	0.100	0.171	0.27 J	0.91	GC-10B	0.2-0.2	0.91	NA	5 f	5 f
100-41-4	Ethyl Benzene	ug/L	5/44	0.126	0.326	0.100	0.077	0.25 J	0.46 J	GC-11C	0.2-0.2	0.46	130	5 f	4.5 s
95-47-6	o-Xylene	ug/L	4/44	0.125	0.370	0.100	0.084	0.24 J	0.49 J	GC-11C	0.2-0.2	0.49	NA	5 f	19 s
179601-23-1	p- m- Xylenes	ug/L	5/44	0.319	0.860	0.250	0.207	0.69 J	1.2	GC-11C	0.5-0.5	1.2	NA	5 f	19 s
108-88-3	Toluene	ug/L	15/44	0.367	0.88	0.100	0.579	0.21 J	2.7	GC-11C	0.2-0.2	2.7	520	6000 s	92 s
1330-20-7	Xylenes, Total	ug/L	5/44	0.397	1.156	0.300	0.300	0.69 J	1.7	GC-11C	0.6-0.6	1.7	NA	5 f	19 s
Semi-Volatiles															
606-20-2	**2,6-Dinitrotoluene**	ug/L	1/44	1.62	16.0	1.28	2.2	16	16	GC-12D	2.5-2.78	16	NA	**5 g**	**0.07 f**
83-32-9	Acenaphthene	ug/L	1/44	0.0265	0.062	0.026	0.005	0.0615	0.0615	GC-4A	0.05-0.0556	0.0615	90	20 f	6.6 s
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	27/44	1.5215	2.3171	0.619	2.580	0.54 J	11.9 J	GC-7D	0.5-0.556	11.9	**0.37**	**5 f**	**0.6 f**
206-44-0	Fluoranthene	ug/L	4/44	0.03	0.08	0.03	0.017	0.0718	0.1	GC-10A	0.05-0.0556	0.1	20	NA	50 f
86-73-7	Fluorene	ug/L	1/44	0.0267	0.072	0.026	0.007	0.0718	0.0718	GC-4B	0.05-0.0556	0.0718	70	NA	2.5 s
129-00-0	Pyrene	ug/L	2/44	0.0300	0.1220	0.026	0.021	0.1	0.144	GC-2C	0.05-0.0556	0.144	30	NA	4.6 f
Miscellaneous															
--	Total Nitrogen	ug/L	42/44	1936	2000	1850	619	1400	4600	GC-7B	1200-1200	4600	NA	NA	NA
--	Nitrogen, Total-Dissolved	ug/L	42/44	1777	1833	1800	395	1300	2900	GC-4D	1200-1200	2900	NA	NA	NA
--	Phosphorous, Dissolved As P	ug/L	36/44	143	169	128	94.9	87	432	GC-12C	50-50	432	NA	NA	NA
--	**Phosphorous, Total As P**	ug/L	35/44	113	135	114	70.5	53	301	GC-12C	50-50	301	NA	NA	**20 f**

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - USEPA National Recommend Water Quality Criteria (USEPA, 2015). Protective of fish consumption.
5 - New York Water Quality Standards, 6 NYCRR Part 703. Accessed September 30, 2015. Saline values presented if available.
6 - New York Division of Water Technical and Operational Guidance. Compilation of ambient water quality guidance values where there are no standards. Saline values presented if available.

Definitions:
J Estimated value
NA Not Applicable/Not Available
g groundwater
f freshwater
s saline

Shaded criterion and chemical name indicates that the maximum detected concentration exceeds one or more screening criteria.

Associated Samples

GC-1A	GC-8B	GC-5D
GC-2A	GC-9B	GC-6D
GC-4A	GC-10B	GC-7D
GC-5A	GC-1C	GC-8D
GC-6A	GC-2C	GC-9D
GC-7A	GC-4C	GC-10D
GC-8A	GC-5C	GC-11A
GC-9A	GC-6C	GC-11B
GC-10A	GC-7C	GC-11C
GC-1B	GC-8C	GC-11D
GC-2B	GC-9C	GC-12A
GC-4B	GC-10C	GC-12B
GC-5B	GC-1D	GC-12C
GC-6B	GC-2D	GC-12D
GC-7B	GC-4D	

TABLE 2-3A

SUMMARY OF DETECTED RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE AUGUST 11, 2015 WET SAMPLING EVENT (COMPARISON TO SCREENING LEVELS)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Recreational Screening Value[4]	Recreational and Fish Ingestion Screening Value[4]	USEPA RSL Tapwater[4, 5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organics																	
78-93-3	2-Butanone	ug/L	1/6	0.118	0.210	0.100	0.045	0.21 J	0.21 J	SW-3	0.2 - 0.2	0.21	14,000 N	13000 N	560 N	No	BSL
67-64-1	Acetone	ug/L	4/6	1.65	2.23	1.85	1.003	1.8 J	3.1	SW-4	1 - 1	3.1	23,000 N	21000 N	1400 N	No	BSL
107-02-8	Acrolein	ug/L	2/6	0.72	1.35	0.40	0.52	1.1 J	1.6 J	SW-3	0.8 - 0.8	1.6	12 N	12 N	**0.0042 N**	No	BSL
71-43-2	Benzene	ug/L	1/6	0.160	0.460	0.100	0.147	0.46 J	0.46 J	SW-2	0.2 - 0.2	0.46	8.7 C	7.3 C	0.46 C	No	BSL
75-15-0	Carbon disulfide	ug/L	2/6	0.142	0.225	0.100	0.065	0.21 J	0.24 J	SW-1	0.2 - 0.2	0.24	1000 N	880 N	81 N	No	BSL
74-87-3	Chloromethane	ug/L	6/6	0.325	0.325	0.335	0.042	0.27 J	0.37 J	SW-3	-	0.37	NA	NA	19 N	No	BSL
108-88-3	Toluene	ug/L	1/6	0.238	0.930	0.100	0.339	0.93	0.93	SW-2	0.2 - 0.2	0.93	410 N	360 N	110 N	No	BSL
Semi-Volatiles																	
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	5/6	2.4	2.8	1.04	2.6	0.533	5.89	SW-2	0.513 - 0.513	5.89	200 C	**1.2 C**	**5.6 C**	**Yes**	ASL
206-44-0	Fluoranthene	ug/L	2/6	0.046	0.087	0.026	0.032	0.0821	0.0923	SW-1	0.0513 - 0.0513	0.0923	1100 N	35 N	80 N	No	BSL
85-01-8	Phenanthrene	ug/L	1/6	0.044	0.13	0.026	0.044	0.133	0.133	SW-1	0.0513 - 0.0513	0.133	NA	NA	NA	No	NTX
129-00-0	Pyrene	ug/L	1/6	0.035	0.082	0.026	0.023	0.0821	0.0821	SW-1	0.0513 - 0.0513	0.0821	19 N	13 N	12 N	No	BSL
Miscellaneous																	
--	Total Nitrogen	ug/L	2/6	1650	2950	1000	1065	2400	3500	SW-1	2000 - 2000	3500	NA	NA	NA	No	NTX
--	Phosphorous, Dissolved As P	ug/L	6/6	89	89	83	21.5	72	132	SW-4	-	132	NA	NA	NA	No	NTX
--	Phosphorous, Total As P	ug/L	6/6	220	220	128	198.0	85	597	SW-4	-	597	NA	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Recreational screening levels were calculated with USEPA's Regional Screening Level Calculator. Tap water RSLs are from the May 2016 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. The noncarcinogenic values (denoted with a "N" flag) correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1E-06 (carcinogens denoted with a "C" flag).
5 - Presented for informational purposes. Grand Canal is not a drinking water source.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the recreational screening level or recreational and fish ingestion screening level. Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
SW 1
SW 2
SW 3
SW 4
SW 5
SW 6

Definitions:
C Carcinogen
COPC Chemical Of Potential Concern
J Estimated value
N Noncarcinogen
NA Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL Above Screening Level.

For elimination as a COPC:
BSL Below COPC Screening Level
NTX No toxicity criteria

TABLE 2-3B

SUMMARY OF DETECTED RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE AUGUST 11, 2015 WET SAMPLING EVENT (COMPARISON TO WATER QUALITY CRITERIA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	National Water Quality Criteria - Human Health, Consumption of Organism[4]	NY Water Quality Standards 6 NYCRR part 703[5]	NY Ambient Water Quality Standards[6]
Volatile Organics															
78-93-3	2-Butanone	ug/L	1/6	0.118	0.210	0.100	0.045	0.21 J	0.21 J	SW-3	0.2 - 0.2	0.21	NA	NA	50 f
67-64-1	Acetone	ug/L	4/6	1.65	2.23	1.85	1.003	1.8 J	3.1	SW-4	1 - 1	3.1	NA	NA	50 f
107-02-8	Acrolein	ug/L	2/6	0.72	1.35	0.40	0.52	1.1 J	1.6 J	SW-3	0.8 - 0.8	1.6	400	5 g	5 f
71-43-2	Benzene	ug/L	1/6	0.160	0.460	0.100	0.147	0.46 J	0.46 J	SW-2	0.2 - 0.2	0.46	16-58	10 s	10 s
75-15-0	Carbon disulfide	ug/L	2/6	0.142	0.225	0.100	0.065	0.21 J	0.24 J	SW-1	0.2 - 0.2	0.24	NA	60 f	60 f
74-87-3	Chloromethane	ug/L	6/6	0.325	0.325	0.335	0.042	0.27 J	0.37 J	SW-3	-	0.37	NA	5 f	5 f
108-88-3	Toluene	ug/L	1/6	0.238	0.930	0.100	0.339	0.93	0.93	SW-2	0.2 - 0.2	0.93	520	6000 s	92 s
Semi-Volatiles															
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	5/6	2.4	2.8	1.04	2.6	0.533	5.89	SW-2	0.513 - 0.513	5.89	**0.37**	**5 f**	**0.6**
206-44-0	Fluoranthene	ug/L	2/6	0.046	0.087	0.026	0.032	0.0821	0.0923	SW-1	0.0513 - 0.0513	0.0923	20	NA	50
85-01-8	Phenanthrene	ug/L	1/6	0.044	0.13	0.026	0.044	0.133	0.133	SW-1	0.0513 - 0.0513	0.133	NA	NA	1.5
129-00-0	Pyrene	ug/L	1/6	0.035	0.082	0.026	0.023	0.0821	0.0821	SW-1	0.0513 - 0.0513	0.0821	30	NA	4.6
Miscellaneous															
--	Total Nitrogen	ug/L	2/6	1650	2950	1000	1065	2400	3500	SW-1	2000 - 2000	3500	NA	NA	NA
--	Phosphorous, Dissolved As P	ug/L	6/6	89	89	83	21.5	72	132	SW-4	-	132	NA	NA	NA
--	Phosphorous, Total As P	ug/L	6/6	220	220	128	198.0	85	597	SW-4	-	597	NA	NA	NA

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - USEPA National Recommend Water Quality Criteria (USEPA, 2015). Protective of fish consumption.
5 - New York Water Quality Standards, 6 NYCRR Part 703. Accessed September 30, 2015. Saline values presented if available.
6 - New York Division of Water Technical and Operational Guidance. Compilation of ambient water quality guidance values where there are no standards. Saline values presented if available.

Definitions:
J Estimated value
NA Not Applicable/Not Available
g groundwater
f freshwater
s saline

Shaded criterion and chemical name indicates that the maximum detected concentration exceeds one or more screening criteria.

Associated Samples
SW 1
SW 2
SW 3
SW 4
SW 5
SW 6

TABLE 2-4A

SUMMARY OF DETECTED RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE SEPTEMBER 3, 2015 DRY SAMPLING EVENT (COMPARISON TO SCREENING LEVELS)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Recreational Screening Value[4]	Recreational and Fish Ingestion Screening Value[4]	USEPA RSL Tapwater[4, 5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Volatile Organics																	
95-63-6	1,2,4-Trimethylbenzene	ug/L	1/6	0.127	0.260	0.100	0.065	0.26 J	0.26 J	SW 4	0.2 - 0.2	0.26	NA	NA	1.5 N	No	BSL
67-64-1	Acetone	ug/L	3/6	1.18	1.87	1.15	0.752	1.8 J	2	SW 5	1 - 1	2	23,000 N	21000 N	1400 N	No	BSL
107-02-8	Acrolein	ug/L	4/6	2.45	3.63	2.30	2.60	2.2	7.2	SW 1	0.2 - 0.2	7.2	12 N	12 N	**0.0042 N**	No	BSL
71-43-2	Benzene	ug/L	1/6	0.125	0.250	0.100	0.061	0.25 J	0.25 J	SW 4	0.2 - 0.2	0.25	8.7 C	7.3 C	0.46 C	No	BSL
95-47-6	o-Xylene	ug/L	1/6	0.127	0.260	0.100	0.065	0.26 J	0.26 J	SW 4	0.2 - 0.2	0.26	730 N	610 N	19 N	No	BSL
179601-23-1	p- m- Xylenes	ug/L	1/6	0.318	0.660	0.250	0.167	0.66 J	0.66 J	SW 4	0.5 - 0.5	0.66	660 N	560 N	19 N	No	BSL
75-65-0	Tert-Butyl Alcohol (TBA)	ug/L	3/6	0.523	0.797	0.480	0.304	0.71 J	0.87 J	SW 2	0.5 - 0.5	0.87	NA	NA	NA	No	NTX
108-88-3	Toluene	ug/L	2/6	0.433	1.10	0.100	0.520	1	1.2	SW 4	0.2 - 0.2	1.2	410 N	360 N	110 N	No	BSL
1330-20-7	Xylenes, Total	ug/L	1/6	0.403	0.920	0.300	0.253	0.92 J	0.92 J	SW 4	0.6 - 0.6	0.92	690 N	590 N	19 N	No	BSL
Semi-Volatiles																	
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	6/6	18.4	18.4	4.56	35.2	2.53	90.3	SW 3	-	90.3	200 C	**1.2 C**	**5.6 C**	**Yes**	ASL
91-20-3	Naphthalene	ug/L	3/6	0.400	0.775	0.311	0.422	0.595	0.867	SW 6	0.0513 - 0.0526	0.867	69 N	57 N	**0.17 C**	No	BSL
Miscellaneous																	
--	Total Nitrogen	ug/L	6/6	2433	2433	2250	455	2000	3100	SW 1	-	3100	NA	NA	NA	No	NTX
--	Nitrogen, Total-Dissolved	ug/L	6/6	2400	2400	2350	329	2000	3000	SW 1	-	3000	NA	NA	NA	No	NTX
--	Phosphorous, Dissolved As P	ug/L	6/6	160	160	152	34.0	128	224	SW 1	-	224	NA	NA	NA	No	NTX
--	Phosphorous, Total As P	ug/L	6/6	148	148	111	90.1	87	320	SW 3	-	320	NA	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Recreational screening levels were calculated with USEPA's Regional Screening Level Calculator. Tap water RSLs are from the May 2016 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. The noncarcinogenic values (denoted with a "N" flag) correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1E-06 (carcinogens denoted with a "C" flag).
5 - Presented for informational purposes. Grand Canal is not a drinking water source.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the recreational screening level or recreational and fish ingestion screening level. Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Associated Samples
SW 1
SW 2
SW 3
SW 4
SW 5
SW 6

Definitions:
C Carcinogen
COPC Chemical Of Potential Concern
J Estimated value
N Noncarcinogen
NA Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL Above Screening Level.

For elimination as a COPC:
BSL Below COPC Screening Level
NTX No toxicity criteria

TABLE 2-4B

SUMMARY OF DETECTED RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE SEPTEMBER 3, 2015 DRY SAMPLING EVENT (COMPARISON TO WATER QUALITY CRITERIA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	National Water Quality Criteria - Human Health, Consumption of Organism[4]	NY Water Quality Standards 6 NYCRR part 703[5]	NY Ambient Water Quality Standards[6]
Volatile Organics															
95-63-6	1,2,4-Trimethylbenzene	ug/L	1/6	0.127	0.260	0.100	0.065	0.26 J	0.26 J	SW 4	0.2 - 0.2	0.26	NA	NA	19 s
67-64-1	Acetone	ug/L	3/6	1.18	1.87	1.15	0.752	1.8 J	2	SW 5	1 - 1	2	NA	NA	50 f
107-02-8	**Acrolein**	ug/L	4/6	2.45	3.63	2.30	2.60	2.2	7.2	SW 1	0.2 - 0.2	7.2	400	**5 g**	**5 f**
71-43-2	Benzene	ug/L	1/6	0.125	0.250	0.100	0.061	0.25 J	0.25 J	SW 4	0.2 - 0.2	0.25	16-58	10 s	10 s
95-47-6	o-Xylene	ug/L	1/6	0.127	0.260	0.100	0.065	0.26 J	0.26 J	SW 4	0.2 - 0.2	0.26	NA	5 f	19 s
179601-23-1	p- m- Xylenes	ug/L	1/6	0.318	0.660	0.250	0.167	0.66 J	0.66 J	SW 4	0.5 - 0.5	0.66	NA	5 f	19 s
75-65-0	Tert-Butyl Alcohol (TBA)	ug/L	3/6	0.523	0.797	0.480	0.304	0.71 J	0.87 J	SW 2	0.5 - 0.5	0.87	NA	NA	NA
108-88-3	Toluene	ug/L	2/6	0.433	1.10	0.100	0.520	1	1.2	SW 4	0.2 - 0.2	1.2	520	6000 s	92 s
1330-20-7	Xylenes, Total	ug/L	1/6	0.403	0.920	0.300	0.253	0.92 J	0.92 J	SW 4	0.6 - 0.6	0.92	NA	5 f	19 s
Semi-Volatiles															
117-81-7	**Bis(2-ethylhexyl)phthalate**	ug/L	6/6	18.4	18.4	4.56	35.2	2.53	90.3	SW 3	-	90.3	**0.37**	**5 f**	**0.6 f**
91-20-3	Naphthalene	ug/L	3/6	0.400	0.775	0.311	0.422	0.595	0.867	SW 6	0.0513 - 0.0526	0.867	NA	10 f	16 s
Miscellaneous															
--	Total Nitrogen	ug/L	6/6	2433	2433	2250	455	2000	3100	SW 1	-	3100	NA	NA	NA
--	Nitrogen, Total-Dissolved	ug/L	6/6	2400	2400	2350	329	2000	3000	SW 1	-	3000	NA	NA	NA
--	Phosphorous, Dissolved As P	ug/L	6/6	160	160	152	34.0	128	224	SW 1	-	224	NA	NA	NA
--	**Phosphorous, Total As P**	ug/L	6/6	148	148	111	90.1	87	320	SW 3	-	320	NA	NA	**20 f**

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - USEPA National Recommend Water Quality Criteria (USEPA, 2015). Protective of fish consumption.
5 - New York Water Quality Standards, 6 NYCRR Part 703. Accessed September 30, 2015. Saline values presented if available.
6 - New York Division of Water Technical and Operational Guidance. Compilation of ambient water quality guidance values where there are no standards. Saline values presented if available.

Definitions:
J Estimated value
NA Not Applicable/Not Available
g groundwater
f freshwater
s saline

Shaded criterion and chemical name indicates that the maximum detected concentration exceeds one or more screening criteria.

Associated Samples
SW 1
SW 2
SW 3
SW 4
SW 5
SW 6

TABLE 2-5

SUMMARY STATISTICS FOR GENERAL WATER QUALITY PARAMETERS - CONTINUOUS MONITORING DATA
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Location - Date	Time Interval[1]		Parameter	Descriptive Statistics			
				Count	Min	Max	Mean
Location A - 2014	7/30/2014	8/12/2014	Temp	1289	22.78	27.89	25.80
	8/13/2014	8/26/2014	Temp	1343	11.97	27.39	24.33
	8/27/2014	9/9/2014	Temp	1343	21.6	29	25.49
	9/10/2014	9/23/2014	Temp	1343	17.6	23.87	21.06
	7/30/2014	8/12/2014	D.O.	1289	1.45	10.22	4.99
	8/13/2014	8/26/2014	D.O.	1343	1.14	13.32	5.41
	8/27/2014	9/9/2014	D.O.	1343	0.36	11.06	4.22
	9/10/2014	9/23/2014	D.O.	1343	1.72	11.47	5.91
	7/30/2014	8/12/2014	Salinity	1289	18.39	27.57	22.92
	8/13/2014	8/26/2014	Salinity	1343	0.28	25.75	19.38
	8/27/2014	9/9/2014	Salinity	1343	3.77	26.44	20.53
	9/10/2014	9/23/2014	Salinity	1343	18.53	25.72	22.28

Location - Date	Time Interval[1]		Parameter	Descriptive Statistics			
				Count	Min	Max	Mean
Location B - 2014	8/15/2014	8/28/2014	Temp	1305	20.83	27.68	24.22
	8/29/2014	9/11/2014	Temp	1343	20.06	28.26	24.77
	9/12/2014	9/25/2014	Temp	1344	18.44	23.67	20.78
	9/26/2014	10/2/2014[2]	Temp	672	17.99	21.59	19.84
	8/15/2014	8/28/2014	D.O.	1305	0.79	13.8	5.64
	8/29/2014	9/11/2014	D.O.	1343	0.22	11.7	5.16
	9/12/2014	9/25/2014	D.O.	1344	1.36	11.76	5.84
	9/26/2014	10/2/2014[2]	D.O.	672	2.77	11.04	5.64
	8/15/2014	8/28/2014	Salinity	1305	7.34	24.2	16.13
	8/29/2014	9/11/2014	Salinity	1343	3.92	24.42	15.48
	9/12/2014	9/25/2014	Salinity	1344	8.8	24.72	18.90
	9/26/2014	10/2/2014[2]	Salinity	672	13.17	23.85	18.66

Location - Date	Time Interval[1]		Parameter	Descriptive Statistics			
				Count	Min	Max	Mean
Location A - 2013	5/15/2013	5/28/2013	Temp	1296	11.17	25.66	18.80
	5/29/2013	6/11/2013	Temp	1344	16.75	26.79	21.94
	6/12/2013	6/25/2013	Temp	1344	17.15	28.54	22.98
	6/26/2013	7/9/2013	Temp	1344	23.64	30.98	26.69
	7/10/2013	7/23/2013	Temp	1341	24.45	32.34	28.36
	7/24/2013	8/6/2013	Temp	1344	21.51	29.1	25.26
	8/7/2013	8/20/2013	Temp	1343	21.55	27.38	24.54
	8/21/2013	9/3/2013	Temp	1344	21.42	26.73	24.53
	5/15/2013	5/28/2013	D.O.	1296	4.6	10.83	7.81
	5/29/2013	6/11/2013	D.O.	1344	2.51	13.37	6.73
	6/12/2013	6/25/2013	D.O.	1344	1.85	10.82	5.55
	6/26/2013	7/9/2013	D.O.	1026	0.51	10.95	4.37
	7/10/2013	7/23/2013	D.O.	1109	1.45	12.31	5.82
	7/24/2013	8/6/2013	D.O.	1344	1.13	12.05	4.73
	8/7/2013	8/20/2013	D.O.	1343	1.06	12.97	4.85
	8/21/2013	9/3/2013	D.O.	1344	1.39	13.40	5.16

TABLE 2-5

SUMMARY STATISTICS FOR GENERAL WATER QUALITY PARAMETERS - CONTINUOUS MONITORING DATA
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Location - Date	Time Interval[1]		Parameter	Descriptive Statistics			
				Count	Min	Max	Mean
Location A - 2013 Continued	5/15/2013	5/28/2013	Salinity	1296	6.7	26.69	18.27
	5/29/2013	6/11/2013	Salinity	1344	5.65	23.97	14.77
	6/12/2013	6/25/2013	Salinity	1344	9.31	23.65	17.30
	6/26/2013	7/9/2013	Salinity	1344	7.45	25.38	15.63
	7/10/2013	7/23/2013	Salinity	1341	13.84	24.86	19.82
	7/24/2013	8/6/2013	Salinity	1344	18.14	25.3	22.15
	8/7/2013	8/20/2013	Salinity	1343	11.43	24.68	20.37
	8/21/2013	9/3/2013	Salinity	1344	14.67	25.3	21.11

Location - Date	Time Interval[1]		Parameter	Descriptive Statistics			
				Count	Min	Max	Mean
Location B - 2013	5/16/2013	5/29/2013	Temp	1345	9.96	24.25	18.63
	7/13/2013	7/26/2013	Temp	1343	22.09	32.51	27.77
	7/27/2013	8/9/2013	Temp	1343	22.39	29.03	25.29
	8/10/2013	8/23/2013	Temp	1344	22.63	27.42	24.77
	8/24/2013	9/6/2013	Temp	1344	21.24	27.08	24.26
	5/16/2013	5/29/2013	D.O.	1345	2.09	12.33	7.26
	7/13/2013	7/26/2013	D.O.	1343	0.47	19.21	5.57
	7/27/2013	8/9/2013	D.O.	1343	-3.61	39.32	7.18
	8/10/2013	8/23/2013	D.O.	1344	0.57	37.58	4.22
	8/24/2013	9/6/2013	D.O.	1344	0.5	13.81	5.17
	5/16/2013	5/29/2013	Salinity	1345	0	24.97	12.98
	7/13/2013	7/26/2013	Salinity	1201	9.14	25.46	18.42
	7/27/2013	8/9/2013	Salinity	data not available			
	8/10/2013	8/23/2013	Salinity	717	11.43	24.1	20.18
	8/24/2013	9/6/2013	Salinity	1344	6.89	24.63	18.61

Footnotes:
1 - Approximately two-week intervals, unless otherwise noted.
2 - One-week interval.

Abbreviations:
Count - Number of data points evaluated
Min - Minimum value
Max - Maximum value
Mean - arithmetric mean
Temp - Temperature
D.O. - Dissolved oxygen

TABLE 2-6

SUMMARY STATISTICS FOR DISSOLVED OXYGEN - CONTINUOUS MONITORING DATA
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Location - Date	Time Interval[1]		Dissolved Oxygen	
			4.8 mg/L	2.3 mg/L
Location A - 2014	7/30/2014	8/12/2014	46.16	7.68
	8/13/2014	8/26/2014	47.36	6.03
	8/27/2014	9/9/2014	63.44	15.26
	9/10/2014	9/23/2014	35.96	1.04
		Average	44.4	6.4
Location B - 2014	8/15/2014	8/28/2014	50.50	13.33
	8/29/2014	9/11/2014	41.62	18.32
	9/12/2014	9/25/2014	41.44	1.04
	9/26/2014	10/2/2014[2]	36.76	0.00
		Average	45.6	11.4
Location A - 2013	5/15/2013	5/28/2013	0.39	0.00
	5/29/2013	6/11/2013	16.52	0.00
	6/12/2013	6/25/2013	40.70	0.74
	6/26/2013	7/9/2013	64.04	15.59
	7/10/2013	7/23/2013	40.49	5.86
	7/24/2013	8/6/2013	56.62	14.36
	8/7/2013	8/20/2013	56.81	9.68
	8/21/2013	9/3/2013	46.88	4.02
		Average	39.5	5.9
Location B - 2013	5/16/2013	5/29/2013	6.39	0.15
	7/13/2013	7/26/2013	56.07	24.27
	7/27/2013	8/9/2013	42.59	14.22
	8/10/2013	8/23/2013	69.42	35.71
	8/24/2013	9/6/2013	50.30	17.78
		Average	45.1	18.1

Footnotes:
1 - Approximately two-week intervals, unless otherwise noted.
2 - One-week interval.

TABLE 2-7

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SURFACE WATER SAMPLES FROM SUFFOLK COUNTY COLLECTED 2008-2014 (USEPA STORET DATA) PUBLIC HEALTH EVALUATION GRAND CANAL, OAKDALE, NEW YORK

Parameter, sorted by units	Count	Maximum	Minimum	Average
#/100ml				
Enterococcus	15880	1940	2.87	41.9
Escherichia coli	1	40	40	40
%				
Cloud cover	699	100	0	46.1
cfu/100ml				
Total Coliform	80	5000	11	600
deg C				
Temperature, air	438	33.2	-10.2	16.9
Temperature, water	67445	27.5	0.13	13.3
kg/m3				
Density	65756	25.25	-10.9	20.3
m				
Depth, bottom	695	92.2	9.2	29.3
Depth, Secchi disk depth	463	6.1	-2.4	2.61
mg/l				
Alkalinity, total	38	45	3.9	24.7
Alkalinity, total as CaCO3	66	58	3	19.4
Ammonia	478	0.098	0.002	0.01
Ammonia-nitrogen	76	4.73	0.01	0.12
Ammonia-nitrogen as N	32	1.62	0.011	0.28
Biochemical oxygen demand, standard conditions	277	4.2	0.6	2.06
Biogenic Silica	774	3.31	0.021	0.53
Chloride	92	78.6	4.5	23.2
Dissolved oxygen (DO)	67924	13.15	-2.37	7.89
Dissolved oxygen saturation	130888	163	-28.71	47.5
Fluoride	21	0.11	0.1	0.10
Hardness, Calcium	18	176	11.5	63.0
Hardness, carbonate as CaCO3	40	70.7	11	42.7
Inorganic nitrogen (nitrate and nitrite)	788	3.89	0.0021	0.20
Inorganic nitrogen (nitrate and nitrite) as N	28	3.61	0.0026	0.41
Kjeldahl nitrogen	73	5.89	0.18	0.79
Nitrate	58	3.88	0.026	1.76
Nitrite	31	0.063	0.01	0.02
Nitrogen	806	0.75	0.092	0.21
Nitrogen dioxide	807	0.234	0.004	0.07
Organic carbon	935	14.6	0.90	2.04
Orthophosphate	818	0.133	0.004	0.03
Phosphorus	931	2.05	0.0036	0.05
Phosphorus, Particulate Organic	760	0.082	0.001	0.01
Silica	765	10.6	0.003	1.04
Sulfate	79	25.5	2	11.7
Total dissolved solids	58	158	43	103
Total Particulate Carbon	766	1.85	0.096	0.45
Total Particulate Nitrogen	762	0.22	0.01	0.06
Total solids	58	165	59	116
Total suspended solids	801	61	1.1	6.25
Total volatile solids	58	53	10	32.1

TABLE 2-7

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SURFACE WATER SAMPLES FROM SUFFOLK COUNTY COLLECTED 2008-2014 (USEPA STORET DATA) PUBLIC HEALTH EVALUATION GRAND CANAL, OAKDALE, NEW YORK

Parameter, sorted by units	Count	Maximum	Minimum	Average
Mole/l				
pH	35781	8.706	6.06	7.86
MPN				
Enterococcus	388	4110	1	56.9
ng/l				
Mercury	18	4.4	0.5	1.25
None				
pH	914	9.03	5.88	7.81
NTU				
Turbidity	58	9.98	0.8	3.44
PCU				
True color	44	72	5	25.6
ppm				
Biochemical oxygen demand, standard conditions	192	6.1	0.5	2.39
Dissolved oxygen (DO)	1384	12.4	4	7.61
Nitrogen dioxide	549	0.268	0.002	0.07
psi				
Pressure	69256	43.54	-2.95E-08	15.7
PSU				
Salinity	67389	31.99	-9.76	27.6
S/m				
Conductivity	65825	4.38	-1.58	3.34
uE/m2/sec				
Light, photosynthetic active radiation (PAR)	67636	3988	-961	64.5
ug/l				
Aluminum	112	147	3.7	41.3
Arsenic	34	2.1	0.211	0.41
Cadmium	49	0.163	0.008	0.03
Calcium	92	37700	3.12	5051
Chlorophyll a	830	125	0.20	4.70
Chlorophyll a (probe relative fluorescence)	65830	82.88	-3.1	8.55
Copper	116	3.4	0.318	1.00
Iron	82	4350	58.2	734
Lead	116	3.3	0.061	0.64
Magnesium	84	15200	1.29	1698
Manganese	85	1490	10.3	253
Mercury	2	0.028	0.023	0.03
Nickel	116	3.1	0.322	1.10
Potassium	79	6980	0.695	1038
Silver	50	0.212	0.005	0.03
Sodium	84	52900	5.48	7915
Tetrachloroethylene	1	0.34	0.34	0.34
Trichloroethylene	1	0.31	0.31	0.31
Zinc	76	11.3	1	4.88
umho/cm				
Specific conductance	112	481	62.7	217

Source: USEPA STORET Data Warehouse. Suffolk County, New York. Accessed October 6, 2015.
Summary statistics are for detected results only.

TABLE 2-8

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SURFACE WATER SAMPLES FROM THE SOUTHERN LONG ISLAND WATERSHED COLLECTED 2008-2014 (USEPA STORET DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter, sorted by units	Count	Maximum	Minimum	Average
#/100ml				
Enterococcus	13947	17329	1	49.8
Escherichia coli	1	40	40	40
Fecal Coliform	1	230	230	230
Total Coliform	1	230	230	230
%				
Cloud cover	57	100	0	51.8
cfu/100ml				
Enterococcus	224	18000	1	300
Fecal Coliform	378	2900000	9	16766
Total Coliform	489	18800000	10	72371
deg C				
Temperature, air	42	24.2	-7.3	11.0
Temperature, water	9455	28.3	2.59	11.0
ft				
Depth, bottom	435	71.3	3	24.0
kg/m3				
Density	8347	25.3	19.4	23.2
m				
Altitude	9	36.4	1.32	18.8
Depth	42	39.2	9	22.5
Depth, bottom	54	92.2	58	77.5
Depth, Secchi disk depth	580	15	-2.4	1.4
mg/l				
Alkalinity, total	47	88.4	3.9	29.0
Alkalinity, total as CaCO3	92	96	3	24.4
Ammonia	97	0.034	0.002	0.01
Ammonia as N	203	7.6	0.011	0.23
Ammonia-nitrogen	86	5.75	0.01	0.17
Ammonia-nitrogen as N	55	1.62	0.011	0.19
Biochemical oxygen demand, standard conditions	60	3	0.6	1.87
Biogenic Silica	146	0.595	0.042	0.24
Chloride	127	10500	4.5	236
Dissolved oxygen (DO)	9598	17.78	0.49	8.90
Dissolved oxygen saturation	16524	114	7.6	53.0
Fluoride	27	0.11	0.1	0.10
Hardness, Calcium	24	176	11.5	67.6
Hardness, carbonate as CaCO3	40	70.7	11	42.7
Inorganic nitrogen (nitrate and nitrite)	227	3.89	0.002	0.58
Inorganic nitrogen (nitrate and nitrite) as N	603	280	0.0012	0.99
Kjeldahl nitrogen	107	6.69	0.15	0.86
Nitrate	64	3.88	0.026	1.73
Nitrate as NO3	496	1.73	0.01	0.24
Nitrite	37	0.063	0.01	0.02
Nitrogen	714	280	0.012	0.97
Nitrogen dioxide	178	0.145	0.005	0.05

TABLE 2-8

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SURFACE WATER SAMPLES FROM THE SOUTHERN LONG ISLAND WATERSHED COLLECTED 2008-2014 (USEPA STORET DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter, sorted by units	Count	Maximum	Minimum	Average
Organic carbon	1593	14.6	0.13	1.42
Orthophosphate	727	0.64	0.005	0.15
Orthophosphate as P	637	0.29	0.025	0.07
Phosphorus	1006	2.05	0.0036	0.07
Phosphorus, Particulate Organic	143	0.069	0.001	0.01
Silica	157	10.6	0.038	0.84
Sulfate	112	1500	2	43.1
Total dissolved solids	64	293	43	116
Total Particulate Carbon	144	0.65	0.14	0.32
Total Particulate Nitrogen	142	0.090	0.01	0.04
Total solids	64	336	59	130
Total suspended solids	191	23	1	4.89
Total volatile solids	64	53	10	32.3
Mole/l				
pH	4397	8.2	6.1	7.78
MPN				
Enterococcus	283	4110	1	56.9
mS/cm				
Specific conductance	690	50.4	20.2	43.5
ng/l				
Mercury	24	4.4	0.5	1.39
None				
pH	875	8.88	5.88	7.58
NTU				
Turbidity	762	74	0	10.5
Pascal				
Barometric pressure	120	37.1	0.80	11.1
PCU				
True color	72	84	5	25.1
ppm				
Biochemical oxygen demand, standard conditions	48	5	0.8	2.21
Dissolved oxygen (DO)	376	12.2	5.2	7.83
Nitrogen dioxide	141	0.176	0.004	0.05
ppth				
Salinity	804	36	12.2	28.9
psi				
Pressure	8562	43.5	0.119	21.3
PSS				
Salinity	120	33.1	19.7	30.0
PSU				
Salinity	8460	32.0	23.8	30.2
S/m				
Conductivity	8347	4.24	2.53	3.32
uE/m2/sec				
Light, photosynthetic active radiation (PAR)	8578	2190	0.0024	34.4

TABLE 2-8

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SURFACE WATER SAMPLES FROM THE SOUTHERN LONG ISLAND WATERSHED COLLECTED 2008-2014 (USEPA STORET DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter, sorted by units	Count	Maximum	Minimum	Average
ug/l				
Aluminum	124	258	3.7	43.4
Ammonia as N	3	7.6	1.4	5.43
Arsenic	40	2.1	0.211	0.39
Boron	1	20.4	20.4	20.4
Cadmium	61	5.6	0.008	0.11
Calcium	127	226000	3.12	12083
Chlorophyll a	718	375.41	0	41.3
Chlorophyll a (probe relative fluorescence)	8347	23.8665	1.3592	4.91
Copper	128	4.2	0.318	1.14
Iron	116	4350	58.2	715
Lead	128	13.5	0.061	0.87
Magnesium	117	727000	1.29	16946
Manganese	119	1490	10.3	235
Mercury	2	0.028	0.023	0.03
Nickel	128	3.1	0.322	1.14
Potassium	112	240000	0.695	6368
Silicon	1124	810	1.5	120
Silver	56	0.212	0.005	0.03
Sodium	117	5450000	5.48	135536
Tetrachloroethylene	1	0.34	0.34	0.34
Trichloroethylene	1	0.31	0.31	0.31
Zinc	88	45.8	1	6.48
umho/cm				
Specific conductance	122	673	62.7	240

Source: USEPA STORET Data Warehouse. Drainage Basin 02030202- Southern Long Island. Accessed October 6, 2015.
Summary statistics are for detected results only.

TABLE 2-9

SUMMARY OF DETECTED RESULTS FOR SEDIMENT SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE DECEMBER 2015 SAMPLING EVENT (COMPARISON TO SOIL SCREENING LEVELS)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

CAS Number	Chemical	Units	Frequency of Detection	Mean of All Samples	Mean of Detected Samples	Median	Standard Deviation	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Recreational Screening Value[4]	Recreational and Fish Ingestion Screening Value[4]	USEPA RSL Residential[4, 5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
Dioxins																	
67562-39-4	1,2,3,4,6,7,8-HpCDF	ng/kg	2/2	28.89	28.9	28.9	NA	9.68	48.1	Dioxin A	-	48.1	NA	NA	NA	No	NTX
39001-02-0	OCDF	ng/kg	2/2	148.9	149	149	NA	32.8	265	Dioxin A	-	265	NA	NA	NA	No	NTX
35822-46-9	1,2,3,4,6,7,8-HpCDD	ng/kg	2/2	148.35	148	148	NA	42.7	254	Dioxin A	-	254	NA	NA	NA	No	NTX
3268-87-9	OCDD	ng/kg	2/2	1957	1957	1957	NA	384	3530	Dioxin A	-	3530	NA	NA	NA	No	NTX
--	Totals-Tetrafurans	ng/kg	1/2	12.425	17.7	12.4	NA	17.7	17.7	Dioxin A	14.3	17.7	NA	NA	NA	No	NTX
--	Totals-Pentafurans	ng/kg	1/2	12.575	18	12.6	NA	18	18	Dioxin A	14.3	18	NA	NA	NA	No	NTX
--	Totals-Pentadioxins	ng/kg	1/2	29.075	51	29.1	NA	51	51	Dioxin A	14.3	51	NA	NA	NA	No	NTX
--	Totals-Hexafurans	ng/kg	1/2	15.975	24.8	16.0	NA	24.8	24.8	Dioxin A	14.3	24.8	NA	NA	NA	No	NTX
--	Totals-Hexadioxins	ng/kg	1/2	86.075	165	86.1	NA	165	165	Dioxin A	14.3	165	NA	NA	NA	No	NTX
--	Totals-Heptafurans	ng/kg	1/2	265.075	523	265	NA	523	523	Dioxin A	14.3	523	NA	NA	NA	No	NTX
--	Totals-Heptadioxins	ng/kg	1/2	44.8	81.3	44.8	NA	81.3	81.3	Dioxin B	16.6	81.3	NA	NA	NA	No	NTX
--	**TEQ**	ng/kg	2/2	2.405	2.41	2.41	NA	0.65	4.16	Dioxin A	-	4.16	30 C	**2.7 C**	4.8 C	Yes	ASL
Pesticides																	
72-54-8	**4,4'-DDD**	mg/kg	11/20	0.156	0.281	0.041	0.228	0.0149	0.651	GC 6A	0.00224 - 0.00658	0.651	11.5 C	**0.14 C**	2.3 C	Yes	ASL
72-55-9	**4,4'-DDE**	mg/kg	14/20	0.036	0.051	0.022	0.044	0.00653	0.143	GC 6A	0.0027 - 0.00497	0.143	8.1 C	**0.0037 C**	2 C	Yes	ASL
50-29-3	**4,4'-DDT**	mg/kg	2/20	0.007	0.052	0.002	0.020	0.0118	0.0913	GC 4A	0.00224 - 0.00763	0.0913	11.4 C	**0.017 C**	1.9 C	Yes	ASL
Polychlorinated Biphenyls (PCB)																	
11097-69-1	**Aroclor 1254**	mg/kg	1/20	0.031	0.171	0.021	0.034	0.171	0.171	GC 5A	0.0227 - 0.077	0.171	0.66 N	**0.0026 C**	**0.12 N**	Yes	ASL
Metals																	
7440-38-2	**Arsenic**	mg/kg	20/20	10.1	10.1	9.07	5.35	1.86	22.9	GC 4B	--	22.9	**3.9 C**	**0.26 C**	**0.68 C**	Yes	ASL
7440-47-3	**Chromium**	mg/kg	20/20	23.2	23.2	20.7	13.7	5.39	55.6	GC 3A	--	55.6	**2.1 C[7]**	**0.12 C[7]**	**0.30 C[7]**	Yes	ASL
7440-50-8	**Copper**	mg/kg	20/20	62.4	62.4	53.2	40.0	14.7	152	GC 4A	--	152	2190 N	**8.1 N**	310 N	Yes	ASL
7439-92-1	Lead	mg/kg	20/20	52.7	52.7	53.7	25.8	9.09	119	GC 6A	--	119	NA	NA	400	No	BSL
7440-02-0	**Nickel**	mg/kg	20/20	13.6	13.6	13.0	7.52	3.76	32.2	GC 3A	--	32.2	1095 N	**9.2 N**	150 N	Yes	ASL
7440-66-6	**Zinc**	mg/kg	20/20	90.4	90.4	88.6	46.6	15.2	180	GC 2A	--	180	16400 N	**43 N**	2300 N	Yes	ASL
7439-97-6	**Mercury**	mg/kg	20/20	0.367	0.367	0.312	0.290	0.0506	1.29	GC 6B	--	1.29	16 N[8]	**0.11 N[8]**	2.3 N[8]	Yes	ASL
Total Solids																	
--	Solids		20/20	39.8	39.8	39.2	14.3	21.6	73.5	GC 1B	--	73.5	NA	NA	NA	No	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Recreational screening levels and fish ingestion values were calculated with USEPA's Regional Screening Level Calculator.
Residential Soil Regional Screening Levels (RSLs) are from USEPA RSLs for Chemical Contaminants at Superfund Sites (May 2016).
The noncarcinogenic values (denoted with a "N" flag) correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1E-06 (carcinogens denoted with a "C" flag).
5 - Presented for informational purposes.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the screening criteria. Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.
7 - Value is for hexavalent chromium. Screening level for trivalent chromium is 12,000 mg/kg.
8 - Value is for mercuric chloride (and other mercury salts).

Associated Samples

GC 1A	GC 6B
GC 1B	GC 7A
GC 2A	GC 7B
GC 2B	GC 8A
GC 3A	GC 8B
GC 3B	GC 9A
GC 4A	GC 9B
GC 4B	GC 10A
GC 5A	GC 10B
GC 5B	Dioxin A
GC 6A	Dioxin B

Definitions:
C Carcinogen
COPC Chemical Of Potential Concern
J Estimated value
N Noncarcinogen

NA Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL Above Screening Level.

For elimination as a COPC:
BSL Below COPC Screening Level
NTX No toxicity criteria

TABLE 2-10

SUMMARY OF EXPOSURE ASSUMPTIONS
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter Code	Exposure Parameter	Child Recreational User	Adolescent Recreational User[1]	Adult Recreational User
All Exposures				
BW	Body Weight (kg)	15[2]	45[6]	80[2]
AT-N	Averaging Time (Non-Cancer) (days)	2,190[2]	3,650[2]	3,650[2]
AT-C	Averaging Time (Cancer) (days)	25,550[2]	25,550[2]	25,550[2]
Incidental Ingestion/Dermal Contact with Surface Water				
C_{sw}	Exposure concentration for surface water (g/L)	Maximum or 95 UCL[3]	Maximum or 95 UCL[3]	Maximum or 95 UCL[3]
ED	Exposure Duration (years)	6[2]	10[2]	10[2]
CR	Contact Rate (L/hour)	0.05[4]	0.01[4]	0.01[4]
EF	Exposure Frequency (days/year)	100[5]	100[5]	50[5]
ET, t_{event}	Exposure Time (hours/day)	4[5]	4[5]	4[5]
EV	Event Frequency (events/day)	1[5]	1[5]	1[5]
SA	Skin Surface Available for Contact (cm^2)	6,365[2]	13,400[6]	19,652[2]
--	Kp (cm/hour), t (hour/event), t (hour), and B (unitless)	chemical specific	chemical specific	chemical specific
CF	Conversion Factor (L/m^3)	1E-03	1E-03	1E-03
Ingestion of Fish				
IR	Ingestion Rate (kg/meal)	0	0	0.227[7]
BCF	Bioconcentration Factor [(mg/kg/mg/L)]	chemical specific	chemical specific	chemical specific
FI	Fraction Ingested (unitless)	0	0	1[8]
EF	Exposure Frequency (meals/year)	0	0	12[8]
Incidental Ingestion/Dermal Contact with Sediment				
C_{sed}	Exposure concentration for sediment (mg/kg)	Maximum or 95 UCL[3]	Maximum or 95 UCL[3]	Maximum or 95 UCL[3]
ED	Exposure Duration (years)	6[2]	10[2]	10[2]
IR	Ingestion Rate (mg/day)	200[2]	100[2]	100[2]
RBA	Relative bioavailability (unitless)	chemical specific	chemical specific	chemical specific
EF	Exposure Frequency (days/year)	100[5]	100[5]	50[5]
FI	Fraction Ingested (unitless)	0.5[9]	0.5[9]	0.5[9]
SA	Skin Surface Available for Contact (cm^2)	2,373[2]	3,750[10]	6,032[2]
AF	Soil to Skin Adherence Factor (mg/cm^2/event)	0.2[11]	0.2[11]	0.07[11]
ABS	Absorption Factor (unitless)	chemical specific	chemical specific	chemical specific
CF	Conversion Factor (kg/mg)	1E-06	1E-06	1E-06

1 - Adolescent ages 6 to 16 years old.
2 - USEPA, 2014: Human Health Evaluation Manual, Supplement Guidance, Update of Standard Default Exposure Factors. OSWER 9200.1-120.
3 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
4 - USEPA Region 4, 2014: Region 4 Human Health Risk Assessment Supplement Guidance.
5 - Professional Judgment. Child and adolescent recreational users are assumed to be exposed four hours a day two days a week, and adult recreational users are assumed to be exposed four hours a day one day a week.
6 - USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Mean total body surface area for combined male and females ages 6 to 16, Table 7-9 (USEPA, 2011).
7 - Assumes a serving size of 8 ounces.
8 - Professional judgment. Assumes one meal per month. Frequency is consistent with the Long Island South Shore Fish Advisory for women under 50 and children under 15 (http://www.health.ny.gov/publications/6532.pdf).
9 - Professional judgment. Assumes intake of sediments is 50 of the predicted daily intake of soils.
10 - Assumes face, forearms, hands, and lower legs are exposed (USEPA, 2011). USEPA, 2011: Exposure Factors Handbook: 2011 Edition. Derivation of surface area included in Attachment F.
11 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 2-11

SUMMARY STATISTICS FOR DETECTED METALS PARAMETERS ANALYZED IN SEDIMENT SAMPLES IN THE VICINITY OF SOUTHERN LONG ISLAND (NCCOS DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

	Benthic Surveillance (1984 to 1989)[1]				Hudson Raritan Estuary (1991)				Long Island Sound (1991)			
Parameter (mg/kg)	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average
Aluminum	8	55500	37800	45900	27	790	210	548	54	7000	3880	5840
Antimony	5	0.48	0	0.23	27	7.8	0.16	2.3	54	2.24	0.13	0.80
Arsenic	8	21.7	2.6	8.2	23	41	4.2	20.9	53	12.3	1.7	8.5
Cadmium	8	1.7	0.061	0.62	26	6.4	0.18	1.9	54	3.99	0.43	1.8
Chromium	8	138	30.3	68	26	420	50	136	54	461	62	134
Copper	8	112	4.4	42.7	27	520	11	168	54	246	19.7	146
Iron	8	46200	21200	29800	27	490	72	358	54	4170	1480	3690
Lead	8	160	15.1	60.8	27	510	30	186	54	461	34.5	136
Manganese	8	1790	479	1040	27	1700	270	748	54	1370	480	695
Mercury	8	1.94	0	0.53	27	15	0.14	2.67	54	1.5	0.10	0.79
Nickel	8	36.1	8.8	19.1	26	130	8.5	43.2	54	227	13.8	43.6
Selenium	8	0.542	0	0.18	27	4.3	0.21	1.2	53	1.35	0.29	0.77
Silicon	3	388000	337000	361000					54	34.3	18.5	24
Silver	8	3.6	0.03	1.3	27	3	0.2	2.1	54	4.96	0.328	2.8
Thallium	3	0.33	0.055	0.20								
Tin	8	15.9	0.75	5.7	26	100	3.2	25.3	54	28.9	2.84	18.2
Zinc	8	309	40.8	145	27	1400	43	321	54	507	65	260

	Mussel Watch (1986-1997)[2]				Newark Bay (1993)				WTC Special Study (2002-2004)[3]			
Parameter (mg/kg)	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average
Aluminum	29	60000	15300	42600	20	65200	32100	52000	13	66500	35800	54800
Antimony					20	8.2	0	0.41	10	282000	0.64	81000
Arsenic	29	23.2	0	8.1	20	16.7	1.94	10.4	13	17.9	8.3	14.6
Cadmium	29	2.47	0.0567	0.864	20	5.7	0.19	2.9	13	147	0.584	29.4
Chromium	29	180	0	84.9	20	277	29.8	133	13	139	60.2	103
Copper	29	170	4.3	71	20	232	14.7	128	13	40900	55.1	8350
Iron	29	42300	5470	24000					13	41400	343	24900
Lead	29	197	9.1	77.9	20	353	31.7	184	13	186	50.1	93
Manganese	25	1220	186	682					13	901	31.7	501
Mercury	29	3.29	0.012	0.66	20	4.3	0.14	2.22	13	2.2	0.48	1
Nickel	29	43.7	3	24.9	20	74.4	17.5	40.8	13	373	15.2	88
Selenium	29	1.4	0	0.45	20	1.3	0.10	0.81	13	0.84	0.35	0.63
Silicon									10	315000	0.898	195000
Silver	29	5.57	0.041	1.8	20	5.7	0	3.0	13	5.7	0.52	2.3
Thallium												
Tin	29	30	0	5.9	20	82.9	4.9	40.4	13	25.7	9.7	14.3
Zinc	29	367	23.3	150	20	720	55.9	356	13	378	3.0	161

Source: National Centers for Coastal Ocean Science (NCCOS) National Status and Trends (NS&T) Data Portal. Accessed March 3, 2016.
Data listed by studies conducted in the general vincity of the Southern Long Island Sound.
1 - Data from Long Island Sound and Raitan Bay.
2 - Data from Huson/Raritan estuary, Long Island, Long Island Sound, and Moriches Bay.
3 - Data from Hudson/Raritan estuary.

TABLE 2-12

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SEDIMENT SAMPLES FROM LONG ISLAND BAYS
COLLECTED IN 2013 (USGS DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter	Western Bays Region				Great South Bay Region			
	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average
Semi-Volatile Organics (ug/kg)								
1-Methyl-naphthalene	4	1.5	1	1.2	ND	ND	ND	ND
1-Methyl-phenanthrene	4	5.2	1.2	2.8	3	1.9	1.1	1
2,3,5-Trimethylnaphthalene	2	1.5	1.3	1.4	ND	ND	ND	ND
2,6-Dimethylnaphthalene	3	1.6	1.5	1.5	1	10	10	10
2-Methyl-naphthalene	4	3	1.3	2.3	2	1.4	1.1	1.3
Acenaphthene	3	2.5	1.2	1.8	ND	ND	ND	ND
Acenaphthylene	3	3.6	1.2	2.3	ND	ND	ND	ND
Anthracene	5	11.2	2.3	4.6	4	1.3	1	1.2
benz[a]-Anthracene	5	58.1	9.7	22.1	10	11.4	1.1	3.8
benzo[a]Pyrene	5	60.7	4.1	22.1	10	11	1	3.7
benzo[b]-Fluoranthene	6	77.6	1.05	25.2	10	13.7	1.3	5.2
benzo[e]Pyrene	5	51	7.2	21.1	10	9.9	1.1	3.9
benzo[g,h,i]-Perylene	5	28.9	5.3	13.0	10	6.9	1.3	3.0
benzo[k]-Fluoranthene	5	66.5	8.7	26.1	10	14	1	4.7
Biphenyl	2	1.2	1	1.1	ND	ND	ND	ND
Chrysene	6	88.5	1.05	26.9	10	11.1	1.1	4.2
dibenz[a,h]-Anthracene	4	7.6	2.4	4.6	2	3.3	2.2	2.8
dibenzo-Thiophene	4	2.8	1.5	2.1	7	1.8	1	1.2
Fluoranthene	6	84.6	2	32.8	10	20.3	1.8	7.9
Fluorene	5	4.3	1.3	2.3	2	1.1	1	1.1
indeno[1,2,3-c,d]-Pyrene	5	38.1	6.1	16.4	10	8.1	1.3	3.7
Naphthalene	5	5.6	1.5	3.8	10	2.5	1.1	1.7
Perylene	4	9.5	1.7	4.9	4	2	1.1	1.6
Phenanthrene	6	34.1	1.42	14.1	10	6.8	1.7	4.2
Pyrene	6	59.5	2.05	26.1	10	18	1.7	7.1
Inorganics (mg/kg)								
Aluminum	6	70735	29135	44542	12	40420	8154	18125
Antimony	4	0.9	0.2	0.5	1	0.1	0.1	0.1
Arsenic	6	14.6	1.5	7.6	11	9.2	0.1	3.0
Barium	6	449	234	308	12	297	77.4	156
Beryllium	6	2.05	0.3	1.2	9	0.9	0.1	0.4
Cadmium	4	0.95	0.2	0.58	1	0.1	0.1	0.10
Chromium	6	88.6	28.2	53.5	12	48.5	4.5	17.1
Cobalt	6	10.5	2.5	5.9	11	6.2	0.1	1.8
Copper	6	42.9	6.8	25.6	12	31.8	0.8	8.5
Iron	6	40509	14618	24093	12	22500	2118	8579
Lead	6	54.3	17.1	31.9	12	36.5	2	11.9
Manganese	6	784	400	575	12	1867	142	524
Mercury	6	0.72	0.05	0.33	11	0.25	0.01	0.06
Molybdenum	4	3.4	0.8	2.2	3	0.7	0.2	0.5
Nickel	6	26.8	5.9	14.5	12	13.7	0.1	4.0

TABLE 2-12

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SEDIMENT SAMPLES FROM LONG ISLAND BAYS
COLLECTED IN 2013 (USGS DATA)
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Parameter	Western Bays Region				Great South Bay Region			
	Count	Maximum	Minimum	Average	Count	Maximum	Minimum	Average
Selenium	4	0.95	0.2	0.69	1	0.1	0.1	0.10
Silver	6	0.7	0.2	0.44	8	0.3	0.1	0.15
Strontium	6	219	108	148	12	162	38.5	79
Thallium	4	0.55	0.2	0.36	1	0.1	0.1	0.10
Tin	6	9.85	1.5	4.6	7	3.8	0.1	1.3
Titanium	6	6449	4016	5044	12	4626	948	1959
Vanadium	6	110	36.9	65.7	12	65.5	7.3	24.1
Zinc	6	120	32.6	76.8	12	120	3.9	32.2

ND - not detected in any sample.
Source: USGS, 2015. Estuarine bed-sediment-quality data collected in New Jersey and New York after Hurricane Sandy, 2013.

TABLE 2-13

SUMMARY STATISTICS FOR DETECTED PARAMETERS ANALYZED IN SEDIMENT SAMPLES FROM SOUTHERN LONG ISLAND WATERSHED COLLECTED 2009 (USEPA STORET DATA) PUBLIC HEALTH EVALUATION GRAND CANAL, OAKDALE, NEW YORK

Parameter	Count	Maximum	Minimum	Average
Semi-Volatile Organics (ug/kg)				
Acenaphthylene	1	22	22	22
Anthracene	2	28	9.7	18.9
Benz[a]anthracene	3	110	26	60.7
Benzo(b)fluoranthene	3	97	37	58
Benzo[a]pyrene	3	110	32	63
Benzo[ghi]perylene	3	65	22	39.3
Benzo[k]fluoranthene	3	87	26	51
Chrysene	3	120	47	76
Dibenz[a,h]anthracene	1	22	22	22
Fluoranthene	3	270	26	132
Indeno[1,2,3-cd]pyrene	3	65	21	38
Phenanthrene	2	91	41	66
Pyrene	3	240	28	126
Inorganics (mg/kg)				
Aluminum	4	953	258	646
Ammonia-nitrogen	4	17	7.5	11.1
Arsenic	1	1.5	1.5	1.5
Barium	4	57	9.7	25.4
Calcium	4	950	146	411
Chromium	4	3	2	2.5
Copper	2	4.9	2.9	3.9
Iron	4	2930	1100	2210
Lead	2	8.1	7.8	8.0
Magnesium	2	604	143	374
Manganese	4	2630	40.3	993
Phosphorus	4	122	47.8	79.2
Selenium	1	1.6	1.6	1.6
Zinc	3	16.8	12.8	14.9
Miscellaneous (%)				
Particle size, Sieve No. 200, 200 mesh, (0.075mm)	4	7.2	3.7	5.0
Carbon, Total Organic (Toc)	1	1.2	1.2	1.2
Total solids	4	75.2	61.6	70.9
Total volatile solids	1	4.6	4.6	4.6
Organic carbon	4	1.58	0.43	0.80

Source: USEPA STORET DataWarehouse. Suffolk County, New York. Accessed May 26, 2016.
Summary statistics are for detected results only.
Searched years 2008 to 2014. Data only available for 4 locations collected in 2009.

TABLE 2-14

SUMMARY OF RECREATIONAL RISKS AND HAZARD INDICES FOR EXPOSURES TO SURFACE WATER
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Direct Contact

Chemical	95 UCL (µg/L)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Direct Contact[1] (g/L)	Estimated ILCR	Primary Target Organs	Direct Contact[1] (g/L)	Estimated HQ
July 2015 samples						
Bis(2-ethylhexyl)phthalate	16.7	200	8E-08	Liver	5500	0.003
August 2015 samples						
Bis(2-ethylhexyl)phthalate	2.3	200	1E-08	Liver	5500	0.0004
August 2015 samples (WET)						
Bis(2-ethylhexyl)phthalate	4.5	200	2E-08	Liver	5500	0.0008
September 2015 samples (DRY)						
Bis(2-ethylhexyl)phthalate[2]	90.3	200	5E-07	Liver	5500	0.02

Fish Ingestion

Chemical	95 UCL (µg/L)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Fish Ingestion[1] (g/L)	Estimated ILCR	Primary Target Organs	Fish Ingestion[1] (g/L)	Estimated HQ
July 2015 samples						
Bis(2-ethylhexyl)phthalate	16.7	1.21	1E-05	Liver	125	0.1
August 2015 samples						
Bis(2-ethylhexyl)phthalate	2.3	1.21	2E-06	Liver	125	0.02
August 2015 samples (WET)						
Bis(2-ethylhexyl)phthalate	4.5	1.21	4E-06	Liver	125	0.04
September 2015 samples (DRY)						
Bis(2-ethylhexyl)phthalate[2]	90.3	1.21	7E-05	Liver	125	0.7

Direct Contact Fish Ingestion

Chemical	95 UCL (µg/L)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Direct Contact Fish Ingestion[1] (g/L)	Estimated ILCR	Primary Target Organs	Direct Contact Fish Ingestion[1] (g/L)	Estimated HQ
July 2015 samples						
Bis(2-ethylhexyl)phthalate	16.7	1.2	1E-05	Liver	123	0.1
August 2015 samples						
Bis(2-ethylhexyl)phthalate	2.3	1.2	2E-06	Liver	123	0.02
August 2015 samples (WET)						
Bis(2-ethylhexyl)phthalate	4.5	1.2	4E-06	Liver	123	0.04
September 2015 samples (DRY)						
Bis(2-ethylhexyl)phthalate[2]	90.3	1.2	8E-05	Liver	123	0.7

1 - Recreational screening levels and fish ingestion values were calculated with USEPA's Regional Screening Level Calculator (see Attachment D).
2 - Maximum concentration presented; UCL exceeds maximum detection.
HQ Hazard Quotient
ILCR Incremental Lifetime Carcinogenic Risk
UCL Upper Confidence Limit

Target Risk Levels: cumulative ILCR 1E-04 for carcinogens, cumulative HI 1 for noncarcinogens

TABLE 2-15

SUMMARY OF RECREATIONAL RISKS AND HAZARD INDICES FOR EXPOSURES TO SEDIMENT
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

Direct Contact

Chemical	95 UCL (mg/kg)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Direct Contact[1] (mg/kg)	Estimated ILCR	Primary Target Organs	Direct Contact[1] (mg/kg)	Estimated HQ
2,3,7,8-TCDD Equivalents	0.0000042 [2]	0.000030	1E-07	Reproductive	0.00034	0.01
4,4'-DDD	0.25	12	2E-08	NA	NA	NA
4,4'-DDE	0.062	8.1	8E-09	NA	NA	NA
4,4'-DDT	0.0913 [2]	11	8E-09	Liver	240	0.0004
Arsenic	12.2	3.9	3E-06	Skin, CVS	220	0.06
Chromium (hexavalent)	28.5	2	1E-05	None Specified	1600	0.02
Chromium (trivalent)	28.5	NA	NA	None Specified	820,000	0.00003
Copper	77.8	NA	NA	Gastrointestinal	22000	0.004
Nickel	16.6	NA	NA	Body weight	11000	0.002
Zinc	108	NA	NA	Blood	160000	0.0007
Mercury	0.51	NA	NA	Central Nervous System	160	0.003
	Risk assuming chromium is present in hexavalent form		**2E-05**	HI assuming chromium is present in hexavalent form		**0.09**
	Risk assuming chromium is present in trivalent form		**3E-06**	HI assuming chromium is present in trivalent form		**0.08**

Fish Ingestion

Chemical	95 UCL (mg/kg)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Fish Ingestion[1] (mg/kg)	Estimated ILCR	Primary Target Organs	Fish Ingestion[1] (mg/kg)	Estimated HQ
2,3,7,8-TCDD Equivalents	0.0000042 [2]	0.0000030	1E-06	Reproductive	0.00010	0.04
4,4'-DDD	0.25	0.14	2E-06	NA	NA	NA
4,4'-DDE	0.062	0.0037	2E-05	NA	NA	NA
4,4'-DDT	0.0913 [2]	0.017	5E-06	Liver	1.1	0.08
Arsenic	12.2	0.28	4E-05	Skin, CVS	47	0.3
Chromium (hexavalent)	28.5	0.12	2E-04	None Specified	69	0.4
Chromium (trivalent)	28.5	NA	NA	None Specified	34,000	0.0008
Copper	77.8	NA	NA	Gastrointestinal	82	0.9
Nickel	16.6	NA	NA	Body weight	92	0.2
Zinc	108	NA	NA	Blood	430	0.3
Mercury	0.51	NA	NA	Central Nervous System	1.1	0.5
	Risk assuming chromium is present in hexavalent form		**3E-04**	HI assuming chromium is present in hexavalent form		**3** [3]
	Risk assuming chromium is present in trivalent form		**7E-05**	HI assuming chromium is present in trivalent form		**2** [3]

Direct Contact Fish Ingestion

Chemical	95 UCL (mg/kg)	Incremental Lifetime Carcinogenic Risk (ILCR)		Estimated Non-Carcinogenic Hazard Quotient (HQ)		
		Direct Contact Fish Ingestion[1] (mg/kg)	Estimated ILCR	Primary Target Organs	Direct Contact Fish Ingestion[1] (mg/kg)	Estimated HQ
2,3,7,8-TCDD Equivalents	0.0000042 [2]	0.0000027	2E-06	Reproductive	0.000077	0.05
4,4'-DDD	0.25	0.14	2E-06	NA	NA	NA
4,4'-DDE	0.062	0.0037	2E-05	NA	NA	NA
4,4'-DDT	0.0913 [2]	0.017	5E-06	Liver	1.1	0.08
Arsenic	12.2	0.26	5E-05	Skin, CVS	38	0.3
Chromium (hexavalent)	28.5	0.12	2E-04	None Specified	66	0.4
Chromium (trivalent)	28.5	NA	NA	None Specified	33,000	0.0009
Copper	77.8	NA	NA	Gastrointestinal	81	1.0
Nickel	16.6	NA	NA	Body weight	92	0.2
Zinc	108	NA	NA	Blood	430	0.3
Mercury	0.51	NA	NA	Central Nervous System	1.1	0.5
	Risk assuming chromium is present in hexavalent form		**3E-04**	HI assuming chromium is present in hexavalent form		**3** [3]
	Risk assuming chromium is present in trivalent form		**7E-05**	HI assuming chromium is present in trivalent form		**2** [3]

1 - Recreational screening levels and fish ingestion values were calculated with USEPA's Regional Screening Level Calculator (see Attachment D).
2 - Maximum concentration presented. UCL was not calculated as there were less than 4 detections.
3 - Target organs less than or equal to HI of 1.
CVS Cardiovascular System
HI Hazard Index
HQ Hazard Quotient
ILCR Incremental Lifetime Carcinogenic Risk
NA Not Applicable
Target Risk Levels: cumulative ILCR 1E-04 for carcinogens, cumulative HI 1 for noncarcinogens

TABLE 3-2

BACTERIOLOGICAL RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURNG THE JULY 15, 2015 TIDAL SURFACE WATER SAMPLING EVENT
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

SAMPLE ID	2012 Recreational Water Quality Criteria (cfu/100 mL)[1]		New York State Standards (number/100 mL)[2]		GC-1C	GC-2C	GC-4C	GC-5C	GC-6C	GC-7C	GC-8C	GC-9C	GC-10C
SAMPLE DATE	**GM**	**STV**	**Water Quality**	**Shellfish**	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015
ANALYTE (MPN/100 mL)													
Enterococci	35	130	NA	NA	>2419.6	>2419.6	2420	1730	>2419.6	>2419.6	2420	866	1550
Total Coliform	NA	NA	2400	70	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600
Fecal Coliforms	NA	NA	200	14	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600

SAMPLE ID	2012 Recreational Water Quality Criteria (cfu/100 mL)[1]		New York State Standards (number/100 mL)[2]		GC-12C	GC-11C	GC-11D	GC-12D	GC-1D	GC-2D	GC-4D	GC-5D	GC-6D
SAMPLE DATE	**GM**	**STV**	**Water Quality**	**Shellfish**	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015
ANALYTE (MPN/100 mL)													
Enterococci	35	130	NA	NA	261	553	770	548	1200	>2419.6	1120	1300	>2419.6
Total Coliform	NA	NA	2400	70	1600	900	>1600	>1600	>1600	>1600	>1600	>1600	>1600
Fecal Coliforms	NA	NA	200	14	1600	900	>1600	>1600	>1600	>1600	>1600	>1600	>1600

SAMPLE ID	2012 Recreational Water Quality Criteria		New York State Standards (number/100 mL)[2]		GC-7D	GC-8D	GC-9D	GC-10D	Replicate	GC-12A	GC-11a	GC-1a	GC-2a
SAMPLE DATE	**GM**	**STV**	**Water Quality**	**Shellfish**	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015
ANALYTE (MPN/100 mL)													
Enterococci	35	130	NA	NA	>2419.6	>2419.6	>2419.6	1410	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6
Total Coliform	NA	NA	2400	70	>1600	>1600	>1600	>1600	>1600	1600	900	>1600	>1600
Fecal Coliforms	NA	NA	200	14	>1600	>1600	>1600	>1600	>1600	1600	900	>1600	>1600

SAMPLE ID	2012 Recreational Water Quality Criteria		New York State Standards (number/100 mL)[2]		GC-4a	GC-5a	GC-6A	GC-7A	GC-8A	GC-9A	GC-10A	GC-1B	GC-2B
SAMPLE DATE	**GM**	**STV**	**Water Quality**	**Shellfish**	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015
ANALYTE (MPN/100 mL)													
Enterococci	35	130	NA	NA	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6
Total Coliform	NA	NA	2400	70	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600
Fecal Coliforms	NA	NA	200	14	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600

SAMPLE ID	2012 Recreational Water Quality Criteria		New York State Standards (number/100 mL)[2]		GC-4B	GC-5B	GC-6B	GC-7B	GC-8B	GC-9B	GC-10B	GC-12B	GC-11B
SAMPLE DATE	**GM**	**STV**	**Water Quality**	**Shellfish**	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015	7/15/2015
ANALYTE (MPN/100 mL)													
Enterococci	35	130	NA	NA	2420	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	>2419.6	579	1050
Total Coliform	NA	NA	2400	70	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600
Fecal Coliforms	NA	NA	200	14	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600	>1600

1 - USEPA, 2012. Based on estimated illness rate of 36 per 1,000 primary contact recreators.
2 - 6 CRR NY 703.4.

cfu - Colony forming units
GM - Geometric mean
MPN - Most probable number
STV - Statistical threshold value

TABLE 3-3

BACTERIOLOGICAL RESULTS FOR SURFACE WATER SAMPLES COLLECTED FROM THE GRAND CANAL DURING THE AUGUST 27, 2015 TIDAL SURFACE WATER SAMPLING EVENT
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

SAMPLE ID	2012 Recreational Water Quality Criteria (cfu/100 mL)[1]		New York State Standards (number/100 mL)[2]		GC-1C	GC-2C	GC-4C	GC-5C	GC-6C	GC-7C	GC-8C	GC-9C	GC-10C	GC-11C	GC-12C
SAMPLE DATE	GM	STV	Water Quality	Shellfish	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015
ANALYTE (MPN/100 mL)															
Enterococci	35	130	NA	NA	3080	2600	1580	805	2280	3650	1670	1130	691	63.0	60.0
Total Coliform	NA	NA	2400	70	16000	9000	220	500	16000	9000	16000	3000	9000	3000	800
Fecal Coliforms	NA	NA	200	14	16000	9000	220	500	16000	9000	16000	3000	9000	3000	500

SAMPLE ID	2012 Recreational Water Quality Criteria		New York State Standards		GC-1D	GC-2D	GC-4D	GC-5D	GC-6D	GC-7D	GC-8D	GC-9D	GC-10D	GC-11D	GC-12D
SAMPLE DATE	GM	STV	Water Quality	Shellfish	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015	8/27/2015
ANALYTE (MPN/100 mL)															
Enterococci	35	130	NA	NA	1520	1330	13000	70.0	437	816	554	405	156	20.0	30.0
Total Coliform	NA	NA	2400	70	9000	5000	500	3000	16000	9000	9000	3000	2200	700	2400
Fecal Coliforms	NA	NA	200	14	9000	5000	500	3000	16000	9000	9000	3000	2200	700	2400

1 - USEPA, 2012. Based on estimated Illness rate of 36 per 1,000 primary contact recreators.
2 - 6 CRR NY 703.4.

cfu - Colony forming units
GM - Geometric mean
MPN - Most probable number
STV - Statistical threshold value

TABLE 3-4

BACTERIOLOGICAL RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE AUGUST 11, 2015 WET SAMPLING EVENT
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

SAMPLE ID	2012 Recreational Water Quality Criteria (cfu/100 mL)[1]		New York State Standards (number/100 mL)[2]		SW 1	SW 2	SW 3	SW 4	SW 5	SW 6
SAMPLE DATE	GM	STV	Water Quality	Shellfish	8/11/2015	8/12/2015	8/13/2015	8/14/2015	8/15/2015	8/16/2015
ANALYTE (MPN/100 mL)										
Enterococci	35	130	NA	NA	275	1250	323	576	801	620
Total Coliform	NA	NA	2400	70	2200	5400	1300	2400	1400	700
Fecal Coliforms	NA	NA	200	14	300	5400	1300	500	700	700

1 - USEPA, 2012. Based on estimated Illness rate of 36 per 1,000 primary contact recreators.
2 - 6 CRR NY 703.4.

cfu - Colony forming units
GM - Geometric mean
MPN - Most probable number
STV - Statistical threshold value

TABLE 3-5

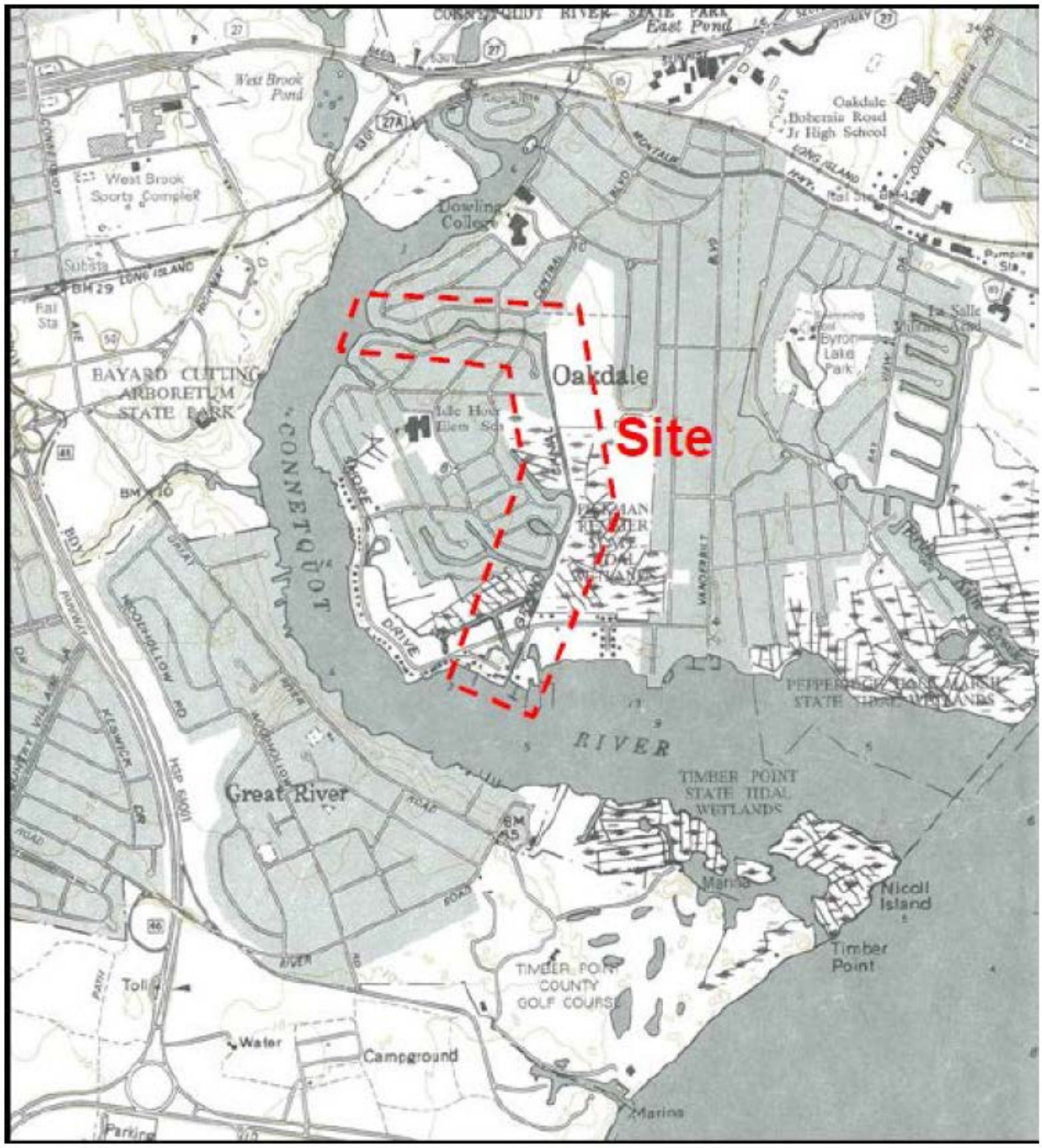
BACTERIOLOGICAL RESULTS FOR STORM WATER SURFACE WATER RUN-OFF SAMPLES COLLECTED DURING THE SEPTEMBER 3, 2015 DRY SAMPLING EVENT
PUBLIC HEALTH EVALUATION
GRAND CANAL, OAKDALE, NEW YORK

SAMPLE ID	2012 Recreational Water Quality Criteria (cfu/100 mL)[1]		New York State Standards (number/100 mL)[2]		SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	WL 1	WL 2	GC North	GC South	WL Ref 1	WL Ref 2
SAMPLE DATE	GM	STV	Water Quality	Shellfish	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015	9/3/2015
ANALYTE (MPN/100 mL)																
Enterococci	35	130	NA	NA	1100	355	20	148	703	1250	318	402	20	ND	776	292
Total Coliform	NA	NA	2400	70	3000	500	130	300	3000	3000	800	2400	220	300	2400	300
Fecal Coliforms	NA	NA	200	14	3000	500	130	300	3000	3000	800	2400	220	300	2400	300

1 - USEPA, 2012. Based on estimated Illness rate of 36 per 1,000 primary contact recreators.
2 - 6 CRR NY 703.4.

cfu - Colony forming units
GM - Geometric mean
MPN - Most probable number
STV - Statistical threshold value

FIGURES



Source: Cashin Associates, 2015

Figure 1. Overview of the Grand Canal Study Area.

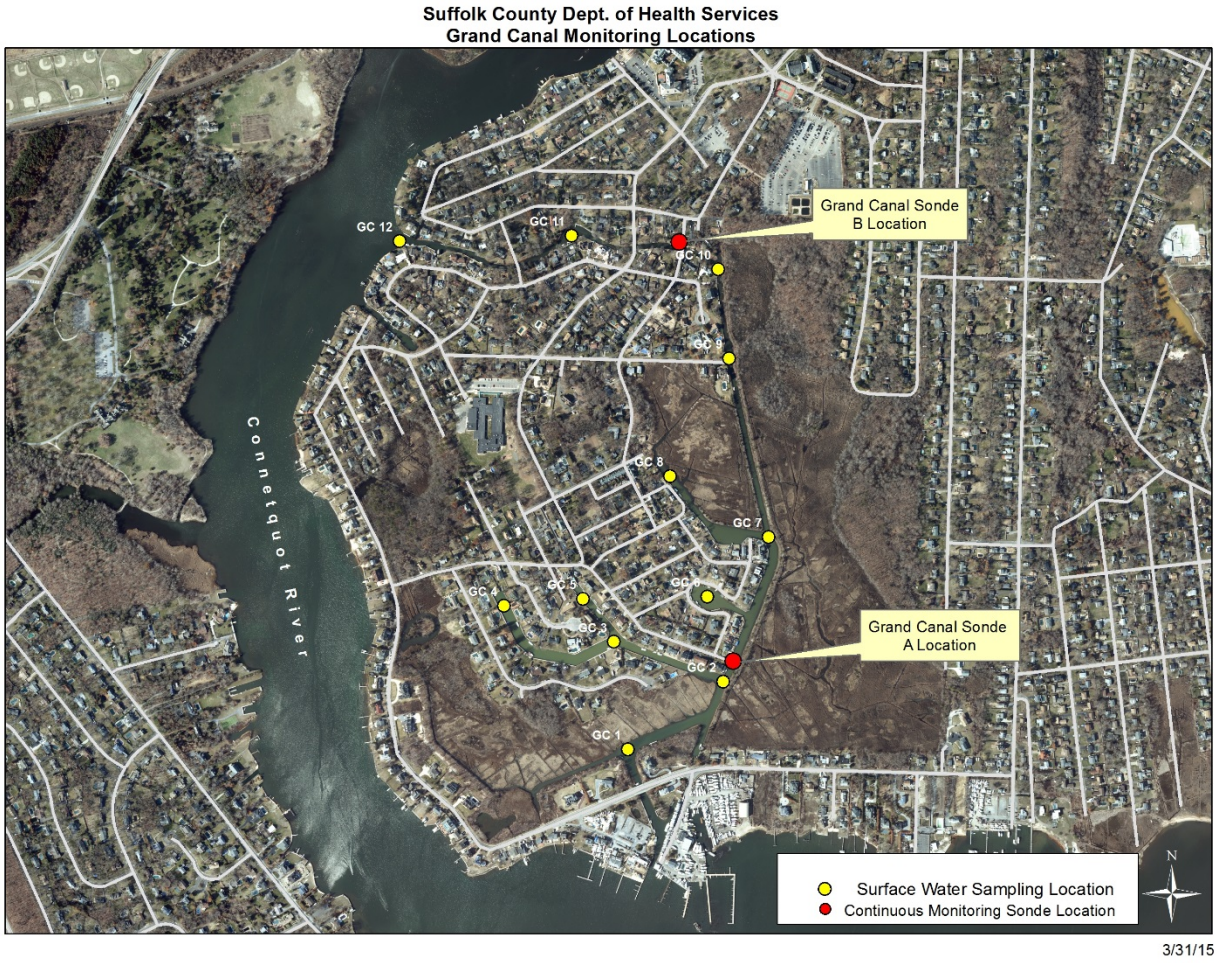


Figure 2. Sampling Locations for 2004 SCDHS/SCDPW and 2015 Cashin Associates Sample Events.

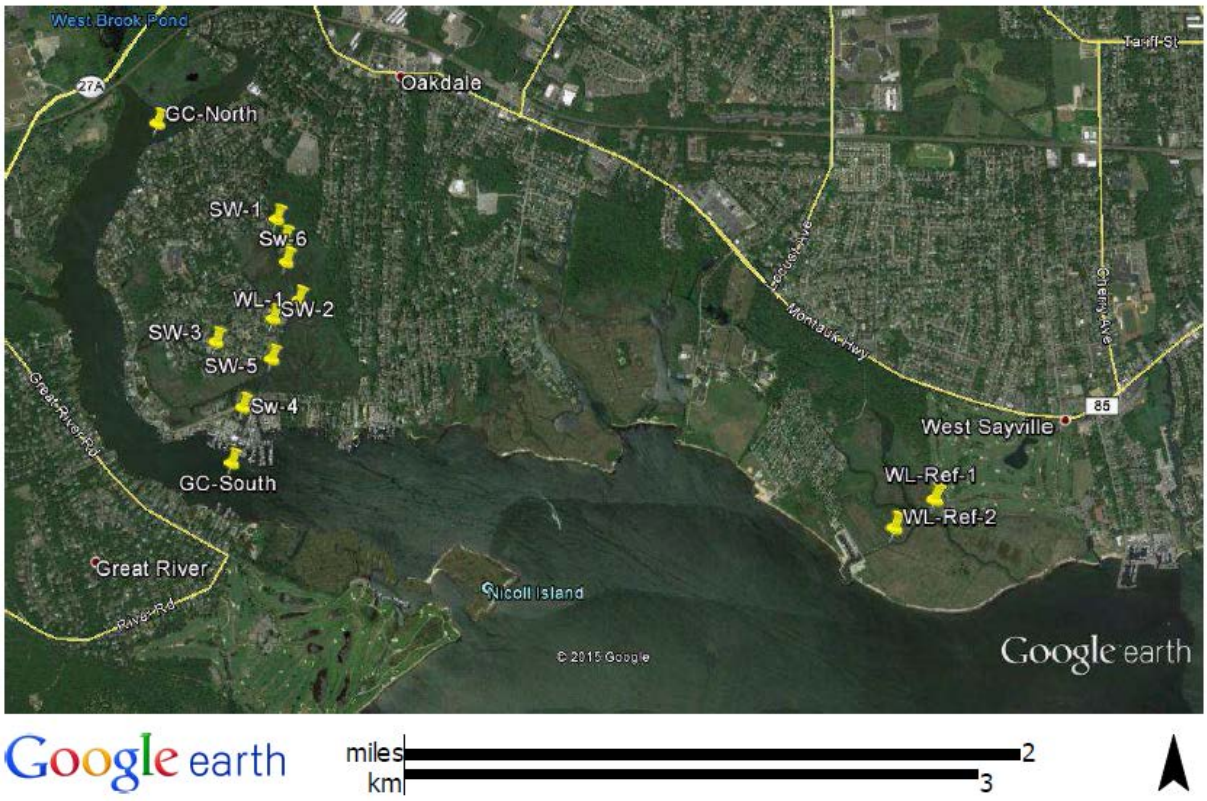


Figure 3. Sampling Locations for 2015 Cashin Associates Sample Events.

Figure 4
Total Nitrogen Concentrations in Surface Water Samples from July 15, 2015
Tidal Surface Water Sampling Event

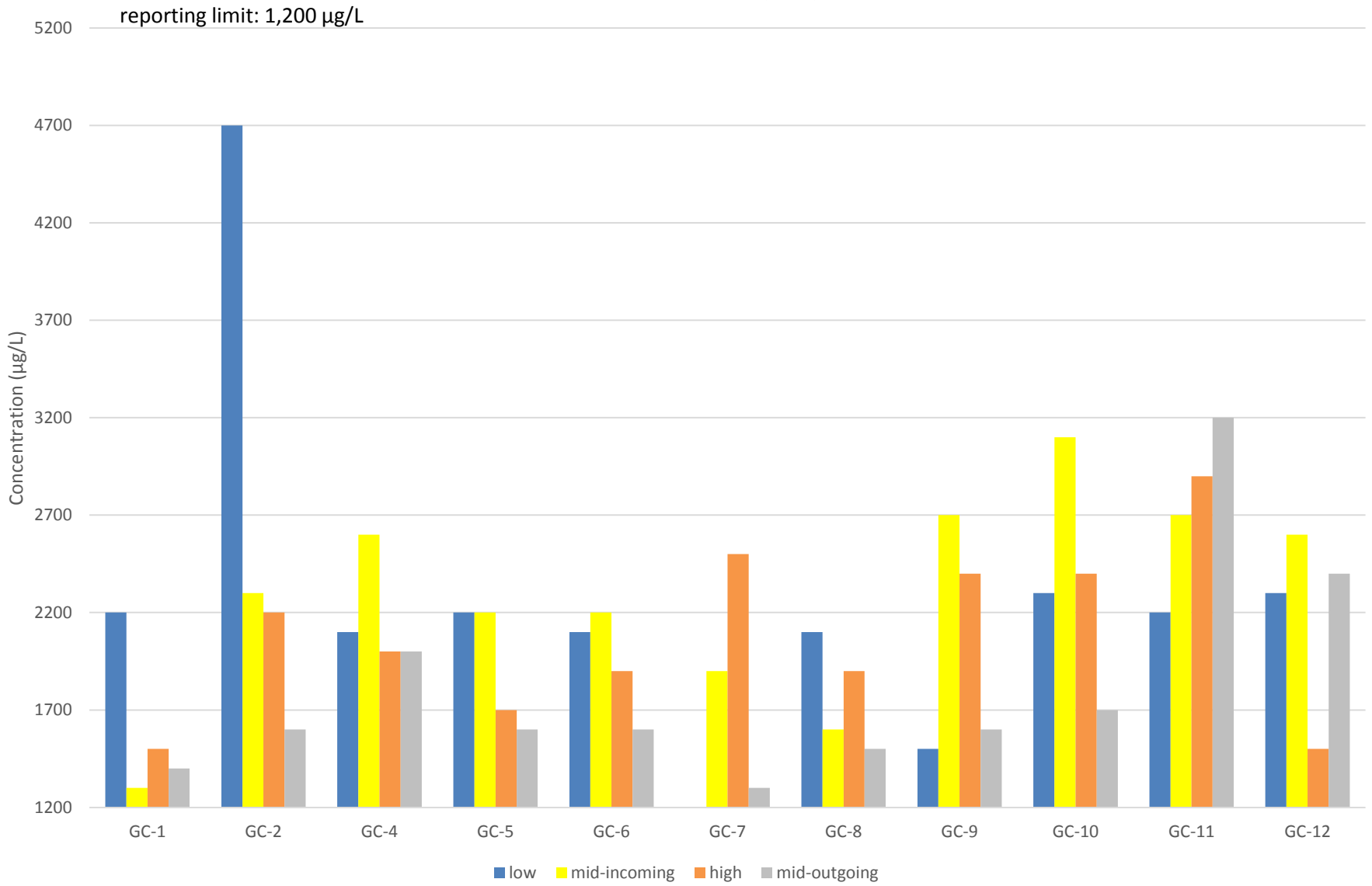


Figure 5
Total Nitrogen Concentrations in Surface Water Samples from August 27, 2015
Tidal Surface Water Sampling Event

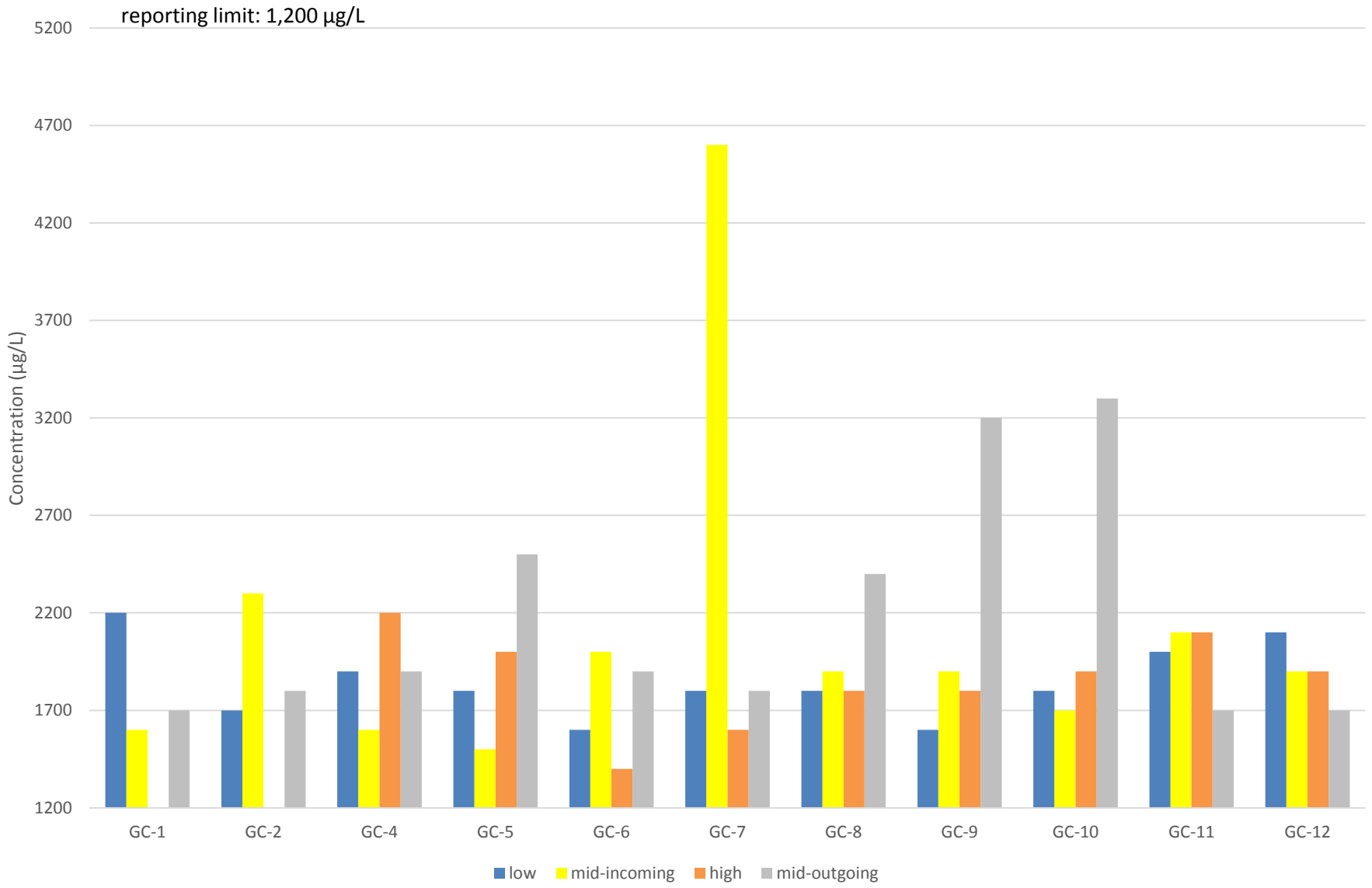


Figure 6
Dissolved Nitrogen Concentrations in Surface Water Samples from July 15, 2015
Tidal Surface Water Sampling Event

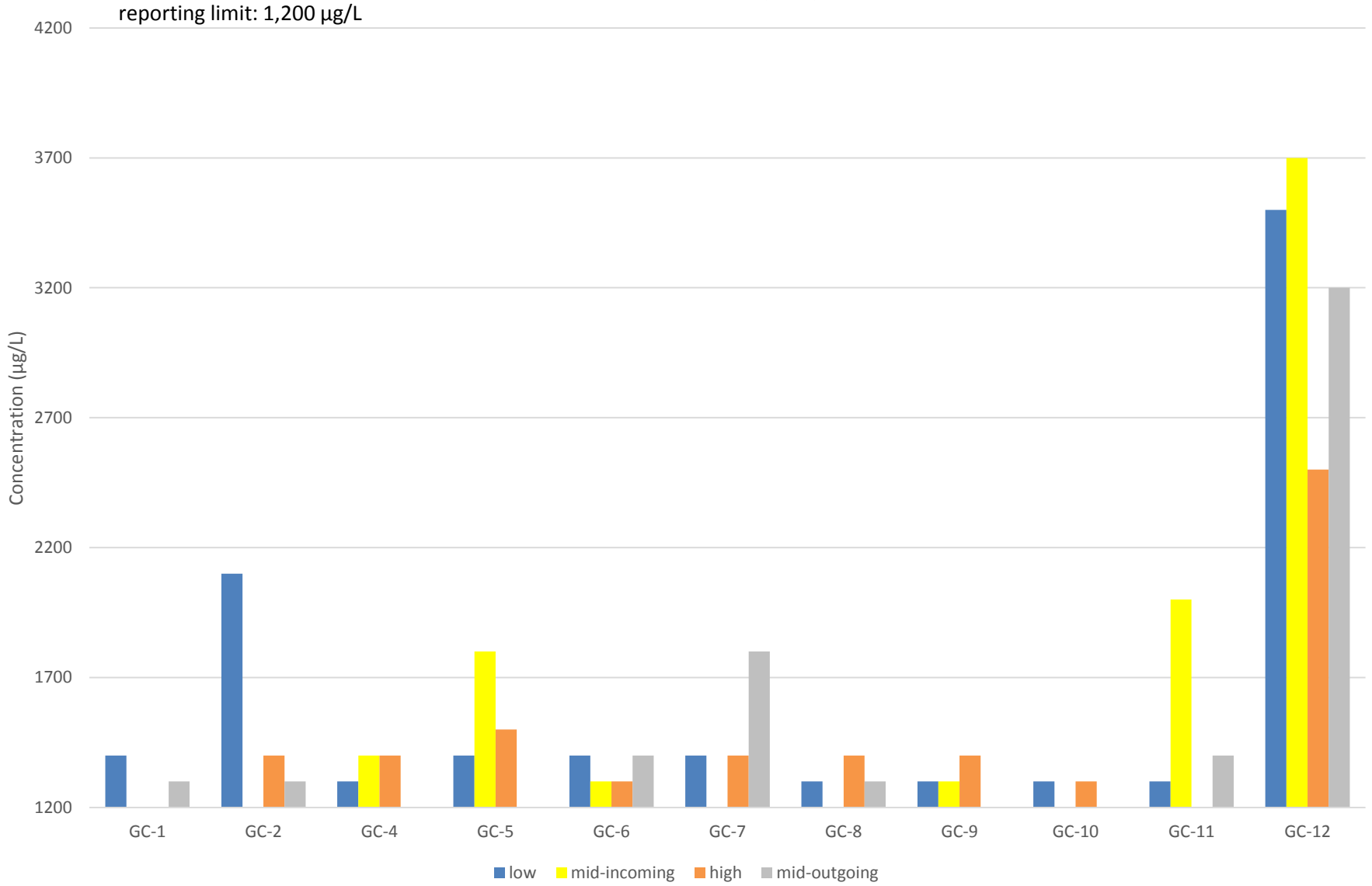


Figure 7
Dissolved Nitrogen Concentrations in Surface Water Samples from August 27, 2015
Tidal Surface Water Sampling Event

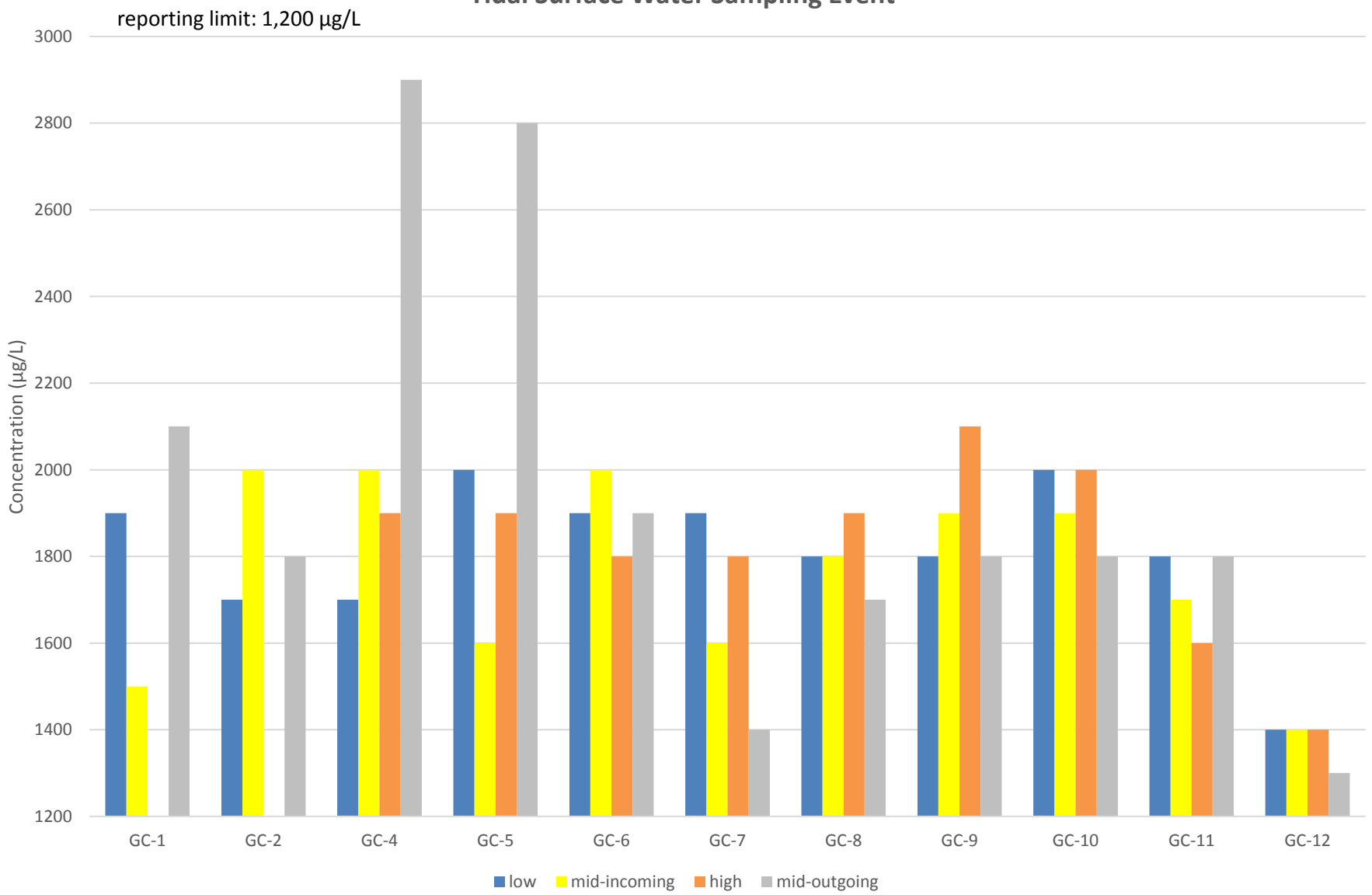


Figure 8
Total Phosphorus Concentrations in Surface Water Samples from July 15, 2015
Tidal Surface Water Sampling Event

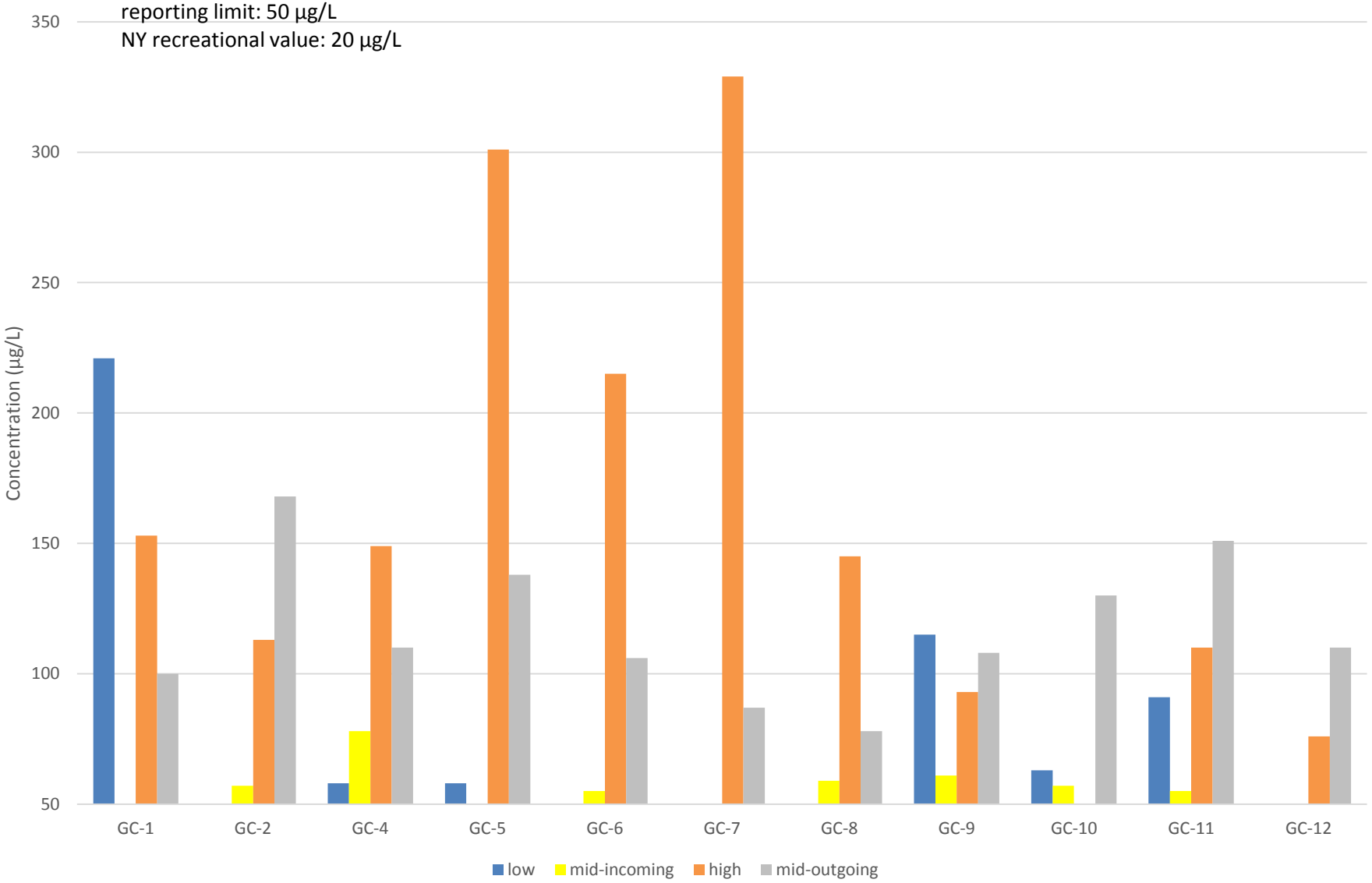


Figure 9
Phosphorus Concentrations in Surface Water Samples from August 27, 2015
Tidal Surface Water Sampling Event

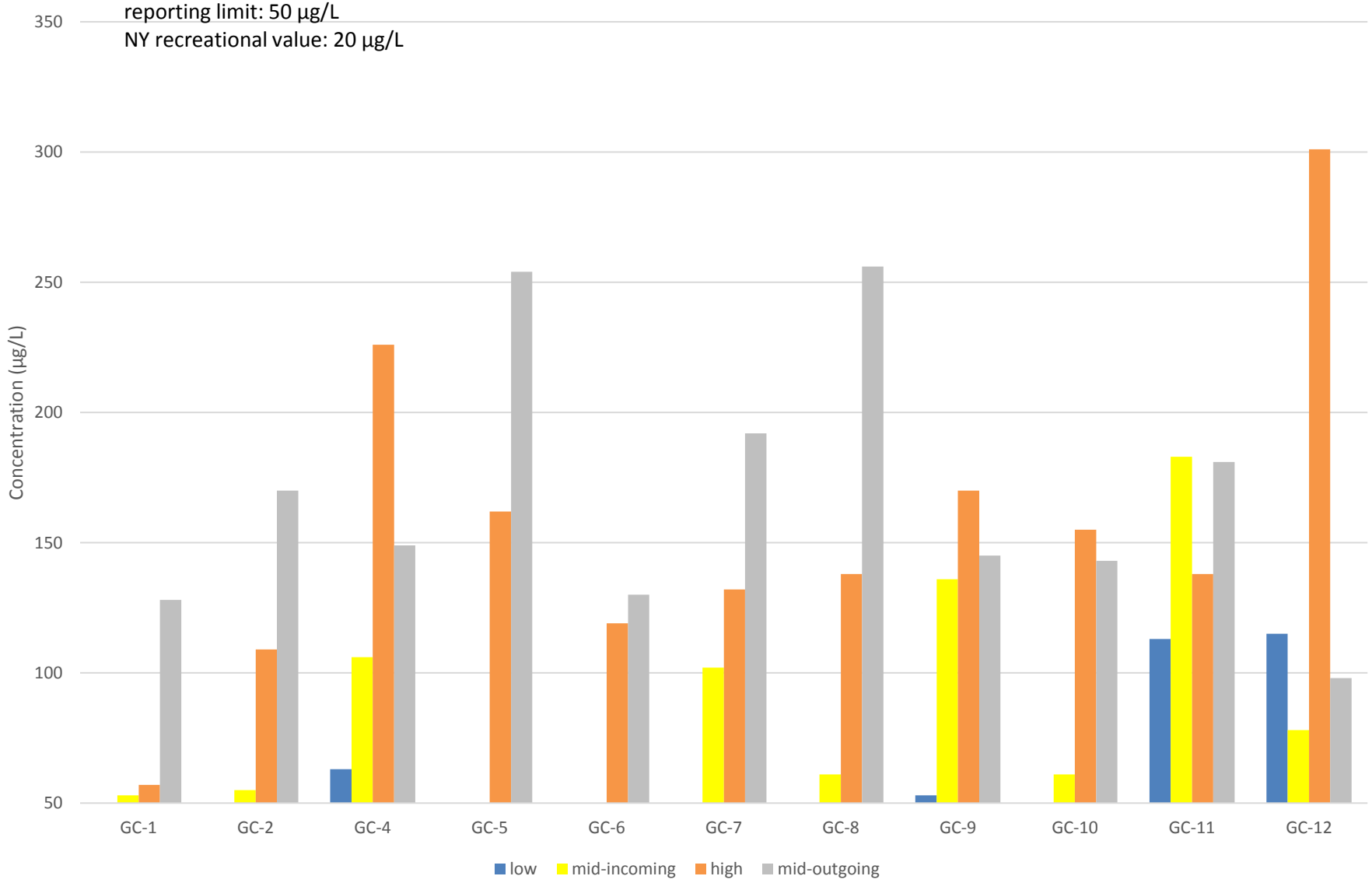


Figure 10
Dissolved Phosphorus Concentrations in Surface Water Samples from July 15, 2015
Tidal Surface Water Sampling Event

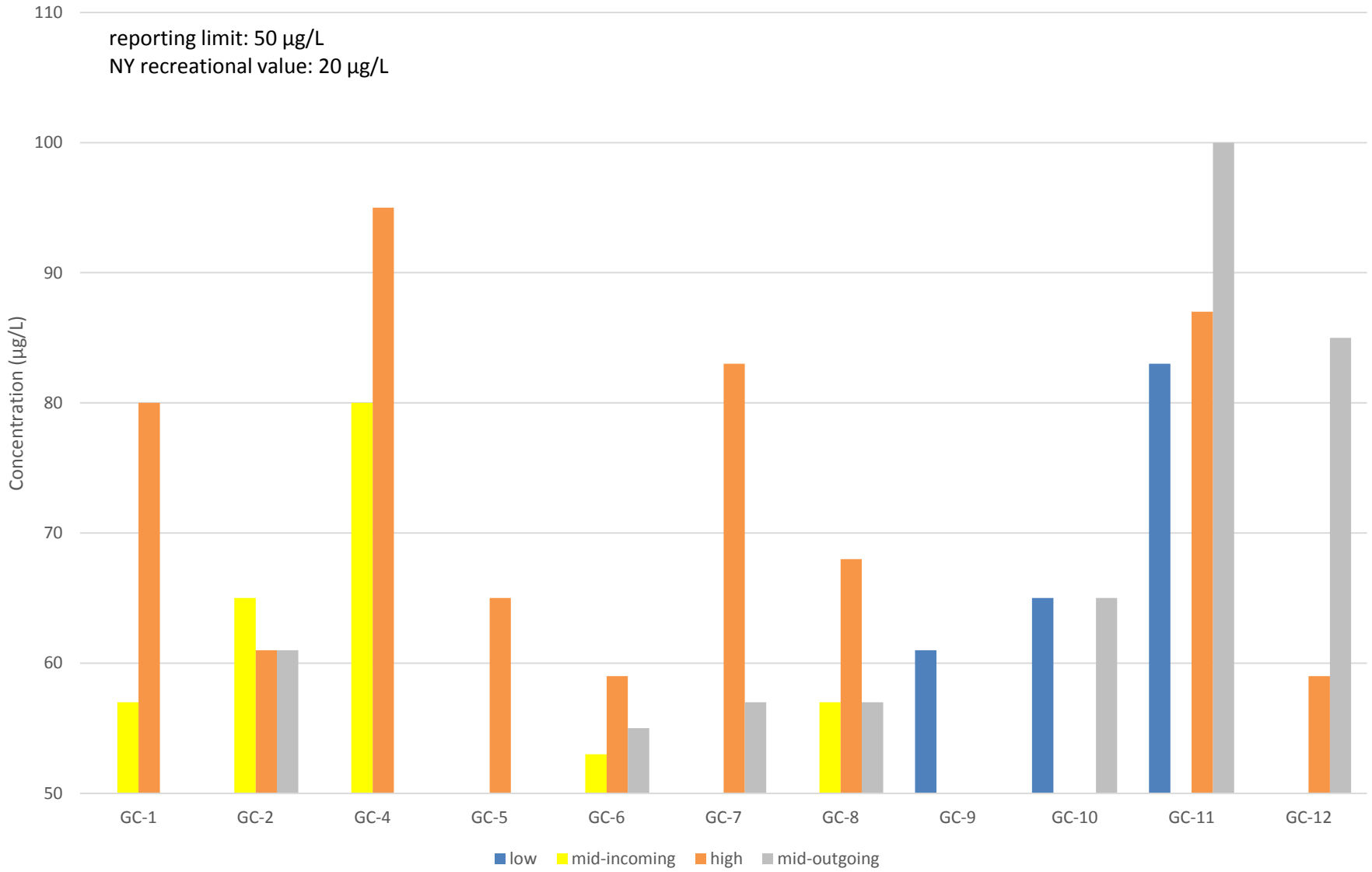


Figure 11
Dissolved Phosphorus Concentrations in Surface Water Samples from August 27, 2015
Tidal Surface Water Sampling Event

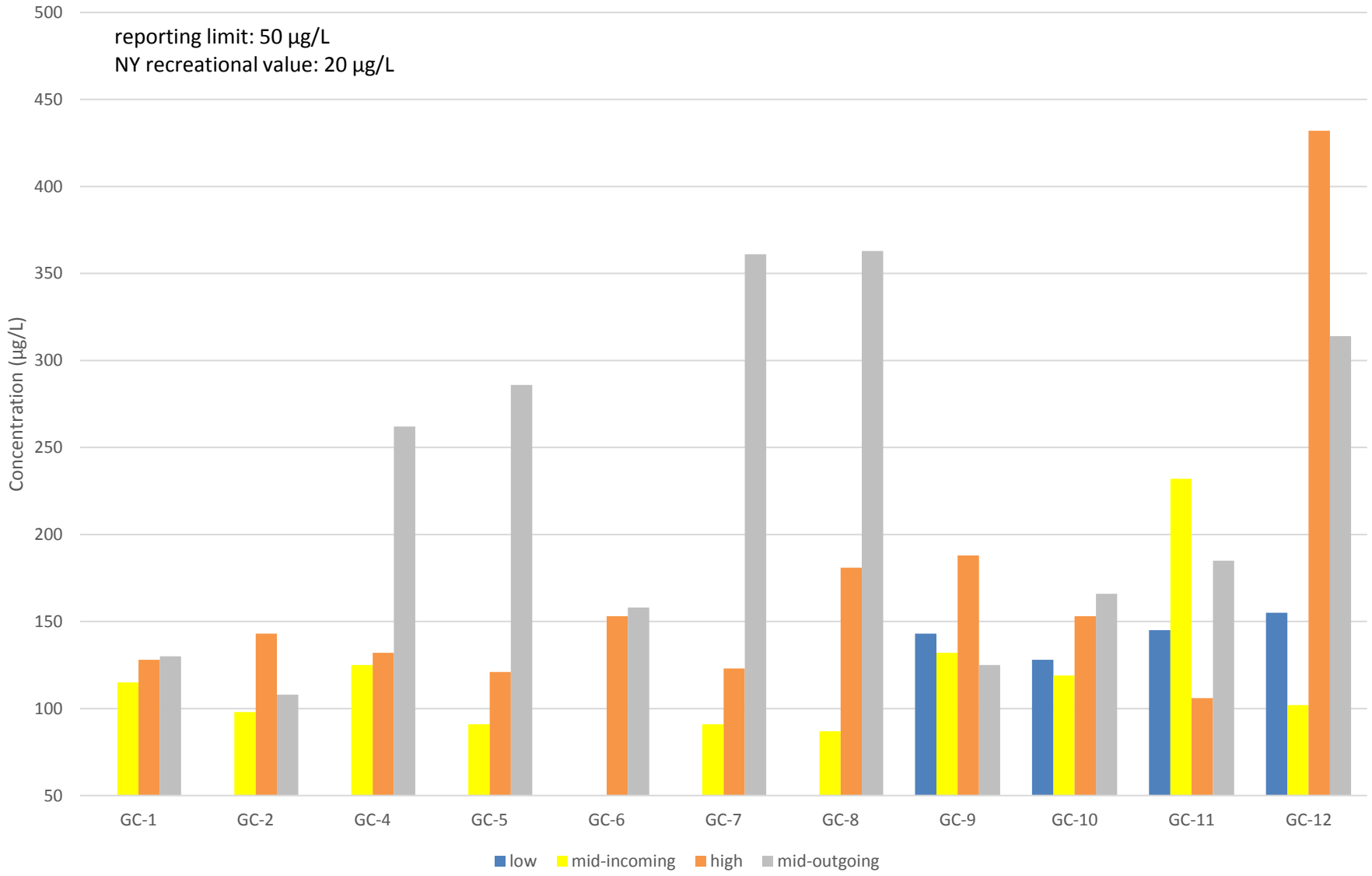


Figure 12
Water Quality Data for July 15, 2015 Tidal Surface Water Sampling Event - Temperature

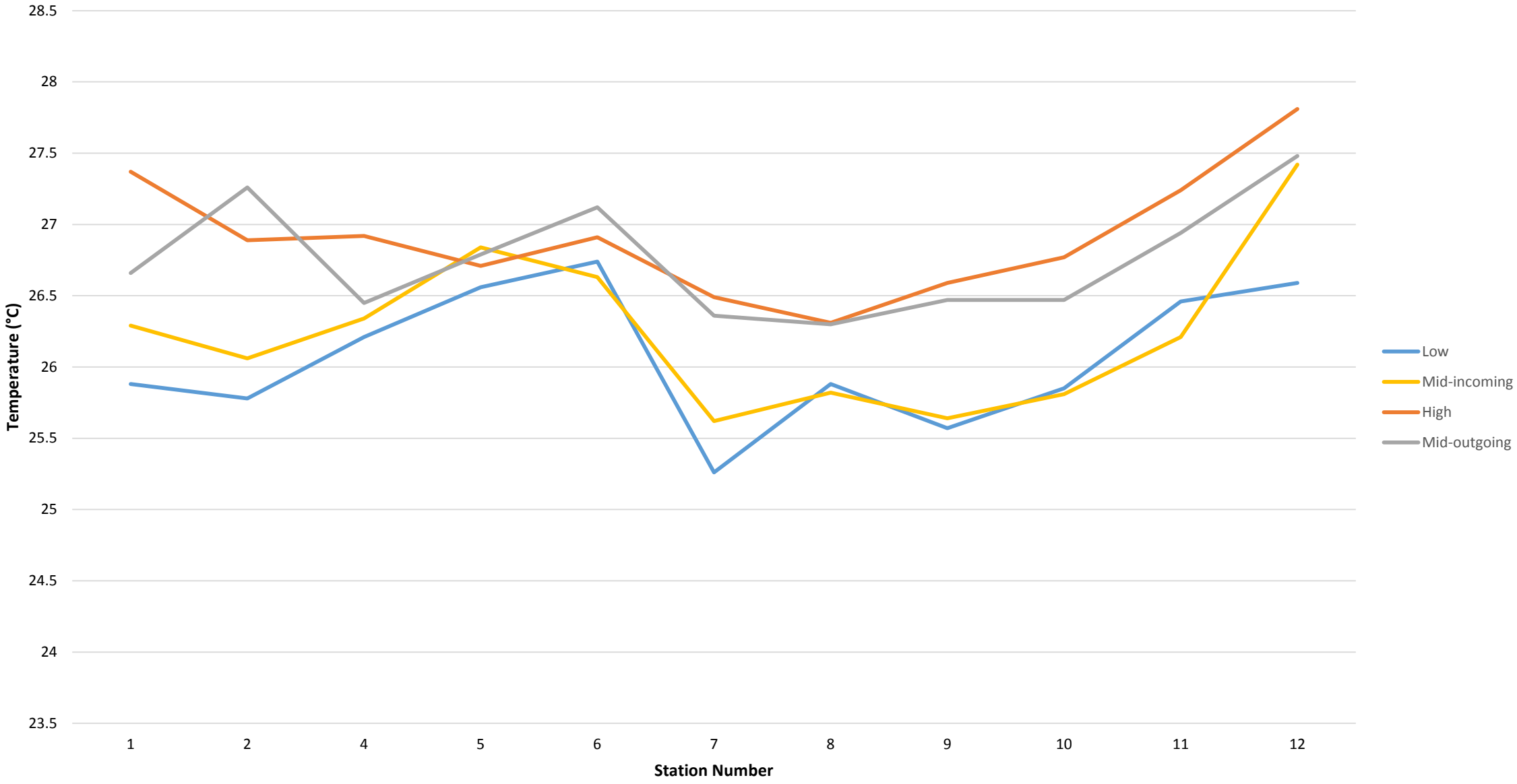


Figure 13
Water Quality Data for July 15, 2015 Tidal Surface Water Sampling Event – Dissolved Oxygen

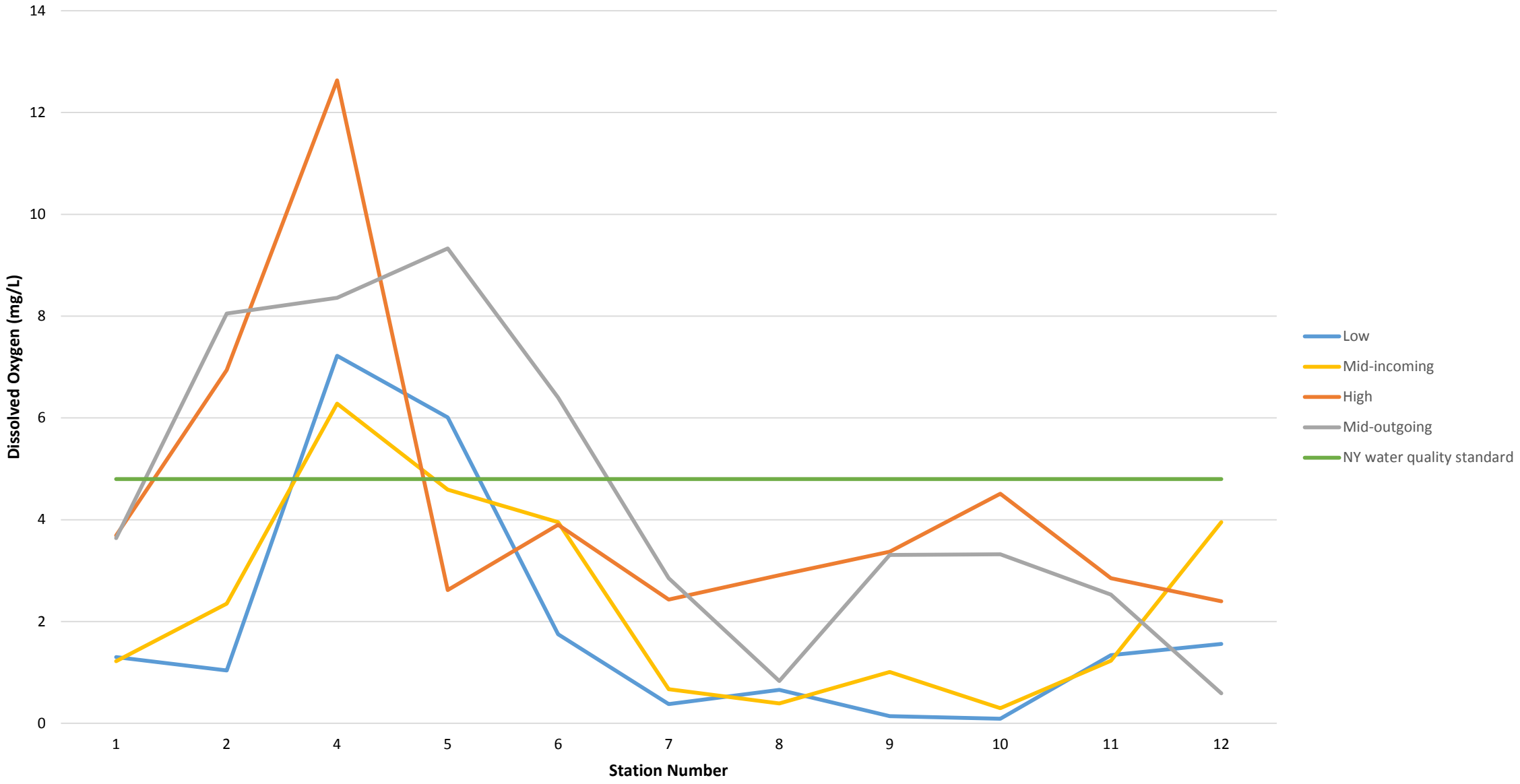


Figure 14
Water Quality Data for July 15, 2015 Tidal Surface Water Sampling Event – Salinity

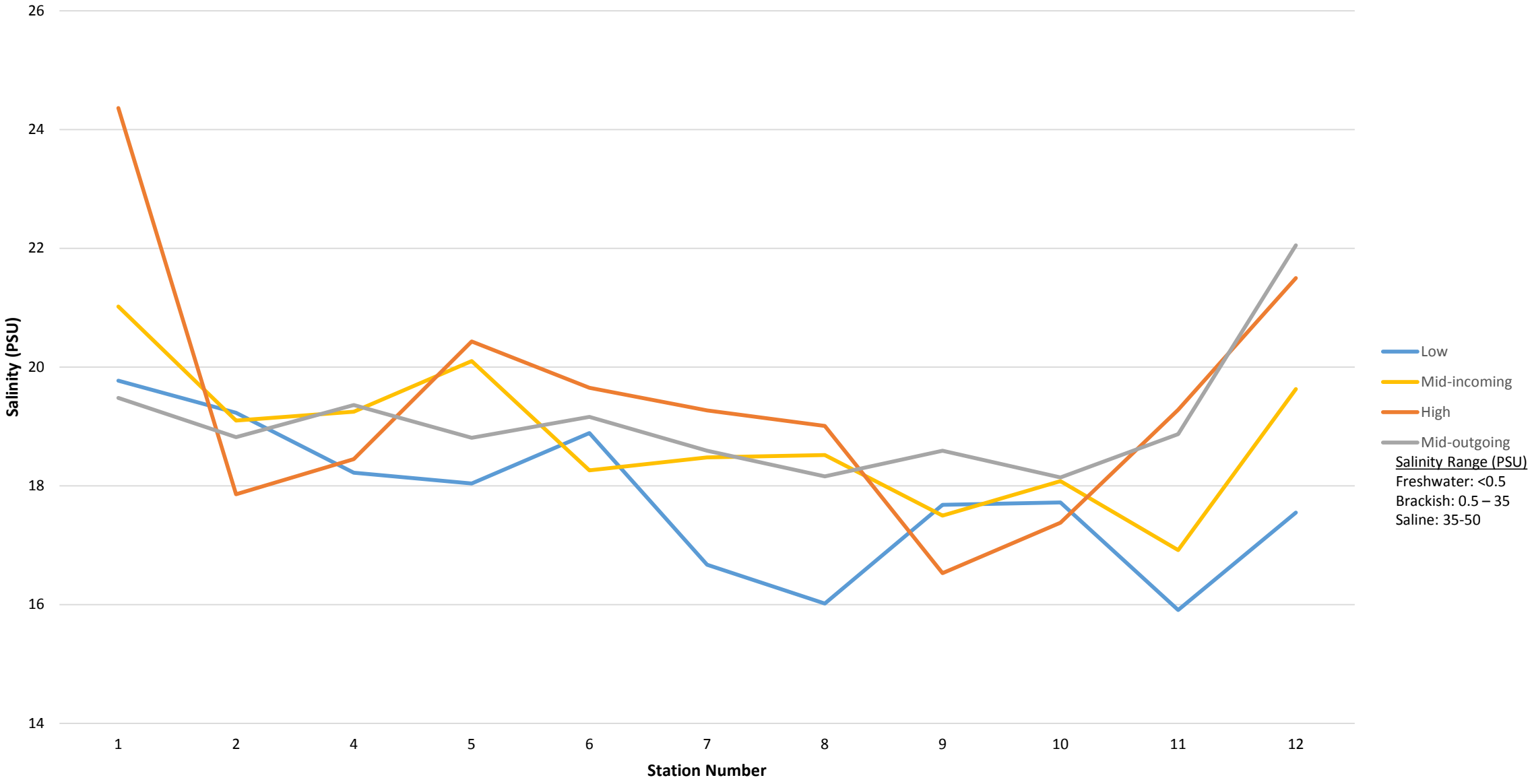


Figure 15
Water Quality Data for July 15, 2015 Tidal Surface Water Sampling Event - Turbidity

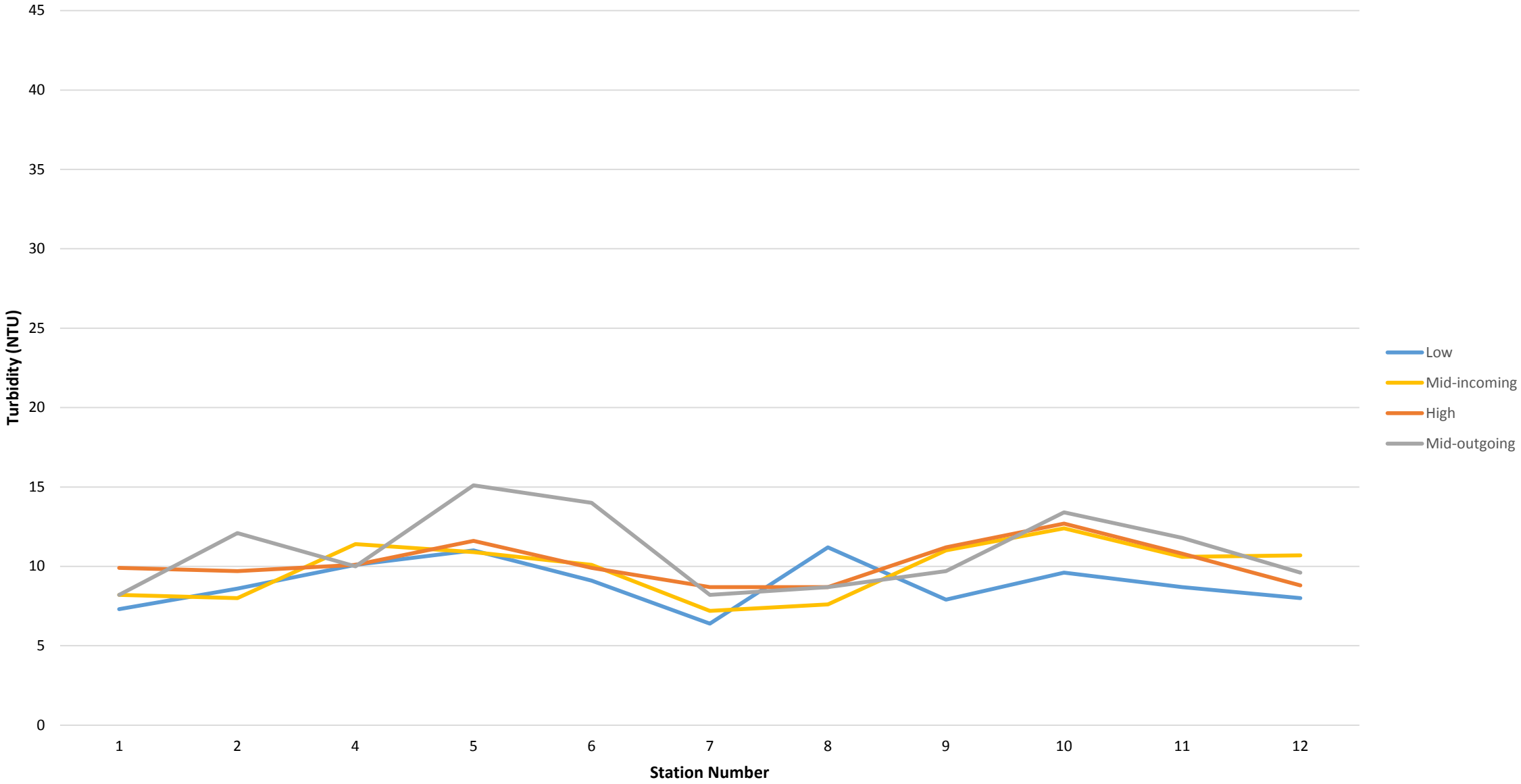


Figure 16
Water Quality Data for August 27, 2015 Tidal Surface Water Sampling Event – Temperature

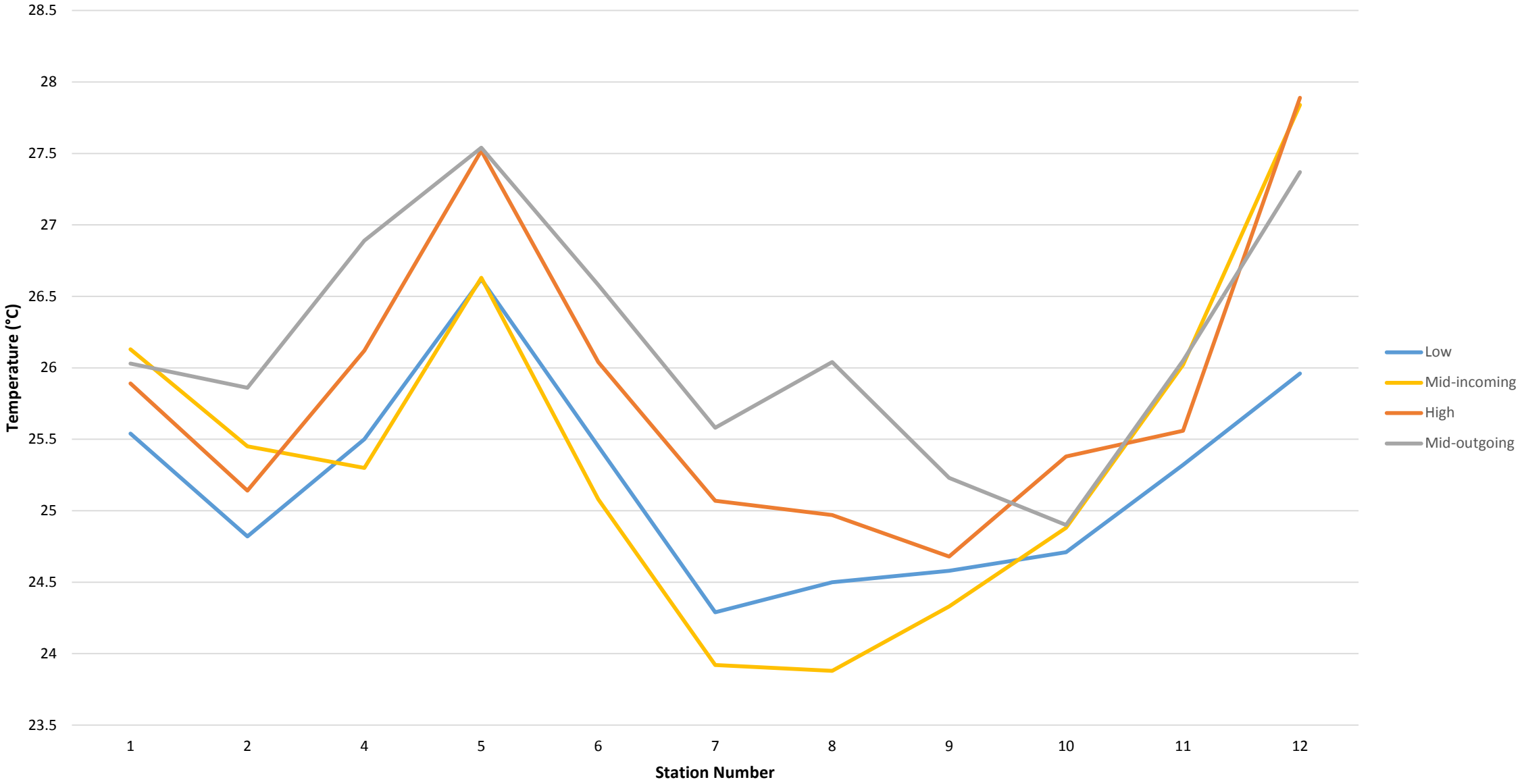


Figure 17
Water Quality Data for August 27, 2015 Tidal Surface Water Sampling Event – Dissolved Oxygen

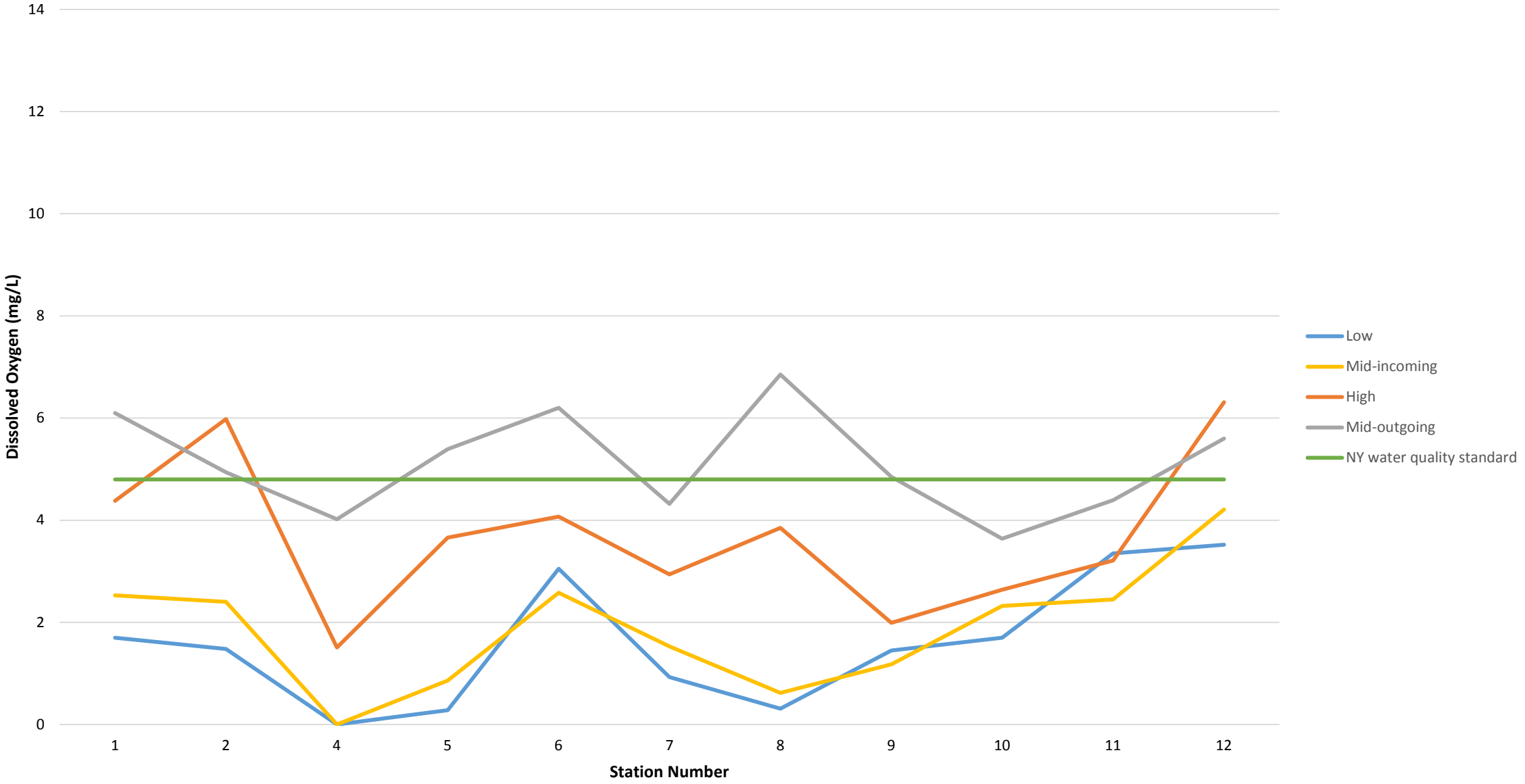


Figure 18
Water Quality Data for August 27, 2015 Tidal Surface Water Sampling Event – Salinity

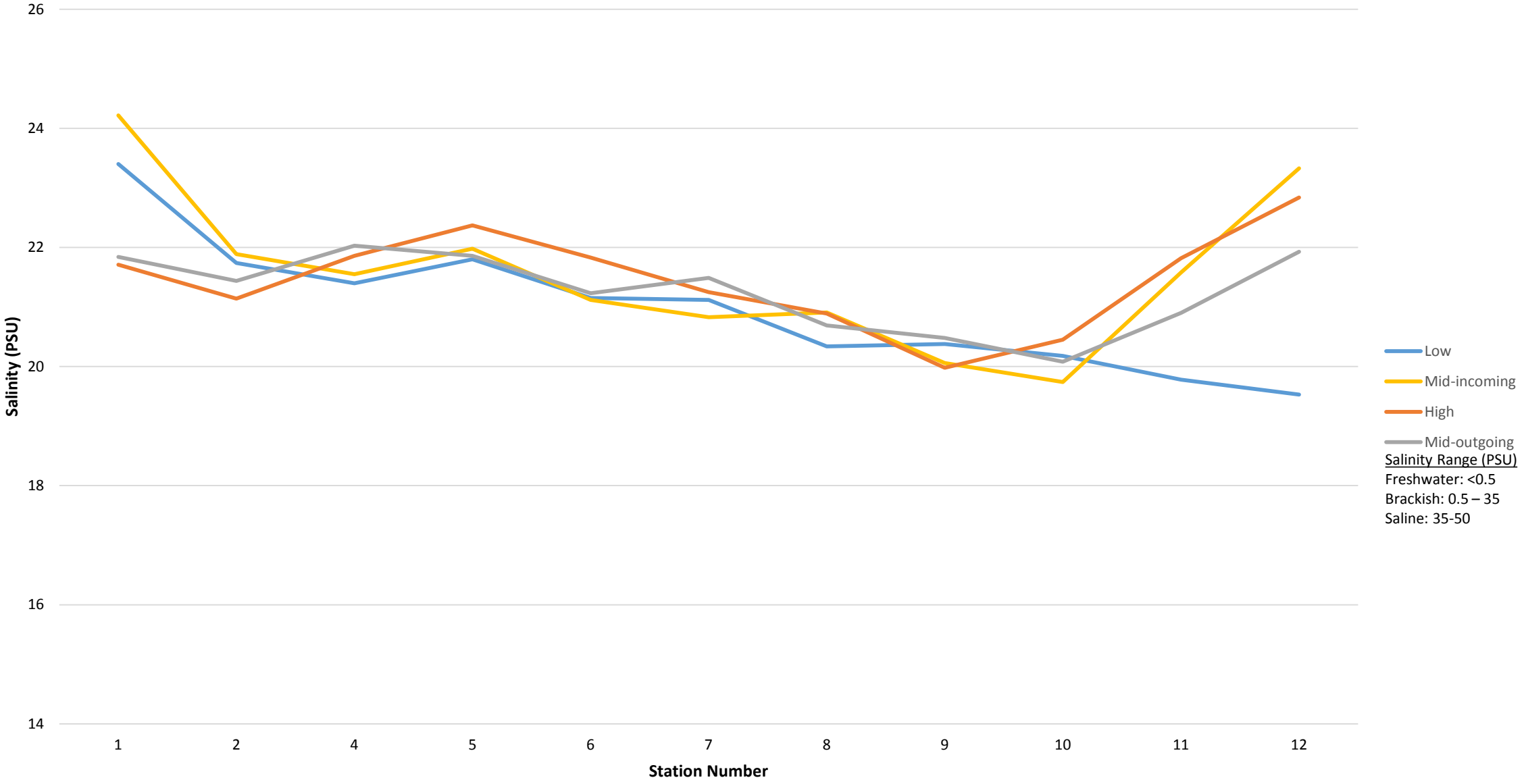


Figure 19
Water Quality Data for August 27, 2015 Tidal Surface Water Sampling Event – Turbidity

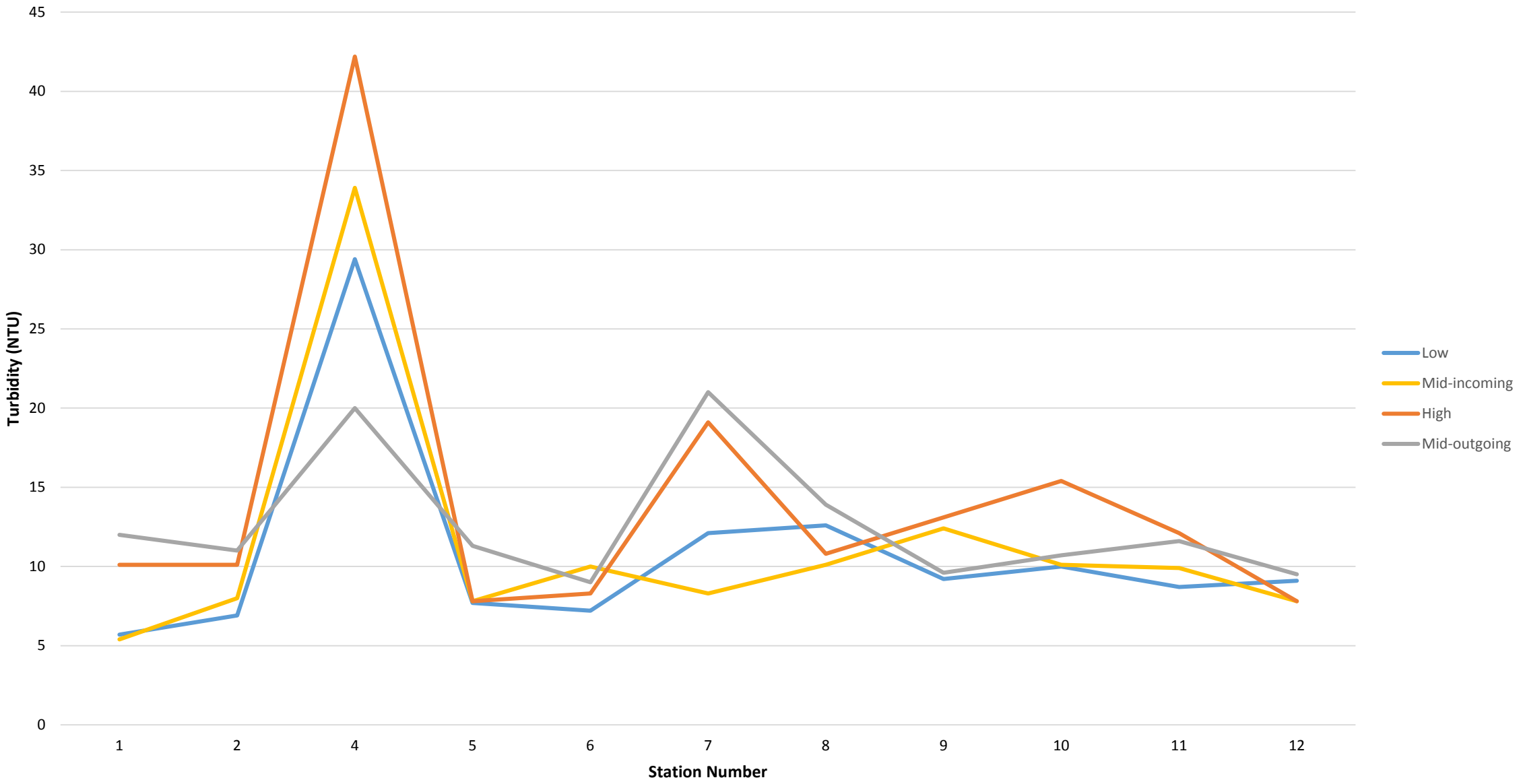


Figure 20
Water Quality Data over a Two-Week Interval in 2014 – Temperature

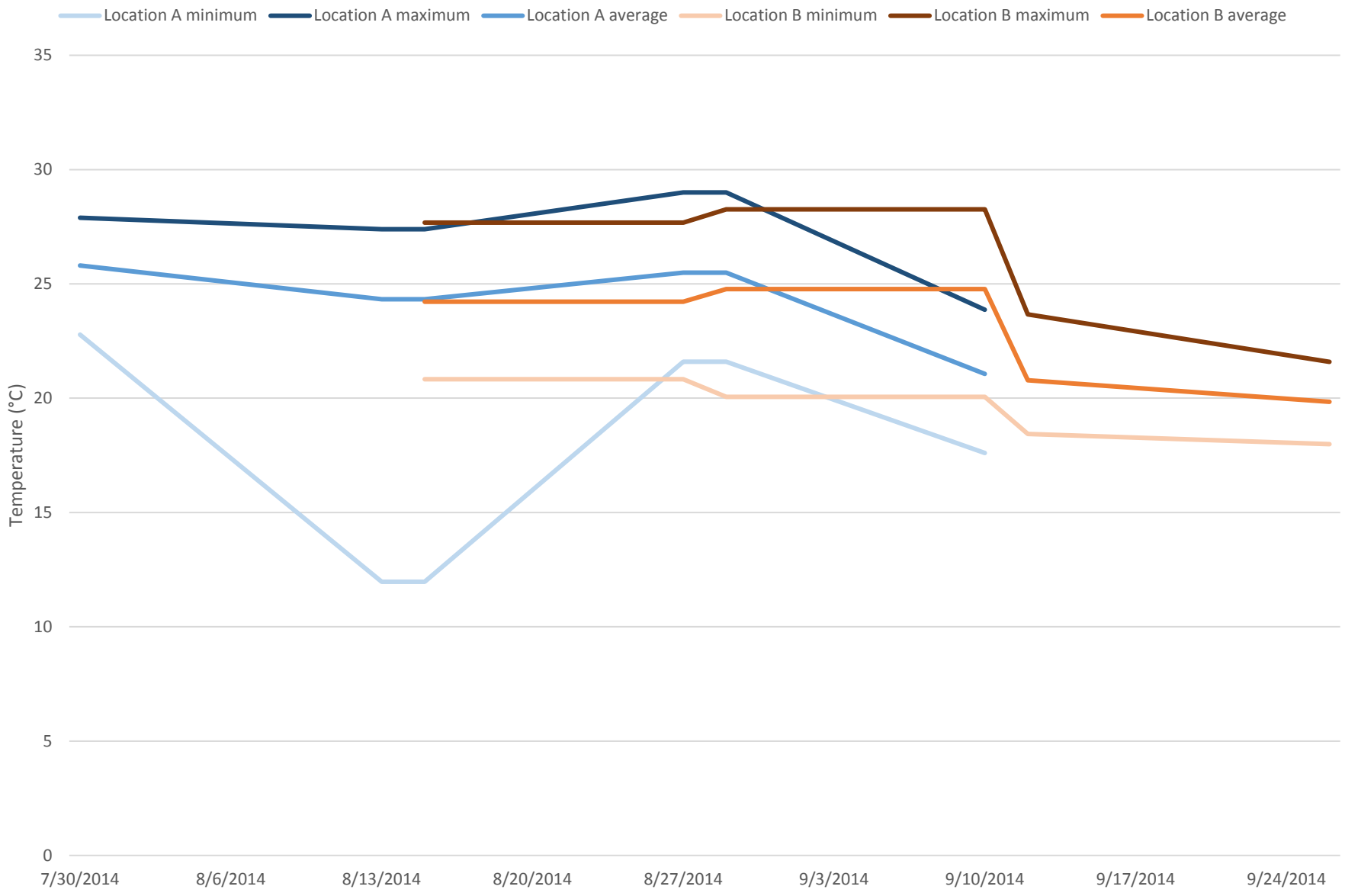


Figure 21
Water Quality Data over a Two-Week Interval in 2014 – Dissolved Oxygen

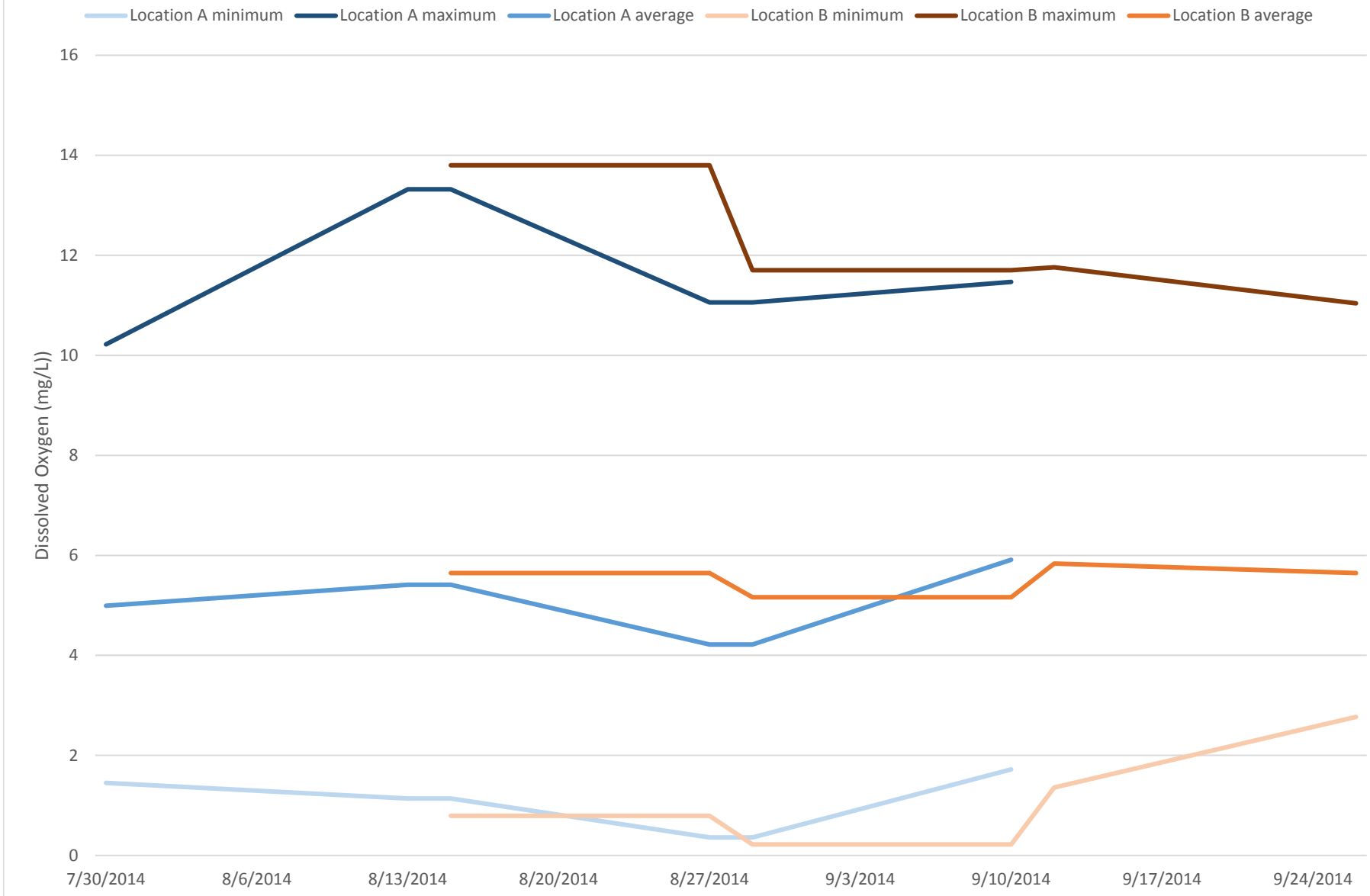


Figure 22
Water Quality Data over a Two-Week Interval in 2014 – Salinity

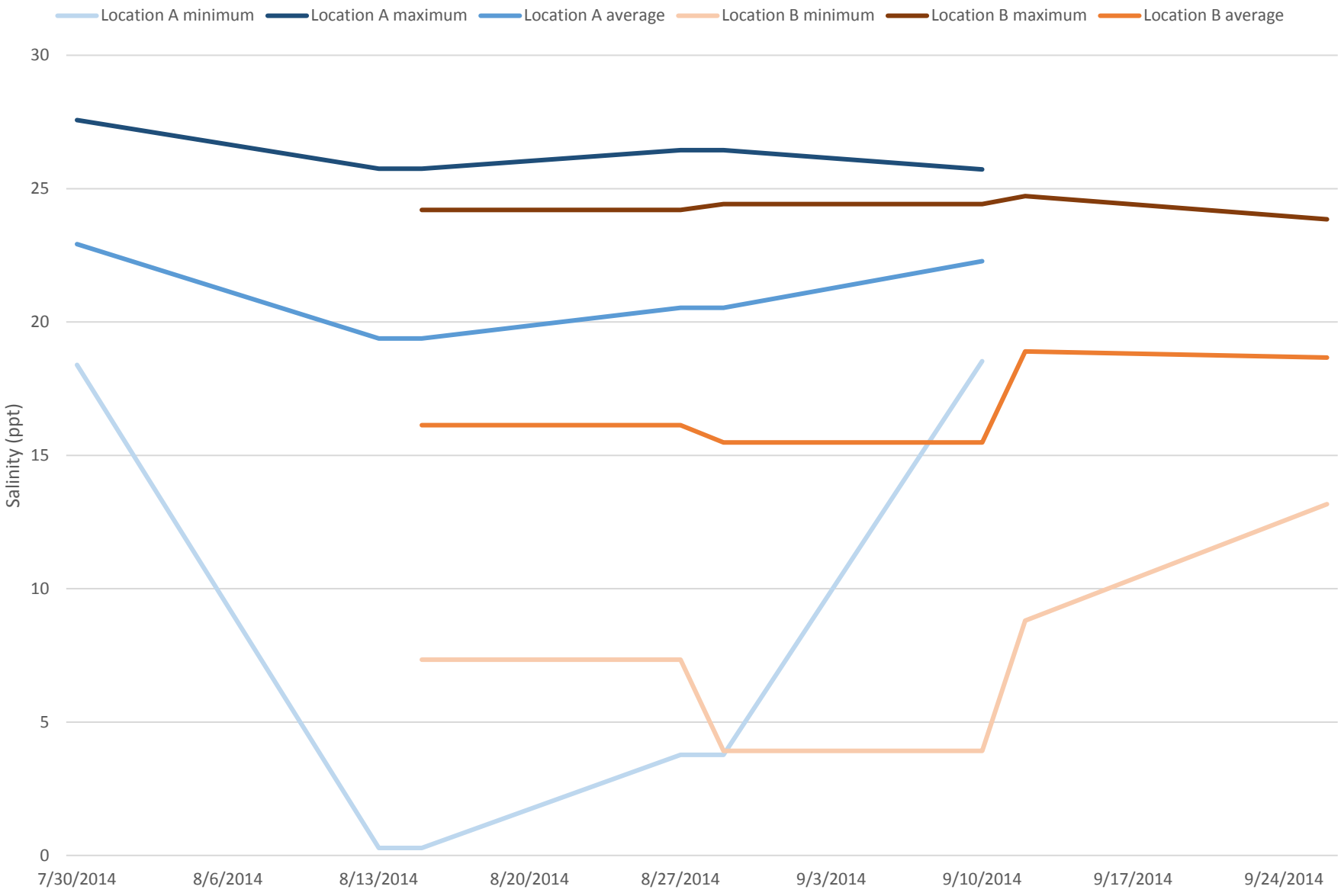


Figure 23
Daily Fluctuation in Salinity for a Five-Day Period in 2014
Tower Mews - A Location

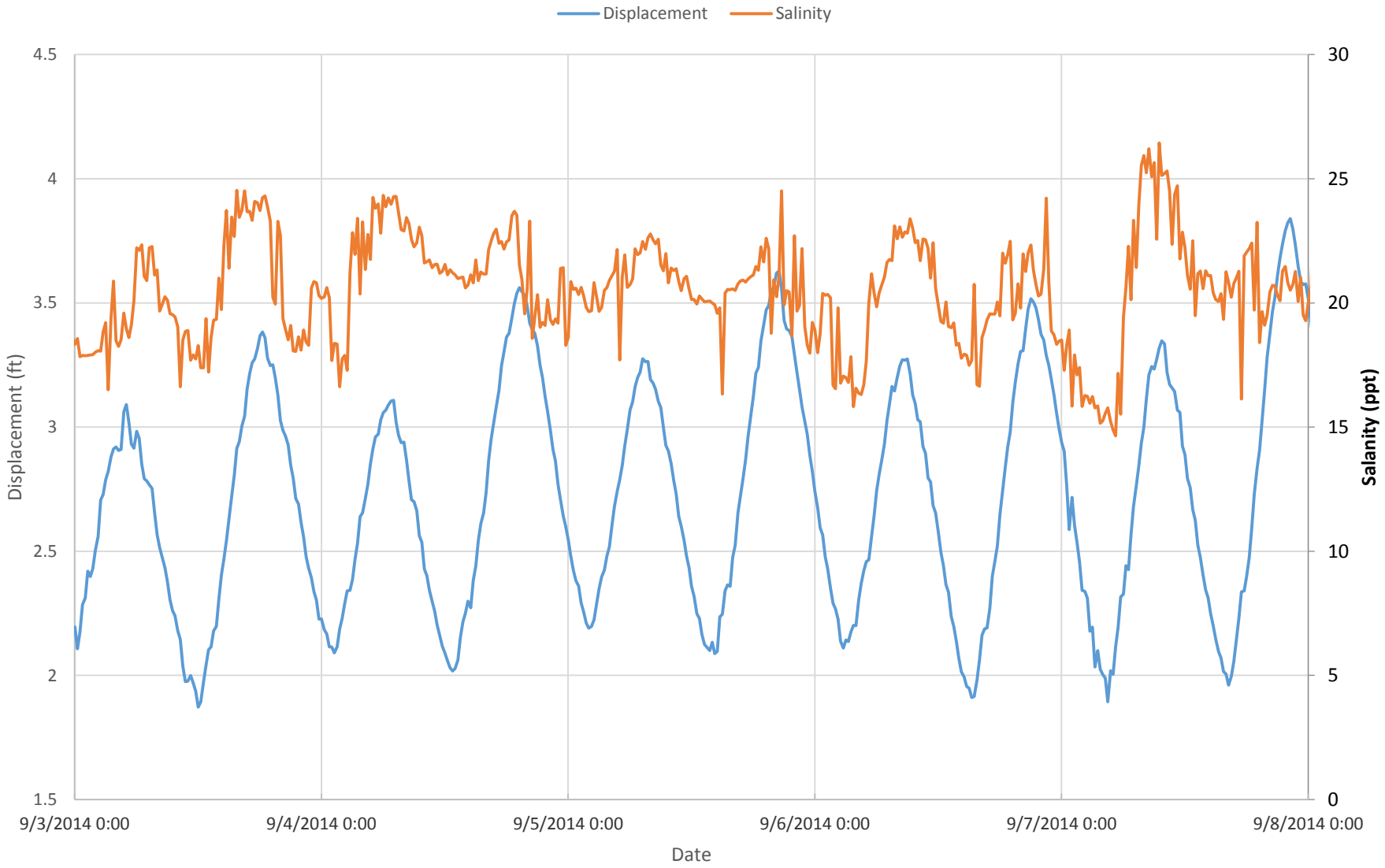


Figure 24
Daily Fluctuation in Temperature for a Five-Day Period in 2014
Tower Mews - A Location

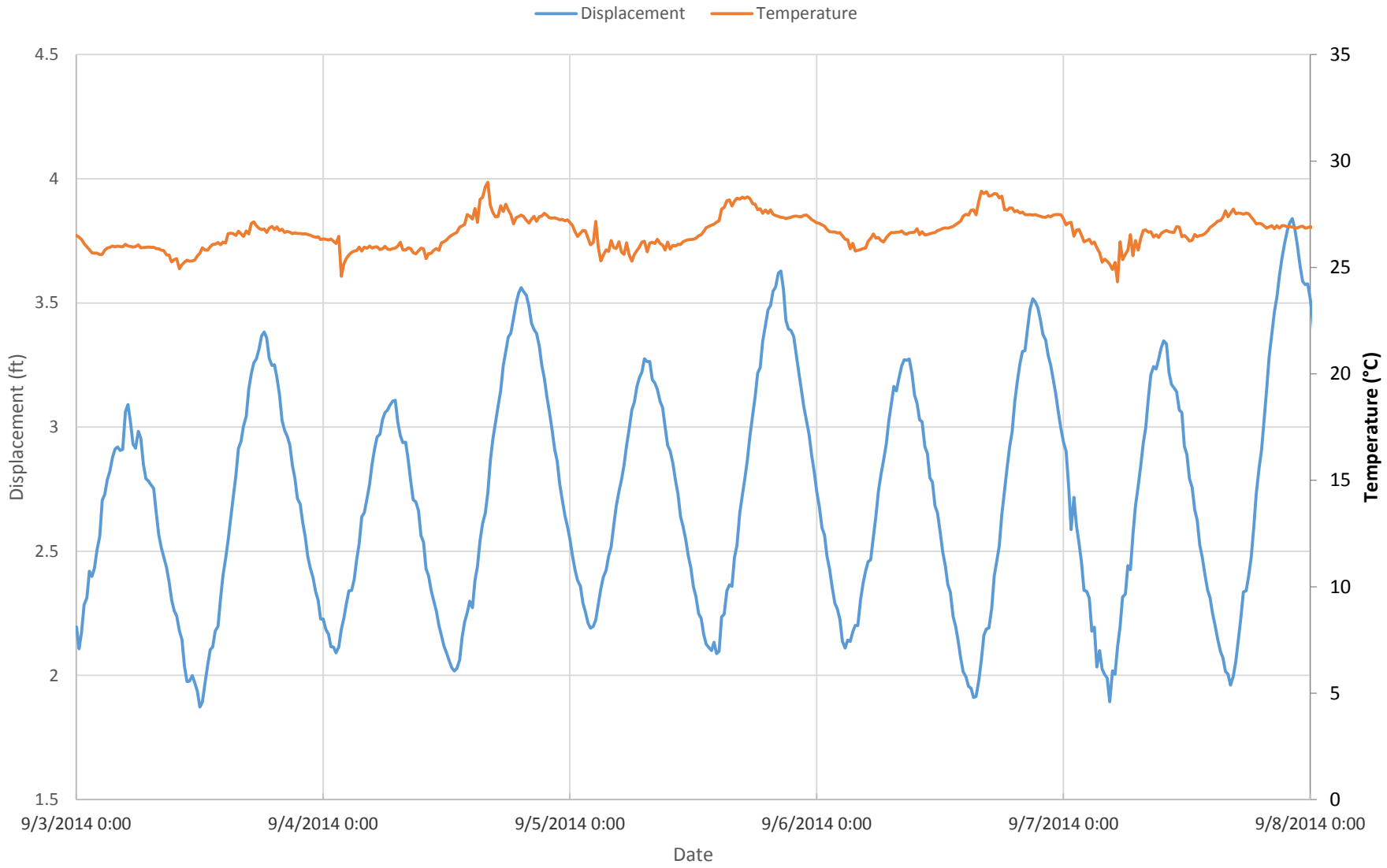
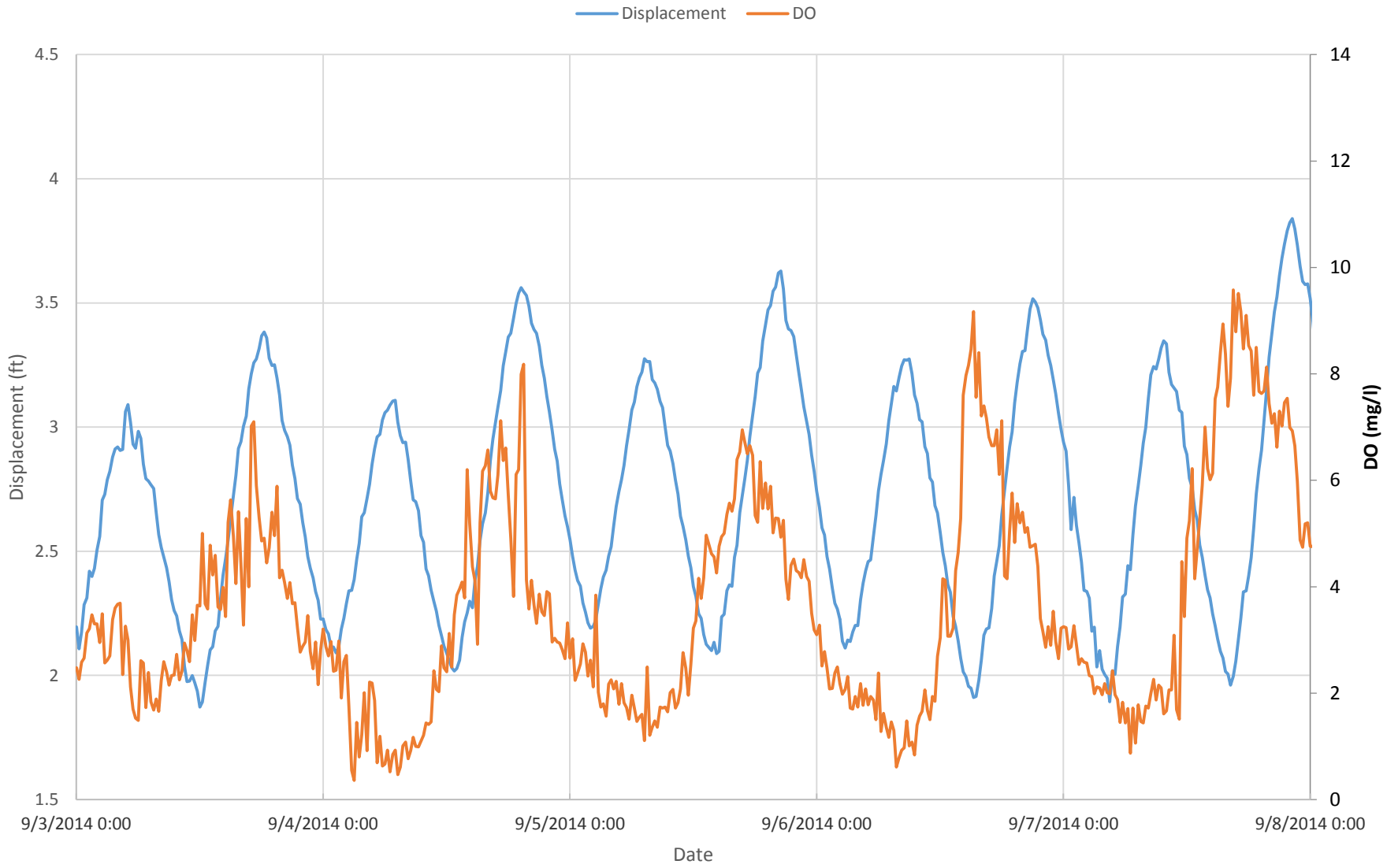


Figure 25
Daily Fluctuation in Dissolved Oxygen for a Five-Day Period in 2014
Tower Mews - A Location



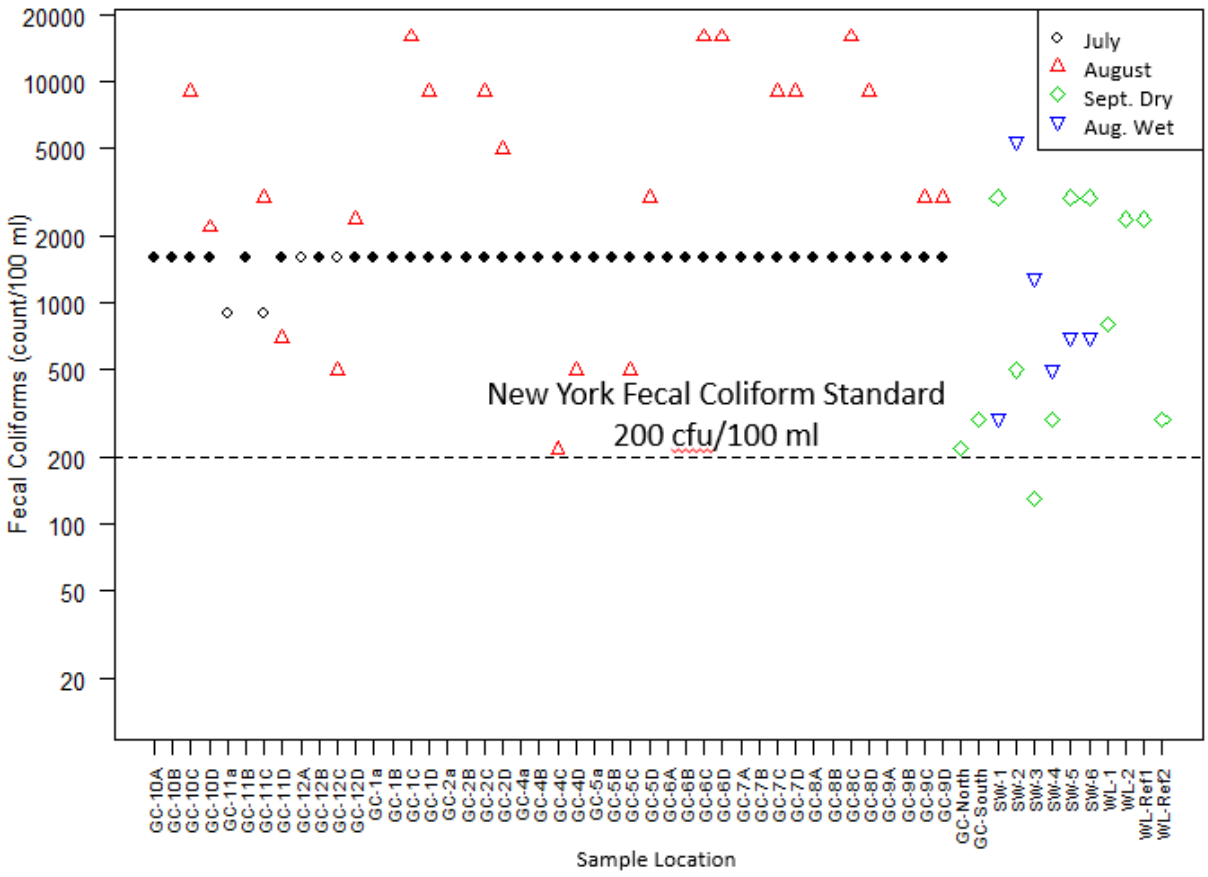


Figure 26. Fecal Coliform for All Sampling Events.

Solid shapes indicate that data value were quantified as " " the reported value'

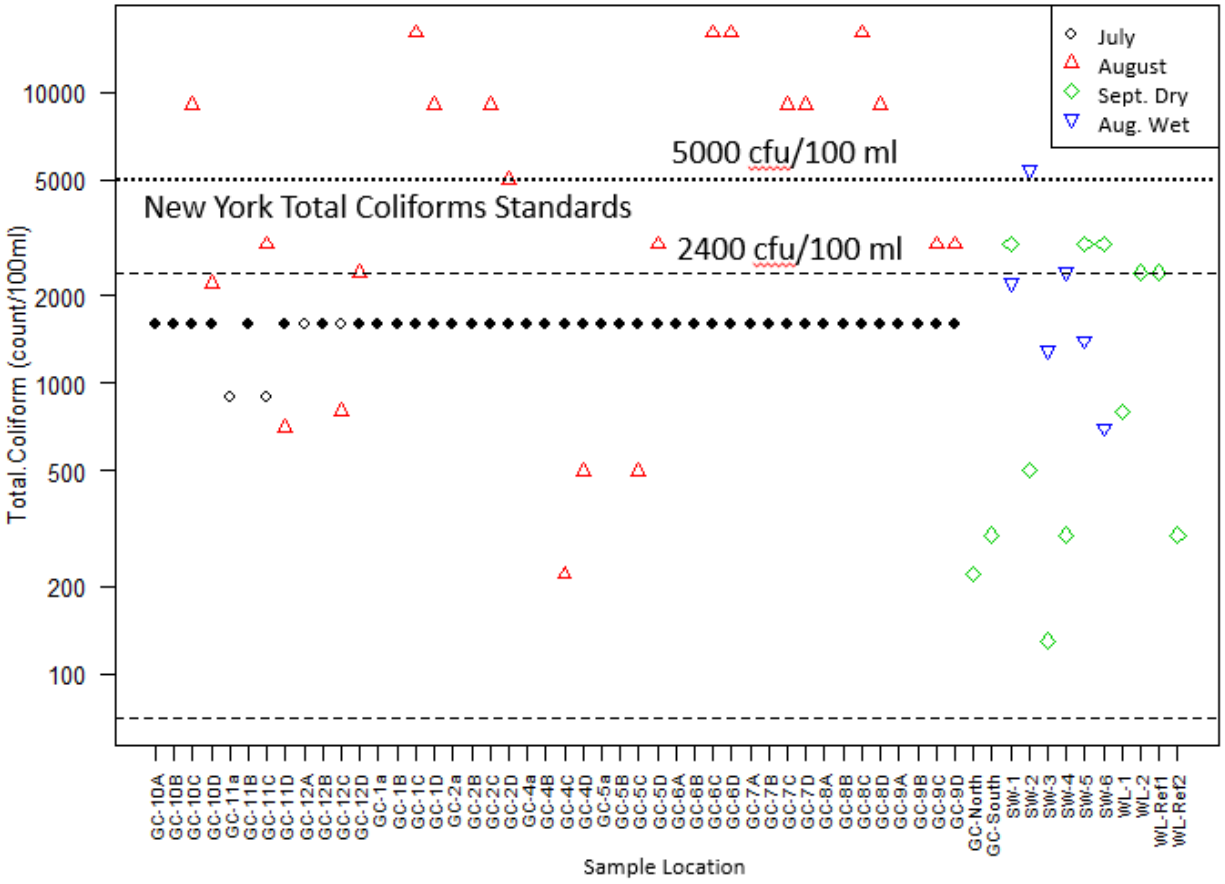


Figure 27. Total Coliform for All Sampling Events.

Solid shapes indicate that data value were quantified as " " the reported value.

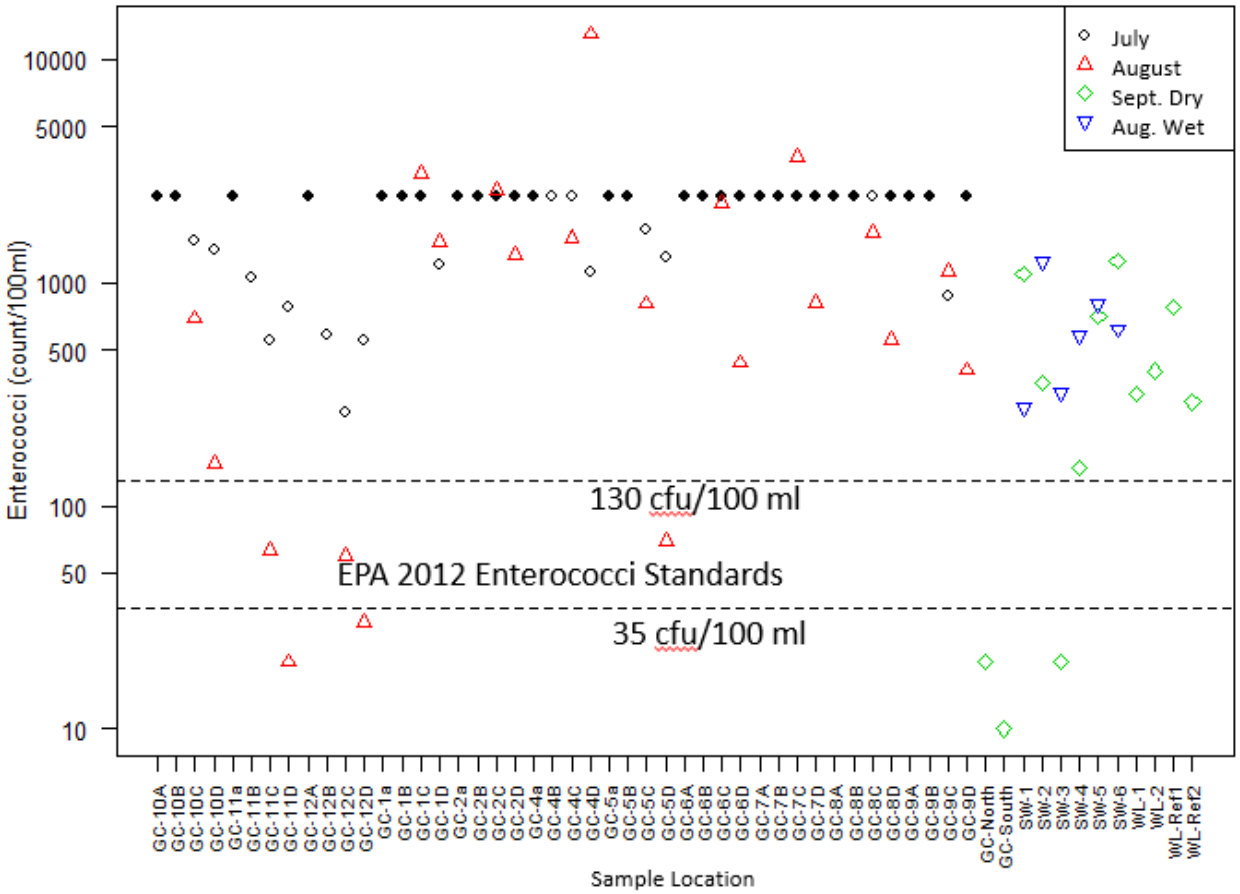


Figure 28. Enterococci for All Sampling Events.

Solid shapes indicate that data value were quantified as " " the reported value.

Figure 29. Mosquito Trap Site Locations.

ATTACHMENT A

ANALYTICAL RESULTS AND DATA QUALITY REVIEW

ATTACHMENT A-1

WATER QUALITY RESULTS AND FIELD NOTES

TABLE A-1
TIDAL CYCLE SAMPLING - JULY 15, 2015
GRAND CANAL

Station	Tidal Cycle	Site Details					Water Quality Results				Notes
		Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)	
1	Low	6:12 AM	N 40.72922	W 73.14925	6	25.88	1.3	19.77	7.3	0	--
	Mid-incoming	8:00 AM	N 40.72918	W 73.14931	5	26.29	1.22	21.02	8.2	0	--
	High	10:45 AM	N 40.72922	W 73.14925	6.7	27.37	3.69	24.36	9.9	0	--
	Mid-outgoing	1:53 PM	N 40.72915	W 73.1493	5.7	26.66	3.64	19.48	8.2	0	--
2	Low	6:25 AM	N 40.73052	W 73.1469	4.7	25.78	1.04	19.23	8.6	0	--
	Mid-incoming	8:07 AM	N 40.73048	W 73.1469	5.8	26.06	2.35	19.1	8	0	--
	High	10:55 AM	N 40.75051	W 73.14706	4.8	26.89	6.94	17.86	9.7	0	(1)
	Mid-outgoing	2:00 PM	N 40.73049	W 73.14702	5.6	27.26	8.05	18.82	12.1	0	--
4	Low	6:40 AM	N 40.73194	W 73.1524	11	26.21	7.22	18.22	10.1	0	--
	Mid-incoming	8:16 AM	N 40.73196	W 73.15247	10.5	26.34	6.28	19.25	11.4	0.1	--
	High	11:05 AM	N 40.73199	W 73.15247	11.7	26.92	12.63	18.45	10.1	0.1	--
	Mid-outgoing	2:15 PM	N 40.73196	W 73.15247	9.8	26.45	8.36	19.36	10	0	--
5	Low	6:48 AM	N 40.73191	W 73.15018	8	26.56	6.01	18.04	11	0	--
	Mid-incoming	8:25 AM	N 40.73194	W 73.15024	6.8	26.84	4.59	20.1	10.9	0	--
	High	11:15 AM	N 40.73199	W 73.15024	8.9	26.71	2.62	20.43	11.6	0	--
	Mid-outgoing	2:25 PM	N 40.73198	W 73.1502	6.6	26.79	9.33	18.81	15.1	0	--
6	Low	6:55 AM	N 40.73212	W 73.14722	7.1	26.74	1.75	18.89	9.1	0	--
	Mid-incoming	8:35 AM	N 40.73214	W 73.14733	7.6	26.63	3.95	18.26	10.1	0	--
	High	11:25 AM	N 40.7321	W 73.14722	7.6	26.91	3.9	19.65	9.9	0	--
	Mid-outgoing	2:32 PM	N 40.7321	W 73.14727	6.7	27.12	6.4	19.16	14	0	--
7	Low	7:05 AM	N 40.73328	W 73.14573	4.7	25.26	0.38	16.67	6.4	0	--
	Mid-incoming	8:42 AM	N 40.73327	W 73.14585	5.8	25.62	0.67	18.48	7.2	0	--
	High	11:37 AM	N 40.73322	W 73.14581	5.6	26.49	2.43	19.27	8.7	0	--
	Mid-outgoing	2:38 PM	N 40.73326	W 73.14585	4.1	26.36	2.85	18.59	8.2	0	--
8	Low	7:13 AM	N 40.73436	W 73.1481	3.2	25.88	0.66	16.02	11.2	0	--
	Mid-incoming	8:48 AM	N 40.73429	W 73.14805	4.8	25.82	0.39	18.52	7.6	0	--
	High	11:44 AM	N 40.73429	W 73.14811	4.3	26.31	2.91	19.01	8.7	0	--
	Mid-outgoing	2:43 PM	N 40.73429	W 73.14811	5	26.3	0.83	18.16	8.7	0	--

TABLE A-1
TIDAL CYCLE SAMPLING - JULY 15, 2015
GRAND CANAL

Station	Tidal Cycle	Site Details					Water Quality Results				Notes
		Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)	
9	Low	7:25 AM	N 40.73668	W 73.1467	4.5	25.57	0.14	17.68	7.9	0	(1)
	Mid-incoming	8:57 AM	N 40.73652	W 73.14664	4.7	25.64	1.01	17.5	11	0	(1)
	High	11:58 AM	N 40.73655	W 73.14669	4.5	26.59	3.37	16.53	11.2	0	--
	Mid-outgoing	2:55 PM	N 40.73663	W 73.14667	4.1	26.47	3.31	18.59	9.7	0	--
10	Low	7:32 AM	N 40.73849	W 73.14695	3.5	25.85	0.09	17.72	9.6	0	(1)
	Mid-incoming	9:05 AM	N 40.73847	W 73.1469	4.6	25.81	0.3	18.08	12.4	0	--
	High	12:05 PM	N 40.73841	W 73.14695	4.9	26.77	4.51	17.38	12.7	0	--
	Mid-outgoing	3:10 PM	N 40.73846	W 73.1469	4.5	26.47	3.32	18.14	13.4	0	(2)
11	Low	5:23 AM	N 40.73914	W 73.15045	4	26.46	1.34	15.91	8.7	0	--
	Mid-incoming	9:28 AM	N 40.73923	W 73.15049	3.5	26.21	1.23	16.92	10.6	0	--
	High	12:30 PM	N 40.73921	W 73.15055	3.5	27.24	2.85	19.28	10.8	0	--
	Mid-outgoing	1:30 PM	N 40.73921	W 73.15048	3.5	26.94	2.53	18.87	11.8	0.1	--
12	Low	5:22 AM	N 40.73897	W 73.15484	5	26.59	1.56	17.55	8	0	--
	Mid-incoming	9:23 AM	N 40.73899	W 73.15486	5.8	27.42	3.95	19.63	10.7	0	--
	High	12:25 PM	N 40.73901	W 73.15495	5.8	27.81	2.4	21.5	8.8	0	--
	Mid-outgoing	1:38 PM	N 40.73897	W 73.15498	5.5	27.48	0.59	22.05	9.6	0	--

Footnotes:
1 - Oily sheen on water.
2- Replicate sample collected.

Abbreviations:
DO - Dissolved oxygen
Sal - Salinity

Notes:
Weather Conditions: 73°F, overcast, winds north 3 mph

Depth to water from 5-star benchmark

6:00 AM	33.25"	Low
7:57 AM	27.75"	Mid-Incoming
11:20 AM	20.75"	High
1:52 PM	29"	Mid-Outgoing

TABLE A-2
TIDAL CYCLE SAMPLING - AUGUST 27, 2015
GRAND CANAL

Station	Tidal Cycle	Site Details					Water Quality Results				Notes
		Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)	
1	Low	6:54 AM	N 40.72915	W 73.14933	6	25.54	1.7	23.4	5.7	0	--
	Mid-incoming	8:57 AM	N 40.72921	W 73.14935	6	26.13	2.53	24.22	5.4	0	--
	High	11:04 AM	N 40.72915	W 73.14935	6.5	25.89	4.38	21.71	10.1	0	--
	Mid-outgoing	1:23 PM	N 40.72905	W 73.14927	6.2	26.03	6.1	21.84	12	0	--
2	Low	6:48 AM	N 40.73047	W 73.14690	4.6	24.82	1.48	21.74	6.9	0	(1)
	Mid-incoming	8:53 AM	N 40.73038	W 73.14702	5	25.45	2.4	21.89	8	0	--
	High	10:58 AM	N 40.73051	W 73.14696	5.1	25.14	5.98	21.14	10.1	0	--
	Mid-outgoing	1:17 PM	N 40.73047	W 73.14690	5.1	25.86	4.94	21.44	11	0	--
4	Low	6:31 AM	N 40.73210	W 73.15247	10.7	25.5	0	21.4	29.4	1	(2)
	Mid-incoming	8:38 AM	N 40.73209	W 73.15251	10.7	25.3	0	21.55	33.9	0	(2)
	High	10:44 AM	N 40.73207	W 73.15253	11	26.12	1.51	21.86	42.2	0	(2)
	Mid-outgoing	1:04 PM	N 40.73207	W 73.15253	10.5	26.89	4.02	22.03	20	0	(2)
5	Low	6:40 AM	N 40.73196	W 73.15016	7.9	26.62	0.28	21.8	7.7	0	--
	Mid-incoming	8:45 AM	N 40.73201	W 73.15024	8	26.63	0.86	21.98	7.8	0	--
	High	10:52 AM	N 40.73201	W 73.15024	8.2	27.52	3.66	22.37	7.8	0	--
	Mid-outgoing	1:11 PM	N 40.73201	W 73.15035	7.9	27.54	5.39	21.86	11.3	0	--
6	Low	6:21 AM	N 40.73210	W 73.14732	6.8	25.45	3.05	21.15	7.2	0	--
	Mid-incoming	8:27 AM	N 40.73207	W 73.14722	7.2	25.08	2.58	21.12	10	0	--
	High	10:32 AM	N 40.73201	W 73.14722	7.5	26.04	4.07	21.83	8.3	0	--
	Mid-outgoing	12:54 PM	N 40.73207	W 73.14718	7.4	26.58	6.2	21.23	9	0	--
7	Low	6:17 AM	N 40.73326	W 73.14575	4.6	24.29	0.93	21.12	12.1	0	--
	Mid-incoming	8:20 AM	N 40.73319	W 73.14571	5	23.92	1.53	20.83	8.3	0	--
	High	10:25 AM	N 40.73329	W 73.14573	5.2	25.07	2.94	21.25	19.1	0	--
	Mid-outgoing	12:44 PM	N 40.73327	W 73.14578	5.2	25.58	4.32	21.49	21	0	--
8	Low	6:10 AM	N 40.73405	W 73.14781	3	24.5	0.31	20.34	12.6	0	--
	Mid-incoming	8:13 AM	N 40.73412	W 73.14787	4.1	23.88	0.62	20.91	10.1	0	--
	High	10:18 AM	N 40.73411	W 73.14777	4.4	24.97	3.85	20.89	10.8	0	--
	Mid-outgoing	12:39 PM	N 40.73414	W 73.14789	4	26.04	6.85	20.69	13.9	0	--

TABLE A-2
TIDAL CYCLE SAMPLING - AUGUST 27, 2015
GRAND CANAL

Station	Tidal Cycle	Site Details					Water Quality Results				Notes
		Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)	
9	Low	6:00 AM	N 40.73663	W 73.14664	4.3	24.58	1.45	20.38	9.2	0	(1)
	Mid-incoming	8:00 AM	N 40.73668	W 73.14667	4.4	24.33	1.18	20.06	12.4	0	--
	High	10:08 AM	N 40.73664	W 73.14667	4.8	24.68	1.99	19.98	13.1	0	(1)
	Mid-outgoing	12:22 PM	N 40.73649	W 73.14661	4.1	25.23	4.85	20.48	9.6	0	--
10	Low	5:54 AM	N 40.73847	W 73.14691	3.4	24.71	1.7	20.18	10	0	--
	Mid-incoming	7:52 AM	N 40.73847	W 73.14698	3.7	24.88	2.32	19.74	10.1	0	(3)
	High	9:48 AM	N 40.73855	W 73.14696	4	25.38	2.64	20.45	15.4	0	(1)
	Mid-outgoing	12:11 PM	N 40.73844	W 73.14696	3.8	24.9	3.64	20.08	10.7	0	(1)
11	Low	5:41 AM	N 40.73911	W 73.15051	3.9	25.32	3.35	19.78	8.7	0	--
	Mid-incoming	7:50 AM	N 40.73907	W 73.14698	4.3	26.02	2.45	21.58	9.9	0	--
	High	9:41 AM	N 40.73905	W 73.15046	4.7	25.56	3.21	21.82	12.1	0	--
	Mid-outgoing	12:04 PM	N 40.73901	W 73.15067	4	26.05	4.39	20.9	11.6	0	--
12	Low	5:29 AM	N 40.73905	W 73.15498	4.8	25.96	3.52	19.53	9.1	0	--
	Mid-incoming	7:40 AM	N 40.73903	W 73.15493	5	27.84	4.21	23.33	7.8	0	--
	High	9:33 AM	N 40.73899	W 73.15498	5.4	27.89	6.31	22.84	7.8	0	--
	Mid-outgoing	11:54 AM	N 40.73907	W 73.15511	4.9	27.37	5.6	21.93	9.5	0	--

Footnotes:
1 - Oily sheen on water.
2 - Smells like sewage. Water very cloudy (white).
3- Replicate sample collected.

Abbreviations:
DO - Dissolved oxygen
Sal - Salinity

Notes:
Weather Conditions: 75°F, partly cloudy, winds northwest 7 mph

Depth to water from 5-star benchmark

5:10 AM	35.25"	Low
7:01 AM	31.0"	Mid-Incoming
9:04 AM	25.25"	High
11:11 AM	29.5"	Mid-Outgoing

TABLE A-3
DRY WEATHER STORMWATER SAMPLING - SEPTEMBER 3, 2015
GRAND CANAL

Site Number	Site Details					Water Quality Results				Notes
	Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)	
Reference										
WL-Ref-1	8:53 AM	N 40.72347	W 73.10586	2	24.13	1.7	22.56	8.4	N/A	Taken from center of canal near southwest corner of golf course. Only bacteria samples were collected.
WL-Ref-2	9:00 AM	N 40.72214	W 73.10837	3	25.02	1.62	22.62	7.9	N/A	Taken from culvert discharging from wetland into canal. Only bacteria samples were collected.
WL-1	9:31 AM	N 40.73286	W 73.14530	0.75	24.75	0	21.28	22	N/A	Taken along N/S running mosquitoe ditch. Only bacteria samples were collected.
WL-2	9:55 AM	N 40.73571	W 73.14620	0.5	23.12	0	18.98	20.1	N/A	Taken at threeway intersection of mosquitoe ditches. Only bacteria samples were collected.
Surface Water										
SW-1	10:00 AM	N 40.73668	W 73.14667	3	25.45	1.43	20.78	6.6	0	Taken from overland runoff into canal from dead end road
SW-2	10:15 AM	N 40.73201	W 73.14690	4.8	25.82	2.15	21.87	6.1	0	Stormwater outfall from road
SW-3	10:27 AM	N 40.73092	W 73.15043	4.6	26.21	2.36	22.21	6.2	0	Stormwater outfall from road
SW-4	10:43 AM	N 40.72785	W 73.14877	5.8	26.96	2	24.07	5.1	0	Outlet from small ditch
SW-5	10:34 AM	N 40.73012	W 73.14698	3	26.34	2.03	22.58	8	0	Taken from stream flowing from wetland into canal
SW-6	10:07 AM	N 40.73468	W 73.14607	2	25.59	1.06	21.33	7.6	0	Taken from culvert discharging from wetland into canal
Grand Canal										
GC-South	10:53 AM	N 40.72524	W 73.14946	20	27.92	5.21	23.97	5.8	N/A	Taken in Connetquot River west of the south entrance of Grand Canal. Only bacteria samples were collected.
GC-North	11:10 AM	N 40.74118	W 73.15408	3.8	28.36	8.56	20.95	8.9	N/A	Taken in Connetquot River north of north entrance of Grand Canal. Only bacteria samples were collected.

Notes:
Weather Conditions: 85°F, mostly cloudy, winds northwest 8 mph
0.00" of rain were observed for 72 hours prior to sampling

Abbreviations:
DO - Dissolved oxygen
Sal - Salinity
N/A - Not available
N/S - North/South

TABLE A-4
WET WEATHER STORMWATER SAMPLING - AUGUST 11, 2015
GRAND CANAL

Site Number	Site Details					Water Quality Results			
	Time	Coordinates		Depth (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Hydrogen Sulfide (mg/L)
SW-1	10:27 AM	N 40.73668	W 73.14667	3	N/A[(1)]	4.15	16.24	11	0
SW-2	10:38 AM	N 40.73201	W 73.14690	4.8	N/A[(1)]	4.21	17.7	9.4	0
SW-3	10:54 AM	N 40.73092	W 73.15043	4.6	N/A[(1)]	3.87	19.68	16.3	0
SW-4	11:08 AM	N 40.72785	W 73.14877	5.8	N/A[(1)]	2.77	18.74	20.2	0
SW-5	11:18 AM	N 40.73012	W 73.14698	3	N/A[(1)]	2.33	19.56	6.9	0
SW-6	11:33 AM	N 40.73468	W 73.14607	2	N/A[(1)]	2.76	16.83	10.7	0

Footnotes:
1 - Temperature sensor was not functioning correctly.

Abbreviations:
DO - Dissolved oxygen
Sal - Salinity
N/A - Not available

Notes:
Weather Conditions: 85°F, mostly cloudy, winds northwest 8 mph
By 8:34 AM, 0.53" of rain had accumulated. Sampling concluded at 11:33 AM within the 3 hour period following the onset of a "significant rainfall event". By 11:56, 1.86" of rain had accumulated.

TABLE A-5
SEDIMENT SAMPLING - DECEMBER 21-22, 2015
GRAND CANAL

	Site Details					Water Quality Results					
						Top				Middle	Bottom
Station	Date	Time	Depth (ft)	Depth @ MLW (ft)	Core Length (ft)	Temp (°C)	DO (mg/L)	Sal (PSU)	Turbidity (NTU)	Sal (PSU)	Sal (PSU)
1	21-Dec	11:11	4	3.5	2.5	7.66	0.64	17.11	6.7	21.44	24.19
2	21-Dec	12:17	3.5	3.25	2.75	8.07	2.33	17.53	6.7	19	20.4
3	21-Dec	1:30	4	4	2	8.31	3.05	15.31	9.4	20	23.15
4	21-Dec	2:10	4	4	2	8.37	3.45	13.43	8.8	14.05	19.9
5	21-Dec	2:50	4	4	2	8.74	4.11	12.79	15.6	15.04	15.53
6	22-Dec	12:50	3	2.75	3.25	9.82	3.39	1.67	6.9	(1)	(1)
7	22-Dec	12:20	3	2.5	3.5	9.18	3.39	1.83	10.4	3.79	16.87
8	22-Dec	11:55	3.5	3	3	9.66	3.23	0.81	0.2	16.53	20.7
9	22-Dec	11:16	3	2.5	3.5	9.57	3.32	0.86	7.9	1.76	13.03
10	22-Dec	10:45	4	3.75	2.25	9.63	2.66	1.2	1	10.2	23.58

Footnotes:
1 - Only top value available, because it was very shallow.

Notes:
It was raining heavily on 12/22, so the salinity is lower.

Abbreviations:
DO - Dissolved oxygen
MLW - Mean low water
Sal - Salinity

ATTACHMENT A-2

ANALYTICAL RESULTS FOR 2015 SURFACE WATER SAMPLES

Detected Results for Surface Water Samples

Detected Results for Grand Canal – July 2015 Tidal Sampling Event

Sample ID		GC-1A		GC-2A		GC-4A		GC-5A		GC-6A		GC-7A		GC-8A		GC-9A	
York ID		15G0557-01		15G0557-02		15G0557-03		15G0557-04		15G0557-05		15G0557-06		15G0557-07		15G0557-08	
Sampling Date		7/15/2015 6:12:00 AM		7/15/2015 6:25:00 AM		7/15/2015 6:40:00 AM		7/15/2015 6:48:00 AM		7/15/2015 6:55:00 AM		7/15/2015 7:05:00 AM		7/15/2015 7:13:00 AM		7/15/2015 7:25:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	1		0.20	U	0.20	U	0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	0.30	J	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.57		0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.58		0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	1.10		0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	2.20		0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	2.90		0.20	U	0.20	U	0.20	U
Trichloroethylene	79-01-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	3.20		0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	0.51	U	0.62		0.50	U	0.51	U	0.51	U	0.59		0.51	U	0.57	U
Fluoranthene	206-44-0	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.056	U	0.051	U	0.057	U
Naphthalene	91-20-3	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.056	U	0.051	U	0.069	
N-nitroso-di-n-propylamine	621-64-7	2.56	U	2.56	U	2.50	U	2.56	U	2.56	U	2.78	U	2.56	U	2.86	U
Phenanthrene	85-01-8	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.078		0.051	U	0.13	
Pyrene	129-00-0	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.056	U	0.051	U	0.057	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		2,200		4,700		2,100		2,200		2,100		1,200	U	2,100		1,500	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,400		2,100		1,300		1,400		1,400		1,400		1,300		1,300	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		50	U	50	U	50	U	50	U	50	U	50	U	50	U	61	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		221		50	U	58		58		50	U	50	U	50	U	115	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U

Sample ID		GC-10A		GC-1B		GC-2B		GC-4B		GC-5B		GC-6B		GC-7B		GC-8B	
York ID		15G0557-09		15G0557-10		15G0557-11		15G0557-12		15G0557-13		15G0557-14		15G0557-15		15G0557-16	
Sampling Date		7/15/2015 7:32:00 AM		7/15/2015 8:00:00 AM		7/15/2015 8:07:00 AM		7/15/2015 8:16:00 AM		7/15/2015 8:25:00 AM		7/15/2015 8:35:00 AM		7/15/2015 8:42:00 AM		7/15/2015 8:48:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.50		0.20	U	0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.40	J	0.20	U	0.45	J
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.31	J	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.54		0.20	U	0.23	J
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	1.10		0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	1.50		0.20	U	0.78	
Trichloroethylene	79-01-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	1.60		0.60	U	0.72	J
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		10		1	
Bis(2-ethylhexyl)phthalate	117-81-7	0.51	U	15.10		0.51	U	0.50	U	4.52		7.60		101	D	5.15	
Fluoranthene	206-44-0	0.051	U	0.051	U	0.051	U	0.050	U	0.056	U	0.051	U	0.050	U	0.050	U
Naphthalene	91-20-3	0.051	U	0.051	U	0.051	U	0.050	U	0.056	U	0.051	U	0.050	U	0.050	U
N-nitroso-di-n-propylamine	621-64-7	2.56	U	2.56	U	2.56	U	2.50	U	2.78	U	2.56	U	2.50	U	2.50	U
Phenanthrene	85-01-8	0.051	U	0.051	U	0.051	U	0.050	U	0.056	U	0.051	U	0.050	U	0.050	U
Pyrene	129-00-0	0.051	U	0.051	U	0.051	U	0.050	U	0.056	U	0.051	U	0.050	U	0.050	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		2,300		1,300		2,300		2,600		2,200		2,200		1,900		1,600	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,300		1,200	U	1,200	U	1,400		1,800		1,300		1,200	U	1,200	U
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		65		57		65		80		50	U	53		50	U	57	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		63		50		57		78		50	U	55		50		59	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U

Sample ID		GC-9B		GC-10B		GC-1C		GC-2C		GC-4C		GC-5C		GC-6C		GC-7C	
York ID		15G0557-17		15G0557-18		15G0557-19		15G0557-20		15G0557-21		15G0557-22		15G0557-23		15G0557-24	
Sampling Date		7/15/2015 8:57:00 AM		7/15/2015 9:05:00 AM		7/15/2015 10:45:00 AM		7/15/2015 10:55:00 AM		7/15/2015 11:05:00 AM		7/15/2015 11:15:00 AM		7/15/2015 11:25:00 AM		7/15/2015 11:37:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	7.50		0.20	U	0.20	U	0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.37	J	0.20	U
Trichloroethylene	79-01-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	4.64		3.08		6.87		4		8.18		9.02		5.33		4.83	
Fluoranthene	206-44-0	0.056	U	0.051	U	0.051	U	0.057	U	0.12		0.051	U	0.056	U	0.050	U
Naphthalene	91-20-3	0.056	U	0.051	U	0.051	U	0.057	U	0.092		0.051	U	0.056	U	0.050	U
N-nitroso-di-n-propylamine	621-64-7	2.78	U	2.56	U	2.56	U	2.86	U	2.56	U	2.56	U	2.78	U	2.50	U
Phenanthrene	85-01-8	0.056	U	0.051	U	0.051	U	0.057	U	0.051	U	0.051	U	0.056	U	0.050	U
Pyrene	129-00-0	0.056	U	0.051	U	0.051	U	0.057	U	0.062		0.051	U	0.056	U	0.050	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		2,700		3,100		1,500		2,200		2,000		1,700		1,900		2,500	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,300		1,200	U	1,200	U	1,400		1,400		1,500		1,300		1,400	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		50	U	50	U	80		61		95		65		59		83	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		61		57		153		113		149		301		215		329	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U

Sample ID		GC-8C		GC-9C		GC-10C		GC-1D		GC-2D		GC-4D		GC-5D		GC-6D	
York ID		15G0557-25		15G0557-26		15G0557-27		15G0557-28		15G0557-29		15G0557-30		15G0557-31		15G0557-32	
Sampling Date		7/15/2015 11:44:00 AM		7/15/2015 11:58:00 AM		7/15/2015 12:05:00 PM		7/15/2015 1:53:00 PM		7/15/2015 2:00:00 PM		7/15/2015 2:15:00 PM		7/15/2015 2:25:00 PM		7/15/2015 2:32:00 PM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	3.50		0.20	U	0.20	U	0.20	U	2	J	2.60	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Trichloroethylene	79-01-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	4.83		9.61		4.39		3.62		4.41		5.24		28.10		9.76	
Fluoranthene	206-44-0	0.056	U	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.051	U	0.051	U
Naphthalene	91-20-3	0.056	U	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.051	U	0.051	U
N-nitroso-di-n-propylamine	621-64-7	2.78	U	2.56	U	2.56	U	2.50	U	2.56	U	2.56	U	2.56	U	2.56	U
Phenanthrene	85-01-8	0.056	U	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.051	U	0.051	U
Pyrene	129-00-0	0.056	U	0.051	U	0.051	U	0.050	U	0.051	U	0.051	U	0.051	U	0.051	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,900		2,400		2,400		1,400		1,600		2,000		1,600		1,600	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,400		1,400		1,300		1,300		1,300		1,200	U	1,200	U	1,400	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		68		50	U	50	U	50	U	61		50	U	50	U	55	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		145		93		50	U	100		168		110		138		106	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U

Sample ID		GC-7D		GC-8D		GC-9D		GC-10D		GC-11A		GC-11B		GC-11C		GC-11D	
York ID		15G0557-33		15G0557-34		15G0557-35		15G0557-36		15G0557-37		15G0557-38		15G0557-39		15G0557-40	
Sampling Date		7/15/2015 2:38:00 PM		7/15/2015 2:43:00 PM		7/15/2015 2:55:00 PM		7/15/2015 3:10:00 PM		7/15/2015 5:23:00 AM		7/15/2015 9:28:00 AM		7/15/2015 12:30:00 PM		7/15/2015 1:30:00 PM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	2	J	0.20	U	0.20	U	2.70		4.30	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Trichloroethylene	79-01-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	7.17	U1	6.66	U1	6.66	U1	6.36	U1	7.21	U1	7.03	U1	6.43	U1	3.72	U1
Fluoranthene	206-44-0	0.054	U	0.054	U	0.054	U	0.054	U	0.087		0.054	U	0.054	U	0.054	U
Naphthalene	91-20-3	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U
N-nitroso-di-n-propylamine	621-64-7	2.70	U	2.70	U	2.70	U	2.70	U	2.70	U	2.70	U	2.70	U	4.32	J
Phenanthrene	85-01-8	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U	0.054	U
Pyrene	129-00-0	0.054	U	0.054	U	0.054	U	0.054	U	0.065		0.054	U	0.054	U	0.054	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,300		1,500		1,600		1,700		2,200		2,700		2,900		3,200	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,800		1,300		1,200	U	1,200	U	1,300		2,000		1,200	U	1,400	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		57		57		50	U	65		83		50	U	87		100	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		87		78		108		130		91		55		110		151	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,200		1,050	U	1,050	U

Sample ID		GC-12A		GC-12B		GC-12C		GC-12D		Replicate		Trip Blank	
York ID		15G0557-41		15G0557-42		15G0557-43		15G0557-44		15G0557-45		15G0557-46	
Sampling Date		7/15/2015 5:22:00 AM		7/15/2015 9:23:00 AM		7/15/2015 12:25:00 PM		7/15/2015 1:38:00 PM		7/15/2015 3:00:00 PM		7/15/2015 3:00:00 PM	
Client Matrix		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L				ug/L	
Dilution Factor		1		1		1		1				1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
1,3,5-Trimethylbenzene	108-67-8	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	NT		0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	NT		0.50	U
Toluene	108-88-3	0.45	J	0.20	U	0.20	U	0.20	U	NT		0.20	U
Trichloroethylene	79-01-6	0.36	J	0.22	J	0.20	U	0.20	U	NT		0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	NT		0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Bis(2-ethylhexyl)phthalate	117-81-7	8.28	U1	6.03	U1	6.09	U1	6.50	U1	6.27	U1	NT	
Fluoranthene	206-44-0	0.054	U	0.054	U	0.054	U	0.056	U	0.056	U	NT	
Naphthalene	91-20-3	0.054	U	0.054	U	0.054	U	0.056	U	0.056	U	NT	
N-nitroso-di-n-propylamine	621-64-7	2.70	U	2.70	U	2.70	U	2.78	U	2.78	U	NT	
Phenanthrene	85-01-8	0.054	U	0.054	U	0.054	U	0.056	U	0.056	U	NT	
Pyrene	129-00-0	0.054	U	0.054	U	0.054	U	0.056	U	0.056	U	NT	
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Total Nitrogen		2,300		2,600		1,500		2,400		1,700		NT	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Nitrogen, Total-Dissolved		3,500		3,700		2,500		3,200		3,900		NT	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Phosphorous, Dissolved as P		50	U	50	U	59		85		76		NT	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Phosphorous, Total as P		50	U	50	U	76		110		65		NT	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Total Inorganic Nitrogen, Dissolved		1,400		1,600		1,050	U	1,050	U	1,050	U	NT	

Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
NT=this indicates the analyte was not a target for this sample

Validation Qualifiers:
1 - Qualified as nondetect due to method blank contamination

Detected Results for Grand Canal – August 2015 Tidal Sampling Event

Sample ID		GC-1A		GC-2A		GC-4A		GC-5A		GC-6A		GC-7A		GC-8A		GC-9A	
York ID		15H0938-01		15H0938-02		15H0938-03		15H0938-04		15H0938-05		15H0938-06		15H0938-07		15H0938-08	
Sampling Date		8/27/2015 6:54:00 AM		8/27/2015 6:48:00 AM		8/27/2015 6:31:00 AM		8/27/2015 6:40:00 AM		8/27/2015 6:21:00 AM		8/27/2015 6:17:00 AM		8/27/2015 6:10:00 AM		8/27/2015 6:00:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
2-Butanone	78-93-3	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.80	U	0.20	U	0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
2,6-Dinitrotoluene	606-20-2	2.50	U	2.50	U	2.56	U	2.56	U	2.78	U	2.56	U	2.50	U	2.50	U
Acenaphthene	83-32-9	0.050	U	0.050	U	0.062		0.051	U	0.056	U	0.051	U	0.050	U	0.050	U
Bis(2-ethylhexyl)phthalate	117-81-7	0.50	U	1.07		2.41		0.93		0.56	UJ2	0.51	U	0.89		0.50	U
Fluoranthene	206-44-0	0.050	U	0.050	U	0.072		0.051	U	0.056	U	0.051	U	0.050	U	0.050	U
Fluorene	86-73-7	0.050	U	0.050	U	0.051	U	0.051	U	0.056	U	0.051	U	0.050	U	0.050	U
Pyrene	129-00-0	0.050	U	0.050	U	0.051	U	0.051	U	0.056	U	0.051	U	0.050	U	0.050	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		2,200		1,700		1,900		1,800		1,600		1,800		1,800		1,600	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,900		1,700		1,700		2,000		1,900		1,900		1,800		1,800	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		50	U	50	U	50	U	50	U	50	U	50	U	50	U	143	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		50	U	50	U	63		50	U	50	U	50	U	50	U	53	

Sample ID		GC-10A		GC-1B		GC-2B		GC-4B		GC-5B		GC-6B		GC-7B		GC-8B	
York ID		15H0938-09		15H0938-10		15H0938-11		15H0938-12		15H0938-13		15H0938-14		15H0938-15		15H0938-17	
Sampling Date		8/27/2015 5:54:00 AM		8/27/2015 8:57:00 AM		8/27/2015 8:53:00 AM		8/27/2015 8:38:00 AM		8/27/2015 8:45:00 AM		8/27/2015 8:27:00 AM		8/27/2015 8:20:00 AM		8/27/2015 8:13:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.31	J	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
2-Butanone	78-93-3	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	3.50		2.10	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.25	J	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.24	J	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.75	J	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.82		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.99	J	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
2,6-Dinitrotoluene	606-20-2	2.50	U	2.56	U	2.50	U	2.56	U	2.50	U	2.50	U	2.50	U	2.56	U
Acenaphthene	83-32-9	0.050	U	0.051	U	0.050	U	0.051	U	0.050	U	0.050	U	0.050	U	0.051	U
Bis(2-ethylhexyl)phthalate	117-81-7	4.18		0.51	UJ2	0.50	UJ2	0.62	J2	0.69	J2	0.50	U	0.50	UJ2	1.06	
Fluoranthene	206-44-0	0.10		0.051	U	0.050	U	0.082		0.050	U	0.050	U	0.050	U	0.051	U
Fluorene	86-73-7	0.050	U	0.051	U	0.050	U	0.072		0.050	U	0.050	U	0.050	U	0.051	U
Pyrene	129-00-0	0.050	U	0.051	U	0.050	U	0.051	U	0.050	U	0.050	U	0.10		0.051	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,800		1,600		2,300		1,600		1,500		2,000		4,600		1,900	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		2,000		1,500		2,000		2,000		1,600		2,000		1,600		1,800	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		128		115		98		125		91		50	U	91		87	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		50	U	53		55		106		50	U	50	U	102		61	

Sample ID		GC-9B		GC-10B		GC-1C		GC-2C		GC-4C		GC-5C		GC-6C		GC-7C	
York ID		15H0938-18		15H0938-19		15H0938-20		15H0938-21		15H0938-22		15H0938-23		15H0938-24		15H0938-25	
Sampling Date		8/27/2015 8:00:00 AM		8/27/2015 7:52:00 AM		8/27/2015 11:04:00 AM		8/27/2015 10:58:00 AM		8/27/2015 10:44:00 AM		8/27/2015 10:52:00 AM		8/27/2015 10:32:00 AM		8/27/2015 10:25:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
2-Butanone	78-93-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	4.50		3.40		3.50		4.10		0.20	U	0.20	U	6		2.60	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.91		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.88		0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
2,6-Dinitrotoluene	606-20-2	2.78	U	2.56	U	2.50	U	2.78	U	2.56	U	2.56	U	2.56	U	2.56	U
Acenaphthene	83-32-9	0.056	U	0.051	U	0.050	U	0.056	U	0.051	U	0.051	U	0.051	U	0.051	U
Bis(2-ethylhexyl)phthalate	117-81-7	0.56	U	0.65	J2	0.54	J2	0.56	U	1.58	J2	0.51	U	0.75	J2	4.41	J2
Fluoranthene	206-44-0	0.056	U	0.051	U	0.050	U	0.056	U	0.051	U	0.051	U	0.051	U	0.051	U
Fluorene	86-73-7	0.056	U	0.051	U	0.050	U	0.056	U	0.051	U	0.051	U	0.051	U	0.051	U
Pyrene	129-00-0	0.056	U	0.051	U	0.050	U	0.14		0.051	U	0.051	U	0.051	U	0.051	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,900		1,700		1,200	U	1,200	U	2,200		2,000		1,400		1,600	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,900		1,900		1,200	U	1,200	U	1,900		1,900		1,800		1,800	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		132		119		128		143		132		121		153		123	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		136		61		57		109		226		162		119		132	

Detected Results for Grand Canal – August 2015 Tidal Sampling Event

Sample ID		GC-8C		GC-9C		GC-10C		GC-1D		GC-2D		GC-4D		GC-5D		GC-6D	
York ID		15H0938-26		15H0938-27		15H0938-28		15H0938-29		15H0938-30		15H0938-31		15H0938-32		15H0938-33	
Sampling Date		8/27/2015 10:18:00 AM		8/27/2015 10:08:00 AM		8/27/2015 9:48:00 AM		8/27/2015 1:23:00 PM		8/27/2015 1:17:00 PM		8/27/2015 1:04:00 PM		8/27/2015 1:11:00 PM		8/27/2015 12:54:00 PM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
2-Butanone	78-93-3	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	0.20	U	4.30		0.20	U	2.50		3.20		0.20	U	5.70		4.90	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.65		0.47	J	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	0.20	U	0.92		0.94		0.21	J	0.22	J	0.25	J	0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
2,6-Dinitrotoluene	606-20-2	2.56	U	2.56	U	2.56	U	2.56	U	2.56	U	2.50	U	2.56	U	2.78	U
Acenaphthene	83-32-9	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U	0.050	U	0.051	U	0.056	U
Bis(2-ethylhexyl)phthalate	117-81-7	0.51	UJ2	6.12		0.51	UJ2	0.51	UJ2	0.56		0.54		0.51	U	0.62	
Fluoranthene	206-44-0	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U	0.080		0.051	U	0.056	U
Fluorene	86-73-7	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U	0.050	U	0.051	U	0.056	U
Pyrene	129-00-0	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U	0.050	U	0.051	U	0.056	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,800		1,800		1,900		1,700		1,800		1,900		2,500		1,900	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,900		2,100		2,000		2,100		1,800		2,900		2,800		1,900	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		181		188		153		130		108		262		286		158	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		138		170		155		128		170		149		254		130	

Sample ID		GC-7D		GC-8D		GC-9D		GC-10D		GC-11A		GC-11B		GC-11C		GC-11D	
York ID		15H0938-34		15H0938-35		15H0938-36		15H0938-37		15H0938-38		15H0938-39		15H0938-40		15H0938-41	
Sampling Date		8/27/2015 12:44:00 PM		8/27/2015 12:39:00 PM		8/27/2015 12:22:00 PM		8/27/2015 12:11:00 PM		8/27/2015 5:41:00 AM		8/27/2015 7:50:00 AM		8/27/2015 9:41:00 AM		8/27/2015 12:04:00 PM	
Client Matrix		Water		Water		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.37	J	0.20	U	0.20	U	0.46	J	0.20	U
2-Butanone	78-93-3	0.33	J	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Acrolein	107-02-8	7.80		5.70		5.30		6.10		2.20		2.80		2.60		6.20	
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.43	J	0.20	U	0.20	U	0.47	J	0.32	J
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.20	U	0.40	J	0.41	J	0.43	J	0.32	J	0.20	U	0.27	J
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.33	J	0.20	U	0.20	U	0.46	J	0.31	J
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.42	J	0.20	U	0.20	U	0.49	J	0.33	J
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.95	J	0.50	U	0.50	U	1.20		0.71	J
Toluene	108-88-3	0.20	U	0.20	U	0.33	J	2.20		0.20	U	0.26	J	2.70		1.40	
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	1.40	J	0.60	U	0.60	U	1.70		1	J
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
2,6-Dinitrotoluene	606-20-2	2.78	UJ2	2.56	U	2.56	U	2.56	U	2.50	U	2.50	UJ2	2.56	U	2.56	UJ2
Acenaphthene	83-32-9	0.056	UJ2	0.051	U	0.051	U	0.051	U	0.050	U	0.050	UJ2	0.051	U	0.051	UJ2
Bis(2-ethylhexyl)phthalate	117-81-7	11.90	J2	0.71		0.61		0.51	U	1.28		11.60	J2	0.80		2.75	J2
Fluoranthene	206-44-0	0.056	UJ2	0.051	U	0.051	U	0.051	U	0.050	U	0.050	UJ2	0.051	U	0.051	UJ2
Fluorene	86-73-7	0.056	UJ2	0.051	U	0.051	U	0.051	U	0.050	U	0.050	UJ2	0.051	U	0.051	UJ2
Pyrene	129-00-0	0.056	UJ2	0.051	U	0.051	U	0.051	U	0.050	U	0.050	UJ2	0.051	U	0.051	UJ2
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Total Nitrogen		1,800		2,400		3,200		3,300		2,000		2,100		2,100		1,700	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		1,400		1,700		1,800		1,800		1,800		1,700		1,600		1,800	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Dissolved as P		361		363		125		166		145		232		106		185	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1		1		1	
Phosphorous, Total as P		192		256		145		143		113		183		138		181	

Detected Results for Grand Canal – August 2015 Tidal Sampling Event

Sample ID		GC-12A		GC-12B		GC-12C		GC-12D		Replicate		Trip Blank	
York ID		15H0938-42		15H0938-43		15H0938-44		15H0938-45		15H0938-46		15H0938-47	
Sampling Date		8/27/2015 5:29:00 AM		8/27/2015 7:40:00 AM		8/27/2015 9:33:00 AM		8/27/2015 11:54:00 AM		8/27/2015 12:00:00 AM		8/27/2015 12:00:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
2-Butanone	78-93-3	0.20	U	0.20	U	0.20	UJ2	0.20	UJ2	0.20	UJ2	0.20	UJ2
Acrolein	107-02-8	4.60		3.50		0.20	U	0.20	U	0.20	U	0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
cis-1,2-Dichloroethylene	156-59-2	0.20	U	0.20	U	0.20	U	0.20	U	0.84		0.20	U
Ethyl Benzene	100-41-4	0.20	U	0.20	U	0.20	U	0.28	J	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.69	J	0.50	U	0.50	U
Toluene	108-88-3	0.33	J	0.29	J	0.20	U	1.50		0.85		0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.69	J	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
2,6-Dinitrotoluene	606-20-2	2.50	U	2.50	U	2.50	U	16		2.86	U	NT	
Acenaphthene	83-32-9	0.050	U	0.050	U	0.050	U	0.050	U	0.057	U	NT	
Bis(2-ethylhexyl)phthalate	117-81-7	1.87		2.39		0.50	U	1.04		0.77		NT	
Fluoranthene	206-44-0	0.050	U	0.050	U	0.050	U	0.050	U	0.057	U	NT	
Fluorene	86-73-7	0.050	U	0.050	U	0.050	U	0.050	U	0.057	U	NT	
Pyrene	129-00-0	0.050	U	0.050	U	0.050	U	0.050	U	0.057	U	NT	
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Total Nitrogen		2,100		1,900		1,900		1,700		1,800		NT	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Nitrogen, Total-Dissolved		1,400		1,400		1,400		1,300		1,700		NT	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Phosphorous, Dissolved as P		155		102		432		314		164		NT	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L			
Dilution Factor		1		1		1		1		1			
Phosphorous, Total as P		115		78		301		98		153		NT	

Q is the Qualifier Column with definitions as follows:
D=result is from an analysis that required a dilution
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated
NT=this indicates the analyte was not a target for this sample

Validation Qualifiers:
1 - Qualified as nondetect due to trip blank contamination
2 - Qualified as estimated due to LCS noncompliance

Detected Results for Grand Canal – August 2015 Wet Sampling Event

Sample ID		**SW-1**		**SW-2**		**SW-3**		**SW-4**		**SW-5**		**SW-6**	
York ID		**15H0318-01**		**15H0318-02**		**15H0318-03**		**15H0318-04**		**15H0318-05**		**15H0318-06**	
Sampling Date		**8/11/2015 10:27:00 AM**		**8/11/2015 10:38:00 AM**		**8/11/2015 10:54:00 AM**		**8/11/2015 11:08:00 AM**		**8/11/2015 11:18:00 AM**		**8/11/2015 11:33:00 AM**	
Client Matrix		**Water**		**Water**		**Water**		**Water**		**Water**		**Water**	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
2-Butanone	78-93-3	0.20	U	0.20	U	0.21	J	0.20	U	0.20	U	0.20	U
Acetone	67-64-1	2.10		1.90	J	1.80	J	3.10		1	U	1	U
Acrolein	107-02-8	0.80	U	1.10	J	1.60	J	0.80	U	0.80	U	0.80	U
Benzene	71-43-2	0.20	U	0.46	J	0.20	U	0.20	U	0.20	U	0.20	U
Carbon disulfide	75-15-0	0.24	J	0.20	U	0.21	J	0.20	U	0.20	U	0.20	U
Chloromethane	74-87-3	0.32	J	0.27	J	0.37	J	0.36	J	0.28	J	0.35	J
Toluene	108-88-3	0.20	U	0.93		0.20	U	0.20	U	0.20	U	0.20	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	1.33		5.89		0.75		5.37		0.51	U	0.53	
Fluoranthene	206-44-0	0.092		0.051	U	0.082		0.051	U	0.051	U	0.051	U
Fluorene	86-73-7	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U	0.051	U
Phenanthrene	85-01-8	0.13		0.051	U	0.051	U	0.051	U	0.051	U	0.051	U
Pyrene	129-00-0	0.082		0.051	U	0.051	U	0.051	U	0.051	U	0.051	U
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Total Nitrogen		3,500		2,000	U	2,000	U	2,000	U	2,000	U	2,400	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Phosphorous, Dissolved as P		80		87		85		132		80		72	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Phosphorous, Total as P		85		282		115		597		140		100	

Q is the Qualifier Column with definitions as follows:
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated

Detected Results for Grand Canal – September 2015 Sampling Event

Sample ID		SW 1		SW 2		SW 3		SW 4		SW 5		SW 6	
York ID		15I0122-01		15I0122-02		15I0122-03		15I0122-04		15I0122-05		15I0122-06	
Sampling Date		9/3/2015 10:00:00 AM		9/3/2015 10:15:00 AM		9/3/2015 10:27:00 AM		9/3/2015 10:43:00 AM		9/3/2015 10:34:00 AM		9/3/2015 10:07:00 AM	
Client Matrix		Water		Water		Water		Water		Water		Water	
Compound	**CAS Number**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organics, 8260 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
1,2,4-Trimethylbenzene	95-63-6	0.20	U	0.20	U	0.20	U	0.26	J	0.20	U	0.20	U
Acetone	67-64-1	1	U	1.80	J	1	U	1	U	2		1.80	J
Acrolein	107-02-8	7.20		0.20	U	2.40		2.70		2.20		0.20	U
Benzene	71-43-2	0.20	U	0.20	U	0.20	U	0.25	J	0.20	U	0.20	U
o-Xylene	95-47-6	0.20	U	0.20	U	0.20	U	0.26	J	0.20	U	0.20	U
p- & m- Xylenes	179601-23-1	0.50	U	0.50	U	0.50	U	0.66	J	0.50	U	0.50	U
tert-Butyl alcohol (TBA)	75-65-0	0.81	J	0.87	J	0.71	J	0.50	U	0.50	U	0.50	U
Toluene	108-88-3	1		0.20	U	0.20	U	1.20		0.20	U	0.20	U
Xylenes, Total	1330-20-7	0.60	U	0.60	U	0.60	U	0.92	J	0.60	U	0.60	U
Semi-Volatiles, 8270 - Comprehensive		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Bis(2-ethylhexyl)phthalate	117-81-7	2.53		4.15		90.30		2.75		4.97		5.71	
Naphthalene	91-20-3	0.053	U	0.051	U	0.053	U	0.86		0.60		0.87	
Nitrogen, Total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Total Nitrogen		3,100		2,300		2,900		2,200		2,000		2,100	
Nitrogen, Total-Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Nitrogen, Total-Dissolved		3,000		2,400		2,000		2,400		2,300		2,300	
Phosphorous, Dissolved as P		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Phosphorous, Dissolved as P		224		138		149		164		155		128	
Phosphorous, total		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Phosphorous, Total as P		175		87		320		115		106		87	
Total Inorg. Nitrogen, Dissolved		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Dilution Factor		1		1		1		1		1		1	
Total Inorganic Nitrogen, Dissolved		1,050	U	1,050	U	1,050	U	1,050	U	1,050	U	1,050	U

Q is the Qualifier Column with definitions as follows:
J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
U=analyte not detected at or above the level indicated

All Analytical Results for Surface Water Samples

See Appendix G for Laboratory Results